

**ECOLOGICAL INVESTIGATION OF THE PROPOSED ESKOM SUB-STATION
EXTENSION AT GARONA, NORTHERN CAPE**

Prepared by

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EXECUTIVE SUMMARY

The study area is situated south-east of Upington near Groblershoop. The site consists of disturbed natural vegetation adjacent to an existing substation with a gravel road and railway line passing adjacent to the site. Fieldwork was undertaken to describe the plant communities on site and to determine whether any threatened plant or animal species occurred on the site. The site is on the boundary between two vegetation types, namely Kalahari Karroid Shrubland and *Gordonia Duneveld*, both of which are considered to have Medium sensitivity and importance for conservation. The study area enters the Griqualand West Centre of Plant Endemism close to Groblershoop. During the survey, 21 plant species were recorded, none of which are declared weeds or invader plants. Four plant species considered to be of conservation concern, namely *Hoodia gordonii*, *Brachiaria dura* var. *pilosa*, *Pterothrix tecta* and *Vahlia capensis* subsp. *ellipticifolia* could occur in the types of habitats found on the site, although they were not found during the survey. A single juvenile tree of the protected *Acacia haematoxylon* (protected in terms of the National Forests Act of 1998 (Act 84 of 1998)) was recorded on the site. Two reptiles, six birds and no threatened mammal species have a medium to high chance of occurring in the study area due to geographical distribution and habitat preferences which coincide with that of the study area. These are the Black Spitting Cobra, the Beaked Blind Snake, the Black Harrier, the Kori Bustard, the Martial Eagle, the Ludwig's Bustard, the Lanner Falcon and Sclater's Lark. Of 54 species of butterfly that have a geographical range that includes the study area (out of a total of 666 for South Africa), only three have a slightly restricted range, of which one, the Dune copper, occurs in the type of habitats available on site. None are rare or truly restricted in distribution, and none are presently known to be threatened with extinction.

Impacts identified include increased noise pollution during construction, increased dust during construction, increased risk of veld fires, loss and fragmentation of habitats, spread of alien species, disturbance to sensitive ecosystems, impacts on populations of endemic and red data species, and impacts on the movement and migration of bird and animal species. The impacts of the proposed development are mostly of low significance. However, there is a high incidence of fatalities and injuries due to collisions with overhead powerlines and fences for Ludwig's Bustard, the Peregrine Falcon and the Lanner Falcon. Such impacts are considered to be permanent to long-term at the regional scale and have **MEDIUM negative** significance at the scale of the proposed development. Recommendations are that existing access routes should be used as much as possible during construction and maintenance of the substation, limit disturbance to vegetation and rehabilitate disturbed vegetation as quickly as possible, ensure effective fire control at camp and construction

sites during construction, sections of infrastructure that pose a hazard to Ludwig's bustard and other large birds should be marked with appropriate devices. The identification of the protected tree species found on site, *Acacia haematoxylon*, should be confirmed before any management measures are proposed. The report concludes that the proposed substation extension could have a negative impact on the conservation status of threatened plant or animal species or vegetation communities, but few of these impacts are considered to have a high significance due to the small size of the proposed development. Mitigation can also reduce many of these impacts. The impact of greatest concern is the high incidence of mortality of birds that is associated with electrocution by or impacts with powerlines.

TERMS OF REFERENCE

To conduct an ecological survey at the site of the proposed sub-station extension at Garona, Northern Cape.

Tasks:

The study includes the following tasks:

- A brief discussion on the vegetation type in which the study area is situated, using available literature, in order to place the study in context.
- Description of vegetation communities using standard field-based vegetation survey techniques. Vegetation units will be described in terms of their structure, floristic composition and diversity in order to provide a description of the current status of the ecological communities present on the sites.
- Compilation of a species list (to provide an accurate indication of the floristic diversity) according to latest taxonomic treatments used by the National Herbarium, Pretoria. Alien invasive species, according to the Conservation of Agricultural Resources Act (Act No.43 of 1983) will be highlighted.
- Determination of the occurrence, or possible occurrence, of threatened and / or sensitive plant species (as listed in Hilton-Taylor 1996 with updated threatened status according to IUCN 2000) and sensitive plant communities, on the basis of field surveys, historical distribution records obtained from the South African National Biodiversity Institute, and available literature.
- Assessment of habitat sensitivity incorporating information from the faunal study.
- Assessment of the occurrence of threatened vertebrate fauna at each site on the basis of literature reviews, habitat information derived from the vegetation study and limited fieldwork with updated threatened status according to recent reviews by the relevant authorities. The study includes mammals, reptiles, amphibians and birds.
- The potential impact of the proposed project on habitats for flora and fauna. Impacts will be evaluated according to criteria such as *nature*, *extent*, *duration*, *intensity* and *probability* and, based on the above, the impacts will be rated for significance.
- A discussion on the significant impacts focusing on possible mitigation measures and possible amendments to the development proposal. Possible mitigation and management measures will be recommended for potential impacts

INTRODUCTION

The site of the proposed sub-station extension is south-east of Upington, approximately 18 km north of Groblershoop close to a small railway siding called Roilyf (Figure 1). The Orange River winds past approximately 10 km away to the south and east of the site. According to satellite-derived landcover data for the area the site is considered to be untransformed, consisting of low karroid shrubland (Fairbanks et al. 2000). There is an existing substation adjacent to the site, a gravel road passing the site and a railway line on the other side of the gravel road.

