

Proposed 75 MW Kloofsig Solar PV Energy Facility, Northern Cape – Kloofsig 1, 2 and 3

Draft Ecological Management Plans

Report Prepared for

Kloofsig Solar (Pty) Ltd

Report Number 486618/9



Report Prepared by

 **srk** consulting

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Table of Contents

Disclaimer.....	i
1 Background and Introduction	1
1.1 Background.....	1
2 Alien invasive vegetation management plan	3
1.1 Objectives	3
2.1 Legislative background	3
2.2 General Management for Alien Invasive Species.....	4
2.2.1 Prevention and early detection.....	4
2.2.2 General management measures.....	5
2.2.3 Monitoring.....	6
2.3 Recorded Alien invasive species and control	6
2.4 Monitoring and Management Plan	6
3 Revegetation and habitat rehabilitation plan	10
3.1 Objectives	10
3.2 Vegetation types and sensitivity.....	10
3.3 Rehabilitation methodology.....	10
3.4 Monitoring and maintenance.....	12
4 Open space management plan.....	13
4.1 Objectives	13
4.2 Conservation importance, vegetation types and sensitivity	13
4.3 Monitoring and management plan	14
5 Fire Management Plan	16
5.1 Objectives	16
5.2 General management recommendations.....	16
Appendix A: Site sensitivity map	18
Appendix B: Confirmation from ecologist that Plant Rescue and Protection plan is not required	20

List of Tables

Table 2-1: Alien invasive species recorded from the proposed Kloofsig PV study site	6
Table 2-2: Alien invasive vegetation management plan for Kloofsig PV development	7
Table 2-3: Alien invasive vegetation monitoring plan for Kloofsig PV development	8
Table 4-1: Monitoring and management plan for the Kloofsig PV development	14

List of Figures

Figure 1-1: Site Locality Plan for all three phases	2
Figure A-1: Sensitivity map of the Farm Kalkpoort, based on heritage and ecological features.....	19

Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd. (SRK) by Kloofsig Solar (Pty) Ltd. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

1 Background and Introduction

1.1 Background

Kloofsig Solar (Pty) Ltd proposes to develop a solar photovoltaic (PV) energy generation facility and associated infrastructure on the remaining extent (portion 0) of Farm 18, Kalkpoort in the vicinity of Petrusville in the Northern Cape (Figure 1-1). The proposed development consists of three project phases of 75 MW each (with a total power generation capacity of 225 MW should all phases be developed), covering a total area of approximately 970 ha.

SRK Consulting South Africa (SRK) has been appointed by Kloofsig Solar, as the independent environmental consultants to assess the environmental impacts of the proposed development in terms of the NEMA 2014 EIA Regulations. As part of the Environmental Impact Report (EIR) for the project, the Department of Environmental Affairs (DEA) has requested that certain management plans are provided for the site. This report covers the following management plans for the three Kloofsig PV project phases (Kloofsig 1, 2 and 3), which have been compiled by SRK, taking into account the findings and recommendations of the ecological specialist:

- Alien invasive vegetation management plan (Section 2);
- Re-vegetation and habitat rehabilitation management plan (Section 3);
- Open space management plan (Section 0); and
- Fire management plan (Section 0).

The following management plans (also requested by DEA) have been prepared as separate documents by the relevant specialists:

- Avifaunal monitoring plan;
- Traffic and transportation management plan;
- Stormwater and erosion control management plan; and
- Plant rescue and protection plan (note that due to the absence of plant species of special concern on the site the specialist has provided a letter (see Appendix B) outlining why this plan is not required).

The intention is that the management plans are read in conjunction with the EMP. While some of the aspects covered in the management plans are also included in the EMP, the management plans provide more in-depth specific detail.

