September 2009

ECOLOGICAL SPECIALIST REPORT

SPECIALIST STUDY

PROPOSED KUSILE RAILWAY: ECOLOGICAL SPECIALIST STUDY

Proponent: **Eskom Holdings Limited**

Prepared by: **Zitholele Consulting**

FINAL ECOLOGICAL REPORT

Project 12202

PURPOSE OF THIS DOCUMENT

The growing demand for electricity is placing increasing pressure on Eskom's existing power generation and transmission capacity. Eskom is committed to implementing a Sustainable Energy Strategy that complements the policies and strategies of National Government. Eskom aims to improve the reliability of electricity supply to the country, and in particular to provide for the growth in electricity demand in the Gauteng and Mpumalanga provinces. For this reason, Eskom obtained environmental authorisation to construct the new Kusile Power Station between Bronkhorstspruit and Witbank in 2007. Construction of this power station has already commenced.

The new Kusile Power Station requires the delivery of a sorbent to the plant as a reagent in the power generation process. At present it is anticipated that this delivery will be best suited to rail transport. A proposed project to construct a new railway line from the existing Bronkhorstspruit – Emahlahleni railway line to the Kusile Power Station was therefore commissioned.

Eskom's Generation Division appointed Zitholele Consulting (Pty) Ltd, an independent company, to conduct an EIA to evaluate the potential environmental and social impacts of the proposed project.

As part of the environmental process Eskom requested specialist assessments to be undertaken in order to inform the Impact Assessment Phase. This report details the findings the terrestrial ecology assessment.

Zitholele Consulting have undertaken the aforementioned studies. The purpose of this document is therefore to present the findings from these assessments and to provide impact assessments and mitigation measures for each of the project phases.

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

The growing demand for electricity is placing increasing pressure on Eskom's existing power generation and transmission capacity. Eskom is committed to implementing a Sustainable Energy Strategy that complements the policies and strategies of National Government. Eskom aims to improve the reliability of electricity supply to the country, and in particular to provide for the growth in electricity demand in the Gauteng and Mpumalanga provinces. For this reason, Eskom obtained environmental authorisation to construct the new Kusile Power Station between Bronkhorstspruit and Witbank in 2007. Construction of this power station commenced in 2008.

The new Kusile Power Station requires the delivery of sorbent (Limestone most likely) to the plant as a reagent in the power generation process. At present it is anticipated that this delivery will be best suited to rail transport. This project proposes to construct a new railway line from the existing Bronkhorstspruit – Witbank railway line to the Kusile Power Station. At present three route alternatives are being investigated, varying in length from 12 – 18 km, namely (Figure 1-1):

Alternative 1: Kusile – Wilge River interchange shortcut

The Alternative 1 route alignment, which starts at the existing Pretoria-Witbank railway line (A), heads in a south westerly direction and crosses the N4 highway (F). Thereafter the route follows the course of the Wilge River (FB). This route then heads in a south easterly direction and crosses an unnamed tributary of the Wilge River continuing for six kilometres into the Kusile Power Station (BCDE). This route is approximately 12 km in length.

Alternative 2: Kusile - Wilge River interchange

The second alternative follows the same initial alignment as Alternative 1 (AF), but after crossing the N4 highway the alignment continues in a south westerly direction for approximately 4.5 kilometres. Thereafter the route crosses over the Klipfonteinspruit and turns in a south easterly direction for approximately two kilometres. The route then turns south south east for 2.5 kilometres, turns eastward and crosses the Klipfonteinspruit a second time and then turns to run in a northerly direction for three kilometres before meeting up with alternative 1 approximately 3 kilometres from the Kusile Power Station (BGDE). This route is estimated at 18 km in length.

Alternative 3: Kusile – Wilge River interchange shortcut 2

The Alternative 3 route alignment follows the same initial alignment as Alternative 1 (AF) but it crosses the N4 highway 500 metres eastward of the Alternative 1 and 2 crossing (avoiding the farmstead complexes) (FCDE). The alternative rejoins alternative 1 for approximately seven kilometres before entering the Kusile Power Station. This route is very similar to Alternative 1, with some minor deviations 12.2 km.