The study area falls within Karroid Kalahari Bushveld (Low & Rebelo, 1998). According to the most recent vegetation map of South Africa (Mucina & Rutherford in press), this area is now classified as Kalahari Karroid Shrubland, but close to (within 200 m) the boundary of Gordonia Duneveld. Kalahari Karroid Shrubland and Gordonia Duneveld are mapped as separate units, but typically form belts alternating with one another. The vegetation unit described by Low and Rebelo as Karroid Kalahari Bushveld covers a surface area of approximately 18 643 km² within South Africa, of which approximately 55% is considered to be transformed and only about 0.13% of

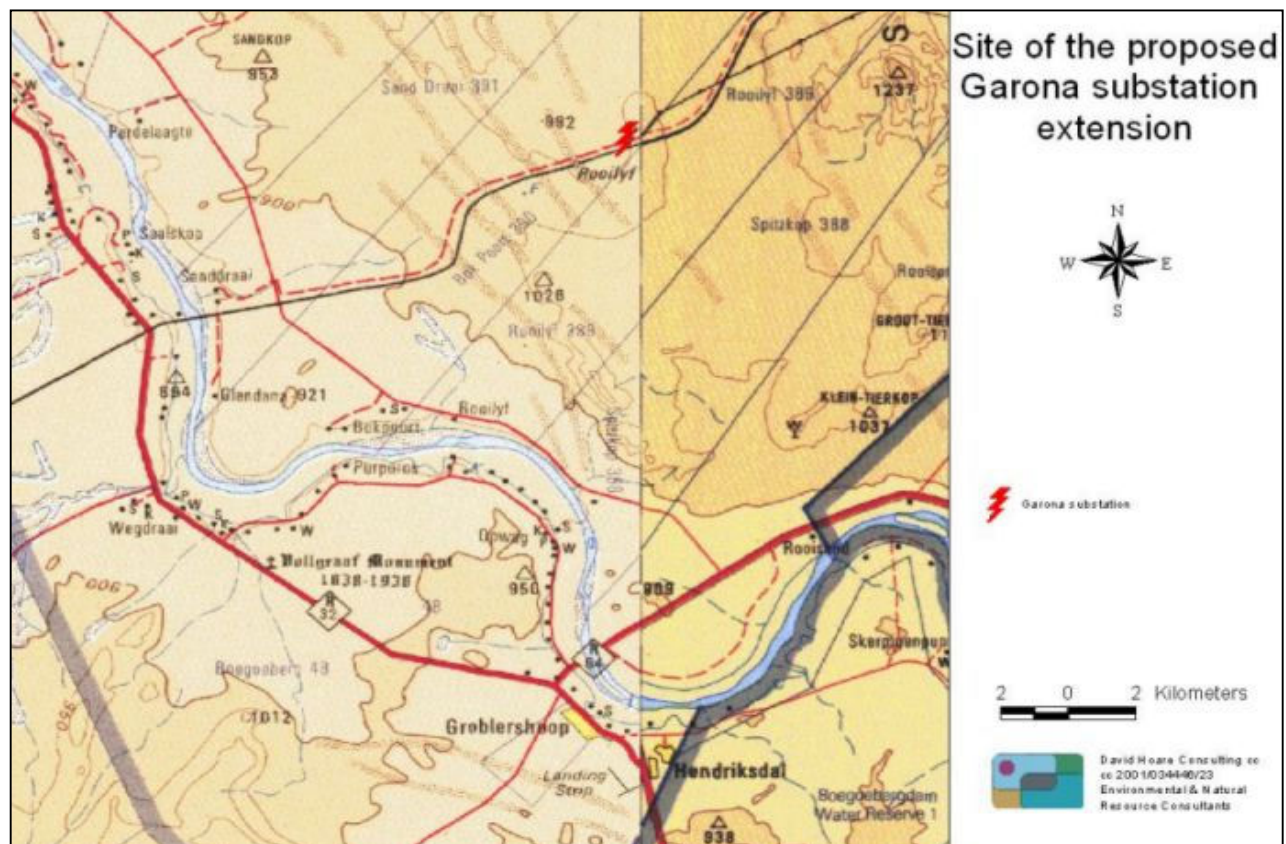


Figure 1: Location of the site.

which is currently conserved (Low & Rebelo, 1998). This assessment is, however, superceded by the more recent one in which, due to low rates of transformation, neither unit is considered to be a threatened vegetation type (Mucina et al. in press) despite very little or none being conserved.

Karrooid Kalahari Bushveld (Low & Rebelo, 1998) is a vegetation type with sparsely scattered individuals of *Acacia erioloba*, with *Boscia albitrunca* found in areas where sand has accumulated. The shrub layer is moderately developed consisting of species such as *Salsola tuberculata*, *Eriocephalus spinescens*, *Rhigozum trichotomum*, *Rosenia humilis*, *Aptosimum spinescens* and *Eriocephalus pubescens*. The grass layer is sparse, consisting of species such as *Stipagrostis obtusa*, *Stipagrostis ciliata*, *Enneapogon desvauxii*, *Eragrostis annulata*, *Eragrostis porosa*, *Eragrostis homomalla*, *Tragus racemosus* and *Schmidtia kalahariensis*.

Acocks (1988) describes this area as Kalahari Thornveld and indicates there are two variations of Kalahari Thornveld with various variations, the site falling within the western and north-western division of Kalahari Thornveld Proper. According to Acocks (1988), this western form is an “extremely open savanna of *Acacia erioloba* and *A. haematoxylon*, except along rivers and near ranges of hills and mountains, where ... *Boscia albitrunca*, *Grewia flava*, *Lycium hirsutum* and *Rhigozum trichotomum* are important. The grasses are ... mostly *Aristida* spp. and *Eragrostis* spp. with the silvery *Stipagrostis uniplumis* conspicuous. On dunes and in valleys, *Stipagrostis namaquensis*, *Centropodia glauca*, *Monechma incanum* and *Crotalaria virgultalis* may be important.” Acocks further indicates that the “sparse tuftedness of the grass and the looseness of the virtually bottomless sand, makes this veld extremely vulnerable to grazing pressure”.

