



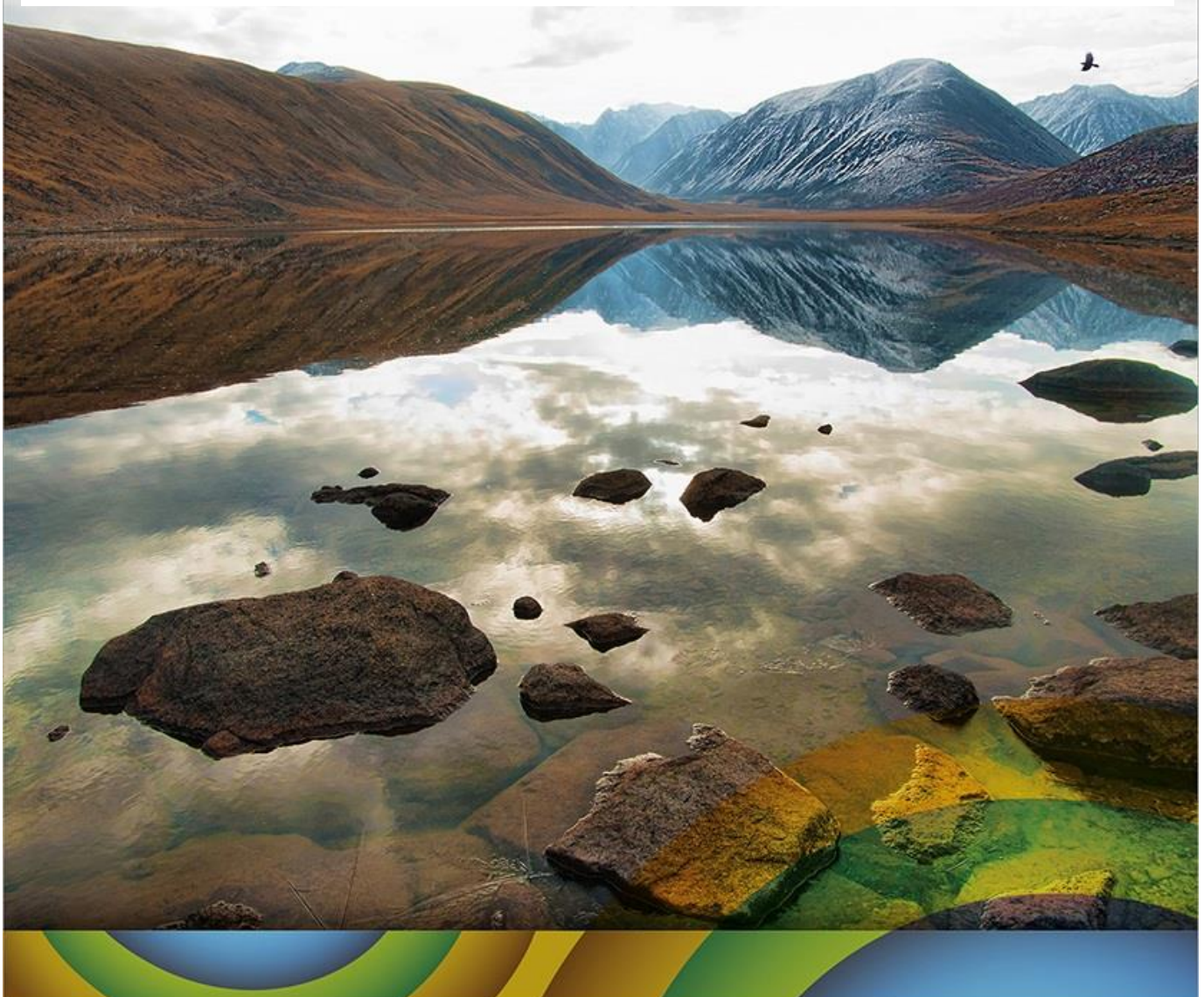
Nkurenkuru

ECOLOGY & BIODIVERSITY

SACNASP REG: 400502/14

FAUNA AND FLORA PRE-CONSTRUCTION WALK- THROUGH REPORT

TRANSALLOYS POWER PLANT NEAR EMALAHLENI,
MPUMALANGA PROVINCE





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*TRANSALLOYS POWER PLANT NEAR
EMALAHLENI, MPUMALANGA PROVINCE*

MARCH 2019

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I. DECLARATION OF CONSULTANT'S INDEPENDENCE

I, Gerhard Botha, as the appointed specialist hereby declare that I:

- » act/ed as the independent specialist in this application;
- » regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- » do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- » have and will not have no vested interest in the proposed activity proceeding;
- » have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- » am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- » have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- » am aware that a false declaration is an offence in terms of regulation 48 of GN No. R. 326.



Gerhard Botha Pr.Sci.Nat 400502/14 (Botanical and Ecological Science)
March 2019

II. LIST OF ABBREVIATIONS:

CARA:	Conservation of Agricultural Resources Act 43 of 1983
ECNCO:	Eastern Cape Nature and Environmental Conservation Ordinance No.19 of 1974
DEA:	Department of Environmental Affairs
EA:	Environmental Authorisation
ECO:	Environmental Control Officer
EMP:	Environmental Management Plan
NFA:	National Forest Act 84 of 1998
NEMA:	National Environmental Management Act 107 of 1998
NEM:BA	National Environmental: Biodiversity Act (Act No. 10 of 2004)
CITES:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
LFA:	Landscape Functional Analysis (Tongway and Hindley 2004)
IP:	Invasive Plant (indigenous or alien)

III. LIST OF DEFINITIONS:

Accelerated soil erosion: Soil erosion induced by human activities.

Acceptable cover: An acceptable cover shall mean that not less than 40% (in regions receiving less than 400 mm rain per annum), of the area rehabilitated and/or planted shall be covered with grass and other species and that there shall be no bare patches of more than 500 cm in maximum dimension.

Alien: originating from another country or continent and originally different environment, commonly used to describe plants that are not indigenous to South Africa and have become problematic (spreading rapidly, threatening existing biodiversity)

Allelopathic components: one or more biochemical compound produced by a plant and released through leaf litter or roots that suppresses the growth, survival, and reproduction of other surrounding vegetation

Bare soil: Un-vegetated soil surface, unaltered by humans

Bush encroachment: means stands of plants of the kinds specified in CARA Table 4, where individual plants are closer to each other than three times the mean crown diameter

Compacted soil surface: A soil surface that has been hardened by an outside source, causing the soil to be more compacted than the surrounding area.

Conservation Important Plant: Any plant species that is protected within relevant international, national and/or provincial legislation and any species that is listed within the Red List of South African plants (version 2017.1).

Container plants: Container plants include all vegetation which are bought or supplied in acceptable containers from nurseries or vegetation lifted out of their natural position and placed in containers.

Desirable end state: the future condition or target on which the rehabilitation is designed and that will serve later as a basis for rehabilitation success evaluation. This can be based on a reference site or modelled according to available information on historic vegetation

Ecological rehabilitation: The process of assisting the recovery of a degraded or damaged ecosystem in a trajectory that renders the ecosystem fully functional, stable, and able to develop further, but not necessarily returning to the original historic state.

Ecological restoration: The process of assisting the recovery of an ecosystem that has been degraded damaged or destroyed, in a trajectory that ultimately returns the ecosystem to its natural successional stage.

Ecosystem: The combination of biota within a given area, together with a suitable environment that sustains the biota and the interactions between biota. It can have a spatial unit of any size, but shows some degree homogeneity as far as structure, function and species composition is concerned. Small-scale ecosystems typically link up to larger scale ecosystems and all contribute to the ecosystem function and services at the landscape-scale.

Establishment of grass: All procedures necessary to produce an acceptable cover of grass on an area.

Establishment Period: The Establishment Period is defined as the period beginning from the actual planting or placing of vegetation until three months thereafter, unless otherwise specified or unless grass cover is unacceptable or unless plants have not taken.