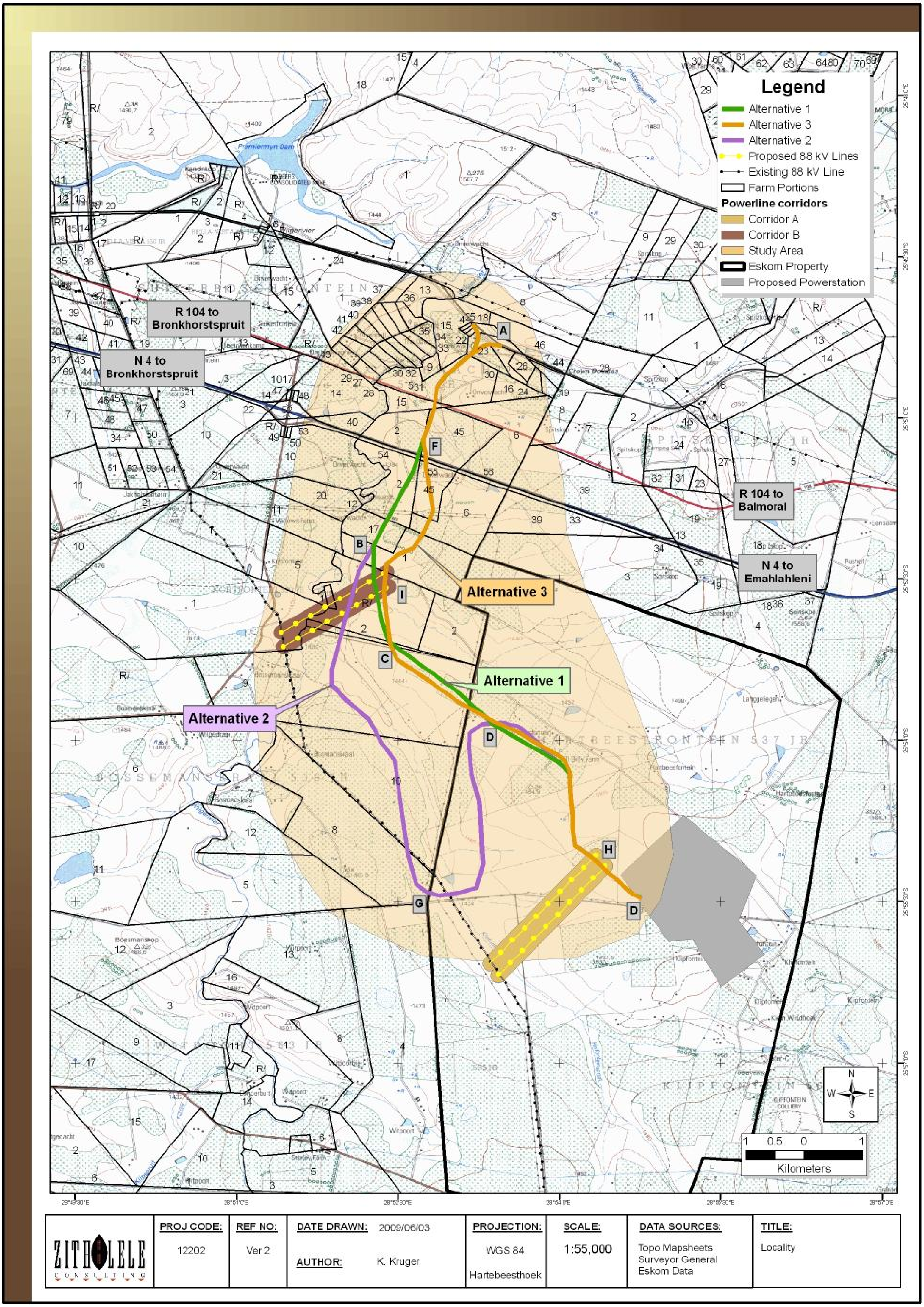

Figure 1-1: Proposed route alternatives for the railway line.

Power Line Alternatives

In order to power the railway line, two 88 kV power lines will be connected to two substations adjacent to the proposed railway line. This line will feed from the existing 88 kV power lines in the area and the potential placements are shown as Corridors A and B that link into the railway lines at points H and I in the Figure above. Each of the corridors requires one power line which will connect to one substation, depending on the route selected.

1.2 STUDY SCOPE

Eskom's Generation Division has appointed Zitholele Consulting (Pty) Ltd, an independent company, to conduct an EIA to evaluate the potential environmental and social impacts of the proposed project. As part of the environmental impact assessment for the aforementioned project it is required that certain biophysical specialist investigations are undertaken. Zitholele Consulting was appointed to undertake the following biophysical specialist studies:

- Wetlands and Surface Water;
- Topography and Visual Impact;
- Soils;
- Agricultural Potential; and
- Terrestrial Ecology.

This report details the findings of the terrestrial ecology assessment.

1.3 STUDY APPROACH

Zitholele Consulting undertook the aforementioned specialist studies during several site visits conducted from the 23rd – 30th March, the 6th – 9th July and 1st – 4th September 2009. The wide spread of site visits during the year were undertaken to obtain a maximum cover of the seasonal variations. The study area encompasses the area within a 500 m radius of the proposed railway line alternatives. Transects were walked on either side of the proposed railway line alternatives in which vegetation, soil, fauna and wetland characteristics were sampled.

1.4 PROJECT PERSONNEL

The following project personnel were involved in the compilation of this report.

Konrad Kruger, BSc Hons (Geog)

Mr. Konrad Kruger graduated from the University of Pretoria with a BSc Honours in Geography in 2003. He has been involved in a variety of environmental projects in the last three years and has become specialised in undertaking specialist studies, mapping and environmental consulting. He has undertaken GIS mapping for mining, residential as well as industrial developments. He is also an experienced land ecologist and will provide expertise for this project in terms of soil surveys, land capability assessments and mapping. He is currently in the process of acquiring his MSc in Geography (Landscape Ecology) from the University of Pretoria.

1.5 ASSUMPTIONS AND LIMITATIONS

The following assumptions were made during the assessment:

- The information regarding the routes provided by Eskom is accurate;
- Ecological and wetland assessments have to be undertaken during the summer months; and
- A corridor width of 500 m was used for each alternative route.

2 BIOPHYSICAL RECEIVING ENVIRONMENT

This section details the receiving environment at the project location. For the context of this report the regional environment refers to a 50 km radius around the study area.

2.1 TERRESTRIAL ECOLOGY

2.1.1 Data Collection

A literature review of the faunal species that could occur in the area was conducted. C-Plan data provided from the Mpumalanga provincial department was used to conduct a desktop study of the area. This data consists of terrestrial components; ratings provide an indication as to the importance of the area with respect to biodiversity.

2.1.2 Regional Description

The biodiversity rating for the bulk of the site (Figure 2-1) is rated as least concern and no natural habitat remaining. The initial stages of Alternatives 1 – 3 are on areas rated as important. It should be noted that the area at the end of the routes is currently the construction site for the Kusile Power Station and therefore sensitivities in this area can be ignored.