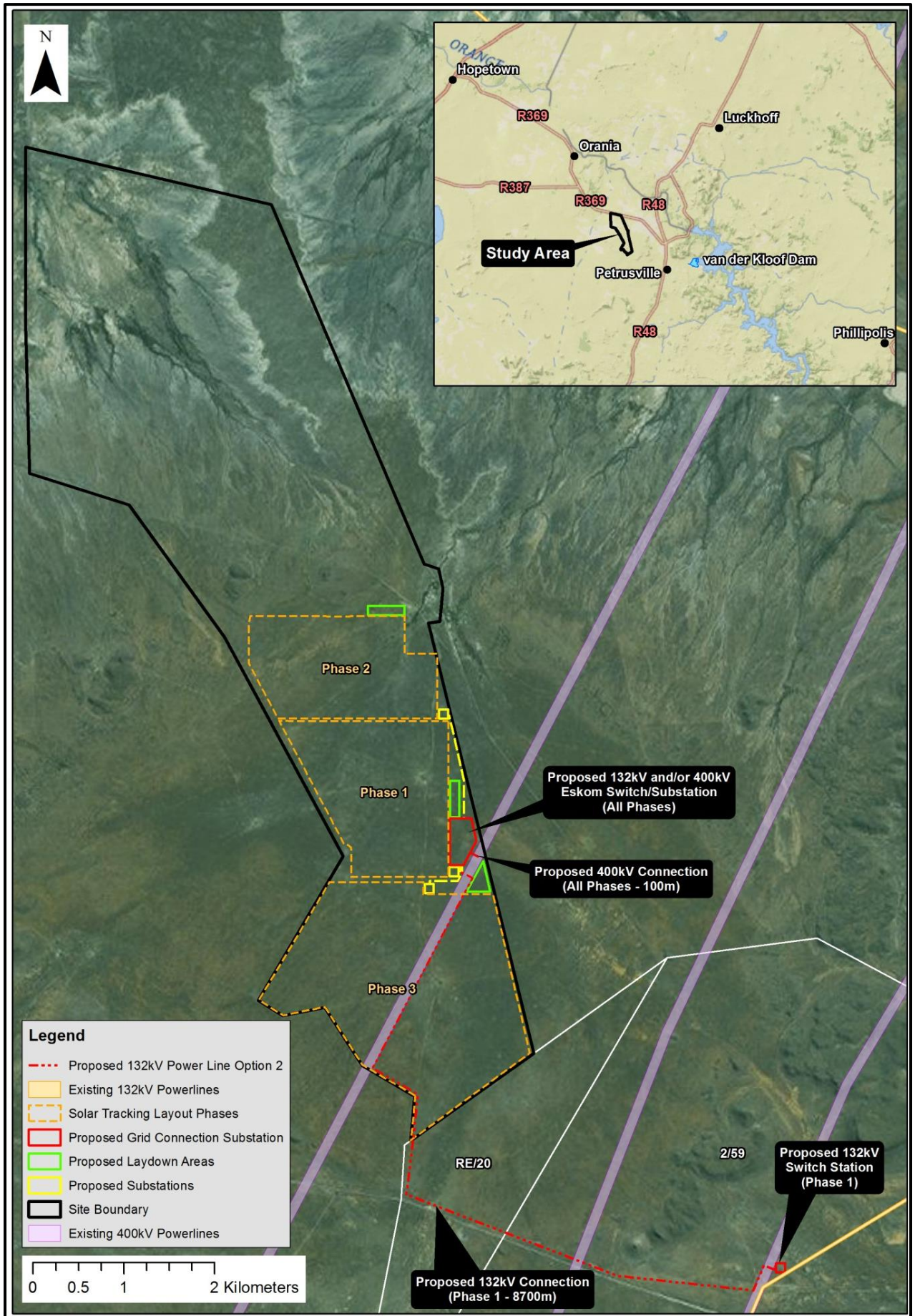


Figure 1-1: Site Locality Plan for all three phases

2 Alien invasive vegetation management plan

1.1 Objectives

Developments that disturb natural landscapes introduce anthropogenic disturbance, in which most alien invasive species thrive. Invasive species are aggressive competitors and overwhelm natural vegetation, causing biodiversity loss among other impacts. As part of the wider management plan for the Kloofsig solar PV facility, alien invasive species already recorded from the site, and those introduced to the site in the future must be controlled throughout the life of the development. The purpose of this plan is to provide a framework for management of alien invasive species during the construction and operation of the proposed Kloofsig solar PV facility.

The objectives of this plan are to:

- Control alien invasive species present on site and ensure they do not become dominant on the site;
- Prevent the invasion of new alien invasive species and those that have been successfully controlled;
- Develop a monitoring programme to ensure invasive species are controlled before they become a threat to the indigenous vegetation;
- Promote natural re-establishment of indigenous species.

The ecological specialist did not record any alien invasive plant species on the site apart from a few isolated Poplar (*Populus spp.*) and Mesquite (*Prosopis spp.*) trees, which appear to have been planted at the watering point on the site.

Other alien invasive vegetation species not confirmed on the site but commonly found invading disturbed areas and requiring management include:

- *Cirsium vulgare* (spear thistle);
- *Opuntia ficus-indica* (prickly pear);
- *Datura ferox* (thorn apple); and
- *Ricinus communis* (castor oil plant)

This plan therefore outlines general control measures for alien invasive species, however it is recommended that a species specific approach is adopted if and when alien invasive species are identified on the site.

2.1 Legislative background

The control of alien invasive plant species is controlled by the Alien and Invasive Species Regulations (published on the 19 July 2013) under the National Environmental Management: Biodiversity Act (NEM:BA) 2004 (Act No 10 of 2004) as well as the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983) (CARA). Regulations 15 and 16 under this Act, which concern problem plants, were amended during March 2001.

The NEM:BA Alien and Invasive Species Regulations classify alien invasive species according to the following categories, which inform the management and permitting requirements:

- **Category 1a:** Invasive species requiring compulsory control. Any individuals that fall into this category must be removed by law. No permits will be issued.
- **Category 1b:** Invasive species requiring some control as part of an invasive species control programme. Species in this category must be removed and destroyed. Species under this category may form part of a government sponsored management programme. No permits may be issued.
- **Category 2:** Invasive species regulated by area. A permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants in this category. No permits for Category 2 plants will be given in riparian zones.
- **Category 3:** Invasive species regulated by activity. A permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any Category 3 plants. No permits will be issued for riparian zones.

In terms of the CARA, all declared aliens must be controlled, and landowners are responsible for the alien invasive species present on their property. Similarly to NME:BA AIS, alien invasive vegetation is classified according to the following three categories:

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

Note that certain alien invasive species that are regulated in terms of the CARA are not listed in the NEM:BA AIS, however both pieces of legislation remain applicable to the management of alien invasive vegetation.

2.2 General Management for Alien Invasive Species

2.2.1 Prevention and early detection

Most importantly, the introduction of alien species must be prevented as far as possible. The risk of introduction is greatest during the construction phase of the development, when management measures to minimise the risk of introducing new species and spreading existing species must be implemented.

