
BECRUX SOLAR PV FACILITY, MPUMALANGA PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME

January 2022

Prepared for

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

The following definitions and terminology may be applicable to this project and may occur in the report below:

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

Biodiversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Commissioning: Commissioning commences once construction is completed. Commissioning covers all activities including testing after all components of the wind turbine are installed.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per the EIA Regulations. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Development area: The development area is that identified area (located within the project site) where the Becrux Solar PV Facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints, and has been assessed within this BA Report and by the respective specialists. The development area is up to ~26.64ha in extent.

Development footprint: The development footprint is the defined area where the PV panel array and other associated infrastructure for the Becrux Solar PV Facility is planned to be constructed. This is the anticipated actual footprint of the facility, and the area which would be disturbed. The exact size of this area is subject to finalisation of the layout. However following initial layout optimisation is up to ~19.95ha.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that is made up of:

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Authorisation (EA): means the authorisation issued by a competent authority (Limpopo Department of Economic Development, Environment and Tourism) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

Environmental Assessment Practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental Control Officer (ECO): An individual appointed by the Developer prior to the commencement of any authorised activities, responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation

Environmental Impact: An action or series of actions that have an effect on the environment.

Environmental Impact Assessment (EIA): Environmental Impact Assessment, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.

Environmental Management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management Programme (EMPr): A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

Environmental Officer (EO): The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Incident: An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party (I&AP): Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method Statement: a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Project site: The project site is that identified area within which the development area and development footprint are located. It is the broader geographic area assessed as part of the BA process, within which direct effects of the proposed project may occur. The project site is ~433ha in extent.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Significant Impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Waste: Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Waste Amendment Act (as amended on June 2014); or any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the *Gazette*.

ABBREVIATIONS

The following abbreviations may be applicable to this project and may occur in the report below:

BA	Basic Assessment
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EO	Environmental Officer
GA	General Authorisation
ha	Hectare
HGM	Hydrogeomorphic
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
km	Kilometres
kV	Kilo Volt
LM	Local Municipality
m	Metres
m ²	Square metres
MDARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NHRA	National Heritage Resources Act
NWA	National Water Act
PV	Photovoltaic
SAHRA	South African National Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South Africa National Biodiversity Institute
SANS	South Africa National Standards
SDF	Spatial Development Framework
SHE	Safety, Health and Environment
SMME	Small, Medium and Micro Enterprise
VIA	Visual Impact Assessment
WUL	Water Use License

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CHAPTER 1: INTRODUCTION

This Environmental Management Programme (EMPr) has been compiled for the 19.99MW_{ac} Becrux Solar Photovoltaic (PV) Facility proposed by Becrux Solar PV Project One (Pty) Ltd. The PV facility is to be developed on Portion 6 of the Farm Goedehoop No. 290, located approximately 7km south-east of Secunda and 15km east of Embalenhle, within jurisdiction of the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in the Mpumalanga Province.

This EMPr has been developed on the basis of the findings of the Basic Assessment(BA), and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Becrux Solar PV Facility. The document must be adhered to and updated as relevant throughout the project life cycle. This document fulfils the requirement of the EIA Regulations, 2014, as amended, and forms part of the BA Report of the project.

In terms of the Duty of Care provision in S28(1) of NEMA, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, halted or minimised. The document must therefore be adhered to and updated as relevant throughout the project life cycle. In terms of the National Environmental Management Act (NEMA), it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.

CHAPTER 2: PROJECT DETAILS

Becrux Solar PV Project One (Pty) Ltd is proposing the development of a Solar PV Facility and associated infrastructure on Portion 6 of the Farm Goedehoop No. 290, located approximately 7km south-east of Secunda and 15km east of Embalenhle, within jurisdiction of the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in the Mpumalanga Province (refer to **Figure 2.1**).

The Solar PV Facility will have a contracted capacity of up to 19.99MW_{ac} and will use bi-facial panels with single axis tracking or fixed tilt systems to harness the solar resource on the project site. The purpose of the facility will be to generate electricity for exclusive use by Sasol Limited. Power generated at the facility will be delivered to Sasol Limited by feeding into the grid through a Wheeling Agreement signed with Eskom and/or direct embedded generation. The construction of the Solar PV Facility aims to reduce Sasol's dependence on direct supply from Eskom's national grid for operation purposes and demonstrate Sasol's move towards a greener future through procurement of renewable energy from Independent Power Producers (IPPs).

A development area of up to ~26.64ha and a development footprint of up to ~19.95ha have been identified within the project site (~433ha) by Becrux Solar PV Project One (Pty) Ltd for the development of the Becrux Solar PV Facility. Infrastructure associated with the Solar PV Facility will include the following:

- » Solar PV array comprising PV modules and mounting structures.
- » Inverters and transformers.
- » Cabling between the panels.
- » E-house containerised or non-containerised substation.
- » 11kV overhead power line for the distribution of the generated power, which will be connected to the existing Goedehoop Substation.
- » Laydown area.
- » Access gravel road (existing) and internal gravel roads (new).
- » Security booth, Operations & Maintenance building, workshop, storage area and site office.

To evacuate the generated power to Sasol Limited, an 11kV overhead power line will be established to connect the 11kV E-house containerised or non-containerised substation with a development footprint of up to 32m², to the existing Goedehoop Substation. A 170m wide and 400m long grid connection corridor has been identified for the assessment and placement of the overhead power line, which will provide for the avoidance of sensitive environment areas and features and allow for the micro-siting of the power line within the corridor.

A detailed description of the project site for the Becrux Solar PV Facility is provided in **Table 2.1** below.

Table 2.1: Detailed description of the Becrux Solar PV Facility project site

Province	Mpumalanga Province
District Municipality	Gert Sibande District Municipality
Local Municipality	Govan Mbeki Local Municipality
Ward number(s)	30
Nearest town(s) (measured from the centre of the project site)	Secunda (~7km south-east)

Affected Properties: Farm name(s), number(s) and portion numbers	Portion 6 of the Farm Goedehoop No. 290
SG 21 Digit Code (s)	TOIS0000000029000006
Current zoning and Land Use	Zoning: Mining/Industrial Land Use: Agriculture (non-irrigated)
Site co-ordinates (centre of development area)	26°34'17.67"S 29°13'11.66"E
Site co-ordinates (corner coordinates of development area)	Corner 1: 26°34'33.37"S; 29°13'5.48"E Corner 2: 26°34'5.98"S; 29°13'6.69"E Corner 3: 26°33'59.02"S; 29°13'4.31"E Corner 4: 26°34'4.98"S; 29°13'20.79"E Corner 5: 26°34'7.95"S; 29°13'18.98"E Corner 6: 26°34'8.58"S; 29°13'22.90"E Corner 7: 26°34'33.72"S; 29°13'9.12"E

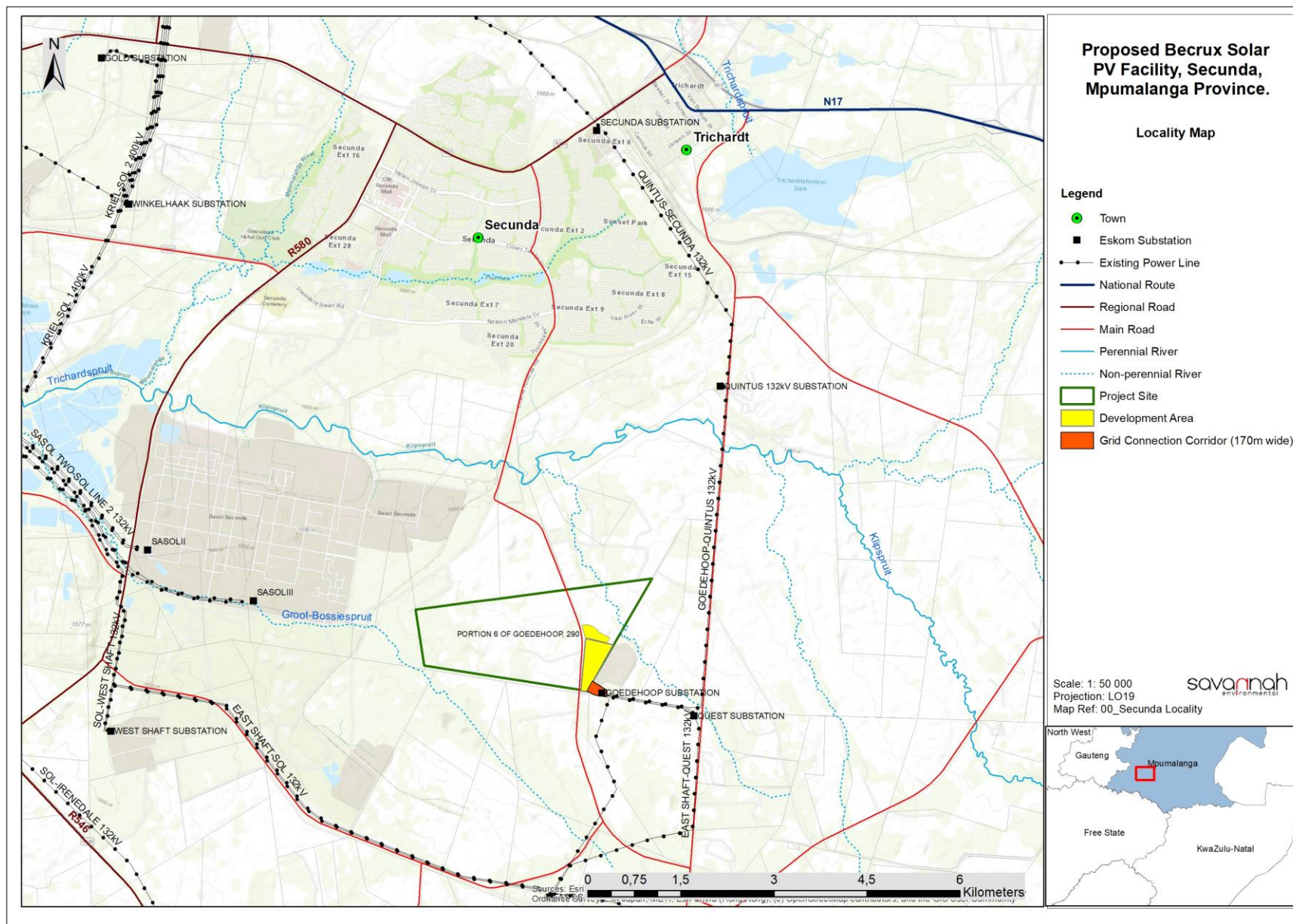


Figure 2.1: Locality map showing the location of the Becrux Solar PV Facility (refer to **Appendix A** for A3 map)

Table 2.2 provides the details and dimensions of typical infrastructure required for the Becrux Solar PV Facility

Table 2.2: Details or dimensions of typical infrastructure required for the Becrux Solar PV Facility

Infrastructure	Footprint and dimensions
Contracted capacity of the facility	Up to 19.99MW _{ac}
Development area	Up to ~26.64ha
Development footprint (permanent infrastructure area)	Up to ~19.95ha (including all associated infrastructure)
PV panels	<ul style="list-style-type: none"> » Height: ~2-3m from ground level (installed) » Up to 25 000 panels required » Bi-facial panels with single axis tracking or fixed tilt systems
Area occupied by the E-house containerized substation	Up to ~32m ²
Capacity of on-site collector substation	11kV
Grid connection	The proposed 11kV E-house containerized or non-containerized substation will be connected to the existing Goedehoop Substation via a new 11kV overhead power line. One grid connection corridor has been identified for the assessment and placement of the overhead power line. The grid connection corridor comprises a 170m wide and 400m long power line corridor to allow for avoidance of environmental sensitivities and suitable placement within the identified corridor.
Length of the power line	Up to ~400m
Capacity of the power line	11kV
Height of the power line towers (pylons)	Up to 20m
Temporary laydown area	~2000m ²
Security booth, O&M building, workshop, storage area and site office	~400m ²
Access and internal roads	An existing gravel road on the affected property will be utilised to access the development area. The access road is 8m wide and 50m in length. New gravel internal access roads will be established. The internal gravel access roads will be up to 6m wide, and 1km in total length.
Underground cabling	Underground cabling will be installed to connect the string inverters to the central inverters and the central inverters to the on-site facility substation. The cabling will have a capacity of up to 33kV.


2.1. Activities and components associated with the construction, operation and decommissioning of the Becrux Solar PV Facility

The main activities/components associated with the Becrux Solar PV Facility are detailed in **Table 2.2**.

Table 2.2: Details of the project development phases (i.e., construction, operation, and decommissioning)

<u>Pre-construction</u>	
Requirements	» Planning and design of facility
Activities to be undertaken	
Site preparation	<ul style="list-style-type: none"> » Confirming the integrity of site access to accommodate the required equipment. » Preparation of the site (e.g., laydown area). » Mobilisation of construction equipment.
Conduct surveys prior to construction	» Including, but not limited to a detailed geotechnical survey, site survey and confirmation of the infrastructure micro-siting footprint, survey of the security booth, O&M building, workshop, storage and site office areas to determine and confirm the locations of all associated infrastructure.
<u>Construction Phase</u>	
Requirements	<ul style="list-style-type: none"> » Project requires Environmental Authorisation from Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) and a wheeling agreement secured with Eskom. » Duration expected to be between 9 – 12 months for the Becrux Solar PV Facility. » Create direct construction employment opportunities: Up to 150 jobs (at peak of construction) created and maintained for approximately 9 – 12 months. » No on-site labour camps will be established. Employees to be accommodated in the nearby towns such as Secunda and transported to and from site on a daily basis. » Overnight on-site worker presence would be mostly limited to security staff. » Security staff will also be present during the night-time of the construction phase. » Waste - waste will be minimised, re-used, and recycled as far as practically possible. Where re-use and recycling is not possible, waste will be removed by a sub-contractor or the municipality, where possible, for disposal at a registered facility. Waste containers, including containers for hazardous waste, will be located at easily accessible locations on site when construction activities are undertaken. » <i>Sanitation</i> – during the construction phase, mobile chemical toilets or a conservancy tank will be placed within the development area for use by contractors. Alternatively employees may be requested to utilise existing ablution facilities in close proximity to the PV Facility. » <i>Electricity supply</i> - electricity required for construction activities will be available from Eskom distribution networks or the Client facilities in the area, back-up generators will be available on site as well. » <i>Water supply</i> – water will be required for the construction phase, which will be approximately 9.2m³/day for human consumption, washing of equipment, earthworks/dust suppression and civil works. Water will be sourced directly from the Sasol Facility or from a registered water services

		provider such as the municipality. The current preference is to source water directly from the neighbouring Sasol Facility (discussions are underway with Sasol regarding this option).
Activities to be undertaken		
Establishment of access roads to the site	of	<ul style="list-style-type: none"> » An existing gravel access road up to 8m in width and 50m in length will be utilised. » Internal access roads up 6m wide will be established within the site at the commencement of construction.
Undertake site preparation	site	<ul style="list-style-type: none"> » Include walk-through of all areas to be developed prior to construction to ensure no nests or fauna species (Species of Conservation Concern) are present in the area. » Including the clearance of vegetation at the footprint of each support structure, establishment of a laydown area, the establishment of internal access roads and excavations for foundations. » Stripping of topsoil to be stockpiled, backfilled, removed from site and/or spread on site. To be undertaken in a systematic manner to reduce the risk of exposed ground being subjected to erosion.
Establishment of laydown areas	of	<ul style="list-style-type: none"> » A laydown area for the storage of project components, including the PV panels and civil engineering construction equipment. » The laydown area will also accommodate building materials and equipment associated with the construction of buildings. » No onsite borrow pits will be required. Infilling or depositing materials will be sourced from licenced borrow pits within the surrounding areas.
Transport of components and equipment to and within the site	of and	<ul style="list-style-type: none"> » Transportation will take place via appropriate National and Provincial roads, and the dedicated access/haul road to the site. » Some of the components (i.e., substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989) by virtue of the dimensional limitations. » Typical civil engineering construction equipment will need to be brought to the site (e.g., excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures and site preparation.
Erect PV Panels		<ul style="list-style-type: none"> » Installation of the solar PV panels and the structural and electrical infrastructure to make the plant operational. » For array installation, typically vertical support posts/piles are driven into the ground. Depending on the results of the geotechnical investigation, a different foundation method may be required. Different options include a screw pile, helical pile, micro-pile or drilled post/pile which may or may not need to be cast in concrete underground at an appropriate depth as determined by the geotechnical investigation. The posts will hold the support structures (tables) on which PV arrays would be mounted. Brackets attach the PV modules to the tables. » Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. » Wire harnesses connect the PV modules to the electrical collection systems.

<p>Establishment of concrete platform and placement of the E-house containerized substation</p>	<p>» The E-house containerized or non-containerised substation will be assembled off-site and thereafter transported to site where it will be mounted on a concrete platform.</p> 
<p>Construction of overhead power line</p>	<p>Overhead power lines are constructed in the following simplified sequence:</p> <ul style="list-style-type: none"> » Step 1: Surveying of the development area, engaging with affected landowners, environmental specialist walkthroughs to inform permitting requirements and micro-siting of the pylon infrastructure. » Step 2: Final design and micro-siting of the infrastructure based on geo-technical, topographical conditions and identified environmental sensitivities. » Step 3: Search-and-rescue activities, vegetation clearance and construction of access roads/tracks (where required) and watercourse crossings (where required). » Step 4: Construction of tower foundations. » Step 5: Assembly and erection of infrastructure on site. » Step 6: Stringing of conductors. » Step 7: Rehabilitation of disturbed areas. » Step 8: Continued maintenance.
<p>Establishment of ancillary infrastructure</p>	<ul style="list-style-type: none"> » Operation and Maintenance buildings, including a security booth, workshop, storage area and site office. » Establishment will require levelling and the excavation of foundations prior to construction.
<p>Connection of PV facility to the E-house containerized substation</p>	<ul style="list-style-type: none"> » Underground cables and overhead circuits connect the string inverters to the on-site AC electrical infrastructure (central inverter) and ultimately the project's E-house containerized substation. » Excavation of trenches are required for the installation of the cables. Trenches will be approximately 1.2m deep. » Underground cables are planned to follow the internal access roads, as far as possible.
<p>Connect E-house containerized substation to the power grid</p>	<ul style="list-style-type: none"> » The proposed 11kV E-house containerized substation will be connected to the existing Goedehoop Substation via a new 11kV overhead power line.
<p>Undertake site rehabilitation</p>	<ul style="list-style-type: none"> » Commence with rehabilitation efforts once construction is completed in an area, and all construction equipment is removed. » On commissioning, access points to the site that will not be required for the operation phase will be closed and prepared for rehabilitation.

Operation Phase

Requirements	<ul style="list-style-type: none"> » Duration will be up to 25 years, or longer depending on the need for the project. » Requirements for security and maintenance of the facility. » Employment opportunities relating mainly to operation activities and maintenance. Up to 10 (full-time and temporary) employment opportunities will be available. » Waste - waste will be minimised, re-used, and recycled as far as practically possible. Where re-use and recycling is not possible, waste will be removed by a sub-contractor or the municipality, where possible, for disposal at a registered facility. Waste containers, including containers for hazardous waste, will be located at easily accessible locations on site when construction activities are undertaken. » Sanitation – during the operation phase, mobile chemical toilets or a conservancy tank will be placed within the development area for use by contractors. Alternatively employees may be requested to utilise existing ablution facilities in close proximity to the PV Facility. » Water supply – water will be required for the operation phase, which will be approximately 2.829m³/day for cleaning, fire control and general usage. Water will be sourced directly from the Sasol Facility or from a registered water services provider such as the municipality. The current preference is to source water directly from the neighbouring Sasol Facility (discussions are underway with Sasol regarding this option). » Current land-use activities (i.e., agriculture – cultivation) being undertaken within the development area will cease during the operation of the PV facility.
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Activities to be undertaken

Operation and maintenance	<ul style="list-style-type: none"> » Full time security, maintenance, and control room staff. » PV facility will be operational except under circumstances of mechanical breakdown, inclement weather conditions, or maintenance activities. » PV facility to be subject to periodic maintenance and inspection. » Disposal of waste products (e.g., oil and other lubricants, etc) in accordance with relevant waste management legislation. » Areas which were disturbed during the construction phase to be utilised should a laydown area be required during operation. » PV panels will be washed during operation utilising clean water or non-hazardous biodegradable cleaning products. Wastewater generated by washing can be allowed to run-off under the panels.
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Decommissioning Phase

Requirements	<ul style="list-style-type: none"> » Decommissioning of the Becrux Solar PV Facility infrastructure at the end of its economic life. » Potential for repowering of the facility, depending on the condition of the facility at the time. » Expected lifespan of up to 25 years (with maintenance) before decommissioning is required. » Decommissioning activities to comply with legislation relevant at the time.
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Activities to be undertaken

Site preparation	<ul style="list-style-type: none"> » Confirming the integrity of site access to accommodate the required equipment. » Preparation of the site (e.g., laydown area and construction platform). » Mobilisation of equipment required for decommissioning.
Disconnect, disassemble, and	<ul style="list-style-type: none"> » Disconnect the facility from the grid. » Dismantle all panels, mounting structures and foundations in line with all relevant legislation. » Recycle, repurpose and re-use as much of the decommissioned project components as possible in accordance with regulatory requirements.

remove solar facility
components

- » Concrete foundations will be removed to a depth as defined by an agricultural specialist.
- » Backfill the mounting structure holes and rehabilitate the area appropriately.
- » Visible cables will be removed.
- » A final site walkthrough will be conducted to remove debris and/or waste generated within the site during the decommissioning process.
- » Rehabilitation may include top soiling, raking, and/or re-seeding (whichever is appropriate).

2.2. Findings of the Basic Assessment (BA) and Identified Environmental Sensitivities

A Basic Assessment was undertaken for the proposed project in accordance with the requirements of the EIA Regulations, 2014 (as amended). The BA Report, together with the specialist studies contained within **Appendices D – I** of the BA Report provide a detailed assessment of the potential impacts that may result from the development of the Becrux Solar PV Facility.

No environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of features of high sensitivity within the project development footprint, as specified by the specialists.

The potential environmental impacts associated with Becrux Solar PV Facility identified and assessed through the BA process are summarised below:

- » Impacts on ecology, including flora, fauna and avifauna.
- » Impacts on aquatic ecology.
- » Impacts on land use, soils and agricultural potential.
- » Impacts on heritage resources, including archaeology and palaeontology.
- » Visual impacts on the area imposed by the components of the facility.
- » Positive and negative social impacts.

As part of the specialist investigations undertaken within the project development area, specific environmental sensitivities were identified. The following sections provide a summary of the findings of the BA Report and a description of the environmental sensitivities identified within the development area:

2.2.1. Ecology (including flora, fauna and avifauna)

The Becrux Solar PV Facility falls within the Soweto Highveld Grassland vegetation type. No plant species protected in terms of the Mpumalanga Biodiversity Conservation Act (No.10 of 1998) and the National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA) were recorded during the field survey of the development area. In addition, no tree species protected in terms of the National Forest Act (No. 84 of 1998) were identified on site.

The development area was superimposed on the Mpumalanga Biodiversity Sector Plan and was found to fall within a site classified as heavily modified. In terms of ecosystem threat status and protection level, the proposed project overlaps with a vulnerable ecosystem and falls within an area that is categorised as "Not Protected".

The development area partially overlaps with a National Protected Area Expansion Strategy (NPAES) focus area but does not overlap with any Mpumalanga Protected Areas Expansion Strategy (MPAES) areas. However, the development area is located in proximity to an MPAES area. No formally protected or conservation areas in terms of the National Environmental Management: Protected Areas Act (No. 57 of 2003) (NEM:PAA) were identified within the development area.

Three main habitats were identified and delineated within the development area, namely drainage lines, wetlands and transformed grassland. All habitats within the development area were allocated a sensitivity category using the guidelines for interpreting site ecological importance in the context of the proposed development activities. According to these guidelines, the wetlands are regarded as being of high ecological sensitivity; the drainage lines have a low ecological sensitivity rating; and the modified grassland is considered to be of very low ecological sensitivity.

Areas rated as High sensitivity and their buffers in proximity to the development area should be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas.

No mammal, reptile, and amphibian species of conservation concern were recorded during the survey period for the development area. Twenty-one (21) avifauna species were recorded in the project area during the survey based on either direct observation, vocalisations, or the presence of visual tracks and signs. None of the species recorded in the project area are considered as species of conservation concern.

Based on the development footprint for the Becrux Solar PV Facility, no project infrastructure is expected to have a significant impact on the vulnerable ecosystem and Protected Areas Expansion Strategy focus area as these have been found to be modified. No faunal species of significance were observed, which further reduced the impact significance of the development on terrestrial biodiversity. Historically, agriculture and the current land use (i.e., non-irrigated agriculture) has led to the deterioration of these habitats and as such, the classification of development area as heavily modified area is corroborated.

Considering that this area has been identified as being of low significance for biodiversity maintenance and ecological processes, impacts are expected to be of low significance and the specialist has recommended that development may proceed. All mitigation measures prescribed must be considered by the competent authority for authorisation and included in the project Environmental Management Programme (EMPr). No fatal flaws are evident for the proposed project and there are no terrestrial ecological considerations that should prevent it from proceeding.

2.2.2. Aquatic Ecology

A total of seven (7) wetland systems were identified and delineated within the 500m regulated area surrounding the development area, three (3) of which could potentially be impacted upon (either directly or indirectly) by the proposed activities i.e., HGM 1, 2 and 3. The seven wetland systems comprised both natural and artificial systems. HGM 1, 2 and 3 are classified as natural systems.

Overall, HGM 1, 2 and 3 scored Intermediate in terms of wetland ecosystem systems. It should however be noted that HGM 2 scored considerably higher indirect benefits than HGM 1 and 3. The overall Present Ecological State (PES) for HGM 1 and 3 has been calculated to be "Seriously Modified", with HGM 2 being scored "Largely Modified".

The Ecological Importance and Sensitivity (EIS) of the units was determined to be High for HGM 3 and Moderate for the HGM 1 and HGM 2. A 22m buffer has been recommended around the delineated wetland units.

A risk assessment was conducted, in accordance with the requirements of GN 509, published in the Government Gazette (no. 40229) under Section 39 of the NWA in August 2016. The GN 509 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a GA, as opposed to a full WULA.

Two post-mitigation scenarios have been considered for this risk assessment, namely avoidance of the wetland buffers and impedence into the wetland buffers. The findings of the risk assessment indicate that various aspects scored "Moderate" pre-mitigation significance ratings. Considering the scenario where the applicant adheres to the buffer zones, all of the post-mitigation significance ratings are expected to be decreased to "Low". In the event that the buffers are impeded on, some of the aspects are expected to still be associated with "Moderate" post-mitigation significance ratings.

Should the 22m buffer zone be impeded on, the first and second steps in the mitigation hierarchy (avoidance and minimising impacts) cannot be met. Therefore, the third step in the mitigation hierarchy (rehabilitation) will need to be implemented. It should be noted that the 22m buffer can only be impeded on up to the 10m mark (therefore 12m from the edge of the buffer) to avoid direct impacts to the wetland.

As part of the impact assessment results, it has been determined that all risks posed by the proposed activities are characterised by "Low" post-mitigation significance ratings. Considering these findings, it is the specialist's opinion that the proposed activities can be favourably considered on condition that all mitigations measures be implemented, including the adherence to the 22m buffer zone.

In terms of water use authorisation, proceeding with the proposed activities and avoiding the wetland buffer zone will constitute "Low" post-mitigation significance ratings, ultimately only requiring general authorisation. By impeding into the buffer zones, a water use license will be required with the condition of rehabilitation (i.e., rehabilitating HGM1 and 2 to "Largely Modified" after construction).

2.2.3. Land Use, Soil and Agricultural Potential

Various soil forms were identified within the Becrux Solar PV Facility development area, namely, Glenrosa, Deep Arcadia, Shallow Arcadia, Darnall and Rensburg. These soils forms have been divided into six main land capability classes according to depth, texture, hydromorphic properties etc. (namely land capability class I, II, III, IV, V and VI). These land capability classes range from a "Low" to a "High" sensitivity, which concurs with the findings from the DFFE Screening Tool. From these six classes as well as the poor climatic capability of "C7"¹, four land potential levels were calculated, namely land potential 3, 5, 6 and "vlei". Therefore, the overall land potential is considered to be "Moderate" to "Low".

Two classes of land capability sensitivity are located within the development area, namely "Moderate" and "High", which concurs with the findings from the Department of Forestry, Fisheries and the Environment (DFFE) screening tool report. No no-go areas have been identified and no buffers have been recommended.

Considering the low post-mitigation significance ratings for all the aspects and phases, it is the specialist's opinion that no significant impacts towards the land capability resources are foreseen. Thus, the proposed development should be considered favourably by the relevant Competent Authority provided the recommended mitigation measures are implemented.

¹ Severe to Very Severe - Severely restricted choice of crops due to heat and moisture stress.

2.2.4. Heritage Resources (archaeology and palaeontology)

During the survey of the Becrux Solar PV Facility, no significant archaeological resources were identified. According to the SAHRIS Palaeosensitivity Map, the PV Facility is underlain by sediments of zero and very high palaeontological sensitivity. The palaeontologically sensitive geology of the area is ascribed to the Vryheid Formation of the Ecca Group of sediments. While the sediments underlying the development area have high levels of palaeontological sensitivity, the nature of the excavations associated with PV facilities tends to be shallow (<3m) and as such, the likelihood of impacting intact Vryheid Formation sediments is low. From a heritage perspective, no no-go areas have been identified and no buffers have been recommended for the PV facility. In addition, the footprint is currently being utilised for non-irrigated agricultural activities and as such, it is unlikely that any palaeontological resources will be encountered during excavations. However, given the very high palaeontological sensitivity of the development area, the specialists recommended that a Chance Fossil Finds Procedure be implemented during the course of construction activities.

The overall impact of the Becrux Solar PV Facility on the identified heritage resources is considered as acceptable after the recommendations below have been implemented:

- » The mitigation measures articulated in the VIA (2021) completed for this project are implemented.
- » The Chance Fossil Finds Procedure is implemented during the course of construction activities.
- » Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.

Impacts on heritage resources can be mitigated to acceptable levels allowing for the development to be authorised.

2.2.5. Visual

Potentially sensitive visual receptors were identified within 1km, 1-3km, 3-6km and beyond 6km of the proposed development area. Impacts on receptors within a 1km radius of the PV facility are likely to be of very high magnitude. Visual receptors within a 1km radius of the PV facility include observers travelling along Secunda secondary road. Impacts on receptors within a 1-3km radius from the PV facility are expected to be of high magnitude. Visual receptors within a 1-3km radius of the PV facility include residents of/visitors to Goedeheop (north), Vlakspruit (north-east), and Vlakspruit (east). The PV facility may have a moderate visual impact on receptors within a 3-6km radius of the facility. Visual receptors within a 3-6km radius include residents of/or visitors to Secunda (outlying), Goedeheop (far north), Vlakspruit (south-east), and Bossiespruit. Receptors beyond 6km are expected to have a low potential visual impact. No no-go areas have been identified and no buffers have been recommended from a visual perspective.

The anticipated visual impacts identified and assessed in the Visual Impact Assessment range from **moderate** to **low** significance. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed PV facility. This impact is primarily applicable to the individual Becrux PV facility, and no cumulative visual impacts are expected.

Considering all factors, it is recommended by the specialist that the development of the facility as proposed be supported; subject to the implementation of the recommended mitigation measures and management programme included in the VIA.

2.2.6. Social

Impacts are expected to occur with the development of the Becrux Solar PV Facility during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive and negative impacts during construction include:

- » Direct employment opportunities
- » Economic multiplier effects
- » Influx of jobseekers and change in population
- » Safety and security impacts
- » Impacts on daily living and movement patterns
- » Nuisance impacts, including noise and dust
- » Visual impacts and impacts on the sense of place

Positive and negative impacts during operation include:

- » Direct employment opportunities
- » Development of clean, renewable energy infrastructure
- » Visual impact and impact on sense of place
- » Impacts associated with the loss of agricultural land

Sensitive receptors from a social perspective are similar to those identified from a visual perspective, as detailed above. No no-go areas have been identified and no buffers have been recommended from a social perspective.

From a social perspective, it is concluded by the specialist that the project is supported, but that mitigation measures should be implemented and adhered to. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws, and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings can be made:

- » The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focussed on the construction of PV facilities (these relate to influx of non-local workforce and jobseekers, intrusion and disturbance impacts, safety and security) and could be reduced with the implementation of the mitigation measures proposed.
- » Employment opportunities will be created in the construction and operation phase and the impact is rated as positive even if only a small number of individuals benefit in this regard.
- » The proposed project could assist the local economy in creating entrepreneurial development, especially if local business could be involved in the provision of general material and services during the construction and operational phases.
- » Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.

- » The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

The proposed Becrux Solar PV Facility and associated infrastructure is unlikely to result in permanent damaging social impacts. From a social perspective, it is concluded that the project should be developed subject to the implementation of the recommended mitigation measures and management actions contained in the Social Impact Assessment.

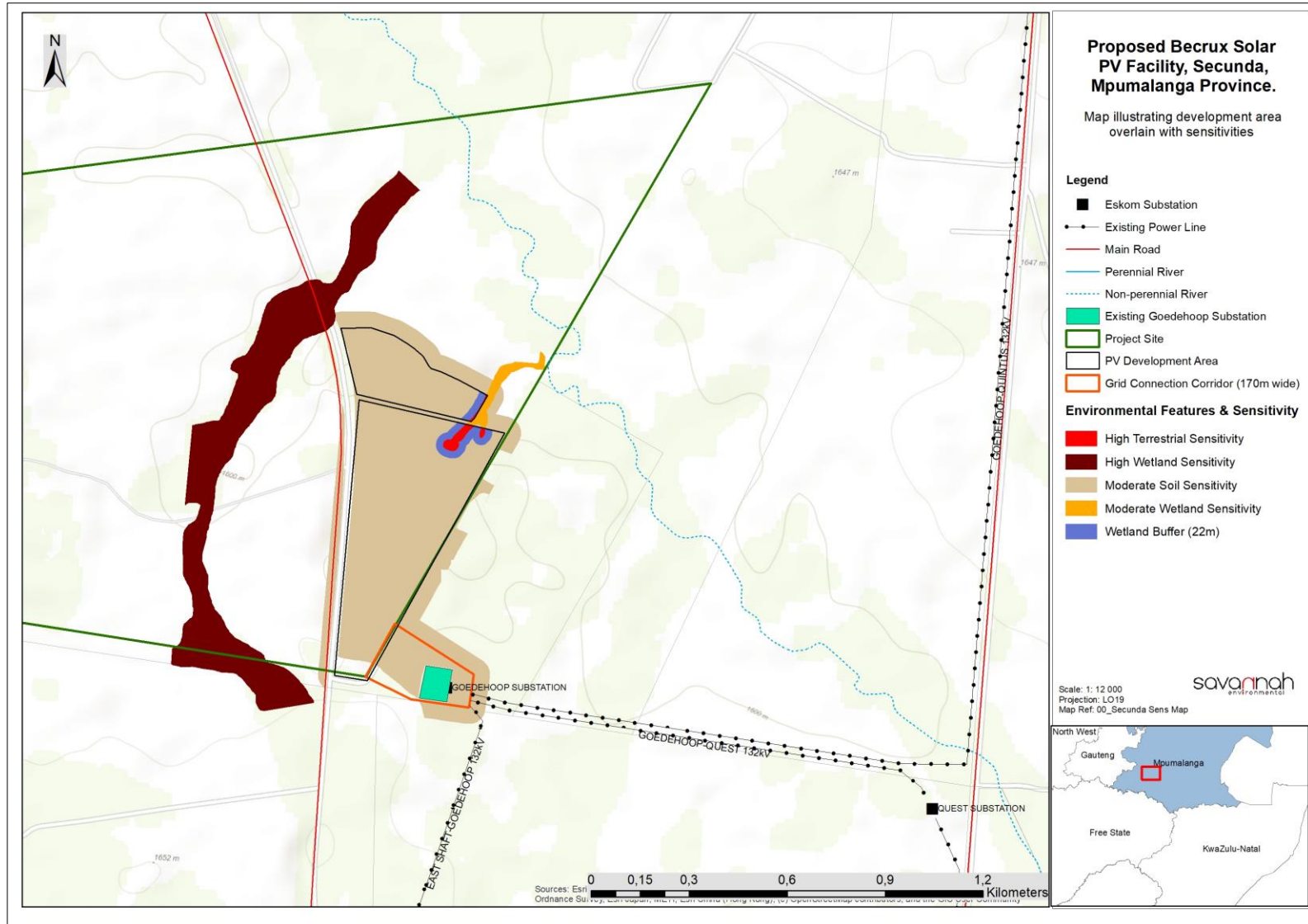


Figure 2.2: The development area for the Becrux Solar PV Facility, as assessed, overlain with the relevant environmental sensitivities (refer to **Appendix A** for A3 map)

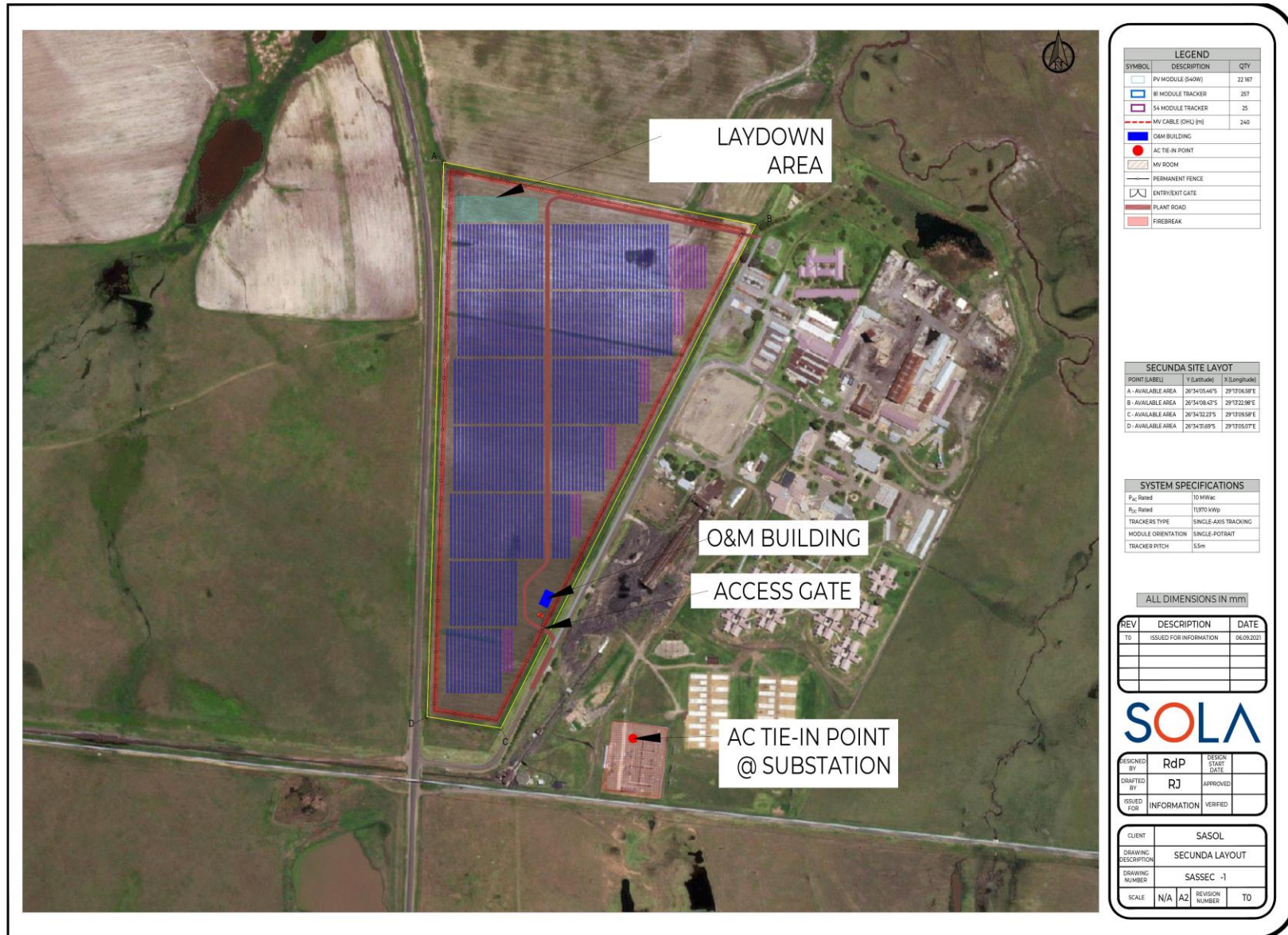


Figure 2.3: Layout for the Becrux Solar PV Facility considered within this BA Report (refer to **Appendix A** for A3 map)

2.3. Optimisation of the Layout

The development footprint, as assessed, has been overlain with the relevant environmental sensitivities in **Figure 2.2**. HGM 1 and 2, including their associated 22m buffer, are located within the proposed development footprint as illustrated in **Figure 2.2**. These wetland systems are regarded to be of high terrestrial sensitivity and have been classified as no-go areas from an ecological perspective. To ensure avoidance of these sensitive environmental features, the facility layout has been optimised by the project developer as illustrated in **Figure 2.4**.