2.1.3 Vegetation

Data Collection

The floral study involved extensive fieldwork, a literature review and a desktop study utilizing GIS. The site was investigated during two one week site visits, conducted from the 23rd – 30th March and 1st – 4th September 2009, in late summer and early spring respectively. The area within the servitude was sampled using transects placed at 300 m intervals. At random points along the transect an area of 20 m x 20 m was surveyed. All species within the 20 m x 20 m quadrant were identified, photographed and their occurrence noted. Sensitive features such as ridges or wetlands were sampled by walking randomly through the area concerned and identifying all species within the area.

The floral data below is taken from The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford 2006). Also, while on site, the following field guides were used:

- Guide to Grasses of Southern Africa (Frits van Oudtshoorn, 1999);
- Field Guide to Trees of Southern Africa (Braam van Wyk and Piet van Wyk, 1997);
- Field Guide to the Wild Flowers of the Highveld (Braam van Wyk and Sasa Malan, 1998);
- Problem Plants of South Africa (Clive Bromilow, 2001); and

- Medicinal Plants of South Africa (Ben-Erik van Wyk, Bosch van Oudtshoorn and Nigel Gericke, 2002)

Regional Description

The area under investigation straddles two Biomes, namely the Savanna and the Grassland Biomes. Each biome comprises several bioregions which in turn has various vegetation types within the bioregion. The Grassland Biome is represented by Mesic Highveld Grassland bioregion. Each of these bioregions is described below. These descriptions are adapted from Mucina and Rutherford, 2006.

Mesic Highveld Grassland

Mesic Highveld Grassland is found mainly in the eastern, high rainfall regions of the Highveld, extending all the way to the northern escarpment. These are considered to be “sour” grasslands and are dominated by primarily andropogonoid grasses. The different grassland types are distinguished on the basis of geology, elevation, topography and rainfall. Shrublands are found on outcrops of rock within the bioregion, where the surface topography creates habitat in which woody vegetation is favoured above grasses.

As mentioned above the railway line corridors were visited for a lengthy period of time and the following vegetation types were identified along the route:

- Rand Highveld Grassland
- Eastern Highveld Grassland; and
- Eastern Temperate Freshwater Wetlands

The vegetation types identified on site are indicated in Figure 2-1 below and described in detail below.

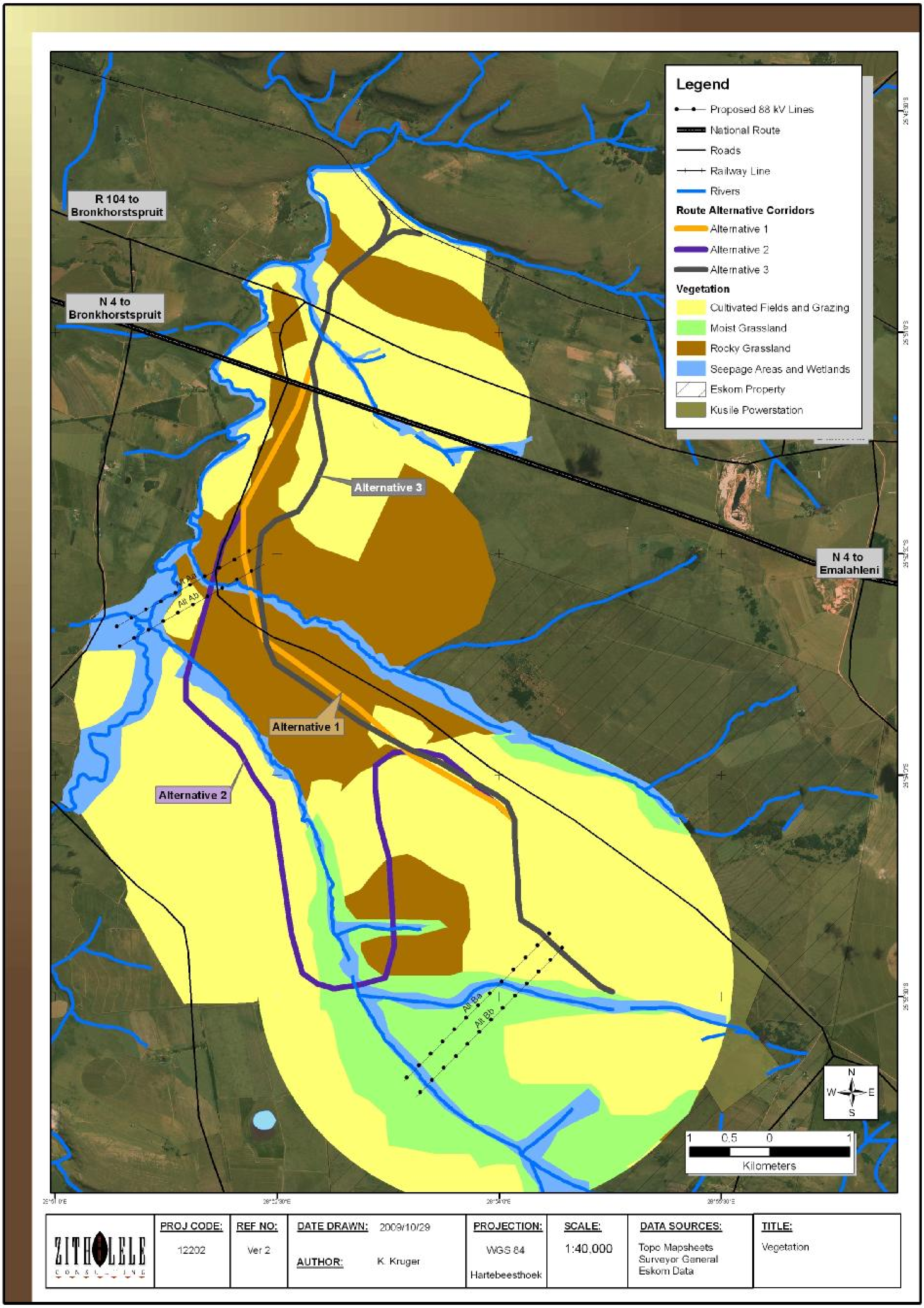

Figure 2-1: Vegetation Map the site.

