



Draft EMPr

14/12/16/3/3/2/829

PROPOSED RENEWABLE ENERGY GENERATION PROJECT ON THE REMAINDER OF THE FARM EAST No. 270, KURUMAN RD, JOE MOROLONG LOCAL MUNICIPALITY, JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE

Short name: East 2 Solar Park

May 2016

**Commissioned by: Palus Energy (Pty) Ltd
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Proposed Renewable Energy Generation Project on Remaining Extent of the Farm East No. 270, Kuruman RD, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province

Short name: East 2 Solar Park

May 2016

PROJECT APPLICANT

Company name: **PALUS ENERGY (Pty) Ltd - Reg. No: 2013/087976/07**
Contact Person: Ms Izel van Rooy (PlanWize)
Physical Address: 4th Floor Aloe Grove, Houghton Estate Office Park, 2 Osborn Road, Houghton 2198 - South Africa
Postal Address: P.O. Box 225, Highlands North 2037, South Africa
Telephone Number: +27 (0) 86 599 3858
Fax Number: +27 (0) 86 599 3858
S.A. Mobile Number +27 (0) 82 449 7626
E-mail: palusenergy@gmail.com

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Company Name: AGES Limpopo (Pty) Ltd (Reg: 2006/020831/07)
Contact Persons: Mr. Johan Botha / Ms. Engela Grobler
Physical Address: 120 Marshall Street, Polokwane, 0699, South Africa
Postal Address: P.O. Box 2526, Polokwane, 0700, South Africa
Telephone Number: +27 (83) 557 6494 / +27 0(15) 291 1577
Fax Number: +27 (15) 291 1577
E-mail: jbotha@ages-group.com/egrobler@ages-group.com

AGES (Pty) Ltd

J.H. Botha (Senior Environmental Scientist – M.Sc. Environmental Management (*Pri Sci Nat*))
E. Grobler (Environmental Scientist – M.Sc. Environmental Management (Univ of Stellenbosch))

LIMPOPO PROVINCE: 120 Marshall Street Polokwane 0699, P.O Box 2526 Polokwane 0700

Tel: +27-15-291 1577 Fax: +27 (0)15 291 1577 www.ages-group.com

Offices: Eastern Cape Gauteng Limpopo Province Namibia North-West Province Western Cape Zimbabwe

AGES Limpopo Directors: JH Botha R Crosby SJ Pretorius

AGES (PTY) LTD Board of Directors: JA Myburgh S Lerefolo R Crosby FN de Jager AS Potgieter

Advisory Board: SJ Pretorius Z Pemba



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Name	Institution
Ms. I. van Rooy	Palus Energy (Pty) Ltd
Herman Alberts	Department of Environmental Affairs (DEA) (2 copies)
Mr. S Cloete	Department of Water Affairs – Lower Vaal WMA
Ms M Marubini	Department of Agriculture, Forestry & Fisheries (DAFF)
Mr. Mothibi	Department of Agriculture, Land Reform & Rural Development
Mr. M Ramakulukusha Ref.: NC/NAT/JTG/KUR/2014	Northern Cape Department of Environment and Nature Conservation (DENC)
Municipal Manager Mr. Tshepo Bloom	Joe Morolong Local Municipality
Municipal Manager: Mrs. M Bokgwathile	John Taolo Gaetsewe District Municipality
Mr. N Nongauza Mr. J Geeringh	Eskom
Dr. Sita	Department of Science and Technology (DST)
Dr. P Lochner	Council for Scientific and Industrial Research (CSIR)
Dr Adrian Tiplady	Square Kilometre Array (SKA)
	Registered Interested and Affected Parties

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1. GENERAL INFORMATION

Palus Energy (Pty) Ltd (Reg. No. 2013/087976/07) is proposing the development of a renewable solar energy facility in a key strategic location in terms of the connection to the Eskom grid and in terms of the favourable solar irradiation.

The proposed site is **the Remainder (964.2695 ha) of the Farm East 270 Kuruman RD** located in the **Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province**, 4 km North of Hotazel and 50 km North of Kathu.

The total extent of the project site is 964.2695 ha.

Site location: Remainder of Farm East 270, Kuruman Registration Division – Surveyor-general 21 digit site code:

C	0	4	1	0	0	0	0	0	0	0	0	0	2	7	0	0	0	0	0
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The name of the project is **EAST 2 SOLAR PARK** and it envisages a **photovoltaic (PV) power plant having a maximum generation capacity of 120 MW**.

The **footprint** (fenced area) of the proposed development is up to **250 ha**, to be located on the Remainder of the Farm East 270, East of / adjacent to the Eskom “Hotazel - Heuningvlei” 132 kV power line, which crosses the property in a South to North direction.

Access to the development area will be from the secondary road (coming from R31) running along the eastern boundary of Portion 2 of the Farm East 270. Two new access roads (of 4.6 km and 235 m respectively) - will link the secondary road to the proposed development area.

The East 2 Solar Park will participate to the Renewable Energy IPP Procurement Programme (REIPPPP) issued on 3 August 2011 by the DoE (Department of Energy).

In order to develop the facility, Palus Energy must undertake an Environmental Impact Assessment (EIA) process and acquire environmental authorization from the National Department of Environmental Affairs (DEA), in consultation with the *Northern Cape Department of Environment and Nature Conservation*, in terms of the EIA Regulations (2010) published in terms of Section 24(2) and 24D of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This project has been registered with the **DEA application reference number 14/12/16/3/3/2/829**.

The East 2Solar Park may be connected either:

- a) **to the Eskom Hotazel substation**, 3.5 km south of the project site, via a new 132 kV power line approximately 4.5 km long and running parallel to the existing Eskom “Hotazel - Heuningvlei” 132 kV power line (**Alternative connection 1**); or
- b) **to the new Eskom Umtu substation**, 4 km south-west of the project site, via a new 132 kV power line approximately 10.9 km long and running parallel to the existing Eskom “Hotazel - Heuningvlei” 132 kV power line (for 4.9 km) and to the Eskom “Hotazel - Umtu” 132 kV power line (for 6.0 km) (**Alternative connection 2**).

The alternative connection assessed in the EIA Report and Annexures - for which environmental authorisation is applied for - is the *Alternative connection 1*.

With regard to **the alternative connection 2**, whereby a new 132 kV power line may be erected outside the project site, **a separate Basic Assessment will be conducted by AGES** (the applicant is Palus Energy).

Eskom is the entity which should assess the connection solutions described in the EIA Report. Eskom also coordinates the necessary liaising between Palus Energy, Eskom Transmission, Eskom Distribution and Eskom Land & Rights Department.

All or part of the infrastructure required for the connection may be owned and/or operated by Eskom Distribution and this will depend on the Eskom grid code in relation to the IPPs (Independent Power Producers) and on the Connection Agreement to be finalized prior to or simultaneously with the conclusion of the PPA (Power Purchase Agreement) in respect of the options of retaining ownership of the connection works once completed.

The independent Environmental Assessment Practitioners (EAPs) which have been appointed for the undertaking of the detailed environmental studies in compliance with the 2014 EIA Regulations are **AGES Limpopo**.

1.1 PROJECT OBJECTIVE

This Environmental Management Programme (EMPr) is an environmental management tool used to prevent or mitigate avoidable adverse impacts of the construction, operation and decommissioning of the proposed East 2 Solar Park.

This EMPr can also be considered a tool useful for the enhancement of the positive benefits of the project.

This EMPr is done with the objective to supply the Department of Environmental Affairs (DEA) in consultation with the *Northern Cape Department of Environment and Nature Conservation (DENC)*, with the necessary environmental information to make a decision regarding the approval of the proposed development, providing consistent information and guidance for the management and monitoring measures and helping in achieving environmental policy goals.

In order to comply with the Environmental Impact Assessment Regulations released on 4 December 2014 in terms of Section 24(2) and 24D of the National Environmental Management Act (NEMA, Act No. 107 of 1998) (GNR R 983 of 4 December 2014), the EIA report must contain an Environmental Management Programme.

1.2 PURPOSE AND AIMS OF THE EMP

This Environmental Management Programme is compiled with reference to the requirements of the EIA Regulations 2014.

The mitigation measures stated in the Environmental Management Programme (EMPr) should be observed during the different phases of the development. In this EMPr all possible impacts and mitigations are assessed for each of the three project phases: **construction, operation and decommissioning**.

As far as the decommissioning phase is concerned, it is important to specify that this phase will be subject to a decommissioning plan once the project is nearing its operational life (25-30 years). Decommissioning will also be subject to an environmental authorization (Activity 31 of

R983 of 4 December 2014). This phase is important because it states the **reversibility of the development** and has to be carefully planned and executed in order to enable the natural re-growth of indigenous vegetation and fauna re-population as well as the reuse of the area for grazing purposes.

For this reason, in this Draft Environmental Management Programme, the decommissioning phase has been included and analysed, in order to anticipate activities and actions to be taken to minimize the relevant impacts and assure the reversibility of the development.

The decommissioning phase is similar to the construction phase but all possible care must be considered for the recycling of the materials and for the re-establishment of the site as it was the *status quo* – *ex ante* the development.

The three phases have been carefully examined in relation to the PV plant and the connection infrastructure (preferred connection solution).

With regard to **the alternative options (alternative connection 2) for the connection infrastructure**, whereby a new 132 kV power line may be erected outside the project site, a separate Basic Assessment will be conducted. The mitigation and management measures in the Environmental Impact Assessment process are systematically addressed in this EMPr which ensures the minimisation of adverse environmental impacts to an acceptable level.

In particular, the objectives of this EMPr are:

- to outline mitigation measures and environmental specifications required for the three phases of the project in order to manage and minimise the potential environmental impacts associated with the solar park;
- to ensure that the three phases do not have adverse environmental impacts and that any potential environmental benefits are improved;
- to detect the responsible people/entities for the implementation of the measures, outlining functions and responsibilities;
- to state mechanisms and frequency for preventing long term or permanent environmental degradation;
- to facilitate responses to unforeseen events or changes in the project implementation not considered in the EIA process.

In order to achieve the goal of good and correct environmental management, the role of the contractor is very important. The contractor must be aware of the responsibilities of the relevant environmental legislation and of the specific contents of this EMPr. Specifically, the contractors must ensure that employees have a basic understanding of the environmental features of the site and of the surrounding environment and that employees are familiar with the requirements of this EMPr having also attended an environmental awareness training course. A copy of the EMPr needs to be available to all on-site staff members.

2 AUTHORITIES, LEGAL CONTEXT AND ADMINISTRATIVE REQUIREMENTS

The legislative and regulatory framework of reference for the solar power plant project includes statutory and non-statutory instruments by which National, Provincial and Local authorities exercise control throughout the development of the same project.

The development and the environmental assessment process of a solar power plant project involve various authorities dealing with the different issues related to the project (economic, social, cultural, biophysical etc.).

2.1 REGULATORY AUTHORITIES

2.1.1 National Authorities

At national level, the main regulatory authorities and agencies are:

- *Department of Energy (DoE)*: the Department is competent and responsible for all policies related to energy, including renewable energy. Solar energy is contemplated and disciplined under the White Paper for Renewable Energy and the Department constantly conducts research activities in this respect;
- *Department of Environmental Affairs (DEA)*: the Department is competent and responsible for all environmental policies and is the controlling authority under the terms of NEMA and EIA Regulations. The DEA is also the competent authority for the proposed project, and is entrusted with granting the relevant environmental authorisation;
- *National Energy Regulator of South Africa (NERSA)*: the Regulator is competent and responsible for regulating all aspects dealing with the electricity sector and, in particular, issues the licence for independent power producers;
- *South African Heritage Resources Agency (SAHRA)*: the Agency is responsible for the protection and the survey, in association with provincial authorities of listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes under the terms of the National Heritages Resources Act (Act no. 25 of 1999);
- *South African National Roads Agency Limited (SANRAL)*: the Agency is responsible for all National road routes.

2.1.2 Provincial Authorities

At provincial level, the main regulatory authority is the *Northern Cape Department of Environment and Nature Conservation (DENC)*; this Department is responsible for environmental policies and is the Provincial authority in terms of NEMA and the EIA Regulations. The Department is also the commenting authority for the proposed project. The project should comply with the *Northern Cape Nature Conservation Act* (Act No. 9 of 2009).

2.1.3 Local Authorities

At a local level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape Province, Municipalities and District Municipalities are involved in various aspects of planning and the environment related to solar energy facilities development. The Local Municipality is *Joe Morolong*, which is part of the *John Taolo Gaetsewe District Municipality*.

Under the terms of the Municipal System Act (Act no. 32 of 2000), all municipalities are deemed to go through an Integrated Development Planning (IDP) process in order to devise a five-year strategic development plan for the area of reference. The identification of priority areas for conservation and their positioning within a planning framework of core, buffer, and transition areas is the subject of bioregional planning.

Priority areas are individuated and defined with reference to visual and scenic resources and their identification and protection is granted through visual guidelines drafted for the area included in bioregional plans.

Local authorities also provide specific by-laws and policies in order to protect visual and aesthetic resources with reference to urban edge lines, scenic drives, special areas, signage, communication masts etc.

The **Spatial Development Framework (SDF) 2012 of the Joe Morolong Local Municipality** has three main nodes where relatively higher economic activity takes place, namely Vanzylsrus, Hotazel and Blackrock. The proposed solar park is situated near Hotazel and Blackrock. It is stated in the SDF that investment should be focused on these areas to expand the node into a more diverse economic centre. It is mentioned that a replacement economic activity should be found when the mineral resources are depleted for Hotazel and Blackrock. The proposed renewable energy project will contribute towards meeting this goal by introducing new economic activity and job opportunities to the area.

The SDF furthermore outlines Spatial Planning Categories. Spatial Planning Category F involves *Surface infrastructure and Buildings*, i.e. all surface infrastructure and buildings, including roads, railway lines, power lines, communication structures, etc.

The Sub-Category: F(i) includes *Renewable Energy Structures*: These include any wind turbine or solar photovoltaic apparatus, or grouping thereof, which captures and converts wind or solar radiation into energy for commercial gain irrespective of whether it feeds onto an electricity grid or not. It includes any appurtenant structure or any test facility which may lead to the generation of energy on a commercial basis.

Development Guidelines for Sub-Category: F(i) states that "*all surface infrastructure and buildings that are required for sustainable socio-economic development and resource use must be undertaken in accordance with site specific design and planning guidelines. All industry must be regulated and managed in accordance with sustainability standards (e.g. ISO 14001)*".

The East 2 Solar Park will comply with the international standards and regulations for photovoltaic power plants.

The proposed solar park, situated nearby Hotazel and Blackrock, will aid the Municipality in the upliftment of these areas. It will a sustainable form of land development and will be developed in compliance with the Development Guidelines stipulated under Sub-Category F(i) of the SDF. The proposed Solar Park will comply with the SDF of the Joe Morolong Local Municipality.

Local authorities also provide specific by-laws and policies in order to protect visual and aesthetic resources with reference to urban edge lines, scenic drives, special areas, signage, communication masts etc.

Finally, there are also various non-statutory bodies and environmental groups, who are involved in the definition of various aspects of planning and the protection of the environment, which may influence the development of the proposed project.

2.2 LEGISLATION, REGULATIONS AND GUIDELINES

A review of the relevant legislation involved in the proposed development is detailed in table 1.