This approach ensures the application of the mitigation hierarchy (i.e., avoid, minimise, mitigate and offset) to the Becrux Solar PV project, which ultimately ensures the avoidance, reduction and/or mitigation of all identified detrimental or adverse impacts on sensitive features as far as possible. The optimised facility layout is recommended as the preferred layout for implementation (refer to **Figure 2.5**).

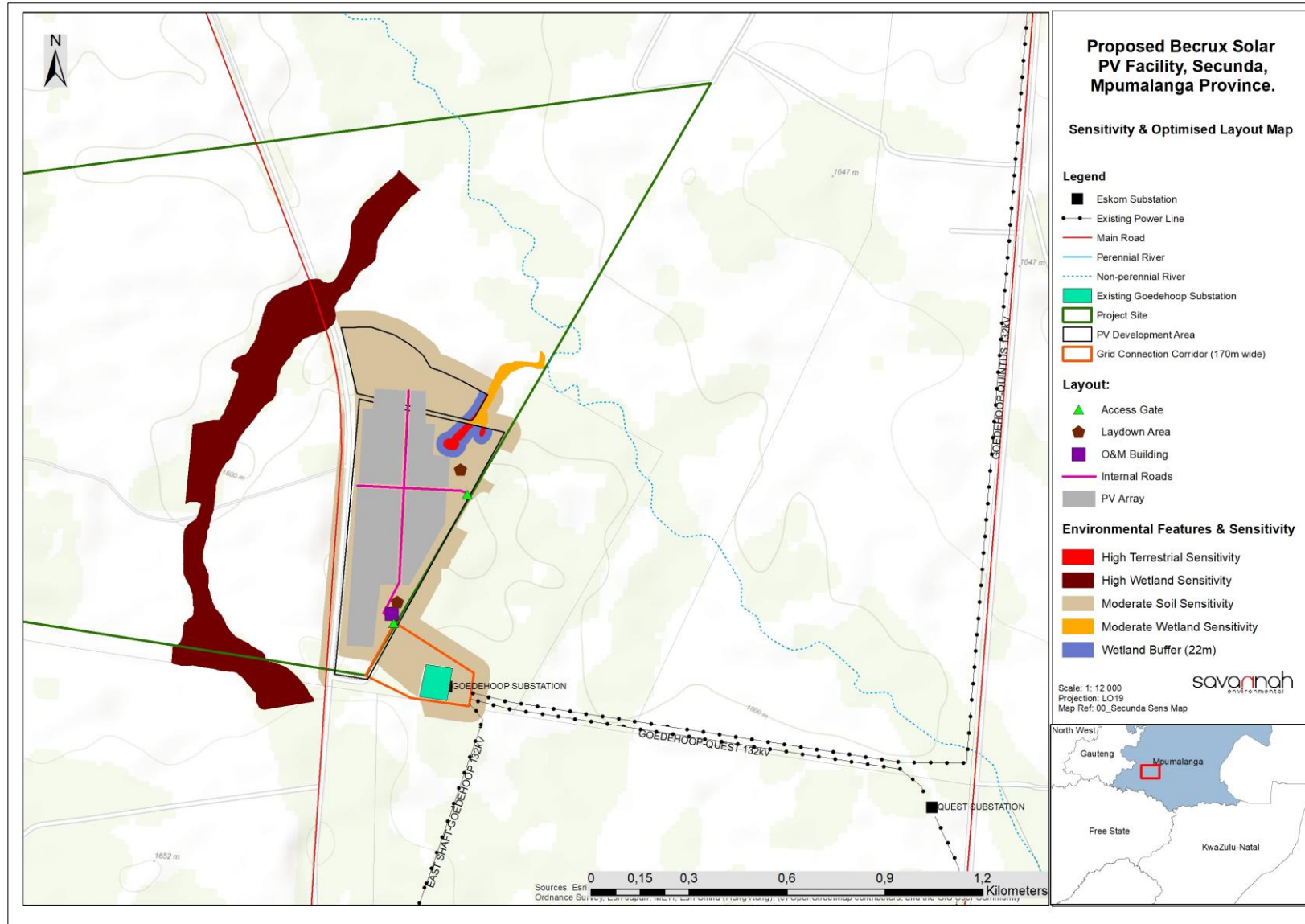


Figure 2.4: Final preferred (optimised) layout for the Becrux Solar PV Facility overlain with the relevant environmental sensitivities (refer to **Appendix A** for A3 map)

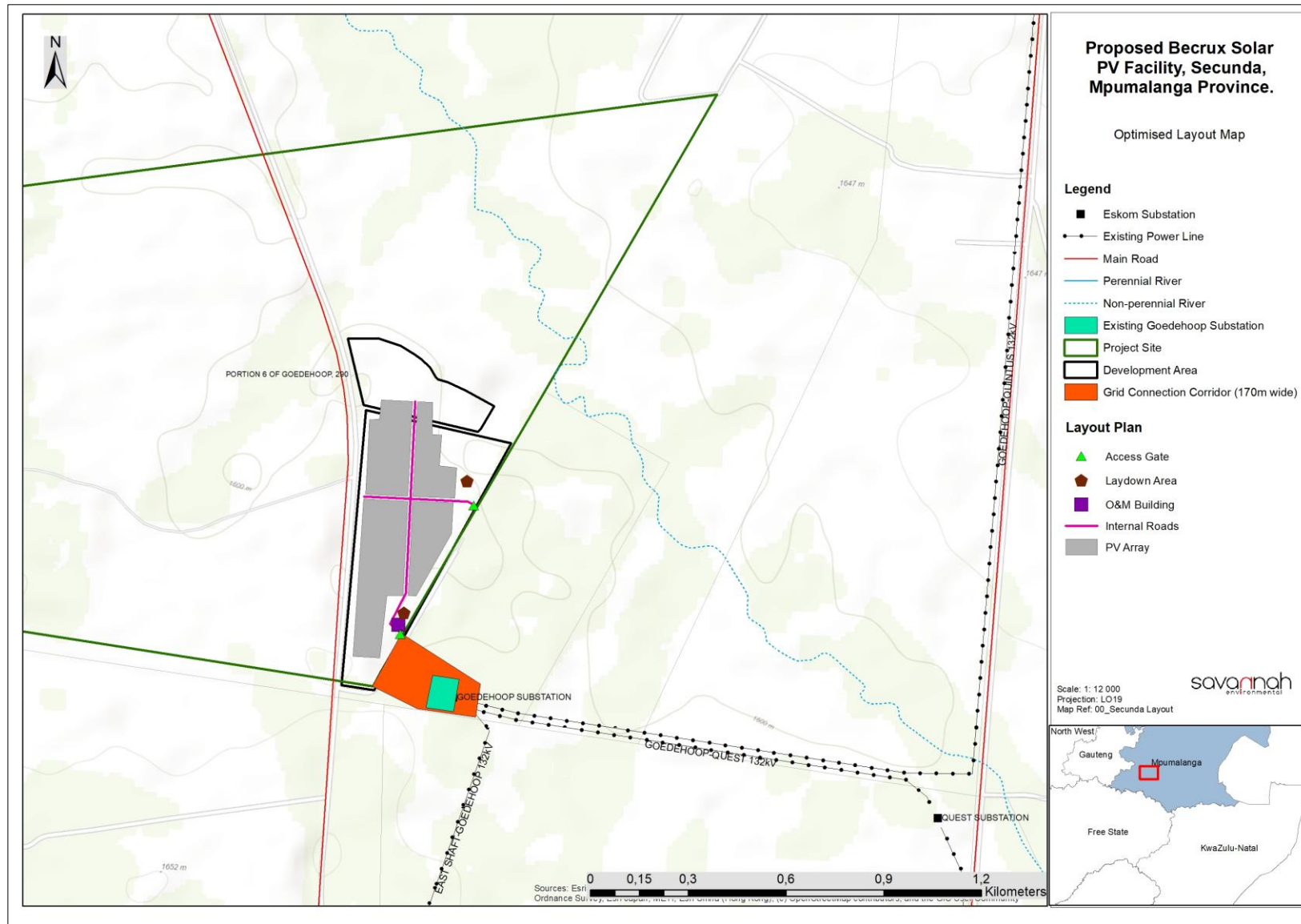


Figure 2.5: Final preferred (optimised) layout for the Becrux Solar PV Facility considered to be acceptable for development and proposed for authorisation (refer to **Appendix A** for A3 map)

2.4. Overall Conclusion (Impact Statement)

A technically viable development area for the project was proposed by Becrux Solar PV Project One (Pty) Ltd and assessed as part of the BA process. The environmental assessment of the development area was undertaken by independent specialists and their findings have informed the results of this BA Report. Becrux Solar PV Project One (Pty) Ltd has proposed a technically viable layout for the project and associated infrastructure, which has been assessed as part of the independent specialist studies. The Specialists considered desktop data, results from field work, existing literature and the National Web-based Environmental Screening Tool to inform the identification of sensitivities.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of the project.

From an ecological perspective, the site is located outside any Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and formally protected or conservation areas. The proposed development area does however overlap a vulnerable ecosystem and an NPAES focus area. Three habitats, namely, a wetland, drainage lines and transformed grassland were identified within the development area. Only the wetland is regarded to be of high ecological sensitivity and has been declared as a no-go area for development, including its associated 22m buffer. No faunal component of significance was observed, which further reduced the impact significance of the development on terrestrial biodiversity. Overall, there are no specific long-term impacts likely to be associated with the development of the Becrux Solar PV Facility that cannot be reduced to a low significance. There are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

From an aquatic perspective, a total of seven (7) wetland systems were identified and delineated within the 500m regulated area surrounding the development area, three (3) of which could potentially be impacted upon (either directly or indirectly) by the proposed activities (i.e., HGM 1, 2 and 3). The Ecological Importance and Sensitivity (EIS) of these units was determined to be High for HGM 3 and Moderate for the HGM 1 and HGM 2 and a 22m buffer has been recommended around these wetland systems.

From a soils perspective, two classes of land capability sensitivity were found to be located within the development area, namely "Moderate" and "High". No no-go areas have been identified and no buffers have been recommended from a soils perspective.

No sensitivities were identified from a heritage perspective. Visual receptors that are likely to experience very high and high visual impacts as a result of the PV facility structures were identified within a 1km and 1-3km radius of the PV facility. Overall, the post mitigation significance of the visual impacts is expected to range from moderate to low.

The Social Impact Assessment has identified short-term (construction related) impact indicators and operational related social impact indicators. The assessment of the proposed facility, and its net effect from a social perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment.

As detailed in the cost-benefit analysis, the benefits of the Becrux Solar PV Facility are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been

largely limited through the appropriate placement of infrastructure in the development area within medium and low sensitive areas, and through the avoidance of features and areas considered to be of very high and high sensitivity, the benefits of the project are expected to partially offset the localised environmental costs of the PV facility.

Based on the conclusions of the specialist studies undertaken, it can be concluded that the development of the Becrux Solar PV Facility based on the current layout as provided by the developer will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

2.5. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer within the development area, the avoidance of the sensitive environmental features within the development area, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Becrux Solar PV Facility is acceptable within the landscape and can reasonably be authorised. The proposed optimised layout as provided by the developer (**Figure 2.3**) is considered to be the most appropriate from an environmental perspective as it avoids identified sensitivities and recommended buffer areas.

The following infrastructure would be included within an authorisation issued for the project:

- » Solar PV array comprising PV modules and mounting structures.
- » Inverters and transformers.
- » Cabling between the panels.
- » E-house containerised or non-containerised substation.
- » 11kV overhead power line for the distribution of the generated power, which will be connected to the existing Goedehoop Substation.
- » Laydown area.
- » Access gravel road (existing) and internal gravel roads (new).
- » Security booth, Operations & Maintenance building, workshop, storage area and site office.

CHAPTER 3 : PURPOSE AND OBJECTIVES OF THE EMPr

An EMPr is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced”. The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (site clearing and site establishment) through to those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site rehabilitation (soil stabilisation, re-vegetation) and operation. The EMPr also defines monitoring requirements in order to ensure that the specified objectives are met.

This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Becrux Solar PV Facility. The document must be adhered to and updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations, 2014 (as amended). This is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the Becrux Solar PV Facility/or as the project develops. This will ensure that the construction and operation activities are planned and implemented taking sensitive environmental features into account. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

The EMPr has the following objectives:

- » Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the Becrux Solar PV Facility.
- » Ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » Identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- » Propose mechanisms and frequency for monitoring compliance, and prevent long-term or permanent environmental degradation.
- » Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the BA process.

The mitigation measures identified within the BA process are systematically addressed in the EMPr, ensuring the minimisation of adverse environmental impacts to an acceptable level.

The Developer must ensure that the implementation of the project complies with the requirements of all Environmental Authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and implementation of this EMPr, and through its integration into the relevant contract documentation provided to parties responsible for construction and/or operation activities on the site. Since this EMPr is part of the BA process for the Becrux Solar PV Facility, it is important that this document be read in conjunction with the BA Report compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the Environmental Authorisation, the stipulations in the Environmental Authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

This EMPr shall be binding on all the parties involved in the planning, construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project. The document must be adhered to and updated as relevant throughout the project life cycle.

CHAPTER 4: STRUCTURE OF THIS EMPR

The preceding chapters provide background to the EMPr and the Becrux Solar PV Facility, while the chapters which follow consider the following:

- » Planning and design activities;
- » Construction activities;
- » Operation activities; and
- » Decommissioning activities.

These chapters set out the procedures necessary for the project owner to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation for the project, an overarching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management programme has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental objective. The information provided within the EMPr table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the BA specialist studies

Project Component/s	List of project components affecting the objective, i.e.: <ul style="list-style-type: none"> » PV panels. » Access roads. » Associated infrastructure.
Potential Impact	Brief description of potential environmental impact if objective is not met.
Activity/Risk Source	Description of activities which could affect achieving the objective.
Mitigation: Target/Objective	Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management programme.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

- » Planned activities change (i.e. in terms of the components and/or layout of the facility).
- » Modification to or addition to environmental objectives and targets.
- » Additional or unforeseen environmental impacts are identified and additional measures are required to be included in the EMPr to prevent deterioration or further deterioration of the environment.
- » Relevant legal or other requirements are changed or introduced.
- » Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

4.1 Contents of this Environmental Management Programme

This EMPr has been prepared as part of the BA process being conducted in support of the application for Environmental Authorisation (EA) for the Becrux Solar PV Facility. This EMPr has been prepared in accordance with the requirements as contained in Appendix 4 of the 2014 EIA Regulations, as amended (GNR 326). It provides recommended management and mitigation measures with which to minimise impacts and enhance benefits associated with the project.

An overview of the contents of this EMPr, as prescribed by Appendix 4 of the 2014 EIA Regulations (GNR 326), and where the corresponding information can be found within this EMPr is provided in Table 4.1.

Table 4.1: Summary of where the requirements of Appendix 4 of the 2014 NEMA EIA Regulations (GNR 326) are provided in this EMPr.

Requirement	Location in this EMPr
(1) An EMPr must comply with section 24N of the Act and include –	
(a) Details of –	Chapter 4 Appendix I
(i) The EAP who prepared the EMPr.	
(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.	Chapter 2
(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.	Chapter 2 Figure 2.2 Figure 2.4 Appendix A
(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.	Chapter 6
(ii) Pre-construction activities.	Chapter 6
(iii) Construction activities.	Chapter 7
(iv) Rehabilitation of the environment after construction and where applicable post closure.	Chapter 8
(v) Where relevant, operation activities.	Chapter 9
(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.	Chapters 6 - 9
(ii) Comply with any prescribed environmental management standards or practices.	

Requirement	Location in this EMPr
(iii) Comply with any applicable provisions of the Act regarding closure, where applicable.	
(iv) Comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable.	
(g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 6 - 9
(h) The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 6 - 9
(i) An indication of the persons who will be responsible for the implementation of the impact management actions.	Chapters 6 - 9
(j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented.	Chapters 6 - 9
(k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f).	Chapters 6 - 9
(l) A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations.	Chapter 7
(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. (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment.	Chapter 7
(n) Any specific information that may be required by the competent authority.	Table 4.1
(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

4.2 Project Team

In accordance with Regulation 12 of the 2014 EIA Regulations, as amended, (GNR 326), the Applicant appointed Savannah Environmental (Pty) Ltd as the independent environmental consultant responsible for managing the application for EA and the supporting BA process. The application for EA and the BA process, is being managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), and all other relevant applicable legislation.

4.2.1 Details and Expertise of the Environmental Assessment Practitioner (EAP)

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned), and is rated as a Level 2 Broad-based Black Economic Empowerment (B-BBEE) Contributor. Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 13 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development.

The project team responsible for this BA process include:

- » **Mmakoena Mmola** holds a B.Sc. Honours in Geochemistry from the University of the Witwatersrand and 4 years of experience in the environmental management field. Her key focus is on undertaking

environmental impact assessments, environmental permitting and authorisations, compliance auditing, public participation, and environmental management programmes. She is registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP), Registration Number: 126748.

- » **Tebogo Mapinga** an experienced professional with 14 years across the fields of environment and permitting in both the public and the private sector. She holds a B.Sc. Degree (Majoring in Physiology and Zoology) from the University of Limpopo (Turfloop Campus). Her competencies lie in Environmental Impact Assessments, Basic Assessments, Environmental Screening, Environmental Management Plans, compliance monitoring and obtaining permits for small- and large-scale projects. She is a member of the International Association for Impact Assessments (IAIA) and is a registered Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP).
- » **Lehlogonolo Mashego** holds an M.Sc. in Environmental Science as obtained from the University of Witwatersrand. She is a Gauteng Branch Committee Member for International Association for Impact Assessment South Africa (IAIASA) facilitating the students and young professionals division. She has 5 years of professional working experience in the public participation field; specializing in overall public facilitation, stakeholder engagement, public awareness, stakeholder liaison and project administration. She is responsible for project management of public involvement participation processes for a wide range of projects across South Africa in industries which include but not limited to mining, renewable energy, infrastructure and recreation. Through her role as an environmental practitioner, she has facilitated a range of Screening Assessments, Basic Assessments, Scoping and Environmental Impact Assessments, Environmental Auditing and Environmental Training.

Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 15 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development, and therefore have extensive knowledge and experience in EIAs and environmental management, having managed and drafted EMPs for numerous other power generation projects throughout South Africa.

4.2.2 Details of the Specialist Consultants

A number of independent specialist consultants have been appointed as part of the BA project team in order to adequately identify and assess potential impacts associated with the project (refer to **Table 4.2**). The specialist consultants have provided input into the BA Report as well as this EMP.

Table 4.2: Specialist consultants which form part of the BA project team.

Specialist	Specialist Study
Lindi Steyn and Martinus Erasmus of The Biodiversity Company	Terrestrial Ecology Impact Assessment
Ivan Baker of The Biodiversity Company	Pedology Impact Assessment
Ivan Baker of The Biodiversity Company	Wetland Impact Assessment
Jenna Lavin and Nicholas Wiltshire of CTS Heritage	Heritage Impact Assessment
Lourens du Plessis of LOGIS	Visual Impact Assessment
Nondumiso Bulunga of Savannah Environmental (Pty) Ltd	Social Impact Assessment

CHAPTER 5: ROLES AND RESPONSIBILITIES

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to the overall implementation of the EMPr

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Technical Director/Manager, Site Manager, Internal Environmental Officer, Safety and Health Representative, Independent Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. Formal responsibilities are necessary to ensure that key procedures are executed. **Figure 5.1** provides an organogram indicating the organisational structure for the implementation of the EMPr.

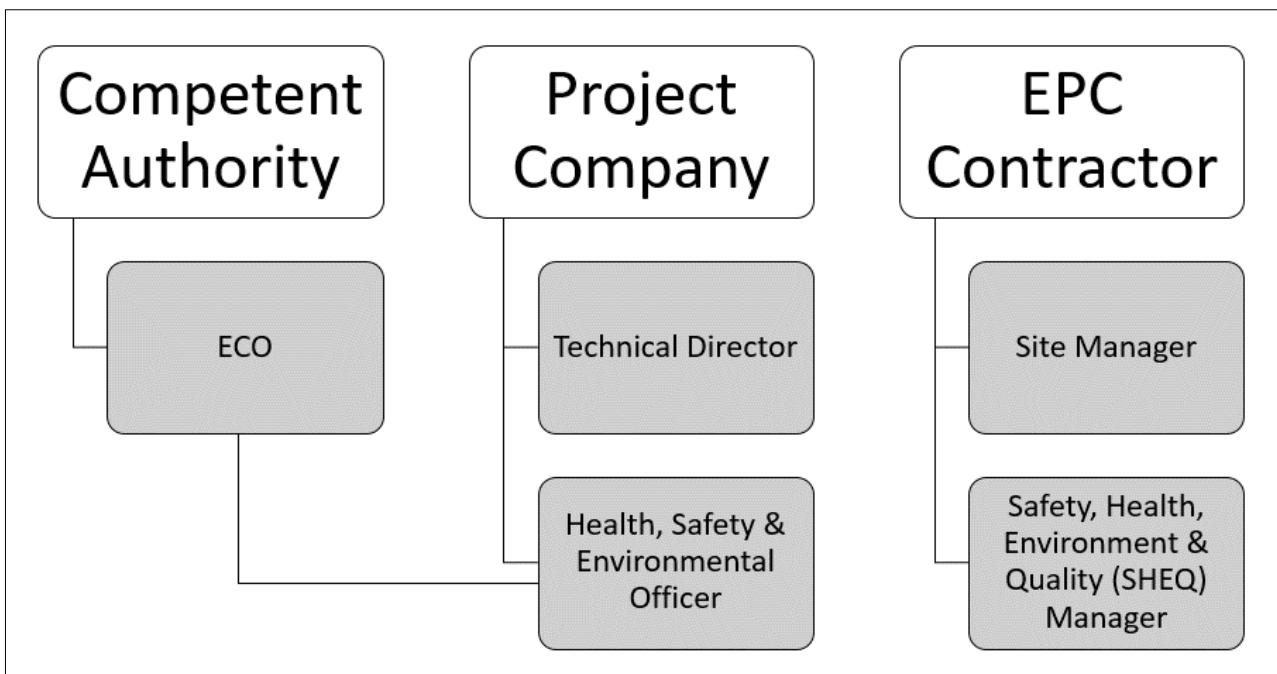


Figure 6.1: Organisational structure for the implementation of the EMPr

i) The Developer

As the Proponent, Becrux Solar PV Project One (Pty) Ltd, must ensure that the implementation of the project complies with the requirements of all environmental authorisations and all other permits, and obligations emanating from other relevant environmental legislation.

ii) Construction Manager

The Construction Manager will:

- » Ensure all specifications and legal constraints, specifically with regards to the environment, are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that the Developer and its Contractor(s) are made aware of all stipulations within the EMPr.

- » Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes through input from the independent ECO.
- » Be fully conversant with the BA for the project, the EMPr, the conditions of the Environmental Authorisation, and all relevant environmental legislation.
- » Be fully knowledgeable with the contents of all relevant licences and permits.

iii) Site Manager

The Project Manager/Site Manager is responsible for overall management of project and EMPr implementation. The following tasks will fall within his/her responsibilities:

- » Be fully conversant with the BA for the project, the EMPr, the conditions of the EA (once issued), and all relevant environmental legislation.
- » Be fully knowledgeable with the contents of all relevant licences and permits.
- » Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures.
- » Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Monitor site activities on a daily basis for compliance.
- » Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This must be documented as part of the site meeting minutes.
- » Conduct internal audits of the construction site against the EMPr.
- » Confine the construction site to the demarcated area.
- » Rectify transgressions through the implementation of corrective action.

iv) Environmental Control Officer

A suitably qualified Environmental Control Officer (ECO)² must be appointed by the project proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- » Be fully knowledgeable of the contents of the BA.
- » Be fully knowledgeable of the contents of the conditions of the EA (once issued).
- » Be fully knowledgeable of the contents of the EMPr.
- » Be fully knowledgeable of all the licences and permits issued to the site.
- » Be fully knowledgeable of the contents of all relevant environmental legislation.
- » Ensure that the contents of the EMPr are communicated to the Contractors site staff and that the Site Manager and Contractors are constantly made aware of the contents through ongoing discussion.
- » Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements or site-specific plans.

² The ECO should have a relevant degree or technical diploma in environmental management and at least 2 years of experience in the field.

- » Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing).
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Keep records of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- » Independently report to the Mpumalanga DARDLEA in terms of compliance with the specifications of the EMPr and conditions of the EA (once issued).
- » Keep records of all reports submitted to the Mpumalanga DARDLEA.

The ECO must be present full-time on site for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, to facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter, monthly compliance audits can be undertaken, provided that adequate compliance with the EA, environmental permits and EMPr is achieved. The developer must appoint a designated Environmental Officer (EO) to be present on-site to deal with any environmental issues as they arise. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

v) Contractors

The Lead Contractor is responsible for the following:

- » Ensure compliance with the EA, environmental permits and the EMPr at all times during construction.
- » Have the overall responsibility of the EMPr and its implementation.
- » Ensure that all appointed contractors and sub-contractors are aware of the EMPr and their respective responsibilities.
- » Provide all necessary supervision during the execution of the project.
- » Comply with any special conditions as stipulated by landowners.
- » Inform and educate all employees about the environmental risks associated with the various activities to be undertaken, and highlight those activities which must be avoided during the construction process in order to minimise significant impacts to the environment.
- » Maintain an environmental register which keeps a record of all incidents which occur on the site during construction. These incidents include:
 - * Public involvement / complaints;
 - * Health and safety incidents;
 - * Hazardous materials stored on site;
 - * Non-compliance incidents; and
 - * Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- » Conduct audits to ensure compliance to the EMPr.
- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » Should the Contractor require clarity on any aspect of the EMPr, the Contractor must contact the Environmental Consultant/Officer for advice.

Contractors and Service Providers must be aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » A copy of the EMPr must be easily accessible to all on-site staff members.
- » Employees must be familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the Solar PV Facility.
- » Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Staff will be informed of environmental issues as deemed necessary by the ECO.

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- » Ensuring adherence to the environmental management specifications.
- » Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken.
- » Any lack of adherence to the above will be considered as non-compliance to the specifications of the EMPr.
- » Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- » Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- » Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- » Ensuring that a register of all public complaints is maintained.
- » Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).

vi) Contractor's Safety, Health and Environment Representative/Environmental Officer

The Contractor's Safety, Health and Environment (SHE) Representative/Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE/EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

The Contractor's SHE/EO should:

- » Be well versed in environmental matters.
- » Understand the relevant environmental legislation and processes.
- » Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.

- » Know the background of the project and understand the implementation programme.
- » Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
- » Keep accurate and detailed records of all EMPr-related activities on site.

OBJECTIVE 2: Establish clear reporting, communication, and responsibilities during operation in relation to overall implementation of the EMPr during operation

Formal responsibilities are necessary to ensure that key procedures are executed during operation. Several professionals will form part of the operation team. For the purposes of the EMPr, the generic roles that need to be defined are those of the:

- » Operations Manager.
- » Environmental Manager.

It is acknowledged that the specific titles for these functions may vary once the project is implemented. The purpose of this section of the EMPr is to give a generic outline of what these roles typically entail. It is expected that this will be further defined during project implementation.

i) Operations Manager

The Plant Manager will:

- » Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMPr.
- » Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
- » Take appropriate action as a result of findings and recommendations in management reviews and audits.
- » Provide forums to communicate matters regarding environmental management.

ii) Environmental Manager

The Environmental Manager will:

- » Develop and Implement an Environmental Management System (EMS) for the Solar PV Facility.
- » Manage and report on the Solar PV Facility's environmental performance.
- » Maintain a register of all known environmental impacts and manage the monitoring thereof.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies (such as the Provincial Department of Environmental Affairs and conservation authorities) on environmental performance and other issues.
- » Conduct environmental training and awareness for the employees who operate and maintain the Solar PV Facility.
- » Compile environmental policies and procedures.
- » Liaise with interested and affected parties on environmental issues of common concern.
- » Track and control the lodging of any complaints regarding environmental matters.

The Environmental Manager must provide fourteen (14) days written notification to the Mpumalanga DARDEA that the Becrux Solar PV Facility operation phase will commence.

CHAPTER 6: PLANNING AND DESIGN MANAGEMENT PROGRAMME

Overall Goal: Undertake the pre-construction activities (planning and design phase) in a way that:

- » Ensures that the preferred design and layout of the PV panels and associated infrastructure responds to the identified environmental constraints and opportunities.
- » Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- » Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Ensures that the best environmental options are selected for the linear components (underground cable network, short distribution power line), including the internal access roads.
- » Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

6.1 Objectives

OBJECTIVE 1: Ensure the facility design responds to identified environmental constraints and opportunities

Subject to approval by the Mpumalanga DARDLEA, the proposed layout within the development footprint detailed in **Figure 2.3** must be implemented. Cognisance of sensitive areas defined in **Figure 2.2** and within the BA Report must be considered when undertaking the final design of the layout.

Project Component/s	Project components affecting the objective include all infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Impact on identified sensitive areas. » Design fails to respond optimally to the environmental considerations.
Activities/Risk Sources	<ul style="list-style-type: none"> » Positioning of all project components. » Pre-construction activities, e.g. geotechnical investigations, site surveys and environmental walk-through surveys. » Positioning of temporary sites.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The design of the PV facility and grid connection responds to the identified environmental constraints and opportunities, including the constraints identified through the BA process. » To ensure the pre-construction activities are undertaken in an environmentally friendly manner by, for example, avoiding identified sensitive areas.

» Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Areas rated as High sensitivity and their buffers (as shown in Figure 2.2) must be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas from construction workers and machinery. The infrastructure must be realigned to prioritise development within low sensitivity areas. Mitigated development in medium sensitivity areas is permissible.	Developer Contractor	Design phase
All laydown areas, chemical toilets etc. should be restricted to very low-low sensitivity areas.	Developer Contractor	Design phase
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments and to avoid unnecessary disturbances to adjacent areas.	Contractor	Pre-construction
Outside lighting should be designed and limited to minimize impacts on fauna where possible. All outside lighting should be directed away from highly sensitive areas where possible. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (green/red) lights should be used wherever possible.	Developer Design engineer	Design and planning
Schedule construction activities and operations during least sensitive periods (between May and August) where possible, to avoid migration, nesting and breeding seasons.	Developer Contractor	Pre-construction planning
A qualified environmental control officer must be on site when construction begins.	Developer	Pre-construction
The area must be walked through with a suitably qualified specialist prior to construction, to ensure no faunal species remain in the habitat and get killed. Should animals (including SCCs) not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated.	Developer Specialist	Pre-construction
The footprint area of the construction should be kept to a minimum.	Developer Contractor	Pre-construction planning
No activities are permitted within the wetlands and associated 22m buffer areas.	Developer Contractor	Design phase
Demarcate all access routes. This activity should be finished at least prior to the commencement of any construction activities	Contractor	Pre-construction planning
Retain and maintain natural vegetation (if present) immediately adjacent to the development footprint/power line servitude where possible.	Contractor	Pre-construction
Investigate the potential to screen the PV facility from the Secunda secondary road (located within 1km of the facility) with planted vegetation cover or solid fencing, where possible.	Developer Contractor	Pre-construction planning
Use anti-reflective panels and dull polishing on structures, where possible.	Developer Contractor	Pre-construction planning

Mitigation: Action/Control	Responsibility	Timeframe
Make use of existing roads wherever possible and plan the layout and construction of roads and infrastructure with due cognisance of the topography to limit cut and fill requirements.	Developer Design engineer	Design and planning
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) wherever possible.	Developer Contractor	Pre-construction planning
Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised.	Developer Contractor	Pre-construction planning
Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas.		
Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the PV Facility and the ancillary infrastructure. The following is recommended: Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). <ul style="list-style-type: none"> * Limit mounting heights of fixtures, or use foot-lights or bollard lights. * Make use of minimum lumen or wattage in fixtures. * Making use of down-lighters or shielded fixtures. * Make use of Low Pressure Sodium lighting or other low impact lighting. * Make use of motion detectors on security lighting, so allowing the site to remain in darkness until lighting is required for security or maintenance purposes 	Developer Design engineer	Design and planning
Plan and conduct pre-construction activities in an environmentally acceptable manner and in a manner that does not lead to unnecessary impacts and disturbance.	Developer Contractor	Pre-construction
Consider design level mitigation measures recommended by the specialists as detailed within the BA Report and relevant appendices.	Developer Contractor	Design phase
The appointed EPC contractor must appoint a security company and appropriate security procedures are to be implemented to limit access to the site and surrounding areas.	Contractor	Pre-construction planning
Clear rules and regulations for access to the proposed site must be developed.	Developer Contractor	Pre-Construction
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer Contractor	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » The design meets the objectives and does not degrade the environment. » The design and layout respond to the mitigation measures and recommendations in the BA Report.
Monitoring	<ul style="list-style-type: none"> » Ensure that the design implemented meets the objectives and mitigation measures in the BA Report through review of the facility design by the Project Manager and ECO prior to the commencement of construction.

OBJECTIVE 2: Ensure that relevant permits and site-specific plans are in place to manage impacts on the environment

Project Component/s	Project components affecting the objective include all infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	» Impact on identified sensitive areas.
Activities/Risk Sources	» Positioning of all project components. » Project-related activities.
Mitigation: Target/Objective	» To ensure that relevant permits are obtained and that the conditions thereof are complied with to manage impacts on the environment. » To ensure that site-specific plans are compiled and implemented to manage impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
A hydrocarbon spill management plan must be put in place, to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas.	EO Contractor	Pre-construction
Develop and implement an alien vegetation management plan.	EO Contractor	Pre-construction
Compile and implement a pest control plan.	EO Contractor	Pre-construction
A stormwater management plan must be compiled and implemented.	Contractor	Pre-construction
Develop and implement a rehabilitation management and monitoring plan at least 2 months prior to the implementation of soil stripping.	EO Contractor	Pre-construction
Obtain any additional environmental permits required prior to the commencement of construction. Copies of permits/licenses must be submitted to the Mpumalanga DARDLEA and kept on site during the construction and operation phases of the project.	Developer	Pre-construction
Obtain abnormal load permits for transportation of project components to site (if required).	Contractor(s)	Prior to construction
Develop a detailed method statement for the implementation of the alien invasive management plan and open space management plan for the site (refer to Appendix C).	Developer	Pre-construction
Develop a detailed method statement for the implementation of the re-vegetation and habitat rehabilitation plan for the site (refer to Appendix D).	Developer	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Develop a detailed method statement for the implementation of the traffic and transportation management plan for the site (refer to Appendix E).	Developer	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Permits are obtained and relevant conditions complied with. » Relevant management plans and Method Statements prepared and implemented.
Monitoring	<ul style="list-style-type: none"> » Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction. » Monitor ongoing compliance with the EMPr and method statements.

OBJECTIVE 3: Ensure compliance of required mitigation measures and recommendations by contractors

Project Component/s	<p>Project components affecting the objective include all infrastructure including:</p> <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Impact on identified sensitive areas.
Activities/Risk Sources	<ul style="list-style-type: none"> » Positioning of all project components. » Pre-construction activities. » Positioning of temporary sites.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that appropriate planning is undertaken by the contractor to ensure compliance with the conditions of the EA and EMPr. » To ensure that pre-construction activities are undertaken in an environmentally friendly manner.

Mitigation: Action/Control	Responsibility	Timeframe
All construction workers must undergo an environmental induction that includes instruction on the need to comply with speed limits and the requirements of the EMPr and other permits that may be issued for the project to respect all forms of fauna. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".	Contractor	Pre-construction
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Developer Contractor	Pre-construction
All personnel and contractors must undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on the avoidance and protection of the wetland areas. Contractors and employees must be made aware of the "no-go" areas to be avoided.	Contractor EO	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions as well as the overall master plan.	Contractor EO	Pre-construction
An Environmental Control Officer (ECO) must be appointed to oversee the construction process and ensure compliance with conditions of approval and the EMPr.	Developer	Pre-construction

Performance Indicator	» Conditions of the EMPr form part of all contracts.
Monitoring	» Monitor ongoing compliance with the EMPr and method statements.

OBJECTIVE 4: Ensure effective communication mechanisms

It is important to maintain on-going communication with the public (including affected and surrounding landowners and other relevant stakeholders within the area) during the construction and operation phases of the Becrux Solar PV Facility. Any issues and concerns raised must be addressed as far as possible in as short a timeframe as possible.

Project component/s	Project components affecting the objective include all infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	» Impacts on affected and surrounding landowners and land uses.
Activity/risk source	» Activities associated with construction. » Activities associated with operation.
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners, and communities. » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (including the affected and surrounding landowners) (using Appendix B) to be implemented during both the construction and operation phases of the solar facility and if applicable during decommissioning. This procedure must include the details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues. The mechanism must also	Developer Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)

Mitigation: Action/control	Responsibility	Timeframe
include procedures to lodge complaints in order for the local community to express any complaints or grievances with the construction process. A Public Complaints register must be maintained by the Contractor to record all complaints and queries relating to the project and the actions taken to resolve the issue. A Project Specific Grievance Mechanism must be developed and implemented prior to construction and operation.		
Develop and implement a grievance mechanism for the construction, operation and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Developer Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Organise local community meetings with specific stakeholders (e.g. Ward Councillors, community leaders etc.) to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for.	Contractor	Pre-construction
Develop an incident reporting system to record non-conformances to the EMPr.	Contractor	Pre-construction Duration of construction
Clearly inform the local municipality of the potential impact of the proposed project in order for the necessary preparations to take place.	Developer	Pre-construction
Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns.	Developer	Pre-construction
A Community Liaison Officer must be appointed. A method of communication must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.	Developer	Pre-construction

Performance Indicator	» Effective communication procedures in place for all phases as required.
Monitoring	<ul style="list-style-type: none"> » A Public Complaints register must be maintained by the Contractor to record all complaints and queries relating to the project and the action taken to resolve the issue. » Developer and contractor must keep a record of local recruitments and information on local labour; to be shared with the ECO for reporting purposes during construction. » An incident reporting system used to record on-conformances to the EMPr. » Grievance mechanism procedures implemented.