Site Description

At the time of the site visit it was found that a large section of the site is already being developed as part of the Kusile Power Station construction phase. In addition large sections of the site have been burned and the vegetation in these areas could not be identified. Information was supplemented with the specialist ecological report[1] undertaken for the Kusile Power Station EIA.

Three main vegetation types were identified, namely rocky grassland, moist grassland and grazed/cultivated fields. Each of these vegetation types are described in more detail below and illustrated in Figure 2-1 above. The species list for the site is attached in Appendix 1. The species that could occur in the quarter degree grid was obtained from the Plants of Southern Africa (POSA) online database upheld by the South African National Botanical Institute (SANBI) and supplemented with field notes. The list provides species names, common names, as well as notes on which species were observed on site. In total 136 species have could occur in the area with 43 confirmed species.

Hyparrhenia hirta **Anthropogenic Grassland (Grazed and Cultivated Fields)**

This tall grassland occurs over vast areas, usually on shallow, leached soils on the Johannesburg granite dome, and on undulating north-facing warm andesitic lava slopes of the Suikerbosrand, Witwatersrand and Klipriviersberg areas. Disturbed grassland or other disturbed areas such as road reserves or fallow fields, not cultivated for some years, are also usually *Hyparrhenia* dominated (Coetzee et al. 1995; Bredenkamp & Brown 2003).

This *Hyparrhenia* – dominated grassland may appear to be quite natural, but they are mostly associated with an anthropogenic influence from recent or even iron-age times. This grassland is characterised by the tall growing dominant Thatch grass (*Hyparrhenia hirta*), and Bankrupt Bush (*Stoebe vulgaris*), an invader dwarf shrub which usually indicates grassland's degraded condition (Bredenkamp & Brown 2003).

This grassland mostly has low species richness, with only a few other species able to establish or survive in the shade of the dense sward of tall grass. Most of these species are relict pioneers or early seral species. The most prominent species include the grasses *Cynodon dactylon, Eragrostis plana, E. racemosa, E. curvula and Aristida congesta*. Forbs are rarely encountered, though a few individuals of species such as *Anthospermum rigidum, Conyza podocephala, Crabbea angustifolia and Helichrysum rugulosum* are often present (Bredenkamp & Brown 2003).

[1] Proposed Coal-Fired Power Station Near Kendal, Witbank Area Ecological Report, Dr. P.J. Du Preez, 2006.

Figure 2-2 below provides an illustration of the *Hypparrhenia* grassland unit with the current Kusile Power Station construction works underway in the background.

Figure 2-2: Hyparrhenia grassland.

Schizachyrium sanguineum -Loudetia simplex Grassland (Rocky Grassland)

This high altitude grassland is found throughout the study area on rocky midslopes of ridges and hills. The soils are often shallow with high rock cover (up to 60% in some cases). This vegetation is found mostly on cooler aspects, but also occur on the warmer north-facing aspects where scattered individuals of dwarf shrubs are present. In some degraded areas *Aristida junciformis, A. congesta and Cynodon dactylon* are more prominent (Coetzee et al. 1995; Bredenkamp & Brown 2003).

This grassland is dominated by the grasses *Digitaria monodactyla, Loudetia simplex, Trachypogon spicatus, Eragrostis racemosa, Andropogon shirensis, Schizachyrium sanguineum, Brachiaria serrata and Themeda triandra (*Figure 2-3*).*

The woody layer consists mainly of a few scattered individuals of the dwarf shrubs *Protea welwitschii, Lopholaenia coriifolia*, and the geoxylophyte *Parinari capensis*, that are locally prominent. The grasses *Alloteropsis semialata, Panicum natalense, Urelytrum agropyroides, Tristachya leucothrix, Monocymbium ceresiiforme, Digitaria monodactyla,* *Sporobolus pectinatus, Alloteropsis semialata, Bewsia biflora and Elionurus muticus* are also abundant together with the forbs *Cyanotis speciosa, Bulbostylis burchellii, Senecio venosus, Sphenostylus angustifolia and Pentanissia angustifolia* (Coetzee et al. 1995; Bredenkamp & Brown 2003).

Figure 2-3: Rocky Grassland.

***Eragrostis plana* Moist Grassland (Moist Grassland)**

The *Eragrostis plana* Grassland is well represented occurring mainly in high rainfall parts. This grassland type is a moist grassland, usually restricted to flat plains or bottomlands, mostly on moist, deep, clayey and poorly drained, seasonally wet soils, adjacent to wetlands , seasonal as well as perennial rivers. These habitats are often fairly unstable due to seasonal flooding and drying, which, together with frequent overgrazing, cause degradation of the vegetation (Bezuidenhout & Bredenkamp 1990).

Eragrostis plana is conspicuous, often dominant member of this grassland type (Figure 2-4). *Paspalum dilatatum*, and the rhizomatous *Cynodon dactylon*, often presents in degraded sites, are also diagnostic, as well as the forbs *Crabbea acaulis, Berkheya radula, B. pinnatifida and Trifolium africanum.* Grass species such as *Eragrostis curvula, Themeda triandra, Setaria sphacelata and Digitaria eriantha* are often abundantly present, and may be locally dominant, while forbs are generally quite rare (Coetzee et al. 1995; Bredenkamp & Brown 2003).

Figure 2-4: Eragrostis Plana Moist Grassland.