Areas that are disturbed are more likely to be invaded - these include areas cleared during the construction phase, as well as those that have been already degraded, and are therefore susceptible to invasion.

Monitoring is essential, and any new invasive species should be recorded as soon as possible and a control and management plan drawn up and implemented for these species¹. Various means are available for controlling invasive species, and the sooner it is implemented the better as delays would result in more difficult and costly the control. Control measures may range from manually removing seedlings to the introduction of biological control agents, depending on the situation and available remedies.

As the threat of spread of invasive species on the site is limited at this stage, simple control measures to eradicate them should suffice. Should herbicides be considered as an option for eradication, care must be taken not to impact on water resources and indigenous vegetation in the area. Herbicide application would only be recommended if manual or biological means of control have been excluded as viable options, and only in situations where they would not pose a risk to watercourses (drainage lines, wetlands, etc.).

2.2.2 General management measures

Management should be continuous and adaptive, following the following general model for the site:

- A monitoring plan must be implemented to ensure the identification and recording of new invasive species and new individuals of already recorded species. This should be implemented in the construction phase, and continue into the operation phase to ensure consistent effective management.
- Any alien growth recorded should be promptly removed and should not be allowed to flower; at this stage control is relatively easy and can often be done by hand. Care should be taken that no reproductive material is left at the control sites (especially with the *Cactaceae* family, where cladodes – leaf sections – can regrow to form adult plants).
- Introduction of alien plants to the site should be avoided wherever possible. Any imported sand or earth should be sterile or invasive free where possible. Vehicles entering the site should be checked for any cactus cladodes. Soil and sand stockpiles should be checked regularly and any sprouting aliens removed.
- Control should be continuous - often, existing seed banks will continue to germinate. Need for control tapers off as these become depleted.
- Effective and early containment and control of alien invasive species will ensure that efficient use of resources is maximised in their ongoing management.
- Alien vegetation control is a long term commitment and should include follow up actions for rehabilitation of the area once it has been cleared of alien vegetation.
- Collective management planning with neighbouring landowners may be required to prevent seeds from being dispersed across borders through wind and watercourses.

¹ A good resource for control is Problem Plants and Alien Weeds of South Africa (Bromilow, 2010)

2.2.3 Monitoring

Monitoring is important as it provides an initial starting point for the management plan, as well as allowing for adaptive management. General monitoring principles include:

- Clearing should be recorded through photographs.
- Management measures must be recorded including methods used, areas cleared and herbicide used where appropriate.
- Should monitoring result in the recording of new species, or new invaded areas these should be immediately adopted into the management plan.

2.3 Recorded Alien invasive species and control

The alien invasive plant species recorded by the ecological specialists during their site visits (2015 and 2016) are listed in Table 2-1 below, together with the categorisation in terms of the NEM:BA AIS and CARA lists. Note that as only genus level information was provided, the exact species present on site cannot be confirmed, however it is assumed that the individuals recorded fall within the species covered by the categories listed below.

Table 2-1: Alien invasive species recorded from the proposed Kloofsig PV study site

Scientific name	Common name	Category: NEM:BA	Category: CARA
<i>Populus spp.</i>	Poplar	2	2
<i>Prosopis spp.</i>	Mesquite	3 (in N Cape)	2 (in N Cape)

2.4 Monitoring and Management Plan

The site comprises three spatial zones, each of which require different levels of monitoring and management:

- The footprint of the development, which will be directly impact through vegetation clearing and disturbance, and will require high monitoring intensity;
- The Area of Influence, which extends slightly outside the development footprint area, and will be indirectly impacted through disturbance and spread of alien invasive seed, and will require moderate monitoring intensity; and
- The Study Area, comprising the whole property (remaining extent of Farm 18, Kalkpoort), which will require lower monitoring intensity.

The footprint of the development will be directly disturbed and therefore will be the most vulnerable to invasion by alien species. This will need to be managed and monitored more regularly than the other areas. The area of influence will not be directly impacted but will be vulnerable to spread of alien invasive vegetation from the footprint area, as will the whole property, to a lesser extent. Alien invasives already present on the site may also provide a source for invasions of disturbed areas in the vicinity.

Monitoring and management plans for the site are provided in Table 2-2 and Table 2-3 below.