OBJECTIVE 5: Stimulate and enhance positive socio-economic impacts

Project component/s	Project components affecting the objective include all infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers.
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	<ul style="list-style-type: none"> » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	» High local economic benefits
Activities/risk sources	<ul style="list-style-type: none"> » Procurement practices. » Training and skills development.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Employ local community members as far as possible » Stimulate the local economy

Mitigation: Action/control	Responsibility	Timeframe
Training and skills development programmes should be initiated prior to the commencement of the construction phase.	Developer	Pre-construction
Becrux Solar PV Project One (Pty) Ltd should develop a database of local companies, specifically Historically Disadvantaged (HD) companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work, where applicable.	Developer	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Developer has engaged with local authorities and business organisations. » Percentage of labour force employed from local community.
Monitoring	» The contractors to provide the information on local labour to the ECO to report in ECO reports.

CHAPTER 7: MANAGEMENT PROGRAMME: CONSTRUCTION

Overall Goal: Undertake the construction phase in a way that:

- » Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
- » Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, traffic and road use.
- » Minimises the impact on the indigenous natural vegetation.
- » Minimises impacts on fauna (including birds) in the study area.
- » Minimises the impact on heritage sites, should they be uncovered.
- » Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

An environmental baseline must be established during the undertaking of construction activities, where possible.

7.1 Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE 1: Securing the site and minimising impacts related to inappropriate site establishment

Project component/s	Construction of all infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Hazards to construction employees. » Security of materials. » Substantially increased damage to vegetation. » Potential scarring of the landscape due to erosion.
Activities/risk sources	<ul style="list-style-type: none"> » Open excavations (foundations and cable trenches). » Movement of construction employees, vehicles and plant equipment in the area and on-site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To secure the site against unauthorised entry. » To protect construction employees. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint. » Intact vegetation cover outside of the immediate construction work areas.

Mitigation: Action/control	Responsibility	Timeframe
Areas rated as High sensitivity and their buffers in proximity to the development areas should be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas from construction workers and machinery. The infrastructure should be realigned to prioritise development within low sensitivity areas. Mitigated development in medium sensitivity areas is permissible.	Contractor EO	Construction
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further than that proposed for the project. Clearing of vegetation outside of the project footprint should be minimized and avoided where possible.	Contractor	Construction
All laydown areas, chemical toilets etc. should be restricted to very low-low sensitivity areas.	Contractor	Construction
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments.	Contractor	Construction
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas.	Contractor	Construction
Toilets at the recommended Health and Safety standards must be provided. These should be emptied regularly, to prevent staff from using the surrounding vegetation.	Contractor EO	Construction
A comprehensive employee induction programme which covers land access protocols, fire management and road safety should be prepared.	Contractor EO	Construction
Secure the site, working areas and excavations in an appropriate manner.	Contractor EO	Construction
The Contractor must take all reasonable measures to ensure the safety of its employees. Where the construction employees could be exposed to danger by any of the works or site activities, suitable flagmen, barriers and/or warning signs in English and any other relevant indigenous languages, all to the approval of the Site Manager must be provided. All unattended open excavations shall be adequately demarcated and/or fenced.	Contractor	Construction
Site access must be controlled and no unauthorised persons must be allowed onto the site.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry. » No construction employees are injured as a result of construction activities. » Appropriate and adequate sanitation facilities are provided at the construction site. » Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.
Monitoring	<ul style="list-style-type: none"> » Regular visual inspection of the fence for signs of deterioration/forced access. » An incident reporting system must be used to record non-conformances to the EMPr.

- » A complaints register must be developed and maintained on site.
- » ECO/ EO to monitor all construction areas on a continuous basis until all construction is completed; immediate reporting back to the site manager.
- » ECO/ EO to address any infringements with responsible contractors as soon as these are recorded.
- » Monitoring of vegetation clearing during construction (by contractor as part of construction contract).

OBJECTIVE 2: Appropriate management of the construction site and construction workers

Project Component/s	Construction of all infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Damage to vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	<ul style="list-style-type: none"> » Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
Contractors and construction workers must be clearly informed of the 'no-go', very high and high sensitivity areas.	Developer Contractor	Prior to the commencement of construction
To minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the BA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.	Contractors	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	Contractor and sub-contractor/s	Pre-construction
Introduce an incident reporting system to be tabled at weekly/monthly project meetings.	Contractor and sub-contractor/s	Pre-construction
All construction vehicles must adhere to clearly defined and demarcated roads.	Contractor	Construction
Ensure all construction equipment and vehicles are properly maintained at all times.	Contractor	Construction
Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing.	Contractor	Construction
Pre-construction environmental induction must be undertaken for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising fauna interactions, remaining within demarcated construction areas etc.	Contractor	Construction
Regular toolbox talks must be undertaken to ensure appropriate levels of environmental awareness.	Contractor	Construction
Contact details of emergency services should be prominently displayed on site.	Contractor	Construction
No fires must be allowed on-site.	Contractor	Construction
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	Contractor	Construction
Personnel trained in first aid should be on site to deal with smaller incidents that require medical attention.	Contractor	Construction
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	Contractor	During construction.
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site. Ablutions must be removed from site when construction is completed.	Contractor and sub-contractor/s	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Cooking and eating of meals must take place in a designated area.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area.	Contractor and sub-contractor/s	Duration of contract
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor	Duration of contract
A Method Statement must be compiled for the management of pests and vermin within the site, specifically relating to the canteen area if applicable.	Contractor	Construction
Ensure proper health and safety plans in place prior to and during the construction period to ensure safety on and around site during construction.	Contractor and sub-contractor/s	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » 'No-go' and sensitive areas are avoided by construction activities. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not undertaken. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of the construction phase. » Compliance with OHS Act.
Monitoring	<ul style="list-style-type: none"> » Regular audits of the construction camps and areas of construction on site by the EO. » Proof of disposal of sewage at an appropriate licensed wastewater treatment works. » Proof of disposal of waste at an appropriate licensed waste disposal facility. » An incident reporting system must be used to record non-conformances to the EMPr. » Observation and supervision of Contractor practices throughout the construction phase by the EO. » Complaints are investigated and, if appropriate, acted upon. » Comprehensive record of accidents and incidence and related investigations, findings and corrective action in accordance with the OHS Act.

OBJECTIVE 3: Maximise impacts on the social environment associated with the construction phase

Employment opportunities will be created during the construction phase, specifically for semi-skilled and unskilled workers. Employment of locals and the involvement of local Small, Medium and Micro Enterprises (SMMEs) would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.

Project Component/s	» Construction activities associated with the establishment of the PV facility.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	<ul style="list-style-type: none"> » Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area.

	<ul style="list-style-type: none"> » Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area.
Enhancement: Target/Objective	<ul style="list-style-type: none"> » The contractor should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors. » Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building.

Mitigation: Action/Control	Responsibility	Timeframe
It is recommended that the local employment policy be adopted where possible to maximise the opportunities made available to the local labour force. Becrux Solar PV Project One (Pty) Ltd must make it a requirement for contractors to implement a 'locals first' policy, especially for semi and low skilled job categories. If this is not possible, then the broader focus areas should be considered for sourcing workers.	Contractor	Construction
Employment opportunities will be for the immediate local area, Govan Mbeki Local Municipality. If this is not possible, then the broader focus areas should be considered for sourcing employees.	Contractor	Construction
During the recruitment selection process, consideration must be given to women.	Contractor	Construction
It is recommended that realistic local recruitment targets be set for the construction phase.	Contractor	Construction
It is a requirement to source as much goods and services as possible from the local area.	Contractor	Construction
Engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers, where feasible.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Maximum number of semi and unskilled labour locally sourced where possible. » Local suppliers and SMMEs contracted where possible. » Skills transfer facilitated where required.
Monitoring	<ul style="list-style-type: none"> » Contractors and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE 4: Protection of sensitive areas, flora, fauna and soils

Project Component/s	<p>Construction of all infrastructure including:</p> <ul style="list-style-type: none"> » PV panels » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads.
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	» Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Impacts on vegetation and fauna. » Loss of vegetation (if present) due to construction activities and vegetation clearing. » Impacts on soil. » Loss of topsoil. » Erosion.
Activity/Risk Source	<ul style="list-style-type: none"> » Vegetation clearing. » Site preparation and earthworks. » Excavation of foundations. » Construction of infrastructure. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise the development footprint as far as possible. » To minimise impacts on surrounding sensitive areas. » To minimise impacts on soils. » To minimise impacts on fauna. » Minimise spoil material. » Minimise erosion potential.

Mitigation: Action/Control	Responsibility	Timeframe
Where possible, existing access routes and walking paths must be made use of.	Contractor	Construction
Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Contractor	Construction
It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Contractor	Construction
No trapping, killing, or poisoning of any animals is to be allowed.	Contractor	Construction
All construction workers should undergo an environmental induction that includes instruction on the need to comply with speed limits and the requirements of the EMPr and other permits that may be issued for the project to respect all forms of fauna. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Contractor	Construction
Any excavations or holes must be conducted in a progressive manner. Should the holes/excavations stay open overnight they must be covered temporarily, to ensure no small fauna species fall in.	Contractor	Construction
Ensure that any cables and connections are insulated successfully to reduce electrocution risk.	Contractor	Construction
A pest control plan must be put in place and implemented. It is imperative that poisons not be used due to the likely presence of fauna.	Contractor	Construction
Speed limits must be put in place to reduce erosion.	Contractor	Construction
Continuously monitor erosion on site.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
A hydrocarbon spill management plan must be put in place, to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas.	Contractor	Construction
The Contractor must be in possession of an emergency spill kit that must always be complete and available on site. The Contractor should ensure that personnel is trained accordingly in the use of spill kits.	Contractor	Construction
Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.	Contractor	Construction
No servicing of equipment may occur on site, unless necessary.	Contractor	Construction
Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Contractor	Construction
Noise must be kept to an absolute minimum during the evenings and at night where possible, to minimize all possible disturbances to amphibian species and nocturnal mammals.	Contractor	Construction
Storage of potential contaminants must be undertaken in bunded areas.	Contractor	Construction
All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".	Contractor	Construction
Toilets at the recommended Health and Safety standards must be provided. These should be emptied regularly to prevent staff from using the surrounding vegetation.	Contractor	Construction
Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint.	Contractor	Construction
No materials may be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded.	Contractor	Construction
No storage of vehicles or equipment will be allowed outside of the designated project areas.	Contractor	Construction
Exposed areas must be ripped and vegetated to increase surface roughness	Contractor	Construction
Signs of erosion must be addressed immediately to prevent further erosion.	Contractor	Construction
The contractor must ensure that open fires on the site for heating, smoking or cooking are not allowed except in designated areas.	Contractor	Construction
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	Contractor	Construction
Avoid establishing large concrete areas to minimise impacts on soil.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No disturbance outside of designated work areas. » Minimised clearing of existing vegetation. » Vegetation loss restricted to infrastructure footprint. » No poaching etc. of fauna by construction personnel during construction. » Removal to safety of fauna encountered during construction » Low mortality of fauna due to construction machinery and activities » Topsoil appropriately stored, managed and rehabilitated. » Limited soil erosion, compaction and pollution around site. » No activity in restricted areas.
Monitoring	<ul style="list-style-type: none"> » Contractor's Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities. » Supervision of all clearing and earthworks by the ECO. » Ongoing monitoring of erosion management measures within the site by the ECO. » An incident reporting system will be used to record non-conformances to the EMPr. This will be done by the EO.

OBJECTIVE 5: Minimise the establishment and spread of alien invasive plants

Major factors contributing to invasion by alien invader plants include high disturbance activities and negative grazing practices. Consequences of this may include:

- » Loss of indigenous vegetation.
- » Change in vegetation structure leading to change in various habitat characteristics.
- » Change in plant species composition.
- » Change in soil chemical properties.
- » Loss of sensitive habitats.
- » Loss or disturbance to individuals of rare, endangered, endemic, and/or protected species.
- » Fragmentation of sensitive habitats.
- » Change in flammability of vegetation, depending on alien species.
- » Hydrological impacts due to increased transpiration and runoff.

Project Component/s	<p>Construction of all infrastructure including:</p> <ul style="list-style-type: none"> » PV panels » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species. » Impacts on soil. » Impact on faunal habitats. » Degradation and loss of agricultural potential.

Activities/Risk Sources	<ul style="list-style-type: none"> » Transport of construction materials to the development footprint. » Movement of construction machinery and personnel. » Site preparation and earthworks causing disturbance to indigenous vegetation. » Construction of main access road. » Stockpiling of topsoil, subsoil and spoil material. » Routine maintenance work – especially vehicle movement.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To significantly reduce the presence of weeds and eradicate alien invasive species. » To avoid the introduction of additional alien invasive plants to the site. » To avoid distribution and thickening of existing alien plants in the site. » To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the site.

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an Invasive Alien Plant Control and Eradication Programme (refer to Appendix C).	Contractor	Construction
Avoid creating conditions in which alien plants may become established: <ul style="list-style-type: none"> » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants. 	Contractor	Construction
When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.	Contractor	Construction
No planting or importing any listed invasive alien plant species (all Category 1a, 1b and 2 invasive species) to the site for landscaping, rehabilitation or any other purpose must be undertaken.	Contractor	Construction
All alien plant re-growth must be monitored and should it occur these plants should be eradicated	Contractor	Construction
Any alien and invasive vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species	Contractor	Construction
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	Contractor	Construction

Performance Indicator	» Low abundance of alien plants. For each alien species: number of plants and aerial cover of plants within the site and immediate surroundings.
Monitoring	<ul style="list-style-type: none"> » On-going monitoring of area by EO during construction. » Annual audit of development footprint and immediate surroundings by qualified botanist. Reporting frequency depends on legal compliance framework.. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site)

or per unit area), age and/or size classes of plants and aerial cover of plants. The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the site. The environmental manager/site agent should be responsible for driving this process.

OBJECTIVE 6: Minimise impacts on water resources

Project component/s	<ul style="list-style-type: none"> » Construction activities. » Storage of dangerous goods. » Ablution facilities. » Waste management.
Potential Impact	<ul style="list-style-type: none"> » Pollutants such as lime-containing (high pH) construction materials such as concrete, cement, grouts, etc. could be harmful to aquatic biota, particularly during low flows when dilution is reduced. » Removal of wetland habitat. » Compaction of soils within and surrounding the wetlands. » Erosion of soils surrounding wetlands. » Potential proliferation of alien and invasive species within the wetlands.
Activity/risk source	<ul style="list-style-type: none"> » Development of PV facility in close proximity to wetlands. » Increased hardened surfaces.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Reduce potential loss of habitat and ecological structure. » No incidents related to spills of chemicals and hazardous materials. » No release of contaminated water in wetlands. » No misbehaviour of construction workers (i.e. ablution activities, washing).

Mitigation: Action/control	Responsibility	Timeframe
No activities are permitted within the wetlands and associated 22m buffer areas.	Contractor	Construction
No non-environmentally friendly suppressants may be used for dust suppression purposes as this could result in pollution of water sources.	Contractor	Construction
The drainage features, even though not regarded as wetlands, must be conserved by ensuring that erosion control measures are implemented within these systems and that proper stormwater management plans incorporate the conservation of these systems by means of best-practice culvert designs.	Contractor	Construction
Storage of potential contaminants must be undertaken in bunded areas.	Contractor	Construction
All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".	Contractor	Construction
No cleaning or servicing of vehicles, machines and equipment may be undertaken in water resources.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area.	Contractor	Construction
Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems.	Contractor	Construction
All waste generated on-site must be adequately managed and separated and recycling of different waste materials should be supported.	Contractor	Construction
Exposed areas must be ripped and vegetated to increase surface roughness.	Contractor	Construction
Silt traps and fences must be placed in the preferential flow paths along the road to prevent sedimentation of the watercourse	Contractor	Construction
Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions as well as the overall master plan.	Contractor	Construction
Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed.	Contractor	Construction
Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash.	Contractor	Construction
Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility.	Contractor	Construction
Appropriately stockpile topsoil cleared from the development footprint.	Contractor	Construction

Performance Indicator	» No degradation and erosion of wetlands.
Monitoring	» Monitor management measures in place for protection of freshwater resources.

OBJECTIVE 7: Protection of heritage resources

Project Component/s	Construction of all infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	» Heritage objects or artefacts found on site are inappropriately managed or destroyed.
Activity/Risk Source	» Site preparation and earthworks.

	<ul style="list-style-type: none"> » Foundations or plant equipment installation. » Mobile construction equipment movement on site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

Mitigation: Action/control	Responsibility	Timeframe
Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.	Contractor EO	Construction
<p>The Chance Fossils Finds procedure must be implemented during the course of construction. Actions to be undertaken as per the procedure are as follows:</p> <ul style="list-style-type: none"> * One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material. * Once a workman notices possible fossil material, he/she should report this to the ECO or site agent. Procedure to follow if it is likely that the material identified is a fossil: <ul style="list-style-type: none"> - The ECO or site agent must ensure that all work ceases immediately in the vicinity of the area where the fossil or fossils have been found. - The ECO or site agent must inform SAHRA of the find immediately. This information must include photographs of the findings and GPS co-ordinates. - The ECO or site agent must compile a Preliminary Report and fill in the attached Fossil Discoveries: Preliminary Record Form within 24 hours without removing the fossil from its original position. The Preliminary Report records basic information about the find including: <ul style="list-style-type: none"> • The date. • A description of the discovery. • A description of the fossil and its context (e.g. position and depth of find). • Where and how the find has been stored. • Photographs to accompany the preliminary report (the more the better): <ul style="list-style-type: none"> ○ A scale must be used. ○ Photos of location from several angles. ○ Photos of vertical section should be provided. ○ Digital images of hole showing vertical section (side). <p>Upon receipt of this Preliminary Report, SAHRA will inform the ECO or site agent whether or not a rescue</p> 	Contractor EO	Construction

Mitigation: Action/control	Responsibility	Timeframe
<p>excavation or rescue collection by a palaeontologist is necessary. Digital images of fossil or fossils.</p> <ul style="list-style-type: none"> * Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation. * If the find cannot be stabilised, the fossil may be collect with extreme care by the ECO or the site agent and put aside and protected until SAHRA advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs. * No work may continue in the vicinity of the find until SAHRA has indicated, in writing, that it is appropriate to proceed. 		

Performance Indicator	<ul style="list-style-type: none"> » No disturbance outside of designated work areas. » All heritage items located are dealt with as per the legislative guidelines.
Monitoring	<ul style="list-style-type: none"> » Observation of excavation activities by the EO throughout the construction phase. » Supervision of all clearing and earthworks. » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites (if required). » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 8: Appropriate Stormwater Management

Stormwater management is covered under the Pre-construction and Construction Phase management, but aspects thereof will also continue into the Operation Phase. It is important that the engineers and contractors responsible for the detailed design of the stormwater systems take into account the requirements of this EMPr, as well as the recommendations by the participating specialists.

Project Component/s	» Alteration of natural areas into hard surfaces impacting on the local hydrological regime of the area.
Potential Impact	» Poor stormwater management and alteration of the hydrological regime.
Activities/Risk Sources	» Placement of hard engineered surfaces.
Mitigation: Target/Objective	» Reduce the potential increase in surface flow velocities and the impact on localised drainage systems.

Mitigation: Action/Control	Responsibility	Timeframe
Well-engineered, and wide enough culvert systems must be installed at all drainage systems, including those minor systems not identified during the site assessment.	Contractor	Construction
Temporary stormwater channels must be filled with aggregate and/or logs (branches included) to dissipate flows.	Contractor	Construction
It is recommended that the material surrounding and holding the culverts in place include a coarse rock layer that has been specifically incorporated to increase the porosity and permeability to accommodate flooding and very low flows.	Contractor	Construction
The culverts used in the design should be as large as possible, partially sunken and energy dissipating material must be placed at the discharge area of each culvert to prevent erosion of these areas. The use of larger culverts will prevent the build-up of debris by allowing the free movement of debris through the large culverts.	Contractor	Construction
Culverts must avoid inundation (damming) of upstream areas by facilitating streamflow and catering properly for both low flows and high flows.	Contractor	Construction
Surface run-off from the roads flowing down the embankments often scours the watercourse on the sides of the culvert causing sedimentation of the channel. This should be catered for with adequate concreted stormwater drainage depressions and channels with energy dissipaters that channel these flows into the river in a controlled manner.	Contractor	Construction
The culvert installations must take into account the scouring action of high flows and gabion structures or similar must be placed on both sides of the culvert on the embankments both upstream and downstream. This will serve as retention of the soils from scouring around and underneath the culvert structures aiding in the protection of the structure.	Contractor	Construction
Large aggregate outsourced or from the project area (if available) can be used for energy dissipation in the channel downstream of the culverts to reduce the likelihood of scouring the riverbed and sedimentation of the catchment. It is preferable that larger aggregate be used to avoid flows removing material from the site	Contractor	Construction
Silt traps and fences must be placed in the preferential flow paths along the Secunda Secondary Road to prevent sedimentation of the watercourse.	Contractor	Construction
Implement an effective storm water management plan. The effectiveness of the plan must be regularly assessed and revised if necessary.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No impacts due to runoff. » Minimise erosion as far as possible. » Appropriate storm water management system in place.
Monitoring	<ul style="list-style-type: none"> » Ongoing monitoring of erosion management measures within the site by the EO and ECO. » Monthly inspections of sediment control devices by the EO. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 9: Management of dust and emissions

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the internal access roads.

Project component/s	<p>Movement of vehicles.</p> <p>Construction of all infrastructure including:</p> <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Dust impacts can occur from cleared areas and from vehicle movement along gravel roads. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and construction equipment.
Activity/risk source	<ul style="list-style-type: none"> » Clearing of vegetation and topsoil. » Excavation, grading, scraping. » Transport of materials, equipment, and components. » Vehicle movement on gravel roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction engines. » The movement of construction vehicles and their activities on the site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase. » To avoid and or minimise the potential dust impacts associated with heavy vehicles, and also minimise damage to roads. » Suppression of dust, pollution control and minimise dust generation.

Mitigation: Action/control	Responsibility	Timeframe
Dust-reducing mitigation measures must be put in place and strictly adhered to. This includes wetting of exposed soft soil surfaces.	Contractor	Construction
Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Contractor	Duration of contract
Speed of construction vehicles must be restricted to 40km/hr on all roads within the site.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable in line with the progression of construction activities.	Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
All vehicles and containers used for moving waste must encapsulate the waste, which prevents the waste from causing odours and from escaping or blowing around the site. This will also prevent leachate material from spilling out of the containers, which is hazardous.	Contractor	Duration of contract
Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Visual presence of dust. » Dust does not cause health (inhaling, eye irritation) and safety risks (low visibility). » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	<ul style="list-style-type: none"> » The appointed EO must monitor indicators listed above to ensure that they have been met for the construction phase. » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » An incident register and non-conformance must be used to record incidents and non-conformances to the EMP. » A complaints register must be used to record grievances by the public.

OBJECTIVE 10: Minimise visual impacts associated with construction

During construction, heavy vehicles, components, cranes, equipment and construction crews will frequent the area and may cause, at the very least, a visual nuisance to landowners and residents in the area as well as road users.

Project component/s	<ul style="list-style-type: none"> » Construction site. » Transportation of staff and equipment.
Potential Impact	<ul style="list-style-type: none"> » Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and the resulting erosion. » Construction traffic.
Activity/risk source	<ul style="list-style-type: none"> » The viewing of visual scarring by observers in the vicinity of the wind farm or from the roads in the surrounding area.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimal disturbance to vegetation cover in close vicinity of the wind farm and its related infrastructure. » Minimised construction traffic, where possible. » Minimal visual intrusion by construction activities and intact vegetation cover outside of the immediate construction work areas.

Mitigation: Action/control	Responsibility	Timeframe
Retain and maintain natural vegetation (if present) immediately adjacent to the development footprint.	Contractor	Construction
Ensure that vegetation cover adjacent to the development footprint (if present) is not unnecessarily removed during the construction phase, where possible.	Contractor	Construction
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Contractor	Construction
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Contractor	Construction
Reduce and control construction dust using approved dust suppression techniques as and when required (i.e., whenever dust becomes apparent).	Contractor	Construction
Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Construction site maintained in a neat and tidy condition. » Site appropriately rehabilitated after construction is complete.
Monitoring	<ul style="list-style-type: none"> » Monitoring of vegetation clearing during construction by EO. » Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).

OBJECTIVE 11: Traffic management and transportation of equipment and materials to site

The construction and decommissioning phases of the project will be the most significant in terms of traffic impacts resulting from the transport of equipment, materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate mostly to works within the site boundary and the external road network.

Project component/s	<ul style="list-style-type: none"> » Construction vehicles. » Construction work force.
Potential Impact	<ul style="list-style-type: none"> » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted. » Risk of accidents. » Deterioration of road pavement conditions (i.e. both surfaced and gravel road) due to abnormal loads.
Activity/risk source	<ul style="list-style-type: none"> » Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Mobile construction equipment movement on-site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise impact of traffic associated with the construction of the PV facility on the local traffic volume, existing infrastructure, animals, and road users.

- » To minimise the potential for negative interaction between pedestrians or sensitive users and traffic associated with the wind farm construction.
- » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions.

Mitigation: Action/control	Responsibility	Timeframe
All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues.	Contractor	Construction
Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.	Contractor	Construction
Avoid heavy vehicle activity during 'peak' hours (when people are driving to and from work).	Contractor	Construction
The developer and engineering, procurement and construction (EPC) contractors must ensure that any damage / wear and tear caused by construction related traffic to the roads is repaired.	Contractor	Construction
Heavy vehicles must be inspected regularly to ensure their road safety worthiness.	Contractor	Construction
The movement of heavy vehicles associated with the construction phase must be timed to avoid weekends, public holidays and holiday periods where feasible.	Contractor	Construction
If feasible, no construction activities should be carried out during weekends and outside day time working hours	Contractor	Construction
Stagger component delivery to the site where possible.	Contractor	Construction
Speed limits must be put in place and appropriate signage must be put up to raise awareness in this regard.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No traffic incidents involving project personnel or appointed contractors. » Appropriate signage in place. » No complaints resulting from traffic congestion, delays or driver negligence associated with construction of the wind farm.
Monitoring	<ul style="list-style-type: none"> » Visual monitoring of traffic control measures to ensure they are effective. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 12: Conservation of the soil resource within the site and in the adjacent areas

The natural soil on the site needs to be preserved as far as possible to minimise impacts on the environment. Soil degradation, including erosion (by wind and water) and subsequent deposition elsewhere is of a concern. Uncontrolled run-off relating to construction activities (excessive wetting, etc.) will also lead to accelerated erosion. Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems.

A set of strictly adhered to mitigation measures are required to be implemented in order to effectively limit the impact on the environment. The disturbed areas where human impact is likely are the focus of the mitigation measures laid out below.

Project component/s	Construction of all infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Erosion and soil loss. » Increased runoff. » Downstream sedimentation.
Activities/risk sources	<ul style="list-style-type: none"> » Rainfall and wind erosion of disturbed areas. » Excavation, stockpiling and compaction of soil. » Concentrated discharge of water from construction activity. » Stormwater run-off from sealed surfaces. » Mobile construction equipment movement on site. » Roadside drainage ditches. » Project related infrastructure, such as buildings and fences.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise erosion of soil from site during construction. » To minimise damage to vegetation by erosion or deposition. » To retain all topsoil with a stable soil surface

Mitigation: Action/control	Responsibility	Timeframe
Vegetation clearing must occur in a phased manner to minimise erosion and/or run-off.	Contractor	Construction
Topsoil must be removed and stored separately from subsoil. Topsoil must be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.	Contractor	Construction
Stockpile topsoil for re-use in the rehabilitation phase. Maintain stockpile shape and protect from erosion.	Contractor	Construction
Storing topsoil: <ul style="list-style-type: none"> » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. » Rapid decomposition of organic material in warm, moist topsoil rapidly decreases microbial activity necessary for nutrient cycling, and reduces the amount of beneficial micro-organisms in the soil. » Stockpile location must ideally be in a disturbed but weed-free area. » Storage of all topsoil that is disturbed must be of a maximum height of 2m and the maximum length of time before re-use is 18 months. » Topsoil handling must be reduced to stripping, piling (once), and re-application. Between the stockpiling and 	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
<p>reapplication, stored topsoil must not undergo any further handling except control of erosion and (alien) invasive vegetation.</p> <ul style="list-style-type: none"> » Where topsoil can be reapplied within six months to one year after excavation, it will be useful to store the topsoil as close as possible to the area of excavation and re-application, e.g. next to cabling trenches. » Do not mix overburden with topsoil stockpiles, as this will dilute the proportion of fertile soil (with less fertile subsoil or rock material). » Employ wind nets made from Hessian or similarly fibrous and biodegradable material, where required, to stabilise newly placed topsoil stockpiles and to reduce wind erosion. » In cases where topsoil has to be stored longer than 6 months or during the rainy season, soils must be kept as dry as possible and protected from erosion and degradation by: <ul style="list-style-type: none"> * Preventing ponding on or between heaps of topsoil * Covering topsoil berms * Preventing all forms of contamination or pollution * Preventing any form of compaction * Monitoring the establishment of all invasive vegetation and removing such if it appears * Keeping slopes of topsoil at a maximal 2:1 ratio * Monitoring and mitigating erosion where it appears » Where topsoil needs to be stored in excess of one year, it is recommended to either cover the topsoil or allow an indigenous grass cover to grow on it – if this does not happen spontaneously, seeding must be considered. 		
<p>Regular monitoring of the site (minimum of twice annually) must be undertaken to identify possible areas of erosion, particularly after large summer thunder storms have been experienced. Problem areas must receive follow-up monitoring by the EO to assess the success of the remediation.</p>	Contractor	Construction
<p>Any erosion problems observed to be associated with the project infrastructure must be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.</p>	Contractor	Construction
<p>Re-instate as much of the eroded area to its pre-disturbed, "natural" geometry (no change in elevation and any banks not to be steepened) where possible.</p>	Contractor	Construction
<p>Erosion control measures such as silt fences (for areas of works) and gravel strips may be considered at the impact zone where water falls from the solar panels onto the soil surface (due to deterioration in natural grassland because of poor maintenance or lack of solar radiation).</p>	Contractor	Construction
<p>Silt traps must be used where there is a danger of topsoil eroding and entering lower lying wetland resources.</p>	Contractor	Construction
<p>Construction of gabions and other stabilisation features must be undertaken to prevent erosion, if deemed necessary.</p>	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Level any remaining soil removed from excavation pits that remained on the surface instead of allowing small stockpiles of soil to remain on the surface.	Contractor	Construction
<p>Reapplying topsoil:</p> <ul style="list-style-type: none"> » Spoil materials and subsoil must be back-filled first, then covered with topsoil. » Immediate replacement of topsoil after the undertaking of construction activities within an area. » Generally, topsoil must be re-applied to a depth slightly greater than the topsoil horizon of a pre-selected undisturbed reference site. » The minimum depth of topsoil needed for re-vegetation to be successful is approximately 20 cm. » If the amount of topsoil available is limited, a strategy must be devised to optimise re-vegetation efforts with the topsoil available. » Reapplied topsoil must be landscaped in a way that creates a variable microtopography of small ridges and valleys that run parallel to existing contours of the landscape. The valleys become catch-basins for seeds and act as run-on zones for rainfall, increasing moisture levels where the seeds are likely to be more concentrated. This greatly improves the success rate of re-vegetation efforts. » To stabilise reapplied topsoil and minimise raindrop impact and erosion: <ul style="list-style-type: none"> * Use organic material from cleared and shredded woody vegetation where possible * Alternatively, suitable geotextiles or organic erosion mats can be used as necessary » Continued monitoring will be necessary to detect any sign of erosion early enough to allow timeous mitigation. 	Contractor	Construction
Re-applied topsoil needs to be re-vegetated as soon as possible.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Minimal level of soil erosion around site. » Minimal level of soil degradation. » No activity outside demarcated areas. » Acceptable state of excavations. » No activity in restricted areas. » Acceptable state of excavations, as determined by EO and ECO. » No indications of visible topsoil loss.
Monitoring and Reporting	<ul style="list-style-type: none"> » Continual inspections of the site by the EO. » Reporting of ineffective sediment control systems and rectification as soon as possible. » If soil loss is suspected, acceleration of soil conservation and rehabilitation measures must be implemented.

OBJECTIVE 13: Appropriate handling and management of waste

The construction of the solar facility and associated infrastructure will involve the generation of various wastes. In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented.

The major waste stream during the Construction Phase are:

- » Cardboard waste from the panels.
- » Rubber caps placed on all eight corners of the PV panels – volumes uncertain.
- » Wooden pallets on which the PV boxes arrive.
- » Plastic wrap.

Other wastes include:

- » Other general solid waste.
- » Hazardous waste.
- » Inert waste (rock and soil).
- » Liquid waste (including grey water and sewage).

Project Component/s	» Storage and handling of waste.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	» Packaging. » Other construction wastes. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	» To comply with waste management legislation. » To minimise production of waste. » To ensure appropriate waste storage and disposal. » To avoid environmental harm from waste disposal.

Mitigation: Action/Control	Responsibility	Timeframe
Waste management must be a priority and all waste must be collected and stored adequately. Waste should be stored at a licensed facility. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. Maximum domestic waste storage period will be up to 10 days.	Contractor	Duration of contract
Sealable and properly marked domestic waste collection bins must be supplied on site and all solid waste collected must be disposed of at a licensed disposal facility. Under no circumstances may domestic waste be burned on site.	Contractor	Construction
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
deposited on adjacent/surrounding properties, and that the waste is disposed of at dumping site as approved by the Council.		
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled. This must be regularly removed and recycled (where possible) or disposed of at an appropriately licensed landfill site.	Contractor	Duration of contract
Waste must be stored in accordance with the relevant legislative requirements.	Contractor	Construction
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works.	Contractor	Construction
All liquid wastes should be contained in appropriately sealed vessels/ponds within the footprint of the development, and be disposed of at a designated waste management facility after use.	Contractor	Duration of contract
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials. The onus is on the Contractor to identify and interpret the applicable legislation. Hazardous waste to be disposed of at a registered landfill site.	Contractor	During and post construction.
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Regularly serviced chemical toilet facilities and/or septic tank must be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Daily inspection of all chemical toilets and septic tanks must be performed by environmental representatives on site.	Contractor	Duration of contract
In the event where sewage is discharged into the environment, all contaminated vegetation/ rock and soil must be removed immediately and treated as hazardous waste.	Contractor	Duration of construction
Ensure that the below ground storage of the septic tank can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams.	Contractor	Construction
Waste management must be a priority and all waste must be collected and stored adequately.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » Proof of disposal of sewage at an appropriate wastewater treatment works. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 14: Appropriate handling and storage of chemicals and/or hazardous substances

The construction phase may involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

Project Component/s	» Storage and handling of chemicals and hazardous substances.
Potential Impact	<ul style="list-style-type: none"> » Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers. » Soil pollution.
Activity/Risk Source	<ul style="list-style-type: none"> » Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon spills by vehicles and machinery during levelling, vegetation clearance and transport of workers, materials and equipment and fuel storage tanks. » Accidental spills of hazardous chemicals. » Polluted water from wash bays and workshops. » Pollution from concrete mixing.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. » Prevent and contain hydrocarbon leaks. » Undertake proper waste management. » Store hazardous chemicals safely in a bunded area.

Mitigation: Action/Control	Responsibility	Timeframe
Implement an emergency preparedness plan during the construction phase.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Any liquids stored on site, including fuels and lubricants, must be stored in accordance with applicable legislation.	Contractor	Construction
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Construction
Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment must be contained using a drip tray with plastic sheeting filled with absorbent material when not parked on hard standing.	Contractor	Construction
<p>Establish an appropriate Hazardous Stores which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not be limited to:</p> <ul style="list-style-type: none"> » Designated area; » All applicable safety signage; » Firefighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and » Has adequate capacity to contain 110% of the largest container contents. 	Contractor	Construction
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. Where required, a NEMA Section 30 report must be submitted to the relevant environmental authority within 14 days of the incident.	Contractor	Construction
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Construction
Spilled concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Construction
Check vehicles and machinery daily for oil, fuel and hydraulic fluid leaks and undertake regular high standard maintenance on vehicles.	Contractor	Construction
Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately in line with procedures by trained staff with the appropriate equipment.	Contractor	Construction
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Construction
Routine servicing and maintenance of vehicles must not take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Construction
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Construction
Construction machinery must be stored in an appropriately sealed area.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Construction
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Construction
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor	Construction
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean stormwater system.	Contractor	Construction
As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site.	Contractor	Construction
Have appropriate action plans on site, and training for contactors and employees in the event of spills, leaks and other potential impacts to the aquatic systems. All waste generated on-site during construction must be adequately managed.	Contractor	Construction
Implement a contingency plan to handle spills, so that environmental damage is avoided.	Contractor	Construction
Drip trays must be used during fuel/chemical dispensing.	Contractor	Construction
Drip trays to be placed beneath standing machinery/plant.	Contractor	Construction
In the case of petrochemical spillages, the spill must be collected immediately and stored in a designated area until it can be disposed of in accordance with the Hazardous Chemical Substances Regulations, 1995 (Regulation 15).	Contractor	Construction
The Contractor must be in possession of an emergency spill kit that must always be complete and available on site.	Contractor	Construction
Appropriately contain any generator diesel storage tanks and machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No chemical spills outside of designated storage areas. » No water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping. » Safe storage of hazardous chemicals. » Proper waste management.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » An incident reporting system will be used to record non-conformances to the EMPr. » On-going visual assessment to detect polluted areas and the application of clean-up and preventative procedures. » Monitor hydrocarbon spills from vehicles and machinery during construction continuously and record volume and nature of spill, location and clean-up actions.

- » Monitor maintenance of drains and intercept drains weekly.
- » Analyse soil samples for pollution in areas of known spills or where a breach of containment is evident when it occurs.
- » Records of accidental spills and clean-up procedures and the results thereof must be audited on an annual basis by the ECO.
- » Records of all incidents that caused chemical pollution must be kept and a summary of the results must be reported to management annually.

7.2 Detailing Method Statements

OBJECTIVE 15: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

- » Responsible person/s.
- » Construction procedures.
- » Materials and equipment to be used.
- » Getting the equipment to and from site.
- » How the equipment/material will be moved while on-site.
- » How and where material will be stored.
- » The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur.
- » Timing and location of activities.
- » Compliance/non-compliance with the Specifications.
- » Any other information deemed necessary by the Site Manager.

Method Statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities. Specific areas to be addressed in the method statement: pre, during and post construction include:

- » Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- » Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).

