

PROPOSED EXPANSION OF THE EXISTING KOMSBERG MAIN TRANSMISSION SUBSTATION

SUTHERLAND

NORTHERN CAPE PROVINCE

Ecological Specialist Report for Basic Assessment

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EXECUTIVE SUMMARY

It is Eskom Holdings SoC Ltd.'s intention to expand the Komsberg Main Transmission Substation (MTS) (hereinafter referred to as Komsberg MTS) in order to cope, amongst other, with the increase in load that will be created by the number of proposed Wind Farm developments occurring within the area and which will connect to the Eskom grid via the Komsberg MTS. The expansion/ undeveloped area available within the Eskom property, and considered for the assessment, is approximately 19.8 ha. Of this 19.8 ha only a small portion will be utilized for the proposed development (the high voltage yard will only cover an area of approximately 5 ha whilst the total development including the portion of access road to be upgraded will not cover more than an estimated 10 ha). Within the expansion area two site alternatives have been identified. For the first alternative (preferred alternative) the proposed infrastructure will be placed between the existing capacitor banks installation whilst for the second alternative the proposed infrastructure will be located more to the east of the capacitor bank installations. The existing Capacitor banks will form part of the expanded substation footprint. The actual footprint of the development is approximately 440m x 450m. Regarding the upgrade (widening) of a section of the current access road, approximately 600 m of the access road will be widened by about 8 m. A basic assessment process has been initiated in order to obtain authorisation for the expansion of the Komsberg MTS. Savannah Environmental is conducting the required Basic Assessment process for the development and has deemed an ecological input as required for the study.

A desktop study as well as a site visit to the affected area was conducted in order to detail the ecological characteristics of the site, identify any sensitive features present within the affected area and provide an assessment of the likely ecological impacts associated with the development.

The extent of the development footprint area in this study is very limited and furthermore restricted to an area already transformed by the existing infrastructure. During the study it was found that the majority of the site can be regarded as Low Sensitive with the exception of a rocky patch and drainage line which is regarded as Medium Sensitive. The medium sensitive rockery forms a small patch within the core of Eskom's property as well as within the area of the preferred site (site alternative one). The proposed footprint area of site alternative two is situated just east of this rocky patch, although constructing activities is still expected to potentially impact on this area due to the close proximity. Furthermore, given the limited footprint of the development and the characteristics of the receiving environment, there are not likely to be any significant impacts resulting from the construction and operation of the infrastructure as found by this study.

No species of conservation concern, in terms of Threatened Status was observed during the site investigation. However, there is a possibility for some cryptic and dormant species to be present and which may only be visible (active growing phase) during other periods of time. Having said this if present these species would be present at a low densities since they were not observed within the relatively limited extent of the site.

A few species were however noted within the proposed footprint area, that is Protected according to Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009). These species are as follows:

- All species of the family Mesembryanthemaceae: *Ruschia cradockensis* subsp. *triticiformis*, *Antimima pumila*, *Hammeria salteri*, *Cheiridopsis namaquensis* and *Lampranthus uniflorus*.

- All species of the genus *Colchicum* (Family Colchicaceae): *Colchicum coloratum*, *C. cuspidatum*
- All species of the family Crassulaceae: *Crassula deltoidea*, *Crassula muscosa*, *Crassula glomerata*
- All species of the genus *Euphorbia* (Family Euphorbiaceae): *Euphorbia mauritanica*
- All species of the family Iridaceae: *Romulea atrandra*, *Romulea luteoflora*, *Lapeirousia plicata*, *Morea* spp. and *Babiana* spp.
- All species of the family Orchidaceae: *Holothrix aspera*
- All species of the genus *Oxalis* (Oxalidaceae): *Oxalis obtusa*, *Oxalis* spp.

Species such as *Holothrix aspera*, *Babiana* spp. and mesembs such as *Hammeria salteri* and *Cheiridopsis namaquensis* occur less frequent within the surrounding landscape and should preferably be avoided and if not possible be removed prior to the development and transplanted outside the footprint area but still in a similar habitat type. Take note that no protected species may be destroyed, removed and transplanted or disturbed in any manner without the appropriate approval (permit) from the relevant authority (Northern Cape Department of Environmental Nature Conservation).

1 INTRODUCTION

It is Eskom Holdings SoC Ltd.'s intention to expand the Komsberg Main Transmission Substation (MTS) (hereinafter referred to as Komsberg MTS) in order to cope, amongst other, with the increase in load that will be created by the number of proposed Wind Farm developments occurring within the area and which will connect to the Eskom grid via the Komsberg MTS. The expansion/ undeveloped area available within the Eskom property, and considered for the assessment, is approximately 20 ha. Of this 20 ha only a small portion will be utilized for the proposed development (the high voltage yard will only cover an area of approximately 5 ha whilst the total development including the portion of access road to be upgraded will not cover more than an estimated 10 ha). Within the expansion area two site alternatives have been identified. For the first alternative (preferred alternative) the proposed infrastructure will be placed between the existing capacitor banks installation whilst for the second alternative the proposed infrastructure will be located more to the east of the capacitor bank installations. The existing Capacitor banks will form part of the expanded substation footprint. The actual footprint of the development is approximately 440m x 450m. Regarding the upgrade (widening) of a section of the current access road, approximately 600 m of the access road will be widened by about 8 m.

The proposed site is located west of the R354, 40km south of Sutherland and 30km north of Matjiesfontein.

The activity will occur solely on the property of Eskom Holdings SoC Ltd, i.e. portion 2 of the Farm Standvastigheid 210, and is bordered by portion 1 of the Farm Standvastigheid 210.

The purpose of this report is to detail the ecological characteristics of the site and provide an assessment of the likely ecological impacts associated with the proposed development. The full scope of the study is detailed below.

1.1 SCOPE OF STUDY

To conduct an ecological study and impact assessment of the selected target area where the expansion of the Komsberg MTS is proposed in order to:

- » identify any sensitive areas;
- » compile sensitivity map according to results;
- » identify any Red Data Species and Protected Species (fauna and flora);
- » investigate the possible impact of the development on the immediate environment as well as the surrounding environment;
- » draw a conclusion from above mentioned and present recommendations and mitigation measures to protect sensitive areas and to keep environmental destruction to an absolute minimum.

1.2 LEGISLATION

The following legislation was taken into account whilst compiling the following report:

A. Provincial

- » Northern Cape Nature Conservation Act, No. 9 of 2009

B. National

- » National Environmental Management Act / NEMA (Act No 107 of 1998), and all amendments and supplementary listings and/or regulations
- » Environment Conservation Act (ECA) (No 73 of 1989) and amendments
- » National Environmental Management Act: Biodiversity Act / NEMA:BA (Act No. 10 of 2004) and amendments
- » National Forest Act 1998 / NFA (No 84 of 1998)
- » National Veld and Forest Fire Act (Act No. 101 of 1998)
- » National Environmental Management: Biodiversity Act (NEM:BA) 2004 (Act No, 10 of 2004)

C. International

- » Convention on International Trade in Endangered Species of Fauna and Flora (CITES)
- » Convention on Biological Diversity, 1995

1.3 GENERAL ASSUMPTIONS AND LIMITATIONS

1.1.1. *General assumptions*

- » This study assumes that the project proponents will always strive to avoid, mitigate and/or offset potentially negative project related impacts on the environment, with impact avoidance being considered the most successful approach, followed by mitigation and offset. It is further assumed that the project proponents will seek to enhance potential positive impacts on the environment.
- » Geographical Information Systems (GIS) spatial datasets used as part of the field surveys (site demarcation) and analyses are accurate.
- » The project proponents will commission an additional study to assess the impact(s) if there is a change in the size, location and/or extent of the study area that is likely to have a potentially highly significant and/ or unavoidable impact on the natural environment.

1.1.2. Limitations

The following refers to general limitations that affect the applicability of information represented within this report (also refer to Conditions of the Report):

- » This report specifically focuses on the identification, and classification of vegetation units restricted to the study area (See also: Conditions of this report).
- » A single baseline assessment was conducted.
- » Accuracy of the maps, routes and desktop assessments is based on the current 1:50 000 topographical map series of South Africa;
- » Accuracy of Global Positioning System (GPS) coordinates was limited to 8 m accuracy in the field.
- » A single survey limited the amount of biota identified at the site; and
- » Whilst every care is taken to ensure that the data presented are qualitatively adequate, inevitably conditions are never such that that is possible. Under the circumstances it must be pointed out that the nature of the vegetation, the time of year, human intervention etc. limit the veracity of the material presented.

1.4 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.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

- » Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011), where relevant.
- » No Critical Biodiversity Areas (CBA) mapping or systematic conservation planning has been conducted for the area with the result that no detailed conservation priority area information is available for the area.
- » Information on plant and animal species recorded for the Quarter Degree Squares (QDS) 3220 DC was extracted from the SABIF/SIBIS database hosted by South African National Biodiversity Institute (SANBI).
- » The International Union for Conservation of Nature (IUCN) conservation status (Table 1) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2013).

- » Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas (NFEPA) assessment, NFEPA (Nel et al. 2011). This includes rivers, wetlands and catchments defined under the study.
- » Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- » Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (SANBI’s SIBIS and BGIS databases).
- » Additional information on reptiles were extracted from the SARCA web portal, hosted by the ADU, <http://vmus.adu.org.za>
- » The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- » The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2013) (See Figure 1) and where species have not been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

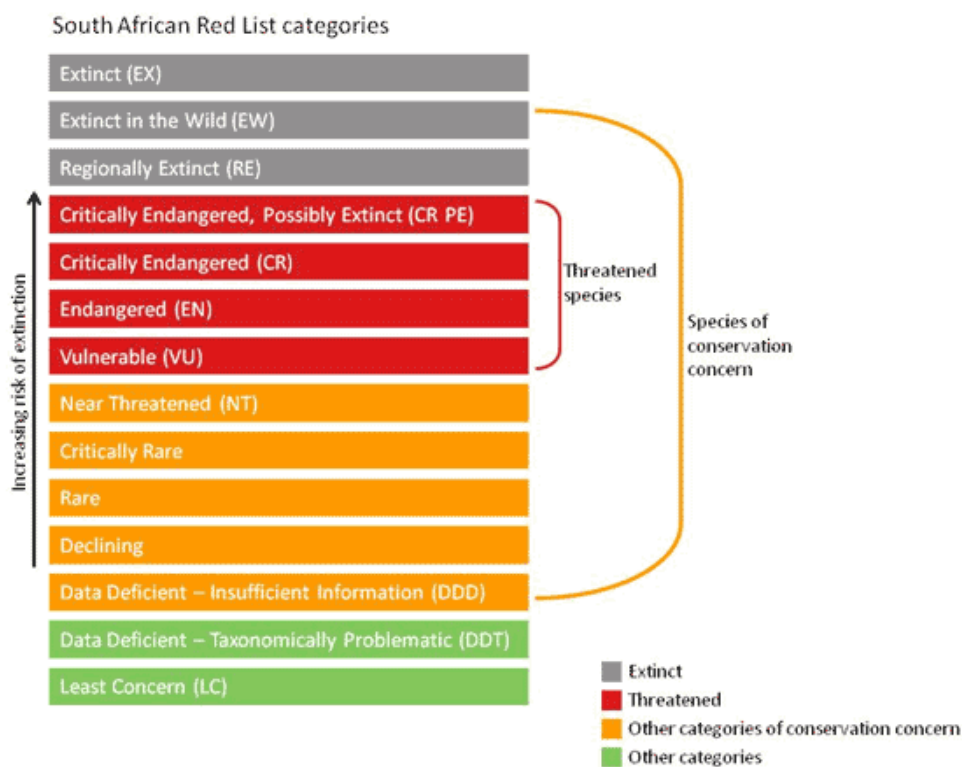


Figure 1: Schematic representation of the South African Red List categories. Taken from <http://redlist.sanbi.org/redcat.php>

2.2 FIELD SAMPLING & ASSESSMENT METHODOLOGY

The area affected by the proposed development has been visited on the 24th of August 2015.

The proposed development footprint as well as surrounding land was inspected on foot. Random selected 10m X 10m sampling plots were selected and the total visible floristic composition was noted. All sensitive features present within the development footprint were mapped and any species of conservation concern which might be affected by the development were recorded.

All terrestrial vertebrate fauna directly or indirectly observed at the site were noted and certain habitats such as rocky outcrops etc. were specifically searched for reptiles and amphibians. Furthermore, the likely occurrence, based on the availability of suitable habitat, of species of conservation concern known to or potentially occurring in the area was assessed.