Table 2-2: Alien invasive vegetation management plan for Kloofsig PV development

Task	Description	Responsible Party	Frequency		
			Footprint	Area of Influence	Whole property
Construction phase					
1.1	Clearing of alien vegetation must be scheduled and designated	Contractor	Pre-construction		
1.2	All manually cleared alien plants must be disposed of to a landfill site and must not be dumped in any areas of indigenous vegetation.	Contractor	Daily	Daily	Daily
1.3	Any exposed construction areas that have become invaded should be controlled through spraying with herbicides (only those that break down on contact with the soil) if population density merits this. This must be done before the plants reach seed-bearing stage.	Contractor	Weekly	N/A	N/A
1.4	Any soil stockpiles that have become invaded with alien vegetation should be cleared through manual control methods (weeding).	Contractor	Weekly	N/A	N/A
1.5	Areas that will be vegetated though rehabilitation must be done so through the rehabilitation plan. No organic matter from outside the site should be used to encourage regrowth of vegetation.	Contractor	Monthly	N/A	N/A
1.6	Introduction of alien plant species to the site should be prevented as far as practicable. Vehicles entering should be inspected, outside sources of soil and sand should be clear of invasive species.	Contractor	Continuous		
1.7	Alien invasive species must be controlled throughout the entire site during the construction process.	Contractor	Monthly	Every 3 months	Every 6 months
1.8	Species-specific control measures should be developed and implemented. If any new species are recorded, best practice means of control must be researched and used.	Contractor	Monthly	Every 3 months	Every 6 months
Operational Phase					
2.1	Surveys of the site for alien invasive species must be conducted throughout the life of the project. These include new invasions by recorded species and new species on site.	Contractor	Quarterly for 2 years, then every 6 months.	Annually for 2 years, then every 2 years.	After 2 years, then every 5 years.
2.2	To prevent increased invasion in areas cleared for construction but not needed for operation, rehabilitation of the natural vegetation should be completed as early as possible, in accordance with the Revegetation and Habitat Rehabilitation Plan.	Contractor	Refer to Revegetation and Habitat Rehabilitation Plan (Section 3)		
2.3	Areas where vegetation is required to be kept low (such as along power line servitudes), should be managed using non-invasive means (e.g. weed-eaters) to maintain the indigenous vegetation and reduce invasion potential.	Contractor	As required	N/A	N/A

Table 2-3: Alien invasive vegetation monitoring plan for Kloofsig PV development

Task	Description	Method	Deliverable	Responsible Party	Frequency		
					Footprint	Area of Influence	Whole property
Construction phase							
1.1	Document all alien invasive species	<ul style="list-style-type: none"> GPS recording locations of all alien invasive species & number of individuals in each population 	<ul style="list-style-type: none"> A list of alien invasive species on site. A map of the location of populations of each species. 	Contractor / ECO	Preconstruction		
1.2	Document changes in alien vegetation	<ul style="list-style-type: none"> GPS recording locations of all alien invasive species & number of individuals in each population 	<ul style="list-style-type: none"> Updated list of alien invasive species on site. Updated map of the location of populations of each species Record of changes in population size. 	Contractor / ECO	3 Monthly	Every 6 months	Once – post-construction
1.3	Document and record alien control measures used	<p>For each population for which control is implemented record:</p> <ul style="list-style-type: none"> The method used The quantity and type of herbicides used (if any) The cost associated with control 	Record of control measures and the populations controlled	Contractor	3 Monthly	Every 6 months	Once – post-construction
1.4	Evaluate and review control methods and success	<p>For each population for which control is implemented record:</p> <ul style="list-style-type: none"> Number of individuals remaining If follow-up treatment is required. 	Record of control measures and the populations controlled	Contractor	3 Monthly	Every 6 months	Once – post-construction
Operational Phase							
2.1	Record changes in alien vegetation on site.	<ul style="list-style-type: none"> Aerial imagery with on-site verification of the footprint and Area of Influence. GPS recording 	<ul style="list-style-type: none"> Updated list of alien invasive species on site. Updated map of the location of populations of each species Record of changes in population size. 	Developer	Every 6 months for 2 years, thereafter every 2 years.	Annually for 2 years, then every 3 years.	After 2 years, then every 5 years.

Task	Description	Method	Deliverable	Responsible Party	Frequency		
					Footprint	Area of Influence	Whole property
		locations of all alien invasive species & number of individuals in each population					
2.2	Document and record alien control measures used.	For each population for which control is implemented record: <ul style="list-style-type: none"> • The method used • The quantity and type of herbicides used (if any) • The cost associated with control 	Record of control measures and the populations controlled	Contractor	Every 6 months for 2 years, thereafter every 2 years.	Annually for 2 years, then every 3 years.	After 2 years, then every 5 years.
2.3	Evaluate and review control methods and success.	For each population for which control is implemented record: <ul style="list-style-type: none"> • Number of individuals remaining • If follow-up treatment is required 	Record of control measures and the populations controlled	Contractor	Every 6 months for 2 years, thereafter every 2 years.	Annually for 2 years, then every 3 years.	After 2 years, then every 5 years.

3 Revegetation and habitat rehabilitation plan

3.1 Objectives

The aim of this plan is to provide a framework for ensuring that areas of the site that are cleared or otherwise disturbed during construction of the Kloofsig PV facility and associated infrastructure are rehabilitated and plant cover is re-established so that erosion risks are limited, as well as re-establishment of ecosystem functioning as far as possible.

The key long term objectives of this plan are summarised as follows:

- Reduce the long-term impact of the proposed development on the ecology of the site and surroundings;
- Achieve stabilisation of disturbed areas and minimise erosion potential;
- Minimise visual impacts resulting from vegetation clearing and disturbance; and
- Revegetate disturbed areas with indigenous species suitable to the site.

This plan is intended to be used in conjunction with the Environmental Management Programme (EMPr) for the project (Chapter 7 of the EIR) and other relevant management plans including:

- Alien Invasive vegetation management plan (Section 2 of this document); and
- Stormwater management and Erosion control plan (Appendix H3 of the EIR)

Furthermore, this plan should form part of an adaptive management process and must be updated regularly based on new information, including as ongoing feedback on rehabilitation successes and failures. This is important for determining the best rehabilitation methods for the study site, which can then be integrated into the rehabilitation plan. Rehabilitation must be incremental and start concurrently with construction of the proposed development.

3.2 Vegetation types and sensitivity

Ten vegetation types were identified in the study area, as shown on Figure A-1, which also indicates habitat sensitivity. A detailed description of the vegetation of the site can be found in the Biodiversity Impact Assessment Report (Appendix G4 of the EIR). Areas of sensitive habitat are limited to the northern half of the property, outside the proposed development footprint. Impacts on these areas are therefore expected to be limited at most.