This part of the Karoo Biome has not been studied in detail recently and the only information comes from the original study by Acocks (1988). Leistner (1967) undertook some broad studies in the southern Kalahari, but this excluded the current site. The site falls within the Ae land-type, a land-type being an area that is uniform with respect to terrain form, soil patterns and climate (Land Type Survey Staff 1985). This land-type is relatively widespread in this region and also corresponds to the boundaries of the Kalahari Karroid Shrubland vegetation unit (Mucina & Rutherford in press). The study area enters the Griqualand West Centre of Plant Endemism (van Wyk & Smith 2001) close to Groblershoop. It is also within 100 km of the Gariep Centre of Plant Endemism (van Wyk & Smith 2001) to the west. The features of potential sensitivity include the Griqualand West Centre as well as the Orange River and its tributaries.

METHODS

The fieldwork component of this survey was conducted on the 14th of July 2006. Since the site is relatively small, no attempt was made to undertake formal vegetation mapping. The most recent vegetation map of the region undertaken by the South African National Biodiversity Institute (Mucina & Rutherford in press) was accepted as an adequate general description of the surrounding vegetation and floristic information was collected to supplement this at the scale of the current study. Due to the brief duration of the survey and the lack of seasonal coverage, the species list provided in Appendix 1 for the area can not be regarded as comprehensive, but is nevertheless likely to include the majority of the dominant and common species present. Plant names follow Germishuizen & Meyer (2003).

Searches were undertaken specifically for Red List plant species, and any other species with potential conservation value, e.g. endemic species. These are listed in Appendix 2. All exotic species categorised as alien invaders or weeds (as listed in amendments to Conservation of Agricultural Resources Act, 1983, Act No. 43 of 1983) were recorded. Historical occurrences of Red List plant species were obtained from the South African National Biodiversity Institute for the quarter degree square within which the site is located.

A literature survey was undertaken to identify any threatened vertebrate animal species (mammals, birds, reptiles, amphibians) that may occur in the study area (Barnes 2000; Branch 1988; Branch 2001; Mills & Hes 1997; Passmore & Carruthers 1995; Smithers 1986). Specific attention was paid to listing those species that could potentially occur on the site based on habitat preferences and the availability of habitats on the site. Red-listed vertebrates that have a geographical distribution that includes the study area are listed in Appendix 3.

VEGETATION AND LANDCOVER

Most of the area around the site consists of untransformed natural vegetation, although within the site itself there has been some historical disturbance. The existing substation is located adjacent to a gravel road and railway line as well as a small railway siding. The original construction of the substation resulted in some local disturbance to the vegetation, which is clearly visible as lighter areas on aerial images of the site (see Figure 2). The natural habitats around the site are relatively uniform, but a long tongue of Kalahari sand extends from north to south past the eastern side of the site and this has a band of slightly denser vegetation around its base. Despite these slight variations, the vegetation and species composition is relatively uniform, with slight changes in species dominance from one place to another.