Extinction debt: is a concept that describes the future extinction of species due to events in the past. Extinction debt occurs because of time delays between impacts on a species, such as destruction of habitat or reduction of population size, and the species' ultimate disappearance.

Geophytic: resprouting during the growing season from an underground storage organ such as bulbs, corms, tubers or rhizomes, and dying back completely during unfavourable seasons

Indigenous: refers to a plant or animal that occurs naturally in the place in which it is currently found

Invasive plant: a kind of plant which has under section 2 (3) of CARA been declared an invader plant, and includes the seed of such plant and any vegetative part of such plant which reproduces itself asexually

Landscape: Consists of a mosaic of two or more ecosystems that exchange organisms, energy, water, and nutrients.

Nursery conditions: These are the necessary conditions to maintain healthy growth of rescued and/or container plants. This includes protection of such plants against wind, frost, direct sunlight, pests, rodents, diseases, and drought. It also includes the provision of suitable water, fertilizer and any other measures required to maintain the container plants.

Period of Maintaining: The Period of Maintaining is defined as the period following directly after the Establishment Period until the end of the Period of Maintenance for the whole Contract as defined in the General Conditions of Contract, unless otherwise specified.

Revegetation: The process of establishing a vegetative cover on exposed soils, regardless of species composition or structure, as long as the species are non-invasive and their presence will not impede the gradual process of ecological rehabilitation or – restoration.

Soil Erosion: is a natural process whereby the ground level is lowered by wind or water action and may occur as a result of inter alia chemical processes and or physical transport on the land surface.

Scarifying: To roughen the surface of soil as a preparation for seeding or topsoil addition.

Trimming: To neatly round off the levels of existing or previously shaped earthworks to blend in with the levels of other earthworks, constructed works, or natural landforms.

Transformation: The conversion of an ecosystem to a different ecosystem or land use type.

Topsoil: uppermost layer of soil, in natural vegetation maximally 30 cm, in cultivated landscapes the total depth of cultivation, containing the layer with humus, seeds and nutrients. Topsoils that are applied to landscapes to be rehabilitated must be free of refuse, large roots and branches, stones, alien weeds and/or any other agents that would adversely affect the topsoils suitability for re-vegetation.

Weed: a plant that grows where it is not wanted, and can therefore be an indigenous or alien species. An unwanted plant growing in a garden is just called a weed, but the 198 listed IPs are called “declared weeds and invaders”.

(Coetzee 2005, Clewell et al. 2005, SER 2004)

TRANSALLOYS POWER PLANT NEAR EMALAHLENI, MPUMALANGA PROVINCE

PRE-CONSTRUCTION ECOLOGICAL (FAUNA AND FLORA) WALKTHROUGH REPORT

1 INTRODUCTION

Nkurenkuru Ecology & Biodiversity Pty (Ltd) was appointed by Savannah Environmental Pty (Ltd) to conduct a Pre-Construction Ecological (Fauna and Flora) Walkthrough of the footprint earmarked for the development of the Transalloys Power Plant (Fluidised Bed Power Station) near Emalahleni, Mpumalanga Province.

Transalloys (Pty) Ltd have received Environmental Authorisation for the development of the Transalloys Fluidised Bed Power Station (55MW) on the following property Farm Elandsfontein 309 JS, south of the N4, approximately 8 km west of the town of eMalahleni and just north of Clewer in the Mpumalanga Province. This property falls within the eMalahleni Local Municipality which is located within the greater Nkangala District Municipality

Project Name	DEA REF NO
➤ Proposed Transalloys Power Plant and Associated Infrastructure	14/12/16/3/3/3/97

The purpose of the walk-through is to locate and identify any conservation important plant species or fauna within the development footprint and which may be impacted by the development. This report details the findings of the walk-through study that was conducted for the proposed footprint of the power station. The identity and location of all listed and protected species is provided, which can be used as input for the vegetation clearing permit application that is required from the provincial authority before construction can commence. Recommendations for avoidance or search and rescue are provided as appropriate.

1.1 Relevant Aspects of the Development

The layout of the Transalloys Power Plant development footprint is illustrated in Figure 1 below. The facility will have a generating capacity in a range of 120 – 150MW and will cover an extent of approximately 64 ha in total for two sites.

As mentioned, the proposed developments are located approximately 8 km west of the town of eMalahleni and south of the N4. The development will be located on the Farms Elandsfontein 309 JS.

Infrastructure associated with the proposed power station Facilities will include:

- Power Station Area
 - Main Plant House for one 120-150 MW unit
 - Auxiliary plant buildings, including administration building and warehouse;
 - Other operational support buildings;
 - Maintenance workshops and storage facilities including electrical and instrument workshops and stores, and machine shop;
 - Laboratory area for both routine testing and specialised analysis and investigation; and
 - High voltage yard.
- Associated Infrastructure
 - In-plant coal stock yard and storage;
 - Lime storage area;
 - 120 meter stack;
 - Coal conveyors;
 - Water supply pipelines (temporary and permanent);
 - Amenities including potable water; sanitary and sewer utilities; electrical utility interconnection; telephone utilities;
 - Sewage treatment plant;
 - Access road and internal roads;
 - Ash dump;
 - Ash dump runoff ponds;
 - Water storage reservoir for raw water supply;
 - Raw water treatment plant;
 - Zero effluent/evaporation pond;
 - Recycle pond.