Seepage areas and wetland communities

Seepage areas are seasonally wet areas that occur in sandy areas where water seeps into lowlying drainage lines after rains. These areas are usually covered by hygrophytes such as sedges and reeds. The dominant sedge in the study area is *Juncus rigidus*. Sometimes bulrush (*Typha capensis*) and reeds (*Phragmites australis*) also occur.

Wetlands are of a more permanent nature and occur in low-lying areas such as tributaries of streams and rivers. Here hydrophytes can be found. Typical plants are the Orange River Lily (*Crinum bulbispermum*), bulrush (*Typha capensis*) and reeds (*Phragmites australis*), sedges of the *Cyperus, Fuirena and Scirpus* genera also occur (Figure 2-5).

Figure 2-5: Seepage Area.

Red data Flora Species

The findings of the ecological assessment undertaken for the Kusile Power Station identified *Cyrtanthus breviflorus* within the non-perennial drainage line running just south of the current Kusile Power Station site. None of the proposed railway line alternatives are in close proximity to this area, and none of the potential red data species were found within the corridors. Table 2-1 below illustrates the potential red data species that could occur in the area, according to the red data species database from the Mpumalanga and Gauteng environmental departments.

Table 2-1: Possible Red Data plant species occurring in the study area.

Biological Name
Delosperma gautengense
Delosperma macellum
Encephalartos brevifoliolatus
Encephalartos middelburgensis
Eulophia coddii
Frithia pulchra
Habenaria mossii
Khadia beswickii
Melolobium subspicatum

2.1.4 Terrestrial species

Methodology

This section was adapted from the Golder report *"Ecological Follow-up Surveys for the Proposed ESKOM Bravo Power Station near Kendal, Mpumalanga*, 2008". In order to enable a characterization of the environment, as well as floral and faunal species that may be impacted by the proposed Kusile railway line, faunal and floral groups were investigated. The groups of species investigated were:

- Vegetation;
- Arthropoda;
- Mammals;
- Herpetofauna (Reptiles); and
- Amphibia.

Avifauna was excluded as a separate specialist study was conducted for the avi-fauna. Methods implemented during this investigation are based on accepted scientific investigative techniques and principles and were performed to acceptable standards and norms, taking the limitations of this investigation into consideration. The Precautionary Principle was applied throughout the assessments.

Arthropoda

Arthropods were surveyed by means of setting out of pitfall traps, in selected areas within the various vegetation communities, and intensive transects making use of visual identification. Furthermore capture of species on the wing was also undertaken in order to aid identification, this was done by means of sweep-netting. Identification of species was done to the lowest possible taxonomic level using Picker et al (2002).

Suitable habitat was identified for scorpions, spiders and butterflies in order to select areas in which to sample by means of pitfall traps and visual identification, as well as to determine the possibility of the occurrences of Red Data or protected species of these taxa.

Reptilia

Suitable areas were identified and sampled using active search and capture methods, searches were concentrated in rocky areas and disused ant hills were investigated for the presence of snakes. Snakes and other reptiles are identified visually and only captured if visual identification is hampered by swift-moving snakes or if the snake is obscured from view. Branch, 1996 was used as an identification guide, where necessary.

Amphibia

Suitable areas for frogs were sampled by means of active search and capture and acoustic identification methods, especially at night when highest amphibian activity is expected. Areas were also netted for tadpoles and amphibian species identified by means of tadpoles. Carruthers (2001) was used to confirm identification where necessary.

Mamalia

Sherman traps were placed at the sites during the night in order to capture small mammals. Visual sightings and ecological indications were used to identify the small mammal inhabitants of the study area. Scats were also collected and used for identification of nocturnal small mammals. Stuart and Stuart (1993) and Smithers (1992) were used for identification purposes.

Red Data Faunal Assessment

The following parameters were used to assess the Probability of Occurrence of each Red Data species:

Habitat requirements (HR) – Most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics in the study area was evaluated.

Habitat status (HS) – The status or ecological condition of available habitat in the area is assessed. Often a high level of habitat degradation prevalent in a specific habitat will negate the potential presence of Red Data species (this is especially evident in wetland habitats).

Habitat linkage (HL) – Movement between areas for breeding and feeding forms an essential part of the existence of many species. Connectivity of the study area to surrounding habitat and the adequacy of these linkages are evaluated for the ecological functioning of Red Data species within the study area.

Probability of occurrence is presented in four categories, namely:

- Low;
- Medium;
- High; and
- Recorded.

Impacts to biological patterns and processes

The assessments of potential impacts are discussed according to biological patterns and processes. The identified potential impacts for each of these are discussed below.

Patterns

Habitat

- Habitat Loss
  - Loss of wetland habitats within the site, where infrastructure and deposits are planned.
  - Alteration of wetland and aquatic system functioning as a result of coal mining activities and the construction of the power station to the east of the site.
  - Loss of Eastern Highveld Grassland within Site, where infrastructure and deposits are planned.
  - Loss of Grassland and Rocky outcrop habitats along the linear infrastructure
  - Loss of wetland habitat along the linear infrastructure
- Habitat Alteration
  - Alteration of wetland functioning as a result on infrastructure altering water flow
  - Alteration in habitat quality as a result of pollution, dust and altered temperatures of discharge
- Rare and Sensitive Species
  - Loss of rare and sensitive species (All Sites)

Processes

Biological

- Migration
  - Noise, and pollution, may deter fauna from settling or passing through the area
  - Physical barrier to species using and moving across the area
- Competition
  - Alteration in quality and quantity of available habitat
- Predation

- Alteration in species composition - occurrence and abundance

- Anthropogenic
  - Increased human activity in the area

Faunal Assessment

Arthropoda

A total of 67 arthropods were recorded during the site investigation and are given in Table 2-2. All of the species recorded during the survey were common grassland species and are not restricted in terms of habitat or distribution. It is likely that more species may occur in the area. However it is unlikely that Red Data arthropod species, such as *Aloeides dentatis* or *Aloeides merces*, occur on this site as the host plants for these species are not present.