- » Soil management/stockpiling and erosion control.
- » Excavations and backfilling procedure.
- » Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions).
- » Storm water method statement.
- » Ablution facilities (placement, maintenance, management and servicing).
- » Solid Waste Management:
 - * Description of the waste storage facilities (on site and accumulative).
 - * Placement of waste stored (on site and accumulative).
 - * Management and collection of waste process.
 - * Recycle, re-use and removal process and procedure.
- » Liquid waste management.
- » Design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into the surrounding environment. Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facility where possible. Where no facilities are available, grey water runoff must be controlled to ensure no seepage into the surrounding environment occurs.
- » Dust and noise pollution:
 - * Describe the necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.
 - * Procedure to control dust at all times on the site, access roads and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- » Hazardous substance storage (ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
 - * Lists of all potentially hazardous substances to be used.
 - * Appropriate handling, storage and disposal procedures.
 - * Prevention protocol of accidental contamination of soil at storage and handling areas.
 - * All storage areas, (i.e. for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- » Fire prevention and management measures on site.
- » Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).
 - * Rehabilitation, re-vegetation process and bush clearing.
- » Incident and accident reporting protocol.
- » General administration.
- » Designate access road and the protocols while roads are in use.
- » Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager (with input from the ECO), except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method

statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

7.3 Awareness and Competence: Construction Phase

OBJECTIVE 16: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that all personnel involved in the project are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The ECO is responsible for monitoring compliance pre, during and post construction. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

- » All Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment. This includes the discussion/explanation of site environmental matters during toolbox talks.
- » The content and requirements of Method Statements are to be clearly explained to all plant operators and general workers. All staff acting in a supervisory capacity are to have copies of the relevant Method Statements and be aware of the contents thereof.
- » Ensuring that a copy of the EMPr is readily available on-site, and that all senior site staff are aware of the location and have access to the document. Senior site staff will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training session. The training session must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
 - * Records must be kept of those that have completed the relevant training.
 - * Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
 - * Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.
- » All sub-contractors must have a copy of the EMPr and sign a declaration/ acknowledgement that they are aware and familiar with the contents and requirements of the EMPr and that they will conduct work in such a manner as to ensure compliance with the requirements of the EMPr.
- » Contractors and main sub-contractors should have a basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

7.3.1 Environmental Awareness and Induction Training

The EO, in consultation with the contractor, shall ensure that all construction workers receive an induction presentation, as well as on-going environmental education and awareness, on the importance and implications of the EMPr and the environmental requirements it prescribes. The presentation shall be conducted, as far as is possible, in the employees' language of choice. The contractor should provide a translator from their staff for the purpose of translating should this be necessary.

As a minimum, induction training should include:

- » Explanation of the importance of complying with the EMPr.
- » Explanation of the importance of complying with the Environmental Authorisation.
- » Discussion of the potential environmental impacts of construction activities.
- » Awareness regarding sensitivities on the site, including sensitive plant species (including the use of visual aids and on-site identification).
- » The benefits of improved personal performance.
- » Employees' roles and responsibilities, including emergency preparedness (this should be combined with this induction, but presented by the contractor's Health and Safety Representative).
- » Explanation of the mitigation measures that must be implemented when carrying out their activities.
- » Explanation of the specifics of this EMPr and its specification (no-go areas, etc.).

Environmental Awareness Training must take the form of an on-site talk and demonstration by the EO/ECO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the EO/ECO on site. Proof of awareness training should be kept on record. Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should be undertaken by the Contractor's Environmental Officer and should include discussing Becrux Solar PV Project One (Pty) Ltd's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the EO/ECO on site.

7.3.2 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) where foremen, environmental and safety representatives of different components of the works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and ones recommended by the onsite EO and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

7.4 Monitoring Programme: Construction Phase of the Becrux Solar PV Facility

OBJECTIVE 17: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the EA (once issued). Where this is not clearly dictated, the Developer will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Technical Director/ Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to monitor the implementation of the specified environmental specifications, in order to:

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
- » Ensure adequate and appropriate interventions to address non-compliance.
- » Ensure adequate and appropriate interventions to address environmental degradation.
- » Provide a mechanism for the lodging and resolution of public complaints.
- » Ensure appropriate and adequate record keeping related to environmental compliance.
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site.
- » Aid in communication and feedback to authorities and stakeholders.

All documentation e.g. audit/monitoring/compliance reports and notifications must be submitted to the Mpumalanga DARDLEA in terms of the EA.

Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

7.4.1. Non-Conformance Reports

All supervisory staff including Foremen, Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

7.4.2. Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to the Mpumalanga DARDLEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out. The contractor must ensure that all waste manifests are provided to the ECO on a monthly basis in order to inform and update the Mpumalanga DARDLEA regarding waste related activities.

7.4.3. Audit Reports

The holder of the EA must, for the period during which the EA and EMPr remain valid, ensure that project compliance with the conditions of the EA and the EMPr is audited, and that the audit reports are submitted to the Mpumalanga DARDLEA.

An environmental internal audit must be conducted and submitted every 3 months or in accordance with the frequency stated in the EA and an external audit must be conducted once a year. An annual external audit report must be compiled and submitted to the Mpumalanga DARDLEA until the completion of construction and rehabilitation. This report must be compiled in accordance with Appendix 7 of the EIA Regulations, 2014, as amended, and indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

7.4.4. Final Audit Report

A final environmental audit report must be compiled by an independent auditor and be submitted to the Mpumalanga DARDLEA upon completion of the construction and rehabilitation activities. The report must be submitted within 30 days of completion of rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

CHAPTER 8: MANAGEMENT PROGRAMME: REHABILITATION

Overall Goal: Undertake the rehabilitation measures in a way that:

- » Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

8.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE 1: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and those areas that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	<ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	» Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	<ul style="list-style-type: none"> » Temporary construction areas. » Temporary access roads/tracks. » Other disturbed areas/footprints. » Site preparation and earthworks. » Excavation of foundations and trenches. » Temporary laydown areas.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
A site rehabilitation programme must be compiled and implemented (refer to Appendix D).	Contractor	Following execution of the works
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during	Contractor	Following completion of construction activities in an area

Mitigation: Action/Control	Responsibility	Timeframe
flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species.		
All temporary facilities, equipment, and waste materials must be removed from site as soon as construction is completed.	Contractor	Following completion of construction activities in an area
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area
All voids must be backfilled.	Contractor	Following completion of construction activities in an area
Where disturbed areas are not to be used during the operation of the PV facility, these areas must be rehabilitated/re-vegetated with appropriate natural indigenous vegetation and/or local seed mix. A seed mix must be applied to rehabilitated and bare areas. No exotic plants must be used for rehabilitation purposes.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
No planting or importing any listed invasive alien plant species (all Category 1a, 1b and 2 invasive species) to the site for landscaping, rehabilitation or any other purpose must be undertaken.	Contractor	Following completion of construction activities in an area
Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation. Soils must be replaced in the correct sequence / profile.	Contractor	Following completion of construction activities in an area
Re-vegetated areas may need to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Proponent in consultation with rehabilitation specialist	Post-rehabilitation
Appropriately rehabilitate the project area by ripping, landscaping and re-vegetating with locally indigenous species.	Contractor	Following completion of construction activities in an area

Performance Indicator	<ul style="list-style-type: none"> » All portions of the site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Completed site free of erosion and alien invasive plants.
Monitoring	<ul style="list-style-type: none"> » Rehabilitated areas should be monitored (responsibility of EO) on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has rehabilitated to a satisfactory level. » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

CHAPTER 9: OPERATION MANAGEMENT PROGRAMME

Overall Goal: To ensure that the operation of the Becrux Solar PV Facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- » Enables the operation activities to be undertaken without significant disruption to other land uses in the area.
- » Minimise impacts on fauna using the site.

9.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE 1: Securing the site and general maintenance during operation

Safety issues may arise with public access to the solar facility (e.g. unauthorised entry to the site). Prevention and control measures to manage public access are therefore important.

General maintenance at the Becrux Solar PV Facility will be required during the operation phase. The maintenance required may also include the replacement of PV panels, if required during the operation lifetime of the facility.

Project component/s	All infrastructure including: <ul style="list-style-type: none"> » PV panels. » Inverters and transformers. » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	» Hazards to operation and maintenance staff.
Activities/risk sources	» Uncontrolled access to the solar facility and associated infrastructure.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect operation and maintenance staff.

Mitigation: Action/control	Responsibility	Timeframe
Site access must be controlled and no unauthorised persons must be allowed onto the site.	O&M Operator	Operation
General onsite maintenance of the solar facility during the operation phase must in no way impact or negatively affect the environment. Contractors or other service providers providing	O&M Operator	Operation

Mitigation: Action/control	Responsibility	Timeframe
onsite maintenance must be made aware of this EMPr and the contents thereof.		
Post information boards within the project footprint about public safety hazards and emergency contact information.	O&M Operator	Operation
<p>A grievance and consultation plan must be developed and kept on the site at all times during operation of the solar facility. All grievances must be recorded and dealt with in the appropriate grievance channels as outlined in the grievance plan which must be established.</p> <p>Community consultation with surrounding landowners and community members must continue through the life cycle of the project, and must be reported on as such in the grievance and consultation plan.</p> <p>This will allow the receipt of - and facilitate resolution of concerns and grievances about the project's social and environmental issues raised by individuals or groups during the project operational period.</p>	O&M Operator	Operation
<p>Should PV panels need to be replaced, the following will apply:</p> <ul style="list-style-type: none"> » Site access must be confirmed for the transportation of the required components and equipment to the site. » Materials and PV panels are to be stored within the previously disturbed construction laydown area. No disturbance of areas outside of these areas should occur. » Full clean-up of all materials must be undertaken after the removal and replacement of the PV panels and associated infrastructure is complete, and disturbed areas appropriately rehabilitated. » Recycle components as far as possible. No waste materials may be left on-site following the replacement. » Waste material which cannot be recycled shall be disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation. 	O&M Operator	Operation

<p>Performance Indicator</p>	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry. » No operational and maintenance staff are injured. » No complaints from adjacent landowners/ public.
<p>Monitoring and Reporting</p>	<ul style="list-style-type: none"> » Regular visual inspection of fence for signs of deterioration/forced access. » An incident reporting system must be used to record non-conformances to the EMPr. » A public complaints register must be developed and maintained on site.

OBJECTIVE 2: Protection of sensitive areas, flora, fauna (including avifauna), soils, water features and maintenance of rehabilitation

Indirect impacts on sensitive areas, vegetation, fauna, soils and water features during operation could result from maintenance activities and the movement of people and vehicles on site. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project component/s	<ul style="list-style-type: none"> » Areas requiring regular maintenance. » Solar facility, including internal access roads grid connection. » Areas disturbed during the construction phase and subsequently rehabilitated at its completion.
Potential Impact	<ul style="list-style-type: none"> » Impacts on sensitive areas. » Disturbance to or loss of flora and fauna. » Alien plant invasion. » Soil pollution. » Impacts on water features. » Environmental integrity of site undermined resulting in erosion, compromised land capability and the requirement for on-going management intervention.
Activity/Risk Source	<ul style="list-style-type: none"> » Movement of employee vehicles within and around site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Maintain minimised footprints of disturbance of vegetation/ habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation. » Minimise soil erosion and pollution.

Mitigation: Action/Control	Responsibility	Timeframe
Areas rated as High sensitivity and their buffers in proximity to the development area should be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas from operation and maintenance staff and machinery.	O&M Operator	Operation
A hydrocarbon spill management plan must be put in place, to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas.	O&M Operator	Operation
The Operator must be in possession of an emergency spill kit that must always be complete and available on site.	O&M Operator	Operation
Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.	O&M Operator	Operation
No servicing of equipment may occur on site, unless necessary.	O&M Operator	Operation
Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	O&M Operator	Operation
Storm Water run-off & Discharge Water Quality monitoring must be undertaken.	O&M Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	O&M Operator	Operation
Noise must be kept to an absolute minimum during the evenings and at night where possible, to minimize all possible disturbances to amphibian species and nocturnal mammals	O&M Operator	Operation
No trapping, killing, or poisoning of any animals is to be allowed.	O&M Operator	Operation
All staff should undergo an environmental induction that includes instruction on the need to comply with speed limits and the requirements of the EMPr and other permits that may be issued for the project to respect all forms of fauna. The induction must also include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".	O&M Operator	Operation
Speed limits must still be enforced to ensure that road killings and erosion is limited.	O&M Operator	Operation
Heat generated from the substation, if any, must be monitored to ensure it does not negatively affect the local fauna.	O&M Operator	Operation
Ensure that any cables and connections are insulated successfully to reduce electrocution risk.	O&M Operator	Operation
Monitoring of the overhead power line route must be undertaken to detect bird carcasses to enable the identification of any potential areas of high impact to be marked with bird flappers if not already done so. Monitoring should be undertaken at least once a month for the first year of operation.	O&M Operator	Operation
Implement an alien vegetation management plan.	O&M Operator	Operation
Speed limits must be put in place to reduce erosion	O&M Operator	Operation
A stormwater management plan must be implemented.	O&M Operator	Operation
Continuously monitor erosion and compaction on site	O&M Operator	Operation

Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to vegetation or terrestrial faunal habitats. » No soil erosion and pollution problems resulting from operational activities within the solar facility. » Low abundance of alien plants within affected areas. » Maintenance of a ground cover that resist erosion. » Continued improvement of rehabilitation efforts. » No impacts to wetland features.
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation on-site by environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas. » Annual monitoring with records of alien species presence and clearing actions. » Annual monitoring with records of erosion problems and mitigation actions taken with photographs.

OBJECTIVE 3: Minimise dust and emissions to air

During the operation phase, limited gaseous or particulate emissions are anticipated from exhaust emissions (i.e. from operational vehicles). Windy conditions and the movement of vehicles on site may lead to dust creation.

Project Component/s	<ul style="list-style-type: none"> » Gravel roads and surfaces. » On-site vehicle movement.
Potential Impact	<ul style="list-style-type: none"> » Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles.
Activities/Risk Sources	<ul style="list-style-type: none"> » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle engines.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements. » To ensure emissions from the power generation process are minimised.

Mitigation: Action/Control	Responsibility	Timeframe
Implement appropriate dust suppression measures on a regular basis in any exposed surfaces.	O&M Operator	Operation
Re-vegetation of cleared areas as soon as practically feasible.	O&M Operator	Operation
Speed of vehicles must be restricted on site to 40km/hr.	O&M Operator	Operation
Vehicles and equipment must be maintained in a road-worthy condition at all times.	O&M Operator	Operation

Performance Indicator	<ul style="list-style-type: none"> » No complaints regarding dust or vehicle emissions. » Dust suppression measures implemented, where required. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.
Monitoring	<ul style="list-style-type: none"> » Immediate reporting by personnel of any potential or actual issues with nuisance or dust to the Power Station Manager. » A complaints register must be maintained, in which any complaints will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE 4: Minimise visual impacts during operation

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

Project component/s	<p>All infrastructure including:</p> <ul style="list-style-type: none"> » PV panels. » Inverters and transformers.
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	<ul style="list-style-type: none"> » Cabling between panels. » E-house containerised or non-containerised substation. » Overhead power line. » Laydown area. » Access road and internal roads. » Associated buildings.
Potential Impact	<ul style="list-style-type: none"> » Enhanced visual intrusion. » Visual impact of the PV facility degradation and vegetation rehabilitation failure.
Activity/risk source	<ul style="list-style-type: none"> » Size/scale of PV panels and power line. » Associated lighting. » Internal access roads. » Other associated infrastructure. » Viewing of the degradation and vegetation rehabilitation failure by observers on or near the site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise the potential for visual impact. » Minimise the contrast with the surrounding environment and visibility of the PV panels to humans. » The containment of light emitted from the facility in order to eliminate the risk of additional night-time visual impacts. » Well maintained and neat facility.

Mitigation: Action/control	Responsibility	Timeframe
Maintain the general appearance of the facility as a whole.	O&M Operator	Operation
Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).	O&M Operator	Operation
Adjust tilt angles of the panels if glint and glare issues become evident, where possible.	O&M Operator	Operation
Use dull polishing on PV structures, where possible.	O&M Operator	Operation
If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site, where possible.	O&M Operator	Operation

Performance Indicator	<ul style="list-style-type: none"> » Well maintained and neat facility with intact vegetation on and in the vicinity of the wind farm. » No complaints regarding visual impacts received from users of the Secunda secondary road.
Monitoring and Reporting	<ul style="list-style-type: none"> » Monitoring of the entire site on an ongoing basis by the operator.

OBJECTIVE 5: Ensure the implementation of an appropriate fire management plan and general management measures during the operation phase

The following recommendations below must be considered with regards to fire protection on site:

- » Cigarette butts may not be thrown in the veld, but must be disposed of correctly. Designated smoking areas must be established with suitable receptacles for disposal.

- » In case of a fire outbreak, contact details of the local fire and emergency services must be readily available.
- » Contractors must ensure that basic firefighting equipment is available on site as per the specifications defined by the health and safety representative / consultant.
- » The fire risk on site is a point of discussion that must take place as part of the environmental induction training.
- » The contractor must also comply with the requirements of the Occupational Health and Safety Act with regards to fire protection.

The following below can be used as a guide for appropriate fire management (also refer to **Appendix H**):

Project Component/s	<ul style="list-style-type: none"> » PV Array. » Associated buildings.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the PV facility infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Sasol Limited's fire management plan must be implemented during operations to restrict the impact fire might have on the surrounding areas.	O&M Operator	Operation
Provide adequate firefighting equipment on site.	O&M Operator	Operation
Provide fire-fighting training to selected operation and maintenance staff.	O&M Operator	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	O&M Operator	Operation
Fire breaks should be established and maintained where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	O&M Operator	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	O&M Operator	Operation
Contact details of emergency services should be prominently displayed on site.	O&M Operator	Operation

Performance Indicator	<ul style="list-style-type: none"> » Firefighting equipment and training provided before the operation phase commences. » Appropriate fire breaks in place and are regularly maintained. » Contact details of emergency services are displayed in conspicuous locations on site.
Monitoring	» The O&M Operator must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 6: Maximise local employment, skills development and business opportunities associated with the construction phase

Project Component/s	<ul style="list-style-type: none"> » Operation and maintenance activities associated with the facility. » Availability of required skills in the local communities for the undertaking of the operation and maintenance activities.
Potential Impact	<ul style="list-style-type: none"> » The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	<ul style="list-style-type: none"> » Limited use of local labour, thereby reducing the employment and business opportunities for locals. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area. » Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area.
Enhancement: Target/Objective	<ul style="list-style-type: none"> » The Developer / O&M Operator should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors. » Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building.

Mitigation: Action/Control	Responsibility	Timeframe
It is recommended that a local employment policy be adopted by the developer to maximise the project opportunities being made available to the local community.	O&M Operator	Operation
Enhance employment opportunities for the immediate local area, Govan Mbeki Local Municipality. If this is not possible, then the broader focus areas should be considered for sourcing employees.	O&M Operator	Operation
The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.	O&M Operator	Operation
The developer should establish vocational training programs for the local employees to promote the development of skills.	Developer	Operation

Performance Indicator	<ul style="list-style-type: none"> » Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities as appropriate. » Locals and previously disadvantaged individuals (including women) are considered during the hiring process. » Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation. » The involvement of local labour is promoted. » Reports are not made from members of the local communities regarding unrealistic employment opportunities or that only outsiders were employed. » Skills training and capacity building initiatives are developed and implemented.
Monitoring	<ul style="list-style-type: none"> » O&M Operator must keep a record of local recruitments and information on local labour to be shared with the external auditor for reporting purposes.

OBJECTIVE 7: Appropriate handling and management of hazardous substances, waste and dangerous goods

The operation of the PV facility will involve the storage of chemicals and hazardous substances, as well as the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, hazardous waste and sewage waste.

Project Component/s	<ul style="list-style-type: none"> » PV facility. » Associated infrastructure.
Potential Impact	<ul style="list-style-type: none"> » Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	<ul style="list-style-type: none"> » Transformers, switchgear and supporting equipment. » Fuel and oil storage.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe
Hazardous substances (such as used/new transformer oils, etc.) must be stored in sealed containers within a clearly demarcated designated area.	O&M Operator	Operation
A hydrocarbon spill management plan must be implemented to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas.	O&M Operator	Operation
All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.	O&M Operator	Operation
Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.	O&M Operator	Operation
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	O&M Operator	Operation and maintenance
Storage areas for hazardous substances must be appropriately sealed and banded.	O&M Operator	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	O&M Operator	Operation
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	O&M Operator	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately	O&M Operator	Operation and maintenance

Mitigation: Action/Control	Responsibility	Timeframe
sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.		
All food waste, litter and all general waste at the site should be placed in bins with lids and removed from the site on a regular basis. The waste should be disposed of at a licensed waste facility / landfill. Where possible, general waste should be recycled.	O&M Operator	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	O&M Operator	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	O&M Operator	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	O&M Operator	Operation
All servicing and re-fuelling of machines and equipment must either take place off-site, or in controlled and bunded working areas.	O&M Operator	Operation
Separation and recycling of different waste materials should be supported.	O&M Operator	Operation
Immediately report significant spillages and initiate an environmental site assessment for risk assessment and remediation if necessary.	O&M Operator	Operation
Suitable temporary solid waste facilities are to be incorporated into the design to prevent unsanitary conditions. These are to be weekly cleared and waste collected by the local waste management department.	Developer O&M Operator	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	O&M Operator/ waste management contractor	Operation
No waste may be burned or buried on site.	O&M Operator	Operation

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil.
Monitoring	<ul style="list-style-type: none"> » Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection. » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the O&M operator. » All appropriate waste disposal certificates accompany the monthly reports.

9.2. Monitoring Programme: Operation Phase of the Becrux Solar PV Facility

OBJECTIVE 8: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. An internal environmental audit must be conducted every 6 months or in accordance with the frequency stated in the EA and an external audit must be conducted once a year in order to confirm compliance with the requirements of all environmental permits (including the EA, once issued) for the project, this EMPr, and all relevant legislation. The results of the audit reports must be made available to the Mpumalanga DARDLEA and the relevant authorities on request, and must be part of monitoring and audit reports. An annual external audit report must be compiled and submitted to Mpumalanga DARDLEA. The aim of the auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
- » Ensure adequate and appropriate interventions to address non-compliance.
- » Ensure adequate and appropriate interventions to address environmental degradation.
- » Provide a mechanism for the lodging and resolution of public complaints.
- » Ensure appropriate and adequate record keeping related to environmental compliance.
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site.
- » Aid in the communication and feedback to authorities and stakeholders.

CHAPTER 10: MANAGEMENT PROGRAMME: DECOMMISSIONING

The lifespan of the proposed Becrux Solar PV Facility will be up to 25 years. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life or if it is no longer required. The lifespan of the facility could be extended depending on the condition of the infrastructure. An assessment will be undertaken prior to the end of the lifecycle of the plant to determine whether the plant should be decommissioned or whether the operation of the plant should continue.

It is most likely that decommissioning activities of the infrastructure of the facility discussed in the BA process would comprise the disassembly, removal and disposal of the infrastructure. Decommissioning activities will involve disassembly of the production units and ancillary infrastructure, demolishing of buildings, removal of waste from the site and rehabilitation to the desired end-use. Future use of the site after decommissioning of the Becrux Solar PV Facility could possibly form part of an alternative industry that would be able to utilise some of the existing infrastructure associated with the facility. This would however be dependent on the development plans of the area at the time.

As part of the decommissioning phase, the developer will undertake the required permitting processes applicable at the time of decommissioning.

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore are not repeated in this section.

9.1. Objectives

Within a period of at least 12 months prior to the decommissioning of the site, a Decommissioning Method Statement must be prepared and submitted to the Local Planning Authority, as well as the Provincial and Environmental Authority. This method statement must cover site restoration, soil replacement, landscaping, conservation, and a timeframe for implementation. Furthermore, this decommissioning must comply with all relevant legal requirements administered by any relevant and competent authority at that time.

The objectives of the decommissioning phase of the proposed project are to:

- » Follow a process of decommissioning that is progressive and integrated into the short- and long-term project plans that will assess the closure impacts proactively at regular intervals throughout project life.
- » Implement progressive rehabilitation measures, beginning during the construction phase.
- » Leave a safe and stable environment for both humans and animals and make their condition sustainable.
- » Return rehabilitated land-use to a standard that can be useful to the post-project land user.
- » Where applicable, prevent any further soil and surface water contamination by maintaining suitable storm water management systems.
- » Maintain and monitor all rehabilitated areas following re-vegetation, and if monitoring shows that the objectives have been met, apply for closure.

9.2. Approach to the Decommissioning Phase

It is recommended that planning of the decommissioning of the project and rehabilitation of the site take place well in advance (at least two years) of the planned decommissioning activities. Important factors that need to be taken into consideration are detailed below.

Two possible scenarios for this decommissioning phase are detailed below:

SCENARIO 1: TOTAL DECOMMISSIONING OF PV FACILITY

If the decision is taken at the end of the project lifespan to totally decommission the facility, i.e. make the land available for an alternative land use, the following should take place:

- » All concrete and imported foreign material must be removed from the PV facility i.e. panels, support structures etc.
- » The holes where the panel support structures are removed must be levelled and covered with subsoil and topsoil.
- » Infrastructure not required for the post-decommissioning use of the site must be removed and appropriately disposed of.
- » Access roads not required for the post-decommissioning use of the site must be rehabilitated. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.
- » Tracks that are to be utilised for the future land use operations should be left *in-situ*. The remainder of the tracks to be removed (ripped) and topsoil replaced.
- » All ancillary buildings and access points are to be removed unless they can be used for the future land use.
- » Underground electric cables are to be removed if they cannot be used in the future land use.
- » All material (cables, PV Panels etc.) must be re-used or recycled wherever possible.
- » The competent authority may grant approval to the owner not to remove the landscaping and underground foundations.
- » The site must be seeded with locally sourced indigenous vegetation (unless otherwise dictated by the future land use) to allow revegetation of the site.
- » Monitor rehabilitated areas quarterly for at least three years (expected) following decommissioning, and implement remedial action as and when required.

SCENARIO 2: PARTIAL DECOMMISSIONING OF PV FACILITY

Should more advanced technology become available it may be decided to continue to use the site as a PV facility. Much of the existing infrastructure is likely to be re-used in the upgraded facility. In this case, all infrastructure that will no longer be required for the upgraded facility must be removed as described for Scenario 1. The remainder of the infrastructure should remain in place or upgraded depending on the requirements of the new facility. Any upgrades to the facility at this stage must comply with relevant legislation.

9.2.1. Identification of structures for post-closure use

Access roads should be assessed to determine if these could be used post-closure. Where not required, these access roads should be decommissioned and rehabilitated.

9.2.2. Removal of infrastructure

All infrastructure must be dismantled and removed. Inert material must be removed from site and disposed of at a suitably registered landfill site. The PV facility components must be removed and recycled where possible or disposed of at a suitably registered landfill site. All foundations must be removed to a depth of 1m. Hard surfaces must be ripped to a depth of 1m and vegetated.

9.2.3. Soil rehabilitation

The steps that should be taken during the rehabilitation of soils are as follows:

- » The deposited soils must be ripped to ensure reduced compaction.
- » An acceptable seed bed should be produced by surface tillage.
- » Restore soil fertility.
- » Incorporate the immobile fertilisers in to the plant rooting zone before ripping.
- » Apply maintenance dressing of fertilisers on an annual basis until the soil fertility cycle has been restored.

9.2.4. Establishment of vegetation

The objective is to restore the project site to a self-sustaining cycle, i.e. to realise the re-establishment of the natural nutrient cycle with ecological succession initiated.

The objectives for the re-vegetation of reshaped and top-soiled land are to:

- » Prevent erosion.
- » Restore the land to the agreed land capability.
- » Re-establish eco-system processes to ensure that a sustainable land use can be established without requiring fertilizer additions.
- » Restore the biodiversity of the area as far as possible.

9.2.5. Maintenance

Established vegetation requires regular maintenance. If the growth medium consists of low-fertility soils, then regular maintenance will be required until the natural fertility cycle has been restored.

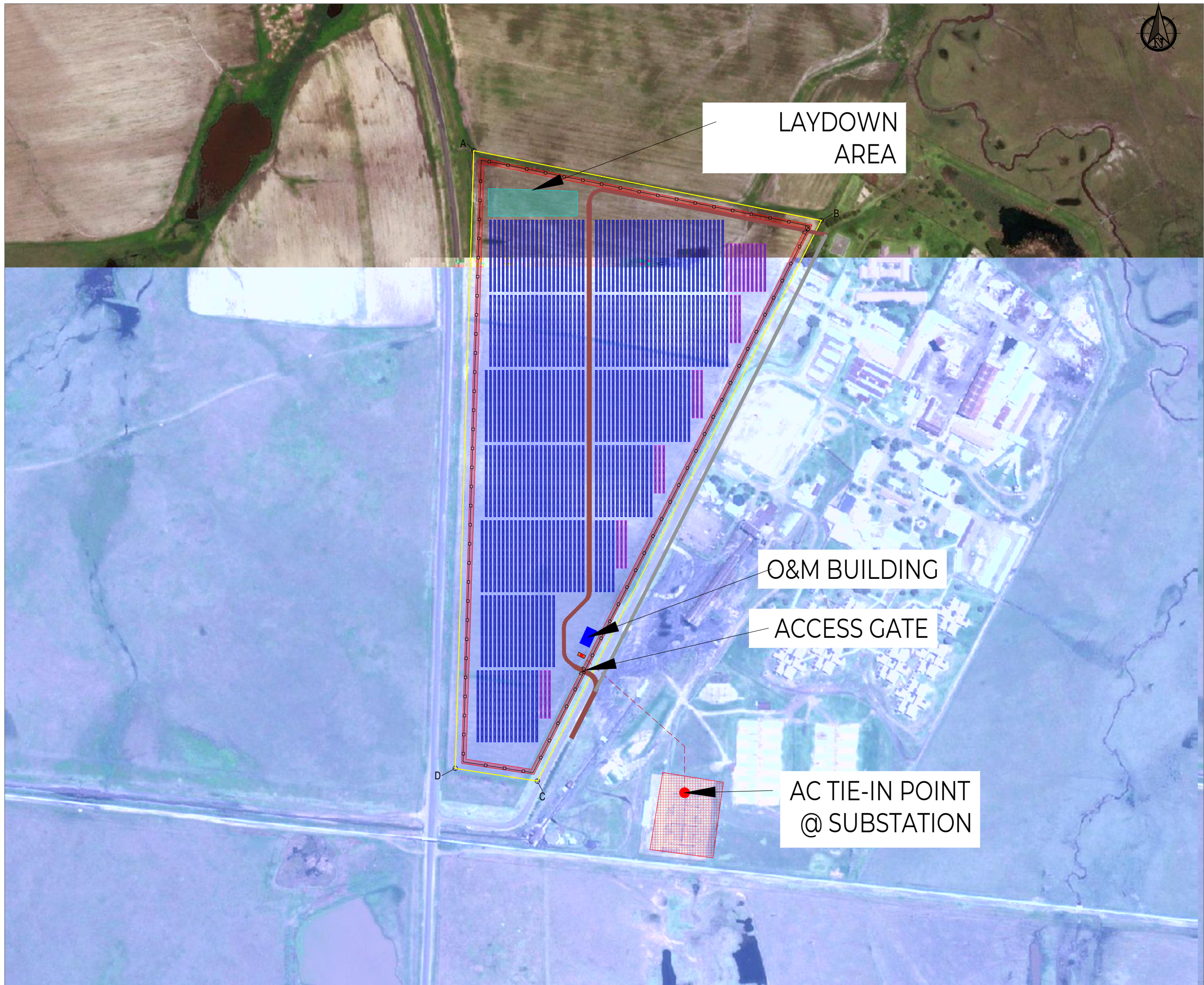
9.2.6. Monitoring

The purpose of monitoring is to ensure that the objectives of rehabilitation are met and that the rehabilitation process is followed. The physical aspects of rehabilitation should be carefully monitored during the progress of establishment of desired final ecosystems.

The following items should be monitored continuously:

- » Erosion status.
- » Vegetation species diversity.
- » Faunal re-colonisation.

**APPENDIX A:
FACILITY LAYOUT AND SENSITIVITY MAPS**



LEGEND		
SYMBOL	DESCRIPTION	QTY
	PV MODULE (540W)	22 167
	81 MODULE TRACKER	257
	54 MODULE TRACKER	25
	MV CABLE (OHL) (m)	240
	O&M BUILDING	
	AC TIE-IN POINT	
	MV ROOM	
	PERMANENT FENCE	
	ENTRY/EXIT GATE	
	PLANT ROAD	
	FIREBREAK	

SECUNDA SITE LAYOT		
POINT (LABEL)	Y (Latitude)	X (Longitude)
A - AVAILABLE AREA	26°34'05.46"S	29°13'06.58"E
B - AVAILABLE AREA	26°34'08.43"S	29°13'22.98"E
C - AVAILABLE AREA	26°34'32.23"S	29°13'09.58"E
D - AVAILABLE AREA	26°34'31.69"S	29°13'05.07"E

SYSTEM SPECIFICATIONS	
P _{ac} Rated	10 MWac
P _{dc} Rated	11,970 kWp
TRACKERS TYPE	SINGLE-AXIS TRACKING
MODULE ORIENTATION	SINGLE-PORTAIT
TRACKER PITCH	5.5m

ALL DIMENSIONS IN mm

REV	DESCRIPTION	DATE
TO	ISSUED FOR INFORMATION	06.09.2021

SOLA

DESIGNED BY	RdP	DESIGN START DATE	
DRAFTED BY	RJ	APPROVED	
ISSUED FOR	INFORMATION	VERIFIED	

CLIENT	SASOL
DRAWING DESCRIPTION	SECUNDA LAYOUT
DRAWING NUMBER	SASSEC -1
SCALE	N/A A2
REVISION NUMBER	T0



Proposed Becrux Solar PV Facility, Secunda, Mpumalanga Province.

Map illustrating development area overlain with sensitivities

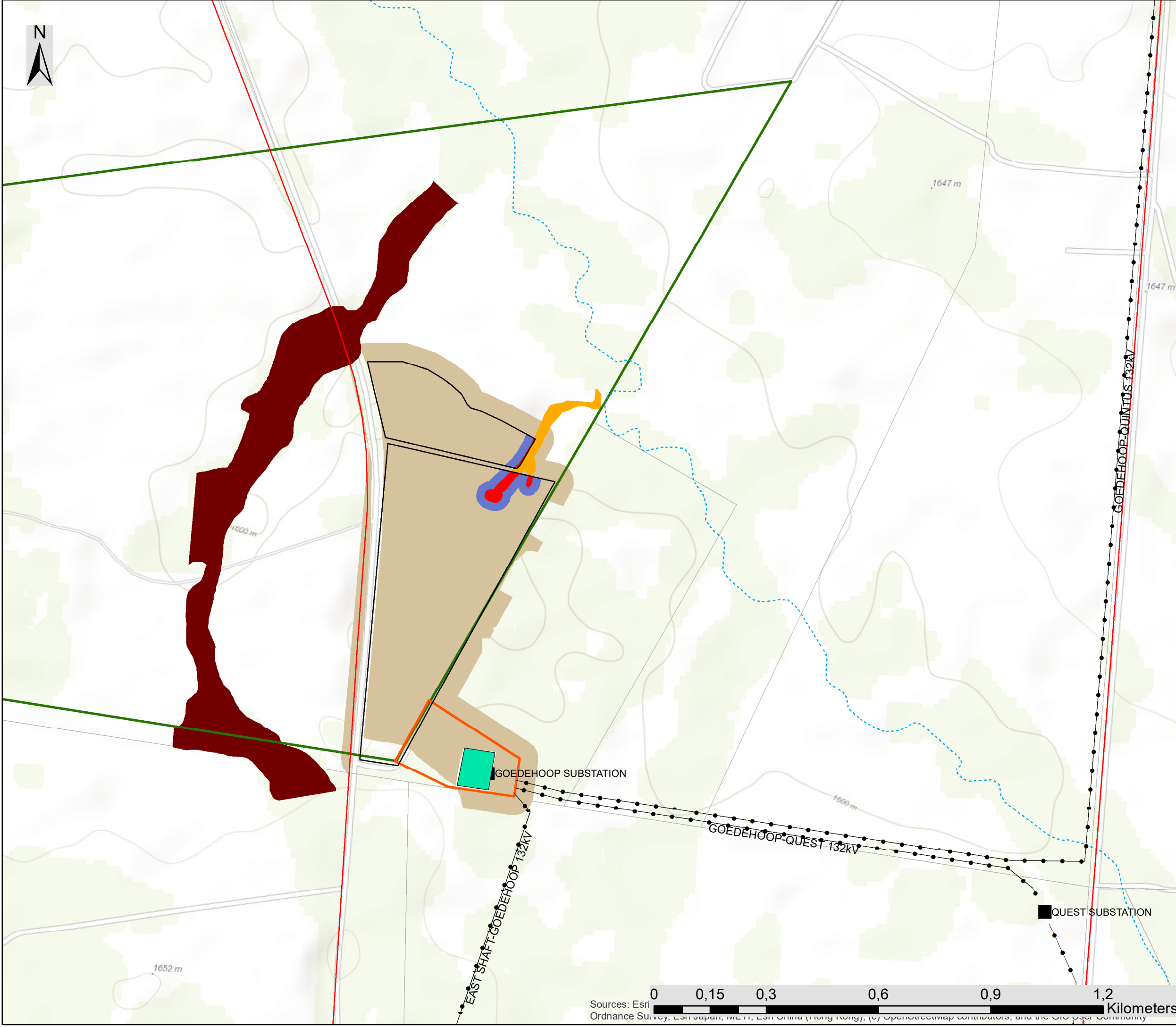
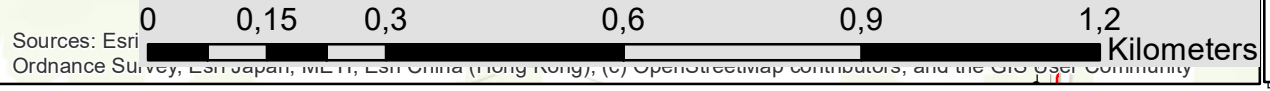
Legend

- Eskom Substation
- Existing Power Line
- Main Road
- Perennial River
- - - Non-perennial River
- Existing Goedehoop Substation
- Project Site
- PV Development Area
- Grid Connection Corridor (170m wide)

Environmental Features & Sensitivity

- High Terrestrial Sensitivity
- High Wetland Sensitivity
- Moderate Soil Sensitivity
- Moderate Wetland Sensitivity
- Wetland Buffer (22m)

Scale: 1: 12 000
Projection: LO19
Map Ref: 00_Secunda Sens Map





Proposed Becrux Solar PV Facility, Secunda, Mpumalanga Province.