Table 1: Review of relevant legislation

National Legislation	Sections applicable to the proposed project
Constitution of the Republic of South Africa (Act no. 108 of 1996)	<ul style="list-style-type: none"> • Bill of Rights (S2) • Rights to freedom of movement and residence (S22) • Environmental Rights (S24) • Property Rights (S25) • Access to information (S32) • Right to just administrative action (S33)
Fencing Act (Act no. 31 of 1963)	<ul style="list-style-type: none"> • Notice in respect of erection of a boundary fence (S7) • Clearing bush for boundary fencing (S17) • Access to land for purpose of boundary fencing (S18)
Conservation of Agricultural Resources Act (Act no. 43 of 1983)	<ul style="list-style-type: none"> • Prohibition of the spreading of weeds (S5) • Classification of categories of weeds & invader plants and restrictions in terms of where these species may occur (Regulation 15 of GN R0148) • Requirement and methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R0148)
Environment Conservation Act (Act no. 73 of 1989)	<ul style="list-style-type: none"> • National Noise Control Regulations (GN R154 dated 10 January 1992)
National Water Act (Act no. 36 of 1998)	<ul style="list-style-type: none"> • Entrustment of the National Government to the protection of water resources (S3) • Entitlement to use water (S4) - Schedule 1 provides the purposes which entitle a person to use water (reasonable domestic use, domestic gardening, animal watering, fire-fighting and recreational use) • Duty of Care to prevent and remedy effects of water pollution (S19) • Procedures to be followed in the event of an emergency incident which may impact on water resources (S20) • Definition of water use (S21) • Requirements for registration of water use (S26 and S34) • Definition of offences in terms of the Act (S151)
National Forests Act (Act no. 84 of 1998)	<ul style="list-style-type: none"> • Protected trees
National Environmental Management Act (Act no. 107 of 1998)	<ul style="list-style-type: none"> • Definition of National environmental principles (S2): strategic environmental management goals and objectives of the government applicable within the entire Republic of South Africa to the actions of all organs of state, which may significantly affect the environment • NEMA EIA Regulations (GN R982, 983, 984, 985 of 4 December 2014) • Requirement for potential impact on the environment of listed activities to be considered, investigated, assessed and reported on to the competent authority (S24 - Environmental Authorisations)

	<ul style="list-style-type: none"> • Duty of Care (S28): requirement that all reasonable measures are taken in order to prevent pollution or degradation from occurring, continuing and recurring, or, where this is not possible, to minimise and rectify pollution or degradation of the environment • Procedures to be followed in the event of an emergency incident which may impact on the environment (S30)
National Heritage Resources Act (Act no. 25 of 1999)	<ul style="list-style-type: none"> • SAHRA, in consultation with the Minister and the Member of the Executive Council of every province must establish a system of grading places and objects which form part of the national estate (S7) • Provision for the protection of all archaeological objects, paleontological sites, material and meteorites entrusted to the provincial heritage resources authority (S35) • Provision for the conservation and care of cemeteries and graves by SAHRA, where it is not responsibility of any other authority (S36) • List of activities which require notification from the developer to the responsible heritage resources authority, with details regarding location, nature, extent of the proposed development (S38) • Requirement for compilation of a Conservation Management Plan and permit from SAHRA for the presentation of archaeological sites for tourism (S44) promotion
National Environmental Management: Biodiversity Act (Act no. 10 of 2004)	<ul style="list-style-type: none"> • Provision for the Member of the Executive Council for Environmental Affairs/Minister to publish a list of threatened ecosystems in need of protection (S52) • Provision for the Member of the Executive Council for Environmental Affairs/Minister to identify any process or activity which may threaten a listed ecosystem (S53) • Provision for the Member of the Executive Council for Environmental Affairs/Minister to publish a list of: critical endangered species, endangered species, vulnerable species and protected species (S56(1) - see Government Gazette 29657) • Three government notices were published: GN R150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R151 (Lists of critically endangered, vulnerable and protected species) and GN R152 (Threatened Protected Species Regulations)
National Environmental Management: Air Quality Act (Act no. 39 of 2004)	<ul style="list-style-type: none"> • Provision for measures in respect of dust control (S32) • Provision for measures to control noise (S34)
National Environmental Management: Waste Management Act (Act no. 59 of 2008)	<ul style="list-style-type: none"> • Waste management measures • Regulations and schedules • Listed activities which require a waste licence
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	<ul style="list-style-type: none"> • Indigenous flora protected under this act • No hunting to take place without a permit
Occupational Health and Safety Act (Act No. 85 of 1993)	<ul style="list-style-type: none"> • Health and safety of all involved before and after construction must be protected.

Guideline Documents	Sections applicable to the proposed project
South African National Standard (SANS) 10328, Methods for environmental noise impact assessments in terms of NEMA no. 107 of 1998	<ul style="list-style-type: none"> • Impact of noise emanating from a proposed development may have on occupants of surrounding land by determining the rating level • Noise limits are based on the acceptable rating levels of ambient noise contained in SANS 10103
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	<ul style="list-style-type: none"> • The Guidelines outline rules and conditions related to transport of abnormal loads and vehicles on public roads and detailed procedures to be followed for the grant of exemption permits

Policies and White Papers	Sections applicable to the proposed project
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	<ul style="list-style-type: none"> • The White Paper supports investment in renewable energy initiatives, such as the proposed solar power plant project
The White Paper on Renewable Energy (November 2003)	<ul style="list-style-type: none"> • The White Paper outlines the Government's vision, policy, principles, strategic goals and objectives for the promotion and the implementation of renewable energy in South Africa
Integrated Resource Plan (IRP1) Integrated Resources Plan 2010-2030 (IRP 2010).	<ul style="list-style-type: none"> • The first Integrated Resource Plan (IRP1) was released in late 2009. Subsequently the DoE decided to undertake a detailed process to determine South Africa's 20-year electricity plan, called Integrated Resources Plan 2010-2030 (IRP 2010). • The IRP1 and the IRP 2010 outline the Government's vision, policy and strategy in matter of the use of energy resources and the current status of energy policies in South Africa. • In particular, the IRP 2010 highlights the necessity of commissioning 1200 MW with solar PV technology by the end of 2015.
Request For Qualification and Proposals For New Generation Capacity under the IPP Procurement Programme(3 August 2011)	<ul style="list-style-type: none"> • The REIPP Procurement Programme, issued on 3rd August 2011 by the DoE, envisages the commissioning of 3725 MW of renewable projects (1450 MW with Solar photovoltaic technology) capable of beginning commercial operation before the end of 2020.
Equator Principles (July 2006)	<ul style="list-style-type: none"> • The Equator Principles provide that future developments with total project capital costs of US\$10 million or more shall be financed only if socially and environmentally sustainable

2.4 LISTED ACTIVITIES IN TERMS OF NEMA

The “listed activities” in terms of sections 24 and 24D of NEMA involved in the proposed development are detailed in table 2 below:

Table 2: Listed Activities in terms of sections 24 and 24D of NEMA potentially involved in the proposed development

Relevant notice	Description
<p>GN R.983 Item 11 (i)</p> <p><i>The development of facilities or infrastructure for the transmission and distribution of electricity -</i></p> <p><i>(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.</i></p>	<p>The East 2 Solar Park may be connected to:</p> <p>a) Eskom Hotazel distribution substation, 3.5 km south of the project site, via a new 132 kV power line approximately 6.4 km long (from East 2) and running parallel to the existing Eskom “Hotazel - Heuningvlei” 132 kV power line (alternative connection 1); and/or</p> <p>b) Eskom Umtu distribution substation / planned Eskom Hotazel transmission substation, 4 km south-west of the project site, via a new 132 kV power line approximately 10.9 km long (from East 2) and running parallel to the existing Eskom “Hotazel - Heuningvlei” 132 kV power line (for 4.9 km) and to the Eskom “Hotazel - Umtu” 132 kV power line (for 6.0 km) (alternative connection 2).</p> <p>The connection infrastructure will consist of:</p> <ul style="list-style-type: none"> • one small on-site high-voltage substation with high-voltage power transformers, stepping up the voltage to the voltage of the Eskom grid (132 kV), and one high-voltage bus bar with metering and protection devices (also called “switching station”); • a new 132 kV power line (single or double circuit) to be connected to the Eskom Hotazel distribution substation and/or Eskom Umtu distribution substation and/or planned Eskom Hotazel transmission substation; • a new feeder bay to be commissioned and equipped at the Eskom Hotazel distribution substation and/or Eskom Umtu distribution substation and/or planned Eskom Hotazel transmission substation. <p>The connection solution may also entail intervention on the Eskom’s grid.</p>
<p>GN R.983 Item 24 (ii)</p> <p><i>The development of –</i></p> <p><i>(ii) a road with a reserve wider than 13,5m, or where no reserve exists where the road is wider than 8m.</i></p>	<p>Access to East 2 Solar Park will be from a secondary road from R31. Two new on-site access roads, 8.0 m wide) and 235 m long (East 2) are envisaged. During the construction phase, the road reserve may be wider than 13.5 meters in order to allow the transportation of abnormal loads (e.g. the high-voltage step-up transformers of the new on-site high-voltage substation). Internal roads will be maximum 8.0 m wide with a road reserve maximum 12.0 m wide. At the turning points / intersection points, some internal roads may be wider than 8.0 m and the road reserve may be wider than 13.5 m, due to the shape of the intersection / turning points.</p>

<p>GN R.984 Item 1</p> <p><i>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more</i></p>	<p>Palus Energy (Pty) Ltd is proposing the establishment of East 2 Solar Park on Remainder of East 270, Kuruman RD, 964.3 ha in size, in Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province. The project will consist of construction, operation and maintenance of a PV Power Plant with a maximum generation capacity of 120MW with associated infrastructure and structures.</p>
<p>GN R.984 Item 15</p> <p><i>The clearance of an area of 20 ha or more of indigenous vegetation</i></p>	<p>The PV Power Plant with associated infrastructure and structures will be constructed and operated on two footprints bigger than 20 ha (250 ha). The required footprint should be cleared from the existing bushes and trees.</p>

The closest watercourse is the *Gamagara Spruit*, which run parallel to the western boundary of the project site, but at a minimum distance of 600 m from the proposed development area.

A pan (endorheic depression) was found on the north-eastern corner of the Remainder Portion of the Farm East 270, at a minimum distance of 850 m from the proposed development area.

No infilling or depositing of any material or dredging, excavation, removal or moving of soil should take place in the proximity of the *Gamagara Spruit* or of the pan: the construction activities must be restricted to the proposed PV plant fenced area / footprint.

The alternative connection assessed in this EIA Report and Annexures - for which environmental authorisation is applied for - is the *Alternative connection 1*. With regard to **the alternative connection 2**, whereby a new 132 kV power line may be constructe outside the project site, **a separate Basic Assessment will be conducted by AGES.**

Eskom is the entity which should assess the connection solutions described in the EIA Report. Eskom also coordinates the necessary liaising between Palus Energy, Eskom Transmission, Eskom Distribution and Eskom Land & Rights Department. Furthermore, a part of the connection infrastructure (the 132 kV busbar of the on-site substation and the new 132 kV power line) may be executed, owned and operated by Eskom.

3 TRAFFIC MANAGEMENT PLAN

3.1 TRAFFIC DURING THE CONSTRUCTION PHASE

The construction timeframe is estimated to be approximately **15 months**.

Approximately 100 people are expected to be employed during the construction period (15 months), although this number can increase to 150 for short spaces of time during peak periods. A small accommodation area with few prefabricated buildings inside the work site may be foreseen, if accommodation facilities in Hotazel, Kuruman or Kathu are not sufficient to accommodate all workers.

Overall traffic to and from the work site will amount to approximately **1000 medium / heavy vehicle trips** over the whole construction period. As indicated in the table below, the average number of medium and heavy trucks to and from the site will be of **3 trucks per working day**.

Table 3: Construction timeframe: average daily trips of medium and heavy vehicles

Transportation of:	months	1	2	3	4	5	6	7	8
fencing and tools	trips/month	8	8	0	0	0	0	0	0
clearance of the site (vegetation transportation)	trips/month	56	32	0	0	0	0	0	0
piles / frames for mounting systems	trips/month	0	0	20	20	20	20	20	0
sands & gravel for on-site concrete production	trips/month	0	30	48	48	48	52	52	54
PV modules	trips/month	0	0	0	0	0	0	0	0
MV stations	trips/month	0	0	0	0	0	12	12	12
HV substation components	trips/month	0	0	8	8	8	0	0	0
cables	trips/month	0	0	0	0	0	0	0	16
Average trips per month	trips/month	64	70	76	76	76	84	84	82
Average trips per working day (*)	trips/day	2.9	3.2	3.5	3.5	3.5	3.8	3.8	3.7

Transportation of:	months	9	10	11	12	13	14	15	TOTAL
fencing and tools	trips/month	0	0	0	0	0	0	0	16
clearance of the site (vegetation transportation)	trips/month	0	0	0	0	0	0	0	88
piles / frames for mounting systems	trips/month	0	0	0	0	0	0	0	100
sands & gravel for on-site concrete production	trips/month	52	48	32	0	0	0	0	464
PV modules	trips/month	0	16	32	68	66	34	0	216
MV stations	trips/month	12	12	0	0	0	0	0	60
HV substation components	trips/month	0	0	0	0	0	0	0	24
cables	trips/month	16	0	0	0	0	0	0	32
Average trips per month	trips/month	80	76	64	68	66	34	0	1000
Average trips per working day (*)	trips/day	3.6	3.5	2.9	3.1	3.0	1.5	0.0	3.03

(*) 22 working days per month

The provision of a fuelling area on the work site could reduce the load of heavy vehicles on public roads. The installation of two steel fuel tanks (capacity of 30,000 litres each) is planned.

- Medium and heavy trucks should access / leave the site **only during the working days (Monday to Friday), on the daytime (8h - 17h)**.
- Vehicles must be well serviced so that it does not produce excessive smoke and noise.
- Construction vehicles must be well maintained and serviced to minimise leaks and spills.
- Spill trays must be used during refueling of vehicles on site.
- Speed of construction vehicles should be kept as low as possible to reduce the generation of dust and noise.
- Drip pans should be used during re-fueling and servicing of construction vehicles. Used parts like filters should be contained and disposed of at a site licensed for dumping of these waste products.
- Oil traps must be installed in the vehicle wash bay to prevent pollution. Oil traps must be serviced on a regular basis by an approved service agent.
- Diesel storage must be less than 80 000 litres at construction camps. Diesel tanks and other harmful chemicals and oils must be within a bunded area.
- The vehicle maintenance yard and construction storage area should be placed 100 m away from watercourses. This area should have bund walls and lined with impermeable material to prevent ground and surface water pollution.
- The Contractor shall conform to the Occupational Health and Safety act (Act 85 of 1993) and regulations applicable. The Act requires the designation of a Health and Safety representative when more than 20 employees are employed.
- Proper access control (I.D. cards) should be enforced to ensure that no authorised persons enter the site.
- A fence should be constructed along the boundary of the development.

3.2 TRAFFIC DURING THE OPERATION PHASE

The traffic impact during the operation phase will be insignificant, considering that about 35-40 people will work on the PV facility, in the following manner:

- during the daytime approximately 14 people;
- during the night-time, 6 people.

4 MANAGEMENT OF THE SOLAR PARK DURING OPERATION

Approximately 35-40 people will be employed during the operation phase, which will have a lifetime of 25 - 30 years.

The East 2 Solar Park will be in operation 7 days per week; therefore personnel will operate according to shifts. The surveillance team will be ensured during day-time, night-time and weekends.

The operational team of the project will consist of the following people:

- 1 person as plant manager
- 1 person for administration
- 4 people as technicians / plant operators
- 9/12 people for electric and generic maintenance
- 20/22 people as guards

The “**fire team**” will be composed of people for generic maintenance, who will attend a comprehensive fire-fighting training program. After this training programme, the fire team will be able to drive/use/manage properly the fire extinguishers and the fire fighting vehicle, that will be available on the site.