The broad-scale ecological sensitivity map of the site was produced by integrating the above information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases (SIBIS, BGIS). The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Units with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. This category is reserved specifically for areas where the natural vegetation has already been transformed, usually for agricultural purposes. These areas represent opportunities for development since they have low biodiversity value and the impact of development within these areas will generally be low.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These can be developed with relatively low ecological impact provided that suitable mitigation and amelioration measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. Development within these areas is undesirable and should proceed extremely cautiously. Extensive mitigation measures may be necessary to reduce the ecological impact of development within these areas to an acceptable level.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These are essentially no-go areas from a development perspective and any direct or indirect impacts to these areas should be avoided as much as possible.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 LOCATION

The study site is situated within the Karoo Hoogland Local Municipality and is approximately 30km north of Matjiesfontein and 40km south of Sutherland in the Northern Cape Province and falls within the quarter degree grid 3220DC.

The development is solely situated within the property of Eskom, i.e. portion 2 of the Farm Standvastigheid 210, and is bordered by portion 1 of the Farm Standvastigheid 210.

The study area is located just to the east of the R354 that links Matjiesfontein (and the N1) to Sutherland. Access to the site is via a gravel provincial road and Eskom's access road to the existing Komsberg MTS.

3.2 PHYSIOGRAPHY AND SOILS

The greater area within which the development site is located can broadly be described as rugged terrain just to the south of the great Escarpment. The Klein Roggeveldberge run in an approximately north-south direction to the north of the study site. The study site self is a lower lying area which can be described as a undulating landscape sloping mainly in a south to north direction (See Figure 2). The elevation varies from 1079 to 1098 m above sea level. The site is underlain by mudstone and arenite of the Beaufort Group of the Karoo Supergroup.

The site is in the catchment of the Meintjiesplaasrivier, which flow into the Buffelsrivier, before passing through Laingsburg. There are a few drainage lines within the surrounding area dissecting the landscape, most of which are dry or non-perennial. Such a drainage line is present within the north-eastern section of the study site and runs in north-easterly direction where it finally terminates in a small soil / gravel dam.

Detailed soil information is not available for broad areas of the country. As a surrogate, landtype data was used to provide a general description of soils in the study area (landtypes are areas with largely uniform soils, typography and climate). There are primarily one landtype characterizing the study area, namely the Fc landtype (Land Type Survey Staff, 1987).

The F-group of land types refer to pedologically young landscapes that are not predominantly rock and or predominantly alluvial or aeolian and in which the dominant soil-forming processes have been rock weathering, the formation of orthic topsoil horizons and, commonly, clay illuviation, giving rise typically to lithocutanic horizons (MacVicar et al. 1974). The soil forms that epitomize these processes are Glenrosa and Mispah. The Fc landtype refers to land where lime occurs regularly (there need not be much of it and it need not occur in every soil present) in upland valley bottom soils (MacVicar et al. 1974).



Figure 2: Google image indicating the indicative footprint area and a south to north elevation profile of the Eskom property.

3.3 CLIMATE

The climate is arid to semi-arid. Rainfall may fall at any time of the year, although there is a peak in autumn / winter on the lowlands and slightly earlier (March) on the uplands. Mean temperatures of the mountainous regions are generally lower than the plains to the south of the escarpment. Frost is a common phenomenon in the mountainous areas with up to 50 days of frost per year. Mean annual rainfall is 200 to 250 mm per year.

Altitude has a strong influence on most climatic variables. Generally, an increase in altitude corresponds with a decrease in temperature and an increase in rainfall. Mountains also have an orographic influence on rainfall, escarpment zones usually experiencing increased rainfall and mist, depending on aspect, cause either an increase or decrease in mean daily insolation levels. The study site is located just south of the Great Escarpment and the climate is therefore strongly influenced by the presence of these mountains.

All areas with less than 400 mm rainfall are considered to be arid. The study site can therefore be regarded as arid.

3.4 LANDUSE AND LANDCOVER OF THE STUDY AREA

Landcover data for the area (Fairbanks et al. 2000) indicates that most of the surroundings are in a natural condition. There are some small areas indicated as cultivation in the valley bottoms. The natural parts of the landscape consist primarily of "shrubland and low fynbos" (Fairbanks et al. 2000). Regarding the specific site, Eskom's property is largely transformed by the existing capacitor bank installations, service and access roads and other associated infrastructure. The southern capacitor has been lifted with gravel and furthermore the area between the two capacitors has signs of previous groundwork's. Thus Eskom's property, within which the development is proposed, can be regarded as a largely transformed and degraded patch of land.

3.5 BROAD-SCALE VEGETATION PATTERNS

Vegetation classification according to Mucina & Rutherford (2006)

Despite the varied topography of the region, the vegetation of the site is relatively homogenous largely as a consequence of the similarly homogenous geology. The higher-lying parts to the north and south of the study area are Central Mountain Shale Renosterveld (FRs 5), while the study site and immediate surroundings is Koedoesberge-Moordenaars Karoo (SKv 6) (Figure 3).

The Koedoesberge-Moordenaars Karoo vegetation type is more extensive than Central Mountain Shale Renosterveld and has an extent of 4714km².

The slightly undulating to hilly landscape is primarily covered by low succulent scrub and dotted by scattered tall shrubs, patches of 'white' grass visible on plains, the most conspicuous dominants being dwarf shrubs of *Pteronia*, *Drosanthemum* and *Galenia*. A relatively large number of endemic species are known from this vegetation type (Table 1).

This vegetation types is not well protected within formal conservation areas, although most of the Koedoesberg-Moordenaars Karoo has not been highly impacted by intensive agriculture and is 99% intact. The conservation status of this vegetation type is classified as **Least Threatened**.

Hantam-Roggeveld Centre of Endemism

The development area falls within the southern part of the Hantam-Roggeveld Center of Plant Endemism (HRC) (van Wyk & Smith, 2001). This area occupies predominantly the high-lying far south-western corner of the inland plateau of South Africa. The southern and south-eastern boundaries of the center of plant endemism are demarcated by the Great Escarpment including the Roggeveld Mountains, Klein Roggeveld Mountains, Besenberg and Komsberg.

The HRC is exceptionally rich in geophytic and petaloid monocots, many of which are endemic to the region. The proportion of these species in the flora of this region is in excess of 30%. The area is a center of diversity and endemism for a number of plant groups, including *Hesperantha* and *Romulea* (Iridaceae), as well as Liliaceae, Scrophulariaceae, Asteraceae and Fabaceae.

Table 1: List of biogeographically important and endemic taxa known from the Koedoesberge-Moordenaars Karoo Vegetation Type (Mucina & Rutherford, 2006).

BIOGEOGRAPHICALLY IMPORTANT AND ENDEMIC TAXA OF THE KOEDOESBERGE-MOORDENAARS KAROO (SKv 6)	
<u>Succulent Shrubs</u>	
<i>Deilanthus peersii</i>	Western distribution limit
<i>Hereroa crassa</i>	Great Karoo basin endemic
<i>Pleiospilos nelii</i>	Great Karoo basin endemic
<i>Rhinephyllum graniforme</i>	Great Karoo basin endemic
<i>Ruschia crassa</i>	Great Karoo basin endemic
<i>Ruschia perfoliata</i>	Great Karoo basin endemic
<i>Antimima karroidea</i>	Endemic
<i>Antimima loganii</i>	Endemic
<i>Calamophyllum teretiusculum</i>	Endemic
<i>Cerochlamys gemina</i>	Endemic
<i>Drosanthemum comptonii</i>	Endemic
<i>Ruschia karrooica</i>	Endemic
<i>Tanquana archeri</i>	Endemic
<i>Trichodiadema hallii</i>	Endemic
<i>Tylecodon faucium</i>	Endemic
<u>Low Shrubs</u>	
<i>Felicia lasiocarpa</i>	Great Karoo basin endemic
<i>Sericocoma pungens</i>	Southern distribution limit
<i>Pelargonium stipulaceum</i> subsp. <i>ovato-stipulatum</i>	Endemic
<u>Semiparasitic Shrub</u>	Endemic
<i>Thesium marlothii</i>	Endemic
<u>Herbs</u>	
<i>Helichrysum cerastioides</i> var. <i>aurosicum</i>	Western distribution limit
<i>Ifloga molluginoides</i>	Southern distribution limit
<u>Geophytic Herbs</u>	
<i>Brusnvia comptonii</i>	Southern distribution limit
<i>Drimia karrooica</i>	Western distribution limit
<i>Lachenalia comptonii</i>	Endemic
<i>Strumaria undulata</i>	Endemic
<u>Succulent Herbs</u>	
<i>Aloe longistyla</i>	Western distribution limit
<i>Crassula hemispaerica</i>	Western distribution limit
<i>Pectinaria longipes</i> subsp. <i>longipes</i>	Roggeveld-Hantam endemic
<i>Piранthus comptus</i>	Great Karoo basin endemic
<i>Quaqua parviflora</i> subsp. <i>gracilis</i>	Roggeveld-Hantam endemic
<i>Tridentea parvipuncta</i> subsp. <i>parvipuncta</i>	Great Karoo basin endemic
<i>Haworthia nortieri</i> var. <i>pehlemanniae</i>	Endemic

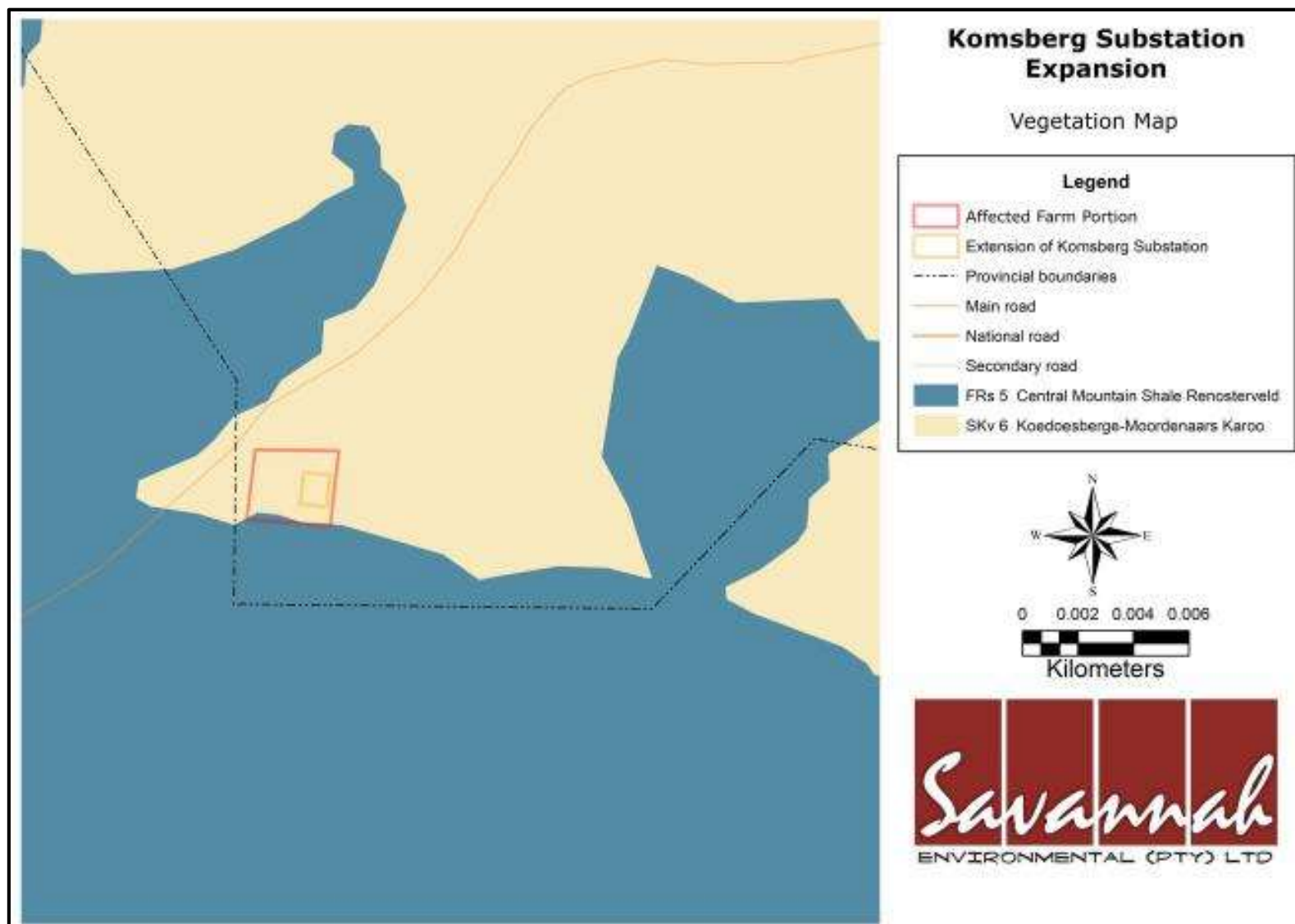


Figure 3: Vegetation map (Mucina and Rutherford, 2006) of the study site and surroundings.