Sensitivity & Optimised Layout Map

Legend

- Eskom Substation
- Existing Power Line
- Main Road
- Perennial River
- - - Non-perennial River
- Existing Goedehoop Substation
- Project Site
- PV Development Area
- Grid Connection Corridor (170m wide)

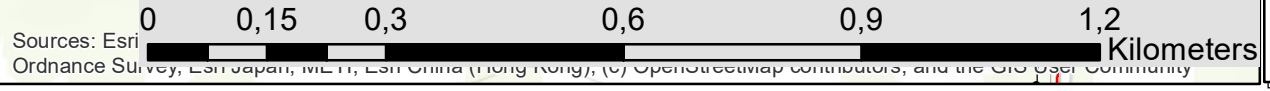
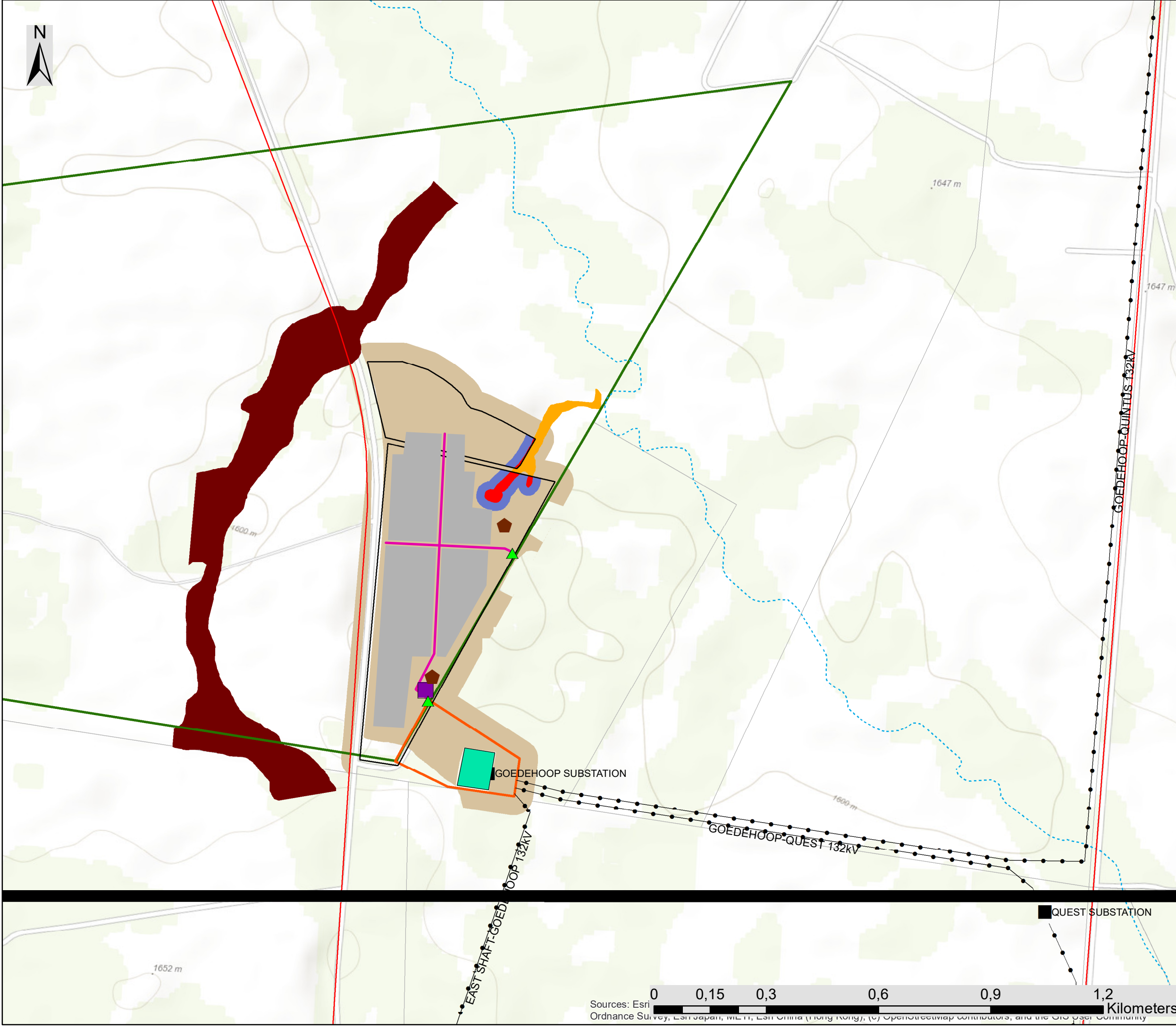
Layout:

- ▲ Access Gate
- Laydown Area
- O&M Building
- Internal Roads
- PV Array

Environmental Features & Sensitivity

- High Terrestrial Sensitivity
- High Wetland Sensitivity
- Moderate Soil Sensitivity
- Moderate Wetland Sensitivity
- Wetland Buffer (22m)

Scale: 1: 12 000
Projection: LO19
Map Ref: 00_Secunda Sens Map



Sources: Esri, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

APPENDIX B:
GRIEVANCE MECHANISM FOR COMPLAINTS AND ISSUES

GRIEVANCE MECHANISM / PROCESS

1. PURPOSE

This Grievance Mechanism has been developed to receive and facilitate the resolution of concerns and grievances regarding the project's environmental and social performance. The aim of the Grievance Mechanism is to ensure that grievances or concerns raised by stakeholders are addressed in a manner that:

- » Provides a predictable, accessible, transparent, and credible process to all parties, resulting in outcomes that are fair and equitable, accountable and efficient.
- » Promotes trust as an integral component of broader community relations activities.
- » Enables more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

The aim of this Grievance Mechanism is to provide a process to address grievances in a manner that does not require a potentially costly and time-consuming legal process.

2. PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

The following proposed grievance procedures are to be complied with throughout the construction, operation and decommissioning phases of the project. These procedures should be updated as and when required to ensure that the Grievance Mechanism is relevant for the project and effective in providing the required processes.

- » Local landowners, communities and authorities must be informed in writing by the Developer of the grievance mechanism and the process by which grievances can be brought to the attention of the Developer through its designated representative. This must be undertaken with the commencement of the construction phase.
- » A company representative must be appointed as the contact person to which grievances can be directed. The name and contact details of the contact person must be provided to local landowners, communities and authorities when requested.
- » Project related grievances relating to the construction, operation and or decommissioning phases must be addressed in writing to the contact person. The contact person should assist local landowners and/or communities who may lack resources to submit/prepare written grievances, by recording grievances and completing written grievance notices where applicable, translating requests or concerns or by facilitating contact with relevant parties who can address the raised concerns. The following information should be obtained, as far as possible, regarding each written grievance, which may act as both acknowledgement of receipt as well as record of grievance received:
 - a. The name and contact details of the complainant.
 - b. The nature of the grievance.
 - c. Date raised, received, and for which the meeting was arranged.
 - d. Persons elected to attend the meeting (which will depend on the grievance).
 - e. A clear statement that the grievance procedure is, in itself, not a legal process. Should such avenues be desired, they must be conducted in a separate process and do not form part of this grievance mechanism.
- » The grievance must be registered with the contact person who, within 2 working days of receipt of the grievance, must contact the Complainant to discuss the grievance and, if required, agree on a suitable

date and venue for a meeting in order to discuss the grievances raised. Unless otherwise agreed, the meeting should be held within 2 weeks of receipt of the grievance.

- » The contact person must draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting (once agreed and only if required).
- » A grievance register must be kept on site (in electronic format, so as to facilitate editing and updating), and shall be made available to all parties wishing to gain access thereto.
- » Prior to the meeting being held the contact person must contact the Complainant to discuss and agree on the parties who should attend the meeting, as well as a suitable venue. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or Developer are entitled to invite their legal representatives to attend the meeting/s, it should be made clear to all the parties involved in the process that the grievance mechanism process is not a legal process, and that if the Complainant invites legal representatives, the cost will be their responsibility. It is therefore recommended that the involvement of legal representatives be limited as far as possible, as a matter of last resort, and that this process be primarily aimed at stakeholder relationship management as opposed to an arbitration or litigation mechanism.
- » The meeting should be chaired by the Developer's representative appointed to address grievances. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- » Draft copies of the minutes must be made available to the Complainant and the Developer within 5 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days of receipt of the draft minutes.
- » The meeting agenda must be primarily the discussion of the grievance, avoidance and mitigation measures available and proposed by all parties, as well as a clear indication of the future actions and responsibilities, in order to put into effect the proposed measures and interventions to successfully resolve the grievance.
- » In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- » In the event of a dispute between the Complainant and the Developer regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s must note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.
- » In the event that the parties agree to appoint a mediator, the Developer will be required to identify three (3) mediators and forward the names and Curriculum Vitae (CVs) to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the Developer, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Developer. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- » In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the

measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.

- » In the event of the dispute not being resolved, the mediator must prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- » The draft report must be made available to the Complainant and the Developer for comment before being finalised and signed by all parties, which signature may not be unreasonably withheld by either party. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days. The way forward will be informed by the recommendations of the mediator and the nature of the grievance.

A Complaint is closed out when no further action is required, or indeed possible. Closure status must be classified and captured following mediation or successful resolution in the Complaints Register as follows:

- » Resolved. Complaints where a resolution has been agreed and implemented and the Complainant has signed the Confirmation Form.
- » Unresolved. Complaints where it has not been possible to reach an agreed resolution despite mediation.
- » Abandoned. Complaints where the Complainant is not contactable after one month following receipt of a Complaint and efforts to trace his or her whereabouts have been unsuccessful.

**APPENDIX C:
ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN**

ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN

1. PURPOSE

Invasive alien plant species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this Alien Plant and Open Space Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Becrux Solar PV Facility. The broad objectives of the plan include the following:

- » Ensure alien plants do not become dominant in parts of the site, or the whole site, through the control and management of alien and invasive species presence, dispersal and encroachment.
- » Develop and implement a monitoring and eradication programme for alien and invasive plant species.
- » Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

This plan should be updated throughout the lifecycle of the project, as required in order to ensure that appropriate measures are in place to manage and control the establishment of alien and invasive plant species and to ensure compliance with relevant legislation. This plan should be implemented with specific focus on sensitive areas.

2. LEGISLATIVE CONTEXT

Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA), all declared alien plant species must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act, alien invasive plant species are ascribed to one of the following categories:

- » Category 1: Prohibited and must be controlled.
- » Category 2 (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- » Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)

The National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices GNR 506, 507, 508 and 509 of 2013 under NEM:BA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought, or sold without a permit. Below is an explanation of the three categories:

- » **Category 1a:** Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.

- » **Category 1b:** Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- » **Category 2:** Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- » **Category 3:** Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

The following guide is a useful starting point for the identification of alien plant species: Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.

It is important to note that alien plant species that are regulated in terms of the CARA as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM: BA.

3. ALIEN PLANT MANAGEMENT PRINCIPLES

3.1. Prevention and early eradication

A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas.

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species already on site, as well as those that are introduced to the site by the construction activities. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When additional Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide (where permissible only) should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

3.2. Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The uses of chemicals are not recommended for any wetland areas. Herbicides should be applied directly to the plant and not to the soil. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least amount of energy and resources are required to maintain this status over the long-term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

3.3. General Clearing and Guiding Principles

Alien species control programmes are long-term management projects and should consist of a clearing plan which includes follow up actions for rehabilitation of the cleared area. The lighter infested areas should be cleared first to prevent the build-up of seed banks. Pre-existing dense mature stands ideally should be left for last, as they probably will not increase in density or pose a greater threat than they are currently. Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of alien species are easily dispersed across boundaries by wind or watercourses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

i. Clearing Methods

Different species require different clearing methods such as manual, chemical, or biological methods or a combination of both. Care should however be taken that the clearing methods used do not encourage further invasion and that they are appropriate to the specific species of concern. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Fire should not be used for alien species control or vegetation management at the site. The best-practice clearing method for each species identified should be used.

» Mechanical control

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g., uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive and could cause severe soil disturbance and erosion.

» Chemical Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien plant invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- * Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- * All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product, and spray mixtures.
- * Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of at a suitable site.
- * To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- * Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- * The appropriate health and safety procedures should also be followed regarding the storage, handling, and disposal of herbicides.
- * The use of chemicals is not recommended for wetland areas.

For all herbicide applications, the following Regulations and guidelines should be followed:

- * Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
- * Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) (ARSRA)– GNR 1120 of 2010.
- * South African Bureau of Standards (SABS), South African National Standard (SANS) 10206 (2010).

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to “*acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container*”.

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, ARSRA. This is regulated by the Department of Agriculture, Forestry and Fisheries (DAFF).

» **Biological control**

Biological weed control consists of the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers, or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plant's reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), DAFF can be contacted.

3.4. General management practices

The following general management practices should be encouraged or strived for:

- » Establish an on-going monitoring programme for the construction phase to detect and quantify any alien species that may become established.
- » Alien vegetation regrowth on areas disturbed by construction must be immediately controlled.
- » Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.
- » Cleared areas that have become invaded by alien species can be sprayed with appropriate herbicides provided that these herbicides break down on contact with the soil. Residual herbicides should not be used.
- » The effectiveness of vegetation control varies seasonally, and this is also likely to impact alien species. Control early in the wet season will allow species to re-grow, and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control, and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the middle of the wet season, with a follow-up event towards the end of the wet season. There are no

exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.

- » Alien plant management is an iterative process, and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.
- » Some alien species are best individually pulled by hand. Regular vegetation control to reduce plant biomass within the site should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the cost of alien plant management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.
- » No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally occurring species should be used.
- » During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All alien plants identified should be cleared using appropriate means.

3.5. Monitoring

In order to assess the impact of clearing activities, rehabilitation efforts, follow-ups and monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide an assessment of the magnitude of alien plant invasion on site, as well as an assessment of the efficacy of the management programme.

In general, the following principles apply for monitoring:

- » Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
- » Simple records must be kept of daily operations, e.g., area/location cleared, labour units and, if ever used, the amount of herbicide used.
- » It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure management of alien invasive plant species.

Construction Phase

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien plant species	Pre-construction Monthly during Summer and Autumn (Middle November to end of March) 3 Monthly during Winter and Spring
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien plant control measures implemented	Record of clearing activities	3 Monthly

Operation Phase

Monitoring Action	Indicator	Timeframe
Document alien plant species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Biannually
Document rehabilitation measures implemented, and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

**APPENDIX D:
RE-VEGETATION AND HABITAT REHABILITATION PLAN**

REVEGETATION AND HABITAT REHABILITATION PLAN

1. PURPOSE

The purpose of the Rehabilitation Plan is to ensure that areas cleared or impacted during construction activities within the development footprint for the Becrux Solar PV Facility that are not required for operation are rehabilitated to their original state before the operation phase commences, and that the risk of erosion from these areas is reduced. The purpose of the Rehabilitation Plan for the development footprint can be summarised as follows:

- » Achieve long-term stabilisation of all disturbed areas.
- » Re-vegetate all disturbed areas with suitable local plant species.
- » Minimise visual impact of disturbed areas.
- » Ensure that disturbed areas are rehabilitated to a condition similar to that found prior to disturbance.

This Rehabilitation Plan should be read in conjunction with other site-specific plans, including the Erosion Management Plan, Alien Invasive Management Plan and Plant Rescue and Protection Plan. Prior to the commencement of construction, a detailed Rehabilitation Plan and Method Statement for the site should be compiled with the aid of a suitably qualified, professionally registered specialist (with a botanical or equivalent qualification).

2. RELEVANT ASPECTS OF THE SITE

The project site is situated within the grassland biome which is centrally located in southern Africa and adjoins all except the desert, fynbos and succulent Karoo biomes. The grassland biome comprises many different vegetation types. According to Mucina and Rutherford (2006), the project site is situated within the Soweto Highveld Grassland vegetation type.

Soweto Highveld Grassland

The Soweto Highveld Grassland vegetation type is found in Mpumalanga, Gauteng and to a small extent also in neighboring Free State and North-West Provinces. This vegetation type typically comprises an undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elyonurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. Scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.

The following species are important in the **Soweto Highveld Grassland** vegetation type:

Graminoids: *Andropogon appendiculatus*, *Brachiaria serrata*, *Cymbopogon pospischilii*, *Cynodon dactylon*, *Elyonurus muticus*, *Eragrostis capensis*, *E. chloromelas*, *E. curvula*, *E. plana*, *E. planiculmis*, *E. racemosa*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Setaria nigrirostris*, *S. sphacelata*, *Themeda triandra*, *Tristachya leucothrix*, *Andropogon schirensis*, *Aristida adscensionis*, *A. bipartita*, *A. congesta*, *A. junciformis* subsp. *galpinii*, *Cymbopogon caesius*, *Digitaria diagonalis*, *Diheteropogon amplexans*, *Eragrostis micrantha*, *E. superba*, *Harpochloa falx*, *Microchloa caffra*, *Paspalum dilatatum* (Mucina & Rutherford, 2006).

Herbs: *Hermannia depressa*, *Acalypha angustata*, *Berkheya setifera*, *Dicoma anomala*, *Euryops gilfillanii*, *Geigeria aspera* var. *aspera*, *Graderia subintegra*, *Haplocarpha scaposa*, *Helichrysum miconiifolium*, *H. nudifolium* var. *nudifolium*, *H. rugulosum*, *Hibiscus pusillus*, *Justicia anagalloides*, *Lippia scaberrima*, *Rhynchosia effusa*, *Schistostephium crataegifolium*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata* (Mucina & Rutherford, 2006).

Geophytic Herbs: *Haemanthus humilis* subsp. *hirsutus*, *H. montanus*. **Herbaceous Climber:** *Rhynchosia totta* (Mucina & Rutherford, 2006).

Low Shrubs: *Anthospermum hispidulum*, *A. rigidum* subsp. *pumilum*, *Berkheya annectens*, *Felicia muricata*, *Ziziphus zeyheriana* (Mucina & Rutherford, 2006).

According to Mucina & Rutherford (2006), the Soweto Highveld Grassland is classified as Endangered. By 2006, nearly half of the area of occupancy of this vegetation type had already been transformed by cultivation, urban sprawl, mining and building of road infrastructure. The amount of area transformed has most likely increased substantially. Some Soweto Grassland areas have been flooded by dams including Grootdraai, Leeukuil, Trichardtsfontein, Vaal and Willem Brummer.

3. REHABILITATION METHODS AND PRACTISES

The following general management practices should be encouraged or strived for:

- » Clearing of invaded areas should be conducted as per the Alien Management Plan, included in the Environmental Management Programme (EMPr).
- » No harvesting of vegetation may be undertaken outside the area to be disturbed by construction activities.
- » Indigenous plant material must be kept separate from alien material.
- » Indigenous seeds may be harvested for purposes of revegetation in areas that are free of alien invasive vegetation, either at the project area prior to clearance or from suitable neighbouring sites.
- » Topsoil should be reserved wherever possible on the project area, to be utilised during rehabilitation.
- » Sods used for revegetation should be obtained directly from the project area, but not from the sensitive areas. Sods should contain at least a 50mm topsoil layer and be minimally disturbed, in particular to existing root systems. Sods must ideally be obtained from areas as close as possible to the region that is to be rehabilitated.
- » Water used for the irrigation of re-vegetated areas should be free of chlorine and other pollutants that might have a detrimental effect on the plants.
- » All seeded, planted, or sodded grass areas and all shrubs or trees planted are to be irrigated at regular intervals.
- » On steep slopes and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.
- » In areas where soil saver is used, it should be pegged down to ensure that it captures soil and organic matter flowing over the surface.
- » The final rehabilitated area should resemble the current composition and structure of the soil as far as practicably possible.

- » Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible.
- » No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been rehabilitated.
- » Where rehabilitation sites are located within actively grazed areas, they should be fenced off, this must be undertaken in consultation with the landowner.
- » Any runnels, erosion channels or wash-aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.
- » Re-vegetated areas should be monitored frequently. Where signs of inadequate surface coverage are evident after two growth seasons, re-vegetation should be done from scratch. Adequate recovery must be assessed by a qualified botanist or rehabilitation specialist.
- » The stockpiled vegetation from the clearing operations should be reduced to mulch where possible and retained along with topsoil to encourage seedbank regrowth and soil fertility.
- » Mulches must be collected in such a manner as to restrict the loss of seed.
- » Mulch must be stored for as short a period as possible.
- » Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants.
- » Where herbicides are used to clear vegetation, species-specific chemicals should be applied to individual plants only. General spraying should be strictly prohibited, and only the correct herbicide type should be applied.
- » Once rehabilitated, areas should be protected to prevent trampling and erosion.
- » Fencing should be removed once a sound vegetative cover has been achieved.

4. MONITORING AND FOLLOW-UP ACTION

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of rehabilitated areas. During the construction phase, the Environmental Office (EO) and Engineering, Procurement and Construction (EPC) Contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the Developer / O&M Operator will need to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- » Associated nature and stability of surface soils.
- » Re-emergence of alien and invasive plant species. If noted, remedial action must be taken immediately, as per the alien management plan and mitigation measures contained within the EMPr.

Rehabilitation success, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following monitoring protocol is recommended:

- » Rehabilitated areas should be monitored (responsibility of the EO) on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has been rehabilitated to a satisfactory level.
- » Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e., have increased runoff and a decreased infiltration rate) increasing the erosion potential.

- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the timeframe between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control and rehabilitation strategy.
- » Any areas showing erosion, should be adaptively managed with particular erosion control measures, depending on the extent of the erosion.

If the current state of the environment prior to construction (which will be disturbed during the construction phase) is not achieved post impact, within the specified rehabilitation period, maintenance of these areas must continue until an acceptable state is achieved (excluding alien plant species or weeds). Additional rehabilitation methods may be necessary to achieve the current state before construction commenced.

Monitoring of the rehabilitation success, as well as follow-up adaptive management, combined with the clearing of emerging alien plant species should all continue for as long as is considered necessary, depending on regrowth rates.

**APPENDIX E:
TRAFFIC AND TRANSPORTATION MANAGEMENT PLAN**

TRAFFIC AND TRANSPORTATION GUIDING PRINCIPLES

1. PURPOSE

The purpose of this Traffic and Transportation Management Guide is to address regulatory compliance, traffic management practices, and protection measures to help reduce impacts related to transportation and the construction of temporary and long-term access within the vicinity of the Becrux Solar PV Facility development area. The objectives of these guiding principles include the following:

- » To ensure compliance with all legislation regulating traffic and transportation within South Africa (National, Provincial, Local & associated guidelines).
- » To avoid incidents and accidents while vehicles are being driven and while transporting personnel, materials, and equipment to and from the project area.
- » To raise greater safety awareness in each driver and to ensure the compliance of all safe driving provisions for all the vehicles.
- » To raise awareness to ensure drivers respect and follow traffic regulations.
- » To avoid the deterioration of access roads and the pollution that can be created due to noise and emissions produced by equipment, machinery, and vehicles.

2. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES

- » Prior to the commencement of construction, the contractor must develop a detailed Transport Management Plan (TMP) based on relevant traffic volumes and road carry capacity.
- » The transport contractor must ensure that all required permits for the transportation of abnormal loads are in place prior to the transportation of equipment and project components to the project area. Specific abnormal load routes must be developed with environmental factors taken into consideration.
- » Before construction commences, authorised access routes must be clearly marked in the field with signs or flagging. The Construction Contractor must review the location of designated access and will be responsible for ensuring construction travel is limited to designated routes.
- » All employees must attend an environmental training program (e.g., toolbox talks) by the Environmental Officer (EO). Through this program, employees will be instructed to use only approved access roads, drive within the delineated road limits, and obey jurisdictional and posted speed limits to minimise potential impacts to the environment and other road users.
- » The contractor will be responsible for making sure that their suppliers, vendors, and subcontractors strictly comply with the principles of this TMP and the contractor's TMP.
- » Adjacent landowners must be notified of the construction schedule.
- » Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.
- » Signs must be posted in the project area to notify landowners and others of the construction activity.
- » Flagging must be provided at access points to the site and must be maintained until construction is completed on the site.
- » Speed limits must be established prior to commencement of construction and enforced over all construction traffic.
- » Speed controls and implementation of appropriate dust suppression measures must be enforced to minimise dust pollution.

- » Throughout construction, the contractor will be responsible for monitoring the condition of roads used by project traffic and for ensuring that roads are maintained in a condition that is comparable to the condition they were in before the construction began.
- » Drivers must have an appropriate valid driver's license and other operation licences required by applicable legislation.
- » All vehicles must be maintained in good mechanical, electrical, and electronic condition, including but not limited to the brake systems, steering, tires, windshield wipers, side mirrors and rear-view mirror, safety belts, signal indicators, and lenses.
- » Any traffic delays attributable to construction traffic must be co-ordinated with the appropriate authorities.
- » No deviation from approved transportation routes must be allowed unless roads are closed for reasons outside the control of the contractor.
- » Impacts on local communities must be minimised. Consideration where possible should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.

3. MONITORING

- » The principal contractor must ensure that all vehicles adhere to the speed limits.
- » A speeding register must be kept with details of the offending driver.
- » Repeat offenders must be penalised.
- » Where traffic signs are not being adhered to, engineering structures must be used to ensure speeds are reduced.

**APPENDIX F:
STORMWATER AND EROSION MANAGEMENT PLAN**

STORMWATER MANAGEMENT GUIDE

1. PURPOSE

By taking greater cognisance of natural hydrological patterns and processes, it is possible to develop storm water management systems in a manner that reduces these potentially negative impacts and mimic nature. The main risks associated with inappropriate storm water management are increased erosion risk and risks associated with flooding. Therefore, this Stormwater Management Guide and the Erosion Management Plan are closely linked to one another and should be managed together.

This Stormwater Management Guide addresses the management of stormwater runoff from the development area and significant impacts relating to resultant impacts such as soil erosion and downstream sedimentation. The main factors influencing the planning of stormwater management measures and infrastructure are:

- » Topography and slope gradients.
- » Placing of infrastructure and infrastructure design.
- » Annual average rainfall.
- » Rainfall intensities.

The objective of these guiding principles is therefore to provide measures to address runoff from disturbed portions of the development area, such that they:

- » Do not result in concentrated flows into natural watercourses i.e., provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural watercourses.
- » Do not result in any necessity for concrete or other lining of natural watercourses to protect them from concentrated flows off the development if not necessary.
- » Do not divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.

This Stormwater Management Guide must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

2. RELEVANT ASPECTS OF THE SITE

The topography or terrain morphology of the region within which the Becrux Solar PV Facility is proposed is broadly described as *Slightly Undulating Plains of the Interior Plain*. The slope of the entire project site is relatively even (flat) with a gradual drop (approximately 100m) from the north-eastern and southern sections of the project site to the Klipspruit River which flows south of Secunda. The proposed development area itself is located at an average elevation of 1 615m above sea level and has an even slope to the north.

The slope percentage of the development area and immediate surrounds was determined and ranges from 0 to 13%, with the majority of the area being characterised by a gentler slope (between 0 and 5%).

Strategic Water Source Areas

Strategic Water Source Areas (SWSAs) are defined as areas of land that:

- » Supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important.
- » Have high groundwater recharge and where the groundwater forms a nationally important resource.
- » Meet both criteria mentioned above.

They include transboundary Water Source Areas that extend into Lesotho and Swaziland. The development area is noted located in a SWSA.

Freshwater Features:

The wetland areas within the project site were delineated in accordance with the DWAF (2005) guidelines. Seven (7) hydrogeomorphic (HGM) units were identified within the 500m regulated area, namely, unchanneled valley bottom wetlands (HGM 1,3 and 7), a seep (HGM 6), a depression (HGM 2) and a floodplain (HGM 5). Of the identified wetland systems, three (3) could potentially be impacted upon (either directly or indirectly) by the proposed activities, namely, HGM 1, 2 and 3.

3. STORMWATER MANAGEMENT PRINCIPLES

In the design phase, various stormwater management principles should be considered including:

- » Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion.
- » Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, and silt fences). As construction progresses, the stormwater control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
- » Silt traps must be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Construction of gabions and other stabilisation features on steep slopes may be undertaken to prevent erosion, if deemed necessary.
- » Minimise the area of exposed bare soils to minimise the erosive forces of wind, water and all forms of traffic.
- » Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
- » Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development.
- » Plan and construct stormwater management systems to remove contaminants before they pollute surface waters or groundwater resources.
- » Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
- » Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.
- » Design and construct roads to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the pre-development stormwater flow should not exceed the capacity of the culvert. To assist with the stormwater run-off, gravel roads should typically be graded and shaped with a 2-3% cross fall back into the slope, allowing stormwater to be channelled in a controlled manner towards the natural drainage lines and to assist with any sheet flow on the project area.
- » Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point. Provide detention storage on the road and/or upstream of the stormwater culvert.

- » Design outlet culvert structures to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.
- » Where the construction of a building causes a change in the vegetative cover of the site that might result in soil erosion, the risk of soil erosion by stormwater must be minimised by the provision of appropriate artificial soil stabilisation mechanisms or re-vegetation of the area. Any inlet to a piped system should be fitted with a screen or grating to prevent debris and refuse from entering the stormwater system.
- » Preferably all drainage channels on the project area and contained within the larger area of the property (i.e., including buffer zone) should remain in the natural state so that the existing hydrology is not disturbed.

3.1. Engineering Specifications

Detailed engineering specifications for a Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of this Stormwater Management Guide. This should include erosion control measures. Requirements for project design include:

- » Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction) must be indicated within the Final/Updated Stormwater Management Plan.
- » All temporary and permanent water management structures or stabilisation methods must be indicated within the Final/Updated Stormwater Management Plan.
- » The drainage system for the project area should be designed to specifications that can adequately deal with a 1:50 year intensity rainfall event or more to ensure sufficient capacity for carrying stormwater around and away from infrastructure.
- » Procedures for stormwater flow through a project area need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.
- » An on-site Engineer or Environmental Officer (EO) is to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
- » The Engineering, Procurement and Construction (EPC) Contractor holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.

During the construction phase, the contractor must prepare a Stormwater Control Method Statement to ensure that all construction methods adopted on the project area do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of the Stormwater Management Plan are met before, during and after construction. The designated responsible person on the project area, must be indicated in the Stormwater Control Method Statement and shall ensure that no construction work takes place before the relevant stormwater control measures are in place.

An operation phase Stormwater Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

PRINCIPLES FOR EROSION MANAGEMENT

1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this Erosion Management Plan, the Storm water Management Plan and the Revegetation and Habitat Rehabilitation Plan are closely linked to one another and should not operate independently but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

- » A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and is likely to be accelerated by construction related activities.
- » An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting from all phases of the development is addressed.

This plan must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

2. RELEVANT ASPECTS OF THE SITE

The slope of the entire project site is relatively even (flat) with a gradual drop (approximately 100m) from the north-eastern and southern sections of the project site to the Klipspruit River which flows south of Secunda. The proposed development area itself is located at an average elevation of 1 615m above sea level and has an even slope to the north. The development area is currently leased on a short-term basis to a tenant farmer for agriculture (non-irrigated) and as such, agricultural activities would have to cease to accommodate the proposed development.

Soil erosion is a frequent risk associated with solar facilities on account of the vegetation clearing and disturbance associated with the construction phase of the development and may continue occurring throughout the operation phase. All areas where vegetation is removed from the soil surface in preparation for the infrastructure construction will result in exposed soil surfaces that will be prone to erosion. Both wind and water erosion are a risk, as the project area falls within a region that is characterised by a mean annual precipitation that reaches approximately 662mm.

During the operation phase, the areas where vegetation was cleared will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the project area.

3. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction at the project area should be to:

- » Protect the land surface from erosion.
- » Intercept and safely direct run-off water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment.

- » Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

3.1. On-Site Erosion Management

General factors to consider regarding erosion risk at the project area include the following:

- » Reduction of a stable vegetation cover and associated below-ground biomass that currently increases soil surface porosity, water infiltration rates and thus improves the soil moisture availability. Without the vegetation, the soil will be prone to extensive surface capping, leading to accelerated erosion and further loss of organic material and soil seed reserves from the local environment.
- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.
- » The extent of disturbance will influence the risk and consequences of erosion. Therefore, site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared all at once, especially in areas where the risk of erosion is higher.
- » Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the natural contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.
- » Where necessary, new roads constructed should include water diversion structures with energy dissipation features present to slow and disperse the water into the receiving area.
- » Roads used for project-related activities and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- » Runoff may have to be specifically channelled or storm water adequately controlled to prevent localised rill and gully erosion.
- » Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.
- » All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.
- » Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Gabions and other stabilisation features must be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
- » Activity at the project area after large rainfall events when the soils are wet and erosion risk is increased should be reduced. No driving off of hardened roads should occur at any time, and particularly immediately following large rainfall events.
- » Topsoil should be removed and stored in a designated area separately from subsoil and away from construction activities. Topsoil should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation in cleared areas.
- » Regular monitoring of the project area for erosion problems during construction (on-going) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced. The Environmental Control Officer (ECO) will determine the frequency of monitoring based on the severity of the impacts in the erosion prone areas.

3.1.1 Erosion control mechanisms

The contractor may use the following mechanisms (whichever proves more appropriate/ effective) to combat erosion when necessary:

- » Reno mattresses.
- » Slope attenuation.
- » Hessian material.
- » Shade catch nets.
- » Gabion baskets.
- » Silt fences.
- » Storm water channels and catch pits.
- » Soil bindings.
- » Geofabrics.
- » Hydro-seeding and/or re-vegetating.
- » Mulching over cleared areas.
- » Boulders and size varied rocks.
- » Tilling.

3.2 Engineering Specifications

A detailed engineering specifications Storm water Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of the Storm water Management Plan and this should include erosion control measures. Requirements for project design include:

- » Erosion control measures to be implemented before and during the construction period, including the final storm water control measures (post construction).
- » All temporary and permanent water management structures or stabilisation methods must be indicated within the Storm water Management Plan.
- » An on-site Engineer or EO/ Safety, Health and Environment (SHE) Representative to be responsible for ensuring implementation of the erosion control measures on the project area during the construction period. The ECO should monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.
- » The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved Storm water Management Plan is not correctly or appropriately implemented and damage to the environment is caused.

3.3 Monitoring

The project area must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on-site the EO/ SHE Representative (during construction) or Environmental Manager (during operation) must:

- » Assess the significance of the situation.
- » Take photographs of the soil degradation.
- » Determine the cause of the soil erosion.

- » Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan to be approved by the Site/Environmental Manager in conjunction with the ECO.
- » Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.
- » Report and monitor the progress of rehabilitation weekly and record all the findings in a site register (during construction).
- » All actions with regards to the incidents must be reported on a monthly compliance report which should be kept on file for if/when the Competent Authority requests to see it (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor (in consultation with an appropriate specialist, e.g., an engineer) must:

- » Select a system/mechanism to treat the erosion.
- » Design and implement the appropriate system/mechanism.
- » Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapted or adjusted to ensure the accelerated erosion is controlled.
- » Continue monitoring until the area has been stabilised.

3 CONCLUSION

The Erosion Management Plan is a document to assist the Proponent/ EPC Contractor with guidelines on how to manage erosion during all phases of the project. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the Environmental Management Programme (EMPr) and is required to be considered and adhered to during the design, construction, operation, and decommissioning phases of the project (if and where applicable). During the construction phase, the contractor must prepare an Erosion Control Method Statement to ensure that all construction methods adopted on the project area do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of this plan are met before, during and after construction. The designated responsible person on the project area, must be indicated in the Method Statement and shall ensure that relevant erosion control measures are in place throughout the construction phase.

An operation phase Erosion Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

**APPENDIX G:
WASTE MANAGEMENT PLAN**

WASTE MANAGEMENT PLAN

1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management throughout all phases of the project. The plan prescribes measures for the collection, temporary storage and safe disposal of the various waste streams associated with the project and includes provisions for the recovery, re-use, and recycling of waste. The purpose of this plan is therefore to ensure that effective procedures are implemented for the handling, storage, transportation, and disposal of waste generated from the project activities.

This WMP has been compiled as part of the project Environmental Management Programme (EMPr) and is based on waste stream information available at the time of compilation. Construction and operation activities must be assessed on an ongoing basis in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be updated once further detail regarding waste quantities and categorisation become available, during the construction and/or operation stages. This plan should be updated throughout the lifecycle of the Becrux Solar PV Facility, as required, in order to ensure that appropriate measures are in place to manage and control waste and to ensure compliance with relevant legislation.

Prior to the commencement of construction, a detailed Waste Management Method Statement for the project should be compiled by the Contractor.

2. RELEVANT ASPECTS OF THE SITE

It is expected that the development of the Becrux Solar PV Facility will generate construction solid waste, general waste and hazardous waste during the lifetime of the facility.

Waste generated originates from various sources, including but not limited to:

- » Concrete waste generated from spoil and excess concrete.
- » Contaminated water, soil, rocks, and vegetation due to hydrocarbon spills.
- » Hazardous waste from vehicle, equipment and machinery parts and servicing, fluorescent tubes, used hydrocarbon containers, and waste ink cartridges.
- » Recyclable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, Polyvinyl chloride (PVC), Low-density polyethylene (LDPE)) and cardboard.
- » Organic waste from food waste as well as alien and endemic vegetation removal.
- » Sewage from portable toilets.
- » Inert waste from spoil material from site clearance and trenching works.

2.1 Panel Cleaning

It is anticipated that the PV panels will be washed four times a year during operation (approximately 8-10m³/cycle will be required for module cleaning, with four cleaning cycles occurring annually (32-40m³/annum)). Only clean water (i.e., with no cleaning products), or non-hazardous biodegradable cleaning products, will be utilised for the washing of panels. Wastewater generated by washing panels will be collected and recycled for future use, or alternatively, in the event that an environmentally friendly non-

hazardous biodegradable cleaning product is utilised, wastewater can be allowed to run-off under the panels.

2.2 Effluent and Wastewater

During the construction and operation phases, mobile chemical toilets or a conservancy tank will be placed within the development area for use by contractors. These facilities will be maintained and serviced regularly by an appropriate waste contractor. Any other effluent discharge during construction and operation will be collected in sealed containers/tanks and collected by a registered service provider (i.e., the Local Municipality/Contractor) to be disposed of at an approved facility off-site.

Alternatively, employees may be requested to utilise existing ablution facilities in close proximity to the PV Facility.

2.3 Waste

All waste generated on site will be handled in accordance with the contractor's Waste Management Plan. Solid waste generated during construction will mainly be in the form of construction material, excavated substrate and domestic solid waste. Cardboard waste will be produced from panel packaging, which will be compacted on site prior to removal. Other wastes include rubber caps on panel edges, wooden pallets, and plastic wrapping (all related to the panel packaging). Waste will be disposed of in either waste skips and/or scavenger proof recycling bins (where possible) and temporarily placed in a central location for removal by an appropriate contractor. Where possible, waste will be recycled. Non-recyclable solid construction waste will be temporarily held in skips or other appropriate waste containers to be disposed of at an appropriately licensed landfill site. Any other waste and excess material will be removed once construction is complete and disposed of at a registered waste facility.

During construction, use of the following hazardous substances is anticipated: paint, grease, petrol / diesel for trucks, cranes, bulldozers etc. Limited amounts of transformer oils and chemicals will be used. Dangerous goods required to be stored during construction (e.g., limited quantities of fuel, oil, lubricants etc.) will be stored in compliance with relevant legislation (i.e., stored on covered and bunded areas / bin, and disposed of at a registered hazardous waste site). Hazardous waste will be appropriately stored and disposed of.

3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by several regulations, including:

- » National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008).
- » National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014).
- » The South African Constitution (Act 108 of 1996).
- » Hazardous Substances Act (Act 5 of 1973).
- » Health Act (Act 63 of 1977).
- » Environment Conservation Act (Act 73 of 1989).
- » Occupational Health and Safety Act (Act 85 of 1993).
- » National Water Act (Act 36 of 1998).
- » The National Environmental Management Act (Act 107 of 1998) (as amended).
- » Municipal Structures Act (Act 117 of 1998).
- » Municipal Systems Act (Act 32 of 2000).

- » Mineral and Petroleum Resources Development Act (Act 28 of 2002).
- » Air Quality Act (Act 39 of 2004).

Storage of waste must be conducted in accordance with the National Norms and Standards for the Storage of Waste, published in Government Notice Regulation (GNR) 926.

4. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management is needed on site. Such an approach is illustrated in **Figure 1**.

It is important to ensure that waste is managed with the following objectives in mind during all phases of the project:

- » Reducing volumes of waste is the greatest priority.
- » If reduction is not feasible, the maximum amount of waste is to be recycled.
- » Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner.