5 ENVIRONMENTAL AWARENESS PLAN

The environmental awareness plan entails the management of staff and personnel on site during both the construction and operational phases.

During the construction phase the amount of workers on site is significantly higher than during the operational phase. Also the risks for pollution or any negative environmental impact is significantly higher during the construction phase. During the operational phase the negative impacts are extremely low and there are almost no risks involved. This environmental awareness plan will concentrate on management actions and procedures during the construction phase.

During the construction phase there will be an Environmental Officer on site as well as a person responsible for adherence to the Occupational Health and Safety Act (Act No. 85 of 1993) (OHSAC). There is a lot of overlap in the OHSAC and responsible environmental management procedures during the construction period. Impacts to be limited include:

1. Water and soil pollution and related impacts including health issues as identified in the OHSAC.
2. Water usage (human consumption and other uses).
3. Erosion (storm water)
4. Air quality (dust suppression during construction activities)
5. Noise levels
6. Pollution as a result of waste generation on site (both household and hazardous waste)
7. Fire
8. Potential import of alien vegetation
9. Natural fauna (wildlife) in the area

1. Water pollution

All personnel on site must attend monthly meetings in order to instruct all on site to avoid and limit any waste and/or spillages. Instructions on how to handle spillages on site must be displayed clearly in a step-by-step format, at the site office in terms of steps to follow. Training should be provided and spill kits must be on site, all the time.

2. Water usage

Water for human consumption must be available at all times but should be managed and all leakages and wastage should be reported to the site manager immediately. This issue must be included and reiterated in the monthly environmental meetings. Water used for construction purposes should be done with care and with adequate supervision both from the site manager and site officer. The on-site environmental officer must do quarterly monitoring of the water quality on site.

3. Erosion and storm water management

An erosion management plan is included in this EMPr in the next section and personnel should have access to this information (EMPr) and be given training accordingly.

4. Air quality (dust suppression during construction activities)

As a result of vegetation clearing activities as well as the traffic from construction and other vehicles, there will be dust formation in the general area. Dust suppression with water tanks must be done only if and when necessary.

5. Noise levels

Noise levels must be maintained at acceptable levels and only allowed during day light hours and on week days. This must be emphasized at weekly meetings.

6. Pollution as a result of waste generation on site (both household and hazardous waste)

Before construction commences and when new personnel arrive on site a short training course must be given in the principle waste to be reduce, re-used and recycled. This must be a continues process. The same applies here as in the case of potential water pollution in terms of household and/or hazardous waste. The training must also include steps to be taken in case of a spillage or wastage and the clean-up process to be explained in order to be understood by all involved. Everything should be in place for the removal of waste, including the availability of enough dust bins and containers, which should all be clearly marked and displayed.

7. Fire

Fire risks, on site is discussed in section 8.2. Practical training should be provided by a qualified person in the use of a fire extinguisher and all other fire fighting equipment to a dedicated fire fighting team.

8. Potential import of alien vegetation

Personnel should be trained to be able to identify indigenous and alien vegetation. If this cannot be done by the on site ECO, then a qualified and suitable person should provide a short, concise training programme to enable personnel to identify alien vegetation. This training should involve procedure to follow in the case of finding alien vegetation on site.

9. Natural fauna (wildlife) the area

Training should be provided in the handling of animals encountered on site, including procedures to follow when and if animals are found on site. If the on-site ECO is unable to do so, a qualified person must be appointed to provide training in the form of a short concise course.

In conclusion, all personnel on-site must have access to the EIA Report and EMPr as well as course material where training and short courses have been presented. The principals must be emphasised at regular meetings (preferably monthly) and everything should be made available to new personnel coming on-site.

6 EROSION MANAGEMENT PLAN

A major component of construction at solar PV sites is the clearing and grading of land, which exposes, disturbs, and moves the soil. This inevitably increases an area's susceptibility to erosion. Since in these situations it is not feasible to eliminate all erosion risk factors and, thus, all erosion, the goal of implementing erosion control measures is primarily to minimize erosion. Erosion, by the action of water and wind, is a natural process in which soil and rock material is loosened and removed. There are two major classifications of erosion:

- (1) Geological erosion, and
- (2) Man-made erosion.

Geological erosion, which includes soil-forming as well as soil-removing, has contributed to the formation of soils and their distribution on the surface of the earth.

Man-made erosion, which can greatly accelerate the natural erosion process, includes the breakdown of soil aggregates and the increased removal of organic and mineral particles; it is caused by clearing, grading, or otherwise altering the land. Erosion of soils that occurs at construction sites is **man-made erosion**.

Human activities can cause compaction of the soil, or disturbance of the soil. This hardening of the soil prevents water from effectively infiltrating the soil. This then results in larger volumes of water which moves quickly across a site carrying sediment to streams and rivers away from the site. The main factor causing or helping erosion on is erosion by water. This is the loosening and removal of soil and rock particles from a piece of land by running water, mostly caused by rain storms. There are a number of factors influencing or affecting erosion namely soil characteristics, climate, rainfall intensity and duration, vegetation or other surface cover and topography

6.1 PROBLEMS CAUSED BY EROSION

The most important effect of erosion is the permanent loss of valuable topsoil at a site. If it is not controlled from the onset of a project and through the duration of the project, it will cause a loss of topsoil and can degrade the area permanently. The sediment that is transported by the rain water can end up in surface streams and drainage lines and other water bodies.

6.2 ACTIONS TO STOP OR MINIMISE EROSION ON A SITE

The affected area must be stabilised as soon as possible during or after construction on the area. Preserving of existing vegetation or re-vegetation of disturbed soil as soon as possible after construction is usually the most effective way of controlling erosion.

A vegetation cover acts in the following ways to reduce potential erosion:

- Shielding the soil against the direct impact of rain drops falling on the ground.
- It improves the soil water storage porosity, and more water filters into the ground.
- It slows down runoff so that the sediment can settle on the land.
- It holds the soil in place through the plant root system.

Areas which cannot be re-vegetated must be shaped or changed to effectively slow down the speed of the water over the area or by preventing the water to flow over such an area by diverting it away from the site.

Mechanical ways can also be used to minimise or control erosion on a site.

6.3 PRESERVING OF NATURAL VEGETATION

By preserving natural vegetation, especially grasses, on the site that does not interfere with the construction process, should be left undisturbed or maintained to minimize damage. It will minimise erosion potential and aesthetically is pleasing which beneficial. The more vegetation area that is preserved the less area exposed to erosion. This is important to the areas between the panels where reseeding of the area afterwards is difficult. This should be planned still before the construction activities on site starts. The trees and shrubs in the area between the panels will unfortunately have to be removed.

- Do not grade the area to a “clean” state before constructing the panel supports and panels. Only remove the rocks and vegetation that will be in the way of the panels. The grass cover can be slashed or sprayed with a herbicide to temporarily slow down the regrowth of the grasses during construction.
- Do not let any vehicles drive around in the veld where the panels have to be constructed apart from a few designated driveways. This will prevent the compaction of the soil and the destruction of the vegetation in those areas.

6.3.1 Advantages of preserving natural vegetation

- Can handle higher volumes of storm water runoff than newly seeded areas.
- Does not require time to establish. Increases the filtering capacity because the vegetation and root structure are usually denser in preserved natural vegetation than in newly seeded or base areas
- Enhances aesthetics
- Provides areas for infiltration, reducing the volume and velocity of storm water runoff.
- Usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.

It does however require good planning to be able to preserve natural vegetation.

6.3.2 Planting of new vegetation

It is important to establish permanent vegetation to minimize soil exposure to water and wind erosion. Vegetation/plants that have fibrous root system with fast establishment of roots and ground cover are good options

The grass cover can be sown by hand or machine sowing after scarifying the soil. Keep the planted area moist if possible so that the seeds can germinate quickly.

Do not move over these areas again until a grass cover has been established.

6.3.3 Mulching

Similar to seeding, mulching is a method of applying plant or non-plant materials on the surface of the land to cover bare soil surface. Materials used are grass, hay, woodchips, wood fibres, straw, or gravel that is placed on the soil surface. The main goal of mulching is to protect the surface of the soil from the impact of erosive forces like the falling raindrops. In construction sites, mulch can be placed to minimize wind and water erosion.

However, the type of mulching selection depends on the land (i.e., slope). Heavy and large sized mulch would be more appropriate for a steep slope. In steep or gentle slopes, matting can be done to hold the mulch in place and reduce its movement by wind or water.

When used together with seeding or planting, mulching can aid in plant growth by holding the seeds, fertilizers, and topsoil in place, by helping to retain moisture (conserve moisture), and by insulating against extreme temperatures. If the mulch is plant-based or organic, it also increases the soil fertility. Mulching can provide immediate, effective, and inexpensive erosion control.

6.3.4 Advantages of mulching

- Provides immediate protection to soils that are exposed and that are subject to heavy erosion
- Retains moisture, which may minimize the need for watering
- Requires no removal because of natural deterioration of mulching

6.3.5 Disadvantages of mulching

- It can delay germination of some seeds because cover reduces the soil surface temperature
- Mulch can be easily blown or washed away by runoff if not secured
- Mulch may absorb nutrients necessary for plant growth

6.4 STRUCTURAL MEASURES TO CONTROL EROSION

6.4.1 Berms

Berms can be constructed around a site on especially the upstream side to keep extra water out of the site. This will minimise the volume of water flowing over a site which limits the erosion on the site

Berms can also be constructed on road surfaces with a gradient to slow down the velocity of the water and to divert the water off the road into storm water drains on the site.

6.4.2 Storm water drains

The storm water drains can be packed with rocks on short intervals and at the end to slow down the velocity of the flowing water and to dissipate the energy of the water where it leaves the site.

6.4.3 Gabions

Gabions of wire packed with rocks and lined with geotextile can slow down the water especially where the slope is steep. The geotextiles can also aid in trapping the sediment. This can be used in storm water drains next to roads by installing flat gabions on the drain surface to prevent unnecessary scouring of the soil surface in the drains if it is not constructed of concrete.

6.5 MONITORING OF EROSION ON SITE

During the planning stage of the construction period, the site manager must appoint a person who will be on site for the duration of the construction period. This person will have the responsibility to monitoring the risk of erosion and actual erosion arising from activities on site. His responsibilities must include:

- Monitoring the movements of vehicles and construction equipment on site to ensure that there is minimal movement in the veld areas off the normal roads and agreed drive lanes between the solar PV panels.
- Monitor the preservation of the vegetation in open spaces to ensure the integrity of the vegetation and soil is kept intact.

- Ensure that only the necessary areas are cleared of vegetation according to the site plans
- Ensure that only the planned roads are graded on the site.
- Ensure that gravel roads are kept moist during dry times to prevent the wind from blowing dust away and thus causing erosion in this manner.
- Regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible.
- Monitor any erosion damage after rains events so that repairs to damaged areas can be done before the next rain event.
- Oversee the re-vegetation/mulching of cleared areas as soon that it is possible and to prevent unnecessary re-entry or movement in these areas.

7 MONITORING GUIDE

Construction at solar PV sites will inevitably use equipment and vehicles that contain hazardous substances or which has the potential to spill hazardous substances on the site. There will also be chemicals and other hazardous substances which are used on site, which needs to be stored on site. This creates the potential for possible spillages and the potential that these substances can pollute soil and water systems on site. It needs to be handled with care and strict control needs to be exercised over the handling and use of such substances.

7.1 POSSIBLE SOURCES OF HAZARDOUS SUBSTANCES

The following substances are potentially stored or used on site:

- Most of the construction vehicles and equipment used on site runs on diesel. The diesel is stored either in stationary tanks or in mobile fuel trailers or bowsers on site.
- The oils needed for lubrication of the equipment and vehicles.
- Hydraulic oils used in drills and equipment like cranes, TLB's and graders.
- Paints used on site.
- Petrol cans for supplying fuel to four wheeler motor cycles used on site.
- Other chemicals and detergents used on site.

7.2 MEASURES TO STORE HAZARDOUS SUBSTANCES ON SITE

All hazardous substances on site must be handled in the following ways:

- All access to any of these substances must be controlled access which means that the substances must be locked away.
- All containers or store rooms where these substances are kept must have an impermeable floor and must be able to contain the substance in the room/store where it may be cleaned up.
- Where the floor is not impermeable, the substances will be stored in a drip tray capable of containing any spills from these containers
- Material Safety Data Sheets (MSDS) for the specific substances must be available in a central file and at the place where the substance is stored.
- All substances will only be issued against a signature - records will be kept.
- Stationary diesel tanks will be kept in a concrete bunding able to contain at least 110% of the volume of the tank. The tap to drain storm water inside this bunding must run through an oil/water separator. All oils and fuel from this separator must be taken to an oil recycling company. Keep records of all oil/fuel removed in this way.
- Fuel trailers must be parked either with sufficient drip trays underneath or it must be parked on an area where there is plastic sheeting underneath the soil to prevent ingress of the fuel/oil into the subsoil or groundwater. Polluted soil has to be removed from time to time to a site registered to accept this material.

7.3 HANDLING OF SPILLS

7.3.1 Small spills on the ground

- Pick up the soil to a depth where it is clean from the substance and store it in a closed container from where it cannot leak and closed to rain.
- Have this soils removed by a registered contractor and keep records of volumes and details of each removal.

7.3.2 Large spills on the ground

- Keep spill kits available on site.
- Contain the spill by either using a spill absorbent sock from the spill kit or by making a soil berm around the spill.
- Scoop or pump out as much as possible of the pollutant into a closed container.
- Remove the polluted soil to a depth below the pollutant and place on a large sail to prevent any leaching of the pollutant to the soil and groundwater.
- Close the sails to prevent the ingress rainwater.
- Have the soil removed from site by a company registered to do that to a permitted waste site or let the company treat the soil on site until the pollutants levels are low enough to dispose of the soil on site again.
- If there is any possibility that there is pollution of groundwater or surface water, samples have to be taken to be analysed to ensure that pollution can be treated if necessary.

7.4 TRANSPORTATION OF HAZARDOUS SUBSTANCES

- It is the responsibility of the transportation company to train their drivers and crews to handle the packaging and transportation of hazardous substances safely and environmentally responsible.
- All vehicles transporting hazardous substances to the PV solar site must carry spill response kits as first line treatment of spillages of hazardous substances from their freight.
- Material Safety Data Sheets (MSDS) for the specific substances transported must be available in the vehicle used for the transportation of the substances.

7.5 TRAINING OF STAFF

- All staff working on site and responsible for a specific area must be trained in the detection of incidents, and the reporting there-of.
- All staff on site must be trained in the using of the spill response kit.
- All staff must be trained in the using of MSDS's and first aid kits should it be necessary during any spill incident.
- The staff must undergo an environmental consciousness course.

7.6 GENERAL

All spill incidents must be reported to the environmental control officer who must then report it to the authorities as required by law.

Each pollution incident must be entered into a register on site. All details about the spill, the emergency measures taken and the clean-up done must also be part of the entry in the register. Preventative measures must be drawn up to prevent recurring of the incident.

The incident register must be available for scrutiny by IAP's should it be requested.

8 OPEN SPACE MANAGEMENT PLAN

Open space is any open piece of land that is undeveloped (has no buildings or other built structures) and is accessible to the public. Open space can include: green space (land that is partly or completely covered with grass, trees, shrubs, or other vegetation). In the case of the solar PV plant, the space is defined as green space as it is usually covered by vegetation, but it is not accessible by the public.