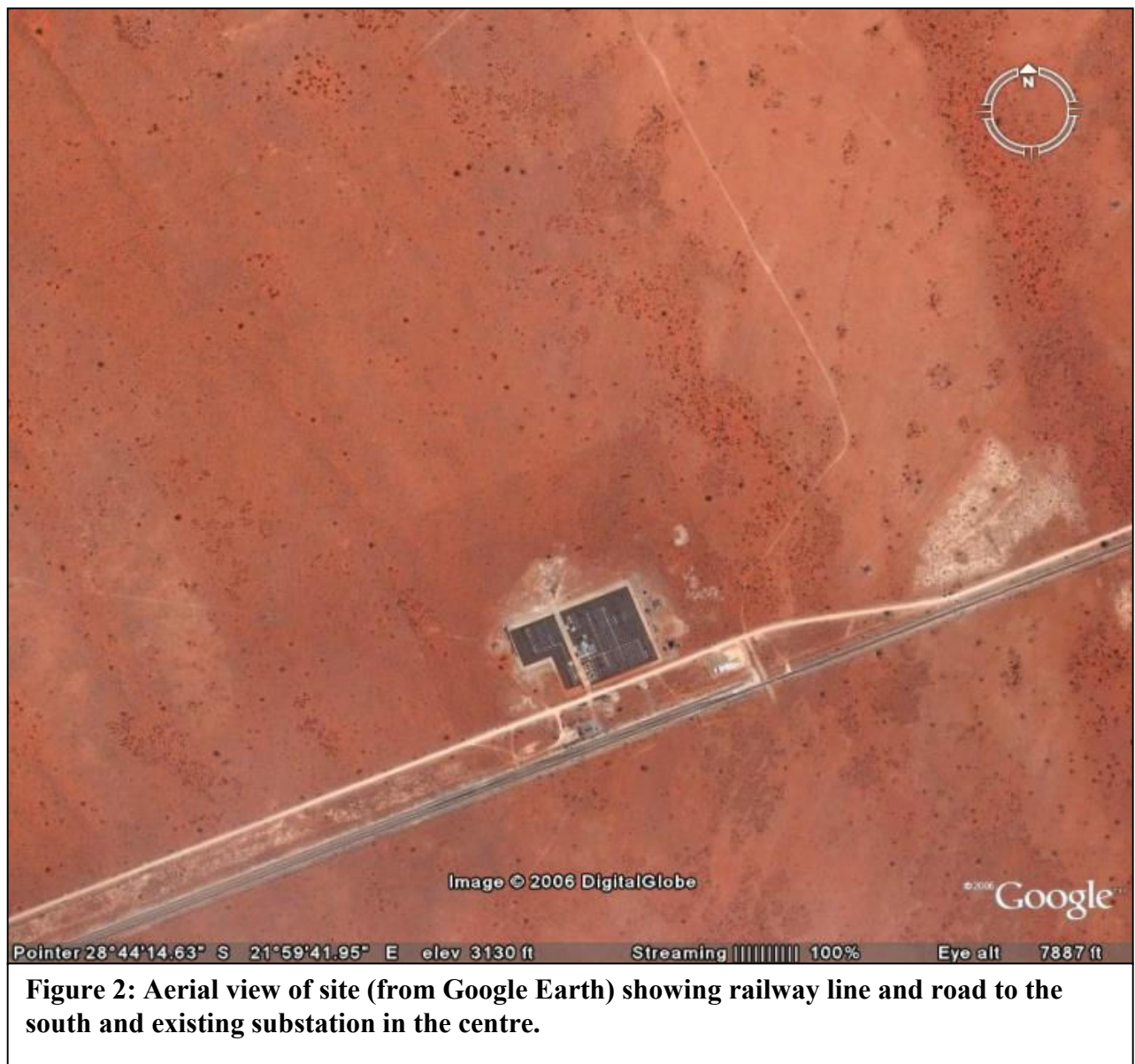


Figure 2: Aerial view of site (from Google Earth) showing railway line and road to the south and existing substation in the centre.

Vegetation of the study area

The two major vegetation types occurring on the site and in the immediate surroundings are Kalahari Karroid Shrubland and Gordonia Duneveld. A general description and sensitivity of each of these is given below, followed by a description of the site itself.

Kalahari Karroid Shrubland

This is the broad vegetation type that occurs around the site. It is described as a low karroid shrubland occurring on flat gravel plains. Dominant species include the small trees, *Acacia mellifera*, *Parkinsonia africana* and *Boscia foetida*, the tall shrub, *Rhigozum trichotomum*, the low shrubs, *Hermannia spinosa* and *Phaeoptilum spinosum*, the herbs, *Dicoma capensis*, *Chamaesyce inaequilatera* and *Limeum aethiopicum*, and the grasses, *Aristida adscensionis*, *Enneapogon desvauxii*, *E. scaber*, *Stipagrostis obtusa* and *Aristida congesta*.

There are no known endemics in this vegetation, but the grass *Dinebria retroflexa* has its south-western distribution limit in this vegetation type in this area (Mucina et al. in press). At a national scale this vegetation type has been transformed only a small amount, but it contains the preferred routes of many roads and about a quarter of the vegetation type is invaded by *Prosopis* sp.

Although only a small amount is conserved in Augrabies Falls National Park, it is not considered to be a threatened vegetation type (Mucina et al. in press). From a natural vegetation perspective this vegetation is therefore considered to have a MEDIUM sensitivity to disturbance by the proposed development for the following reasons:

1. disturbance due to construction will cause some local disturbance and/or transformation, but this is insignificant relative to the untransformed extent of the vegetation type, since only a small amount of this vegetation type will be affected by the proposed extension to the substation;
2. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including Ludwig's Bustard;
3. the low vegetation cover makes this vegetation vulnerable to disturbance.

Gordonia Duneveld

This vegetation type occurs in bands running through the broad study area. It consists of loose to partially stabilized sand dunes with very sparse vegetation that occurs primarily at the footslopes.

There are no known endemics in this vegetation type (Mucina et al. in press). At a national scale this vegetation type has not been transformed (Mucina et al. in press). Although none of this vegetation is conserved, it is not considered to be a threatened vegetation type (Mucina et al. in press). From a natural vegetation perspective this vegetation is considered to have a MEDIUM sensitivity to disturbance by the proposed development for the following reasons:

1. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including the Beaked Blind Snake, as well as the sensitive plant species *Hoodia gordonii*, *Pterothrix tecta*, *Vahlia capensis* subsp. *ellipticifolia* and *Brachiaria dura* var. *pilosa*.
2. the vegetation contains the protected tree species (according to the National Forests Act of 1998, Act 84 of 1998), *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca*.

Flora of the site

All plant species found during the survey are listed in Appendix 1. Due to the fact that the fieldwork component of this survey lacked seasonal coverage, the species list provided is unlikely to be comprehensive, but nevertheless provides a good indication of the species diversity and composition of the study area.

Species richness in the vegetation of the study area is very low: during the survey 21 species were recorded, none of which are exotic or declared weeds or invader plants. Considering the degree of historical disturbance due to the construction of the original substation, the absence of alien invasive plants is remarkable. However, a number of the indigenous species on site may be regarded as weeds of disturbed areas. The site appears to have many of the characteristics of a dune footslope, a habitat which is characterized by low species richness.

There were no declared weeds or alien invader species, according to the Conservation of Agricultural Resources Act (Act No.43 of 1983).

Red List Plant Species and other plant species of special concern

No Red List plant species were recorded in the field during the current survey. Historical records of Red List plant species (from the Threatened Species Programme of the South African National Biodiversity Institute) were consulted in order to determine the likelihood of any such species

occurring in the study area. There were six species recorded in the quarter degree grid that includes the site that were listed in the Red List of southern African plants. Two species, *Adenium oleifolium* and *Lavrana marlothii*, are listed as Least Concern, i.e. they are not currently considered to be threatened and are not therefore of conservation concern. Four species are considered to be of some conservation concern due to declining populations, lack of information or due to the fact that they are naturally rare, including *Hoodia gordonii*, *Brachiaria dura* var *pilosa*, *Pterothrix tecta* and *Vahlia capensis* subsp. *ellipticifolia*. The succulent *Hoodia gordonii* has been recorded during previous vegetation studies undertaken in the area and therefore has a high chance of occurring in the study area. It is also considered to be a Gariep Centre of Endemism near-endemic species. It is found in a number of habitats, including within Gordonia Duneveld. The other three species, *Brachiaria dura* var. *pilosa*, *Vahlia capensis* subsp. *ellipticifolia* and *Pterothrix tecta* have been previously recorded in dune sand or between dunes and are therefore most likely to occur in Gordonia Duneveld vegetation.