The Integrated Waste Management Approach to Waste

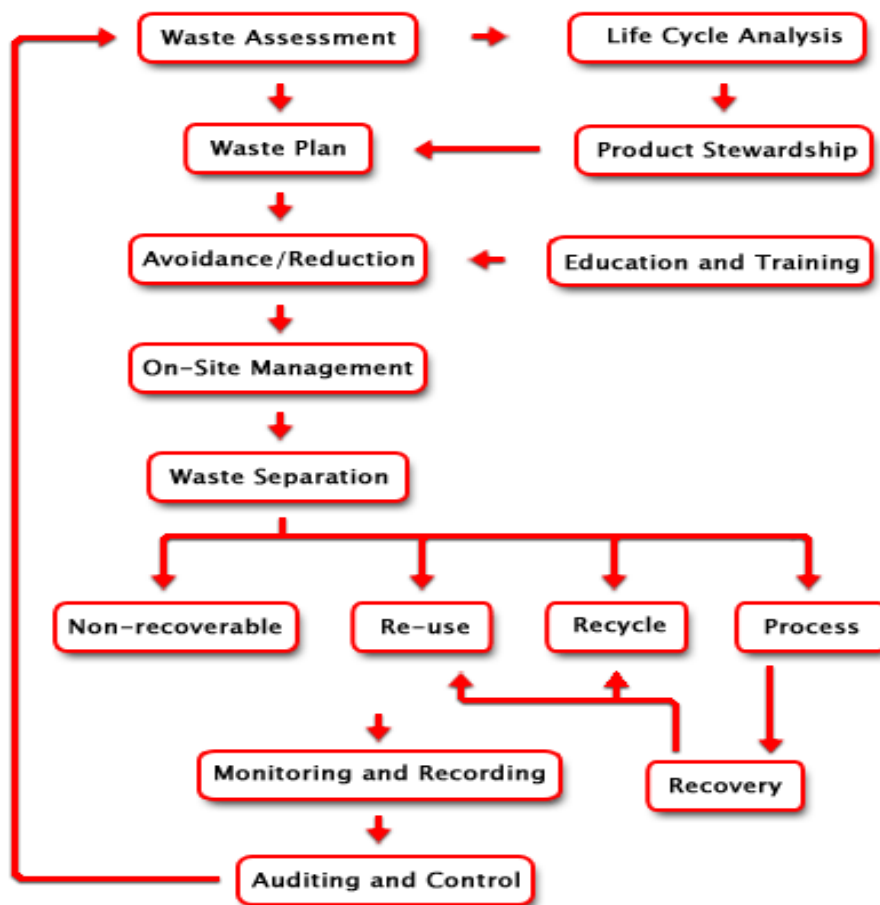


Figure 1: Integrated Waste Management Flow Diagram

(Source: <http://www.enviroserv.co.za/pages/content.asp?SectionId=496>)

4.1. Construction phase

A plan for the management of waste during the construction phase is detailed below. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction, for approval by the Resident Engineer.

4.1.1. Waste Assessment / Inventory

- » The Environmental Officer (EO), or designated staff member, must develop, implement, and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- » Construction methods and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities, to be pro-actively implemented.
- » Once a waste inventory has been established, targets for the recovery of waste (minimisation, re-use, recycling) should be set.
- » The EO must conduct waste classification and rating in terms of South African National Standard (SANS) 10288 and Government Notice 634 published under the NEM: WA.

4.1.2. Waste collection, handling, and storage

- » It is the responsibility of the EO to ensure that each subcontractor implements their own waste recycling system, i.e., separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc. Such practises must be made contractually binding upon appointment of the subcontractors.
- » Waste manifests and waste acceptance approvals (i.e., receipts) from designated waste facilities must be kept on file at the site office, in order to record and prove continual compliance for future auditing.
- » Portable toilets must be monitored by the EO or responsible subcontractor and maintained regularly.
- » Waste collection bins and hazardous waste containers must be provided by the principal contractor and subcontractors and placed at strategic locations around the site for the storage of organic, recyclable, and hazardous waste.
- » A dedicated waste area must be established on the project area for the storage of all waste streams before removal from area. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
- » Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e., paper, cardboard, metals, food waste, glass etc.).
- » Hazardous waste must be stored within a bunded area constructed according to South African Bureau of Standards (SABS) requirements and must ensure complete containment of the spilled material in the event of a breach. As such, appropriate bunding material, design, capacity, and type must be utilised to ensure that no contamination of the surrounding environment will occur despite a containment breach. The net capacity of a bunded compound in a storage facility should be at least 120% of the net capacity of the largest tank.
- » Take into consideration the capacity displaced by other tanks within the same bunded area and any foundations.
- » Treat interconnected tanks as a single tank of equivalent total volume for the purposes of the bund design criteria.
- » The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control, while being reasonably placed in terms of centrality and accessibility on site. Where required, an

additional temporary waste storage area may be designated, provided identical controls are exercised for these locations.

- » Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- » A dedicated waste management team must be appointed by the principal contractors' Safety, Health and Environment (SHE) Officer, who will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the SHE Officer.
- » All waste removed from site must be done by a registered/ licensed subcontractor, who must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made, records of which must be kept on file at the site camp for the duration of the construction period.

4.1.3. Management of waste storage areas

- » Waste storage must be undertaken in accordance with the relevant Norms and Standards.
- » The position of all waste storage areas must be located so as to ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and contaminated storm water.
- » Collection bins placed around the project area and at subcontractors' camps (if at a different location than the main site camp) must be maintained and emptied on a regular basis by the principal contractor to avoid overflowing receptacles.
- » Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked, or colour coded and well-maintained. Monitor for rodents and take corrective action if they become a problem.
- » Waste must be stored in designated containers and not on the ground.
- » Inspections and maintenance of bunds must be undertaken regularly. Bunds must be inspected for leaks or cracks in the foundation and walls.
- » It is assumed that any rainwater collected inside the bund is contaminated and must be treated by oil/water separation (or similar method) prior to dewatering, or removed and stored as hazardous waste, and not released into the environment.
- » If any leaks occur in the bund, these must be amended immediately.
- » Bund systems must be designed to avoid dewatering of contaminated water, but to rather separate oil and hydrocarbons from water prior to dewatering.
- » Following rainfall event bunds must always be dewatered in order to maintain a sufficient storage capacity in the event of a breach.
- » No mixing of hazardous and general waste is allowed.

4.1.4. Disposal

- » Waste generated on the project area must be removed on a regular basis. This frequency may change during construction depending on waste volumes generated at different stages of the construction process, however removal must occur prior to the storage capacity being reached to avoid overflow of containers and poor waste storage.
- » Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor to the EO and Environmental Control Officer (ECO).

4.1.5. Record keeping

The success of the WMP is determined by measuring criteria such as waste volumes, cost recovery from recycling and cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan.

- » Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
- » Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.

4.1.6. Training

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions with the EO and at the frequency as set out by the ECO.

4.2. Operation phase

It is expected that the operation phase will result in the production of limited amounts of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Hazardous wastes (including grease, oils) will also be generated. All waste generated will be required to be temporarily stored at the facility in appropriate sealed containers prior to disposal at a permitted landfill site or other facilities.

The following waste management principles apply during the operation phase:

- » The SHE Manager must develop, implement and maintain a waste inventory reflecting all waste generated during operation for both general and hazardous waste streams.
- » Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.
- » Recyclable waste must be removed from the waste stream and stored separately.
- » All waste must be stored in appropriate temporary storage containers (separated between different operation wastes and contaminated or wet waste).
- » Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
- » Waste generated on site must be removed on a regular basis throughout the operation phase.
- » Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

5. Monitoring of Waste Management Activities

Records must be kept of the volumes/ mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- » Monthly volumes/ mass of the different waste streams collected.
- » Monthly volumes/ mass of the waste that is disposed of at a landfill site.
- » Monthly volumes/ mass of the waste that is recycled.
- » Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must form part of the EO's reports to the ECO on a monthly basis.

**APPENDIX H:
EMERGENCY PREPAREDNESS, RESPONSE AND FIRE
MANAGEMENT PLAN**

EMERGENCY PREPAREDNESS, RESPONSE AND FIRE MANAGEMENT PLAN

1. PURPOSE

The purpose of the Emergency Preparedness and Response Plan is:

- » To assist contractor personnel to prepare for and respond quickly and safely to emergency incidents, and to establish a state of readiness which will enable prompt and effective responses to possible events.
- » To control or limit any effect that an emergency or potential emergency may have on site or on neighbouring areas.
- » To facilitate emergency responses and to provide such assistance on the site as is appropriate to the occasion.
- » To ensure communication of all vital information as soon as possible.
- » To facilitate the reorganisation and reconstruction activities so that normal operations can be resumed.
- » To provide for training so that a high level of preparedness can be continually maintained.

This plan outlines response actions for potential incidents of any size. It details response procedures that will minimise potential health and safety hazards, environmental damage, and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to an emergency event. The plan will enable an effective, comprehensive response to prevent injury or damage to the construction personnel, public, and environment during the project. Contractors are expected to comply with all procedures described in this document. A Method Statement should be prepared at the commencement of the construction phase detailing how this plan is to be implemented as well as details of relevant responsible parties for the implementation. The method statement must also reflect conditions of the IFC Performance Standard 1 and include the following:

- » Identification of areas where accidents and emergency situations may occur;
- » Communities and individuals that may be impacted;
- » Response procedure;
- » Provisions of equipment and resources;
- » Designation of responsibilities;
- » Communication; and
- » Periodic training to ensure effective response to potentially affected communities.

2. PROJECT-SPECIFIC DETAILS

The proposed project entails the development of a Solar Photovoltaic (PV) Energy Facility and associated infrastructure on Portion 6 of the Farm Goedehoop No. 290, located approximately 7km south-east of Secunda and 15km east of Embalenhle, within jurisdiction of the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in the Mpumalanga Province.

The Solar PV Energy Facility will have a contracted capacity of up to 19.99MW_{ac} and will use bi-facial panels with single axis tracking or fixed tilt systems to harness the solar resource on the project site. The purpose of the facility will be to generate electricity for exclusive use by Sasol Limited. Power generated at the facility will be delivered to Sasol Limited by feeding into the grid through a Wheeling Agreement signed with Eskom and/or direct embedded generation. The construction of the Solar PV Energy Facility aims to reduce Sasol's

dependence on direct supply from Eskom's national grid for operation purposes and demonstrate Sasol's move towards a greener future through procurement of renewable energy from Independent Power Producers (IPPs).

A development area of up to ~26.64ha and a development footprint of up to ~19.95ha have been identified within the project site (~433ha) by Becrux Solar PV Project One (Pty) Ltd for the development of the Becrux Solar PV Energy Facility. Infrastructure associated with the Solar PV Energy Facility will include the following:

- » Solar PV array comprising PV modules and mounting structures.
- » Inverters and transformers.
- » Cabling between the panels.
- » E-house containerised or non-containerised substation.
- » 11kV overhead power line for the distribution of the generated power, which will be connected to the existing Goedehoop Substation.
- » Laydown area.
- » Access gravel road (existing) and internal gravel roads (new).
- » Security booth, Operations & Maintenance building, workshop, storage area and site office.

To evacuate the generated power to Sasol Limited, an 11kV overhead power line will be established to connect the 11kV E-house containerised or non-containerised substation to the existing Goedehoop Substation. A 170m wide and 400m long grid connection corridor has been identified for the assessment and placement of the overhead power line, which will provide for the avoidance of sensitive environment areas and features and allow for the micro-siting of the power line within the corridor.

Due to the scale and nature of this development, it is anticipated that the following risks could potentially arise during the construction and operation phases:

- » Fires.
- » Leakage of hazardous substances.
- » Storage of flammable materials and substances.
- » Flood events.
- » Accidents.
- » Natural disasters.

3. EMERGENCY RESPONSE PLAN

There are three levels of emergency as follows:

- » Local Emergency: An alert confined to a specific locality.
- » Site Emergency: An alert that cannot be localised and which presents danger to other areas within the site boundary or outside the site boundary.
- » Evacuation: An alert when all personnel are required to leave the affected area and assemble in a safe location.

If there is any doubt as to whether any hazardous situation constitutes an emergency, then it must be treated as an Evacuation.

Every effort must be made to control, reduce or stop the cause of any emergency provided it is safe to do so. For example, in the event of a fire, isolate the fuel supply and limit the propagation of the fire by cooling

the adjacent areas. Then confine and extinguish the fire (where appropriate) making sure that re-ignition cannot occur.

3.1. Emergency Scenario Contingency Planning

3.1.1. Scenario: Spill which would result in the contamination of land, surface or groundwater

i. Spill Prevention Measures

Preventing spills must be the top priority at all operations which have the potential of endangering the environment. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the Environmental Control Officer (ECO). In order to reduce the risk of spills and associated contamination, the following principles should be considered during construction and operation activities:

- » All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed/contained or bunded designated areas.
- » All maintenance materials, oils, grease, lubricants, etc. should be stored in a designated area in an appropriate storage container.
- » No refuelling, storage, servicing, or maintenance of equipment should take place within sensitive environmental resources in order to reduce the risk of contamination by spills.
- » No refuelling or servicing should be undertaken without absorbent material or drip pans properly placed to contain spilled fuel.
- » Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.
- » If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
- » Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.
- » Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

ii. Procedures

The following action plan is proposed in the event of a spill:

1. Spill or release identified.
2. Assess person safety, safety of others and environment.
3. Stop the spill if safely possible.
4. Contain the spill to limit entering surrounding areas.
5. Identify the substance spilled.
6. Quantify the spill (under or over guideline/threshold levels).
7. Notify the Site Manager and emergency response crew and authorities (in the event of major spill).
8. Inform users (and downstream users) of the potential risk.
9. Clean up of the spill using spill kit or by HazMat team.

10. Record of the spill incident on company database.

a) Procedures for containing and controlling the spill (i.e. on land or in water)

Measures can be taken to prepare for quick and effective containment of any potential spills. Each contractor must keep sufficient supplies of spill containment equipment at the construction sites, at all times during and after the construction phase. These should include specialised spill kits or spill containment equipment. Other spill containment measures include using drip pans underneath vehicles and equipment every time refuelling, servicing, or maintenance activities are undertaken.

Specific spill containment methods for land and water contamination are outlined below.

Containment of Spills on Land

Spills on land include spills on rock, gravel, soil and/or vegetation. It is important to note that soil is a natural sorbent, and therefore spills on soil are generally less serious than spills on water as contaminated soil can be more easily recovered. It is important that all measures be undertaken to avoid spills reaching open water bodies located outside of the project site. The following methods could be used:

- » *Dykes* - Dykes can be created using soil surrounding a spill on land. These dykes are constructed around the perimeter or down slope of the spilled substance. A dyke needs to be built up to a size that will ensure containment of the maximum quantity of contaminant that may reach it. A plastic tarp can be placed on and at the base of the dyke such that the contaminant can pool up and subsequently be removed with sorbent materials or by pump into barrels or bags. If the spill is migrating very slowly, a dyke may not be necessary, and sorbents can be used to soak up contaminants before they migrate away from the source of the spill.
- » *Trenches* - Trenches can be dug out to contain spills. Spades, pick axes or a front-end loader can be used depending on the size of the trench required. Spilled substances can then be recovered using a pump or sorbent materials.

b) Procedures for transferring, storing, and managing spill related wastes

Used sorbent materials are to be placed in plastic bags for future disposal. All materials mentioned in this section are to be available in the spill kits. Following clean up, any tools or equipment used must be properly washed and decontaminated, or replaced if this is not possible.

Spilled substances and materials used for containment must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

c) Procedures for restoring affected areas

Criteria that may be considered include natural biodegradation of oil, replacement of soil and revegetation. Once a spill of reportable size has been contained, the ECO and the relevant Authority must be consulted to confirm that the appropriate clean up levels are met.

3.1.2. Scenario: Fire (and fire water handling)

i. Action Plan

The following action plan is proposed in the event of a fire:

1. Quantify risk.
2. Assess person safety, safety of others and environment.
3. If safe – attempt to extinguish the fire using appropriate equipment.
4. If not safe to extinguish, contain fire.
5. Notify the Site Manager and emergency response crew and authorities.
6. Inform users of the potential risk of fire.
7. Record the incident on the company database or filing register.

ii. Procedures

Because large scale fires may spread very fast it is most advisable that the employee/contractor not put his/her life in danger in the case of an uncontrolled fire.

Portable firefighting equipment must be provided at strategic locations throughout the site, in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguishers, hose reels and hydrants must be maintained and inspected by a qualified contractor in accordance with the relevant legislation and national standards.

Current evacuation signs and diagrams for the building or site that are compliant to relevant state legislation must be provided in a conspicuous position, on each evacuation route. Contact details for the relevant emergency services should be clearly displayed on site and all employees should be aware of procedures to follow in the case of an emergency.

a) Procedures for initial actions

Persons should not fight the fire if any of the following conditions exist:

- » They have not been trained or instructed in the use of a fire extinguisher.
- » They do not know what is burning.
- » The fire is spreading rapidly.
- » They do not have the proper equipment.
- » They cannot do so without a means of escape.
- » They may inhale toxic smoke.

b) Reporting procedures

In terms of the requirements of National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), the responsible person must, within 14 days of the incident, report to the Director General, provincial head of department and municipality.

- » Report fire immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
- » The site manager must have copies of the Report form to be completed.

SUMMARY: RESPONSE PROCEDURE

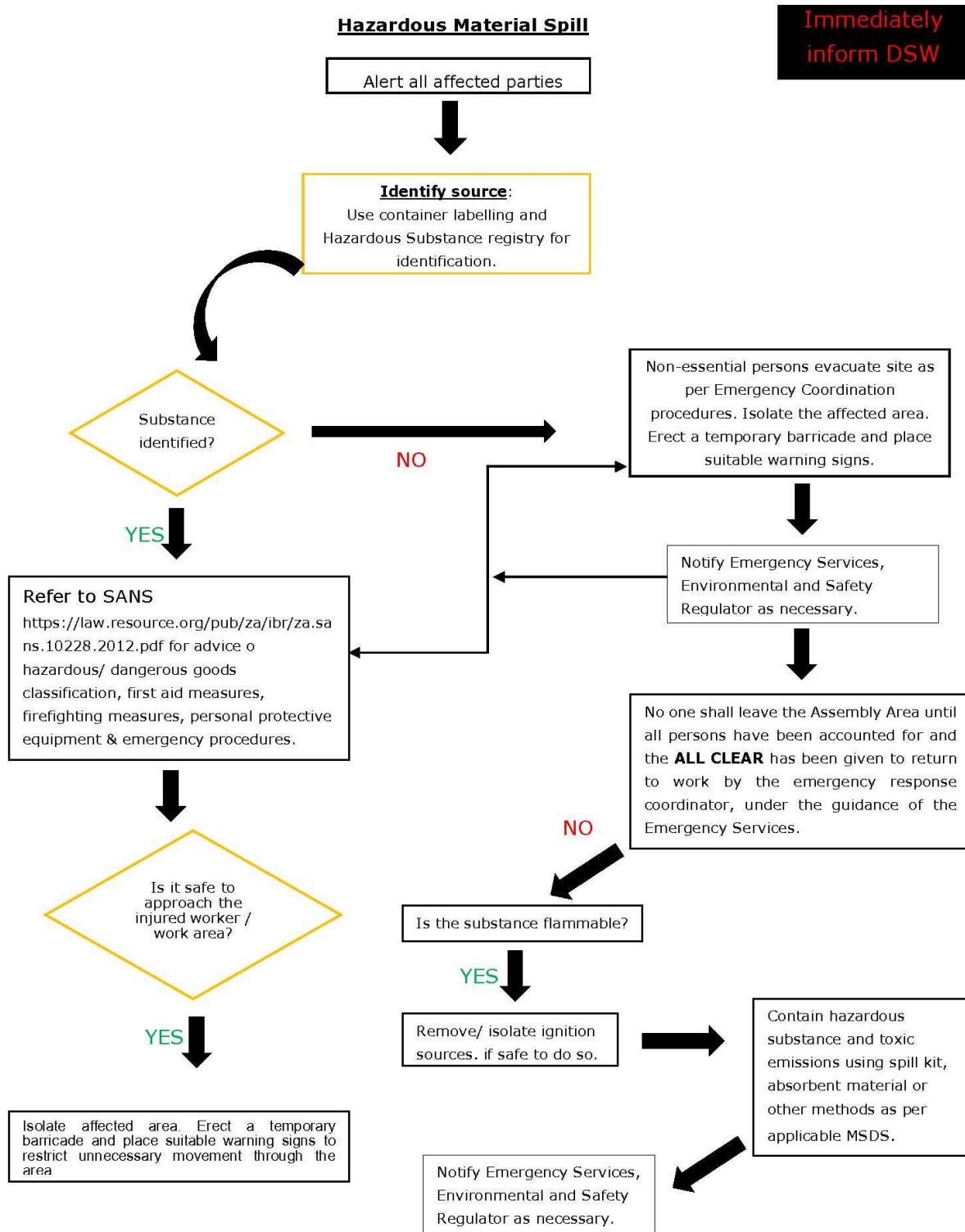


Figure 1: Hazardous Material Spill

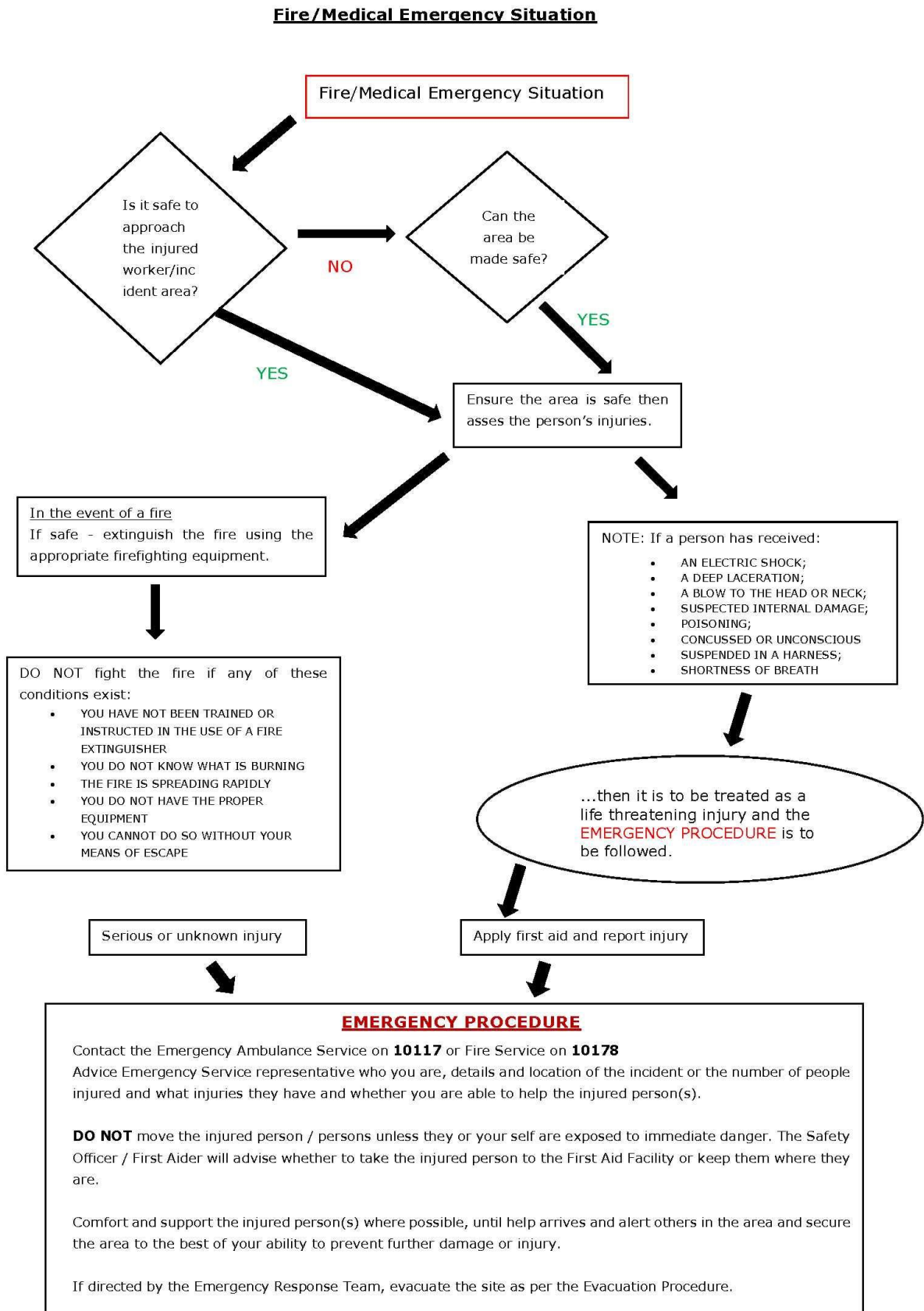


Figure 2: Emergency Fire/Medical

4. PROCEDURE RESPONSIBILITY

The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this Plan, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues.

The local authorities will provide their assistance when deemed necessary, or when it has been requested and/or indicated in Section 30 (8) of NEMA. The provincial authority will provide assistance and guidance where required and conduct awareness programmes.

**APPENDIX I:
CURRICULUM VITAE OF THE PROJECT TEAM**

CURRICULUM VITAE OF MMAKOENA MMOLA

Profession :	Environmental Assessment Practitioner
Specialisation:	Environmental Permitting, Environmental Assessments, and Compliance
Work Experience:	4 years

VOCATIONAL EXPERIENCE

Mmakoena is an Environmental Consultant with 4 years of experience in the environmental field. She holds a B.Sc. (Hons) in Geochemistry from the University of the Witwatersrand and is currently completing her B.Sc. (Hons) in Environmental Management with the University of South Africa.

Mmakoena's experience includes undertaking environmental permitting and environmental authorisation applications, compiling basic assessment reports, scoping and environmental impact assessment reports and environmental management programmes, executing the public participation process, undertaking environmental compliance audits, providing environmental control officer services, conducting environmental screening assessments, managing sub-consultants, project management and preparing proposals and budgets in response to requests for quotations.

SKILLS BASE AND CORE COMPETENCIES

- Well-developed communication and report writing skills
- Adaptability and ability to handle pressure
- Organisational skills
- Ability to build and maintain client relationships
- Loyalty, dedication and dependability
- Ability to coordinate and synthesize environmental information
- Ability to work to tight deadlines and on multiple projects
- Thorough knowledge of environmental legislation and the environmental impact assessment process
- Quality focus and attention to detail
- Ability to deliver high quality work to agreed budgets
- MS Office Package (Word, PowerPoint and Excel)
- Adobe Acrobat
- Google Earth
- ArcGIS (basic)

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- Bachelor of Science (Hons) Environmental Management, in progress, University of South Africa
- Bachelor of Science (Hons) Geochemistry, 2016, University of the Witwatersrand
- Bachelor of Science Geology, 2015, University of the Witwatersrand

Short Courses:

- Environmental Management and Regulations, 2018, Kuvimbika
- Research Methodology and Report Writing, 2017, Imsimbi Training

Professional Society Affiliations:

- Candidate Natural Scientist, Environmental Science, South African Council for Natural and Scientific Professions – Registration Number: 126748

EMPLOYMENT

Date	Company	Roles and Responsibilities
2021 - Current:	Savannah Environmental (Pty) Ltd	<p><i>Environmental Assessment Practitioner</i></p> <p><u>Tasks include:</u></p> <ul style="list-style-type: none"> • Undertake environmental screening assessments, environmental permitting and environmental authorisation applications. • Undertake water use authorisation applications on the e-WULAA system. • Complete Part 1 and Part 2 EA amendment applications and prepare motivation reports in support of applications for Part 2 EA amendments. • Undertake environmental compliance audits and provide ECO services. • Efficient and quality report writing to execute and manage the delivery of environmental impact assessment (EIA) reports and Environmental Management Programmes in line with the requirements of the National Environmental Management Act and EIA Regulations. • Liaison with relevant environmental authorities. • Execution of the public participation process. • Professional client liaison. • Project management. • Manage third parties or sub-consultants to which functions have been outsourced. • Preparation of proposals and budgets.
2019 - 2020	Golder Associates Africa (Pty) Ltd	<p><i>Junior Environmental Consultant</i></p> <p><u>Tasks included:</u></p> <ul style="list-style-type: none"> • Water use license applications • Environmental compliance and water use license audits

Date	Company	Roles and Responsibilities
		<ul style="list-style-type: none"> • Environmental control officer services • Annual integrated water and waste management plan updates • Assist with wetland assessments • Assist with mine closure and rehabilitation plans • Liaise with clients and competent authorities • Provide assistance on local environmental and social impact assessments • Undertake site visits • Compile environmental reports • Generate environmental screening reports • Undertake administrative tasks
2017 - 2019	Shango Solutions	<p>Junior Consultant</p> <p><u>Tasks included:</u></p> <ul style="list-style-type: none"> • Conduct environmental compliance and financial provision audits for prospecting sites as per the MPRDA • Environmental authorisation applications • Prospecting right and mining permit applications • Basic assessment reports • Environmental management programmes/plans • Execute the public participation process • Section 102 amendment applications as per the MPRDA • Prepare maps • Liaise with sub-consultants/specialists • Undertake administrative tasks

PROJECT EXPERIENCE

RENEWABLE POWER GENERATION PROJECTS: SOLAR ENERGY FACILITIES AND WIND ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
700MW (7x 100MW) Mutsho Solar PV, Limpopo Province	CRI Eagle	EAP
Angora Wind Energy Facility, Northern Cape Province	Great Karoo Renewable Energy (Pty) Ltd	EAP
Merino Wind Energy Facility, Northern Cape Province	Great Karoo Renewable Energy (Pty) Ltd	EAP
Vrede and Rondavel Solar PV Facilities, Free State Province	Mainstream Renewable Energy Developments (Pty) Ltd	Assistant EAP
400MW (4x 100MW) Pixley Park Solar PV, Northern Cape Province	Mulilo Energy Holdings	EAP

Basic Assessments

Project Name & Location	Client Name	Role
Northam Solar Photovoltaic (PV) Facility, Limpopo Province	Northam Platinum Limited	EAP

Hamlett Wind Energy Facility, Eastern Cape Province (project in progress)	Hamlett (Pty) Ltd	EAP
Becrux Solar PV Facility, Mpumalanga Province	The SOLA Group	EAP

Screening Studies

Project Name & Location	Client Name	Role
Environmental Screening for the Proposed Secunda and Sasolburg Solar PV Facilities, Free State Province and Mpumalanga Province	The SOLA Group	EAP

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Biodiversity Permitting and General Authorisation Applications for the Harmony Tshepong, Nyala and Eland Solar PV Facilities, Free State Province	Nyala Photovoltaic (Pty) Ltd Tshepong Photovoltaic (Pty) Ltd Eland Photovoltaic (Pty) Ltd	EAP
General Authorisation Application for the Northam Solar PV Facility, Limpopo Province	Northam Platinum Limited	EAP

Environmental Authorisation Amendment Applications

Project Name & Location	Client Name	Role
Part I Amendment: Proposed 75MW Sannaspos PV Plant (Phase 1) and its associated infrastructure, Free State Province	ENGIE BU Africa	EAP
Part I Amendment: Construction of the 140MW Korana Wind Energy Facility, Northern Cape Province	Mainstream Renewable Energy Developments (Pty) Ltd	EAP
Part I Amendment: Construction of the 75MW Korana Solar Energy Facility, Northern Cape Province	Mainstream Renewable Energy Developments (Pty) Ltd	EAP
Part I Amendment: Construction of the 140MW Khai-Ma Wind Energy Facility, Northern Cape Province	Mainstream Renewable Energy Developments (Pty) Ltd	EAP

GRID INFRASTRUCTURE PROJECTS

Basic Assessments

Project Name & Location	Client Name	Role
Electrical Grid Infrastructure for the Kolkies and Sadawa PV clusters, Western Cape Province	Mainstream Renewable Energy Developments (Pty) Ltd	EAP
Electrical Grid Infrastructure for the Vrede and Rondavel Solar PV Facilities, Free State Province	Mainstream Renewable Energy Developments (Pty) Ltd	EAP
Sadawa Collector Substation, Western Cape Province	Mainstream Renewable Energy Developments (Pty) Ltd	EAP
Main Transmission Substation (MTS) associated with the Choje Wind Farm cluster, Eastern Cape Province (project in progress)	Wind Relic (Pty) Ltd	EAP

Environmental Authorisation Amendment Applications

Project Name & Location	Client Name	Role
<i>Part I Amendment: Construction of a 132kV power lines associated with the Poortjies Wind Energy Facility, Northern Cape Province</i>	<i>Mainstream Renewable Energy Developments (Pty) Ltd</i>	<i>EAP</i>
<i>Part I Amendment: Construction of a 132kV power lines associated with the Khai-Ma Wind Energy Facility, Northern Cape Province</i>	<i>Mainstream Renewable Energy Developments (Pty) Ltd</i>	<i>EAP</i>

GAS EXPLORATION PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
<i>Kroonstad Gas Exploration Right and Environmental Authorisation, Free State Province</i>	<i>Western Allen Ridge Gold Mines (Pty) Ltd</i>	<i>Assistant EAP and Public Participation Consultant</i>

MINING PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
<i>Pure Source Mine Mining Right Application, Free State Province</i>	<i>Monte Cristo Commercial Park (Pty) Ltd</i>	<i>Assistant EAP and Public Participation Consultant</i>

Basic Assessments

Project Name & Location	Client Name	Role
<i>Basic Assessment for the Western Margin Gap West Prospecting Right, Free State Province</i>	<i>White Rivers Exploration (Pty) Ltd</i>	<i>Assistant EAP</i>
<i>Basic Assessment for the Ventersburg Consolidated Prospecting Right, Free State Province</i>	<i>White Rivers Exploration (Pty) Ltd</i>	<i>Assistant EAP</i>
<i>Basic Assessment for the Nkunzana Prospecting Right, KwaZulu-Natal Province</i>	<i>WRE Base Metals (Pty) Ltd</i>	<i>Junior EAP</i>
<i>Basic Assessment for the Kroonstad North Prospecting Right, Free State Province</i>	<i>White Rivers Exploration (Pty) Ltd</i>	<i>Junior EAP</i>
<i>Basic Assessment for the Vredefort West Extension Prospecting Right, Free State Province</i>	<i>White Rivers Exploration (Pty) Ltd</i>	<i>Junior EAP</i>
<i>Basic Assessment for the Beisa North Prospecting Right, Free State Province</i>	<i>Sunshine Mineral Reserves (Pty) Ltd</i>	<i>EAP</i>
<i>Basic Assessment for the Palmietfontein Mining Permit, North-West Province</i>	<i>Palm Chrome (Py) Ltd</i>	<i>Assistant EAP</i>

Specialist Studies

Project Name & Location	Client Name	Role
<i>New Largo Mine Closure and Rehabilitation Plan, Mpumalanga Province</i>	<i>Seriti Coal</i>	<i>Junior Environmental Consultant</i>
<i>Smarty Minerals Integrated Environmental Authorisation: Wetland Impact Assessment Report, Limpopo Province</i>	<i>Smarty Minerals Investment (Pty) Ltd</i>	<i>Junior Environmental Consultant</i>
<i>Glencore Water Treatment Plant Pipeline: Wetland Monitoring, Mpumalanga Province</i>	<i>Glencore</i>	<i>Junior Environmental Consultant</i>

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Glencore Merafe Wonderkop Smelter, Regulation 34 Audit, North West Province	Glencore	Auditor
Tshipi Borwa Mine Water Use Licence Audit, Northern Cape Province	Tshipi Borwa Mine	Auditor
Samancor Middelburg Ferrochrome: Construction of ore dryer, Mpumalanga Province	Samancor Middelburg Ferrochrome	ECO
Various Annual Financial Provision and Environmental Compliance Audits for prospecting sites as per the MPRDA, Free State and KwaZulu-Natal Province	White River's Exploration (Pty) Ltd	Auditor
Impala Platinum Limited – Springs annual external Water Use Licence Audit, Gauteng Province	Impala Platinum Limited	Auditor

INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)**Specialist Studies**

Project Name & Location	Client Name	Role
Closure cost model estimate and closure cost report for the Proposed Surface Pipeline and Associated Infrastructure, Gauteng Province	AngloGold Ashanti	Junior Environmental Consultant
Wetland Impact Assessment report for Proposed Surface Pipeline and Associated Infrastructure, Gauteng Province	AngloGold Ashanti	Junior Environmental Consultant

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
MWCAP-2A Environmental Management Audit, Limpopo Province	Nexia SAB&T	Auditor

AGRICULTURE PROJECTS**Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

Project Name & Location	Client Name	Role
Dew Crisp Water Use Licence Application, Gauteng Province	Dew Crisp (Pty) Ltd	Junior Environmental Consultant (providing assistance)

OTHER**Environmental Impact Assessments and Environmental Management Programmes**

Project Name & Location	Client Name	Role
Anglo African Metals Zero Waste Recovery Solution, Mpumalanga Province	Anglo African Metals (Pty) Ltd	EAP
Eskom Majuba Landfill, Mpumalanga Province (project in progress)	Eskom	EAP
Expansion of Recreational and Sports Facilities at the Country Club Johannesburg	Country Club Johannesburg	EAP

CURRICULUM VITAE OF TEBOGO MAPINGA

Profession :	Business Operations Manager and EAP
Specialisation:	Environmental Impact Assessments, Water Use Licencing, Waste Licencing, Environmental Permitting
Work Experience:	14 years' experience in Environmental Management, National Water Act, Mineral and Petroleum Resources Development Act, Project Management, Compliance Auditing, Stakeholder Engagement, Policy and Legislation Advisory and Peer Review.

VOCATIONAL EXPERIENCE

Tebogo is an experienced professional with 14 years across the fields of Environment, Permitting, Project Management, Contract Management and Business Development, within the built infrastructure and most recently renewable energy sectors. I have an excellent track record and across-the-board proficiency within the following business environments: Business Development | Tender Management | Environmental Regulations & Compliance (Renewable Energy, Power, Infrastructure, Mining, ect) | Project Finance Environmental Due Diligence | Project Management (including contract management) | Design, Execution and management Project Permitting Processes | Team Management | Stakeholder Interfaces | Policy and Legislation Advisory.

I'm an assertive individual with a passion for renewable energy industry and power markets. I am a self-motivated and results orientated individual, able to effectively and expediently learn and absorb the nuances of new markets and take on strong leadership roles accordingly. I possess a strong business development, environmental and permitting acumen which also comes with the ability to cultivate significant synergies between stakeholders and authorities; and maintaining those relationships.

SKILLS BASE AND CORE COMPETENCIES

- Renewable Energy Permitting;
- Environmental Management;
- Environmental Due Diligence and Analysis;
- Tender and Bid Management;
- Project Management and client liaison;
- Contract Management;
- Report Writing, drafting proposals and tenders;
- Review of ECO Monitoring Reports and External Audit Reports
- Financial management and marketing;
- Understanding and Implementation of all Environmental Regulations and all other relevant legislation;
 - Water Use Licence Applications (NWA)
 - General Authorisations (NWA)
- Ability to work independently and in a team;
- Good verbal, writing and presentation skills;
- Time management and workload management; and
- Facilitation and Training skills.