No protected plants or species of special concern were noted by the ecological specialist for the proposed development site. Should any such species be identified on the site during construction however, and disturbance of the plants is unavoidable, the correct legal procedures with regard to licensing and relocation should be followed.

3.3 Rehabilitation methodology

While one of the key aims of the EMPr is to limit the disturbance footprint and to minimise the construction area, it is inevitable that some areas will be cleared or disturbed for construction but not be used in operation. Rehabilitation efforts should be concentrated on these areas and will be restricted to the construction footprint of the development, and any other areas that are disturbed during construction, operation or decommissioning of the facility. This will include such areas as road

reserves, powerline servitudes, and areas between and around the solar arrays, which would require rehabilitation to a level that is conducive to the operation of the facility (i.e. establishment of indigenous vegetation cover to prevent erosion, but not to the level that it would limit access for maintenance and operational activities). Other disturbed areas, would be subject to more extensive rehabilitation as outlined below. The following general methods should be employed:

- Although no rare, red data or protected plant species were observed during the ecological survey, and no such species are listed in red data or protected plant data bases for the two Grids 2924DC Havengabrug and 3024BA Petrusville, it is recommended that any individuals of succulent (e.g. Aloes) or geophytic (bulb) plant species that are found within the construction footprint should be kept in a temporary nursery to be used later in re-vegetation programs, as the survival of these species when re-planted will be more likely than that of the dominant dwarf shrubs. Rescued plants can also be relocated at suitable sites (e.g. farm houses, site gate or site offices etc.). Harvesting or removal, other than for rescue purposes, of any plant material outside the construction footprint is strictly prohibited;
- As soon as possible after construction in the area has been completed (progressive rehabilitation of areas is encouraged) and directly after topsoil has been re-instated on disturbed areas, revegetation with suitable indigenous plant species should commence;
- A seed bank of indigenous plant seed is likely to remain present in the topsoil (if it has been correctly maintained during construction), and will provide initial vegetation cover. In some areas however, regeneration of natural vegetation may be poor (for various reasons), and application of additional seed to enhance revegetation may be required;
- If possible, seeds should be harvested by a suitably qualified botanist / rehabilitation specialist, from indigenous plants on the site, for use during rehabilitation. This will increase biodiversity of the revegetated areas;
- Collected seeds should be stored in paper or canvas bags that have been dusted with insecticide, and planted at the start of the rainy season;
- Seed should preferably be sown in conjunction with methods to enhance their germination such as mulching and application of additional organic matter to enrich the soil and assist with water retention;
- To speed up rehabilitation and progression through the natural successional stages, once pioneer species have established. If necessary the area should be re-planted with more perennial and woody species. This process may require several repetitions, and excludes servitudes and areas between the panels, where low-growing herbaceous vegetation only will be maintained so as to allow access for inspections and maintenance;
- During rehabilitation and once revegetated, areas must be protected from further disturbance or compaction through driving, trampling, etc.;
- Livestock should be prevented from grazing on areas undergoing rehabilitation, through fencing if necessary (to be removed once vegetation cover has established sufficiently);
- Any areas of erosion e.g. runnels, channels, wash-aways, should be backfilled (with additional erosion control measures if necessary) and rehabilitated as described above;
- Final vegetation cover should resemble the pre-construction condition of the site *as closely as possible* (based on photographic evidence), and that of the surrounding area, in general species composition and cover.

3.4 Monitoring and maintenance

Regular monitoring and adaptive management should take place throughout the life of the development, to detect and address any new areas requiring rehabilitation and monitor and respond to rehabilitation success. During construction, this will be the responsibility of the contractor's environmental officer, with monitoring and reporting on compliance by the Environmental Control Officer (ECO). Once the development is operational, the developer will assume responsibility for contracting a suitably qualified sub-contractor to undertake the monitoring. The following criteria (and any others, as appropriate) should be monitored, as part of rehabilitation:

- Composition and density of vegetation regrowth, including presence of any alien invasive species (if these are noted, remedial action must be taken as per the Alien invasive vegetation management plan (Section 2). Distinction should also be made between primary successional species and those present in established sites;
- Nature and stability of soils in the area undergoing rehabilitation (and requirement for any remedial action), and presence of erosion.

The initial revegetation period could range from 6 to 12 months, depending on the type of vegetation involved. Thereafter, monitoring and any follow ups relating to rehabilitation should continue until the end of the defects notification period, or until rehabilitation success has been achieved (measured as 75% of the pre-construction density of vegetation cover, made up of species that are reflective of those found in the surrounding area i.e. minimal difference between the rehabilitated site and the surrounding area). Additional planting rounds may be required to achieve this. The following monitoring protocol is proposed:

- Revegetated areas should be monitored quarterly for a year after the end of construction (or until the end of the defects notification period, whichever is longer). This could be aligned with monitoring for alien invasive vegetation (Section 2);
- Areas showing inadequate vegetation coverage after a year of rehabilitation (<20% cover) should be revegetated as described above (and follow up monitoring continue for an additional year, or as long as is considered necessary by the rehabilitation expert);
- Areas showing erosion should be re-contoured (or other appropriate erosion control measures implemented) and seeded with indigenous grasses or other suitable indigenous vegetation.

