

Most of the land is used for animal grazing with only a small portion that is cultivated. North of the Magaliesberg is an extensive canal system for irrigation and water is supplied by the Hartbeespoort Dam. Grazing and mining are the largest land users and it is expected that the role of mining will continue to increase as more mines open. (Index, 2012)

The transmission line has the potential to impact the portions of land where irrigation occurs, as towers will need to be located along the route, access roads will be required during the construction and operational phases, as well as the construction camps. These potential impacts can be prevented or mitigated by ensuring that the tower sites, access road and construction camp areas are not located on any portion of land used for irrigation purposes.

9.6 Flora

In terms of the North West State of Environment Report two major biomes occur within the Province which includes the Grassland Biome and the Savanna Biome. The eastern part of the province is mountainous and includes the scenic Magaliesberg, while the western and central parts of the province is characterised by gently undulating plains.

The proposed alternative powerline routes and associated 1km study area traverses the Magaliesberg as well as the Witwatersberg. In terms of the South African National Biodiversity Institute (SANBI) data, the vegetation cover in the study area is comprised of Andesite Mountain Bushveld, Gauteng Shale Mountain Bushveld, Gold Reef Mountain Bushveld, Marikana Thornveld, Moot Plains Bushveld, and Norite Koppies Bushveld. The table below (Table 22) provides details on the conservation status of the vegetation types found within the study area.

Table 22: Study Area Vegetation Types and Associated Conservation Status

Vegetation Type	Associated Landscape Character	Conservation Status
Andesite Mountain Bushveld	Undulating landscape with hills and valleys.	Least Threatened
Gauteng Shale Mountain Bushveld	Low broken ridges varying in steepness with high surface rock cover.	Vulnerable
Gold Reef Mountain Bushveld	Rocky hills and ridges often west-east trending.	Least Threatened
Marikana Thornveld	Valleys and slightly undulating	Endangered

Vegetation Type	Associated Landscape Character	Conservation Status
	plains with some low hills.	
Moot Plains Bushveld	Plains and some low hills.	Vulnerable
Norite Koppies Bushveld	Plains, koppies and noritic outcrops.	Least Threatened

Mucina & Rutherford (2006) classified the study area as comprised of the following vegetation type units: Andesite Mountain Bushveld, Gauteng Shale Mountain Bushveld, Gold Reef Mountain Bushveld, Marikana Thornveld, Moot Plains Bushveld, and Norite Koppies Bushveld, as indicated in **Figure 50**. Refer to Figure 11 for an illustration of the Vegetation types found within the study area.