EDUCATION AND PROFESSIONAL STATUS

Degrees:

BSc (Zoology and Physiology), The University of Limpopo

Short Courses:

- MS WORD- Computer Course (University of Limpopo (2006)
- Environmental Assessment Administration (2012)

Professional Society Affiliations:

- South African Council for Scientific Natural Professionals (SACNASP): Certified Natural Scientist – Pr.Sci.Nat. (Membership No.: 115518)
- IAAsa Member

Other Relevant Skills:

- GPS use, spatial data capturing and ground truthing

EMPLOYMENT

Date	Company	Roles and Responsibilities
April 2021 - Current:	Savannah Environmental (Pty) Ltd	Business Operations Manager & EAP <u>Tasks include:</u> Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments, water use license applications, general authorisations, and permit applications, environmental compliance officer audits and reporting, Ensuring environmental compliance on permitting processes, project management, staff management and co-ordination, client liaison and relationship management.
February 2018 – March 2021	Zitholele Consulting (Pty) Ltd	Senior Environmental Consultant <u>Tasks included:</u> Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments, water use license applications, general authorisations, mining rights and permit applications, environmental compliance officer audits and reporting, Ensuring environmental compliance on permitting processes, client liaison and relationship management, public participation processes for environmental authorisations and conducting peer reviews. Conducted Rain Readiness Assessments for Eskom.

Date	Company	Roles and Responsibilities
April 2014 – December 2017	Savannah Environmental (Pty) Ltd	<p>Senior Environmental Consultant & Principal Environmental Consultant</p> <p><u>Tasks included:</u> Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments, water use license applications, general authorisations, mining rights and permit applications, environmental compliance officer audits and reporting, Ensuring environmental compliance on permitting processes, client liaison and relationship management, public participation processes for environmental authorisations and environmental screening reports..</p>
April 2013 – March 2014	GIBB Engineering and Science	<p>Senior Environmental Scientist</p> <p><u>Tasks included:</u> Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments. Ensuring environmental compliance on permitting processes, client liaison and relationship management, public participation processes for environmental authorisations and environmental screening reports.</p>
April 2010 – March 2013	Department of Forestry, Fisheries and the Environment	<p>Environmental Officer Specialised Production:</p> <p><u>Tasks included:</u> The review of BARs, EIRs, EMPr's and Environmental Authorisations mainly for Parastatal projects (Eskom projects, SANRAL projects, Rand Water Project), Renewable energy projects and National Projects; and Drafting recommendations for EIA submissions.</p>
April 2008 – March 2010	Strategic Environmental Focus	<p>Environmental Consultant</p> <p><u>Tasks included:</u> Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments. Ensuring environmental compliance on permitting processes, client liaison, project management and relationship management, public participation processes for environmental authorisations and environmental screening reports.</p>
January 2007 – March 2008	Phaki Phakanani Environmental Consultants	<p>Environmental Consultants</p> <p><u>Tasks included:</u> Undertaking environmental impact assessments, basic assessments, environmental management programmes</p>

Date	Company	Roles and Responsibilities
		(EMPrs), environmental amendments. Ensuring environmental compliance on permitting processes, client liaison, project management and relationship management, public participation processes for environmental authorisations and environmental screening reports.

PROJECT EXPERIENCE

Project experience includes project management, EIA, BA and EMPr documentation development, integrated water use license applications, general authorisations, and impact assessments, compliance auditing and monitoring, vegetation rehabilitation and monitoring plans, integrated waste management plans and waste licencing.

Industry experience includes conduction Rain Readiness Assessments for Eskom Power Stations, the waste sector (IWMP's and waste licencing), road infrastructure (BAR, S&EIR, WUL/GA, Waste Licence), Filling station applications for Shell SA and BP, private sector clients across varying industries (various permits), mining sector (BAR & S&EIR), conservation sector (biodiversity plans), renewable energy industry (BAR, S&EIR) as well as the gas industry.

RENEWABLE POWER GENERATION PROJECTS: WIND & SOLAR ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Thabametsi Coal Fired Power Station	G7 Renewable Energy (Pty) Ltd	Environmental consultant
Richards Bay CCPP Power Project	Eskom SOC Ltd	Project Manager Environmental consultant
Gunstfontein Wind Energy Facility	Ginstfontein Wind Farm (Pty) Ltd	Project Manager Environmental consultant
Pofadder 3 Wind and 1 solar Energy Facilities	Mainstream Renewable Power South Africa	Project Manager Environmental consultant
Solar Reserve Kotulo Tsatsi PV 2 Facility	Solar Reserve Pty (Ltd)	Project Manager Environmental consultant

Environmental Permitting, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Klawer Wind Farm FC Permitting	Building Energy and G7	Project Manager, Environmental consultant, Public Participation
Karusa Wind Farm FC Permitting (GA and Biodiversity Permit)	Karusa Wind Farm (Pty) Ltd	Project Manager, Environmental consultant, Public Participation
Roggeveld Wind Farm FC Permotting	Building Energy and G7	Project Manager, Environmental consultant, Public Participation
Soetwater Wind Farm FC Permitting (GA and Biodiversity Permit)	Soetwater Wind Farm (Pty) Ltd	Project Manager, Environmental consultant, Public Participation

Nxuba Wind Farm FC Permitting (GA and Biodiversity Permit)	Nxuba Wind Farm (Pty) Ltd	Project Manager, Environmental consultant, Public Participation
Adams PV Facility Upgrading of Charles Street FC Permitting	Aurora Power Solutions (Pty)	Project Manager, Environmental consultant, Public Participation
Bellatrix PV Facility FC Closure	Aurora Power Solutions (Pty)	Project Manager, Environmental consultant, Public Participation

HOUSING AND URBAN PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Proposed Housing Development on Portion 237 of the Farm Hartebeestpoort 328 in Koedoespoort, Gauteng Province	Housing Development Agency	Project Manager, Environmental consultant, Public Participation

Basic Assessments

Project Name & Location	Client Name	Role
Pienaarspoort Wind Energy Facility, Northern Cape Province	ABO Wind renewable energies (Pty) Ltd	Environmental consultant
Doornkop Maize Mill EIA, Mpumalanga Province	Department of Rural Development and Land Reform	Project Manager, Environmental consultant, Public Participation
Proposed Housing Development on Portion 237 of the Farm Hartebeestpoort 328 in Koedoespoort, Gauteng Province	Housing Development Agency	Project Manager, Environmental consultant, Public Participation
Karusa Wind Energy Facility Grid Connection BAR	Karusa Wind Farm (Pty) Ltd	Project Manager, Environmental consultant, Public Participation
Soetwater Wind Energy Facility Grid Connection BAR	Soetwater Wind Farm (Pty) Ltd	Project Manager, Environmental consultant
Gunstfontein Wind Energy Facility Grid Connection	Gunstfontein Ind Farm (Pty) Ltd	Project Manager, Environmental consultant
Great Fish River Watercourse Crossing BAR	African Clean Energy Developers (Pty) Ltd (ACED)	Project Manager, Environmental consultant

Screening Studies

Project Name & Location	Client Name	Role
Bobididi Solar Facility	Environmental Screening-Root 60FOUR Energy (Pty) Ltd	Project Manager, EAP
Hazelwood Stormwater Environmental Screening	Johannesburg Water	Project Manager, Environmental consultant

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
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Transnet Depot and Siding compliance auditing programme, Johannesburg, Gauteng & Rustenburg, North-West Province	Transnet SOC Ltd	ECO
Environmental compliance monitoring for the office complex development within the Pretoria National Botanical Gardens, Pretoria, Gauteng	South African National Biodiversity Institute (SANBI)	Project Manager, Environmental consultant, Public Participation, ECO

Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
EIA, WULA and waste variation for the retrofitting of the FGD at Medupi Power Station	Eskom SOC Ltd	Project Manager, Environmental consultant, Public Participation

SPECIALIST STUDIES

Project Name & Location	Client Name	Role
Rain Readiness Assessments for the Matla, Kriel, Majula and Kusile Substations	Eskom SOC Ltd	Environmental specialist

CURRICULUM VITAE OF LEHLOGONOLO MASHEGO

(Comprehensive CV)

Profession: Public Participation and Environmental Consultant
Specialisation: Environmental Assessment Practitioner
Work Experience: Four (4) years and ten (10) months

VOCATIONAL EXPERIENCE

Professional experience lies mainly in the environmental consulting field specialising in environmental impact assessments, public participation processes and facilitation, environmental planning, environmental research, environmental training, rehabilitation. Having served the mining, construction and infrastructure industries.

SKILLS BASE AND CORE COMPETENCIES

- Project management,
- Microsoft Office,
- Interpersonal and communication skills,
- Presenting,
- Report writing and formatting,
- Environmental legislative interpretation,
- Planning and organising, • Leading, coaching and mentoring,
- Research,
- Networking and marketing,
- Data analysis, interpretation and management, and
- Quality management systems and document control.

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- Master's in environmental science, University of Witwatersrand, 2021
- BSocSci Hons in Geographical and Environmental Science, University of Pretoria, 2016
- BA Geography, University of Johannesburg, 2015

Short Courses:

- Rethinking Integrated Environmental Management in Pursuit of the Sustainable Development Goals, IAIAsa National Conference, 2021
- Proposed Amendments to the Financial Provisioning Regulations 2015, IAIAsa, 2021
- Towards Sustainable and Responsible Mine Closure, IAIAsa, 2021
- Comprehensive Safety File Compilation Training Course, MAB Consultancy, 2019

Date	Company	Roles and Responsibilities
		<ul style="list-style-type: none"> • Project assistance • Project administration • Project support • Report writing • Research • Document control • Quality management system management
April 2017 – Mar 2018	Myezo Environmental Management Services	Environmental Intern and Project Assistant <u>Tasks included:</u> <ul style="list-style-type: none"> • Project assistance • Project administration • Project support • Report writing • Research • Document control • Quality management system management
2016	University of Pretoria – Department of Geography and Environmental Sciences	Student mentor <u>Tasks included:</u> <ul style="list-style-type: none"> • Academic mentoring and coaching • Academic support and guidance • Academic recommendations • Research assistance • Personal guidance
Oct 2013 – Sep 2014	University of Johannesburg – Annirand Dayhouse	Hawker/Leader <u>Tasks included:</u> <ul style="list-style-type: none"> • Head of Communication • Secretary • Head of Community Service • Mentoring and academic guidance • Overseeing all administration tasks • In-charge of social media platforms

PROJECT EXPERIENCE

Project experience primarily lies in the mining industry having worked extensively in Mpumalanga, North West and Gauteng Province with an averaged four (4) and a half work experience acquired. Construction and housing development projects in and around the Gauteng Province with an averaged three (3) years work experience acquired.

RENEWABLE POWER GENERATION PROJECTS: SOLAR ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Lephalale Solar Project – Limpopo Province	Grootgeluk Mine – Exxaro Coal	Public Participation Lead

CONVENTIONAL POWER GENERATION PROJECTS (COAL)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
EMPr Amendment Application for Voorspoed Coal Mine, Free State	De Beers Consolidated Mines	Public Participation Lead

GRID INFRASTRUCTURE PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Proposed D onatello Substation , Gauteng Province	MDT Environmental	Junior PPP

MINING SECTOR PROJECTS

Screening Studies

Project Name & Location	Client Name	Role
Feasibility Study of Pitlakes as a Mine Closure Option .	Coaltech Research Association	Public participation lead

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Annual Environment Performance Assessment for Tharisa Mine, North West Province	Tharisa Minerals	ECO
Monthly Audit for Arbor Railway Siding, Mpumalanga Province	Gijima Supply Chain Management	ECO
Monthly Audit for Forfar Railway Siding	Aplorox (Pty) Ltd	ECO
Annual EMPr and IWUL Audit for Hawerklip Railway Siding	Brazen Alger	ECO

Due Diligence Reporting

Project Name & Location	Client Name	Role
Annual Rehabilitation Strategy and Implementation Programme (RSIP) for Mafube Mine, Mpumalanga Province	Exxaro Coal, Mpumalanga	Junior EAP and report writer
Annual Rehabilitation Strategy and Implementation Programme (RSIP) for Belfast Mine, Mpumalanga Province	Exxaro Coal, Mpumalanga	Junior EAP and report writer
Annual Rehabilitation Strategy and Implementation Programme (RSIP) for Rietkuil Siding, Mpumalanga Province	Exxaro Coal, Mpumalanga	Junior EAP and report writer
Annual Rehabilitation Strategy and Implementation Programme (RSIP) for Tharisa Mine, North West Province	Tharisa Minerals	Junior EAP and report writer

INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Basic Assessment Report for the proposed development of the K11 Road , Gauteng Province	Vuka -Afrika Consulting Engineers and Project Managers	Junior EAP
Decommissioning of a Transnet pipeline running from Durban to Johannesburg	Hydro Science	Junior EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
12 th Avenue Bridge Rehabilitation, Gauteng Province	E-Square Engineering	ECO
Oxford Road Road Rehabilitation, Gauteng Province	E-Square Engineering	ECO
Chaplin Stormwater Infrastructure Rehabilitation, Gauteng Province	E-Square Engineering	ECO

HOUSING AND URBAN PROJECTS**Environmental Impact Assessments and Environmental Management Programmes**

Project Name & Location	Client Name	Role
Gauteng Rapid Land Release Programme , Unitas Park and Evaton West, Gauteng Province	Department of Human Settlements	Junior EAP
Matsulu Waste Transfer Station, Mpumalanga Province	Zethu Consulting Services	Junior EAP

Andrew Husted

M.Sc Aquatic Health (Pr Sci Nat)

Cell: +27 81 319 1225

Email: andrew@thebiodiversitycompany.com

Identity Number: 7904195054081

Date of birth: 19 April 1979

Profile Summary

Extensive experience with many mining projects in South Africa, parts of Africa and also Europe, providing specialist input into ESHIAs and EMPs.

Considerable experience with the project management of national and international multi-disciplinary projects.

Specialist guidance, support and facilitation for the compliance with legislative processes, in South Africa as well as with IFC and the Equator principles.

Expertise with Instream Flow and Ecological Water Requirements.

Provide specialist and technical input for faunal, aquatic ecology and wetland studies.

Areas of Interest

Mining, Renewable Energy & Infrastructure Development Projects, Sustainability and Conservation.

Publication of scientific journals and articles.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Fish population structure assessments
- The use of macroinvertebrates to determine water quality
- Aquatic Ecological Assessments
- Aquaculture
- Monitoring Programmes

Countries worked in

Botswana
Cameroon
Democratic Republic of Congo
Ghana
Ivory Coast
Liberia
Mali
Mozambique
Republic of Armenia
Senegal
Sierra Leone
South Africa

Nationality

South African

Qualifications

- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondri Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 Accredited – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams

RELEVANT PROJECT EXPERIENCE

Project Name: The ecological constraints mapping and Critical Habitat re-evaluation for the Anadarko LNG project: Specialist Consultant to conduct Ecological Studies (Fauna and Habitat) and the delineation of wetland systems.

Client: Anadarko.

Personal position / role on project: Wetland Specialist.

Location: Afungi, Mozambique (2015).

Main project features: To identify and map the ecological constraints is to support contractor activities. To redefine the critical habitats within the project area

Project Name: A Joint Basin Survey of the Upper Orange, Lower Orange and Vaal catchments to determine the current status of the systems: Specialist Consultants to conduct Ecological Studies (Fish, Macroinvertebrate, Diatoms, Water Quality and Habitat) and report on the current status (defining system trends).

Client: ORASECOM.

Personal position / role on project: Specialist Ichthyologist.

Location: South Africa (including Namibia, Botswana & Lesotho) (2015).

Main project features: To determine the current status of the catchments and to discuss the temporal and spatial trends of the monitoring reaches.

Project Name: Ecological baseline assessment of local river systems for the Ntem Iron Ore Mine: Specialist Consultants to Undertake Baseline Studies (Fish, Macroinvertebrate, Water Quality and Habitat).

Client: IMIC.

Personal position / role on project: Senior Ichthyologist.

Location: Cameroon (2013).

Main project features: Establishment of the ecological baseline status and functioning assessment of the local river systems.

Project Name: Instream Flow Requirement determination study for the Kibali River hydropower project: Specialist Consultants to Undertake Baseline Studies (Flow, Water Quality and Geomorphology) and Instream Flow Requirement (IFR) Assessment.

Client: Randgold Resources.

Personal position / role on project: Ichthyologist and IFR.

Location: DRC (2012).

Main project features: Establishment of the ecological flow requirements of fishes within the Kibali River.

Project Name: Cost analysis, including the current and potential earning potential of an aquaculture facility: Specialist Consultants to determine the Cost (Current & Potential Earnings) and the Construction of an identical facility (Physical Costs).

Client: Goldstone Resources.

Personal position / role on project: Ichthyologist.

Location: Ghana (2012).

Main project features: Conduct a detailed costs analysis of an aquaculture facility for the compensation for the removal of the operation.

Project Name: Instream Flow Requirement determination study for the Nzoro River hydropower project: Specialist Consultants to Undertake Baseline Studies (Flow, Water Quality and Geomorphology) and Instream Flow Requirement (IFR) Assessment.

Client: Randgold Resources.

Personal position / role on project: Ichthyologist and IFR.

Location: DRC (2011).

Main project features: Establishment of the ecological flow requirements of fishes within the Nzoro River.

Project Name: Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam.

Client: European Union

Personal position / role on project: Ichthyologist.

Location: Selebi-Phikwe, Botswana (2007 - 2009).

Main project features: Evaluation of the existing fish communities within the Letsibogo Man-made lake with specific consideration of the threats of alien invasive fishes in the lake. The study resulted in the publication of two peer-reviewed papers titled: Comparative behavioural assessment of an established and a new Tigerfish *Hydrocynus vittatus* population in two man-made lakes in the Limpopo (O'Brien et al., 2013) and First observation of Africa Tigerfish (*Hydrocynus vittatus*) predating on Barn Swallows (*Hirundo rustica*) in flight (O'Brien et al., in press).

Project Name: Environmental and Social Impact Assessment of the Kazungula Bridge on the Zambezi River.

Client: Loci on behalf of the Government of Botswana.

Personal position / role on project: Ichthyologist.

Location: Botswana, Zambia, Namibia and Zimbabwe (2009-2010).

Main project features: Evaluation of the current ecological integrity status of various living and non-living components of the Zambezi River ecosystem and the potential ecological and social consequences of the construction and use of the Kazungula Bridge. The study showed that although water quality and habitat modification impacts will occur as a result of the construction and use of the bridge the long term impacts associated with the operation of the bridge should not result in any major impacts to the local aquatic ecosystem.

ACHIEVEMENTS

- Co-founded The Biodiversity Company in 2015 to provide scientific technical services and policy advice to various sectors.
- Successfully tasked by Digby Wells Environmental to establish and develop a company presence in the United Kingdom. This included the staffing and development of offices in London and Jersey.
- Designed and implemented numerous "specific" turnkey items for clients, these have included the design of plant nurseries, aquaculture projects, search and rescue of select flora, re-introduction of fish species into systems and tree marking and counting.
- Managed and developed the Biophysical Department at Digby Wells Environmental to consist of four specialist units, namely: Fauna & Flora, Pedology, Wetlands & Aquatics as well as Rehabilitation.
- The establishment and growth of the Rehabilitation Unit at Digby Wells Environmental which now offers specialist services for all levels of rehabilitation, from management plans, off-set strategies to implementation.

OVERVIEW

An overview of the specialist technical expertise include the following:

- Aquatic ecological state and functional assessments of rivers and dams.
 - Instream Flow Requirement or Ecological Water Requirement studies for river systems.
 - Ecological wetland assessment studies, including the integrity (health) and functioning of the wetland systems.
 - Wetland offset strategy designs.
 - Wetland rehabilitation plans.
 - Monitoring plans for rivers and other wetland systems.
 - Toxicity and metal analysis of water, sediment and biota.
 - Bioaccumulation assessment of fish communities.
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- Fish telemetry assessment that included the translocation of fish as well as the monitoring of fish in order to determine the suitability of the hosting system.
 - Faunal surveys which includes mammals, birds, amphibians and reptiles.
 - The design, compilation and implementation of Biodiversity and Land Management Plans and strategies.

TRAINING

Some of the more pertinent training undergone include the following:

- Wetland and Riparian Delineation Course for Consultants (Certificate of Competence) – DWAF 2008
- The threats and impacts posed on wetlands by infrastructure and development: Mitigation and rehabilitation thereof – Gauteng Wetland Forum 2010
- Ecological State Assessment of Lentic Systems using Fish Population Dynamics – University of Johannesburg/Rivers of Life 2010
- Soil Classification and Wetland Delineation – Terra Soil Science 2010
- Wetland Rehabilitation Methods and Techniques - Gauteng Wetland Forum 2011
- Application of the Fish Response Assessment Index (FRAI) and Macroinvertebrate Response Assessment Index (MIRAI) for the River Health Programme 2011
- Tools for a Wetland Assessment (Certificate of Competence) – Rhodes University 2011

EMPLOYMENT EXPERIENCE

- - - -

I co-founded The Biodiversity Company in 2015, consisting of experienced ecologists who provide technical expertise and policy advice to numerous sectors, such as mining, agriculture, construction and natural resources. The team at The Biodiversity Company have conducted stand-alone specialist studies, and provided overall guidance of studies with a pragmatic approach for the management of biodiversity that takes into account all the relevant stakeholders, most importantly the environment that is potentially affected. We manage risks to the environment to reduce impacts with practical, relevant and measurable methods.

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Digby Wells assigned me to the role of Country Manager for the United Kingdom. This was a new endeavour for the company as the company's global footprint continues to increase. The primary responsibilities for the role included the following:

- **Clint liaison** to be able to interact more efficiently and personally with current mining clients, mining industry service providers, legal firms and banking institutions in order to introduce Digby Wells as a services provider with the aim of securing work.
- **Project management** for international projects which may require a presence in the United Kingdom, this was dependent on the location and needs of the client. These projects would mostly be based on the Equator Principles (EP) and International Finance Corporation (IFC) Performance Standards.
- **Technical input** to provide specialist technical expertise for projects, this included fauna, aquatic ecology, wetlands and rehabilitation. Continued with the design and implementation of Biodiversity and Land Management Plans to assist clients with managing the natural resources. Responsibilities also included the mentorship and management (including reviewing and guiding) other expertise such as flora, fauna and pedology.

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Manager of a multi-disciplinary department of scientists providing specialist services in support of national and international requirements as well as best practice guidelines, primarily focussing on the mining sector. In addition to managing the department, I was also expected to contribute specialist services, most notably focusing on water resources. Further responsibilities also included the management of numerous projects on a national or international scale. A general overview of the required responsibilities are as follows:

- – – for single as well as multi-disciplinary studies on a national and international scale. This included legislation and commitments for the respective country being operated in, as well as included the World Bank (WB), EP and IFC requirements.
- – – – – in order to provide mentoring and supportive structures for development and growth in support of the company's strategic objectives.
- – – – to ensure that the relevant standards and requirements have been attained, namely local country legislation, as well as WB, EP and IFC requirements.
- – – – in order to ensure compliance and consideration of relevant legislation and guidelines and also quality control.
- – – – to facilitate the collaboration and integration of specialist skills for the respective projects. This also included the development of Biodiversity and Land Management Plan for clients.
- - – – – for numerous clients in order to establish as well as maintain working relationships.

An overview of the tenure working with the company is provided below

- – – – – – Deployed to establish a presence for the company (remote office) in the United Kingdom by means of generating project work to support the employment of staff and operation of a business structure.
 - – – – – – Responsible for the development and growth of the department to consist of four specialist units. This included the development of a new specialist unit, namely Rehabilitation.
 - – – – – – In addition to implementing aquatic and wetland specialist services, the role required the overall management of additional specialist services which included fauna & flora.
 - – – – – – This required the marketing and implementation of specialist programmes for the client base such as biomonitoring and wetland off-set strategies. In addition to this, this also included expanding on the existing skill set to include services such as toxicity, bioaccumulation and ecological flow assessments.
 - – – – – – Employed as a specialist to establish the aquatic services within the company. In addition to this, wetland specialist services were added to the existing portfolio.
- – – – –
- June 2007 – July 2008: Junior aquatic ecologist
 - Researcher
 - Technical assistant for fieldwork
 - Reporting writing
 - Project management

Literacy Read, write and speak English fluently. Read, write and speak Afrikaans. Basic German.

Generic Advanced user of Microsoft Office applications.

Mapping Introductory skill level for ArcGIS and Quantum GIS.

Compliance audits Conducting site investigations in order to determine the level of compliance attained, ensuring that the client maintains an appropriate measure of compliance with environmental regulations by means of a

	legislative approach
Control officer	Acting as an independent Environmental Control Officer (ECO), acting as a quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts
Screening studies	Project investigations in order to determine the level of complexity for the environmental and social studies required for a project. This is a form of risk assessment to guide the advancement of the project.
Public consultation	The provision of specialist input in order to communicate project findings as well as assist with providing feedback if and when required.
Water use licenses	Consultation with the relevant authorities in order to establish the project requirements, as well as provide specialist (aquatics/wetland) input for the application in order to achieve authorisation.
Closure	Primarily the review of closure projects, with emphasis on the closure cost calculations. Support was also provided by assisting with the measurements of structures during fieldwork.
Visual	The review of visual studies as well as the collation of field data to be considered for the visual interpretation for the project.

University of Johannesburg, Johannesburg, South Africa (2009): MAGISTER SCIENTIAE (MSc) - Aquatic Health:

Title: *Aspects of the biology of the Bushveld Smallscale Yellowfish (Labeobarbus polylepis): Feeding biology and metal bioaccumulation in five populations.*

Rand Afrikaans University (RAU), Johannesburg, South Africa (2004): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Zoology

Rand Afrikaans University (RAU), Johannesburg, South Africa (2001 - 2004): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Botany.

Tate RB and Husted, A. 2015. Aquatic Biomonitoring in the upper reaches of the Boesmanspruit, Carolina, Mpumalanga, South Africa. African Journal of Aquatic Science.

Tate RB and Husted A. 2013. Bioaccumulation of metals in *Tilapia zillii* (Gervai, 1848) from an impoundment on the Badeni River, Cote D'Ivoire. African Journal of Aquatic Science.

O'Brien GC, Bulfin JB, Husted A. and Smit NJ. 2012. Comparative behavioural assessment of an established and new Tigerfish (*Hydrocynus vittatus*) population in two manmade lakes in the Limpopo catchment, Southern Africa. African Journal of Aquatic Science.

Tomschi, H, Husted, A, O'Brien, GC, Cloete, Y, Van Dyk C, Pieterse GM, Wepener V, Nel A and Reisinger U. 2009. Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam near Selebi Phikwe, Botswana. EC Multiple Framework Contract Beneficiaries.8 ACP BT 13 – Mining Sector (EDMS). Specific Contract N° 2008/166788. Beneficiary Country: Botswana. By: HPC HARRESS PICKEL CONSULT AG

Husted A. 2009. Aspects of the biology of the Bushveld Smallscale Yellowfish (*Labeobarbus polylepis*): Feeding biology and metal bioaccumulation in five populations. The University of Johannesburg (Thesis).

Ivan Baker

M.Sc Environmental Science and Hydropedology (*Pr Sci Nat pending*)

Cell: +27 79 898 4056

Email: ivan@thebiodiversitycompany.com

Identity Number: 9401105251087

Date of birth: 10 January 1994

Profile Summary

Working experience throughout Southern Africa

Working experience in West-Africa

Specialist experience with mining, construction and agriculture.

Specialist expertise include hydropedology, pedology, land contamination, agricultural potential, land rehabilitation, rehabilitation management and wetlands resources.

Experience hydropedological modelling (HYDRUS model)

Areas of Interest

Mining, Oil & Gas, Renewable Energy & Bulk Services Infrastructure Development, Farming, Land contamination, Sustainability and Conservation.

Key Experience

- Environmental Impact Assessments (EIA)
- Environmental Management Programmes (EMP)
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Soil-and rock classification
- Level 1, 2 and 3 hydropedology assessments
- Agriculture potential assessments
- Land contamination assessments
- Modulation of surface- and subsurface flows (HYDRUS model)

Country Experience

South Africa	Mozambique
Swaziland	Zimbabwe
Guinea	Zambia

Nationality

South African

Languages

English – Proficient

Afrikaans – Proficient

Qualifications

- MSc (North-West University of Potchefstroom) – Hydropedology
- BSc Honours (North-West University of Potchefstroom) – Environmental geology- Pedology and rehabilitation
- BSc Environmental sciences
- Cand Sci Nat (Pr Sci Nat Pending)
- Certificate of Competence: Fertiliser Society of South Africa
- Certificate of Competence: Tools for Wetland Assessments

Location: Cuamba, Mozambique, Southern-Africa

Main project features: To conduct various assessments according to IUCN standards in regard to ecosystem services

Project Name: Land contamination assessment for the proposed Fleurhof Development

Personal position / role on project: Soil Specialist

Location: Fleurhof, South Africa

Main project features: To conduct assessments relevant to the determination of land contamination, including recommendations, mitigations and risk assessments.

OVERVIEW

An overview of the specialist technical expertise include the following:

- Ecological wetland assessment studies, including the integrity (health) and functioning of the wetland systems.
- Wetland offset strategy designs.
- Wetland rehabilitation plans.
- Monitoring plans for wetland systems.
- Soil classification and agricultural assessments.
- Stripping and stockpiling guidelines.
- Soil rehabilitation plans.
- Soil and stockpile monitoring plans.
- Hydropedological assessments.

TRAINING

Some of the more pertinent training undergone includes the following:

- Tools for a Wetland Assessment (Certificate of Competence) – Rhodes University 2018; and
- Workshop on digital soil mapping.

EMPLOYMENT EXPERIENCE

Internship at SRK consulting (January 2017-August 2017)

- **Field assistant** for SRK consulting during 2017 included the sampling of surface and groundwater as well as on site tests, the accumulation of various different data sets from field loggers, presenting and arranging the relevant data and ultimately using it for my own personal post-graduate studies.

Internship at The Biodiversity Company (August 2017-December 2017)

Employed as an intern (wetland and soil scientist) during the last few months of 2017. During this period, I was part of a variety of soil- and wetland projects, both as report writer and/or field assistant.

CURRENT EMPLOYMENT: The Biodiversity Company (January 2018 – Present)

- **Scientific report writing** to ensure that the relevant standards and requirements have been attained, namely local country legislation, as well as WB, EP and IFC requirements.

ACADEMIC QUALIFICATIONS

North-West University of Potchefstroom: MAGISTER SCIENTIAE (MSc) - Hydropedology:

Title: *Characterisation of vadose zone processes in a tailings facility*

North-West University of Potchefstroom (2016): BACCALAUREUS SCIENTIAE HONORIBUS (Hons) – Environmental Geology- Pedology and rehabilitation

North-West University of Potchefstroom (2015): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Geology and Geography



CEDAR TOWER
SERVICES

CURRICULUM VITAE



Jenna Lavin

Tel: 083 619 0854 (c); 013 0131 (w)
E-mail address: jenna.lavin@cedartower.co.za
ID number: 8512050014089

EDUCATION:

Tertiary

- 2014 - M.Phil in Conservation of the Built Environment (University of Cape Town)
Ongoing - expected to graduate in 2015
- 2011 Continued Professional Development Course in Urban Conservation Management (University of Cape Town) Part I and Part II
- 2010 M.Sc. with Distinction in Archaeology (University of Cape Town)
Title: *Palaeoecology of the KBS member of the Koobi Fora Formation: Implications for Pleistocene Hominin Behaviour.*
- 2007 B.Sc. Honours in Archaeology (University of Cape Town)
Title: *The Lost Tribes of the Peninsula: An Investigation into the historical distribution of Chacma baboons (*Papio ursinus*) at the Cape Peninsula, South Africa.*
Koobi Fora Field School, Rutgers University (U.S.A.)/ National Museums of Kenya
- 2006 B.Sc. Archaeology (University of Cape Town)
B.Sc. Environmental and Geographic Science (University of Cape Town)

Secondary

- 1999-2003 Rustenburg High School for Girls
Firsts in English, Afrikaans, Mathematics HG, Biology HG, History HG, Entrepreneurship.



CEDAR TOWER
SERVICES

EMPLOYMENT HISTORY:

PROFESSIONAL DEVELOPMENT

Environmental and Heritage Management:

- Head of Heritage Operations for Heritage CTS Consultants and member of OpenHeritage NPC.
July 2016 to present
- Assistant Director for Policy, Research and Planning at Heritage Western Cape.
August 2014 to June 2016

Responsibilities include drafting of new heritage related policy, the grading and declaration of Provincial Heritage Sites, the development of Conservation Management Plans, facilitating the development of inventories of heritage resources through local authorities as well as managing the development of the Western Cape's Heritage Information Management System (HIMS).

Acting Deputy Director from April to December 2015.

- Heritage Officer for Palaeontology and for the Mpumalanga Province at the South African Heritage Resources Agency (SAHRA).
January 2013 to June 2014

Responsibilities include dealing with palaeontological permit applications in terms of Section 35 of the NHRA and development applications in terms of Section 38 of the NHRA. Projects included the development of a National Palaeotechnic Report identifying significant palaeontological deposits throughout SA, as well as developing professional relationships between SAHRA and the Palaeontological Society of South Africa (PSSA) and the Geological Society of South Africa (GSSA). During this time, I was part of the team that developed the digitised National Palaeontological Sensitivity Map (<http://www.sahra.org.za/about/news/nov2013/palaeosensitivitymap>), the first of its kind in the world.

- Heritage Officer for Archaeology, Palaeontology and Meteorites at Heritage Western Cape (HWC).
September 2010 to December 2012

HWC is a Public Entity that forms part of the Heritage Resource Management Component of the Provincial Governments' Department of Cultural Affairs and Sport (DCAS). Projects included the declaration of Pinnacle Point and the West Coast Fossil Park as Provincial Heritage Sites (PHS), the management of the development of the Baboon Point PHS Conservation Management Plan as well as an educational outreach program as part of the DCAS MOD Centre Project.



CEDAR TOWER
SERVICES

- Heritage Officer for the Archaeology, Palaeontology and Meteorites Unit of the South African Heritage Resources Agency (SAHRA) as part of a three month contract.
January 2010 to March 2010
- Environmental Control Officer, Amathemba Environmental Management Consulting
Part time: 2007 to 2009

Other

My private experience as a traveler in South Africa, Tanzania, Kenya, Namibia, Zambia, Malawi and Mozambique has inspired a passion for the conservation of environmental and heritage resources. I am passionate about sustainable living, with my Bachelor of Science in Environmental and Geographical Science providing a framework on which to base my values.

With a friend, I established the fundraising initiative, Chicks4Change, through which we managed to organize a number of successful events and raise R40 000 for Project Rhino to assist with anti-poaching initiatives.

In 2013 I was asked to join the panel of judges for the Ministerial awards for Heritage in the Western Cape. From 2013 to July 2014, I was a member of the Heritage Western Cape Archaeology, Palaeontology and Meteorites Committee. In July 2014, I presented at the Conference for the Palaeontological Society of South Africa on the use of GIS in the management of palaeontological resources in the face of increased development pressures. In April 2015 I participated in a conference on Landscape Archaeology hosted by the Leakey Foundation in San Fransisco, presenting on the management of archaeological landscapes in South Africa. In April 2016, I presented at the ICAHM Conference in Salalah, Oman on the management of archaeological heritage in South Africa.

In November 2013, I was awarded a bursary from the Department of Arts and Culture to complete the Masters in Philosophy in Conservation of the Built Environment through the UCT Faculty of Engineering and the Built Environment in 2014 and 2015.

I am a paid up member of the Association for Southern African Professional Archaeologists (ASAPA), the Association of Professional Heritage Practitioners (APHP), the Palaeontological Society of South Africa (PSSA) and ICOMOS South Africa, for which I am Vice-President of the Board. I am also a member of the International Committee for Archaeological Heritage Management (ICAHM).

CURRICULUM VITAE LOURENS DU PLESSIS

PERSONAL INFORMATION AND CONTACT DETAILS

Name: Lourens Martinus du Plessis
Date of birth: 1969-11-13
Marital status: Married
Nationality: South African
Profession/specialisation: Geographer/environmental GIS specialist
Company: MetroGIS (Pty) Ltd
Years with firm: 11 years
Position: Director
Experience: 20 years
Postal address: PO Box 384, La Montagne, 0184
Telephone/fax: 012 349 2884/5 (w) 082 922 9019 (cell) 012 349 2880 (fax)
E-mail: lourens@metrogis.co.za

KEY QUALIFICATIONS AND EXPERIENCE

Primary function

The application of Geographic Information Systems (GIS) in environmental planning and management, impact assessments and spatial modeling.

Experience and expertise

- Data sourcing and acquisition
- Data capture
- Data evaluation
- Data conversion and transfer
- GIS database development, implementation and maintenance
- Spatial analysis/modelling (visibility, slope, aspect, shadow, surface, raster, proximity, etc.)
- Digital terrain/elevation modeling
- Terrain evaluation
- Image processing
- Impact assessment and impact management
- Environmental management
- Decision support systems interface development
- Project management
- Map production, display, queries and reporting
- Environmental sciences expertise
- Process development
- Visual impact assessment

Technological (software) expertise

- Arc/Info and ArcGIS
- ArcView
- PlanetGIS
- Vistapro (virtual landscape rendering software)
- Various GIS support software packages and applications
- Range of Microsoft standard applications (including Microsoft Word/Excel/Access, etc.)