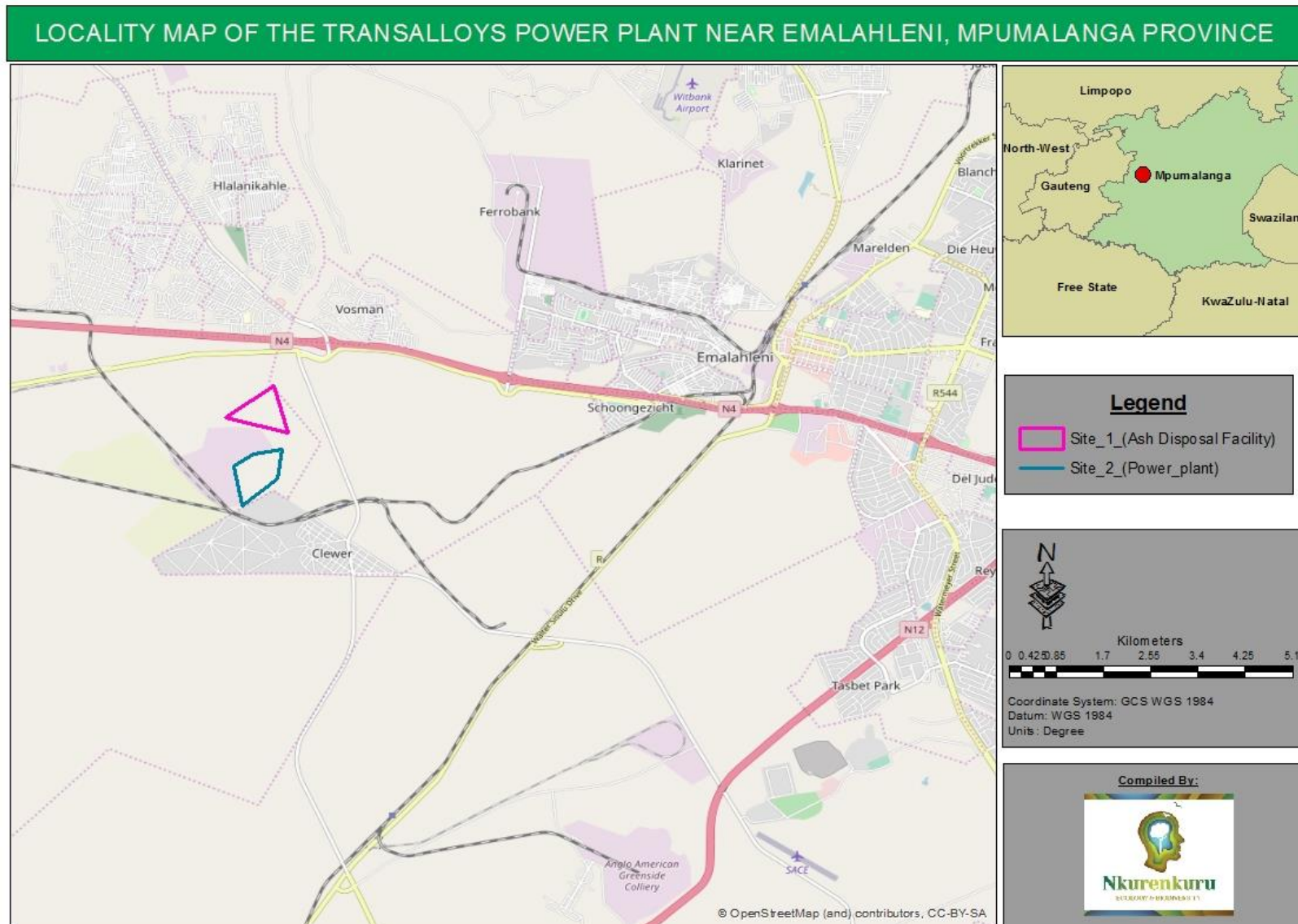


Figure 1: Location map of the proposed Transalloy Power Plant and Ash Disposal Facility west of Emalahleni, Mpumalanga Province.

1.2 Conditions of this Report

Findings, recommendations and conclusions provided in this report are based on the authors' best scientific and professional knowledge and information available at the time of compilation. The author, however, accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document. No form of this report may be amended or extended without the prior written consent of the author. Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or make reference to this report. Whenever such recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety.

1.3 Scope and Purpose of the Report

Conduct a pre-commencement ecological walk-through survey / assessment of the footprint areas of the duly authorised activity and layout to:

- Provide a professional opinion on ecological issues relating to terrestrial fauna and flora within the footprint areas;
- Serve as background information for any permits required for the disturbance to, destruction of, or removal of protected plants or trees;
- Serve as additional ecological information for the Project Company, contractors and ECOs involved in the development.
 - This is also to facilitate micro-siting of footprint areas when they are demarcated, with the aim to further reduce negative impacts of the development.
- Aid in future decisions and environmental management regarding the project

1.4 Limitations

The presence of annuals and geophytes may be slightly lower than expected due to the dry preceding seasons, and also the different emergence cycles of geophytes in particular. Conditions, however, at the time of the walk-through can still be regarded as favourable and have not impacted the ability of the study to locate and identify most to potentially all species of conservation concern. Thus, the results of the walk-through are therefore considered to be both representative and reliable and no additional studies are deemed necessary.

2 IDENTIFICATION OF LISTED AND PROTECTED SPECIES

Plant species of conservation concern which may occur in the area were identified based on the ecological assessment conducted by Botha (2014) for the Transalloys Power Plant as well as a species list for the broad area extracted from the SANBI SIBIS database for the quarter degree square 2529CC.

Species of conservation concern were extracted from the following:

- The generated list based on their status according to
 - Red List of South African plants version 2017.1 (<http://redlist.sanbi.org/>),
 - Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (2014)
 - The Red List of Mammals of South Africa, Swaziland and Lesotho (2016)
 - Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland (2004)
- Species listed as endangered or protected under the Mpumalanga Nature Conservation Act, 1999 (Act no. 10 of 1998): Schedule 11 and 12
- Protected Trees listed within the National Forest Act (NFA) (Nation Forest Act 1998; No 84 of 1998),
- Species listed under the Convention on International Trade in Endangered Species of Fauna and Flora (CITES).

Of particular relevance to the current study are the following, which are extracted from the legislation and are not intended to provide a comprehensive list of all protected species, only those which are likely to be encountered in the area. The reader is referred to the schedules of the Act for a full list of species listed under the act.

Schedule 11: Protected Flora

- Family ORCHIDACEAE – all species
- Family PROTEACEAE – all species
- Genus *ZANTEDESCHIA* – all species
- Genus *KNIPHOFIA* – all species
- Genus *ALOE* – all species, excluding species not occurring naturally in Mpumalanga
- Genus *EUCOMIS* – all species
- Genus *HAEMANTHUS* – all species
- Genus *BOOPHONE* – all species
- Genus *NERINE* – all species
- Genus *BRUNSVIGIA* – all species
- Genus *CRINUM* – all species
- Genus *CYRTANTHUS* – all species
- Genus *GLADIOLUS* – all species

- Genus *BRACHYSTELMA* – all species
- Genus *HUERNIOPSIS/HUERNIA* – all species
- Genus *DUVALIA* – all species
- Genus *STAPELIA* – all species
- Genus *ORBEA* – all species
- *Ammocharis coranica*

In terms of fauna the following are species which potentially occur at the site and are listed as protected species:

Schedule 2. Protected Game

In terms of fauna, the following *inter alia* are protected and may not be hunted, captured or harmed without a permit:

- Order REPTILIA – Reptiles, all indigenous species excluding water leguan, rock leguaan and all species of the sub order Serpentes (snakes)
- *Pyxicephalus adspersus* - Bullfrog
- *Atelerix frontalis* – Hedgehog
- *Raphicerus campestris* – Steenbok
- *Aonyx capensis* – Cape clawless otter
- *Manis temminckii* – Pangolin
- *Otocyon megalotis* - Bat-eared fox/Bakoovos
- *Proteles cristatus* – Aardwolf/Maanhaarjakkals
- *Orycteropus afer* - Aardvark / Ant-bear Erdvark / Aardvark
- *Lutra maculicollis* – Spotted necked otter

Of relevance to the current study would be burrows of any of the above species within the development footprint, specialized habitat home to red-listed fauna, or nesting and roosting sites of birds such as raptors or cranes.

According to previous records with the wider area, the following Red Listed species may occur within the study area:

Red Listed Plant Species

- *Boophone disticha* – Declining
- *Frithia humulis* – Endangered
- *Hypoxis hemerocallidea* – Declining
- *Crinum bulbispermum* – Declining
- *Eucomis autumnalis* - Declining

Red Listed Faunal Species

In terms of fauna, the following *inter alia* are protected and may not be hunted, captured or harmed without a permit:

- *Pyxicephalus adspersus*, Giant Bullfrog – Near Threatened
- *Crocidura maquassiensis*, Maquassie Musk Shrew – Vulnerable
- *Crocidura mariquensis*, Swamp Musk Shrew – Near Threatened
- *Felis nigripes*, Black-footed Cat – Vulnerable
- *Atelerix frontalis*, South African Hedgehog – Near Threatened
- *Leptailurus serval*, Serval – Near Threatened
- *Aonyx capensis*, African Clawless Otter – Near Threatened
- *Poecilogale albinucha*, African Striped Weasel – Near Threatened

3 METHODOLOGY

The site was visited on the 3rd of January 2019, during the start of the growing and flowering season for most species. During the walk-through, each of the development sites (Site 1: Ash and Slag Storage and Site 2: Power Plant) were walked and all listed and protected species observed were recorded. Transects of between 10 and 30m apart were walked across each of the development areas. This was deemed sufficient to provide an accurate estimate of the number of conservation important species present at the site as it is relatively open with a relative short vegetation cover (at the time of the survey) and it is therefore highly unlikely that any species of concern were not observed at the site. Furthermore, this distance was deemed sufficient as narrower transects may lead to individual species being repetitively counted, especially those occurring in fairly dense populations over larger areas. Also, this distance is regarded as affective in determining population numbers more accurately. However, for smaller geophytes and succulents, it is not always possible to locate all individuals as their density may be high and they may be very small with the result that they can only be seen from close and their density is estimated from the walk-through which is considered to represent 75-80% of the site, which is deemed more than adequate to provide a reliable estimate of the total number of individuals affected, especially as there are no species of high conservation concern present at the site. The total length of the track that was walked within the development areas at the site exceeds 13 km.