3.6 FINE-SCALE VEGETATION DESCRIPTION

The Vegmap does not provide an adequate representation of the vegetation patterns at the site. Based on the site visit, it appears that the majority of the study site is represented by vegetation consistent of Koedoesberg-Moordenaars Karoo Vegetation Type. There is however small sections to the west and south where the vegetation resembles a type of crossover (ecotone) between Koedoesberge-Moordenaars Karoo and Central Mountain Shale Renosterveld. Furthermore to the north-east of the study site a drainage line is present running in a north-easterly direction towards a small gravel / soil dam. Apart from the “Koedoesberg-Moordenaars Karoo – Central Mountain Shale Renosterveld crossover” variation, rocky patches with shallow to little soil, also provides a variation in vegetation composition of the study area.

The major vegetation units that would be affected by the development are described in more detail below.

Koedoesberge-Moordenaars Karoo / Central Mountain Shale Renosterveld Crossover (with a strong affiliation with renosterveld)

This unit is largely dominated by three species diagnostic of Central Mountain Shale Renosterveld namely; *Dicerotheramnus rhinocerotis*, *Euryops lateriflorus* and *Eriocephalus* spp. (Most likely *E. ericoides* subs.p *erocoides*), *D. rhinocerotis* epitomize this unit along with *Chrysocoma ciliata* providing the structural characteristics of the vegetation of this unit which can be summarized as follow: A tall to medium grey shrubby unit with a poorly represented dwarf shrub and herb layer and a few geophytic species in more open areas dotted between the tall shrubs. Other shrubs present in this unit are *Eriocephalus* spp. 2 (*E. punctulatus*), *Pteronia incana* and *P. glomerata*. This unit is relative species poor when compared to the other two units and the herb layer and smaller shrub layer is poorly developed. The largest portion of the proposed development area is covered by this vegetation unit and is also dominant within the neighboring properties located the north, west and south of Eskom’s property. The proposed section of access road that will be widened will also cross predominantly through this unit



Figure 5: Vegetation of this unit is dominated by *Dicerotheramnus rhinocerotis* with some shrubby species of *Chrysocoma ciliate*, *Eriocephalus ericoides* subs.p. *erocoides* and *Euryops lateriflorus*.

Koedoesberge-Moordenaars Karoo / Central Mountain Shale Renosterveld Crossover (with a strong affiliation with succulent karoo)

This unit occurs on more gravely / stony soil and is characterized by a mixture of tall shrubs, dwarf shrubs and a few succulent shrubs. Geophytes are also relatively well represented within this unit. This unit is the most species rich unit. The large shrubby layer is dominated by *Euryops lateriflorus*, *Rosenia glandulosa* (x2), *Pteronia glomerata*, *P. pallens* and *Eriocephalus ericoides* subsp. *ericoides*. Although not as dominant, *Dicrothamnus rhinocerotis* is still well represented in this unit. The succulent shrub, *Ruschia cradockensis* subsp. *triticiformis* forms the dominant lower shrub layer. The herb layer is characterized by *Heliophila crithmifolia*, *H. cornuta*, *Zaluzianskya cohabitans*, *Lasiopogon muscoides* and *Othonna auriculifolia*. Geophytes are represented by *Romulea atrandra*, *Rumulea luteoflora*, *Oxalis obtusa* and *Lapeirousia plicata*. The disturbed areas around the existing infrastructure of the Komsberg Substation is characterized by the dominance of *Galenia africana*, the exotic weed *Dittrichia graveolens* and the presence of *Eragrostis curvula*.

Species of conservation concern found within the surveyed development footprint area, only include those which are protected according to Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) and include the following species:

- All species of the family Mesembryanthemaceae: *R. cradockensis* subsp. *triticiformis*.
- All species of the genus *Colchicum* (Family Colchicaceae): *Colchicum coloratum*
- All species of the family Crassulaceae: *Crassula glomerata*
- All species of the family Iridaceae: *Romulea atrandra*, *Romulea luteoflora*, *Moraea* spp. and *Lapeirousia plicata*
- All species of the genus *Oxalis* (Oxalidaceae): *Oxalis obtusa*.

Species such as the well represented *Ruschia cradockensis* subsp. *triticiformis* are usually indicative of some levels of disturbance, usually due to overgrazing by livestock. Thus from the abundance of this species it is evident that the area has undergone some level of overgrazing in the past and/or that this species also react (increase) to moderate levels of physical disturbance. The fact that most of these protected species still remain in the slightly to moderately disturbed areas indicates that these species are capable of handling some levels of disturbance although the capability of surviving and/or resettling in severely transformed and cleared areas can be regarded as low.

Take note that no protected species may be destroyed, removed and transplanted or disturbed in any manner without the appropriate approval (permit) from the relevant authority (Northern Cape Department of Environmental Nature Conservation).



Figure 6: Typical Koedoesberg-Moordenaars Karoo dominated by a few species of *Eriocephalus* and *Pteronia* as well as *Euryops lateriflorus*. The photo on the right indicates the lifted area and bank of the southern capacitor which is highly transformed.

Shrubby succulent Rocky patch (Koedoesberge-Moordenaars Karoo)

This patch is located between the two existing capacitors and comprises out of mainly rock and stone with little topsoil. Topsoil is furthermore very coarse to gravelly. Although this is a highly disturbed area with indications of old earthworks and grading, it still houses a unique set of species. The area is mainly dominated by succulent shrubs and herbs as well as geophytes. Succulent shrubs and herbs associated with this rocky patch include *Ruschia cradockensis*, *Antimima pumila*, *Hammeria salteri*, *Cheiridopsis namaquensis*, *Lampranthus uniflorus*, *Crassula deltoidea*, *C. muscosa*, *C. glomerata* and *Euphorbia decussata*. Low shrubs and forbs include *Pteronia pallens*, *P. scariosa* and *Eriocephalus microphyllus*. *Euryops lateriflorus* is also found scattered where soil is deeper. As mentioned, geophytes were also well represented within this unit and include *Colchicum coloratum*, *C. cuspidatum*, *Bulbine torta*, *Babiana* spp. *Lapeirousia plicata*, *Oxalis obtusa*, *Oxalis* spp. *Albuca spiralis*, *Eriospermum capense*, *Romulea atrandra*, *R. diversiformis* and *Holothrix aspera*.

Species of conservation concern found within the surveyed development footprint area, only include those which are protected according to Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) and include the following species:

- All species of the family Mesembryanthemaceae: *Antimima pumila*, *Hammeria salteri*, *Cheiridopsis namaquensis* and *Lampranthus uniflorus*.
- All species of the genus *Colchicum* (Family Colchicaceae): *Colchicum coloratum*, *C. cuspidatum*
- All species of the family Crassulaceae: *Crassula deltoidea*, *Crassula muscosa*, *Crassula glomerata*
- All species of the genus *Euphorbia* (Family Euphorbiaceae): *Euphorbia mauritanica*
- All species of the family Iridaceae: *Romulea atrandra*, *Romulea luteoflora*, *Lapeirousia plicata* and *Babiana* spp.
- All species of the family Orchidaceae: *Holothrix aspera*
- All species of the genus *Oxalis* (Oxalidaceae): *Oxalis obtusa*, *Oxalis* spp.

This area forms a small patch within the core of Eskom's, property as well as within the area of the preferred site (site alternative one). The proposed footprint area of site alternative two is situated just east of this rocky patch. Most of these protected species are capable of colonizing previously disturbed areas at an effective rate, either via the seedbank or from surrounding species. Species such as *Holothrix aspera*, *Babiana* spp. and mesembs such as *Hammeria salteri* and *Cheiridopsis namaquensis* occur less frequent within the surrounding landscape and should preferably be avoided and if not possible be removed prior to the development and transplanted outside the footprint area but still in a similar habitat type as identified by an appropriate specialist.

Take note that no protected species may be destroyed, removed and transplanted or disturbed in any manner without the appropriate approval (permit) from the relevant authority (Northern Cape Department of Environmental Nature Conservation).



Figure 7: Rocky section just east of the proposed preferred footprint area.

Drainage Line

This non-perennial drainage line originates from the north eastern section of the existing northern capacitor. This drainage line has been significantly impacted by the existing development. Culverts and shallow artificial drainage lines have been constructed within this part of Eskom's property in order to drain surface runoff from the capacitor into the drainage line. Moderate levels of erosion are present within the drainage line. Some of the erosion can be attributed to the disturbance cause by the access road crossing the drainage line. The drainage line is low in plant species diversity and consists mainly out of the sedge; *Scirpoides diocus* and the graminoid species; *Stipagrostis ciliata* and *S. obtusa*. *Galenia*

africana also occurs along the edges of the drainage channel within Eskom's property indicating disturbance.

It is highly unlikely that the new proposed upgrading of the Komsberg Substation will have any further significant effects on the drainage line although the upgrading (widening) of the access road will impact on the drainage line as the drainage line is crossed by the current access road. However, the upgrading of the access road has the potential to ameliorate past impacts, which include moderate levels of erosion. This can be done by constructing suitably sized culverts with storm water and erosion control features such as gabions. The culverts should be large enough not to impede the natural flow pattern of the drainage line or channelize the flow of water as this will most probably exaggerate the effect of erosion with the potential of sedimentation occurring downstream. Although already in a permanently altered state, if the above mentioned mitigation measures is implement the condition of the drainage line can be moderately improved, especially in terms of the effects of erosion on the sandy bed and bank area and in terms of a more natural moister retaining regime (gabions will slow down accelerated surface water flow and roughage from established vegetation will furthermore aid in moisture retainment).

No species of conservation concern have been noted.



Figure 8: The species poor and highly disturbed upper section of the drainage line.



Figure 9: The section where the access road crosses the drainage line (Note the moderate levels of erosion present within this section of the drainage line).

3.7 LISTED & PROTECTED PLANT SPECIES

According to the SANBI Plants of Southern Africa (POSA) database, almost 128 indigenous species have been recorded from the 3220DC quarter degree square within which the site is located. However, it is expected that the area should contain much higher species richness and the low total reflects the poor historical sampling of the area rather than an indication of the number of plant species present in the area. Therefore, the list has been expanded to include the following Quarter Degree Grids: 3220DA, 3220DB, 3220DC & 3220DD (total of 329 species have been recorded within these quarter degree grids). Within these quarter degree grids 21 species of conservation concern (Table 2) have been noted, none of which were identified during the site investigation within the development footprint.

No species of conservation concern, in terms of Threatened Status (Red Data Species) was observed during the site investigation. A few species however, were noted within the proposed footprint area, that is Protected according to Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009). These species are as follows:

- All species of the family Mesembryanthemaceae: *Ruschia cradockensis* subsp. *triticiformis*, *Antimima pumila*, *Hammeria salteri*, *Cheiridopsis namaquensis* and *Lampranthus uniflorus*.
- All species of the genus *Colchicum* (Family Colchicaceae): *Colchicum coloratum*, *C. cuspidatum*
- All species of the family Crassulaceae: *Crassula deltoidea*, *Crassula muscosa*, *Crassula glomerata*
- All species of the genus *Euphorbia* (Family Euphorbiaceae): *Euphorbia mauritanica*
- All species of the family Iridaceae: *Romulea atrandra*, *Romulea luteoflora*, *Lapeirousia plicata*, *Morea* spp. and *Babiana* spp.
- All species of the family Orchidaceae: *Holothrix aspera*
- All species of the genus *Oxalis* (Oxalidaceae): *Oxalis obtusa*, *Oxalis* spp.

Take note that no protected species may be destroyed, removed and transplanted or disturbed in any manner without the appropriate approval (permit) from the relevant authority (Northern Cape Department of Environmental Nature Conservation).

Table 2: Species of conservation concern according to their IUCN Status (3230DC quarter degree grid).