Table 2-2: Arthropoda recorded on site.

Family	Genus	Species
Gomphidae	*Ictinogomphus*	*ferox*
Aeshnidae	*Aeshna*	*miniscula*
	Anax	*imperator*
Libellulidae	*Nothiothemis*	*jonesi*
	Trithemis	*stictica*
Blattidae	*Deropeltis*	*erythrocephala*
	Periplenata	*americana*
Blatellidae	*Blatella*	*germanica*
Blaberidae	*Derocalymma*	
Pseudophyllodromiidae	*Supella*	*dimidiata*
Termitidae	*Macrotermes*	*natalensis*
Hymenopodidae	*Harpagomantis*	*tricolor*
Mantidae	*Sphodromantis*	*gastrica*
	Miomantis	
Empusidae	*Empusa*	*guttula*
Libiduridae	*Euborellia*	*annuplipes*
Anostostomatidae	*Onosandrus*	
Bradyporidae	*Hetrodes*	*pupus*
Tettigonidae	*Phaneroptera*	
	Eurycorypha	*sp.*
	Phaneroptera	*sp.*
Gryllidae	*Gryllus*	*bimaculatus*
	Gryllotalpidae	*sp.*
Pamphagidae	*Hoplolopha*	
Pyrgomorphidae	*Zonocerus*	*elegans*
Lentulidae	*Lentula*	
Acrididae	*Acrida*	*acuminata*
	Truxaloides	
	Cyrtacnthacris	*aeruginosa*
Phasmatidae	*Palophus*	*reyi*
Miridae	*Deraeocoris*	

Family	Genus	Species
Reduviidae	*Etrichodia*	*crux*
	Glymmatophora	
	Lopodytes	*grassator*
Plataspidae	*Solenostethium*	*lilligerum*
Alydidae	*Mirperus*	*faculus*
Pentatomidae	*Nezara*	*viridula*
Scarabidae	*Gymnopleurus*	*humanus*
	Anachalcos	*convexus*
	Copris	*mesacanthus*
Cerambycidae	*Prosopocera*	*lactator*
Carabidae	*Passalidius*	*fortipes*
	Acanthoscelis	*ruficornis*
Melirydae	*Melyris*	
Tennebrionidae	*Psammodes*	*striatus*
	Stenocara	*dentata*
	Dichtha	*incantatoris*
Meloidae	*Actenoidia*	*curtula*
Curculionidae	*Prionorhinus*	*canus*
Myrmeleontidae	*Centroclisi*	*sp.*
	Hagenomyia	*tristis*
Tabanidae	*Philoliche*	*rostrata*
Culicidae	*Aedes*	
	Culex	
Bombyliidae	*Exoprosopa*	
Calliphoridae	*Chrysomya*	*chloropyga*
Saturniidae	*Bunaea*	*alcinoe*
Pieridae	*Eurema*	*brigitta*
Nymphalidae	*Hamanumida*	*daedalus*
	Danaus	*chrysippus*
Vespidae	*Ropalidia*	
	Belonogaster	*dubia*
Apidae	*Apis*	*mellifera*
Formicidae	*Camponotus*	*sp.*
Arachnidae		
Araneidae	*Argiope*	*australis*
	Gasteracanthus	*sanguinolenta*

Reptilia

Nine reptilian species were recorded during the site survey (Table 2-3). None of the recorded species are restricted in terms of habitat and distribution, or classified as Red Data Species. It is likely that more species may occur in the area but unlikely that any of the species occurring on this site are classified as Red Data species.

Table 2-3: Reptilia recorded on site.

Scientific Name	**Common Name**
Chammaesaura aenea	Transvaal Grass Lizard

Lamprophis fuliginosus	Brown House Snake
Mabuya striata punctatissima	Striped Skink
Psammophylax rhombeatus	Rhombic Skaapsteker
Mabuya striata punctatissima	Striped Skink
Mabuya varia	Variable Skink
Pelomedusa subrufa	Marsh Terrapin
Philothamnus hoplogaster	Green Water Snake
Varanus niloticus	Water monitor

Amphibia

Seven species of amphibians were recorded as occurring within the study area and are given in Table 2-4. These species are not restricted in terms of habitat or distribution and none of the species recorded are classified as Red Data species. It is possible that more species may occur in the area but, due to the fact that no Red Data amphibian species are known to occur in this vegetation type, it is unlikely that any Red Data amphibian species occur at this site.

Table 2-4: Amphibia recorded on site.

Species	Revised Status
Bufo gutturalis	Not Listed
Schismaderma carens	Not Listed
Tomopterna cryptotis	Not Listed
Kassina senegalensis	Not Listed
Xenopus laevis	Not Listed
Cacosternum boettgeri	Not Listed
Afrana angolensis	Not Listed

Mammalia

Mammal species diversity was very low at this site, with only 17 species being recorded (Table 2-5). Although no individuals of these species were found during this survey, *Mystromys albicaudatus,* White-tailed mouse, are Red Data species that may utilize this habitat type.

Table 2-5: Mammalia recorded at site.