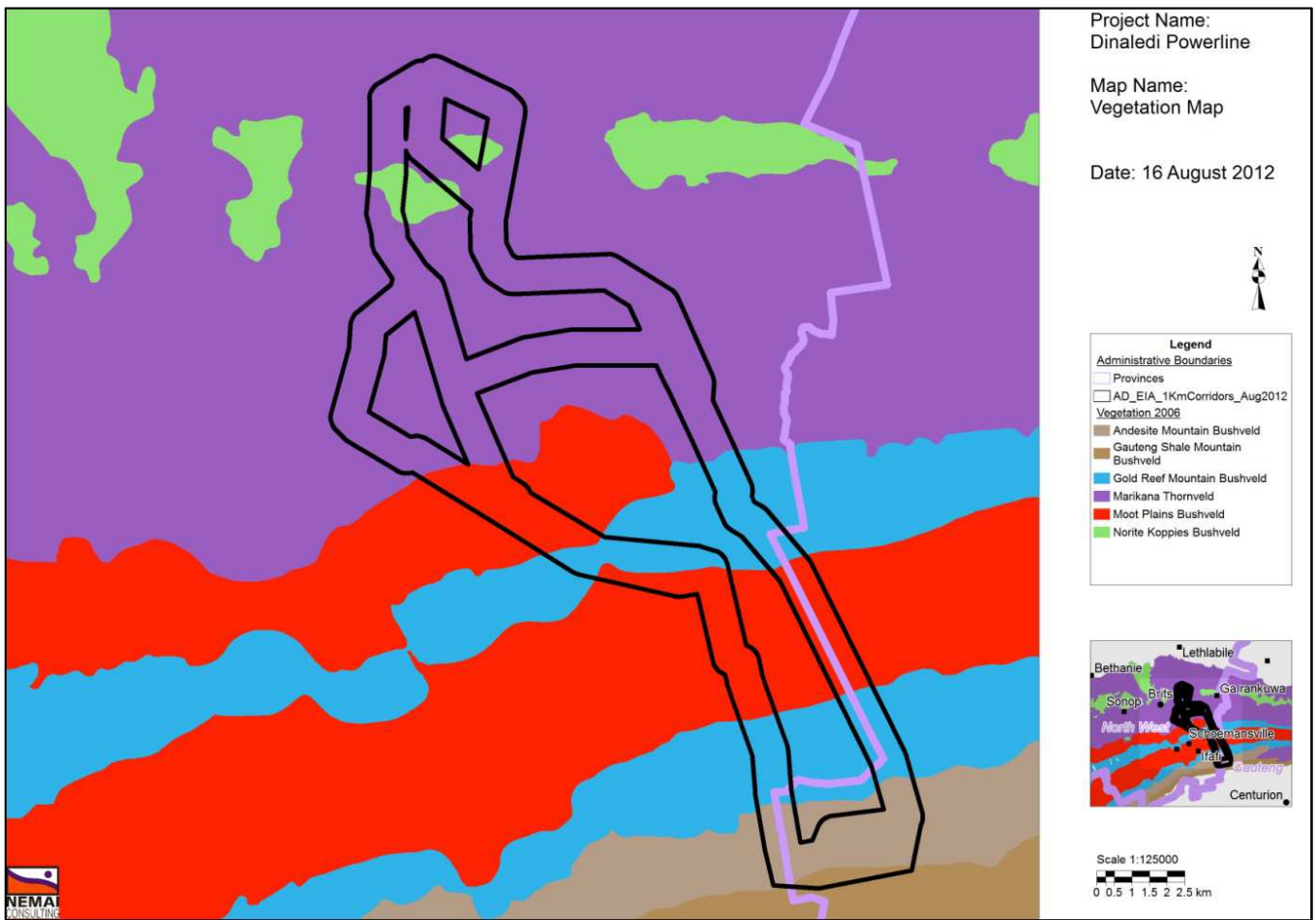


Figure 50: Vegetation units identified in the study area

The proposed transmission alternative lines will traverse through the Magaliesberg Protected Natural Environment (MPNE), Magaliesberg Natural Area and Wonderboom Municipal Nature Reserve as indicated in **Figure 51**. According to Greater Pretoria Metropolitan Council (2001), the MPNE is

considered to be almost 100 times older than Mount Everest and has unique geology, topography and bio diverse habitats as well as heritage features. The areas proclaimed as PNE are mostly privately owned and no formal fence clearly demarcates the MPNE boundary. This adds to the ad hoc nature of management and activities especially on the edges of the MPNE. The different ecological systems that occur in the study area include mountainous areas, streams, rivers, indigenous woodland and grassland floral communities and these ecological systems are observed in the MPNE.



Figure 51: Protected areas in the study area

Plant communities recorded in the study area (Phampe, 2012)

The following plant communities were identified during the field visit and are described below.

Eastern Route Alternative and Eastern Route Alternative Deviation

A number of indigenous trees as well as exotic plants were identified along this route. A list of identified species is available in the Fauna and Flora Report (Appendix D1). Two species, *Hypoxis hemerocallidea* and *Boophane distacha*, declared as “Protected” by the Nature Conservation Ordinance 1974 (No. 19 of 1974) were recorded along this route during the surveys. Species of *Sclerocarya birrea* subsp. *caffra* (Marula) were recorded along the proposed route. This species is protected according to National Forests Act 1998 (Act No 84 of 1998).



Figure 52: *Hypoxis hemerocallidea* recorded along the proposed routes

Central Route Alternative

The koppie/ridge, through which the proposed transmission will traverse, provides suitable habitats for Red Data listed species. Species of *Sclerocarya birrea* subsp. *caffra* (Marula) were recorded along the proposed route and this species, as previously mentioned, is protected according to National Forests Act 1998 (Act No 84 of 1998). No Red Data or Orange-Listed plant species were recorded on this route.

Western Route Alternative, Deviations Western, Eastern and Southern

The western route alternative incorporates the existing powerlines, mostly along the R511 to Brits and passes through the Xstrata Eland Platinum Mine. The vegetation on this route is highly disturbed due to previous construction of the transmission lines and is dominated by weeds and alien invasive species such as *Melia azedarach*, *Opuntia ficus-indica*, *Campuloclinium macrocephalum*, and *Solanum mauritianum* (Figure 53).



Figure 53: Alien invasive plant species recorded along the proposed routes

The sensitive areas that the proposed route will traverse are the Magaliesberg Natural Area, MPNE, and Magaliesberg & Witwatersberg IBA. Only one protected plant species was recorded on this proposed route, *Sclerocarya birrea* subsp. *Caffra* (Marula).