Awards

Award: Best South African Environmental Technical Paper
Awarded for: National Environmental Potential Atlas (ENPAT National)
Awarded by: Environmental Planning Professions Interdisciplinary Committee (EPPIC)
Date: 1995

Award: Map Gallery Most Analytical Competition - 3rd Place
Awarded for: Environmental Potential Atlas for South Africa
Awarded by: Environmental Systems Research Institute (ESRI)
Date: 1997 International ESRI User Conference

Award: Best Cartographic Map Gallery Competition - 3rd Place
Awarded for: Environmental Potential Atlas for South Africa (Publication)
Awarded by: Environmental Systems Research Institute (ESRI)
Date: 1998 International ESRI User Conference

Award: QDC Performance Award
Awarded for: ENPAT Development
Awarded by: Q Data Consulting
Date: 1998

Award: Best South African Environmental Technical Paper
Awarded for: Environmental Potential Atlas for South Africa (Publication)
Awarded by: Environmental Planning Professions Interdisciplinary Committee (EPPIC)
Date: 1998

Publications/maps featured in publications

Name: Environmental Potential Atlas for South Africa
Authors: W. van Riet, J. van Rensburg, P. Claassen, L. du Plessis and T. van Viegen
Publisher: J.L. van Schaik
Date: 1997

Name: ESRI Map Book (Volume 13)
Authors: Various
Publisher: Environmental Systems Research Institute (ESRI)
Date: 1998

Name: Pilanesberg Official Map and Park Guide
Authors: North-West Parks & Tourism Board and Jacana
Publisher: Jacana Media (Pty) Ltd
Date: 2001

Name: KwaZulu-Natal - A celebration of biodiversity
Authors: Jacana
Publisher: Jacana Media (Pty) Ltd
Date: 2001

Name: Garden Route - Still Bay to Storms River (Discover the Magic)
Authors: Jacana
Publisher: Jacana Media (Pty) Ltd
Date: 2003

Name: Lowveld and Kruger Guide

Authors: High Branching Team
Publisher: Jacana Media (Pty) Ltd
Date: 2004

Name: Heights to Homes to Oceans (H₂O) Water Wise information poster
Authors: Rand Water
Publisher: Rand Water
Date: 2004

Name: Kruger National Park Map and Photographic Guide
Authors: Andy Tinker Photography
Publisher: Andy Tinker Photography
Date: 2007

WORK EXPERIENCE/EMPLOYMENT DETAILS

GisLAB CC (Geographic Information Systems Laboratory - University of Pretoria)
Period: 4/1990 - 9/1997
Position: Member / Project Manager

GISBS (Geographic Information Systems Business Solutions - Q Data Consulting)
Period: 10/1997 - 10/1999
Position: Project Manager

MetroGIS (Pty) Ltd
Period: 11/1999 - to date
Position: Director / Project Manager

EDUCATION/QUALIFICATIONS

Degree: BA (University of Pretoria) Geography and Anthropology (Majors)
Other Subjects: Archaeology, Philosophy and Political Science
Date Received: 1993

PROJECTS SUMMARY

*(A brief description of **some** prominent and relevant projects)*

General projects

GIS mapping and database for Black Eagle habitats and flight patterns in the Karoo National Park

Environmental planning and development control schemes for the Drakensberg *Babangibone, Cathkin Peak and Garden Castle* development nodes

Goukou River (Stilbaai) Environmental Structure Plan

Conservation and open space proposals for the Umhlanga Forest

Grootvlei mine water pumping operation (Blesbokspruit sub-catchment)

GIS services for the Saldannah steel plant

ENPAT Provincial (1:250,000 scale GIS decision support systems) based on an inventory of environmental and socio-economic geographic data

- ENPAT Northern Province (Limpopo Province)
- ENPAT Mpumalanga
- ENPAT North-West

ENPAT Metropolitan (1:50,000 scale GIS decision support systems) containing environmental and socio-economic geographic data that were evaluated for conservation opportunities, development constraints and agricultural constraints

- ENPAT Gauteng
- ENPAT Cape Town
- ENPAT Durban Functional Region (DFR)
- ENPAT Bloemfontein/Botshabello
- ENPAT Port Elizabeth

ENPAT National (1:1,000,000 scale GIS decision support system) and ENPAT publication

Environmental Management Frameworks (EMF). Frameworks of spatially represented information connected to environmental management parameters designed to aid in the pro-active identification of potential conflict between development proposals and critical and/or sensitive environments

- EMF Northern Province (Limpopo Province)
- EMF Mpumalanga
- EMF North-West

Spatial Development Initiatives (SDI). The fast tracking of the EMF concept for priority SDI's

- Lubombo Corridor SDI
- Coega Industrial Development Zone (IDZ)
- Wild Coast SDI
- West Coast Investment Initiative

Sigma colliery: North-West strip operation

Development masterplan for the Tswaing Crater Museum

Conservation plan for the Rietvlei Nature Reserve

GIS services for the planning and management of the Chobe National Park (Botswana)

GIS services for an environmental overview of South Africa

Demarcation/delineation of regions in South Africa

Orange-Vaal (ORVAAL) transfer scheme - Caledon cascades scheme

ENPAT Provincial (1:250,000 scale GIS decision support systems) based on an inventory of environmental and socio-economic geographic data

- ENPAT Eastern Cape
- ENPAT Free State
- ENPAT Kwa-Zulu Natal

Environmental Management Frameworks (EMF). Frameworks of spatially represented information connected to environmental management parameters designed to aid in the pro-active

identification of potential conflict between development proposals and critical and/or sensitive environments

- EMF Eastern Cape
- EMF Free State
- EMF Kwa-Zulu Natal

Hennops River EMF (environmental inventory and management proposals in Centurion)

The Important Bird Areas (IBA) of South Africa map and database

Centurion Metropolitan Substructure Environmental Management Framework (EMF)

Alexandra renewal project EMF

Carbon Sinks and Sequestration - Eastern Cape Wild Coast. Information maps for the "*Carbon Sinks - A Rehabilitation Option for South Africa's Natural Environment*" report

Prince Edward and Marion Islands. Maps for the World Heritage Site (WHS) bid document

Theewaterskloof and Genadendal - Integrated spatial data management system

Gauteng Communication Network Strategy (GAUCONS). Environmental zones for the control of the construction of telecommunication structures

Gauteng Industries Buffer Zones. The mapping of industrial and mining activities, the creation of buffer control zones and the development of a GIS-based decision support system for the Gauteng Province

Limpopo National Park (LNP) Mozambique. Base maps for fieldwork and planning

Schmidtsdrift Environmental Management Program Report (EMPR)

Loch Vaal Environmental Management Framework (EMF)

Rustenburg - Strategic Environmental Assessment (SEA). The creation of environmental control zones, a GIS-based decision support system and information poster

Faerie Glen Nature Reserve Strategic Environmental Assessment (SEA)

Willow Quarries - Environmental Impact Assessment (EIA). Modeling of mining expansion plan and the potential impact on Golden Mole habitats

Ekurhuleni Metropolitan Municipality (EMM) Environmental Management Framework (EMF)

Limpopo - State of the Environment Report (SoER)

Windhoek (Namibia) - Environmental Structure Plan (ESP)

Gauteng Supplementation and Implementation of EIA Regulations Project (EIA SIP)

Siyanda District Municipality Environmental Management Framework (EMF)

Olifants and Letaba River Catchments Environmental Management Framework (EMF)

Regional Strategic Environmental Assessments (Regional Assessments)

Regional assessment for the Eskom Wind Energy Facility (Sere) in the Western Cape

Regional assessments for the Eskom Wind Integration Project (WIP)

- Area 1: West Coast (Saldanha to Garies)
- Area 2: Overberg Region
- Area 3: Beaufort West region
- Area 4: Eastern Cape (Tsitsikamma to Port Elizabeth)
- Area 5: Northern Cape (Hondeklipbaai to Port Nolloth)

Sandveld wind energy Regional Assessment

West Coast National Park (Saldanha area) Regional Assessment

Regional Assessment for the Theewaterskloof Municipal area

Brand-se-Baai (Exxaro) wind energy regional assessment

Overberg (BioTherm) wind energy regional assessments

- Area 1: Gordons Bay to Pearly Beach)
- Area 2: Napier RA (Agulhas NP/Swellendal region)

Suurplaat/Sutherland (Investec Wind Energy Development) Regional Assessment

Waterberg (Limpopo) Concentrating Solar Power (CSP) Regional Assessment (Exxaro)

Visual Impact Assessments (VIA), viewshed analyses and visual assessments

Some recent or current projects include:

- Coal strip mining in Zimbabwe viewshed analyses
- Viewshed analyses and sensitivity mapping for telecommunication masts in the northern provinces (Limpopo, Mpumalanga and North-West)
- Siemens 3rd license cellular communications infrastructure EIAs. Viewshed analyses and sensitivity mapping for over 4,000 telecommunication mast sites in all major metropolitan areas of South Africa.
- CSIR high mast viewshed analysis and sensitivity mapping
- Atlantis Open Cycle Gas Turbine power station VIA
- Kynoch Gypsum Tailings dam extension VIA
- N1 Western Bypass Shell service station VIA
- Coega regional hazardous waste processing facility VIA
- Robinson Deep landfill extension VIA
- Hazardous waste blending platform VIA
- Mercury-Ferrum-Garona transmission line integration VIA
- Matimba B (Medupi) coal-fired power station VIA
- Concentrating Solar Power (CSP) plant in Upington VIA
- Zeus to Mercury transmission line (comparative viewshed analyses)
- Mmamabula (Botswana) transmission line and power station viewshed analyses
- Petronet new multi-products pipeline VIA
- Wind energy facility (Sere) in the Western Cape province VIA
- Ankerlig power station conversion and transmission line VIA
- Gourikwa power station conversion and transmission line VIA
- Kyalami strengthening project VIA
- Steelpoort integration project VIA
- Medupi reservoir and telecommunication mast VIA
- Cookhouse wind monitoring masts VIA for a Basic Assessment Report
- Hopefield wind monitoring masts VIA for a Basic Assessment Report
- Amakhala wind monitoring masts VIA for a Basic Assessment Report
- Caledon, Worcester and Tulbach wind monitoring masts VIAs for Basic Assessment

Reports

- Overberg masts VIA for a Basic Assessment Report
- Britannia Bay wind monitoring mast VIA for a Basic Assessment Report
- Brand-se-Baai wind monitoring masts VIA for a Basic Assessment Report
- Deep River wind monitoring masts VIA for a Basic Assessment Report
- Happy Valley wind monitoring masts VIA for a Basic Assessment Report
- River Bank wind monitoring mast VIA for a Basic Assessment Report
- Uiekraal wind monitoring masts VIA for a Basic Assessment Report
- Beaufort West wind monitoring masts VIA for a Basic Assessment Report
- Laingsburg Wind monitoring masts VIA for a Basic Assessment Report
- Rheboksfontein, Suurplaat and West Coast wind monitoring masts VIAs for Basic Assessment Reports
- Cookhouse wind energy facility VIA
- Hopefield wind energy facility VIA
- Mokopane Integration Project VIA
- Cradle of Humankind World Heritage Site (WHS) viewshed protection zone, visual character assessment and visual zonation plan
- Proposed Indwe wind energy facility VIA
- Proposed Amakhala wind energy facility VIA
- Proposed Boontjieskraal wind energy facility VIA
- Proposed Britannia Bay wind energy facility VIA
- Proposed Brand-se-Baai wind energy facility VIA
- Proposed Upington and Pofadder solar thermal facilities VIAs
- Proposed Dorper wind energy facility VIA
- Proposed Flagging Trees wind energy facility VIA
- Proposed Rheboksfontein, Suurplaat and West Coast wind energy facilities VIAs
- Proposed Riverbank wind energy facility VIA
- Proposed Waterberg photovoltaic plant VIA
- Eskom wind intergration projects VIAs (current)
- Welgedacht water care works VIA

PROFESSIONAL AFFILIATIONS

Application for *Geographical Information Sciences (GISc) Professional Practitioner* submitted to (and currently under review by) The South African Council for Professional and Technical Surveyors (PLATO).

LANGUAGES

	Reading	Writing	Speaking
Afrikaans	Excellent	Excellent	Excellent
English	Excellent	Excellent	Excellent

CURRICULUM VITAE OF NONDUMISO BULUNGA

Comprehensive CV

Profession :	Lead - Social, GIS and Stakeholder Engagement
Specialisation:	Social, GIS and Stakeholder Engagement in the environmental field.
Work Experience:	8 years in the Environmental field.

VOCATIONAL EXPERIENCE

Nondumiso Bulunga is a Social, GIS and Stakeholder Engagement Specialist at Savannah Environmental. Nondumiso has eight (8) years working experience in project management and facilitation in various industries such as environmental services field including but not limited to recycling, industrial, energy, mining and agriculture.

Working for small and large organisations, Nondumiso has gained exposure in research, collection of data, critical analysis, GIS, and environmental solutions. Nondumiso has worked on projects in South Africa and Malawi.

Nondumiso is very well versed in the IFC Environmental and Social Performance Standards (including IFC PS 2012) and the associated Equator Principles, which have informed the approach and standard for projects regarding ESIA. Nondumiso is skilled at organising and driving effective project teams at a scale relevant to the project's requirements. She has technical experience and can quickly identify the most pertinent issues of a particular project whilst focussing on driving project success by rigorously implementing project management tools.

Nondumiso has experience ranging over several aspects of social research, including the planning and execution of social surveys, participatory rural appraisal, sustainable livelihoods assessments, data management and statistical analysis, capturing and management of spatial data, stakeholder identification and community facilitation. She has worked in local and regional projects taking part in socioeconomic impact assessment, livelihood restoration plans and resettlement plans.

SKILLS BASE AND CORE COMPETENCIES

- Consultation
- Stakeholder Engagement
- Facilitation
- Social Impact Assessments
- Communication
- Project Management
- Project Coordination
- Research
- Training and Development
- Geographical Information Systems, Remote Sensing
- Stakeholder Engagement Plans
- Stakeholder Analysis and Mapping
- IFC Performance Standards
- Comments and Response Reports
- Grievance Mechanism
- Awareness Campaign

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- 2018 : MSC GEOGRAPHICAL INFORMATION SYSTEM and REMOTE SENSING
- 2015 : BAHONS in GEOGRAPHY
- 2013 : BA in GEOGRAPHY AND SOCIOLOGY

Short Courses:

- 2015 One day information session on Modern Technologies and Pathways for the Energetic Use of Biomass
- 2015 One day Public lecture on Climate Change
- 2017 Accredited facilitation certification
- 2017 One day course on Office Management Training
- 2018 Resettlement as part of Impact Assessment

EMPLOYMENT

Duration	Position	Company	Roles and Responsibilities
May 2021 – current ●Permanent	Lead Consultant: Social, Stakeholder Engagement and GIS	Savannah Environmental (Pty) Ltd	Build, lead and manage a Stakeholder Consultation and Engagement team. Advance the Social Impact Assessment reporting service offering. Manage an in-house GIS team and upskill to improve and develop new deliverables for the EIA and Compliance teams. New business development, including development and driving the development of new products and/or services as part of the Savannah Environmental service offering. Manage and mentor staff and critically review and edit reporting/deliverables. Provide strategic input to business and project deliverables.

Duration	Position	Company	Roles and Responsibilities
October 2020 – February 2021 ●Contract	Data Analyst	Community Insights Groups (International)	<ul style="list-style-type: none"> Desk review of project documentation to inform data collection tools Contribute to the development of monitoring indicators Develop new databases of indicators and consolidate with existing databases from the client Develop household and focus group questionnaires Develop interview/ focus group guidelines Develop fieldwork plan Set up survey software Train local enumerators in the use of the survey software (over ZOOM) Provide remote support to the field team on the survey software Undertake phone KIs Develop information campaign materials and visual aids for focus groups, KIs Data organization and quality assurance during the field work (remote) Organize, clean and handover raw data to the client Desktop data analysis – qualitative and quantitative Produce and populate pivot and frequency distribution tables Produce narrative and graphic description of the data for the client report GIS Data Management and Handling Map creation and analysis
November 2019 – March 2021 ●Contract	Policy Coordinator Consultant	International Finance Corporation (International)	<ul style="list-style-type: none"> Support to the Agri-processing resource efficiency program Coordinate public and private stakeholders to propose specific policy Regulatory and procedural measures to promote improved water efficiency Convening a public-private dialogue process to reach consensus Manage partnerships with local authorities Due Diligence and risk assessment
April 2020 – October 2020 ●Contract	Project Manager	Pax Advisory (Pty) Ltd (South African)	<ul style="list-style-type: none"> Plan and implement projects Define project scope Help define goals Define deliverables Define tasks and required resources Create schedule Project timeline Manage budget Allocate project resources Track deliverables Support and direct team Lead quality assurance Monitor and report on project progress Present to stakeholders reports on progress as well as problems and solutions Implement and manage change Project data management

Duration	Position	Company	Roles and Responsibilities
March 2017- November 2019 ●Permanent	Environmental Stakeholder Consultant	Digby Wells Environmental (Pty) Ltd (South African)	Addressing issues and needs of communities' Public participation process and communicate Liaise with stakeholders Scientific report writing for social and stakeholder engagement inclusion Assistance is provided in maintaining and updating Interested and Affected database Print / photocopy and the deliver documents to various stakeholders Distribute information (placing posters, posting, mailing, emailing, sending SMS messages, etc.) Assist with the project administration on large and small projects Data collection and inclusion into scientific reports Assist with information material and report compilation material
February 2015 – February 2017 ●Permanent	Environmental Officer	EcoPartners (Pty) Ltd (South African)	Public participation for environmental legal authorisation applications Compiling legal registers and monthly legal update letter Supply all services required for I and APs Write and edit reports Research various environmental aspects. Environmental awareness training Creation of maps for all environmental applications Collection of spatial information Build and Maintain data and information libraries Data collection and analysis Environmental legal authorisation applications
February 2014- September 2014 ●Permanent	Graduate Researcher	Linkd Environmental Services (Pty) Ltd (South African)	Research for projects given as tenders Collecting data from the different forms of information Collecting data for the purpose of controlling it and reporting on it in order to formulate status quo Create reports based on the data, give recommendations for better quality data to be collected Participate in workshop strategy sessions. Help implement policies formulated in strategy sessions and approved by steerco.
October 2014 – December 2014 ●Contract	Researcher and Report Writer	South African Cities Network (Pty) Ltd (South African)	Research Project co-ordination and management Knowledge management Reporting and administrative support GIS support and map analysis Report writing and research gaps

PROJECT EXPERIENCE

Project Name & Location	Client Name	Role
Proposed Grid Connection Infrastructure for the Woodhouse 1 and Woodhouse 2 Solar Energy Facilities	Genesis Eco-Energy Developments (Pty) Ltd	Report Writer Reviewer, Quality Assurance & Project Support
Environmental Impact Assessment And Public Participation Process For The Proposed	Nama Solar East (Pty) Ltd and Nama Solar West (Pty)	Reviewer, Quality Assurance & Project Support

Project Name & Location	Client Name	Role
Development Of The Nama Solar East Facility And Nama Solar West Solar Facility With Associated Infrastructure, Northern Cape	Ltd.	
Proposed Development of a New Waste Disposal Site at the Eskom Majuba Power Station near Amersfoort, Dr Pixley Ka Seme Local Municipality, Mpumalanga Province	Eskom Holdings Ltd	Report Writer, Quality Assurance & GIS Support
The Construction of the 100MW Nku Solar Photovoltaic Facility (PV1), on portion 96 of the Farm Rondavel 85 and Farm Annex Rondavel, near Richmond, Northern Cape Province	Great Karoo Renewable Energy (Pty) Ltd	Reviewer, Quality Assurance & Project Support
Environment, Social & Governance (ESG) Assessment and Development of ESG Policy	Richards Bay Coal Terminal Proprietary Limited	Report Writer and Assessment Practitioner
Environmental Impact Assessment Process for 2X 100MW Solar PV Facilities	Atlantic Energy Partners (Pty) Ltd	Report Writer - Social Impact Assessment Quality Assurance/Reviewer
Moeding Solar PV Facility and Tiger Kloof Solar Facility with nearby settlements	Kabi (Pty) Ltd	Geographical Information Systems Specialist (GIS) & Reviewer/Quality Assurance
Solar PV Screening, Kathu Northern Cape Province	AGV Projects (Pty) Ltd	Report Writer, Researcher & Quality Assurance & GIS Support
Solar PV Screening/and or Wind Projects, Vredendal Western Cape Province	ABO Wind (Pty) Ltd	Report Writer, Researcher & Quality Assurance & GIS Support
Komsberg West Wind Energy Northern and Western Cape Provinces Revised Environmental Management Programme and Final Layout	Gunstfontein Wind Farm (Pty) Ltd,	Reviewer, Quality Assurance & Project Support
Grid Connection Infrastructure for the Namas Wind Farm	Genesis Namas Wind (Pty) Ltd	Reviewer, Quality Assurance & Project Support
Grid Connection Infrastructure for the Zonnequa Wind Farm	Gensis Zonnequa Wind (Pty) Ltd	Reviewer, Quality Assurance & Project Support
Proposed 10mw Northam Solar Pv Facility Near Thabazimbi, Limpopo Province	Northam Platinum Limited	Reviewer, Quality Assurance & Project Support
Amendment of the Environmental Authorisation for the Proposed Construction of The Gunstfontein Switching Station, 132kv Overhead Power Line And Ancillary Infrastructure For The Proposed Gunstfontein Wind Farm	Gunstfontein Wind Farm (Pty) Ltd	Geographical Information Systems Specialist (GIS) & Reviewer/Quality Assurance
Grid Connection Infrastructure, including 132kv Overhead Powerline, Switching Station And Ancillaries, For The Great Karoo Wind Farm, Northern Cape	Great Karoo Wind Farm (Pty) Ltd	Geographical Information Systems Specialist (GIS)
Perdekraal West Wind Energy Facility and Associated Infrastructure, Located in the Witzenburg Local Municipality Within The Western Cape Province	Perdekraal West Wind Farm (Pty) Ltd	Reviewer, Quality Assurance & Project Support
Pienaarspoort Wind Energy Facility 1, Western Cape Province	Pienaarspoort Wind Energy Facility 1 (Pty)	Reviewer, Quality Assurance & Project Support
Environmental Impact Assessment And Public Participation Process Bergriver Wind Farm, Western Cape Province	FE Berg River (Pty) Ltd	Stakeholder Engagement and Reviewer, Quality Assurance
Construction and operation of the 100MW Rondavel PV facility, BESS and associated infrastructure near Kroonstad, Free State Province	South Africa Mainstream Renewable Power Developments (Pty) Ltd	Reviewer, Quality Assurance & Project Support
Kolkies and Sadawa PV and EGI Suite of projects, Western Cape	South Africa Mainstream Renewable Power Developments (Pty) Ltd	Reviewer, Quality Assurance & Project Support
Cluster Of Renewable Energy Facilities And Redz 3 Power Corridor 400 Main Transmission Substation	Wind Relic (Pty) Ltd	Reviewer, Quality Assurance & Project Support

Project Name & Location	Client Name	Role
Between Somerset East And Makhanda, Eastern Cape Province		
Wind Garden Wind Farm And Fronteer Wind Farm Near Makhanda, Eastern Cape Province	Wind Garden (Pty) Ltd & Fronteer (Pty) Ltd	Reviewer, Quality Assurance & Project Support
Environmental Authorisation required for Prospecting Right Application on various Portions of the Farm Schaapkopje 194 HT, 5km North of Vryheid Town in the AbaQulusi Local Municipality, KwaZulu Natal	Tuutuuka Resources Proprietary Limited	Report Writer and Project Administrator, Stakeholder Engagement & GIS Support
Social Impact Assessment for the Proposed Infrastructure Amendments Environmental Authorisation and Water Use License	Seriti Power (Pty) Ltd	Report Writer- Stakeholder Engagement & GIS Support
Social Impact Assessment for the Proposed Middelburg Mining Services (MMS) Boschmanskrans Section Implementation of Wetland Mitigation and Offset Strategy	Seriti Power (Pty) Ltd	Report Writer- Stakeholder Engagement & GIS Support
Environmental Authorisation And Integrated Water Use Licence Application For The Proposed Liquid Mist Trading Beneficiation Plant Expansion Project	Liquid Mist (Pty) Ltd	Report Writer and GIS Support
Basic Assessment Process In Support Of The Proposed The Construction Of Doornpoort Pumping Main And Pumpstation, Emalahleni Local Municipality In The Mpumalanga Province	Lefatshe Infrastructure Services (Pty) Ltd	Report Writer and Project Administrator & GIS Support
Water Use Licence Renewal Application for the Inyanda Coal Wash Plant, on the Portions 2, 20 And 21 Of Farm Kalbasfontein 284 JS & Portion 4 of Farm Mooifontein 285 JS Near Witbank in the eMalahleni Local Municipality, Mpumalanga	Inyanda Mining Holdings	Report Writer and Project Administrator
Social Impact Assessment for the Proposed Ikwezi Vanadium Mining Project	Ikwezi Vanadium (Pty) Ltd	Report Writer – Social Impact & Project Administrator
Environmental Authorisation (EIA) for the proposed Giyani Renewable Energy Solar Photovoltaic Power	Giyani Renewable Energy	Report Writer- Stakeholder Engagement & GIS Support
Environmental Authorisation required for Prospecting Right Application on farm Mooihoek and various farm portions of farm Pivaanspoort	Pivaanspoort (Pty) Ltd	Report Writer
Draft Basic Assessment Report For The Proposed Upgrade Of Weltevreden Wetland Interventions	Seriti Power (Pty) Ltd	Report Writer
Social and Labour Plan for the Straffontein Colliery	Mnambithi Mining (Pty) Ltd	Report Writer – Social Impact and Social Labour Plans & GIS Support
Social and Labour Plan for the existing operational expansion Leeuwfontein Colliery Mining Right Amendment Applications	Zomhlaba Resources (Pty) Ltd	Report Writer – Social Impact and Social Labour Plans & GIS Support
Social and Labour Plan for the existing operational expansion Lakeside Colliery Mining Right Amendment Applications	Zomhlaba Resources (Pty) Ltd	Report Writer – Social Impact and Social Labour Plans & GIS Support
Social Impact Assessment for the Proposed Aangewys Coal Mine Mining Right Application	National Treasure Minerals (Pty) Ltd	Report Writer – Social Impact and Social Labour Plans & GIS Support
Environmental Impact Assessment And Water Use Licence Application In Support Of The Proposed Grootlaagte Open Cast Mining, Mpumalanga – Arnot OpCo (Pty) Ltd	Arnot OpCo	Report Writer- Stakeholder Engagement & GIS Support
Malawi Solar Projects, Livelihood restoration and social performance monitoring and planning	JCM Power	Data Analyst
750 AMPED Campaign	Health Wellness SETA	Project Manager
Integrity Due Diligence Reports	Various (South African Poultry Industry, Centre of Industrial Scientific Research; SA Milk Producers	Policy Coordinator/ Report Writer

Project Name & Location	Client Name	Role
Policy Component for agri-processing projects	eThekweni Municipality	Policy Coordinator/ Report Writer
Alignment of EIA's and WUL's	South 32	Social Specialist/Report Writer
Environmental Authorisation for Klipspruit Colliery	South 32	Social Specialist/Report Writer
Expansion and Development of Sun City Resorts	Sun International	Social Specialist/Report Writer
Environmental Authorisation for a Regulatory Environmental Process	Blyvoor Gold	Social Specialist/Report Writer
Mooikraal Road Diversion Project	Sasol (Pty) Ltd	Social Specialist/Report Writer
Pretorius Park Housing Development	Luengo Consulting	Social Specialist/Report Writer
Grave Relocation Project	Exxaro Resources	Social Specialist/Report Writer
Syferfontein Housing Development	LTE Consulting	Social Specialist/Report Writer
Leeuwpan Lifex Project	Exxaro Resources	Social Specialist/Report Writer
Environmental Authorisation required for Proposed Palmietkuilen Colliery near Springs	Canyon Resources (Pty) Ltd	Social Specialist/Report Writer
Environmental Authorisation required for the Agnes Gold Mine, Barberton	Galaxy Gold Reefs (Pty) Limited	Social Specialist/Report Writer
Environmental Authorisation for the Proposed Hendrina Underground Coal Mine, Mpumalanga	Glencore Operations South Africa (Pty) Ltd	Social Specialist/Report Writer
Environmental authorisation applications(Waste management, Water use license, EMP)	Various	Social Specialist/Report Writer
Environmental Authorisation Applications related to the Construction of Power Station, Associated Infrastructure, and Coal Mine near Colenso, KZN	Dunrose Investments 244 for Colenso Power (Pty) Ltd	Project Administrator/ Social Specialist
Environmental Awareness Training	Various	Facilitator
Legal register	Various	Report Compiler
Dynamics and Incidence of Child Abuse, Neglect and Exploitation(DICANE)	Department of Social Development	Facilitator
The Alexandra Environment Public Upgrade-management of the public participation process	Johannesburg Development Agency	Project Administrator
Cities Green Transport Programme	South African Cities Network	Project Researcher
Project Management of the EPWP Construction of the Mvoti Regional Landfill	Department of Environmental Affairs	Project Researcher
Development of climate change adaptation and mitigation programme	Department of Agriculture Forestry and Fisheries	Project Researcher
Capacity Building in spatial transformation	South African Cities Network	Project Researcher

**APPENDIX J:
APPLICABLE LEGISLATION**

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	<p>In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that:</p> <p><i>“Everyone has the right –</i></p> <ul style="list-style-type: none"> » <i>To an environment that is not harmful to their health or well-being, and</i> » <i>To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:</i> <ul style="list-style-type: none"> * <i>Prevent pollution and ecological degradation,</i> * <i>Promote conservation, and</i> * <i>Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”</i> 	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the “right to an environment clause” includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No. 107 of 1998) (NEMA)	<p>The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326).</p> <p>In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p> <p>Considering the capacity of the proposed solar PV facility (i.e., contracted capacity of 19MWac) and the triggering of Activity 1 of Listing Notice 1 (GN R.327), a Basic Assessment process is required in support of the application for EA.</p>	Mpumalanga DARDLEA – competent authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the BA process currently underway for the project. The BA process will culminate in the submission of a final BA Report to the competent authority in support of the application for EA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<p>National Environmental Management Act (No 107 of 1998) (NEMA)</p>	<p>In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA, every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.</p> <p>In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.</p>	<p>Mpumalanga DARDLEA</p>	<p>While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.</p>
<p>Environment Conservation Act (No. 73 of 1989) (ECA)</p>	<p>The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces.</p> <p>The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties.</p> <p>In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).</p> <p>Furthermore, the South African noise control regulations describe a disturbing noise as any noise</p>	<p>Mpumalanga DARDLEA</p> <p>Govan Mbeki Local Municipality By-Laws</p>	<p>Noise impacts are expected to be associated with the construction phase of the project. Minimal noise is expected during operation. As the site is located away from noise sensitive receptors and communities, construction noise is unlikely to present a significant intrusion to the local community. There is therefore no requirement for a noise permit in terms of the legislation.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>that exceeds the ambient noise by more than 7dB (ambient noise in rural areas being approximately 45dB). This difference is usually measured at the complainant's location should a noise complaint arise. Therefore, if a new noise source is introduced into the environment, irrespective of the current noise levels, and the new source is louder than the existing ambient environmental noise by more than 7dB, the complainant will have a legitimate complaint.</p>		
<p>National Water Act (No. 36 of 1998) (NWA)</p>	<p>A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible under a GA, or if a responsible authority waives the need for a licence.</p> <p>Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.</p> <p>Consumptive water uses may include taking water from a water resource (Section 21(a)) and storing water (Section 21(b)).</p> <p>Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).</p>	<p>Regional DWS</p>	<p>Wetlands and drainage lines are present within the development footprint for the Becrux Solar PV Facility as identified in the Wetland Impact Assessment (Appendix E of the BA Report).</p> <p>Where the development activities impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of a watercourse, Section 21(c) and 21(i) of the NWA (Act 36 of 1998) would be triggered and the project proponent would need to apply for a WUL or register a GA with the DWS.</p> <p>The sewage generated during the operation phase will be collected and treated as per normal standards using a septic or conservancy tank. Sewage may also be stored in a conservancy tank and collected either by a honey-sucker truck or a service provider (contractor) for treatment at a licensed facility. This activity requires a license (GA if volumes are below 10 000m³) in terms of the NWA.</p>
	<p>In accordance with the provisions of the MPRDA a mining right or permit is required in accordance with</p>		<p>Any person who wishes to apply for a mining permit in accordance with Section</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	<p>Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.</p> <p>Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.</p>	Department of Mineral Resources and Energy (DMRE)	<p>27(6) must simultaneously apply for an Environmental Authorisation in terms of the NEMA. No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA in this regard is not required to be obtained.</p> <p>In terms of Section 53 of the MPRDA, approval is required from the Minister of Mineral Resources and Energy to ensure that the proposed development does not sterilise a mineral resource that might occur on site.</p>
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	<p>The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas, and provide a standard for acceptable dustfall rates for residential and non-residential areas.</p> <p>In accordance with the Regulations (GNR 827), any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation 03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme.</p> <p>Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.</p>	Mpumalanga DARDLEA Gert Sibande District Municipality	In the event that the project results in the generation of excessive levels of dust, the possibility could exist that a dustfall monitoring programme would be required for the project, in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report, and a dust management plan would need to be developed. However, with mitigation measures implemented, the Becrux Solar PV Facility is not anticipated to result in significant dust generation and at this stage, a dust fall monitoring programme is not deemed required.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Heritage Resources Act (No. 25 of 1999) (NHRA)	<p>Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance.</p> <p>Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites.</p> <p>Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority.</p> <p>Section 38(1) of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development.</p> <p>Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.</p>	<p>South African Heritage Resources Agency (SAHRA)</p> <p>Mpumalanga Provincial Heritage Resource Authority</p>	<p>A full Heritage Impact Assessment (HIA) (with field work) has been undertaken as part of the BA process (refer to Appendix G of the BA Report). No heritage and palaeontological resources of significance were identified within the development area.</p> <p>Should a heritage resource be impacted upon, a permit may be required from SAHRA or the Mpumalanga Provincial Heritage Resource Authority in accordance with of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668).</p>
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	<p>Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process.</p> <p>Three government notices have been published in terms of Section 56(1) of NEM:BA as follows:</p> <ul style="list-style-type: none"> » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable, and protected species (GNR 151), as amended in 2020 (GNR 627). » TOPS Regulations (GNR 152). 	<p>DFPE</p> <p>Mpumalanga DARDLEA</p>	<p>Under NEM:BA, a permit would be required for any activity that is of a nature that may negatively impact on the survival of a listed protected species.</p> <p>An Ecological Impact Assessment (including flora and fauna) has been undertaken as part of the BA process (refer to Appendix D of the BA Report). No protected flora and fauna species which require a permit under NEM:BA were identified within the development area.</p>

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	<p>NEM:BA provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process, including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 1002, 9 December 2011, GG 34809).</p>		
<p>National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)</p>	<p>Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out.</p> <p>Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864). The updated NEMBA Alien and Invasive Species Regulations were gazetted on 25 September 2020 (in force from 1 March 2021) and the updated Alien and Invasive Species list was gazetted on 18 September 2020 (in force 1 March 2021).</p>	<p>DFFE Mpumalanga DARDLEA</p>	<p>The Ecological Impact Assessment (Appendix D of the BA Report) identified Six (6) invasive alien plant species within the development area. These species are listed under the Alien and Invasive Species List, 2020, Government Gazette No. GN1003 as Category 1b. Category 1b species must be controlled by implementing an Invasive Alien Plant Management Programme, in compliance with section 75 of the NEM:BA.</p>
<p>Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)</p>	<p>Section 05 of CARA provides for the prohibition of the spreading of weeds.</p> <p>Regulation 15 of GN R1048 published under CARA provides for the classification of categories of weeds</p>	<p>Department of Agriculture, Land Reform and Rural Development (DALRD)</p>	<p>CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control</p>

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Regulations (GN R1048) (CARA Regulations)	<p>and invader plants, and restrictions in terms of where these species may occur.</p> <p>Regulation 15E of GN R1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.</p> <p>It should be noted that the CARA regulations for the legal obligations regarding alien invasive plants in South Africa have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which were promulgated on 1 October 2014 (as amended in 2020). However, CARA has not been repealed and is still included as a reference point to use in terms of the management of invasive alien plants where certain species may not be included in the NEM: BA alien invasive species list.</p>		<p>and management plan must be implemented.</p> <p>In terms of Regulation 15E (GN R1048) where Category 1, 2 or 3 plants occur, a land user is required to control such plants by means of one or more of the following methods:</p> <ul style="list-style-type: none"> » Uprooting, felling, cutting, or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer. » Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation 4. » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree	DFFE	A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine

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	<p>Species under the National Forests Act (No. 84 of 1998) was published in GNR 734 (as updated in 2018).</p> <p>The prohibitions provide that “no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister”.</p>		<p>the number and relevant details pertaining to protected tree species present in the development footprint for the submission of relevant permits to authorities prior to the disturbance of these individuals.</p> <p>The Ecological Impact Assessment (Appendix D of the BA Report) identified no protected trees that may require a license in terms of the NFA within the development area.</p>
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	<p>Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it.</p> <p>Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of</p>	DFFE	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the Becrux Solar PV Facility, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and trained personnel for firefighting purposes.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<p>Hazardous Substances Act (No. 15 of 1973) (HAS)</p>	<p>adjoining land and the relevant fire protection association, if any.</p> <p>This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.</p> <ul style="list-style-type: none"> » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product, and » Group V: any radioactive material. <p>The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.</p>	<p>Department of Health (DoH)</p>	<p>It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH).</p>
<p>National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)</p>	<p>The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p> <ul style="list-style-type: none"> » Adding other waste management activities to the list. 	<p>DFFE – Hazardous Waste</p> <p>Mpumalanga DARDLEA – General Waste</p>	<p>No waste listed activities are triggered by the Becrux Solar PV Facility, and as such, no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section</p>

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	<ul style="list-style-type: none"> » Removing waste management activities from the list. » Making other changes to the particulars on the list. <p>In terms of the Regulations published in terms of NEM:WA (GNR 921), a BA or EIA is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> <ul style="list-style-type: none"> » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unfit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and » Pollution of the environment and harm to health are prevented. 		<p>7(1)(c) of NEM:WA will need to be considered in this regard.</p>
<p>National Road Traffic Act (No. 93 of 1996) (NRTA)</p>	<p>The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.</p> <p>Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.</p>	<p>South African National Roads Agency (SANRAL) – national roads</p> <p>Mpumalanga Department of Public Works, Roads and Transport</p>	<p>An abnormal load/vehicle permit will be required to transport the various components to site for construction. These include:</p> <ul style="list-style-type: none"> » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Depending on the trailer configuration and height when loaded, some of the project components may not meet specified

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.</p>		<p>dimensional limitations (height and width).</p>
<p>Astronomy Geographic Advantage Act (Act No. 21 of 2007) (AGA)</p>	<p>The Astronomy Geographic Advantage (AGA) Act (No. 21 of 2007) provides for the preservation and protection of areas within South Africa that are uniquely suited for optical and radio astronomy; for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas and for matters connected thereto.</p> <p>Chapter 2 of the Act allows for the declaration of astronomy advantage areas whilst Chapter 3 pertains to the management and control of astronomy advantage areas. Management and control of astronomy advantage areas include, amongst others, the following:</p> <ul style="list-style-type: none"> * Restrictions on use of radio frequency spectrum in astronomy advantage areas; * Declared activities in core or central astronomy advantage area; * Identified activities in coordinated astronomy advantage area; and * Authorisation to undertake identified activities. 	<p>Department of Science and Technology.</p>	<p>The site proposed for the development of the Becrux Solar PV Facility is located within the Mpumalanga Province and therefore falls outside of the areas considered to be uniquely suited in terms of nationally significant astronomy advantage areas.</p>
<p>Aviation Act (Act No 74 of 1962) 13th amendment of the Civil Aviation Regulations (CARS) 1997</p>	<p>Any structure exceeding 45m above ground level or structures where the top of the structure exceeds 150m above the mean ground level, the mean</p>	<p>South African Civil Aviation Authority (SACAA)</p>	<p>This Act will find application during the operation phase of the Becrux Solar PV Facility. Appropriate marking of project infrastructure >45m above ground level,</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>ground level considered to be the lowest point in a 3km radius around such structure.</p> <p>Structures lower than 45m, which are considered as a danger to aviation shall be marked as such when specified.</p> <p>Overhead wires, cables etc., crossing a river, valley or major roads shall be marked and in addition their supporting towers marked and lighted if an aeronautical study indicates it could constitute a hazard to aircraft.</p>	Air Traffic and Navigation Services SOC Limited (ATNS)	such as the powerline, is required to meet the specifications. as detailed in the CAR Regulations Part 139.01.33. An obstacle approval (or confirmation that no approval is required) would be required to be obtained from the South African CAA.

Provincial Policies / Legislation

Mpumalanga Nature Conservation Act (No. 10 of 1998) (MNCA)	This Act makes provision with respect to nature conservation in the Mpumalanga province. It provides for, among other things, protection of wildlife, hunting, fisheries, protection of endangered fauna and flora as listed in the Convention on international Trade in Endangered Species of Wild Fauna and Flora, the control of harmful animals, freshwater pollution, and enforcement.	Mpumalanga DARDLEA	An Ecological Impact Assessment (including flora and fauna) has been undertaken as part of the BA process (refer to Appendix D of the BA Report). No protected flora and fauna species which require a permit under the MNCA were identified within the development area.
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