It is clear from the quantity and quality of data for the study area that this general geographic region is poorly known. There are few taxonomic collections and relatively little floristic information for the area (van Wyk & Smith 2001). There are 13 species listed as being endemic or near-endemic succulents for the nearby Griqualand West Centre of Endemism (van Wyk & Smith 2001). A number of non-succulent species are also endemic / near-endemic to the Griqualand West Centre of Endemism (van Wyk & Smith 2001). There are over 400 succulent species listed as being endemic or near-endemics for the nearby Gariep Centre of Endemism as well as a long list of non-succulents (van Wyk & Smith 2001). *Sarcocaulon patersonii* is found in a variety of vegetation types, including Bushmanland Vloere, Lower Gariep Broken Veld, Bushmanland Arid Grassland, Bushmanland Basin shrubland and, in one instance, in Gordonia Duneveld.

Tree species that have been recorded in the region that includes the study area that are protected in terms of the National Forests Act of 1998 (Act 84 of 1998) are *Acacia erioloba*, *A. haematoxylon* and *Boscia albitrunca*. *Acacia haematoxylon* was recorded on site. The tree *Acacia erioloba* occurs in dry woodland along watercourses in arid areas where underground water is present as well as on deep Kalahari sands (mostly Bushmanland Arid Grassland and Gordonia Duneveld), *A. haematoxylon* on deep Kalahari sand between dunes or along dry watercourses (Bushmanland Arid Grassland and Gordonia Duneveld) and *Boscia albitrunca* in semi-desert areas and bushveld, often on termitaria, but common on sandy to loamy soils and calcrete soils (mostly Bushmanland Arid

Grassland, but also found in Gordonia Duneveld). *Acacia erioloba* is relatively common in the broader study area, whereas *A. haematoxylon* and *Boscia albitrunca* usually occur more sparsely.

THREATENED ANIMALS

Red List Animal Species

No species of threatened animals were recorded during this survey. Two threatened reptiles and amphibians, eight threatened birds and no threatened mammal species have a broad geographical distribution and habitat preference which coincides with that of the study area (Appendix 3). The Lesser Kestrel, Secretarybird, Black Spitting Cobra and Beaked Blind Snake have a low chance of occurring on the site, due to the fact that their geographical range is marginal to the study area or the preferred habitat of these species is not available or uncommon in the study area. The species with a medium to high chance of occurring in the study area are discussed in more detail below.

Black Harrier

The Black Harrier occurs in open grassland, scrub, semi-desert and mountain areas and is endemic to southern Africa, mostly in South Africa. It is reliant on private farmland and is vulnerable to changing land-use. It is not reported to be affected by powerlines (Barnes 2000) and the proposed substation expansion is therefore unlikely to have a negative impact on the conservation status of this species.

Kori Bustard

The Kori Bustard occurs in dry savanna and moist to semi-arid woodland in South Africa. Threats to this species include habitat destruction, agriculture, bush encroachment, hunting, collision with overhead transmission lines and poisoning (Barnes 2000). In the study area the Kori Bustard favours tree-lined watercourses (Barnes 2000) and it is therefore unlikely to occur at the site of the proposed substation expansion.

Martial Eagle

The Martial Eagle is widespread and tolerates a wide variety of vegetation types. It relies on tall trees and/or electricity pylons to provide nesting sites. The main threats to this species are direct persecution (shooting & trapping), poisoning and drowning in sheer-walled reservoirs, especially in the arid Northern Cape. Lesser threats include electrocution on electricity structures and collision with overhead powerlines. The proposed substation expansion may therefore have an impact on this species due to increased collisions.

Ludwig's Bustard

Ludwig's Bustard occurs in open plains of the semi-arid Karoo (Barnes 2000). They are highly susceptible to collisions with overhead powerlines and telephone wires, the single most important threat to this species. The proposed substation expansion is therefore likely to have an impact on local populations of this species, although the substation itself is relatively small in area and would not, therefore, constitute a widespread threat.

Lanner Falcon

The Lanner Falcon occurs in a wide range of habitats, usually avoiding thick forests (Sinclair 1988). There is a high incidence of fatalities and injuries in this species due to collisions with overhead powerlines and fences. The proposed substation expansion is therefore likely to have an impact on local populations of this species, although the substation itself is relatively small in area and would not, therefore, constitute a widespread threat.

Sclater's Lark

Sclater's Lark occurs in gravelly or stony, semi-desert plains with stunted Karoo scrub (Sinclair 1988). It is endemic to southern Africa and the centre of its known distribution range. occurs nearby to the current project site. Populations in the Bushmanland area are considered to be relatively sedentary and return to the same nesting patch each year (Barnes 2000). The proposed substation expansion may therefore have an impact on this species if nesting sites are directly affected by the substation expansion.

Invertebrates

Most invertebrate groups are very poorly known and also considered to be extremely species rich – approximately 70% of species, including plants and animals, are invertebrates. The Animal Kingdom consists of 11 phyla, of which invertebrates comprise 10 of these, 4 of which are wholly marine (Rothschild 1965). In many cases, especially with insects (Phylum Arthropoda, Class Insecta), it is almost impossible to have specimens identified to beyond family level. This makes evaluation of threatened status very difficult and is usually only possible for better-known groups, such as butterflies. No official published threatened species lists exist for any invertebrates. An aggravating circumstance in the current study area is that it is generally poorly known for all groups

of organisms. The current study therefore only considers a single well-known group – the butterflies.

Of 54 species of butterfly that have a geographical range that includes the study area (out of a total of 666 for South Africa), only 3 have a slightly restricted range. One of these, the Dune copper (*Aloeides simplex*) occurs in sandy areas on red Kalahari dunes. None are rare or truly restricted and none are currently known to be threatened.