In the development of a solar PV plant a large proportion of the site will remain in a natural to near-natural condition. Also, a large proportion of the areas disturbed during the construction phase will be re-vegetated with locally-occurring species. There must not be a long term negative impact on the local environment.

8.1 RISKS AND MANAGEMENT ON SITE

The open spaces present certain risks to the site and have to be operated and maintained for the safe and effective operation of the facility.

8.2 FIRE RISK ON SITE

The vegetation on the site and specifically on the open areas needs to be managed to have a low fire risk.

- Tall woody plants will have to be cut on a regular basis and removed to minimise the fire risk.
- The grass cover will also have to be kept short to minimise the fire risk.
- NO fires will be allowed within the site.
- Fire breaks will have to be maintained. The roads network in the solar facility must be planned to act as fire breaks.

8.3 EROSION RISK ON SITE

An open area where vegetation is removed during construction is prone to erosion by wind or by water. Erosion has to be prevented and minimised as far as possible.

- Demarcate clearance areas and minimise surface disturbance. Do not remove vegetation on areas where panels will not be constructed and which will be used as open spaces.
- Rehabilitate cleared sites as soon as possible.
- Minimise erosion risks. Do not drive in areas designated as open spaces except on roads constructed for driving.
- Monitor the site regularly for erosion especially after rain events.
- Follow the measures in the erosion management plan.
- Implement dust suppression measures.

8.4 ALIEN VEGETATION

Open areas can get infested by alien invasive plants as the plants can spread easily in an area in different ways. Open areas as well as the areas between the panels need to be regularly monitored for alien invasive vegetation and this vegetation must be controlled at a young stage according to the alien invasive management plan.

8.5 LITTERING

There is the risk that an open space can get polluted by littering which could come from workers inside the site or which can be windblown from outside the site. Control littering through good housekeeping and by minimising waste on site.

8.6 SUMMARY

Soil is a very valuable resource that needs to be conserved. Construction site managers need to plan well and make sure that measures are in place for managing the impacts of the construction process on aspects like erosion.

Conserving the soil on a construction site is far less expensive than mitigation of the damage afterwards. It is also far more efficient to maintain existing vegetation cover to limit erosion than planting of new vegetation on the site afterwards.

All pollution incidents, especially with regard to leakages or spillages of hazardous substances, are important and should be reported and investigated to prevent recurrence of such incidents. It is the duty of each worker and staff member to take the responsibility to monitor their work surroundings for spill incidents and to report it should it happen. This will ensure continual improvement in the environmental performance of the construction and operations teams on the site

Open spaces should be kept clean and well managed so that it forms part of the visual appeal of the site. It should be managed in such a way as to preserve biological integrity of the site as well as to limit fire risk on the site.