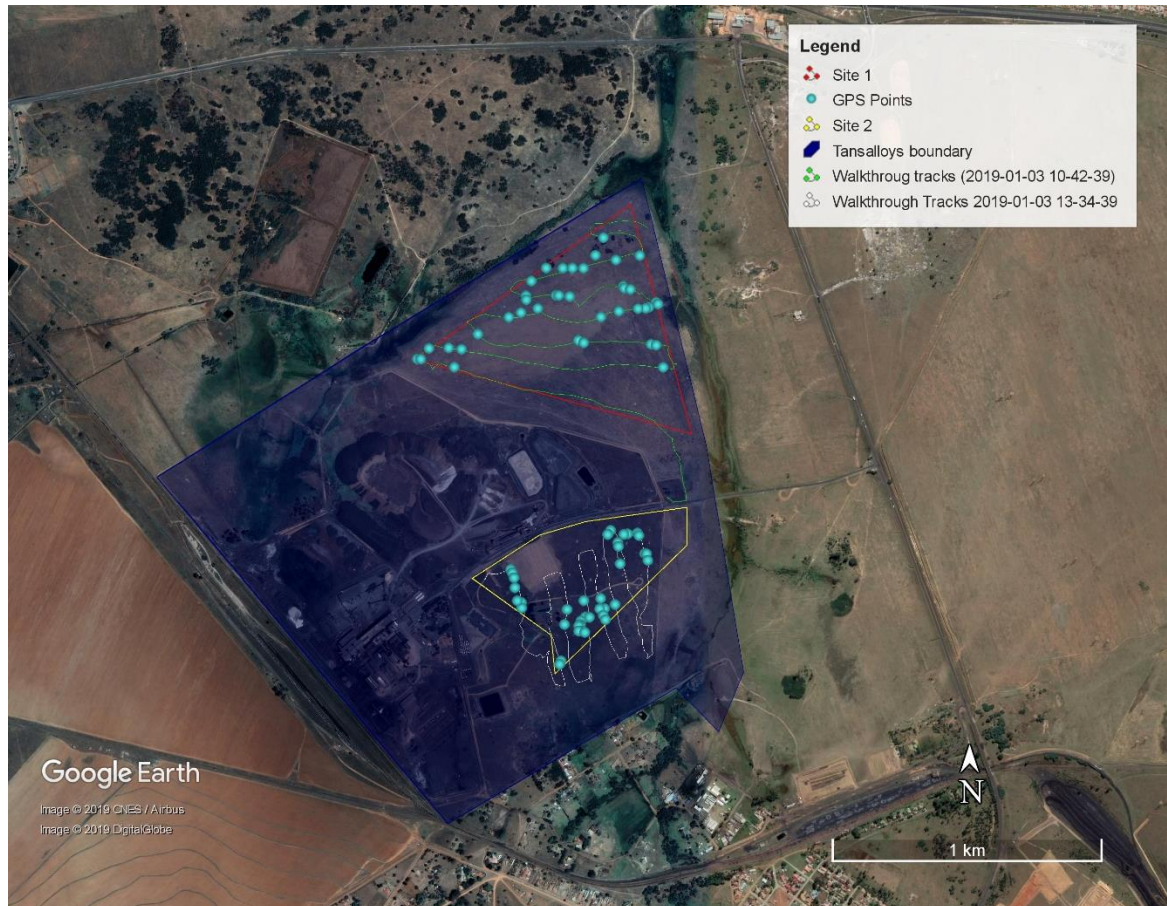


Figure 3: Walk-through tracks with some observed conservation important plant species that were found during the walk-through.

4 GRASSLAND OVERVIEW

Grasslands are one of the most productive landscapes of South Africa and the backbone of a large portion of the local agricultural sector. The dense herbaceous layer holds typically dispersive soils together and preserves it from erosion. Grasses as highly efficient binders of CO₂ keep carbon in the soil instead of in the air, so are a potent tool for combating climate change. The loss of the herbaceous layer, associated loss of soil organic matter and clay minerals during accelerated erosion reduces the water the holding capacity of soil, exacerbating drought conditions substantially and leading to an overall reduced productivity and resilience of the vegetation.

The name 'grassland' is generally misleading and conceals the fact that South African Grasslands are host to an exceptional species richness. Considering vegetation alone, more than 3000 plant species are found within the grassland biome – of which only one in six is a grass species. Many of the succulents and geophytes found in these grasslands are endemic

to their area of occurrence – some of the more unique species are of the families *Euphorbiaceae* and *Orchidaceae*.

Grassland ecosystems in South Africa are severely threatened – the largest threats being transformation to alternative land uses, reduction of basal cover and associated unstable soil conditions due to continued heavy grazing, and Invasive Alien Plant (IAP) infestations (Tainton 1999). Accelerated soil erosion as a result of land use patterns and associated degradation are a wide-spread concern, especially within the higher lying eastern parts of South Africa (Hoffman and Ashwell 2001). Areas within the grasslands that will be particularly prone to erosion are localised, very shallow soils that provide a more arid environment to plants and thus only have a low basal cover of grasses, with a significant presence of dwarf shrubs. In addition, soils with a high clay content are prone to high erosion rates once they become bare, and recovery on such soils may be slow or limited. These ecosystem threats have not only led to habitat loss and species extinction, but also loss of ecosystem services – the latter with detrimental consequences to the end-users of those ecosystem services – humans.

4.1 Species of special concern

The maintenance of biodiversity is a prerequisite to maintain ecosystem health and functioning; once extinct, species cannot be brought back. The local extinction of species, no matter how small or insignificant a species may appear to be, constitutes the gradual transformation of an ecosystem. The cumulative effects of this contribute to further transformation, often degradation and loss of resilience, of the ecosystem. Unfortunately, very little is known about the cumulative effects of local extinctions, and the time scale over which these occur. Extinction debts thus often occur many years after a landscape transformation has been brought about, as the prerequisites of a viable population of a species were not known at the time of the transformation. Good environmental management therefore requires the application of the "Precautionary Principle", aiming to minimise the risk of current and future extinctions, to compensate for uncertainties about the full potential of impacts that could be detrimental to ecosystem functioning and thus to human quality of life. One way of ensuring this is to protect and manage populations of plants and animals within an area, and make sure they do not fall below a minimum viable size. This is the smallest number of individuals which can reproduce and function normally, even under stressful conditions such as drought. It is often not known what this minimum viable population size for individual species is, but it is widely recognised that population numbers of species of special concern are decreasing. Hence, it will always be important to rescue and retain as many individuals of such species in their native environments as possible.

4.2 Dynamics in Grasslands

Healthy grassland dynamics are best understood using the concept of functional landscapes (Tongway and Hindley 2004). Grassland landscapes contain a series of interconnected patches. Nutrients and moisture move from one patch to another, mainly transported by water during rainfall events. Patches are considered basal obstructions such as tufted grasses. The denser such patches, the larger these run-on patches are and the higher their capability to capture and retain nutrients and moisture that is channelled their way via runoff zones. In a degrading landscape, the size of run-on (vegetated) zones decreases while runoff (bare) zones increase. This leads to less interception and an increased speed of runoff, and hence an increase in the loss of resources from an ecosystem – referred to by Tongway and Hindley (2004) as a leaking ecosystem.

The exposure of bare areas to the elements causes soil surfaces to crust, further reducing moisture infiltration into the system, and a further loss in nutrients and moisture. The resultant drier and nutrient-depleted system will not be able to support a highly productive grass layer, only a hardier, less palatable dwarf shrub layer, eventually no vegetation.

The first step in any rehabilitation effort will thus be to ‘plug the holes’ of the leaking ecosystem by creating physical barriers as initial run-on zones. Depending on the nature and severity of degradation, such physical barriers can be complemented by overseeding with grass species. Initial revegetation with rescued plant material to create run-on zones is also considered an optimal method to start rebuilding the patch dynamics necessary for a healthy ecosystem.