4 Open space management plan

4.1 Objectives

Developments that disturb natural landscapes introduce anthropogenic disturbance, which reduces the overall conservation value of the landscape. The Kloofsig solar PV development is dedicated to finding a balance between development and the ecosystem, not only through its function as a renewable energy source, but also through providing well-managed open space areas. The objectives of this plan are to:

- Maintain intact ecosystems within the site; and
- Manage the ecosystem in a natural or near-natural state.

This plan is intended to be used in conjunction with the Environmental Management Programme (EMPr) for the project (Chapter 7 of the EIR) and other relevant management plans including:

- Alien Invasive vegetation management plan (Section 2 of this document); and
- Revegetation and Rehabilitation management plan (Section 3 of this document)

This plan is designed to be used in conjunction with other management plans for the development and also as an adaptive management plan, meaning that it should be periodically updated to include any new relevant management measures, approaches and priorities. The plan must be reviewed and updated annually during the construction phase, and at least every 5 years during the operational phase.

4.2 Conservation importance, vegetation types and sensitivity

Ten vegetation types were identified in the study area, as shown on Figure A-1, which also indicates habitat sensitivity. A detailed description of the vegetation of the site can be found in the Biodiversity Impact Assessment Report (Appendix G4 of the EIR). Areas of sensitive habitat are limited to the northern half of the property, outside the proposed development footprint. Impacts on these areas are therefore expected to be limited at most, and it is anticipated that the current land use (low density stock and game farming) will continue in these parts of the property.

The site is not situated within or close to any Critical Biodiversity Areas (CBAs), however it is located within an Important Bird Area (IBA), and includes watercourses (although these are transient) with associated habitat that should be protected where possible. Buffers in this regard have been proposed by the ecological specialist, as well as the recommendation that the ecologically sensitive areas in the north of the property (mainly associated with watercourses and rocky outcrops, as shown on Figure A-1) remain undeveloped as far as possible and that game (preferably) or livestock stocking rates remain conservative. The aim for these areas should be to conserve the existing habitat in as near natural a condition as possible and prevent impacts such as erosion caused by overgrazing and habitat destruction, and invasion by alien invasive vegetation.

No protected plants or species of special concern were noted by the ecological specialist for the proposed development site. Should any such species be identified on the site during construction however, and disturbance of the plants is unavoidable, the correct legal procedures with regard to licensing and relocation should be followed.

4.3 Monitoring and management plan

A monitoring and management schedule for the open space areas on the property, for implementation during construction and operation of the Kloofsig PV facility, is provided in Table 4-1. For the purposes of this plan, all undeveloped areas of the site are considered to be open space areas. While the plan covers both construction and operational phases of the development, the focus is on the long term operational management of open space areas. It is recognised that the landowner will remain responsible for management of areas outside the development footprint (i.e. the open space areas) and therefore while the developer is ultimately the responsible party to oversee the tasks listed in Table 4-1 below, the understanding is that this will be done in consultation with the landowner where relevant.

Table 4-1: Monitoring and management plan for the Kloofsig PV development

Task	Description	Responsible Party	Frequency/ duration
Construction phase			
1.1	The development should remain within the designated construction footprint and no disturbance of any additional areas shall be allowed. Buffer areas around watercourses must be demarcated as no-go areas.	Contractor	Duration of construction
1.2	Open space areas should be maintained as corridors with no barriers (such as fences, and roads) separating them as far as possible.	Developer*	Duration of construction
1.3	Growth of weeds and alien invasive plants must be prevented and controlled.	Contractor*	As outlined in the Alien Invasive Vegetation Management Plan
1.4	Animal proof bins should be provided for waste generated by workers. Waste should not be dumped, buried or burned in open space areas (or anywhere else) but disposed of at an appropriate waste facility.	Contractor	Waste / litter collected daily from construction site and surrounding areas and stored in bins.
1.5	Vegetation cleared for construction must not be dumped in intact vegetation, even temporarily. Indigenous vegetation cleared may be mulched and used for rehabilitation.	Contractor	Duration of construction and rehabilitation
1.6	No collection of indigenous plants should be allowed on site except for the relevant experts for scientific study or as part of rehabilitation and search and rescue.	Contractor*	Duration of construction
1.7	All workers on site must be trained on the stipulations of the EMP, including the necessity to stay within the footprint of the site to limit disturbance, before construction begins and via regular toolbox talks during construction.	Contractor	Preconstruction & at least weekly during construction
1.8	Prohibited activities in the open space areas include: 1.8.1) Hunting / poaching 1.8.2) Fires 1.8.3) Litter 1.8.4) Collection of plants, including medicinal plants except when required with the relevant permits and overseen by the ECO. Plants may be collected from within the construction footprint only. 1.8.5) No driving off-road 1.8.6) No interfering with fauna, including indigenous animals and livestock. Should fauna requiring removal	Contractor* (monitoring by the ECO)	Construction period