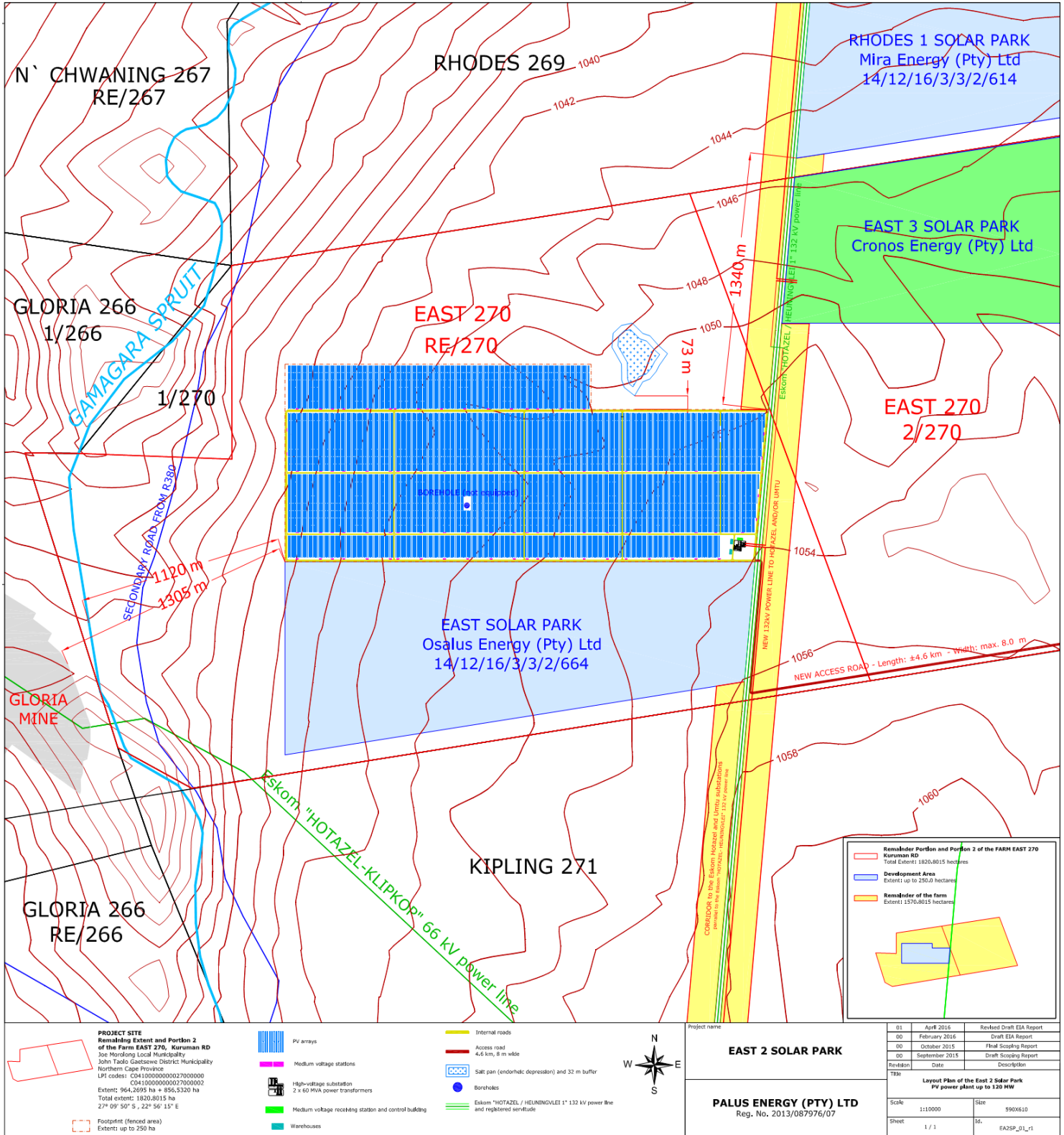


Figure 1: Proposed Layout plan of the East 2 Solar Park

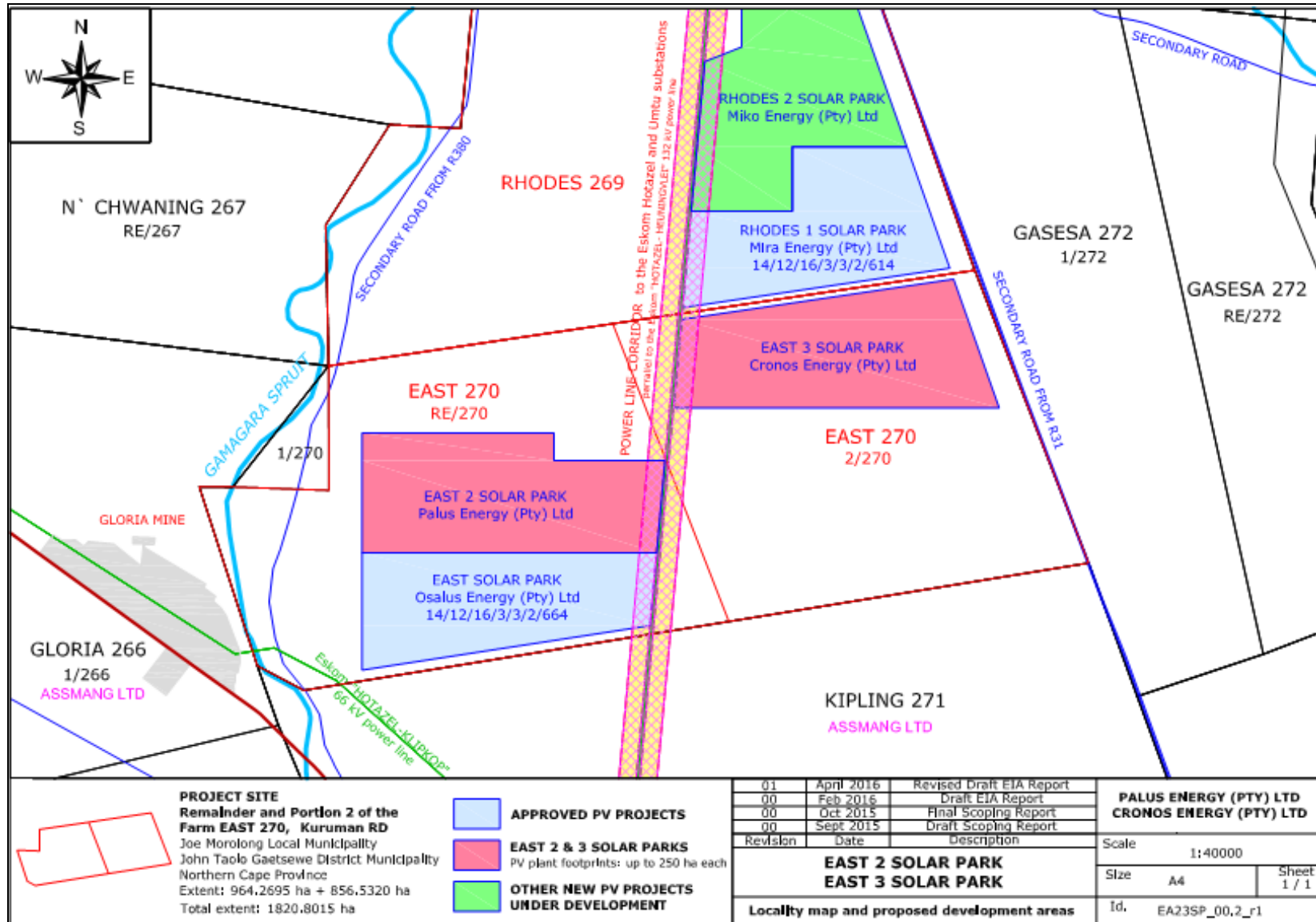


Figure 2: Proposed Developable Area of the East 2 Solar Park

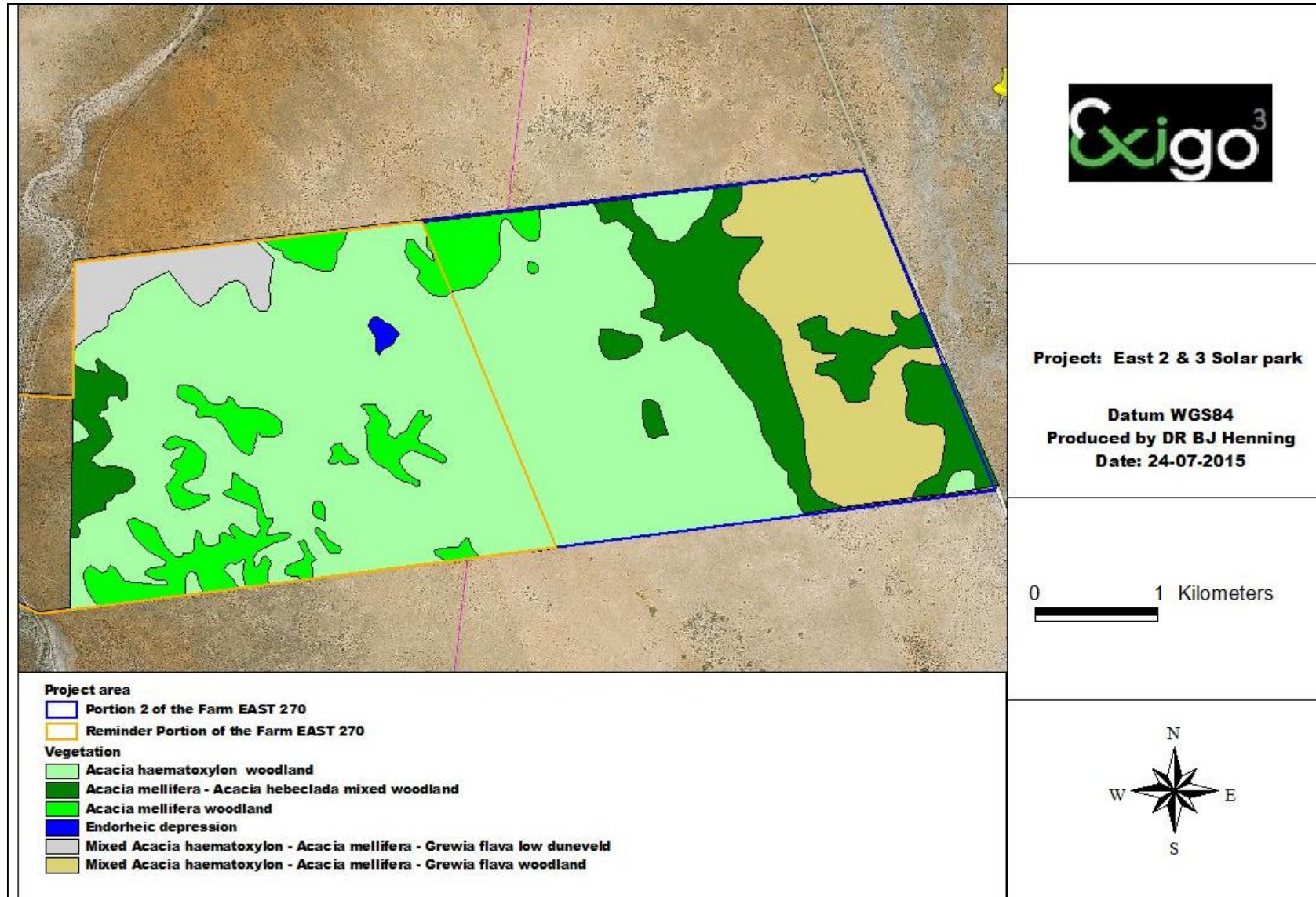


Figure 3: Vegetation Map of the project site

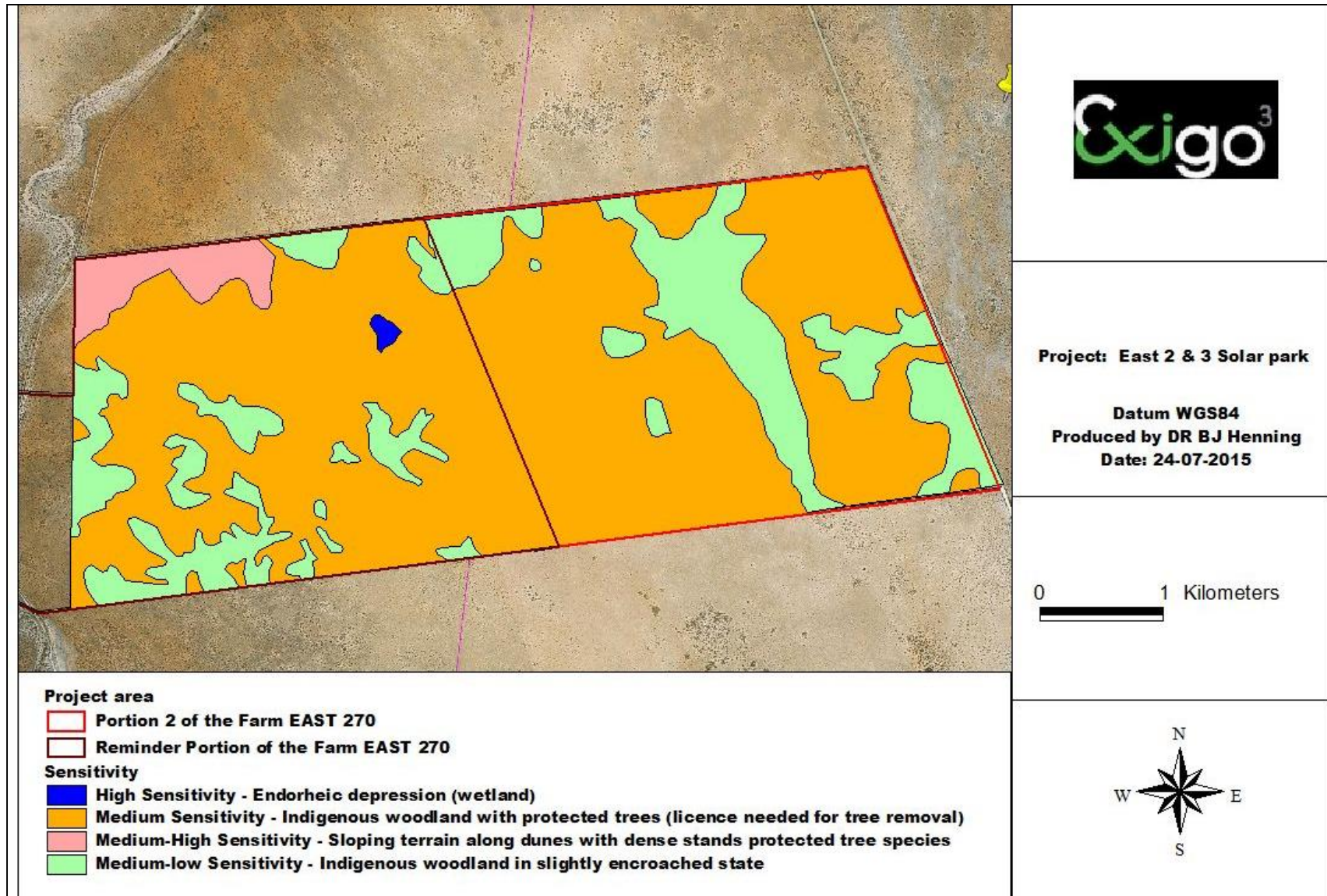


Figure 4: Sensitivity Map of the project site

ENVIRONMENTAL MANAGEMENT PROGRAMME

9 ENVIRONMENTAL MANAGEMENT PROGRAMME - PV POWER PLANT AND CONNECTION INFRASTRUCTURE

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE			
Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Environmental Aspects:			
Air quality			
Earthworks and vegetation clearance by construction vehicles and equipment	Air Pollution by excessive dust formation	<ul style="list-style-type: none"> Construction areas can be damped to prevent excessive dust formation. Clearing of the construction sites should be done in phases as the construction progresses. Cleared topsoil should be stockpiled in such a way that transportation by wind or rain is limited. This can be done by e.g. restricting the height of stockpiles, covering it and/or sandbagging. 	Contractors
Movement of vehicles and construction equipment on site	Air pollution caused by excessive smoke and fumes	<ul style="list-style-type: none"> Vehicles and construction equipment must be well serviced so that it does not produce excessive smoke and noise. Contractors must comply with all noise regulations. The construction machinery must be fitted with noise mufflers and maintained properly. 	Contractors
	Air Pollution by excessive dust formation	<ul style="list-style-type: none"> It should be ensured that the construction personnel comply with speed restriction of between 10-20 km per hour within the site boundaries to reduce the generation of dust and noise. Gravel roads must be dampened to prevent excessive dust formation, especially during the winter months. Internal roads must be maintained on a regular basis during construction. Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an ongoing basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation 	Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
<p>Burning of waste and cleared vegetation The use of fires for cooking and heating at the construction site</p>	<p>Air pollution by excessive smoke</p>	<ul style="list-style-type: none"> • Solid waste generated by the construction teams may not be burned on site or the surrounding areas. Solid waste should be kept in animal proof bins from where they will be removed to the Joe Morolong Municipality's landfill site on a regular basis e.g. weekly. • Cleared vegetation waste may not be burned on site, but removed to various recycling stations in the Joe Morolong Municipality on a regular basis. No open fires are allowed at construction sites. Fires for cooking should be restricted to <i>designated</i> areas, extra care should be taken to ensure to prevent veld fires from occurring. Fire belts must be made around the development according to the regulations of the Veld and Forest Fire Act. • A waste management and recycling plan should be compiled for the construction phase of the development. The aim of the plan should be to ensure that the construction materials/debris generated on site be <u>reduced, reused and recycled</u>. This plan should be compiled in consultation with the contractors and engineers. 	<p>Contractors & Engineers</p>
Noise			
<p>Operation of construction vehicles and equipment</p>	<p>Disturbance & nuisance to surrounding properties</p>	<ul style="list-style-type: none"> • Contractors must comply with all noise regulations .It should be ensured that the construction personnel comply with speed restriction of between 10-20 km per hour within the site boundaries to reduce the generation of dust and noise. • Construction vehicles are to be serviced on a regular basis to ensure that they do not make excessive noise. The construction machinery must be fitted with noise mufflers and be maintained properly. • Construction of the PV plant and its connection should only take place between sunrise and sunset from Monday to Saturday. No construction activities should be allowed to take place on Sunday, unless an agreement has been reached with the surrounding properties' owners. 	<p>Contractors</p>
• Water quality			
<p>Sanitation seepage and spillage from temporary chemical toilets</p>	<p>Biological pollution of freshwater resources Impact on the health of humans & bio-diversity</p>	<ul style="list-style-type: none"> • Chemical sanitation facilities should be used on site and regularly serviced by registered companies to ensure that no spills or leaks from toilets to groundwater or surface water take place. • Chemical sanitation facilities should not be positioned closer than 100m from surface water resources. The ratio of one toilet for every 15 workers on site should be maintained. • The temporary sanitation system should be regularly inspected to ensure that no spills or leaks from sanitation system to groundwater take place. 	<p>Contractors</p>

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Leakage of oil from the power transformers of the on-site HV substation	Chemical pollution of freshwater resources Impact on the health of humans & bio-diversity	<ul style="list-style-type: none"> • The on-site HV substation and switching station should be built according to the Eskom standards and guidelines. • According to the <i>Eskom Oil Clean-Up And Rehabilitation Standards</i>, the containment of a spillage should involve an action that will either prevent or stop a spill from spreading. It is vital to prevent any oil spill from entering the development site's storm-water systems. • Containment of oil pollution can be done using one or more of the following: <ul style="list-style-type: none"> ▪ soil barriers; ▪ sand bags; ▪ bund walls; and ▪ absorbent materials • Polluted soils must be removed to a waste site where it is authorized to be disposed of. 	Contractors
Spillage of fuel and lubricants from construction vehicles	Chemical pollution of freshwater resources Impact on the health of humans & bio-diversity	<ul style="list-style-type: none"> • Construction vehicles should be serviced on a regular basis to prevent or minimize the risk of spills or leakages. • All construction vehicles should be inspected for oil and fuel leaks regularly and frequently. • Vehicles must be parked with spill pans underneath the vehicles • Water falling on areas polluted with oil/diesel or other hazardous substances must be contained. Any excess or waste material or chemicals should be removed from the site and discarded in an environmental friendly way. • Vehicle maintenance will not be done on site except in emergency situations in which case mobile drip trays will be used to capture any spills. 	Contractors
Spillages and leaks from temporary fuel tanks and construction activities (e.g. mixing of concrete, cement, paints etc.).	Surface groundwater contamination &	<ul style="list-style-type: none"> • Drip pans should be used during re-fueling and servicing of construction vehicles. Used parts like filters should be contained and disposed of at a site licensed for dumping of these products. Drip pans must be placed underneath stationary vehicles and equipment. Used or spilled oil should be taken to the nearest oil refinery or recycling plant. • The temporary vehicle maintenance yard and storage area should be fenced off. Diesel storage must be less than 80000 litres at construction camps. A bund wall should be constructed around the fuel tank structures to contain at least 110% of the tank capacity and the run-off diverted to a conservancy tank. Spilled fuel should be disposed of at the nearest approved fuel recycling collection point. Alternatively drip pans can be placed underneath temporary fuel tanks. • All construction vehicles should be inspected for oil and fuel leaks regularly 	Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
		<ul style="list-style-type: none"> Mixing of cement, concrete, paints etc. must be done at designated areas within concrete aprons or on protected plastic linings to contain any possible spillages into surface or groundwater resources. Accidental spillages must be contained and cleaned up promptly according to an applicable procedure as determined by a plan of action for the specific type of disturbance Spill kits should be on-hand to deal with spills immediately Spillages or leakages must be treated according to an applicable procedure as determined by a plan of action for the specific type of disturbance 	
Storage and disposal of waste and littering on site	Pollution of freshwater resources Impact on the health of humans & bio-diversity	<ul style="list-style-type: none"> Solid waste generated by the construction teams may not be burned on site or the surrounding areas. Solid waste should be kept in animal proof bins at the construction camp and construction sites and be removed to the Joe Morolong Municipality's landfill site on a regular basis. Building rubble should be removed to the Joe Morolong Municipality's landfill site as the development progresses. A comprehensive waste and recycling management plan should be compiled for the construction phase. The aim of the plan should be to ensure that the construction materials/debris generated on site be <u>reduced, reused and recycled</u>. This plan should be compiled in consultation with the contractors and engineers. Regular clean-up programs should be put into effect throughout the premises to limit the impact of littering caused by construction activities. 	Contractors & Engineers
Storage of chemicals	Water pollution	<ul style="list-style-type: none"> Chemicals should be stored on an impervious surface protected from rainfall and storm water run-off. It should be locked away. 	Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Storm water run-off over cleared areas and roads	Increased turbidity and decrease in water quality	<ul style="list-style-type: none"> • Clearance of vegetation should be restricted to the proposed 250 ha footprint and to the new section of access road. Construction activities should be restricted to the proposed 250 ha footprint. • The sand dunes located on the western side of the project site (close to the Gamagara Spruit) should remain undeveloped - in compliance with the requirements highlighted in the Geo-technical and Geo-hydrological Study (Annexure I). • The small pan (endorheic depression) on the north-eastern side of the Remainder of East 270 should be avoided; a 32 m buffer zone must be preserved around pan boundary. • Cleared areas should be rehabilitated by reintroducing a grass layer as soon as possible to limit the occurrence of erosion. • Slopes produced by removing of soil must be kept to a minimum to reduce the chances of erosion damage to the area. Trenches for pipes or cables will be constructed following the shortest and the most efficient possible route in order to connect all the plant components (PV strings, MV stations, HV substation, etc.), where possible the construction of these trenches will be dug next to the roads where it will have the smallest impact. Any trenches that are dug for the supply of services to the various buildings of the PV plant must be filled up and compacted well and slightly higher than the areas around it. This would allow for settling of the soil without trenches or erosion gullies forming again. 	Contractors
The use of herbicides to control exotic invasive vegetation species	Pollution of freshwater resources Impact on human & bio-diversity health	<ul style="list-style-type: none"> • Eradication and rehabilitation plan compiled for the exotic invasive plant species present on site should be followed. If needed, contact the ecologist (author of documents). • The use of eco-friendly products to control pests / vermin and invasive plants should be promoted and an ecologist be consulted before use. 	Contractors, Developer and Ecologist
Water quantity			
Construction activities and dust abatement along internal roads and at construction sites	Depletion of groundwater resources	<ul style="list-style-type: none"> • Water should be used sparingly and it should be ensured that no water is wasted. • Roads should be treated with dust abatement chemicals to reduce the use of water. • Washing of construction vehicles should be limited to once or twice a month and must be done with high pressure sprayers to reduce water consumption. • Water tanks should be regularly inspected to ensure that no leaks occur. 	Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Water use by exotic invasive plant species	Depletion of surface and groundwater water resources	<ul style="list-style-type: none"> Current exotic weed species should be eradicated, increasing water seepage towards the surface and groundwater resources. 	Contractors
Ecology (Fauna and Flora)			
Earthworks and vegetation clearance	Loss of indigenous plant species & disturbance to sensitive habitat	<ul style="list-style-type: none"> The herbaceous layer should not be cleared prior to the construction of the plant but slashed. Once erected, the herbaceous layer could be kept short through slashing, which will also allow grazing in the area by small livestock and game species Clearance of vegetation should be restricted to the proposed 250 ha footprint and to the new section of access road. Construction activities should be restricted to the proposed 250 ha footprint. All bare areas should be ripped/scarified after construction The sand dunes located on the western side of the project site (close to the Gamagara Spruit) should remain undeveloped - in compliance with the requirements highlighted in the Geo-technical and Geo-hydrological Study (Annexure I). The small pan (endorheic depression) found on the north-eastern side of the Remainder Portion of East 270 should be avoided; a 32 m buffer zone must be preserved around the pan boundary, as indicated in the Wetland Delineation Study (Annexure G). During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. Construction activities must remain within defined construction areas and the road servitudes. No construction / disturbance must occur outside these areas Care must be taken that unnecessary clearance of natural vegetation does not take place. Restrict it to the footprint area. Cleared areas should be re-vegetated allowing a grass layer to re-establish as soon as possible to limit erosion. Unnecessary driving around in the veld or bulldozing natural habitat must not take place. The herbaceous layer should be revived after clearance of the vegetation and actively managed through slashing during the entire lifetime of the project to help prevent fires in the panel area. Trenches pose a risk to ground-living animals and must be cordoned off and backfilled as soon as possible during construction to prevent animals from falling into the trenches 	Developer & Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
		<ul style="list-style-type: none"> The areas close to the western boundary of the property, affected by the Gamagara Spruit, must be avoided. A monitoring plan is recommended for the construction phase to ensure minimal impact to the Fauna and Flora of the area. Permits must be obtained from the Department of Agriculture, Forestry & Fisheries (DAFF) and Northern Cape authorities prior to the removal of protected tree species and plant species (if any) stipulated in the NCNCA. Permits should be kept on site. The protected tree species <i>Acacia haematoxylon</i> (Grey camel thorn) and <i>Acacia erioloba</i> (Camel thorn) were found across the project site. No protected trees should be removed without authorisation from DAFF. Project must comply with the Northern Cape Nature Conservation Act (Act No. 9 of 2009). The stockpiled topsoil and construction material should be managed in such a way that the material is not transported by wind or rain. This can be done by restricting the height of the stockpiles, sandbagging and avoiding steep slopes. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation Staff that will stay on site should be accommodated in one location of the site to ensure that the impact will be minimal on the larger area. 	
Vegetation clearance and the use of herbicides to control re-growth	Eradication & control of exotic invasive plant species Loss of indigenous plant species	<ul style="list-style-type: none"> Herbicides used to control the invasive plant species should be chosen in consultation with an ecologist, as some of the agents might be detrimental to the surrounding indigenous fauna and flora e.g. Round up is extremely toxic to frogs. Exotic and invasive plants should be eradicated as the construction progresses. Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds Strict control over materials brought onto site, which should be inspected for potential invasive invertebrate species and steps taken to eradicate these before transport to site. Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented The ECO should regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals 	Developer & Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Materials brought onto site	Spreading of invasive animal species	<ul style="list-style-type: none"> • Strict control over materials brought onto site, which should be inspected for invasive invertebrate species and steps taken to eradicate these before transport to the site • Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented • The ECO should regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals 	Developer & Contractors
Impact on avifauna population	Death of birds due to collision or electrocution	<ul style="list-style-type: none"> • The impact of collision of birds should be mitigated by placing the on-site high voltage substation close to the existing and planned Eskom's high-voltage power lines. • The high-risk sections of the power line should be marked with a suitable anti-collision marking device on the earth wire as per the Eskom guidelines. • The possibility of putting up owl boxes and perches to prevent owls and other birds from perching on solar panels should be investigated. • Apply perch managing techniques such as conspicuous objects and support roosting sites along the power line that would allow large raptors and bustards to safely roost. • Lighting of the solar farm (for example security lights) should be kept to a minimum. Lights should be directed downwards to prevent night birds such as owls from becoming confused during flight and colliding with solar panels and infrastructure 	Developer & Contractors
Control of animals on site. Killing, poisoning or hunting of animals	Loss of indigenous fauna to the area	<ul style="list-style-type: none"> • No animals may be killed, captured or hunted or fed on site by construction workers. No poison should be used to control any animals without the input of an ecologist/zoologist. • Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and being trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction process. • Animals like small mammals, reptiles and birds encountered during rehabilitation operations should be captured or moved by a specialist and released in a safe area. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist • Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife • No pets must be allowed on the site 	Developer & Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Construction of roads with a kerb	Fragmentation of available habitat & restriction of movement of small mammals, reptiles and amphibians	<ul style="list-style-type: none"> The internal roads should be constructed without a kerb or with an angle of approximately 45°. This will allow for the free movement of small faunal species throughout the development area. Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance Use existing facilities (e.g., access roads, degraded areas) to the extent possible to minimize the amount of new disturbance During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts. 	Contractors & Developer
Increase in traffic on the site	Increase in road kills (e.g. small mammals, reptiles and amphibians).	<ul style="list-style-type: none"> The speed of construction vehicles on the internal roads should be kept as low as possible (10-20 km/h) to reduce the incidence of road kill. Use existing roads to minimise new disturbance in the area Construction activities must remain within defined construction areas and the road servitudes. 	Contractor
Occurrence of veld fires on site	Destruction of flora/habitats Loss of indigenous fauna	<ul style="list-style-type: none"> The cleared vegetation may not be burned on site. The cleared vegetation should be stockpiled and taken to closest available landfill site. The grass cover along the boundary fences of the adjacent properties should be kept short (30 cm) in order to minimise the fire hazards; Educate construction workers regarding risks and correct disposal of cigarettes Fires should only be allowed in designated places within the construction camp and extra care should be taken to prevent veld fires from occurring. Firebreaks should comply with the National Veld and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks). A fire hydrant system should be designed and installed Staff must be trained in the speedy combat of any veld fire occurring in the area 	Contractors & Developer