Biological Name	Common Name
Elephantulus myurus	Rock elephant shrew
Lepus saxatilis	Scrub hare
Hystrix africaeaustralis	Porcupine
Rhabdomys pumilio	Striped mouse
Mastomys natalensis	Natal multimammate mouse
Dendromus melanotis	Grey climbing mouse
Dendromus mystacalis	Chestnut climbing mouse
Ictonyx striatus	Striped polecat
Cynictis penicillata	Yellow mongoose
Raphicerus campestris	Steenbok
Crocidura cyanea	Reddish grey musk shrew
Otomys angoniensis	Angoni vlei rat
Otomys irroratus	Vlei rat
Dendromus mystacalis	Chestnut climbing mouse
Aonyx capensis	Cape clawless otter
Lutra maculicollis	Spotted-necked otter
Atilax paludinosus	Water mongoose

Red Data Faunal Species

Red Data faunal species that may occur in the area are listed in Table 2-6. A total of 11 Red Data faunal species may occur in the area, according to the provincial departments.

Table 2-6: Red Data faunal species that may occur in the study area.

Biological Name	Common Name
Aloeides dentatis	
Aloeides merces	
Amblysomus septentrionalis	HIGHVELD GOLDEN MOLE (Eng)
Chrysospalax villosus	ROUGH-HAIRED GOLDEN MOLE
Mystromys albicaudatus	WHITE-TAILED MOUSE

The Red Data species that may occur in the study area consist of 2 arthropod species, 0 amphibian species and 3 mammal species. The habitat suitability for Red Data species ranges from low to medium with a 16 species for which the habitat suitability can be classified as high. Although no individuals of these species were found during this survey *Mystromys albicaudatus,* White-tailed mouse is a Red Data species that may utilize this habitat type.

3 IMPACT ASSESSMENT METHODOLOGY

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology was utilised so that a wide rage of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 3-1.

Table 3-1: Quantitative rating and equivalent descriptors for the impact assessment criteria

Rating	Significance	Extent Scale	Temporal Scale
1	VERY LOW	*Isolated sites / proposed site*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

3.1 SIGNIFICANCE ASSESSMENT

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1 000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be

VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 3-2 below.

Table 3-2 : Description of the significance rating scale

Rating		Description
5	Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	High	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	Moderate	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	Very low	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity are needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	No impact	There is no impact at all - not even a very low impact on a party or system.

3.2 SPATIAL SCALE

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in Table 3-3.

Table 3-3 : Description of the significance rating scale

Rating		Description
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level).
3	Local	The impact will affect an area up to 5 km from the proposed study area.
2	Study Area	The impact will affect an area not exceeding the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the power line alignments.

3.3 DURATION SCALE

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in Table 3-4.

Table 3-4: Description of the temporal rating scale

Rating		Description
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of plant.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

3.4 DEGREE OF PROBABILITY

Probability or likelihood of an impact occurring will be described as shown in Table 3-5 below.

Table 3-5 : Description of the degree of probability of an impact occurring

Rating	Description
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

3.5 DEGREE OF CERTAINTY

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in Table 3-6. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 3-6 : Description of the degree of certainty rating scale

Rating	Description
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.
Don't know	The consultant cannot, or is unwilling, to make an assessment given available information.

3.6 QUANTITATIVE DESCRIPTION OF IMPACTS

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

$$\textbf{\textit{Impact Risk}} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown below:

Table 3-7 : Example of Rating Scale

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
	LOW	*Local*	Medium-term	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the table below.

Table 3-8 : Impact Risk Classes

Rating	Impact Class	Description
0.1 – 1.0	**1**	**Very Low**
1.1 – 2.0	**2**	**Low**
2.1 – 3.0	**3**	**Moderate**
3.1 – 4.0	**4**	**High**
4.1 – 5.0	**5**	**Very High**

Therefore with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

3.7 CUMULATIVE IMPACTS

It is a requirement that the impact assessments take cognisance of cumulative impacts. In fulfilment of this requirement the impact assessment will take cognisance of any existing impact sustained by the operations, any mitigation measures already in place, any additional impact to environment through continued and proposed future activities, and the residual impact after mitigation measures.

It is important to note that cumulative impacts at the national or provincial level will not be considered in this assessment, as the total quantification of external companies on resources is not possible at the project level due to the lack of information and research documenting the effects of existing activities. Such cumulative impacts that may occur across industry boundaries can also only be effectively addressed at Provincial and National Government levels.

Using the criteria as described above an example of how the cumulative impact assessment will be done is shown below:

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Initial / Existing Impact (I-IA)	**2**	**2**	**2**	<u>*1*</u>	0.4
Additional Impact (A-IA)	**1**	***2***	<u>**1**</u>	<u>*1*</u>	0.3
Cumulative Impact (C-IA)	**3**	***4***	<u>**2**</u>	<u>*1*</u>	0.6
Residual Impact after mitigation (R-IA)	**2**	***1***	<u>**2**</u>	<u>*1*</u>	0.3

As indicated in the example above the Additional Impact Assessment (A-IA) is the amount that the impact assessment for each criterion will increase. Thus if the initial impact will not increase, as shown for temporal scale in the example above the A-IA will be 0, however, where the impact will increase by two orders of magnitude from 2 to 4 as in the spatial scale the A-IA is 2. The Cumulative Impact Assessment (C-IA) is thus the sum of the Initial Impact Assessment (I-IA) and the A-IA for each of the assessment criteria.

In both cases the I-IA and A-IA are assessed without taking into account any form of mitigation measures. As such the C-IA is also a worst case scenario assessment where no mitigation measures have been implemented. Thus a Residual Impact Assessment (R-IA) is also made which takes into account the C-IA with mitigation measures. The latter is the most probable case scenario, and for the purpose of this report is considered to be the final state Impact Assessment.

3.8 NOTATION OF IMPACTS

In order to make the report easier to read the following notation format is used to highlight the various components of the assessment:

- Significance or magnitude- IN CAPITALS
- Temporal Scale – <u>in underline</u>
- Probability – <u>*in italics and underlined*</u>.
- Degree of certainty - **in bold**
- Spatial Extent Scale – *in italics*

4 IMPACT ASSESSMENT

The Impact Assessment will highlight and describe the impact to the environment following the abovementioned methodology and will assess the Terrestrial Ecology.