* In consultation with the landowner

Task	Description	Responsible Party	Frequency/ duration
	(e.g. snakes) be found on site, an appropriate expert must be contracted. 1.8.8) No graffiti or other markings on natural features such as rocks. 1.8.9) The ablution facilities provided must be used, not the Open Space.		
1.9	Access to the Kloofsig PV development must be strictly controlled, with all contractors and visitors required to adhere to the conditions of the EMPr and management plans.	Contractor	Construction period
2.8	Open space areas shall be monitored for signs of erosion and overgrazing, and control measures implemented where deterioration of the current condition is observed	Contractor*	Annual inspections of open space areas and photographic records maintained.
Operational Phase			
2.1	Open space areas should be maintained as corridors with no barriers (such as fences, and roads) where possible.	Developer*	Duration of operation
2.2	Prevention and control of weeds and alien invasive plants must be maintained.	Developer*	As outlined in the Alien Invasive Vegetation Management Plan
2.3	Rehabilitation of areas that were cleared or disturbed in the construction phase and not required in the operational phase must be completed.	Developer	As outlined in the Revegetation and Habitat Rehabilitation Plan
2.4	No collection of indigenous plants should be allowed in open space areas except for the relevant experts for scientific study or as part of rehabilitation of the site.	Developer*	Duration of operation
2.5	Access to the Kloofsig PV development must be strictly controlled, with all contractors and visitors required to adhere to the conditions of the EMPr and management plans.	Developer	Duration of operation
2.6	Prohibited activities in the open space areas include: 1.8.1) Hunting / poaching 1.8.2) Fires 1.8.3) Litter 1.8.4) Collection of plants, including medicinal plants except when required with the relevant permits and overseen by the ECO. Plants may be collected from within the construction footprint only. 1.8.5) No driving off-road 1.8.6) No interfering with fauna, including indigenous animals and livestock. Should fauna requiring removal (e.g. snakes) be found on site, an appropriate expert must be contracted. 1.8.7) No graffiti or other markings on natural features such as rocks. 1.8.8) The ablution facilities provided must be used, not the Open Space.	Developer*	Duration of operation
2.7	No disturbance of any additional areas outside the development footprint shall be allowed. Buffer areas around watercourses must be demarcated as no-go areas.	Developer*	Duration of operation
2.8	Open space areas shall be monitored for signs of erosion and overgrazing, and control measures implemented where deterioration of the current condition is observed	Developer*	Annual inspections of open space areas and photographic records maintained.

5 Fire Management Plan

5.1 Objectives

While it is recognised that health and safety forms a large part of fire management planning, the aim of this plan is to address the ecological risks resulting from the spread of fire on:

- The surrounding environment, as a result of an increased risk of fires that may result from the Kloofsig PV facility; or
- The proposed Kloofsig PV facility, as a result of fires in the surrounding area.

This plan does not attempt to address the health and safety or design aspects of fire management, and should be used in conjunction with plans to address these aspects (when they are available).

5.2 General management recommendations

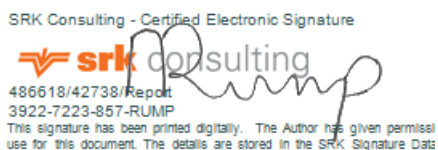
Fire is not recognised to be part of the natural ecology of the study area, based on the vegetation types present, and is not currently a regular occurrence on the site - if fires do occur, they are generally of limited extent (G Bredenkamp (ecologist) and J Havenga (landowner), pers. comm.). Lightning is currently the main cause of fires in the area, and fire breaks are currently not a requirement for agricultural property in the area. The risk of natural fires from the surrounding area impacting on the proposed PV development is therefore considered to be low, especially given that much of the site will be cleared and therefore the combustible biomass load will be low (assuming revegetation efforts focus on vegetation that is indigenous to the area and not fire-prone species, as specified in the Revegetation and Habitat Rehabilitation Plan (Section 3)).

Fire will affect slow-moving animals such as tortoises and chameleons that may not be able to move to safety in time. The construction of the proposed Kloofsig PV development will introduce anthropogenic and other elements to the site that may increase the risk of fires originating on the site. The potential for fires to spread to adjacent agricultural areas would however be limited by the sparse vegetation growth in the general area.

Care should be taken that the development does not result in an increased risk of fires, such as those that may result from increased human activity on the site. The following measures should be in place to manage this, as well as to protect project infrastructure from fires, both during construction and operation:

- The regulatory requirements with regard to fire-fighting equipment, storage and handling of flammable materials, training, fire breaks, reporting and fire management procedures will be adhered to, including membership of the local fire protection association if required;
- The local authority's fire management requirements for the area shall also be taken into account. This may include stipulations relating to fire breaks (width, locations, and frequency and procedure for burning);
- Anthropogenic causes of fires shall be minimised through implementation of control measures relating to smoking, littering, storage and handling of flammable materials, and burning on site; and
- Records shall be kept of any fires on or close to the site.

Prepared by:



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Principal Environmental Scientist

Reviewed by:



Rob Gardiner MSc, Pr Sci Nat

Partner, Principal Environmental Scientist

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Appendix A: Site sensitivity map