IMPACT EVALUATION

Evaluation of impact of proposed development

The objective of this part of the report was to evaluate the impacts of the proposed development of the powerline. Potential impacts are evaluated according to *magnitude, extent, duration* and *probability* and, based on the above, the rated significance of the impacts is given (rated “Low”, “Medium” or “High”). These criteria are drawn from the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989 and are defined as follows:

- Nature

The nature of the impact is whether it is a negative (destructive) or positive (beneficial) impact.

- Extent of the impact

A description of whether the impact will be: (1) local extending only as far as the development site area; or (2) limited to the site and its immediate surroundings; or (3) will have an impact on the region, or (4) will have an impact on a national scale or (5) across international borders. The criterion is scored according to the number in brackets.

- Duration of the impact

The impact is evaluated in terms of whether the lifespan of the impact would be (1) very short term (0-1), (2) short term (2-5 years), (3) medium term (5-15 years), (4) long term (16-30 years) or (5) permanent.

- Magnitude

The magnitude of the impacts is quantified on a scale from 0-10, where 0 is small and will have little effect (e.g. firecracker exploding), and 10 is very large and results in complete destruction (e.g. atomic bomb exploding).

- Probability of occurrence

The probability of the impact actually occurring is estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (low likelihood), 3 is probable

(distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

The significance is calculated by combining the criteria in an additive formula multiplied by the probability: (magnitude+duration+extent) x probability. A significance of <30 is considered to be low, 30–60 as medium, and >60 as high.

Potential impacts include the following:

1. Construction impacts

Increased noise pollution during construction

Increased noise pollution during construction will have a short-term LOW negative impact at a local scale that may affect animal populations in the immediate vicinity. It is unlikely to have a long-term negative impact on the threatened status of any organisms as many animals will move away until the noise abates.

Increased dust during construction

Increased dust pollution during construction will have a short-term LOW negative impact at a local scale that may affect animal populations and vegetation in the immediate vicinity. It is unlikely to have a long-term negative impact on the threatened status of any organisms unless it directly affects populations of threatened species. No threatened plant or animal species were found during the field visit of the site, although there are several species that could occur in the type of habitat found on the site.

Increased risk of veld fires

There may be increased incidence of veld fires in areas surrounding camp and construction site of the construction crew. This may result in a LOW negative impact at the local or site scale, although veld fires could potentially spread to a wider area. However, due to the sparse nature of the vegetation, it is unlikely to spread very far unless extreme environmental conditions, e.g. very strong winds, occur. This impact can be mitigated by ensuring effective fire control and awareness amongst construction staff.

2. Operational and long-term impacts

Loss of habitats

The loss of vegetation and habitats will occur at a local scale (site of substation extension). The impact would be of MEDIUM negative significance at the local scale. The vegetation around the existing substation is already moderately disturbed for a short distance and it is expected that a similar impact would occur beyond the extension to the substation. If existing access roads are used and the potential damage caused by the development is limited in extent as much as possible then the impact would be of LOW negative significance at the local scale.

Spread of alien species

The development activities may result in conditions that, in the long-term, favour the spread of alien species, i.e. disturbance to natural vegetation. This is a long-term LOW negative impact at the scale of the substation. Currently, it does not appear that existing disturbance has led to the establishment of alien plants, but there are indigenous weeds that have favoured the disturbed areas around the site. The impact may be reduced by limiting the extent of disturbance and rehabilitating disturbed areas as quickly as possible. In addition, topsoil from another site should not be unnecessarily translocated to the current site or *vice versa*.

Disturbance to sensitive ecosystems

Sensitive ecosystems are those vegetation types classified as sensitive in the powerline EIA. At the current site, this includes all the undisturbed natural vegetation (classified as having MEDIUM sensitivity). Disturbance of these areas will result in a permanent impact of LOW negative significance at a local scale. Mitigation is not feasible, except to use existing access and limit the spread of disturbance, and it is preferable to locate the proposed substation adjacent to the existing one than to place it in another undisturbed area.

Impacts on populations of endemic and red data species

A number of threatened, endemic, sensitive or protected species have been identified as having the potential to occur in the types of habitats around the site. The protected tree, *Acacia haematoxylon*, was found on the site, but no threatened species were found on site. Disturbance of the vegetation around the site is unlikely to lead to any long-term negative impacts on populations of threatened plant species. The single individual of *Acacia haematoxylon* is small and appears to have grown in a previously disturbed area as a secondary coloniser. A permit may need to be obtained for its

removal. The impact of the removal of this tree will be of LOW negative significance at a site scale.

Impacts on the movement and migration of bird and animal species

Overhead powerlines may have a potentially lethal impact on local populations of some bird species. For example, there is a high incidence of fatalities and injuries due to collisions with overhead powerlines and fences for Ludwig's Bustard, the Peregrine Falcon and the Lanner Falcon (Barnes 2000). Such impacts are permanent to long-term at the regional scale and have MEDIUM negative significance. Possible mitigation includes devices on the powerline to increase visibility, but research is ongoing to deal with such impacts. The proposed substation is relatively small compared to a length of powerline, but it may need to be treated in the same way. The use of devices on the substation will reduce the impact to one of LOW negative significance.

Summary of recommended mitigation and management measures

The following measures are recommended:

1. Using existing access routes as much as possible during construction and maintenance of the substation.
2. Limit disturbance to vegetation and rehabilitate disturbed vegetation as quickly as possible.
3. Ensure effective fire control at camp and construction sites during construction.
4. Sections of infrastructure that pose a hazard to Ludwig's bustard and other large birds should be marked with appropriate devices.
5. The identification of the protected tree species found on site, *Acacia haematoxylon*, should be confirmed.

Table 1: Evaluation of potential impacts.