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Littering (e.g. cans & plastics) along access road & at construction sites	Disturbance & nuisance to surrounding properties /death of indigenous fauna	<ul style="list-style-type: none"> • Solid waste must be kept in adequate animal proof waste bins at the construction camp and construction sites. • Building rubble and various wastes should be removed on a regular basis to the Joe Morolong Municipality's landfill site. A recycling program must be designed in order to minimise production of solid waste (e.g. organic waste will be made into compost, the rest will be sorted and taken to various recycling stations in the Joe Morolong Municipality). • Regular clean-up programs should be put into effect along the access road and throughout the premises to limit the impact of littering caused by construction activities. • Build a fenced waste sorting and transfer site at the construction area so that the waste handling can be centralized and controlled. 	Developer
Geology, Soils and Wetlands			
Leaks or spills construction vehicles and temporary fuel tanks	Contamination of topsoil	<ul style="list-style-type: none"> • Construction vehicles must be well serviced and maintained regularly to prevent oil and fuel leaks. Vehicle maintenance will not be done on site except in emergency situations in which case mobile. Used parts like filters should be contained and disposed of at a site licensed for dumping of these waste products. Drip pans should be used when re-fueling and servicing construction vehicles or equipment. Drip pans must also be placed underneath stationary construction vehicles and equipment. Used or spilled oil should be taken to the nearest oil refiner or recycling plant for recycling. • The temporary vehicle maintenance yard and storage area should be fenced off. Diesel storage must be less than 80 000 litres at construction camps. A bund wall should be constructed around the fuel tank structures and the run-off diverted to a conservancy tank. The spilled fuel should be disposed of at the nearest approved fuel recycling collection point. Alternatively drip pans can be placed underneath temporary fuel tanks. • Prevent spillage of fuel or oil onto the soil, and put in place measures to ensure that any accidental spillages can be contained and cleaned up promptly • Spill kits should be on-hand to deal with spills immediately • All construction vehicles should be inspected for oil and fuel leaks regularly. 	Contractors
Leakage of oil from the power transformers of the on-site HV substation	Contamination of topsoil	<ul style="list-style-type: none"> • The on-site HV substation and switching station should be built according to the Eskom standards and guidelines. • According to the <i>Eskom Oil Clean-Up And Rehabilitation Standards</i>, the containment of spillage should involve an action that will either prevent or stop a spill from spreading. It is vital to prevent any oil spill from entering the storm water system. 	Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
		<ul style="list-style-type: none"> Containment of the oil near the source will minimize pollution and will enable easy clean-up and/or remediation. This shall be done using soil barriers; sand bags; bund walls; and/or absorbent materials. Polluted soils must be removed to a waste site where it is authorized to be disposed of. 	
Spillage from temporary chemical toilets	Contamination of soils	<ul style="list-style-type: none"> Chemical sanitation facilities should be used on site and regularly serviced by registered companies to ensure that no spills or leaks from toilets to groundwater or surface water take place. The ratio of one toilet for every 15 workers on site should be maintained. The temporary sanitation system in the construction site should be regularly inspected to ensure that no spills or leaks from sanitation system to groundwater take place. The toilets must be emptied on a regular cycle by a company registered to do it. 	Contractors
Storage and disposal of building rubble, waste and littering on site	Soil pollution and nuisance	<ul style="list-style-type: none"> Solid waste must be kept in adequate animal-proof waste bins at the construction camp and at the construction sites. Building rubble and waste should be removed on a regular basis to the Joe Morolong Municipality's landfill site. A comprehensive waste management plan should be compiled for the construction phase of the development. The aim of the plan will be to ensure that the construction materials/debris generated on site be <u>reduced, reused and recycled</u>. Regular clean-up programs should be put into effect throughout the premises to limit the impact of littering caused by construction activities. Build a fenced waste sorting and transfer site at the construction area so that the waste handling can be centralized and controlled. 	Contractors & Developer
Storage of chemicals/fuels on site	Soil pollution	<ul style="list-style-type: none"> Chemicals to be stored on an impervious surface protected from rainfall and storm water run-off. It should be locked away. 	Contractors
Excavation for cabling and pipes laying	Soil degradation/erosion	<ul style="list-style-type: none"> Trenches for pipes or cables will be constructed following the shortest and most efficient possible route in order to connect all the plant components (PV strings, MV substations, HV substation, etc.), where possible the construction of this trenches will be dug next to the roads where it will have the smallest impact. Any trenches that are dug for the supply of services to the different buildings of the PV plant must be filled up and compacted well and slightly higher than the areas around it. This would allow for settling of the soil without trenches or erosion gullies forming again. Repair erosion damage as soon as possible, no later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth 	Engineers & Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
		<ul style="list-style-type: none"> Sufficient drainage should be provided along access roads to prevent erosion and pollution of adjacent watercourses or wetlands 	
Handling of soils	Soil compaction	<ul style="list-style-type: none"> Soil should be handled when dry during removal and placement to reduce the risk of compaction During construction, sensitive soils with high risk of compaction (e.g. clayey soils) must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts Topsoil should not be compacted in any way, nor should any object be placed or stockpiled upon it. Stockpile topsoil for the minimum time period possible i.e. strip just before the relevant activity commences and replace as soon as it is completed. Stockpile topsoil separately from subsoil. Stockpile in an area that is protected from storm water runoff and wind. Topsoil stockpiles should not exceed 2.0 m in height and should be protected by a mulch cover where possible. Maintain topsoil stockpiles in a weed free condition. Topsoil must only be used for rehabilitation purposes and not for any other use example the construction of roads. Rip and/or scarify all disturbed areas, including roads that are no longer in use (preferably before the rainy season). Do not rip and/or scarify areas under wet conditions, as the soil will not loosen. Compacted soil can also be decompacted by “Rotary Decompactors” to effectively aerate soils for vegetation establishment. 	Contractor

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Increase in storm water run-off	Soil degradation/erosion and ponding of water along the lower lying areas	<ul style="list-style-type: none"> • Cleared areas should be re-vegetated allowing a grass layer to re-establish as soon as possible to limit erosion. • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Ensure the amount of bare soil exposed is minimized by staging earthworks in phases and leaving as much ground cover intact as possible during construction • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Develop and implement stringent erosion and dust control practices. • Avoid over-wetting, saturation and unnecessary run-off during dust control activities and irrigation. • Retain natural indigenous grass and shrubs and re-vegetate bare areas as soon as possible. • The clearing of the site should be done in phases as the construction progresses. An efficient erosion control and slope-stabilizing program should be designed and implemented along the steep slopes of the site to reduce the risk of erosion. • Conservation of topsoil should be prioritized on site • Maintain topsoil stockpiles in a weed free condition. • Institute a storm water management plan • Sufficient drainage should be provided along access roads to prevent erosion and pollution of adjacent watercourses or wetlands • Have both temporary (during construction) and permanent erosion control plans. • Slopes produced by removing of soil must be kept to a minimum to reduce the chances of erosion damage to the area. • Topsoil must only be used for rehabilitation purposes and not for any other use example the construction of roads. • Erosion control netting or matting (GeoJute or Bio-Jute) may be utilised on steep slopes to assist with soil retention, weed control and vegetation establishment. • Previously excavated areas on the site should be backfilled with suitable topsoil, levelled to resemble the surrounding topography and slopes and scarified for re-vegetation/re-seeding. 	Engineers, Contractors and Developer
Geo-technical characteristics of soils at	Damage to structures and	<ul style="list-style-type: none"> • The recommendations with regard to the geo-technical characteristics of the underlying soils should be adhered to. 	Developer, Contractors and

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
sites	infrastructure	<ul style="list-style-type: none"> The sand dunes located on the western side of the project site (close to the Gamagara Spruit) should remain undeveloped - in compliance with the requirements highlighted in the Geo-technical and Geo-hydrological Study (Annexure I). It is proposed that a more detailed and extensive engineering geological investigation than the one already done, be conducted in order to determine the precise geo-technical character with regard to the design and the construction of the access road, the foundations of the buildings (including the MV stations and HV substation) and the foundation of the modules mounting systems, and the suitability of the underlying soil material as construction materials. 	Engineers
Development and construction activities within the wetlands	Wetlands degradation	<ul style="list-style-type: none"> The areas close to the western boundary of the property, affected by the Gamagara Spruit, must be avoided. Peripheral impacts should be avoided and subsequently the construction activities should be undertaken far away from the related riparian habitat. The small pan (endorheic depression) found on the north-eastern side of the Remainder Portion of East 270 should be avoided; a 32 m buffer zone should be preserved around the pan boundary, as indicated in the Wetland Delineation Study (Annexure G) 	Developer, Contractors and Engineers
Environmental Aspects:			
Social, Visual and Heritage			
Earth moving and soil clearance	Destruction of archaeological and heritage remains	<ul style="list-style-type: none"> Care must be taken during the construction process that anything of archaeological value that is unearthed must be recorded and the archaeologist, SAHRA informed of the discovery. 	Developer and Archaeologist
Construction activities	Loss or injury to human life	<ul style="list-style-type: none"> The Contractor shall conform to all the stipulations of the Occupational Health and Safety act (Act 85 of 1993) and any Regulation applicable at the time of starting of construction. The Act requires the designation of a Health and Safety representative when more than 20 employees are employed. 	Developer and Contractors
Construction activities	Nuisance to people	<ul style="list-style-type: none"> Construction activities must be restricted to working hours Monday to Saturday, unless otherwise approved by the appropriate competent person in consultation with the affected residents. 	Developer and Contractors
Unauthorized entrance to construction areas and construction workers staying overnight at construction site	Elevated crime levels	<ul style="list-style-type: none"> Only key construction workers and security personnel will be allowed to overnight on site. Proper access control (I.D. cards) should be enforced at the entrance gate to ensure that no unauthorised persons enter the site. Security personnel should be appointed to enforce strict access control. Transportation should be pre-arranged for the construction worker to ensure that the workers from the surrounding local communities have daily transportation available to and 	Developer & Contractors

9.1 CONSTRUCTION PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
		<p>from the site.</p> <ul style="list-style-type: none"> • A boundary fence can be constructed around the site, which will act as a security barrier. A temporary fence should be erected around the construction camp and storage area. • Security lights and where possible infra-red video surveillance will be installed at the construction camp and storage area in such a manner that it does not become a nuisance to the surrounding properties. 	
Occurrence of veld fires caused by the negligence of construction workers	Loss of human life and construction equipment etc.	<ul style="list-style-type: none"> • It must be ensured that the development complies with the requirements of the National Veld and Forest Fire Act, 1998 (Chapter 2: Fire Protection Associations and Chapter 4: Duty to Prepare and maintain firebreaks). • The construction workers should be educated about the risk of fires in the area and how to prevent them. No solid waste or vegetation may be burnt on the premises or surrounding areas. • No fires will be allowed outside designated areas (construction camp). 	Developer & Contractors
Construction activities and temporary structures	Visual disturbance	<ul style="list-style-type: none"> • Earth works should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed components are exposed. In all other areas, the natural occurring vegetation, more importantly the indigenous vegetation should be retained. • The materials and colours used in the construction of structures and infrastructure should give preference to natural and eco-friendly choices, if possible to minimize the visual impact on the aesthetic character of the surrounding area. 	Developer & Contractors
Security lights	Visual disturbance and nuisance	<ul style="list-style-type: none"> • The security lights at the temporary maintenance yard and storage area should shine directly down and directed towards the site away from the surrounding properties. • A video-surveillance system using infrared or microwave video cameras, which do not need a switched on lighting system, is recommended. <p>Adherence to the Visual Impact Assessment mitigation measures.</p>	Developer & Contractors
Long and short-term Employment of workers	Direct & indirect Job creation. Skills development of local workforce. Local & regional Economic growth.	<ul style="list-style-type: none"> • Adherence to the Local and District Municipality's guidelines, principles and policies is imperative. • During the construction and operational phases, jobs must be created for unemployed local people and skills must be transferred to them. Where viable, the work must be executed in a labour intensive manner to create as many jobs possible. 	Developer & Contractors