5 WALK-THROUGH RESULTS

5.1 Current vegetation cover on the project sites

The vegetation unit covering the development footprint is Eastern Highveld Grassland (Mucina & Rutherford, 2012). This vegetation type has a fairly extensive distribution within the Mpumalanga Province where it covers undulating plains as well as low hills. Structurally it is a short dense grassland with small, scattered rocky outcrops with wiry, sour grasses and some woody species. The underlying geology is primarily shales and sandstones of the Madzaringwe Formation (Karoo Supergroup). This vegetation type is considered as Endangered according to Mucina and Rutherford (2006), but is listed as Vulnerable within the National List of Threatened Ecosystems (2011).

The vegetation of the proposed development footprint is in a highly degraded and transformed condition with Site 1 comprising of a short secondary grassland occupying old cultivated land whilst Site 2 comprise of predominantly of secondary grassland with patches of primary grassland. Current disturbances within these areas have been reduced and regulated through the fencing of the entire development site avoiding uncontrolled movement through these areas. Site 1 is still used for livestock grazing by the surrounding community, however, as mentioned access is strictly controlled. Site 2 is unavailable for grazing and subsequently most of the grassland have significantly improved and is currently covered by a fairly species rich mixed grassland comprising of a mixture of grasses, forbs and geophytes. Furthermore, extensive clearing of the Category 1b Invasive Alien Trees; *Acacia decurrens* and *A. mearnsii* have occurred over the past few years. the numerous *Acacia dealbata* trees (Invasive Alien Plants: Category 1b). Both sites occupy gentle sloping landscapes (sloping towards the valley-bottom wetlands) with Site 1 mostly sloping in a north-eastern direction, whilst Site 2 generally sloping in an eastern direction.

The secondary grassland of Site 2 can be characterized as a very short grassland dominated by *Cynodon dactylon*. Other species dominant within this site include; *Eragrostis chloromelas*, *E. plana*, *Tragus berteronianus*, *Melenis repens* and *Hypharrhenia hirta*. The forb layer is characterized by *Helichrysum rugolosum*, *H. nudifolium*, *Nidorella hottentotica*, *Commelina africana*, *Dicerocaryum eriocarpum*, and various alien plants such as *Richardia brasiliensis*, *Solanum sisymbriifolium*, *Verbena bonariensis*, *Solanum incanum*, and *Campuloclinium macrocephalum*.



Figure 4: Northern view of the project area indicating the short secondary grassland which is subjected to regular grazing by livestock (cattle and goat).

The grassland of Site 2 is highly variable and comprise of a mosaic pattern of tall and short grassland, predominantly determined by the type of disturbance the area has been subjected to and soil moisture. Historical degradation of this has resulted in a reduction in *Themeda triandra* and an increase graminoids such *Eragrostis chloromelas*, *Hyparrhenia hirta*, *Heteropogon contortus*, *E. racemosa*, *E. superba*, *Elionurus muticus* and *Andropogon Eucomus*. The forb layer as mentioned, is relatively well represented within the site and is characterised by the following species; *Scabiosa columbaria*, *Helichrysum nudifolium*, *H. rugulosum*, *H. coriaceum*, *Eriosema burkei*, *Nidorella hottentotica*, *Hermannia transvaalensis*, *Vahlia capensis*, *Hermannia depressa*, *Ipomoea bathycolpos*, *Ipomoea oblongata* as well as various alien plants such as *Richardia brasiliensis*, *Solanum sisymbriifolium*, *Verbena bonariensis*, *Cyperus esculentis* and *Schkurhia pinnata*. Geophytes where also relative prominent within the development site and included; *Ledebouria revoluta*, *L. cooperi*, *Hypoxis iridifolia*, *H. hemerocallidea* and *Crinum graminicola* Shrubs found within the development site included, *Felicia muricata*, and *Seriphium plumosum*. This vegetation description is consistent with the description provided by Botha (2014).



Figure 5: Most of the northern portion of Site 2 comprise of taller grasses, especially *Hyparrhenia hirta* (Exotic trees in the background).



Figure 6: Most of the southern and eastern portion of Site 2 comprise of a short mixed grassland.

5.2 Floral species of conservation concern and suitable for rehabilitation

During the walk-through survey, no conservation important species were recorded within the development footprint of Site 1 whilst only one conservation important plant species were confirmed within the development footprint of Site 2, which is protected under provincial regulations (Mpumalanga Nature Conservation Act, 1999 (Act no. 10 of 1998)). This species is *Crinum macowanii*. Furthermore, this species is not listed within the Red List of South African plants version 2017.1. However, this species is listed as Declining according to Raimondo et al. (2009) due to general decreasing population trends which can be attributed to intensive harvesting of the bulbs for the medicinal plant trade throughout the country as well as land transformation.

Hypoxis hemerocallidea (star flower, yellow star (Eng.); sterblom, geelsterretjie (Afr.); inkomfe (isiZulu); tshuka (Tsw.) is a tuberous (large corm) perennial with straplike leaves and yellow star-shaped flowers. The leaves are up to 400mm long, neatly arranged one above the other in 3 ranks, broad, stiff and arching outwards with prominent ribs and tapering towards the tips. The lower surface of the leaves is densely hairy. Leaves appear above

ground in spring before the flowers. *H. hemerocallidea* occurs in open grassland and woodland and are sometimes associated with moist soil conditions of the temporary saturated zones of wetlands. Only a single population comprising three specimens was recorded just outside of the development footprint (Site 2) and care should be taken not to disturb these species. Similar to *C. macowanii*, this species is only protected within the provincial conservation act and is listed as declining according to Raimondo et al. (2009) due to pressure created on populations as a result of intensive (over-) harvesting for medicinal trade. This species can be confused with *Hypoxis iridifolia* which is relative abundant within Site 2 (high density population). *H. iridifolia* has a shinier leaf blade which is covered with less hair. Furthermore, the leaves are slightly more folded, upright and are prominently ribbed with margins covered with dense white hairs. As mentioned, this species was relative abundant within Site 2 and even though this species is not listed as a red data species or within any legislation as conservation important, an attempt can be made to search and rescue a portion of this population which can then be used during rehabilitation.

Crinum macowanii (cape coast lily, cape lily, common vlei crinum (Eng.); boslelie, rivierlelie (Afr.); umduze (isiZulu); intelezi (isiXhosa) is a deciduous, summer-growing bulb. The bulbs are large (60 – 250mm). The leaves are large, variable, up to 1m long and 20-200mm wide, bright green to bluish green, fleshy and strap-like with undulating margins. The flowers are large, bell-shaped, strongly sweet-scented white lilies with dark pink stripes, produced in umbels of 5 to 25 flowers on the tip of a long stalk. *C. macowanii* occurs in wide variety of habitats, such as vleis, mountain grassland, seasonally flooded grassland, savanna, deciduous woodland, beside rivers and along the coast, and in various soils, such as gravelly soil, shale or sandy flats. Within the development footprint of Site 2 this species was the most prominent conservation important species recorded with as much as 165 species recorded. This population of *C. macowanii* tend to occur in clumps which may comprise of as much as 20 individuals.

On routes and sites where, protected plants cannot be avoided, these plants –being geophytes – should be extracted from the soil and re-planted in similar habitats where they should be able to resprout and flourish again. It is assumed that not all plants can be salvaged, either due to difficulty in removing and transplanting them, or simply because of the sheer numbers of plants present.

The Project Company will thus have to apply for the necessary destruction and relocation permits from the authorities, which will then be applicable to all contractors/staff appointed by the Project Company. For the species that may have to be destroyed, it is recommended that professional service providers that deal with plant search and rescue be used to remove such plants and use them either for later rehabilitation work other conservation projects.