Family	Species	IUCN Status
FABACEAE	<i>Lotononis venosa</i>	VU
	<i>Lotononis hantamensis</i>	Rare
AMARYLLIDACEAE	<i>Brunsvigia josephinae</i>	VU
APOCYNACEAE	<i>Hoodia gordonii</i>	DDD
ASPHODELACEAE	<i>Bulbine torta</i>	Rare
	<i>Haworthia venosa subsp. granulata</i>	Rare
ASTERACEAE	<i>Euryops ii</i>	Rare
CRASSULACEAE	<i>Crassula roggeveldii</i>	Rare
HYACINTHACEAE	<i>Lachenalia congesta</i>	Rare
IRIDACEAE	<i>Geissorhiza karoocica</i>	NT
	<i>Ixia brevituba</i>	Rare
	<i>Ixia linearifolia</i>	Rare
	<i>Romulea eburnea</i>	VU
	<i>Romulea halli</i>	VU
	<i>Romulea komsbergensis</i>	NT
	<i>Romulea multifida</i>	VU
	<i>Romulea subfistulosa</i>	NT
	<i>Romulea syrongodeoflora</i>	VU
	MESEMBRYANTHEMACEAE	<i>Cleretum lyratifolium</i>
OXALIDACEAE	<i>Oxalis tenuipes var. tenuipes</i>	Rare
ROSACEAE	<i>Cliffortia arborea</i>	VU

3.8 CRITICAL BIODIVERSITY AREAS & BROAD SCALE ECOLOGICAL PROCESSES

The proposed footprint area falls within the planning domain of the *Namakwa District Biodiversity Sector Plan* (Desmet & Marsh 2008), although outside any of the identified Critical Biodiversity Areas (Figure 8). This district-wide biodiversity assessment was commissioned to inform Spatial Development Frameworks (SDFs), Biodiversity Sector plans, Environmental Management Frameworks (EMFs), Strategic Environmental Assessments (SEAs) and the Environmental Impact Assessment (EIA) process. The Biodiversity Assessments identify Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which are encouraged to be maintained in a natural to near natural state. The CBA maps aim to indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. Once gazetted, and incorporated into municipal SDFs and bioregional plans, such fine-scale plans are recognized under NEMA and the various activities listed under the act as described in Section 2.4 come into effect. These plans have however not yet been gazetted and have therefore not yet come into effect. The proposed development, as already mentioned falls outside any proposed CBAs and would therefore not impact on any current fine scale plans, especially considering that the footprint falls within the existing Eskom Komsberg MTS property.

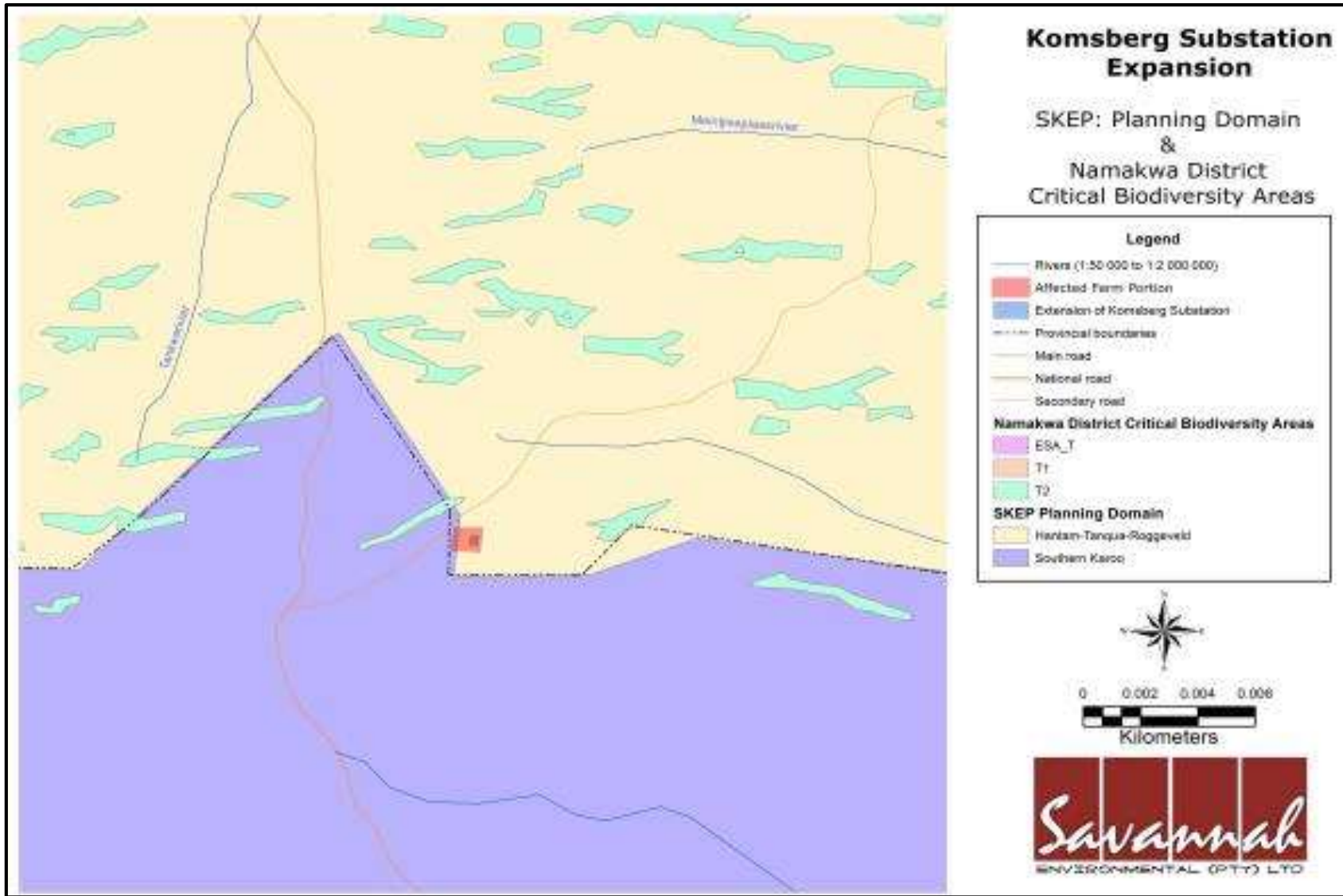


Figure 10: A combination map indicating the, still to be gazette, CBAs (Namakwa District Biodiversity Sector Plan; Desmet & Marsh 2008) and Planning Domain of the Succulent Karoo Ecosystems Programme.

3.9 NATIONAL PROTECTED AREA EXPANSION STRATEGY 2008 (NPAES)

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES, and were designed with strong emphasis on climate change resilience and requirements for freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES.

A large portion of the development footprint area falls within the Western Karoo Focus Area. Due to the relative small size of the development and its location in an already disturbed and transformed portion of land, the contribution of this isolated, small patch of land towards biodiversity, ecological functioning and climate change resilience can be regarded as almost insignificant.

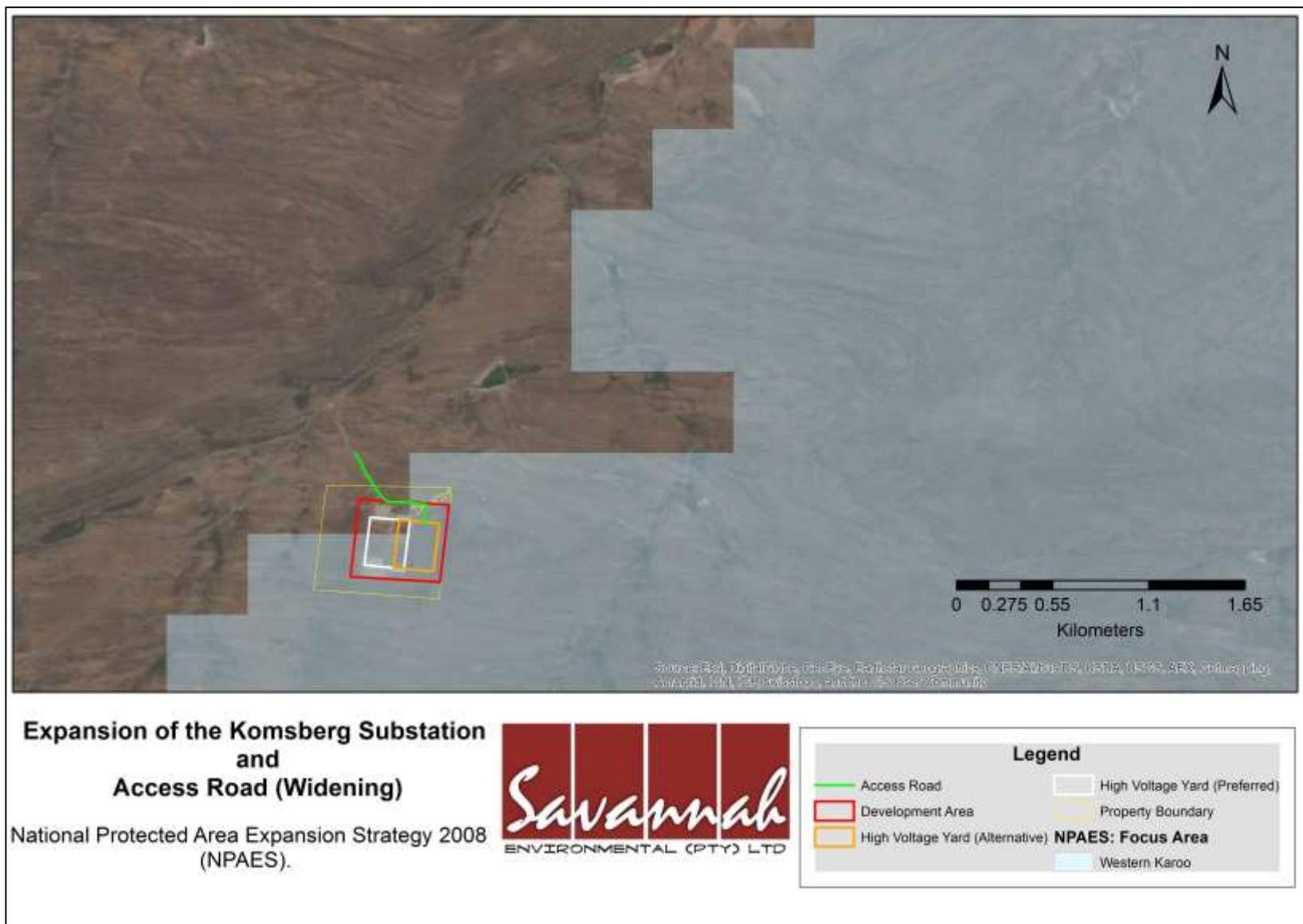


Figure 11: Relationship of the Western Karoo Focus Area (NPAES) to the proposed development area.

3.10 FAUNAL COMMUNITIES

Mammals

The property under Eskom's ownership is small and furthermore the extent of the development is very limited and thus potential impact on mammal species will be **low**. There were little indication of smaller mammal activities within the area. Smaller mammals may none the less, move around between the site and surrounding land. Thus a general description of species that may occur in the surrounding land is provided.

At least 37 mammal species potentially occur within the greater area (Appendix 2). Species commonly observed within the surrounding area include the South African Ground Squirrel, Aardvark, various gerbils, Cape and Bat-eared Fox, Steenbok, Common Duiker and Meerkat. Springbuck are confined by fences and occur only where farmers have introduced them or allowed them to persist and should be considered as part of the farming system rather than as wildlife per se. Both Duiker and Steenbok *Raphicerus campestris* are adaptable species that are able to tolerate high levels of human activity and are not likely to be highly sensitive to the disturbance associated with the development.

In general most mammals are mobile and will temporarily relocate if disturbed by human activity, e.g. construction. Once disturbance has subsided they will return to the general area.

Reptiles

The greater landscape is characterized by a wide variety of habitats, including rocky uplands and cliffs, open flat and lowlands, perennial streams and drainage lines and wetland bodies. This diversity of habitats create living space for a diversity of species especially reptiles. The study site self as well as the immediate surroundings however are less diverse in habitat variation and thus will be less diverse in species. This undulating lowland area are potentially home to about 7 tortoise species, 20 snake species, 17 lizards and skinks species, two chameleon species and 10 gecko species. The only currently listed species which may occur at the site is the Karoo Padloper *Homopus boulengeri* tortoise which is listed as Near Threatened.

The only reptile noted on site was a few species of *Pedioplanis lineoocellata pulchella*. Although not found within the study site, a Angulate Tortoise (*Chersina angulate*) was found crossing the provincial gravel road near Eskom's access road to Komsberg MTS. Tortoises may be negatively impacted by the development as they are vulnerable to collisions with motor vehicles and predation by avian predators while traversing open areas.

In general, the impact on reptiles associated with the development can be regarded as **low**.



Figure 12: Angulate Tortoise *Chersina angulate* found crossing the provincial gravel road close to Eskom’s access road.

Amphibians

No favorable habitat is present for amphibian species within the development footprint. The drainage line do however form more acceptable habitat downstream with areas where water may collect for more extend period during the rainy season and were dense stand of sedges may provide suitable covering. This downstream section also contains softer and deeper soil preferred by some amphibians for estivation. No species of conservation concern are known from the area and all the species which may be present are quite widespread species of low conservation concern. The impact of the development on the amphibian life can most likely be regarded as **negligible**.