9.2 OPERATIONAL PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Environmental Aspects:			
Air quality			
Burning of vegetation refuse and solid waste	Air pollution by excessive smoke and dust	<ul style="list-style-type: none"> A recycling management plan should be compiled for the proposed development. This plan should focus on reducing, recycling and reusing the waste generated during operation. Vegetation refuse should be composted if possible and re-used. The solid waste or vegetation refuse may not be burned on site. Speed of vehicles along the internal roads of the development should be controlled e.g. speed bumps and speed restrictions (10-20 km/h). This will reduce the dust levels associated with the vehicle movement 	Developer
Noise			
Increase in vehicle movement along access roads & internal roads	Disturbance and nuisance to surrounding properties	<ul style="list-style-type: none"> Speed of vehicles along the internal roads of the development should be controlled e.g. speed bumps and speed restrictions (10-20 km/h). This will reduce the noise levels associated with the vehicle movement 	Developer
Water quality			
Disposal and storage of waste	Pollution of freshwater resources. Impact on the health of humans and bio-diversity	<ul style="list-style-type: none"> Solid waste or vegetation refuse may not be burned on site. Solid waste may not be disposed or stored in areas other than designated waste disposal areas e.g. waste disposal bins. The Developer should collect and dispose of the waste to the Joe Morolong Municipality's landfill site on a weekly basis. A comprehensive waste and recycling management plan should be compiled for the proposed development. This plan should focus on reducing, recycling and reusing the waste generated during operation. 	Developer
Leakage of oil from the power transformers of the on-site HV substation	Pollution of freshwater resources. Impact on the health of humans and bio-diversity	<ul style="list-style-type: none"> The on-site HV substation and switching station must be monitored for spills and any spills must be contained, cleaned and rehabilitated immediately. Any leaking containers shall be repaired or removed from site. All maintenance work must be done in terms of the Occupational Health and Safety Act (Act No.85 of 1993). Polluted soils must be removed to a waste site where it is authorized. 	Developer

9.2 OPERATIONAL PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Leaks from the permanent sewerage system	Biological pollution of freshwater resources Impact on the health of humans & bio-diversity	<ul style="list-style-type: none"> The permanent sanitation system should be regularly inspected to ensure that no spills or leaks from sanitation system to groundwater take place. 	Developer
Use of herbicides and insecticides	Biological pollution of freshwater resources	<ul style="list-style-type: none"> The use of eco-friendly products e.g. Organic Compost, herbicides and insecticides should be promoted. 	Developer
Water quantity			
Water use & cleaning of Photovoltaic modules	Depletion of water resources: Water consumption	<ul style="list-style-type: none"> Water use will be limited except for a short period per year when the panels will be cleaned. Cleaning of PV modules will be done only when necessary. Dirt roads should be treated with chemicals to lower the use of water to limit dust. Washing of vehicles should be limited to once a week and must be done with high pressure sprayers to reduce water consumption. Workers should not waste any water. In the buildings and offices half flush systems in the toilets as well as water aerators in all taps must be installed to reduce water consumption. The workers should be educated on the value of water and how to use it sparingly. Only indigenous trees and plants should be planted around the buildings and offices. 	Developer

9.2 OPERATIONAL PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Ecology (Fauna and Flora)			
Rehabilitation of cleared areas	Spreading of exotic invasive plant species Loss of habitat and indigenous flora	<ul style="list-style-type: none"> The areas close to the western boundary of the property, affected by the Gamagara Spruit, must be avoided. Peripheral impacts should be avoided and subsequently the construction activities should be undertaken far away from the related riparian habitat. The small pan (endorheic depression) found on the north-eastern side of the Remainder Portion of East 270 must be avoided; a 32 m buffer zone should be preserved around the pan boundary, as indicated in the Wetland Delineation Study (Annexure G). The exotic invader plant species should be kept under control and removed during operation. No herbicides should be used to control the vegetation at these areas without consulting a competent ecologist. The use of eco-friendly products e.g. organic compost and/or Effective Micro-organisms (EM), which reduce the frequency of application of conventional fertilizers, herbicides and insecticides, should be promoted 	Developer
Periodical vegetation clearing within the corridor of the two new sections of power line	Loss of habitat and indigenous flora	<ul style="list-style-type: none"> Vegetation clearing will consist of trimming, cutting and clearing the minimum amount of vegetation necessary for the safe electrical operation of the power line. Servitude areas shall be cleared in accordance with Eskom's procedure for vegetation clearance and maintenance of overhead power line servitudes. Minimal disturbance shall be caused to vegetation where such vegetation does not interfere with operation of the line. 	Developer
Bird Collisions with power lines	Death of raptor birds in the area	<ul style="list-style-type: none"> The high risk sections of line should be marked with a suitable anti-collision marking device on the earth wire as per the Eskom guidelines 	Developer
Occurrence of veld fires	Loss of indigenous fauna and flora	<ul style="list-style-type: none"> Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks). It is further proposed that 90,000 l of water will be stored in storage tanks which is also available for firefighting purposes 	Developer
Control of pests and vermin	Killing & poisoning of fauna feeding on poisoned pests or vermin	<ul style="list-style-type: none"> The use of eco-friendly products to control pests/vermin and invasive plants should be promoted and an ecologist be consulted before use. 	Developer

9.2 OPERATIONAL PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Control of animals on site. Killing, poisoning or hunting of animals	Loss of indigenous fauna to the area	<ul style="list-style-type: none"> No animals may be killed, captured, hunted or fed on site by workers. No poison should be used to control any animals without the input of an ecologist/zoologist. Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications. 	Developer
Geology, Soils and Wetlands			
Disposal and storage of waste and littering	Soil pollution and nuisance	<ul style="list-style-type: none"> Solid waste or vegetation refuse may not be burned on site. Solid waste may not be disposed or stored in areas other than designated waste disposal areas e.g. waste disposal bins. The Developer should collect and dispose of the waste to the Joe Morolong Municipality's landfill site on a weekly basis. A recycling management plan should be compiled for the proposed development. This plan should focus on <u>reducing, recycling and reusing</u> the waste generated during operation. 	Developer
Leakage of oil from the power transformers of the on-site HV substation	Chemical soil pollution	<ul style="list-style-type: none"> The on-site HV substation and switching station must be monitored for spills and any spills must be contained, cleaned and rehabilitated immediately. Any leaking containers shall be repaired or removed from site. All maintenance work must be done in terms of the Occupational Health and Safety Act (Act No.85 of 1993). Polluted soils must be removed to a waste site where it is authorized. 	Developer
Use of herbicides and insecticides	Soil pollution	<ul style="list-style-type: none"> The use of eco-friendly products e.g. Organic Compost, herbicides and insecticides should be promoted. 	Developer
Functioning and other operational and maintenance activities within the wetlands	Watercourse degradation, loss of equipment	<ul style="list-style-type: none"> The sand dunes located on the western side of the project site (close to the Gamagara Spruit) must remain undeveloped - in compliance with the requirements highlighted in the Geo-technical and Geo-hydrological Study (Annexure I). The small pan (endorheic depression) found on the north-eastern side of the Remainder Portion of East 270 must be avoided; a 32 m buffer zone should be preserved around the pan boundary, as indicated in the Wetland Delineation Study (Annexure G). 	Developer

9.2 OPERATIONAL PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Increased run-off after heavy precipitation events	Erosion of topsoil and ponding of water next to buildings and structures at lower lying areas	<ul style="list-style-type: none"> Given the low rainfall, flat topography and low flow speed of run-off, no formal storm water structures are required as the proposed gravel roads should be developed at ground level so as not to disturb the natural flow of storm water. This means that run-off will not be concentrated and the existing drainage patterns should be left undisturbed. Maintenance of the roads must be kept up to standard to prevent and reduce the incidence of erosion next to roads. 	Developer
Visual, Social and Heritage			
Functioning of development	Destruction of archaeological and heritage remains	<ul style="list-style-type: none"> During operation any discoveries of archaeological importance must be reported to the archaeologist for comments and future mitigations. 	Developer
Luminance caused by security lights	Visual disturbance, nuisance to surrounding properties	<ul style="list-style-type: none"> Security lights should shine directly down and be directed in such a way that it does not become a nuisance to the surrounding neighbours. A video-surveillance system using infra-red or micro-wave video-cameras, which do not need a switched on lighting system, is recommended. Adherence to the Visual Impact Assessment mitigation measures.	Developer
The functioning of the proposed development	Elevated crime levels	<ul style="list-style-type: none"> A security fence should be maintained around the perimeters of the sites to increase security. 	Developer
The risk of veld fires caused by natural or human induced negligence	Loss of human life, infrastructure etc.	<ul style="list-style-type: none"> Maintenance of the vegetation buffer zone will limit or eliminate the occurrence or risk of fires. Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks). It is further proposed that 90,000 l of water should be stored in storage tanks which is also available for firefighting purposes 	Developer

9.3 DECOMMISSIONING PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Environmental Aspects:			
Air quality			
Movement of vehicles and decommissioning equipment on site	Air pollution caused by excessive smoke and fumes	<ul style="list-style-type: none"> Vehicles and decommissioning equipment must be well serviced so that it does not produce excessive smoke and noise. Contractors must comply with all noise regulations. The machinery must be fitted with noise mufflers and be maintained properly. 	Contractors
	Air Pollution by excessive dust formation	<ul style="list-style-type: none"> It should be ensured that the decommissioning personnel comply with speed restriction of between 10-20 km per hour within the site boundaries to reduce the generation of dust and noise. Gravel roads must be dampened to prevent excessive dust formation, especially during the winter months. Internal roads must be maintained (grading or watering) on a regular basis during decommissioning. 	Contractors
Burning of waste The use of fires for cooking and heating at the site	Air pollution by excessive smoke	<ul style="list-style-type: none"> Solid waste generated by the decommissioning teams may not be burned on site or the surrounding areas. Solid waste should be kept in animal proof bins from where they will be removed to Joe Morolong Municipality's landfill site on a regular basis e.g. weekly. No open fires are allowed at sites. Fires for cooking should be restricted to designated areas, extra care should be taken to ensure to prevent veld fires from occurring. A waste management and recycling plan should be compiled for the decommissioning phase of the development (e.g. organic waste will be made into compost, the rest will be sorted and taken to various recycling stations of the Joe Morolong Municipality). This plan should be compiled in consultation with the contractors and engineers. 	Contractors & Engineers
<ul style="list-style-type: none"> Noise 			
Operation of vehicles and equipment	Disturbance & nuisance to surrounding land owners	<ul style="list-style-type: none"> Contractors must comply with all noise regulations .It should be ensured that the decommissioning personnel comply with speed restriction of between 10-20 km per hour within the site boundaries to reduce the generation of dust and noise. Vehicles are be serviced on a regular basis to ensure that they do not make excessive noise. The decommissioning machinery must be fitted with noise mufflers and be maintained properly. Decommission activities should only take place between sunrise and sunset from Monday to Saturday. No decommissioning activities should be allowed to take place on Sunday, unless an agreement has been reached with the surrounding property owners. 	Contractors

9.3 DECOMMISSIONING PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Water quality			
Sanitation seepage and spillage from temporary chemical toilets	Biological pollution of freshwater resources Impact on the health of humans & bio-diversity	<ul style="list-style-type: none"> • Chemical sanitation facilities should be used on site and regularly serviced by registered companies to ensure that no spills or leaks from toilets to groundwater or surface water take place. • Chemical sanitation facilities should not be positioned closer than 100m from surface water resources. The ratio of one toilet for every 15 workers on site should be maintained. • Chemical sanitation facilities must be emptied on a regular basis by a contractor registered to do it. 	Contractors
Leakage of oil from the power transformers of the on-site HV substation	Chemical pollution of freshwater resources. Impact on the health of humans & bio-diversity	<ul style="list-style-type: none"> • The on-site HV substation and switching station should be decommissioned according to the Eskom standards and guidelines. • According to the Eskom Oil Clean-Up And Rehabilitation Standards, the containment of a spillage should involve an action that will either prevent or stop a spill from spreading. It is vital to prevent any oil spill from entering the development site's stormwater systems. • Containment of oil pollution can be done using one or more of the following: <ul style="list-style-type: none"> ▪ soil barriers; ▪ sand bags; ▪ bund walls; and ▪ absorbent materials • Polluted soils must be removed to a waste site where it is authorized to be disposed of. 	Contractors
Spillage of fuel and lubricants from vehicles	Chemical pollution of freshwater resources. Impact on the health of humans & bio-diversity	<ul style="list-style-type: none"> • Vehicles should be serviced on a regular basis to prevent or minimize the risk of spills or leakages. 	Contractors
Spillages and leaks from temporary fuel tanks and decommission activities	Surface & groundwater water contamination	<ul style="list-style-type: none"> • Drip pans should be used during re-fueling and servicing of vehicles. Used parts like filters should be contained and disposed of at a site licensed for dumping of these waste products. Drip pans can also be placed underneath stationary vehicles and equipment. The used or spilled oil should be taken to the nearest oil refiner or recycling plant for recycling. • The temporary vehicle maintenance yard and storage area should be fenced off. A bund wall should be constructed around the fuel tank structures and the run-off diverted to a conservancy tank. Spilled fuel should be disposed of at the nearest approved fuel recycling collection point. Alternatively drip pans can be placed underneath temporary fuel tanks. 	Contractors

9.3 DECOMMISSIONING PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Storage and disposal of waste and disassembled components on site	Pollution of freshwater resources Impact on the health of humans & bio-diversity	<ul style="list-style-type: none"> • Solid waste generated by the decommissioning teams may not be burned on site or on the surrounding areas. Solid waste should be kept in animal proof bins at the decommissioning camp and be removed to the Joe Morolong Municipality's landfill site on a regular basis. Building rubble should be removed to the Joe Morolong Municipality's landfill site as the development progresses. • All components will be disassembled. Silicon of the PV modules will be recycled, as well as the mounting structures (aluminium or zinc coated steel frames and piles), the cables (copper and/or aluminium conductor) and the connection structures. • Non-recyclable components of inverter, transformers and electrical devices will be disposed in appropriate way, in compliance with applicable laws and international standards. • A comprehensive waste and recycling management plan should be compiled for the decommissioning phase of PV plant. The aim of the plan should be to ensure that the decommissioned materials/debris be reduced, reused and recycled. This plan should be compiled in consultation with the contractors and engineers. • Regular clean-up programs should be put into effect throughout the premises to limit the impact of littering caused by decommissioning activities. 	Contractors & Engineers
Storm water run-off over cleared areas	Increased turbidity and decrease in water quality	<ul style="list-style-type: none"> • Cleared areas must be scarified to aid in the germination of seeds and water retention • Cleared areas will be restored by re-planting of indigenous plant species. 	Contractors
Water quantity			
Decommissioning activities and dust abatement along internal roads	Depletion of groundwater resources	<ul style="list-style-type: none"> • Water should be used sparingly and it should be ensured that no water is wasted. • Roads should be treated with dust abatement chemicals to lower the use of water. • Washing of vehicles should be limited to once a week and must be done with high pressure sprayers to reduce water consumption. • Water tanks should be regularly inspected to ensure that no leaks occur. 	Contractors
<ul style="list-style-type: none"> • Ecology (Fauna and Flora) 			
Control of animals on site. Killing, poisoning or hunting of animals	Loss of indigenous fauna to the area	<ul style="list-style-type: none"> • No animals may be killed, captured or hunted on site by workers. No poison should be used to control any animals without the input of an ecologist/zoologist. 	Developer & Contractors
Increase in traffic on the site	Increase in road kills (e.g. small mammals, reptiles and amphibians).	<ul style="list-style-type: none"> • The speed of vehicles on the internal roads should be kept as low as possible to reduce the incidence of road kill. 	Contractors & Developer