5.3 Faunal species of conservation concern

Faunal species recorded within the project site were predominantly small mammals (predominantly rodents), most of which were burrowing, crepuscular species. Furthermore, these species are mostly regarded as highly adaptable generalists capable of coping and co-existing within a relative disturbed environment (even flourishing). Disturbances, includes the silicomanganese production plant and activities associated with the plant, overhead power lines, historically cultivated land, overgrazing and trampling, dumping of construction rubble, high levels of human movement and traffic, invasion with invasive alien plants etc. These disturbances as well as the highly fractured nature of the broader area have significantly impacted species diversity and furthermore created an environment unsuitable some of the listed mammals.

The development footprint was traversed by foot (Figure 3), noting the presence of animals on site or evidence of animal activity, such as droppings, pellets, spoor, nests and burrows. Suitable microhabitats, such as rocky outcrops, were investigated. Visual sightings and ecological indications were used to identify the larger mammal inhabitants of the study area; this includes scats, tracks and habitat such as burrows and dens. The faunal species most frequently observed, or signs of them, were Multimammate Mouse (*Mastomys natalensis*) and Yellow Mongoose – (*Cynictis penicillata*). Both of these species are listed as least concern. The fairly large number of burrows seen in the development site means that there is a dense population of rodents, particularly of multimammate mice and potentially also Highveld Gerbil (*Gerbilliscus brantsii*). Despite these numbers of burrows, there is a low diversity of species. A single fairly large mammalian burrow was recorded within Site 1, but was determined to be abandoned and was likely made by Aardvark - *Orycteropus afer*. Scat belonging to the Common Duiker (*Sylvicapra grimmia*) was also recorded within the northern corner of Site 1. These small antelope flourish in a range of different habitats in woodlands, grasslands and savanna (Kingdon 1997). They benefit from reduced predation and patches of low secondary growth, even in urban areas.

Of the mammal species, or signs of them, recorded within the proposed footprint, only one species are protected within the relevant provincial conservation act (Aardvark), whilst none are listed Red Data species.

Notes on animal burrows: As mentioned, several types of animal burrows have been found along the footprint areas and routes investigated. Occupation of burrows often changes as the resource-base in the surrounding environment changes. Burrows abandoned by their creators are often taken over by other fauna species, either for temporary shelter or on a more permanent basis. As soon as the final footprint areas are properly demarcated by the surveying team and before construction commences, the ECO/EO and the contractor will have to inspect all larger burrows to see if there are animals inside and relocate these where

applicable. Provincial permits for such fauna will only be required where an animal is removed from the specific land portion where it has been found.

For species that require a permit for relocation or destruction, an approximate estimate of number affected as per current layout is given, based on the walk-through survey.

Table 1: Summary of listed and protected species (conservation important species) which were encountered during the walkthrough of the total development area, as well as an extrapolated total number of individuals that would be affected of each species (MPNCA = Mpumalanga Nature Conservation Act, 1999 (Act no. 10 of 1998)).

Species	Red Data Status	MPNCA Schedule 2	MPNCA Schedule 11	NFA	CITES II	Observed	Estimated Total
Flora							
<i>Crinum macowanii</i>	Declining		Y			77	110
<i>Hypoxis iridifolia</i>	Not Listed					46	160
Fauna							
Small rodent (Multimammate Mouse – <i>Mastomys natalensis</i>)	Not Listed					Numerous burrows noted	
Small rodent (Highveld Gerbil – <i>Gerbilliscus brantsii</i>)	Not Listed					Numerous burrows noted	
Aardvark (<i>Orycteropus afer</i>)		Y				Single burrow	1
Yellow Mongoose (<i>Cynictis penicillate</i>)	Not Listed					Scat	6
Common Duiker (<i>Sylvicapra grimmia</i>)	Not Listed					Scat	2

5.4 Alien Invasive Plants (AIPs)

Details of the relevant legislation relating to the effects of the development activities on the establishment of alien invasive species and possible consequences are summarised below:

NEMA: Section 28. Duty of care and remediation of environmental damage:

'(1) Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

(1A) Subsection (1) also applies to a significant pollution or degradation that:

- (a) occurred before the commencement of this Act;
- (b) arises or is likely to arise at a different time from the actual activity that caused the contamination; or
- (c) arises through an act or activity of a person that results in a change to pre-existing contamination.'

Rationale: The development actions of the proposed PV Solar Facilities create an unprecedented window of opportunity for the rapid establishment and spread of alien invasive species. Rapid new establishment or spread of alien invasives on disturbed soils from existing populations or from introduced material may lead to future uncontrolled infestations. Such infestations will lead to continued environmental degradation, primarily by loss of agricultural potential, biodiversity, species displacement and an increase in soil erosion and soil degradation.

'(2) Without limiting the generality of the duty in subsection (1), the persons on whom subsection (1) imposes an obligation to take reasonable measures, include an owner of land or premises, a person in control of land or premises or a person who has a right to use the land or premises on which or in which:

- (a) any activity or process is or was performed or undertaken; or
- (b) any other situation exists, which causes, has caused or is likely to cause significant pollution or degradation of the environment.

(3) The measures required in terms of subsection (1) may include measures to:

- (a) investigate, assess and evaluate the impact on the environment;
- (b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;

- (c) cease, modify or control any act, activity or process causing the pollution or degradation;
- (d) contain or prevent the movement of pollutants or the causant of degradation;
- (e) eliminate any source of the pollution or degradation; or
- (f) remedy the effects of the pollution or degradation.'

Further, the Developer and all contractors/subcontractors are, as authorised users of the development site (as authorised by the respective landowners), subject to the provisions of the National Environmental Management Biodiversity Act No 10 of 2004 as well as the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA). These Acts specifically aims to curb the devastation caused by Invasive Alien Plants as well as their spread. NEM:BA (Act no 10 of 2004) / Alien and Invasive Species List, 2015 identifies a total of 559 alien invasive species / groups of species. Of these 559 species 379 are invasive terrestrial and fresh-water plant species. NEMBA has furthermore, within the Alien and Invasive Species Regulations of 2014, divided these species into four categories. Each category prescribes different courses of action or remedies depending on the seriousness of the threat caused by the identified IAPs within the category.

These categories are as follows:

Category 1a:

- (1) *Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combatted or eradicated*
- (2) *A person in control of a Category 1a Listed Invasive Species must –*
 - (a) *comply with the provisions of section 73(1), (2) and (3) of the Act, and*
 - (b) *immediately take steps to combat or eradicate listed invasive species in compliance with section 75(1), (2) and (3) of the Act, and*
 - (c) *allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.*
- (3) *If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such programme.*

Category 1b:

- (1) *Category 1b Listed Invasive Species are those species listed as such by notice in terms of section (70)(1)(a) of the Act as species which must be controlled.*
- (2) *A person in control of a Category 1b Listed Invasive Species must control the listed invasive species in compliance with sections (75)(1), (2) and (3) of the Act.*

- (3) *If an Invasive Species Management Programme has been developed in terms of section (75)(4) of the Act, a person must control the listed invasive species in accordance with such programme.*
- (4) *A person contemplated in sub-region (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section (75)(4) of the Act.*

Category 2:

- (1) *Category 2 Listed Invasive Species are those species listed by notice in terms of section (70)(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.*
- (2) *Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive species without a permit.*
- (3) *A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.*
- (4) *If an Invasive Species Management Programme has been developed in terms of section (75)(4) of the Act, a person must control the listed invasive species in accordance with such programme.*
- (5) *Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive species and must be managed according to Regulation 3.*
- (6) *Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.*

Category 3:

- (1) *Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.*
- (2) *Any plant species specified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.*




(3) *If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.*



Alien Invasive Plants (AIPs) within the proposed development footprint was moderately extensive and well established. As mentioned, the majority of the invasive tree stands (*Acacia decurrens* and *A. mearnsii*) have been eradicated and has greatly improved grassland and wetland functionality and services provided. However, when comparing the increase in coverage of alien invasive forbs within the footprint, to the levels that was observed at the time of the initial ecological impact assessment in 2014, it was found that such species have become more prominent within the footprint. Especially *Verbena bonariensis* and *Campuloclinium macrocephalum* are regarded as troublesome and if not eradicated and managed during construction and operational phase may potentially pose a significant threat as these species thrive in disturbed areas with *C. macrocephalum* capable of invading the adjacent wetland and grassland habitats. *V. bonariensis* was especially prevalent with the secondary grassland patches and disturbed areas of Site 2 whilst *C. macrocephalum* was more often observed throughout Site 1. Both of these plants are listed as Category 1b AIPs. Other AIPs recorded within the footprint included *Solanum sisymbriifolium* (1b), *Opuntia ficus-indica*(1b), *Nicotiana glauca* (1b), *Pinus species* (2), *Datura stramonium* (1b) *Solanum mauritianum* (1b) and *Cirsium vulgare* (1b). Apart from *V. bonariensis*, *C. macrocephalum* and *S. sisymbriifolium* the remaining listed species, do not occur in high densities and was relatively scattered throughout the development footprint.