3.11 SITE SENSITIVITY ASSESSMENT

The majority of the site has been exposed to some sort of disturbance in the past, mainly due to activities relating to the existing Komsberg Substation infrastructure. Due to the low diversity in plant species and other biota as well as the ability of the species present to effectively re-colonize a disturbed area, the study site can be generally regarded as a **LOW** Sensitive Site with the exception of the rocky patch and the drainage line which is regarded as **MEDIUM** Sensitive. The medium sensitive rockery forms a small patch within the core of Eskom’s property as well as within the area of the preferred site (site alternative one) (refer to Figure 10). The proposed footprint area of site alternative two is situated just east of this rocky patch. The locations of both the preferred and alternative sites for the expansion of substation will, potentially, have a very small to negligible effect on the drainage line. The removal of vegetation and impenetrable surfaces associated with such development might result in a slight increase in flow volume and acceleration into the drainage line during downpours. The widening of the access road, however, will have a slight impact on the drainage line. Having said this, the upgrading of the access road has the potential to ameliorate past impacts, which include moderate levels of erosion. This can be done by constructing suitably sized culverts with stormwater and erosion control features. The culverts should be large enough not to impede the natural flow pattern of the drainage line or channelize the flow of water as this will most probably exaggerate the effect of erosion with the potential of sedimentation occurring downstream. Although already in a permanently altered state, if the above mentioned mitigation measures is implement the condition of the drainage line can be moderately improved, especially in terms of the effects of erosion on the sandy bed and bank area and in terms of a more natural moister retaining

regime (gabions will slow down accelerated surface water flow and roughage from established vegetation will furthermore aid in moisture retainment).

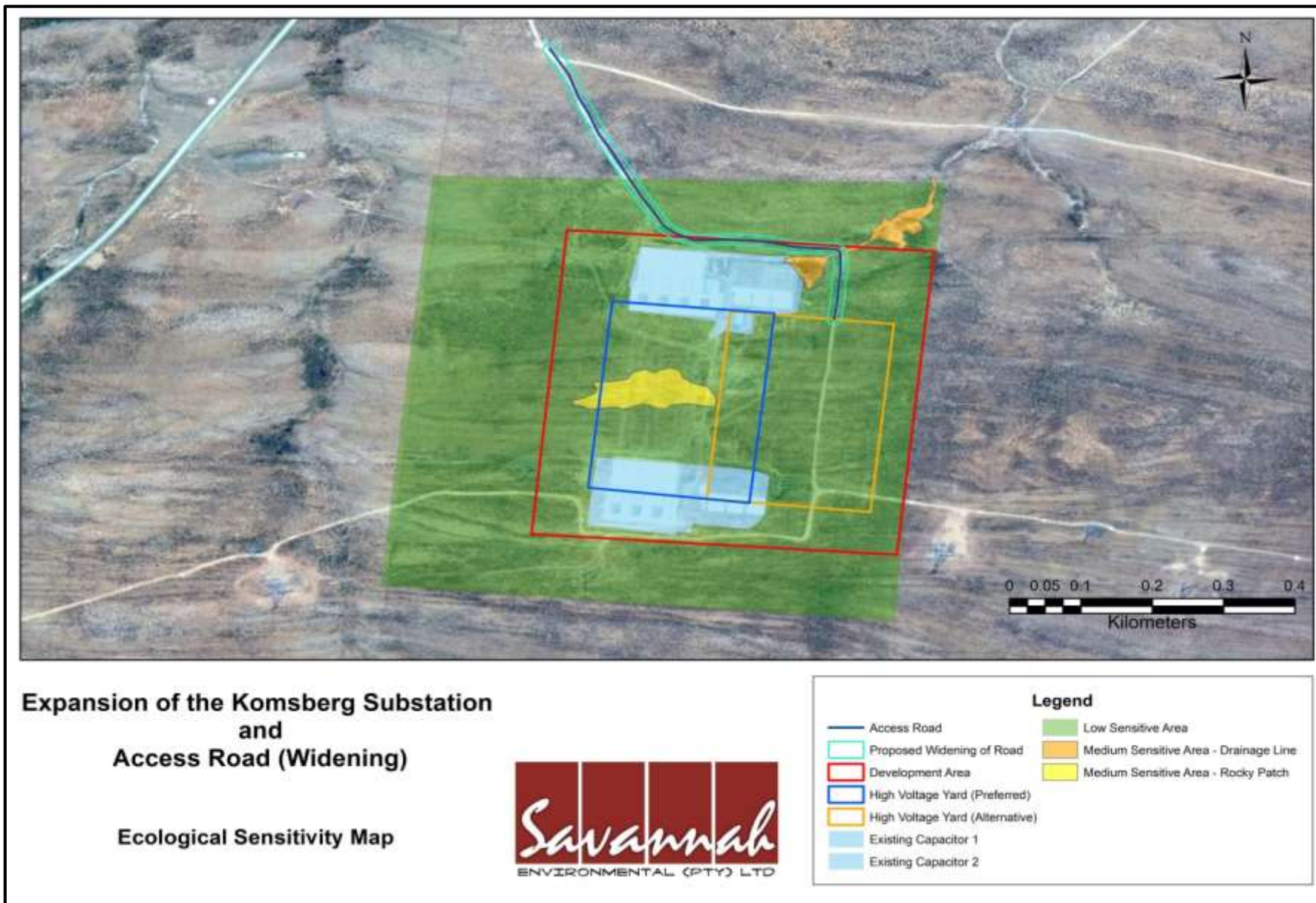


Figure 13: Ecological Sensitivity Map.

4 IMPACT ASSESSMENT

4.1 IDENTIFICATION OF POTENTIAL IMPACTS AND ASSOCIATED ACTIVITIES

The majority of impacts associated with the development will occur during the construction phase as a result of the disturbance associated with the operation of heavy machinery at the site and the presence of construction personnel at the site. The following potential risks are identified as being associated with the development and assessed.

Construction Phase

Impacts on vegetation and listed or protected plant species

- » Some loss of vegetation is an inevitable consequence of the development. However, the footprint of the development, which is proposed within the existing and therefore somewhat disturbed Komsberg MTS, is very limited and there are no parts of the site which are highly sensitive or contain a high abundance of listed plant species. Although this impact is likely to be **low**, it is assessed for the construction phase as some protected species, in terms of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009), are present at the site.

Direct and Indirect Faunal impacts

- » The construction of the Komsberg MTS will result in a slight loss of habitat for resident fauna, as some species are using the affected areas. In addition, increased levels of noise, potential pollution, disturbance and human presence during construction will be unfavourable to resident fauna. Sensitive and shy fauna may move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species (such as mole rats) would not be able to avoid the construction activities and might be killed. From aforementioned it can be concluded that construction activities will most likely have a **low** impact with a slight potential for a low-moderate impact on the faunal component of the study area. During the operational phase, interactions between the infrastructure considered here and fauna are likely to be very **low**.
- » It is important to take note of the following, regarding the protected faunal species:
 - Virtually all indigenous fauna which do not fall under Schedule 1 are classified under Schedule 2, except those species classified as pests. In terms of mammals most rodents (including mole rats), shrews, elephant shrews, bats, hares and rabbits, carnivores such as mongoose, genets, and meerkat, antelope such as mountain reedbuck, steenbok and duiker are included. In terms of other vertebrates, all tortoises, lizards, most harmless snakes and all frogs are listed under Schedule 2. The full list is contained within the Schedule and it is not repeated here.
 - According to the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009), prohibited activities requiring permits include; hunting, importing, exporting, transporting, keeping, breeding or trading in protected species.

Impacts on drainage line

- » As the access road that will be upgraded will cross the drainage line some impact on the drainage line is inevitable. However, the current state of the access road is of such a nature that it contributes to current disturbed state of the drainage line and an upgrade of the road may ameliorate past impacts, which include moderate levels of erosion. Negative impacts that might occur with the absence of mitigation measures include increase runoff during downpours, acceleration of erosion, loss of soil and disturbance to indigenous vegetation. Impacts on the drainage lines are likely to occur during the construction phase, but as mentioned, without the necessary mitigation measures in place may have a permanent effect and even be cumulative over time (e.g. erosion)

Alien Plant Invasion

- » The disturbance associated with the construction phase of the project will render the disturbed areas vulnerable to alien plant invasion. Since the majority of the site is currently little impacted by alien plants, this could potentially have an impact on the site. Regular alien clearing activities would be required to limit the extent of this problem. This impact is highly likely to occur during the operational phase of the development.

ASSESSMENT OF IMPACTS

The major impacts (identified above) that, may potentially or likely will occur, are assessed below, during the construction and operational phase of the substation and power line as well as before and after mitigation.

Construction Impact 1 (Construction Phase): Impacts on vegetation and protected plant species

Impact Nature: Impacts on vegetation and protected plant species would occur due to the construction of the substation.		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (18)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes, to a large extent	
Mitigation	<ul style="list-style-type: none"> • Vegetation clearing to be kept to a minimum. • The rocky patch and drainage line to be avoided as far as possible. • Protected plant species in the vicinity should be avoided as 	

	far as possible.
Cumulative Impacts	Cumulative impacts on vegetation are likely to be very low given the limited expected footprint of the development.
Residual Impacts	With appropriate avoidance and mitigation residual impacts will be very low.

Construction Impact 2 (Construction Phase): Faunal Impacts.

Impact Nature: Construction activities such as the operation of heavy machinery and the presence of construction personnel at the site would result in potential direct and indirect impacts on terrestrial fauna at the site during construction.		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (2)	Low (1)
Probability	Probable (3)	Probable (3)
Significance	Low (15)	Low (12)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Noise and disturbance during the construction phase cannot be avoided but would be transient in nature and with appropriate mitigation; no long-term impacts from the construction phase can be expected.	
Mitigation	<ul style="list-style-type: none"> Any fauna directly threatened by the construction activities should be removed to a safe location by the Environmental Control Officer (ECO)/ Contractor’s Environmental Officer (EO) or other suitably qualified person – the ECO/EO to ensure that any relevant permits, if applicable, are obtained prior to removal of fauna. Construction staff should undergo an environmental induction at the start of the project to ensure that they are aware of the appropriate response to the presence of fauna at the site and do not kill or harm fauna such as snakes or other reptiles which are often feared. All hazardous materials used during construction should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises. 	
Cumulative Impacts	The construction of the infrastructure would contribute to cumulative disturbance and habitat loss for fauna, but the contribution would be very small and is not considered significant.	
Residual Impacts	Residual impacts would be very low.	

Impact 3 (Construction Phase & Operational Phase). Damage to the drainage line.

Impact Nature: Mainly during upgrading of access road: Loss of vegetation responsible for stabilising soils and the eventual acceleration of erosion.		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (2)	Long-term (2)
Magnitude	Low (3)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (18)	Low (15)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	<ul style="list-style-type: none"> • The engineering team must provide effective means to minimise the potential downstream effects of sedimentation and erosion (erosion protection) as well as minimise the loss of vegetation responsible for stabilising the soil. • No vehicles to refuel within the drainage line. • Construction must not cause the width of the watercourse to be narrowed • Disturbed areas should be rehabilitated and re-vegetated as soon as possible. • During the operational phase, monitor culverts to see if erosion arise and if any erosion control is necessary. • Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers. • Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities 	
Cumulative Impacts	Increase in surface run-off velocities which in turn may lead exaggerated erosion.	
Residual Impacts	Residual impacts would be relative low.	

Impact 4: Increased alien plant invasion during operation

Impact Nature: The disturbed and bare ground that is likely to be present at the site after construction will leave the site vulnerable to alien plant invasion for some time. Furthermore, the Conservation of Agricultural Resources Act, (Act No. 43 of 1983) requires that listed alien species are controlled in accordance with the Act.		
	Without Mitigation	With Mitigation
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Short-term (0)
Magnitude	Low (3)	Small (1)

Probability	Probable (3)	Improbable (2)
Significance	MEDIUM (27)	LOW (4)
Status	Negative	Neutral – Slightly Negative
Reversibility	Medium Once species have become settled and have spread into the surrounding areas management and eradication will become complicated, tedious and highly expensive.	High
Irreplaceable loss of resources	Potential loss of important resources due to the replacement of natural vegetation by invading alien plants	No
Can impacts be mitigated?	Yes, to a large extent	
Mitigation	<ul style="list-style-type: none"> • Regular monitoring for alien plants at the site should occur and could be conducted simultaneously with erosion monitoring. • When alien plants are detected, these should be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur. • Clearing methods should themselves aim to keep disturbance to a minimum. • No planting or importing any alien species to the site for landscaping, rehabilitation or any other purpose. 	
Cumulative Impacts	Cumulative impacts within the surrounding environment due to the spread and settlement of alien invasive species beyond the initial disturbed area will lead to the replacement of natural indigenous vegetation and subsequently in natural grazing land etc.	
Residual Impacts	With appropriate avoidance and mitigation residual impacts will be very low.	