9.3 DECOMMISSIONING PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Occurrence of veld fires on site	Destruction of flora / habitats Loss of indigenous fauna	<ul style="list-style-type: none"> Fires should only be allowed in designated places within the decommissioning camp and extra care should be taken to prevent veld fires from occurring. Firebreaks should comply with the National Veld and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks). 	Contractors & Developer
Littering (e.g. cans & plastics) along access road & at the sites	Nuisance & loss / death of indigenous fauna	<ul style="list-style-type: none"> Regular clean-up programs should be put into effect along the access road and throughout the premises to limit the impact of littering caused by decommissioning activities. 	Contractors & Developer
Geology, Soils and Wetlands			
Leaks or spills vehicles and temporary fuel tanks	Contamination of topsoil	<ul style="list-style-type: none"> Vehicles must be well serviced and maintained regularly to prevent oil and fuel leaks. Used parts like filters should be contained and disposed of at a site licensed for dumping of these waste products. Drip pans should be used when re-fueling and servicing vehicles or equipment. Drip pans can also be placed underneath vehicles and equipment. Used or spilled oil should be taken to the nearest oil refiner or recycling plant for recycling. The temporary vehicle maintenance yard and storage area should be fenced off. A bund wall should be constructed around the fuel tank structures and the run-off diverted to a conservancy tank. The spilled fuel should be disposed of at the nearest approved fuel recycling collection point. Alternatively drip pans can be placed underneath temporary fuel tanks. 	Contractors
Leakage of oil from the power transformers of the on-site HV substation	Contamination of topsoil	<ul style="list-style-type: none"> The on-site HV substation and switching station should be decommissioned according to the Eskom standards and guidelines. According to the Eskom Oil Clean-Up And Rehabilitation Standards, the containment of a spillage should involve an action that will either prevent or stop a spill from spreading. It is vital to prevent any oil spill from entering the development site's storm-water systems. Containment of oil pollution can be done using one or more of the following: <ul style="list-style-type: none"> soil barriers; sand bags; bund walls; and absorbent materials Polluted soils must be removed to a waste site where it is authorized. 	Contractors
Spillage from temporary chemical toilets	Contamination of soils	<ul style="list-style-type: none"> Chemical sanitation facilities should be used on site and regularly serviced by registered companies to ensure that no spills or leaks from toilets to groundwater or surface water take place. The ratio of one toilet for every 15 workers on site should be maintained. 	Contractors

9.3 DECOMMISSIONING PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Storage and disposal of building rubble, waste, littering and disassembled components on site	Soil pollution and nuisance	<ul style="list-style-type: none"> • Solid waste must be kept in adequate animal-proof waste bins at the decommissioning camp and at the decommissioning sites. Building rubble and waste should be removed on a regular basis to the Joe Morolong Municipality's landfill site. • All components will be disassembled. Silicon of the PV modules will be recycled, as well as mounting structures (aluminium or zinc-coated steel frames and piles) and cables (copper and/or aluminium conductor). Not-recyclable components of inverter, transformers and electrical devices will be disposed in appropriate way, in compliance with applicable laws and international standards. • A comprehensive waste management plan should be compiled for the decommissioning phase of the PV plant. The aim of the plan should be to ensure that the decommissioned materials/debris be reduced, reused and recycled. • Regular clean-up programs should be put into effect throughout the premises to limit the impact of littering and disassembled components caused by decommissioning activities. 	Contractors & Developer
Increase in storm water run-off	Soil degradation / erosion and ponding of water along the lower lying areas	<ul style="list-style-type: none"> • Hard and solid surfaces must be scarified and reseed to rehabilitate and reduce erosion. • Slopes produced by removing of soil must be kept to a minimum to reduce the chances of erosion damage to the area. 	Engineers, Contractors and Developer
Decommissioning activities within the wetlands	Wetlands degradation	<ul style="list-style-type: none"> • The areas close to the western boundary of the property, affected by the Gamagara Spruit, should be avoided. Peripheral impacts should be avoided and subsequently the decommissioning activities should be undertaken far away from the related riparian habitat. 	Contractors & Developer
Social, Visual and Heritage			
Earth moving and buildings and structures removing	Destruction of archaeological and heritage remains	<ul style="list-style-type: none"> • Care must be taken during the decommissioning process that anything of archaeological value that is unearthed must be recorded and the archaeologist SAHRA informed of the discovery. 	Developer and Archaeologist
Decommissioning activities	Loss or injury to human life	<ul style="list-style-type: none"> • The Contractor shall conform to all the stipulations of the Occupational Health and Safety act (Act 85 of 1993) and the Regulations applicable at the time. The Act requires the designation of a Health and Safety representative when more than 20 employees are employed. 	Developer and Contractors

9.3 DECOMMISSIONING PHASE OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Activity causing the impact	Specific Impacts	Mitigation measure	Responsible Person
Unauthorized entrance to decommissioning areas and workers staying overnight at the site	Elevated crime levels	<ul style="list-style-type: none"> • Only key workers and security personnel should be allowed to overnight on the site. • Proper access control (I.D. cards) should be enforced at the entrance gate to ensure that no unauthorised persons enter the site. Security personnel should be appointed to enforce strict access control. • Adherence to Farm Visit Protocol. • Transportation should be pre-arranged for the workers to ensure that the workers from the surrounding local communities have daily transportation available to and from the site. • A temporary fence should be erected around the decommissioning camp and storage area. 	Developer & Contractors
Occurrence of veld fires caused by the negligence of workers	Loss of human life and equipment etc.	<ul style="list-style-type: none"> • It must be ensured that the development complies with the requirements of the National Veld and Forest Fire Act, 1998 (Chapter 2: Fire Protection Associations and Chapter 4: Duty to Prepare and maintain firebreaks). • The workers should be educated about the risk of fires in the area and how to prevent them. No solid waste or vegetation may be burnt on the premises or surrounding areas. • No fires will be allowed outside designated areas (decommissioning camp). 	Developer & Contractors
Security lights	Visual disturbance and nuisance	<ul style="list-style-type: none"> • The security lights at the temporary maintenance yard and storage area should shine directly down and directed towards the site. <p>Adherence to the Visual Impact Assessment mitigation measures.</p>	Contractors
Employment of workers	Direct & indirect Job creation. Skills development of local workforce. Local & regional Economic growth.	<ul style="list-style-type: none"> • Adherence to the RDP and District Municipality's guidelines, principles and policies is imperative. • During the decommissioning phase, which will last approximately 5 months, jobs must be created for unemployed local people and skills must be transferred to them. Where viable, the work must be executed in a labour intensive manner to create as many jobs possible. 	Developer & Contractors

10 ENVIRONMENTAL MONITORING PROGRAMME - PV POWER PLANT AND CONNECTION INFRASTRUCTURE

10.1 CONSTRUCTION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE								
Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	Once off per site	When applicable	Continuously/daily	Weekly	Quarterly			
Environmental Aspects:								
Noise and air quality								
Dust especially on roads & construction sites caused by construction vehicles and equipment						Visits to the sites where construction occurs	Follow up with contractor when it is observed Dust abatement program as required	Contractors
Smoke from open fires Burning of cleared vegetation & solid waste						Visual inspection	No burning of waste or open fires beyond designated areas. Fines to contractors if it occurs	Contractors
Excessive fumes from construction vehicles						Visual inspection	Vehicle maintenance program to be followed	Contractors
Noise from construction vehicles and equipment						Measure if necessary	Correct when necessary. Work will only be allowed during daylight hours Monday - Saturday. Permission required on Sundays.	Contractors
Water quality								
Sanitation - Possible leaks/spills from e.g. chemical toilets. Ensure ratio of 1 toilet for every 15 workers are maintained. Correct placement of temporary sanitation facilities.						Visual inspection/ Inspect service agreement with contractor	Remedial action as required	Contractors
Spillage of fuel/lubricants from construction vehicles						Visual inspection Agreement letter from fuel/oil recycling plant if necessary	Clean up if necessary Stick to maintenance program	Contractors

10.1 CONSTRUCTION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	Once off per site	When applicable	Continuously/ daily	Weekly	Quarterly			
Environmental Aspects:								
Spillages and leaks from temporary fuel tanks and construction activities (e.g. mixing of concrete, cement, paints etc.)						Visual inspection Agreement letter from fuel/oil recycling plant if necessary	Clean up if necessary Remedial action as required	Developer & Contractors
Leakage of oil from the power transformers of the on-site HV substation						Visual inspection Agreement letter from fuel/oil recycling plant if necessary	Clean up if necessary Remedial action as required	Developer & Contractors
The storage and disposal of building rubble, waste and littering on site						Visual inspection Request for agreement letter between the municipality & contractor regarding disposal	Remedial action as and when required. Ensure that adequate waste disposal bins are available at construction camp and construction sites	Developer & Contractors
Storm water run-off over cleared areas & roads						Visual inspection	Remedial action as required Contact engineers if necessary	Developer, Contractors & Engineers
Solid waste separation						Visual inspection	Follow mitigation steps Remedial action as required	Contractors & Developer
Control of exotic invasive vegetation species.						Visual inspection	Contact ecologist if deemed necessary	Contractors, Developer and Ecologist

10.1 CONSTRUCTION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	Once off per site	When applicable	Continuously/daily	Weekly	Quarterly			
Environmental Aspects:								
Water quantity								
Water consumption from construction activities.						Visual inspection Check total flow meters.	Follow mitigation steps. Remedial action as required. Fines to contractors if water is wasted.	Developer & Contractors
Water consumption for dust suppression						Visual inspection Check total flow meters	Follow mitigation steps Remedial action as required	Contractors
Water consumption by exotic invasive vegetation						Visual inspection/ Check rehabilitation program	Contact ecologist if deemed necessary	Developer & Contractors
Ecology (Fauna and Flora)								
Earthworks and vegetation clearance at construction site						Visual inspection	Fines if there is unnecessary or uncontrolled clearing	Contractors
Rehabilitation of cleared areas & control of grass layer re-growth at development areas						Visual inspection. Check rehabilitation program	Contact ecologist if deemed necessary	Developer & Contractor
The risk of veld fires						Visual inspection	Fines to contractors if open fires are observed outside designated areas. Remedial action as required	Developer & Contractors
Littering along access road & construction sites						Visual inspection	Follow mitigation steps. Remedial action as required.	Contractors & Developer
Poisoning/Killing/Snaring of animals						Visual inspection	Fines to transgressors and contractors if it occurs Contact ecologist, DENC and DEA immediately for remedial steps to be taken.	Contractors

10.1 CONSTRUCTION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	Once off per site	When applicable	Continuously/ daily	Weekly	Quarterly			
Environmental Aspects:								
Geology, Soils and Wetlands								
Pollution from spillage of fuel/lubricants from construction vehicles						Visual inspection Agreement letter from fuel/oil recycling plant if necessary	Clean up if necessary Stick to maintenance program	Contractors
Pollution from spillage of fuel from temporary fuel tanks, oil and chemicals						Visual inspection. Agreement letter from fuel/oil recycling plant if necessary	Clean up if necessary	Developer & Contractors
Leakage of oil from the power transformers of the on-site HV substation						Visual inspection Agreement letter from fuel/oil recycling plant if necessary	Clean up if necessary Remedial action as required	Developer & Contractors
Waste storage and disposal and littering						Visual inspection Request for agreement letter between the municipality and contractor regarding waste disposal	Remedial action as and when required Follow mitigation steps	Developer & Contractors
The regular removal of building rubble during and after construction						Visual inspection	Fines and clean up if necessary	Developer & Contractor
Erosion damage and ponding of water after heavy precipitation events						Visual inspection	Improve storm water management on roads if necessary and correct damages Contact engineers if necessary	Developer, Civil Engineers and Contractors
Erosion damage at service trenches and foundations						Visual inspection	Remedial action as and when required Contact engineers if necessary	Developer & Contractors
Damage to structures and infrastructure as a result of the adverse characteristics of the underlying soils						Visual inspection Request the detailed engineering geological investigation report	Contact engineers if deemed necessary	Developer and Civil Engineers

10.1 CONSTRUCTION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	Once off per site	When applicable	Continuously/ daily	Weekly	Quarterly			
Environmental Aspects:								
Ensure that the current developments corresponds with the original layout plan						Visual inspection Request for layout map	Contact Environmental Assessment Practitioner and DEA if necessary	Developer
Social and Heritage								
Archaeological discoveries						Visual inspection	Call in the SAHRA representatives for investigation if deemed necessary by archaeologist	Developer, Contractors and Archaeologist
The positioning of security lights						Visual inspection	Remedial action as and when required	Developer
Safety of workers and public during the construction phase						Visual inspection	Fines, correct actions and clean up if necessary	Developer & Contractors
Safety of properties						Visual inspection	Fines to contractors where workers other than the key workers and security personnel are staying overnight. SAPS if criminal elements take place. Security company responsibility Adherence to Farm Visit Protocol	Contractors & Developer
Fire hazard – open fires outside designated areas etc.						Visual inspection	No burning of waste. No open fires beyond designated areas. Fines to contractor if it occurs	Developer & Contractors
The employment of construction workers						Request for appointment letters , identification cards etc.	Remedial action as and when required	Developer & Contractors

10.2 OPERATION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	When applicable	Continuously/daily	Weekly	Monthly	Quarterly			
Environmental Aspects:								
Noise and air quality								
The burning of vegetation refuse and solid waste						Visual inspection	No vegetation or solid waste to be burned on site	Developer
Water quality								
The disposal and storage of waste and vegetation waste						Visual inspection of waste bins at waste disposal transfer station. Request a copy of waste management and recycling plan	Remedial action as required	Developer
Leakage of oil from the power transformers of the HV substation						Visual inspection Agreement letter from fuel / oil recycling plant if necessary	Clean up if necessary Stick to maintenance program	Developer
The leaks from the permanent sewerage system						Visual inspection Details of reported incidents	Contact maintenance contractor Remedial action as required	Developer
The use of fertilizers, insecticides & herbicides						Visual inspection Request for rehabilitation and maintenance plan	Contact ecologist if deemed necessary	Developer

10.2 OPERATION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	When applicable	Continuously/daily	Weekly	Monthly	Quarterly			
Environmental Aspects:								
Water quantity								
Water use & cleaning of Photovoltaic modules						Visual inspection Measure total on monthly basis	Remedial action as required	Developer
Ecology (Fauna and Flora)								
Rehabilitation of cleared areas						Visual inspection Request for rehabilitation and maintenance plan	Contact ecologist if deemed necessary Remedial action as and when required	Developer
Disposal of solid waste and littering						Visual inspection of waste bins at the waste disposal transfer station Request a copy of waste management program if necessary	Contact engineers Remedial action as required	Developer
The positioning of the fences and the construction of the road kerb						Visual inspections Request for original layout plan	Remedial action as required	Developer

10.2 OPERATION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	When applicable	Continuously/daily	Weekly	Monthly	Quarterly			
Environmental Aspects:								
Geology, Soils and Wetlands								
The storage and disposal of waste and littering						Visual inspection of waste bins at waste disposal transfer station. Request copy of waste management & recycling plan. Request agreement letter between development & private contractor	Contact engineers Remedial action as required	Developer
Leakage of oil from the power transformers of the on-site HV substation						Visual inspection Agreement letter from fuel / oil recycling plant if necessary	Clean up if necessary Stick to maintenance program	Developer
Erosion damage by storm water run-off e.g. roads and storm water systems						Visual inspection	Improve storm water management if necessary and correct damages	Developer
Social and Heritage								
Archaeological discoveries						Visual inspection	Contact the archaeologist and SAHRA representative for investigation if archaeologist discoveries are unearthed.	Archaeologist & Developer

10.2 OPERATION OF THE PV POWER PLANT AND CONNECTION INFRASTRUCTURE

Action or key area to be monitored	Monitoring frequency					Monitoring method	Action/Remedial action	Responsible person
	When applicable	Continuously/daily	Weekly	Monthly	Quarterly			
Environmental Aspects:								
Buildings and lights- nuisance and pollution						Visual inspection	Remedial action as required Ensure that the agricultural guidelines and building restrictions are adhered to	Developer
The security measures at the development						Visual inspection	Remedial action if required	Developer