Impact	Status	Corrective actions	Extent	Duration	Magnitude	Probability	Significance	Corrective actions
Increased noise pollution during construction	Negative	No	2	2	2	4	Low 24	<ul style="list-style-type: none"> • None required
		Yes	2	2	2	4	Low 24	
Increased dust during construction	Negative	No	2	2	2	4	Low 24	<ul style="list-style-type: none"> • Spray construction area with water regularly
		Yes	2	2	2	4	Low 24	
Increased risk of veld fires	Negative	No	2	2	2	3	Low 18	<ul style="list-style-type: none"> • Ensure effective fire-control at camp and construction sites of construction crew • Raise awareness of necessity for fire-control • Institute management system to react to veld fires that do occur
		Yes	2	2	1	2	Low 10	
Loss of habitats	Negative	No	1	5	2	4	Medium 32	<ul style="list-style-type: none"> • Use existing access • Limit disturbance to site
		Yes	1	5	1	4	Low 28	
Spread of alien species	Negative	No	2	4	1	2	Low 14	<ul style="list-style-type: none"> • Use existing access, limit disturbance to vegetation, rehabilitate disturbed areas, avoid translocating topsoil
		Yes	2	4	1	1	Low 7	
Disturbance to sensitive ecosystems	Negative	No	1	5	2	3	Low 24	<ul style="list-style-type: none"> • None possible
		Yes	1	5	2	3	Low 24	
Impacts on populations of endemic and red data species	Negative	No	3	5	2	2	Low 20	<ul style="list-style-type: none"> • Avoid populations of species of special concern
		Yes	3	5	1	1	Low 9	
Impacts on the movement and migration of bird and animal species	Negative	No	3	5	4	3	Medium 36	<ul style="list-style-type: none"> • Install devices on powerlines to reduce impacts/collisions and cases of electrocution

CONCLUSIONS

A variety of plant and animal species of special concern have been identified during this study that could occur in the type of habitats available at the site. The protected tree, *Acacia haematoxylon*, occurs on site as a single small individual. The vegetation around the site is a mosaic of Kalahari Karroid Shrubland and Gordonia Duneveld and is considered to have medium sensitivity. The proposed substation extension could, therefore, have a negative impact on the conservation status of threatened plant or animal species or vegetation communities, but few of these impacts are considered to have a high significance due to the small size of the proposed development. Mitigation can also reduce many of these impacts. The impact of greatest concern is the high incidence of mortality associated with electrocution or impacts with powerlines by birds.

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APPENDIX 1: Preliminary alphabetical checklist of plant species on site.

Species marked with an asterisk are naturalized exotics. Species taxonomy is according to Germishuizen and Meyer (2003).

■
Acacia haematoxylon
Acacia mellifera subsp. detinens
Albuca setosa
Anthericum sp.
Aristida adscensionis
Asparagus africanus
Indigofera alternans var. alternans
Chenopodium album
Cucumis africanus
Cuspida cernua
Enneapogon desvauxii
Eragrostis annulata
Geigeria cf. obtusifolia
Lycium prunus-spinosa
Melolobium candicans
Pelargonium sp.
Pterothrix spinescens
Rhigozum obovatum
Senecio cf. erysimoides
Stipagrostis namaquensis
Zygophyllum microcarpum

APPENDIX 2: Red Data species recorded within the quarter degree grid within which the study site is situated as well as surrounding grids.

Taxon	Old Status*	IUCN version 3.1 Threat Category**	Orange List Category	Habitat	Probability of occurrence
APOCYNACEAE					
Adenium oleifolium Stapf	nt	LC		Sandy soils	High
Hoodia gordonii (Masson) Sweet ex Decne.	nt	LC	declining	Wide variety of arid habitats	Medium
Lavrania marlothii (N.E.Br.) Bruyns	nt	LC		Slopes	Medium
POACEAE					
Brachyaria dura Stapf var. pilosa J.G.Anderson	R	NE	rare	Sand dunes	High
ASTERACEAE					
Pterothrix tecta Brusse	R	not assessed	rare	Dunes sand or between dunes	High
VAHLIACEAE					
Vahlia capensis (L.f.) Thunb. subsp. ellipticifolia Bridson	K	DD	DD	Dune sand or between dunes	High

* Status according to Hilton-Taylor (1996)

** Status from personal communication with Ms. J.E. Victor of the Threatened Species Programme of the South African National Biodiversity Institute in Pretoria. Conservation Status Category assessment according to IUCN Ver. 3.1 (IUCN, 2001).

Appendix 3: Threatened animal species that have a geographical range that includes the study area.

Species categorised as Least Concern are not included here. The likelihood of occurrence is based on geographical range and habitat preference; HIGH = geographical range overlaps with study area and habitats present at site are suitable, MODERATE = either geographical range or habitat is marginal, LOW = both geographical range and habitat are marginal, or habitat entirely unsuitable.

THREATENED MAMMALS OF NORTHERN CAPE:

Order	Scientific name	Common name	IUCN category	Habitat	Likelihood of occurrence
Chiroptera	<i>Rhinolophus capensis</i>	Cape horseshoe bat	Near Threatened	Wide habitat tolerance. Roosts in caves and hollow trees	Zero, outside geographical distribution range
Lagomorpha	<i>Bunolagus monticularis</i>	Riverine rabbit	Data deficient	Riverine vegetation on alluvial soils adjacent to seasonal rivers	Zero, outside geographical distribution range
Insectivora	<i>Chrysochloris visagiei</i>	Visagie's golden mole	Critically endangered	Subterranean habitats in Bushmanland Nama-karoo	Zero, outside geographical distribution range
Insectivora	<i>Cryptochloris wintoni</i>	De Winton's golden mole	Critically endangered	Subterranean habitats in Strandveld succulent karoo, esp. sand, shingles or pebble shores, incl. sand bars, spits, dunes	Zero, outside geographical distribution range
Insectivora	<i>Chrysochloris asiatica</i>	Cape golden mole	Data Deficient	Subterranean habitats in sandy soils in renosterveld, fynbos and Strandveld succulent karoo	Zero, outside geographical distribution range