5 CONCLUSIONS & RECOMMENDATIONS

- » The extent of the development footprint area in this study is very limited and furthermore restricted to an area already transformed by the existing Komsberg MTS infrastructure. Given the limited footprint of the development and the characteristics of the receiving environment, there are not likely to be any significant impacts resulting from the construction and operation of the infrastructure.
- » During the study it was found that the majority of the site can be regarded as **Low Sensitive**, with regards to fauna and flora, with the exception of the rocky patch and the drainage line which is regarded as **Medium Sensitive**.
- » The medium sensitive rockery forms a small patch within the core of Eskom’s property as well as within the area of the preferred site (site alternative one). The proposed footprint area of site alternative two is situated just east of this rocky patch, although

constructing activities is still expected to potentially impact on this area due to the close proximity.

- » Regarding the drainage line, it is highly unlikely that the new proposed upgrading of the Komsberg Substation will have any further significant effects on an already altered drainage line. The upgrading (widening) of the access road, on the other hand, will impact on the drainage line as the drainage line is crossed by the current access road. However, the upgrading of the access road has the potential to ameliorate past impacts, which include moderate levels of erosion. This can be done by constructing suitably sized culverts with stormwater and erosion control features such as gabions. The culverts should be large enough not to impede the natural flow pattern of the drainage line or channelize the flow of water as this will most probably exaggerate the effect of erosion with the potential of sedimentation occurring downstream. Although already in a permanently altered state, if the above mentioned mitigation measures are implemented the condition of the drainage line can be moderately improved, especially in terms of the effects of erosion on the sandy bed and bank area and in terms of a more natural moisture retaining regime (gabions will slow down accelerated surface water flow and roughage from established vegetation will furthermore aid in moisture retention).
- » No species of conservation concern, in terms of Threatened Status was observed during the site investigation. A few species however, were noted within the proposed footprint area, that is Protected according to Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009). These species are as follows:
 - All species of the family Mesembryanthemaceae: *Ruschia cradockensis* subsp. *triticiformis*, *Antimima pumila*, *Hammeria salteri*, *Cheiridopsis namaquensis* and *Lampranthus uniforus*.
 - All species of the genus *Colchicum* (Family Colchicaceae): *Colchicum coloratum*, *C. cuspidatum*
 - All species of the family Crassulaceae: *Crassula deltoidea*, *Crassula muscosa*, *Crassula glomerata*
 - All species of the genus *Euphorbia* (Family Euphorbiaceae): *Euphorbia mauritanica*
 - All species of the family Iridaceae: *Romulea atrandra*, *Romulea luteoflora*, *Lapeirousia plicata*, *Morea* spp. and *Babiana* spp.
 - All species of the family Orchidaceae: *Holothrix aspera*
 - All species of the genus *Oxalis* (Oxalidaceae): *Oxalis obtusa*, *Oxalis* spp.
- » Most of these protected species are capable of colonizing previously disturbed areas at an effective rate, either via the seedbank or from surrounding species. Species such as *Holothrix aspera*, *Babiana* spp. and Mesembryanthemum species such as *Hammeria salteri* and *Cheiridopsis namaquensis* occur less frequent within the surrounding landscape and should preferably be avoided and if not possible be removed prior to the development and transplanted outside the footprint area but still in a similar habitat type. Take note that no protected species may be destroyed, removed and transplanted or disturbed in any manner without the appropriate approval (permit) from the relevant authority (Northern Cape Department of Environmental Nature Conservation).

The following mitigation measures are recommended:

- » Regarding vegetation and protected plant species:
 - Vegetation clearing to be kept to a minimum.
 - Protected plant species in the vicinity should be avoided as far as possible.

- A preconstruction survey for the species of concern should be undertaken in the final approved footprint of the proposed development to determine which species and how many will be affected by the development.
 - Since a large proportion of the listed species at the site are geophytes or succulent species, the potential for successful translocation is high. Therefore, it is recommended where avoidance is not possible, that individuals of listed species within the development footprint should be marked and trans-located to similar habitat outside the development footprint before construction commences and under the supervision of an ecologist or someone with experience in plant translocation.
 - Permits (Authorisation) from the relevant department should be obtained prior to the commencement of any activities relating to the disturbance, destruction or removal and transplanting of these specimens.
 - Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- » Regarding fauna:
- Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
 - Construction staff should undergo an environmental induction at the start of the project to ensure that they are aware of the appropriate response to the presence of fauna at the site and do not kill or harm fauna such as snakes or other reptiles which are often feared.
 - All hazardous materials used during construction should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
 - All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- » Regarding the drainage line
- The engineering team must provide effective means to minimise the potential downstream effects of sedimentation and erosion (erosion protection) as well as minimise the loss of vegetation responsible of stabilising the soil.
 - No vehicles to refuel within the drainage line.
 - Construction must not cause the width of the watercourse to be narrowed
 - Disturbed areas should be rehabilitated and re-vegetated as soon as possible.
 - During the operational phase, monitor culverts to see if erosion arise and if any erosion control is necessary.
 - Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.
 - Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.
- » Regarding the potential of invasion by alien plants:
- Regular monitoring for alien plants at the site should occur and could be conducted simultaneously with erosion monitoring.
 - When alien plants are detected, these should be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.
 - Clearing methods should themselves aim to keep disturbance to a minimum.

- No planting or importing any alien species to the site for landscaping, rehabilitation or any other purpose.

6 REFERENCES

Apps, P. (ed.). 2012. *Smither's Mammals of Southern Africa. A field guide*. Random House Struik, Cape Town, RSA

Alexander, G. & Marais, J. 2007. *A Guide to the Reptiles of Southern Africa*. Struik Nature, Cape Town.

Branch W.R. 1998. *Field guide to snakes and other reptiles of southern Africa*. Struik, Cape Town.

Brownlie, S. 2005. Guideline for Involving Biodiversity Specialists in EIA Processes: Edition 1. CSIR Report No ENV-S-C 2005 053 C. Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town. 63 pp.

CRITICAL BIODIVERSITY AREAS MAPS (PER MUNICIPALITY) AND GIS DATA AVAILABLE FROM: Biodiversity GIS (BGIS), South African National Biodiversity Institute, Tel. +27 21 799 8739 or CapeNature, Tel. +27 21 866 8000. Or on the web at: <http://bgis.sanbi.org/fsp/project.asp>

Department of Environmental Affairs and Tourism, 2007. National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Publication of lists of Critically Endangered, Endangered, Vulnerable and Protected Species. Government Gazette, Republic of South Africa.

Desmet, P and Marsh A. 2008. Namakwa District Biodiversity Sector Plan. Available from BGIS at <http://bgis.sanbi.org/namakwa/project.asp>.

De Villiers CC, Driver A, Clark B, Euston-Brown DIW, Day EG, Job N, Helme NA, Holmes PM, Brownlie S and Rebelo AB (2005) *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape*. Fynbos Forum and Botanical Society of South Africa, Kirstenbosch.

Du Preez, L. & Carruthers, V. 2009. *A Complete Guide to the Frogs of Southern Africa*. Struik Nature., Cape Town.

Fairbanks, D.H.K., Thompson, M.W., Vink, D.E., Newby, T.S., Van Den Berg, H.M. & Everard, D.A. 2000. The South African Land-Cover Characteristics Database: a synopsis of the landscape. *S.Afr.J.Science* **96**: 69 – 82.

Friedmann, Y. & Daly, B. 2004. Red data book of the mammals of South Africa, a conservation assessment. Johannesburg, Endangered Wildlife Trust.

Hoare, D. 2012. David Hoare Consulting cc (2012). Impact Assessment Report: Specialist ecological study on the potential impacts of the proposed Hidden Valley Wind Energy Facility Project near Matjiesfontein, Northern Cape.

IUCN 2012. IUCN Red List of Threatened Species. Version 2010.2. <www.iucnredlist.org>. Downloaded on 19 January 2012.

Marais, J. 2004. *Complete Guide to the Snakes of Southern Africa*. Struik Nature, Cape Town.

Mucina L. & Rutherford M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Passmore, N.I. & Carruthers, V.C. 1995. *South African Frogs: A complete guide*. Witwatersrand University Press, Johannesburg. 322 pp.

Raimondo, D., Von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C. Kamundi, D.A. & Manyama, P.A. (Eds.). 2009. *Red list of South African plants 2009*. Strelitzia 25:1-668

Skinner, J.D. & Chimimba, C.T. 2005. *The mammals of the Southern African Subregion*. Cambridge University Press, Cambridge.

Skowno, A.L. Holness S.D and P. Desmet. 2009. Biodiversity Assessment of the Central Karoo District Municipality. DEAP Report EADP05/2008, 52 pages.

Strohbach, M. 2013. Mitigation of ecological impacts of renewable energy facilities in South Africa. *The Sustainable Energy Resource Handbook (Renewable Energy) South Africa 4*: 41 – 47.

Strohbach, M. 2013. Savannah Environmental (2013) Ecological Scoping Report: Proposed Gihon Solar Energy Facility South of Bela-Bela, Limpopo Province.

Websites:

AGIS, 2007. Agricultural Geo-Referenced Information System, accessed from

www.agis.agric.za

ADU, 2012. Animal Demography Unit, Department of Zoology, University of Cape Town. <http://www.adu.org.za>

BGIS: <http://bgis.sanbi.org/website.asp>

SANBI databases:

<http://posa.sanbi.org/searchspp.php>

<http://SIBIS.sanbi.org>

7 APPENDICES:

Appendix 1. Listed Plant Species

List of plant species noted within the quarter degree 3220DC. The list is derived from the SANBI:POSA website. Those in red are species of conservation importance - none of which will be affected by the proposed development).

*IUCN (3.1) Categories: VU = Vulnerable; EN = Endangered; CR= Critically Endangered and NT = Near Threatened

Family	Species	IUCN Status	Endemic
AIZOACEAE	<i>Galenia africana</i>	LC	No
	<i>Galenia pubescens</i>	LC	No
	<i>Tetragonia glauca</i>	LC	No
ALLIACEAE	<i>Allium dregeanum</i>	LC	No
AMARYLLIDACEAE	<i>Brunsvigia ii</i>	LC	No
	<i>Brunsvigia josephinae</i>	VU	No
	<i>Gethyllis campanulata</i>	LC	No
	<i>Gethyllis villosa</i>	LC	No
	<i>Haemanthus coccineus</i>	LC	No
ANACARDIACEAE	<i>Laurophyllus capensis</i>	LC	No
	<i>Searsia lancea</i>	LC	No
	<i>Searsia longispina</i>	LC	No
ANTHERICACEAE	<i>Chlorophytum undulatum</i>	LC	No
APIACEAE	<i>Chamarea longipedicellata</i>	LC	No
	<i>Torilis arvensis</i>	Not Evaluated	No
APOCYNACEAE	<i>Hoodia gordonii</i>	DDD	No
	<i>Pectinaria articulata</i> subsp. <i>asperiflora</i>	LC	No
	<i>Piaranthus geminatus</i> subsp. <i>geminatus</i>	LC	No
	<i>Piaranthus parvulus</i>	LC	No
	<i>Quaqua arenicola</i> subsp. <i>arenicola</i>	LC	No
ASPARAGACEAE	<i>Asparagus capensis</i> var. <i>capensis</i>	LC	No
	<i>Asparagus fasciculatus</i>	LC	No
	<i>Asparagus mollis</i>	LC	No
ASPHODELACEAE	<i>Aloe variegata</i>	LC	No
	<i>Bulbine abyssinica</i>	LC	No
	<i>Bulbine alooides</i>	LC	No
	<i>Bulbine capensis</i>	LC	No
	<i>Bulbine longifolia</i>	LC	No
	<i>Bulbine succulenta</i>	LC	No
	<i>Bulbine torta</i>	Rare	No
	<i>Bulbinella elegans</i>	LC	No
	<i>Bulbinella latifolia</i> subsp. <i>denticulata</i>	LC	No
	<i>Bulbinella nutans</i> subsp. <i>nutans</i>	LC	No
	<i>Bulbinella triquetra</i>	LC	No
	<i>Gasteria disticha</i> var. <i>disticha</i>		No
	<i>Haworthia arachnoidea</i> var. <i>arachnoidea</i>	LC	No
	<i>Haworthia arachnoidea</i> var. <i>namaquensis</i>	LC	No
	<i>Haworthia arachnoidea</i> var. <i>scabrispina</i>	LC	No
	<i>Haworthia venosa</i> subsp. <i>granulata</i>	Rare	No
	<i>Haworthia viscosa</i> var. <i>viscosa</i>	LC	No
	<i>Kniphofia sarmentosa</i>	LC	No
	<i>Trachyandra patens</i>	LC	No
	<i>Trachyandra sanguinorhiza</i>		No
	<i>Trachyandra thyrsoidea</i>	LC	No
ASTERACEAE	<i>Arctotheca prostrata</i>	LC	No
	<i>Arctotis campanulata</i> var. <i>campanulata</i>	LC	No
	<i>Arctotis diffusa</i>	LC	No
	<i>Berkheya spinosa</i>	LC	No
	<i>Chrysocoma ciliata</i>	LC	No
	<i>Cotula coronopifolia</i>	LC	No
	<i>Cotula hispida</i>	LC	No