The impact assessment was undertaken for the construction, operational and decommissioning phases of the project. The impact of each line/route alternative was also assessed separately, however, where the impact was not significantly different, only one impact assessment was undertaken. The railway line will constitute a single railway line with a single overhead line and an access road (Figure 4-1). According to the design team at Kwezi V3 the impact footprint for such a railway line would be approximitaly 50 m depending on the cut/fill required.

Figure 4-1: Example of what the railway line would look like

4.1 TERRESTRIAL ECOLOGY

4.1.1 Initial Impact

The initial impact on the terrestrial ecology of the study is mainly in the form of the agricultural establishment over an extended period of time. The natural grasslands have been transformed into croplands where the soils allow and the remainder of the habitat is used for the grazing of livestock. In addition several alien invasive plants have also established themselves in the area, especially *Acacia mearnsii* (Black Wattle) and poplar. The natural grasslands have also been fragmented through the establishment of farms, fences and roads in the area. There are patches of grassland that is still in relatively good condition and that support small faunal species, but no large fauna remain in the area. From personal communications with the farmers in the area larger mammals that used to frequent the area included leopard and warthog. The eastern highveld grassland habitat which this area falls under has been severely impacted upon by coal mining, sand quarrying and industries such as steel smelters and power stations. This is rated as a **High** impact as shown in Table 4-1 below.

4.1.2 Additional Impact

The additional impact of the construction and operation of the railway line will further fragment an already disturbed system. Some habitat will be lost, especially considering the servitude that will be used for the railway line and the associated access road. During the operational phase the impacts from construction will persist and therefore remain a **Moderate** impact as assessed below in Table 4-1.

The wetland and riparian systems is the least impacted in the area and should be preserved if possible. The three alternatives all cross over streams but Alternative 2 cross over more than the other two alternatives and also impact the habitat for a longer length. Therefore either Alternative 1 or 3 is recommended.

4.1.3 Cumulative Impact

The cumulative impact of both the historical impacts and the proposed development remain as assessed for the initial impact assessment.

4.1.4 Mitigation Measures

- All construction areas should be demarcated prior to construction to ensure that the footprint of the impacts are limited (including areas where vehicles may traverse);
- The sensitive vegetation should be avoided and construction limited to 50 m from the edge of the wetlands and streams;
- Alternative 1 should be considered as the preferred alternative;
- All alien invasive species on site should be removed and follow up monitoring and removal programmes should be initiated once construction is complete;
- Adhere to the ESKOM vegetation management guideline;
- Investigate the option of establishing a nature area on Eskom property to act as an impact offset. The area to the north of Kusile power station has been purchased by Eskom and will provide the ideal area for such an offset area;
- Remove sensitive plants by means of the Search-and-Rescue exercise as undertaken for the Kusile power station;

- Place rescued plants in the Kusile nursery prior to re-establishment in a natural area, preferably in the off-set area;
- All alien invasive species on site should be removed and follow up monitoring and removal programmes should be initiated once construction is complete; and
- Install power lines according to the ESKOM bird collision prevention guideline.

4.1.5 Residual Impact

With the successful implementation of the above mitigation measures the impact to the terrestrial ecology can be mitigated to a **moderate** impact. This is also relevant for the operational phase. The residual impact after the closure phase will be a moderate positive impact on the terrestrial ecology.

Table 4-1: Impact Rating Matrix for Terrestrial Ecology

Construction phase					
Impact Type	**Significance**	**Spatial**	**Temporal**	**Probability**	**Rating**
Initial	High	Local Area	Long Term	Has Occurred	**3.7 - High**
Additional	High	Study area	Long Term	Very Likely	**2.7 - Moderate**
Cumulative	High	Local Area	Long Term	Has Occurred	**3.7 - High**
Residual	Moderate	Local Area	Long Term	Very Likely	**2.9 - Moderate**
Operational Phase					
Impact Type	**Significance**	**Spatial**	**Temporal**	**Probability**	**Rating**
Additional	High	Study area	Long Term	Very Likely	**2.7 - Moderate**
Cumulative	High	Local Area	Long Term	Has Occurred	**3.7 - High**
Residual	Moderate	Local Area	Long Term	Very Likely	**2.9 - Moderate**
Closure and Rehabilitation Phase					
Impact Type	**Significance**	**Spatial**	**Temporal**	**Probability**	**Rating**
Residual	Moderate	Local Area	Long Term	Very Likely	**2.9 - Moderate**

5 CONCLUSION

In conclusion the proponent proposes to construct and operate a railway line in order to connect the Kusile Power Station to the existing Bronkhorstspruit – Emahlahleni railway line in order to deliver Limestone to the Power Station.

Zitholele Consulting was appointed to investigate the biophysical aspects and Stakeholder sensitivities of the proposed routes. The aspects investigated include terrestrial ecology impacts.

It was found that the major areas of concern were the habitat fragmentation and loss of agricultural land. Most of the elements analysed indicate that the impacts from Alternative 2 will be larger than the other 2 alternatives as shown in Table 5-1 below.

Table 5-1: Summary of impacts per alternative

Impact	Alt 1	Alt 2	Alt 3
Terrestrial Ecology	Moderate	Moderate but more disturbance in sensitive habitats	Moderate

Alternative 2 is 8 km longer than the other two alternatives and also crosses more streams and the associated riparian and wetland habitat. It is therefore suggested that either Alternative 1 or 3 be used for the railway line rather that Alternative 2. On the basis of the criteria evaluated there is no difference between Alternative 1 and 3 and either can be utilised.

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Appendix 1: Species Lists