REPTILES AND AMPHIBIANS:

Scientific name	Common name	IUCN category	Habitat	Likelihood of occurrence
<i>Naja nigricincta woodii</i>	Black spitting cobra	*Rare	Rocky terrain in arid areas, rocky outcrops and dry water courses	Low

<i>Typhlops schinzi</i>	Beaked blind snake	*Peripheral	Not well-known. Occurs in arid areas and probably burrows in hard ground	Low
<i>Bitis xeropaga</i>	Desert mountain adder	*Peripheral	Bare, rocky hillsides and mountain slopes	Zero, edge of distribution and habitat unsuitable
<i>Pyxicephalus adspersus</i>	Giant bullfrog	NT	Breeds in seasonal, shallow, grassy pans in flat, open areas but also utilizes non-permanent vleis and shallow water on the margins of waterholes and dams	Zero, edge of distribution and habitat unsuitable

*old categories, no updated status available

BIRDS:

Scientific name	Common name	IUCN category	Habitat	Likelihood of occurrence
<i>Polemaetus bellicosus</i>	Martial eagle	Vulnerable	Wide range of habitats, but requiring tall trees or electricity pylons to provide nesting sites	Medium
<i>Falco naumannii</i>	Lesser kestrel	Vulnerable	Roost communally in tall trees, mainly Eucalyptus, in urban areas	Low, edge of distribution
<i>Ardeotis kori</i>	Kori bustard	Vulnerable	Dry savanna and arid scrub	Medium
<i>Neotis ludwigii</i>	Ludwig's bustard	Vulnerable	Open plains of semi-arid karoo	High
<i>Sagittarius serpentarius</i>	Secretarybird	Near Threatened	Open grassland	Low
<i>Circus maurus</i>	Black harrier	Near Threatened	Open grassland, scrub and semi-desert	Medium
<i>Falco peregrinus</i>	Peregrine falcon	Near Threatened	High cliffs and gorges	Zero
<i>Falco biarmicus</i>	Lanner falcon	Near Threatened	Wide range of habitats, avoiding thick forests	Medium
<i>Spizocorys sclateri</i>	Sclater's lark	Near Threatened	Stony, semi-desert with stunted Karoo scrub	Medium

BUTTERFLIES (all species):

Scientific name	Common name	Distribution and notes	Status
<i>Danaus chrysippus aegyptius</i>	African Monarch	Very widespread	
<i>Ypthima impura paupera</i>	African ringlet	Very widespread	
<i>Acraea neobule neobule</i>	Wandering donkey Acraea	Very widespread	
<i>Acraea trimeni</i>	Trimen's Acraea	Widespread	
<i>Vanessa cardui</i>	Painted lady	Very widespread	
<i>Thestor protumnus</i>	Boland skolly	Nama- and succulent Karoo	
<i>Iolais bowkeri</i>	Bowker's sapphire	All of South Africa except moist temperate uplands. Subsp. henningi found in arid savanna in FS, NW and NC Provinces	
<i>Iolais subinfusata reynoldsi</i>	Dusky sapphire	Northern half of NC	
<i>Leptomyrina lara</i>	Cape black-eye	Fynbos, Nama-karoo and Succulent Karoo	
<i>Deudorix antalus</i>	Brown playboy	All South Africa, except Lesotho / high Drakensberg	
<i>Cigaritis phanes</i>	Silvery bar	Savanna and arid savanna	
<i>Tylopaedia sardonix</i>	King copper		
<i>Argyraspodes argyraspis</i>	Warrior silver-spotted copper		
<i>Trimenia argyroplaga</i>	Large silver-spotted copper		
<i>Trimenia macmasteri</i>	McMaster's silver-spotted copper		
<i>Aloeides simplex</i>	Dune copper	Sandy areas in Kalahari, red dunes	Slightly restricted distribution / habitat
<i>Aloeides damarensis damarensis</i>	Damara copper	Nama-karoo, succulent karoo and arid savanna	
<i>Chrysoiritis chrysanthos</i>	Karoo daisy copper	Succulent karoo and south-western part of Nama-karoo	Slightly restricted distribution
<i>Crudaria leroma</i>	Silver-spotted grey	Widespread	
	Black-striped hairtail	Widespread	

	Pale hairtail	Widespread	
	Mashuna hairtail		
	Talbot's hairtail		
	Common blue	Widespread	
	Long-tailed blue	Widespread	
	Salvia blue		
	Patrician blue	Widespread	
	Common meadow blue	Widespread	
	Rayed blue	Widespread	
	Sooty blue	Widespread	
	Dwarf blue	Widespread	
	Velvet-spotted blue	Widespread	
	Topaz-spotted blue	Widespread	
	Thorn-tree blue	Widespread	
	Gaika blue	Widespread	
	Zebra white	Widespread	
	Common orange tip	Widespread	
	Smoky orange tip	Widespread	
	Kalahari orange tip	Arid savanna in NC, NW and Botswana	
<i>Colotis agoye bowkeri</i>	Speckled sulphur-tip	Arid savanna in NC	
	Banded gold tip	Widespread	
	Brown-veined white	Widespread	
	Meadow white	Widespread	
	African clouded yellow	Widespread	
	African migrant	Widespread	
	Broad-bordered grass yellow	Widespread	
	Citrus swallowtail	Widespread	
	Striped policeman	Savanna	
	Small marbled elf	Widespread	
	Dwarf sandman	Succulent karoo, Nama-karoo, Fynbos	

	Mafa sandman	Widespread	
	Common sandman	Widespread	
	Green-marbled sandman	Widespread	
	Karoo sandman	Arid Nama-karoo	Slightly restricted distribution