	<i>Diceamnus rhinocerotis</i>	Not Evaluated	No
	<i>Dimorphotheca cuneata</i>	LC	No
	<i>Eriocephalus africanus</i> var. <i>paniculatus</i>	LC	No
	<i>Eriocephalus ericoides</i> subsp. <i>ericoides</i>	LC	No
	<i>Eriocephalusimius</i>	LC	No
	<i>Eriocephalus punctulatus</i>	LC	No
	<i>Eriocephalus purpureus</i>	LC	No
	<i>Eriocephalus racemosus</i> var. <i>affinis</i>	LC	No
	<i>Euryops lateriflorus</i>	LC	No
	<i>Euryops ii</i>	Rare	No
	<i>Euryops multifidus</i>	LC	No
	<i>Euryops oligoglossus</i> subsp. <i>racemosus</i>	LC	No
	<i>Felicia australis</i>	LC	No
	<i>Felicia brevifolia</i>	LC	No
	<i>Felicia dregei</i>	LC	No
	<i>Felicia dubia</i>	LC	No
	<i>Felicia filifolia</i> subsp. <i>filifolia</i>	LC	No
	<i>Felicia filifolia</i> subsp. <i>schaeferi</i>	LC	No
	<i>Felicia macrorrhiza</i>	LC	No
	<i>Felicia namaquana</i>	LC	No
	<i>Galeomma oculus-cati</i>	LC	No
	<i>Gazania krebsiana</i> subsp. <i>krebsiana</i>	LC	No
	<i>Gazania leiopoda</i>	LC	No
	<i>Helichrysum hamulosum</i>	LC	No
	<i>Helichrysum leontonyx</i>	LC	No
	<i>Helichrysum revolutum</i>	LC	No
	<i>Ifloga decumbens</i>	LC	No
	<i>Ifloga thellungiana</i>	LC	No
	<i>Lasiopogon muscoides</i>	LC	No
	<i>Leysera gnaphalodes</i>	LC	No
	<i>Leysera tenella</i>	LC	No
	<i>Osmitopsis osmitoides</i>	LC	No
	<i>Othonna auriculifolia</i>	LC	No
	<i>Othonna cuneata</i>	LC	No
	<i>Othonna perfoliata</i>	LC	No
	<i>Pteronia adenocarpa</i>	LC	No
	<i>Pteronia empetrifolia</i>	LC	No
	<i>Pteronia incana</i>	LC	No
	<i>Rhynchopsidium sessiliflorum</i>	LC	No
	<i>Rosenia oppositifolia</i>	LC	No
	<i>Senecio abbreviatus</i>	LC	No
	<i>Senecio angustifolius</i>	LC	No
	<i>Senecio cotyledonis</i>	LC	No
	<i>Senecio erosus</i>	LC	No
	<i>Senecio haworthii</i>	LC	No
	<i>Steirodiscus capillaceus</i>	LC	No
	<i>Tripteris aghillana</i> var. <i>aghillana</i>	LC	No
	<i>Tripteris aghillana</i> var. <i>integrifolia</i>	LC	No
	<i>Tripteris sinuata</i> var. <i>linearis</i>	LC	No
	<i>Tripteris sinuata</i> var. <i>sinuata</i>	LC	No
	<i>Troglophyton capillaceum</i> subsp. <i>capillaceum</i>	LC	No
	<i>Troglophyton parvulum</i>	LC	No
	<i>Ursinia anthemoides</i> subsp. <i>versicolor</i>	LC	No
	<i>Ursinia nana</i> subsp. <i>nana</i>	LC	No
BORAGINACEAE	<i>Amsinckia retrorsa</i>	Not Evaluated	No
	<i>Anchusa capensis</i>	LC	No
	<i>Buglossoides arvensis</i>	Not Evaluated	No
BRASSICACEAE	<i>Heliophila carnosia</i>	LC	No
	<i>Heliophila cornuta</i> var. <i>squamata</i>	LC	No
	<i>Heliophila crithmifolia</i>	LC	No
	<i>Heliophila pectinata</i>	LC	No
	<i>Heliophila seselifolia</i> var. <i>ii</i>	LC	No
	<i>Heliophila seselifolia</i> var. <i>seselifolia</i>	LC	No
	<i>Heliophila suborbicularis</i>	LC	No
CANDELARIACEAE	<i>Candelariella coralliza</i>		No
CARYOPHYLLACEAE	<i>Cerastium capense</i>	LC	No
	<i>Stellaria pallida</i>	Not Evaluated	No
COLCHICACEAE	<i>Colchicum albomarginatum</i>	LC	No

	<i>Colchicum coloratum</i> subsp. <i>burchellii</i>	LC	No
	<i>Colchicum eucomoides</i>	LC	No
	<i>Colchicum hantamense</i>	LC	No
	<i>Colchicum volutare</i>	LC	No
	<i>Ornithoglossum undulatum</i>	LC	No
	<i>Wurmbea variabilis</i>	LC	No
CONVOLVULACEAE	<i>Convolvulus sagittatus</i>	LC	No
CRASSULACEAE	<i>Adromischus liebenbergii</i> subsp. <i>liebenbergii</i>	LC	No
	<i>Adromischus marianiae</i> var. <i>immaculatus</i>	LC	No
	<i>Crassula campestris</i>	LC	No
	<i>Crassula deltoidea</i>	LC	No
	<i>Crassula dependens</i>	LC	No
	<i>Crassula natans</i> var. <i>natans</i>	LC	No
	<i>Crassula roggeveldii</i>	Rare	No
	<i>Crassula sebaeoides</i>	LC	No
	<i>Crassula subaphylla</i> var. <i>subaphylla</i>	LC	No
	<i>Crassula tetragona</i> subsp. <i>connivens</i>	LC	No
	<i>Crassula umbella</i>	LC	No
	<i>Crassula umbellata</i>	LC	No
	<i>Crassula vaillantii</i>	Not Evaluated	No
	<i>Tylecodon ventricosus</i>	LC	No
CYPERACEAE	<i>Ficinia argyropus</i>	LC	No
	<i>Isolepis angelica</i>	LC	No
	<i>Isolepis brevicaulis</i>	LC	No
	<i>Isolepis karroica</i> C.B.Clarke	LC	No
	<i>Pseudoschoenus inanis</i>	LC	No
ENCALYPTACEAE	<i>Encalypta vulgaris</i>		No
ERICACEAE	<i>Erica rigidula</i>	LC	No
EUPHORBIACEAE	<i>Euphorbia mauritanica</i> var. <i>mauritanica</i>	LC	No
	<i>Euphorbia multiceps</i>	LC	No
FABACEAE	<i>Indigofera hantamensis</i>	Rare	No
	<i>Indigofera meyeriana</i>	LC	No
	<i>Lessertia falciformis</i>	LC	No
	<i>Lessertia inflata</i>	LC	No
	<i>Lotononis leptoloba</i>	LC	No
	<i>Lotononis venosa</i>	VU	No
	<i>Rafnia capensis</i> subsp. <i>ovata</i>	LC	No
	<i>Sutherlandia frutescens</i>	LC	No
	<i>Sutherlandia humilis</i>	LC	No
	<i>Wiborgia sericea</i>	LC	No
FISSIDENTACEAE	<i>Fissidens rufescens</i>		No
FUNARIACEAE	<i>Goniomitrium africanum</i>		No
GERANIACEAE	<i>Pelargonium hystrix</i>	LC	No
	<i>Pelargonium leipoldtii</i>	LC	No
	<i>Pelargonium magenteum</i>	LC	No
GIGASPERMACEAE	<i>Gigaspermum repens</i>		No
GRIMMIACEAE	<i>Grimmia pulvinata</i>		No
HYACINTHACEAE	<i>Albuca paradoxa</i>	LC	No
	<i>Albuca viscosa</i>	LC	No
	<i>Drimia capensis</i>	LC	No
	<i>Lachenalia ii</i>	LC	No
	<i>Lachenalia congesta</i>	Rare	No
	<i>Lachenalia ensifolia</i>	LC	No
	<i>Ornithogalum hispidum</i> subsp. <i>hispidum</i>	LC	No
HYPOXIDACEAE	<i>Spiloxene aquatica</i>	LC	No
	<i>Spiloxene capensis</i>	LC	No
IRIDACEAE	<i>Babiana cuneata</i>	LC	No
	<i>Geissorhiza cantharophila</i>	LC	No
	<i>Geissorhiza heterostyla</i>	LC	No
	<i>Geissorhiza karooica</i>	NT	No
	<i>Gladiolus ceresianus</i>	LC	No
	<i>Gladiolus karooicus</i>		No
	<i>Gladiolus ii</i>	LC	No
	<i>Gladiolus splendens</i>	LC	No
	<i>Gladiolus uysiae</i>	LC	No
	<i>Gladiolus venustus</i>	LC	No
	<i>Hesperantha bachmannii</i>	LC	No

	<i>Hesperantha ciliolata</i>	LC	No
	<i>Hesperantha cucullata</i>	LC	No
	<i>Hesperantha humilis</i>	LC	No
	<i>Hesperantha ii</i>	LC	No
	<i>Hesperantha pilosa</i>	LC	No
	<i>Hesperantha pseudopilosa</i>	LC	No
	<i>Hesperantha radiata</i>	LC	No
	<i>Ixia brevituba</i>	Rare	No
	<i>Ixia capillaris</i>	LC	No
	<i>Ixia lacerata</i>		No
	<i>Ixia linearifolia</i>	Rare	No
	<i>Ixia marginifolia</i>	LC	No
	<i>Ixia rapunculoides</i>	LC	No
	<i>Ixia sobolifera</i> subsp. <i>sobolifera</i>		No
	<i>Ixia trifolia</i>	LC	No
	<i>Lapeirousia montana</i>	LC	No
	<i>Lapeirousia plicata</i> subsp. <i>plicata</i>	LC	No
	<i>Moraea ciliata</i>	LC	No
	<i>Moraea cookii</i>	LC	No
	<i>Moraea karroica</i>	LC	No
	<i>Moraea longistyla</i>	LC	No
	<i>Moraea miniata</i>	LC	No
	<i>Moraea ochroleuca</i>	LC	No
	<i>Moraea pritzeliana</i>	LC	No
	<i>Romulea atrandra</i> var. <i>atrandra</i>	LC	No
	<i>Romulea austinii</i>	LC	No
	<i>Romulea diversiformis</i>	LC	No
	<i>Romulea eburnea</i>	VU	No
	<i>Romulea hallii</i>	VU	No
	<i>Romulea hirta</i>	LC	No
	<i>Romulea komsbergensis</i>	NT	No
	<i>Romulea multifida</i>	VU	No
	<i>Romulea setifolia</i> var. <i>setifolia</i>	LC	No
	<i>Romulea subfistulosa</i>	NT	No
	<i>Romulea syringodeoflora</i>	VU	No
	<i>Romulea tortuosa</i> subsp. <i>aurea</i>	LC	No
	<i>Romulea tortuosa</i> subsp. <i>tortuosa</i>	LC	No
	<i>Syringodea longituba</i> var. <i>longituba</i>	Not Evaluated	No
	<i>Syringodea unifolia</i>	LC	No
	<i>Tritonia tugwelliae</i>	LC	No
	<i>Xenoscapa fistulosa</i>	LC	No
LAMIACEAE	<i>Salvia disermas</i>	LC	No
	<i>Stachys aurea</i>	LC	No
	<i>Stachys cuneata</i>	LC	No
	<i>Stachys linearis</i>	LC	No
	<i>Stachys rugosa</i>	LC	No
MALVACEAE	<i>Anisodontea anomala</i>	LC	No
	<i>Anisodontea triloba</i>	LC	No
	<i>Hermannia filifolia</i> var. <i>grandicalyx</i>	LC	No
	<i>Hermannia grandiflora</i>	LC	No
	<i>Hermannia johanssenii</i>	LC	No
MELIANTHACEAE	<i>Melianthus major</i>	LC	No
MESEMBRYANTHEMACEAE	<i>Aloinopsis spathulata</i>	LC	No
	<i>Antimima ivori</i>	LC	No
	<i>Antimima pumila</i>	DDT	No
	<i>Antimima stayneri</i>	LC	No
	<i>Cleretum lyratifolium</i>	Rare	No
	<i>Drosanthemum hispidum</i>	LC	No
	<i>Hammeria gracilis</i>	LC	No
	<i>Malephora crassa</i>	LC	No
	<i>Malephora verruculoides</i>	LC	No
	<i>Peersia frithii</i>	LC	No
	<i>Phyllo nitidus</i>	LC	No
	<i>Prenia tetragona</i>	LC	No
	<i>Sceletium emarcidum</i>	LC	No
	<i>Stomatium latifolium</i>	LC	No
	<i>Stomatium villetii</i>	LC	No
	<i>Trichodiadema mirabile</i>	LC	No