It is recommended that an Alien Invasive Plant Management Plan for the proposed development is compiled by a qualified specialist, addressing the monitoring and eradication of such listed AIPs during construction and operational phase. Special emphasis must be placed on the management and eradication of *Campuloclinium macrocephalum* in order to avoid this species from establishing and spreading into unimpacted grasslands and wetlands.


6 PHOTOGRAPHIC GUIDE TO PROTECTED SPECIES




6.1 Botanical Observations

<i>Hypoxis hemerocallidea</i>	
	<p>Protected: Relevant Provincial Conservation Act, Declining according to Raimondo et al. (2009)</p> <p>This species was recorded just outside of the boundary of the proposed Site 2 development footprint and care should be taken not to disturb these species during construction.</p> <ul style="list-style-type: none"> ○ Medium sized underground corm. Strap like leaves arranged one above the other in 3 ranks. Lower leaf surface densely covered with hairs. Can be difficult to locate if not actively growing (in dormant state). ○ Can be difficult to locate if not actively growing (in dormant state). ○ Easy to relocate and replant, ○ Aim to rescue 100% <p>TOTAL SPECIES Observed: 3 species Estimated: 10 species</p>
<i>Crinum macowanii</i>	
 	<p>Protected: Relevant Provincial Conservation Act, Declining according to Raimondo et al. (2009)</p> <ul style="list-style-type: none"> ○ Deciduous summer-growing bulb. ○ Large bulb (60 – 250mm in diameter) ○ Can be difficult to locate if not actively growing (in dormant state). ○ Easy to relocate and replant, ○ Aim to rescue at least 80%. <p>TOTAL SPECIES Observed: 77 species Estimated: 110 species</p>




<i>Hypoxis iridifolia</i>	
	<p>Protected: Not listed or protected</p> <ul style="list-style-type: none"> ○ Distinguishing traits (from <i>H. hemerocallidea</i>): Leaf shinier with less hairs, more folded, upright, prominently ribbed, margins covered with dense white hairs. ○ Can be relocated - may be difficult to locate once died back <p>TOTAL SPECIES Observed: 46 species Estimated: 160 species</p>
	





6.2 Faunal Observations

Aardvark (<i>Orycteropus afer</i>) - Burrows	
	<p>Protected: Relevant Provincial Conservation Act</p> <p>Burrows either inhabited by Aardvark, if abandoned by their creators, often used as shelter by tortoises, and other vertebrates</p> <p>Mobile species that will move away during constructions phase and will not return during operational phase.</p>

Yellow mongoose (<i>Cynictis penicillata</i>) - Scat	
	<p>Not listed or protected</p> <p>Burrows either inhabited by Yellow mongoose, if abandoned by their creators, often used as shelter by other small mammals (Mustelid or Rodentia species)</p> <p>Highly mobile and will move away during construction phase. May move back during operational phase.</p>
Common Duiker (<i>Sylvicapra grimmia</i>) Scat	
	<p>Not listed or protected</p> <p>Highly adaptable small antelope capable of inhabiting a wide variety of habitat types, even urban areas</p> <p>Highly Mobile species that will move away during constructions phase and will not return during operational phase.</p>
Multimammate Mouse (<i>Mastomys natalensis</i>) Burrows	
	<p>Not listed or protected</p> <p>Numerous burrows observed, especially within Site 1.</p> <p>Highly adaptable rodent, especially within the agricultural environment and may become a serious pest of cultivated lands.</p> <p>Indicative of poor ecosystem integrity.</p> <p>Highly Mobile species that will move away during constructions phase and will likely re-establish area during operational phase.</p>

6.3 Alien Invasive Plants (AIPs) Observations

<i>Verbena bonariensis</i>	
	<p>Tall Verbena</p> <p>Status: Category 1b AIP (Declared weed, prohibited and must be controlled)</p> <ul style="list-style-type: none"> ○ It is poisonous to livestock and invades roadsides, disturbed places, moist areas and grasslands.
<i>Solanum sisymbriifolium</i>	
	<p>Dense-thorned bitter apple</p> <p>Status: Category 1b AIP (Declared weed, prohibited and must be controlled)</p> <ul style="list-style-type: none"> ○ Competes with crop plants and indigenous pioneering species. Poisonous.
<i>Opuntia ficus-indica</i>	
	<p>Sweet prickly pear</p> <p>Status: Category 1b AIP (Declared weed, prohibited and must be controlled)</p> <ul style="list-style-type: none"> ○ Competes with and replaces indigenous species. Dense infestations reduce the grazing potential of the land and restrict access by domestic and wild animals. The spiny cladodes can cause injuries to animals and during the fruiting season the minute spines (glochids) on the fruits can be highly irritative and can result in animals being unable to feed.

<i>Campuloclinium macrocephalum</i>	
	<p>Pom pom weed</p> <p>Status: Category 1b AIP (Declared weed, prohibited and must be controlled)</p> <ul style="list-style-type: none"> ○ It causes serious degradation of the veld, lowering the biodiversity and reducing the grazing capacity by being unpalatable to large herbivores. Pose a serious threat to the survival of grasslands and wetlands of the highveld region as well potentially throughout South Africa. ○ There is a very high risk of distributing and re-introducing pom pom weed to neighbouring grasslands and wetlands. This invasive needs to be cleared, now already and kept clear within 50m of all edges of the footprint area. <p style="color: red;">The eradication and management of this species should be thoroughly addressed within an Alien Invasive Management Plan.</p>
	
<i>Nicotiana glauca</i>	
	<p>Wild tobacco</p> <p>Status: Category 1b AIP (Declared weed, prohibited and must be controlled)</p> <ul style="list-style-type: none"> ○ Competes with pioneering indigenous species. Can form dense and extensive stands along watercourses after flooding; this is of particular concern in conservation areas such as the Kruger National Park. Unpalatable and poisonous to domestic and wild animals.
<i>Acacia decurrens</i>	
	<p>Green Wattle</p> <p>Status: Category 2 AIP (Declared invader, allowed only in demarcated (plantations) areas by permit holders)</p> <ul style="list-style-type: none"> ○ Green wattle spreads and invades the grasslands, reducing the grazing area for animals. It competes with and replaces indigenous grassland and riverine animals.