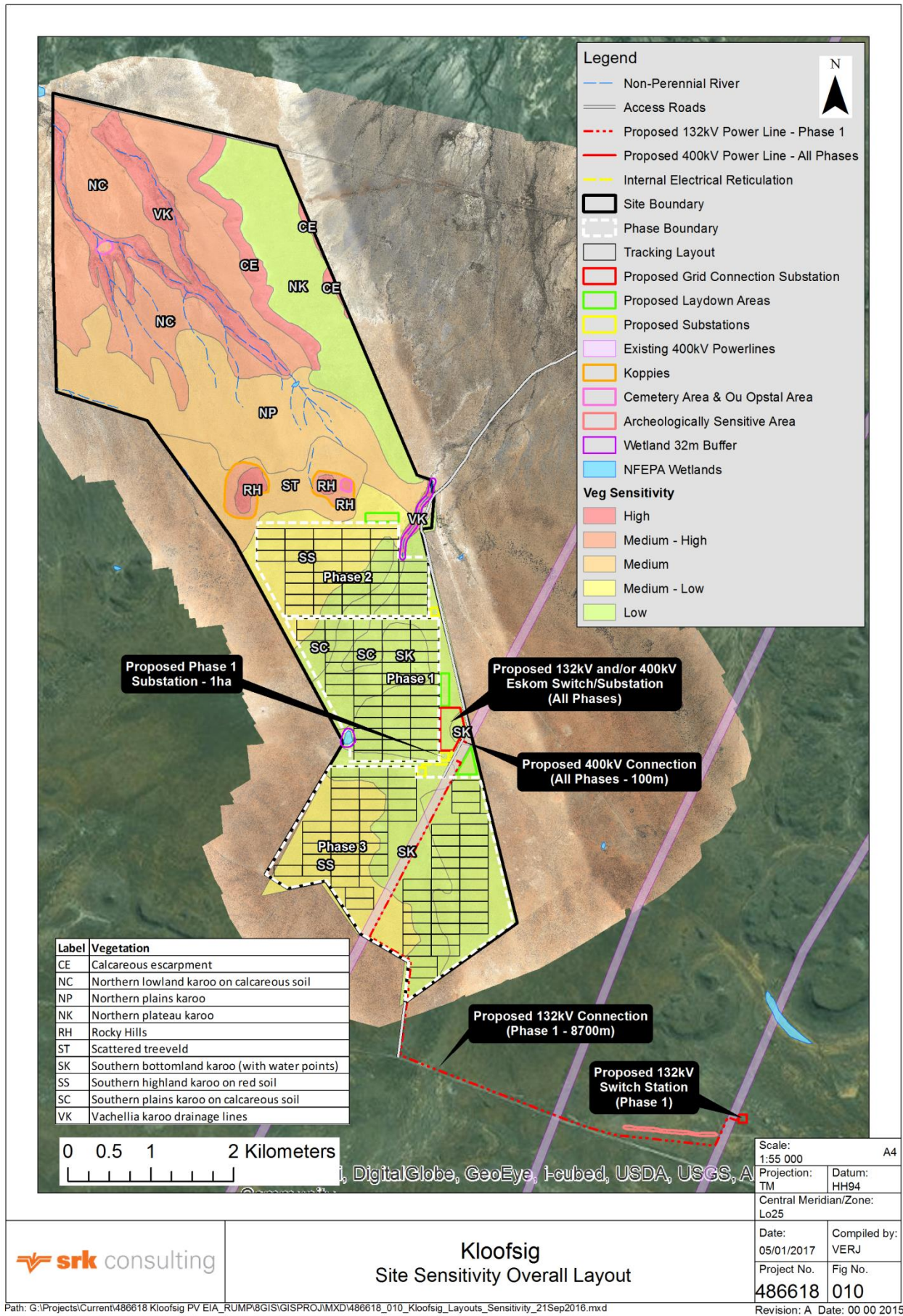


Figure A-1: Sensitivity map of the Farm Kalkpoort, based on heritage and ecological features

Appendix B: Confirmation from ecologist that Plant Rescue and Protection plan is not required



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7 December 2016

Flora search and rescue: Kloofsig PV development Phases 1-3 on the Farm Farm Kalk Poort RE/18, Hopetown

On 1 December EcoAgent CC was appointed by SRK Consulting (Order Q46369) to compile an Ecological Management Plan for the areas proposed for the Kloofsig of the Kloofsig project, Phases 1-3 PV development Project 486618). EcoAgent then realised that what was needed was a “Plant rescue and protection plan” to ensure that protected plant species and plant species of conservation concern (including red data, rare and threatened plant species) be rescued from the relevant areas proposed for the development of Phases 1-3; and how these plants can be re- established and protected in nurseries, gardens or suitable natural habitats.

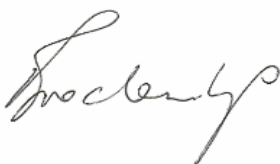
Prof George Bredenkamp of EcoAgent was responsible for the vegetation and flora surveys and compiled the specialist reports, firstly for the entire Kalkpoort RE/18, and later also even more detailed surveys for individual sites identified for the three Kloofsig phases of development.

Based on his field visits and reports Prof Bredenkamp realised that a plant rescue and protection plan for the three sites would not be necessary, as no plant species of conservation concern or protected plant species were found on the relevant sites [refer to the original report on the biodiversity of Kalkpoort RE/18, and particularly the three specialist reports on the vegetation and fauna of the sites of the Kloofsig phases 1-3]. The PRECIS database of SANBI showed that 181 plant species have been collected from the two Grids 2924DC Havengabrug and 3024BA Petrusville. No species of conservation concern were listed. It is, however, also realised that this area is under-collected and that many more plant species could occur there.

It should be mentioned that the original specialist biodiversity report of the entire Kalk Poort RE/18 be cancelled. protected or rare plant species. However, this part of the farm was then excluded from the Kloofsig PV development, and the three proposed phases are restricted to the very homogeneous plains karoo vegetation on the southern part of the farm.

In the light of the above EcoAgent suggests that no plant rescue and conservation plan is needed and that SRK order Q46369

Regards



Prof GJ Bredenkamp
Emeritus professor
Owner of EcoAgent CC

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