MOLLUGINACEAE	Hypertelis salsoloides var. salsoloides	LC	No
	Pharnaceum aurantium	LC	No
MONTINIACEAE	Montinia caryophyllacea	LC	No
ORCHIDACEAE	Corycium crispum	LC	No
	Corycium deflexum	LC	No
	Disperis purpurata subsp. purpurata	LC	No
	Holothrix aspera	LC	No
	Holothrix secunda	LC	No
	Pterygodium hallii	LC	No
	Pterygodium	LC	No
	Pterygodium volucris	LC	No
OROBANCHACEAE	Hyobanche glabrata	LC	No
OXALIDACEAE	Oxalis obtusa	LC	No
	Oxalis palmifrons	LC	No
	Oxalis tenuipes var. tenuipes	Rare	No
POACEAE	Bromus diandrus	Not Evaluated	No
	Bromus pectinatus	LC	No
	Cynosurus coloratus Lehm.	Not Evaluated	No
	Ehrharta calycina	LC	No
	Ehrharta delicatula	LC	No
	Ehrharta erecta var. erecta	LC	No
	Eragrostis curvula	LC	No
	Hordeum murinum subsp. glaucum	Not Evaluated	No
	Hordeum murinum subsp. leporinum	Not Evaluated	No
	Hordeum murinum subsp. murinum	Not Evaluated	No
	Panicum ii	LC	No
	Poa bulbosa	LC	No
	Polypogon monspeliensis	Not Evaluated	No
	Schismus barbatus	LC	No
	Schismus inermis	LC	No
	Schismus scaberrimus	LC	No
POLYGALACEAE	Muraltia horrida	LC	No
	Polygala scabra	LC	No
POTTIACEAE	Didymodon australasii		No
	Didymodon tophaceus		No
	Didymodon xanthocarpus		No
	Pseudocrossidium crinitum		No
	Triquetrella tristicha		No
RANUNCULACEAE	Ranunculus rionii	LC	No
RICCIACEAE	Riccia cavernosa		No
	Riccia concava		No
	Riccia crystallina		No
	Riccia furfuracea		No
ROSACEAE	Cliffortia arborea	VU	No
	Cliffortia ramosissima	LC	No
RUBIACEAE	Anthospermum spathulatum subsp. spathulatum	LC	No
	Nenax microphylla	LC	No
RUTACEAE	Agathosma mucronulata	LC	No
SALICACEAE	Salix babylonica var. babylonica	Not Evaluated	No
SCROPHULARIACEAE	Alonsoa unilabiata	LC	No
	Chaenostoma violaceum	LC	No
	Cromidon varicalyx	LC	No
	Diascia cardiosepala	LC	No
	Diascia hexensis	LC	No
	Diascia macrophylla	LC	No
	Diascia parviflora	LC	No
	Hebenstretia robusta	LC	No
	Hemimeris racemosa	LC	No
	Manulea diandra	LC	No
	Manulea pusilla	LC	No
	Nemesia azurea	LC	No
	Nemesia fruticans	LC	No
	Polycarena aurea	LC	No
	Reyemia nemesioides	LC	No
	Selago divaricata	LC	No
	Selago rigida	LC	No
	Selago subspinosa	LC	No

	<i>Zaluzianskya venusta</i>	LC	No
SINOPTERIDACEAE	<i>Cheilanthes deltoidea</i> subsp. <i>deltoidea</i>	LC	No
	<i>Cheilanthes depauperata</i>	LC	No
	<i>Cheilanthes hastata</i>	LC	No
	<i>Cheilanthes induta</i>	LC	No
	<i>Pellaea rufa</i>	LC	No
SPHAEROCARPACEAE	<i>Sphaerocarpos stipitatus</i>		No
TARGIONIACEAE	<i>Targionia hypophylla</i>		No

Appendix 2. List of Mammals

List of Mammals which may potentially occur within the surrounding area (Species noted within the surroundings during site visit in red). Taxonomy and habitat notes are derived from Skinner & Chimimba (2005), while conservation status is according to the IUCN 2010.

Scientific Name	Common Name	Status
Afrosoricida (Golden Moles):		
<i>Chlorotalpa sclateri</i>	Sclater's Golden Mole	LC
<i>Chrysochloris asiatica</i>	Cape Golden Mole	LC
Macroscledidea (Elephant Shrews):		
<i>Macroscelides proboscideus</i>	Round-eared Elephant Shrew	LC
Tubulentata:		
<i>Orycteropus afer</i>	Aardvark	LC
Lagomorpha (Hares and Rabbits):		
<i>Lepus capensis</i>	Cape Hare	LR/LC
<i>Lepus saxatilis</i>	Scrub Hare	LR/LC
Rodentia (Rodents):		
<i>Cryptomys hottentotus</i>	African Mole Rat	LC
<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC
<i>Graphiurus ocellaris</i>	Spectacled Dormouse	LC
<i>Acomys subspinosus</i>	Cape Spiny Mouse	LC
<i>Rhabdomys pumilio</i>	Four-striped Grass Mouse	LC
<i>Mus minutoides</i>	Pygmy Mouse	LC
<i>Micaelamys namaquensis</i>	Namaqua Rock Mouse	LC
<i>Micaelamys granti</i>	Grant's Rock Mouse	LC
<i>Parotomys brantsii</i>	Brants's Whistling Rat	LC
<i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil	LC
<i>Gerbillurus paebe</i>	Hairy-footed Gerbil	LC
<i>Malacothrix typica</i>	Gerbil Mouse	LC
<i>Dendromus melanotis</i>	Grey Climbing Mouse	LC
Eulipotyphla (Shrews):		
<i>Crocidura cyanea</i>	Reddish-Grey Musk Shrew	LC
Carnivora:		

<i>Proteles cristatus</i>	Aardwolf	LR/LC
<i>Caracal caracal</i>	Caracal	LC
<i>Felis silvestris</i>	African Wild Cat	LC
<i>Panthera pardus</i>	Leopard	SARDB NT
<i>Felis nigripes</i>	Black-footed cat	VU
<i>Genetta genetta</i>	Small-spotted genet	LR/LC
<i>Suricata suricatta</i>	Meerkat	LR/LC
<i>Cynictis penicillata</i>	Yellow Mongoose	LR/LC
<i>Galerella pulverulenta</i>	Cape Grey Mongoose	LR/LC
<i>Vulpes chama</i>	Cape Fox	LC
<i>Canis mesomelas</i>	Black-backed Jackal	LC
<i>Otocyon megalotis</i>	Bat-eared Fox	LC
<i>Ictonyx striatus</i>	Striped Polecat	LR/LC
<i>Mellivora capensis</i>	Ratel/Honey Badger	SARDB EN
Rumanantia (Antelope):		
<i>Sylvicapra grimmia</i>	Common Duiker	LR/LC
<i>Antidorcas marsupialis</i>	Springbok	LC
<i>Raphicerus campestris</i>	Steenbok	LR/LC

Appendix 3. List of Reptiles.

List of reptiles which are known from the broad area according to the SARCA database, derived for the degree square 3220 (species within the 3220DC degree square in red).

Family	Scientific Name	Common name	Red category	list
Agamidae	Agama atra	Southern Rock Agama	Not Evaluated	
Agamidae	Agama hispida	Spiny Ground Agama	Not Evaluated	
Atractaspididae	Homoroselaps lacteus	Spotted Harlequin Snake	Not Evaluated	
Chamaeleonidae	Bradypodion gutturale	Little Karoo Dwarf Chameleon	Not Evaluated	
Chamaeleonidae	Chamaeleo namaquensis	Namaqua Chameleon	Not Evaluated	
Colubridae	Boaedon capensis	Brown House Snake	Not Evaluated	
Colubridae	Lamprophis guttatus	Spotted House Snake	Not Evaluated	
Colubridae	Lycodonomorphus rufulus	Brown Water Snake	Not Evaluated	
Colubridae	Prosymna sundevallii	Sundevall's Shovel-snout	Not Evaluated	
Colubridae	Psammophis crucifer	Cross-marked Grass Snake	Not Evaluated	
Colubridae	Psammophis notostictus	Karoo Sand Snake	Not Evaluated	
Colubridae	Pseudaspis cana	Mole Snake	Not Evaluated	
Cordylidae	Cordylus minor	Western Dwarf Girdled Lizard	Not Evaluated	
Cordylidae	Hemicordylus capensis	Graceful Crag Lizard	Not Evaluated	
Cordylidae	Karusasaurus polyzonus	Karoo Girdled Lizard	Not Evaluated	
Cordylidae	Pseudocordylus microlepidotus namaquensis	Nuweveldberg Crag Lizard	Not Evaluated	
Elapidae	Hemachatus haemachatus	Rinkhals	Not Evaluated	
Elapidae	Naja nigricincta woodi	Black Spitting Cobra	Not Evaluated	
Elapidae	Aspidelaps lubricus lubricus	Coral Shield Cobra	Not Evaluated	
Gekkonidae	Chondrodactylus angulifer angulifer	Common Giant Ground Gecko	Not Evaluated	
Gekkonidae	Chondrodactylus bibronii	Bibron's Gecko	Not Evaluated	
Gekkonidae	Pachydactylus capensis	Cape Gecko	Not Evaluated	
Gekkonidae	Pachydactylus formosus	Southern Rough Gecko	Not Evaluated	
Gekkonidae	Pachydactylus geitje	Ocellated Gecko	Not Evaluated	
Gekkonidae	Pachydactylus kladaroderma	Thin-skinned Gecko	Not Evaluated	
Gekkonidae	Pachydactylus maculatus	Spotted Gecko	Not Evaluated	
Gekkonidae	Pachydactylus mariquensis	Marico Gecko	Not Evaluated	
Gekkonidae	Pachydactylus oculatus	Golden Spotted Gecko	Not Evaluated	
Gekkonidae	Pachydactylus purcelli	Purcell's Gecko	Not Evaluated	
Gekkonidae	Pachydactylus weberi	Weber's Gecko	Not Evaluated	
Gerrhosauridae	Cordylosaurus subtessellatus	Dwarf Plated Lizard	Not Evaluated	
Gerrhosauridae	Tetradactylus tetradactylus	Cape Long-tailed Seps	Not Evaluated	
Lacertidae	Nucras tessellata	Western Sandveld Lizard	Not Evaluated	
Lacertidae	Pedioplanis burchelli	Burchell's Sand Lizard	Not Evaluated	
Lacertidae	Pedioplanis laticeps	Karoo Sand Lizard	Not Evaluated	
Lacertidae	Pedioplanis lineocellata pulchella	Common Sand Lizard	Not Evaluated	
Leptotyphlopidae	Namibiana gracilior	Slender Thread Snake	Not Evaluated	
Scincidae	Trachylepis capensis	Cape Skink	Not Evaluated	
Scincidae	Trachylepis sulcata sulcata	Western Rock Skink	Not Evaluated	

Scincidae	<i>Trachylepis variegata</i>	Variegated Skink	Not Evaluated
Testudinidae	<i>Chersina angulata</i>	Angulate Tortoise	Not Evaluated
Testudinidae	<i>Homopus areolatus</i>	Parrot-beaked Tortoise	Not Evaluated
Testudinidae	<i>Homopus boulengeri</i>	Karoo Padloper	Not Evaluated
Testudinidae	<i>Homopus femoralis</i>	Greater Padloper	Not Evaluated
Testudinidae	<i>Psammobates tentorius tentorius</i>	Karoo Tent Tortoise	Not listed
Testudinidae	<i>Psammobates tentorius verroxii</i>	Verrox's Tent Tortoise	Not listed
Typhlopidae	<i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	Not Evaluated
Viperidae	<i>Bitis arietans arietans</i>	Puff Adder	Not Evaluated