7 DISCUSSION AND RECOMMENDATIONS

- The report indicates the approximate areas of occurrence of conservation important species (red data and protected species) and alien invasive species within the proposed footprint area of the Transalloys Power Plant (Fluidised Bed Power Station). A number of conservation important species have been mapped by GPS (refer to Appendix A) to help locate them, but it must be noted that the GPS accuracy is at best 1.5 – 3 m.
- Only one conservation important plant species have been noted within the proposed development footprint areas namely;
 - *Crinum macowanii*
- This species is protected within the relevant provincial legislation (Species listed as endangered or protected under the Mpumalanga Nature Conservation Act, 1999 (Act no. 10 of 1998)) No red data species (Red List of South African plants version 2017.1) were recorded within the “walked” area, however *C. macowanii* was listed as Declining according to Raimondo et al. (2009).
- *Crinum macowanii* was recorded within the development footprint of Site 2 with no conservation important species recorded within the development footprint of Site 1.
- It will be important to appropriately demarcate all footprint areas prior to construction, and then have a suitably qualified contractor locate and remove/relocate all protected species, supervised and possibly assisted by the project ECO.
- One conservation important faunal species have been noted namely;
 - Aardvark – *Orycteropus afer*
- This species is protected within the relevant provincial legislation (Mpumalanga Nature Conservation Act, 1999 (Act no. 10 of 1998)). No listed red data species were recorded within the “walked” area.
- Listed Alien Invasive Species recorded within the “walked” area includes:
 - *Acacia decurrens* (Category 2);
 - *Acacia mearnsii* (Category 2);
 - *Cirsium vulgare* (Category 1b);
 - *Verbena bonariensis* (Category 1b)
 - *Campuloclinium macrocephalum* (Category 1b)
 - *Solanum sisymbriifolium* (Category 1b)
 - *Opuntia ficus-indica* (Category 1b)

- *Datura stramonium* (Category 1b)
- Especially *C. macrocephalum* and to a lesser extent *V. bonariensis* pose a serious threat to the surrounding grasslands and wetland and special emphasis must be placed on the management and eradication of these species within an Alien Invasive Management Plan
- The Alien Invasive Management Plan should be compiled by a suitable qualified specialist, addressing the monitoring and eradication of such listed AIPs during construction and operational phase.
- Indigenous species that may potentially become invasive within the development footprint following the onset of the construction phase and vegetation clearing includes:
 - *Hypoxis iridifolia*;
- The following Chapters and Sections of the Nature Conservation Act, 1999 (Act no. 10 of 1998) are applicable to this report and proposed development:
 - For protected plants and specially protected plants: Chapter 6, Section 69 – 78 as well as Schedule 11 and 12
 - For invader weeds and plants: Chapter 6, Section 80
 - For endangered and rare species of fauna and Flora: Chapter 7, Section 81 – 82
 - For Wild Animals (Chapter 2)
 - Specially protected game: Sections 5-40 and Schedule 1
 - Protected game: Sections 6-40 and Schedule 2
 - Protected wild animals: Sections 8-40 and Schedule 4
- The above implies that the Project Company will have to apply for a permit for the removal and relocation of all protected plants and animals that will be affected, and will have to get the written permission of the landowner to do so as well. As part of the permit application, this report, which also gives an estimate of the number of specimens per species or species group to be removed/destroyed will have to be submitted.

8 APPENDIX: LIST OF COORDINATES

Coordinates of listed and protected plant species observed during the walk-through.

<u>Species</u>	<u>Status</u>	<u>GPS No.</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Individual or Cluster</u>	<u>Size of Cluster (estimated amount)</u>
Campuloclinium macrocephalum	Category 1b AIP	8	-25.885576	29.127306		
Campuloclinium macrocephalum	Category 1b AIP	10	-25.885499	29.124619		
Campuloclinium macrocephalum	Category 1b AIP	13	-25.884642	29.121833		
Campuloclinium macrocephalum	Category 1b AIP	14	-25.884486	29.122283		
Acacia decurrens	Category 2 AIP	15	-25.884348	29.12291		
Solanum sisymbriifolium	Category 1b AIP	26	-25.883946	29.124091		
Acacia decurrens	Category 2 AIP	29	-25.884056	29.122481		
Verbena bonariensis	Category 1b AIP	30	-25.883923	29.122465		
Verbena bonariensis	Category 1b AIP	31	-25.883429	29.122665		
Acacia decurrens	Category 2 AIP	32	-25.882991	29.123213		
Acacia decurrens	Category 2 AIP	36.1	-25.882561	29.125043	Population Cluster	16
Burrow (Aardvark)	MNCA	36.2	-25.882561	29.125043		
Solanum incanum	Weed	37	-25.882719	29.125807		
Solanum sisymbriifolium	Category 1b AIP	38	-25.882571	29.126691	Population Cluster	18
Opuntia ficus-indica	Category 1b AIP	39.1	-25.881969	29.125338		
Scat (Common Duiker)	Not Listed	39.2	-25.881969	29.125338		
Nicotiana glauca	Category 1b AIP	40	-25.893054	29.12194		
Verbena bonariensis	Category 1b AIP	41	-25.893165	29.122004		
Nicotiana glauca	Category 1b AIP	42	-25.89333	29.122068		
Nicotiana glauca	Category 1b AIP	43	-25.893661	29.122101		
Solanum sisymbriifolium	Category 1b AIP	44	-25.894093	29.122189		
Solanum sisymbriifolium	Category 1b AIP	45	-25.894158	29.122343		

Pinus spp. (pinaster/taeda)	Category 2 AIP	46.1	-25.894337	29.12235	Population Cluster	4
Populus fremontii	Exotic tree	46.2	-25.894337	29.12235	Population Cluster	2
Populus deltoides	Exotic tree	46.3	-25.894337	29.12235	Population Cluster	4
Hypoxis iridifolia	Not Listed	58	-25.896219	29.123748	Population Cluster	50
Hypoxis iridifolia	Not Listed	59	-25.896104	29.123797		
Verbena bonariensis	Category 1b AIP	60	-25.894391	29.124024	Population Cluster	38
Acacia decurrens	Category 2 AIP	61	-25.894891	29.123929		
Crinum macowanii	MNCA, Declining	63	-25.895158	29.124679		
Crinum macowanii	MNCA, Declining	64	-25.895117	29.124573		
Crinum macowanii	MNCA, Declining	65	-25.895112	29.124452		
Crinum macowanii	MNCA, Declining	66	-25.894942	29.12445		
Crinum macowanii	MNCA, Declining	67	-25.894939	29.124514		
Crinum macowanii	MNCA, Declining	68	-25.894894	29.12451		
Crinum macowanii	MNCA, Declining	69	-25.894777	29.124532		
Crinum macowanii	MNCA, Declining	70	-25.894646	29.124699		
Crinum macowanii	MNCA, Declining	71	-25.894643	29.124764		
Crinum macowanii	MNCA, Declining	72	-25.894655	29.12485	Population Cluster	11
Crinum macowanii	MNCA, Declining	73	-25.894097	29.124641	Population Cluster	3
Crinum macowanii	MNCA, Declining	74	-25.894026	29.125263		
Crinum macowanii	MNCA, Declining	75	-25.894374	29.125228	Population Cluster	3
Crinum macowanii	MNCA, Declining	76	-25.894368	29.125407	Population Cluster	21
Crinum macowanii	MNCA, Declining	77	-25.894593	29.12536	Population Cluster	8
Crinum macowanii	MNCA, Declining	78	-25.894735	29.125443	Population Cluster	6
Crinum macowanii	MNCA, Declining	83	-25.894233	29.125796		
Crinum macowanii	MNCA, Declining	84	-25.891889	29.125523		
Crinum macowanii	MNCA, Declining	85	-25.891899	29.125521	Population Cluster	6
Crinum macowanii	MNCA, Declining	86	-25.891759	29.125628	Population Cluster	2
Crinum macowanii	MNCA, Declining	87	-25.892171	29.125894	Population Cluster	7
Crinum macowanii	MNCA, Declining	88	-25.892298	29.125919		

Crinum macowanii	MNCA, Declining	89	-25.892876	29.125981	Population Cluster	3
Crinum macowanii	MNCA, Declining	98	-25.892765	29.127004		
Campuloclinium macrocephalum	Category 1b AIP	99	-25.892546	29.126957		
Crinum macowanii	MNCA, Declining	100	-25.892537	29.126891		
Crinum macowanii	MNCA, Declining	101	-25.891936	29.126672	Population Cluster	3
Crinum macowanii	MNCA, Declining	102	-25.891854	29.126621	Population Cluster	3
Crinum macowanii	MNCA, Declining	103	-25.891879	29.126258	Population Cluster	7
Crinum macowanii	MNCA, Declining	104	-25.891897	29.126116	Population Cluster	24