There is potential for the proposed construction of the transmission line and associated routes to have an impact on the sensitive areas and flora identified along the proposed routes. Of the three proposed routes, the Eastern route is regarded as the route alternative that would pose the greatest threat to the overall biodiversity of the area during construction of the proposed transmission line. This route as it traverses sensitive areas such as MPNE, and the number of Orange Listed plant species recorded on this route were higher than the other route alternatives. The preferred route, in terms of fauna and flora sensitivity, is the Western Route-Western deviation, as most parts of the route are along a main road near an existing powerline. These sections are considered less sensitive in terms of biodiversity compared to the other alternative routes.

These activities have the potential to affect the sensitive vegetation identified along the routes; however the potential impacts however can be mitigated against by ensuring that no protected vegetation is removed, furthermore all protected or sensitive areas must be clearly demarcated prior to commencement of construction activities. Provided that recommendations by all specialists are adhered to, the potential impacts are anticipated to be minimal. Rehabilitation of affected areas is an important

part of the post-construction phase to ensure that should any damage occur, those areas are then immediately

9.7 Fauna

The Magaliesberg Protected Natural Environment (MPNE), which forms part of the study area, provides large areas where species such as hyena and leopard can exist. Caves are known to be found in the MPNE, and they are very important as roosting or breeding sites for bats and other animal species and should be conserved in its natural state.

In terms of Avifauna, the study area falls within the Magaliesberg and Witwatersberg (ZA018) Important Bird Area (IBA) (Barnes, 1988).

This large area includes the magisterial districts of the former Bophuthatswana, Brits, Rustenburg, Swartruggens, Ventersdorp, Koster and Oberholzer. The Magaliesberg range extends in an arc from just south of Rustenburg in the west to Hartbeespoort Dam near Pretoria in the east. Most of the area falls within the MPNE. Within the IBA, several publicly owned protected areas occur. The Diepsloot Nature Reserve, controlled by the Johannesburg Municipality, lies 10 km south of Hartbeespoort Dam. Other protected areas within the IBA include Rustenburg Nature Reserve, which is 2 km southwest of the town, Mountain Sanctuary Park and Hartbeespoort Dam Nature Reserve as well as several private reserves and conservancies. According to Wesson (2006), total 46.6% of the bird species recorded for southern African subregion (including Botswana, Lesotho, Mozambique south of the Zambesi River, Namibia, South Africa, Swaziland and Zimbabwe) have been recorded from the Magaliesberg.

According to Carruthers (2000), the MPNE is ideal for a high diversity of reptiles especially among the rocks, cliffs and crevices and the substrate is an important factor in determining which habitats will be suitable for particular reptile species. Reptiles that are present in the Magaliesberg, ranging from poisonous snakes to agamas and skinks have been recorded by Carruthers (2000). The rivers in the study area provide an ideal habitat for amphibians to occur.

According to Hokka (2006), a total of 140 butterfly species were identified for the MPNE, while 221 species of butterfly have been confirmed to occur in the North West Province. This implies that 63% of the butterfly species that occur in the North West Province have been recorded in the MPNE.

9.7.1 Mammals (Phampe, 2012)

Human activity in some sections of the study area is quite high, and it is unlikely that these areas will comprise significant habitat for any species of threatened larger mammals, except in the MPNE.

According to the Magaliesberg Protected Environment: Environmental Management Framework and Plan - Status Quo Report (2007), Carruthers (2000) has recorded 90 indigenous mammal species in the Magaliesberg. The Sable Antelope (*Hippotragus niger*) is one of the mammal species which historically naturally occurred within the area that was re-introduced into the MPNE. According to Hokka (2006), the following species have been recorded in the MPNE (Table 23).

Table 23: Red Data Mammal Species Recorded in the MPNE

Species	Colloquial Names	Red Listed Status
<i>Suncus infinitesimus</i>	Least dwarf shrew	Indeterminate
<i>Atelerix frontalis</i>	South African hedgehog	Rare
<i>Proteles cristatus</i>	Aardwolf	Rare
<i>Hyaena brunnea</i>	Brown hyaena	Rare
<i>Panthera pardus</i>	Leopard	Rare
<i>Mellivora capensis</i>	Honey badger	Vulnerable
<i>Ourebia ourebi</i>	Oribi	Vulnerable

Mammal species diversity was low across the alternative sites. Good habitat cover is present, especially along the rivers and mountains, and therefore a wide diversity of small to medium mammalian species is expected to flourish. Riparian vegetation promotes ecological functionality as the river forms an ecological corridor that highly-mobile species would utilize for migratory purposes. Mammals are sensitive to disturbances and habitat destruction and degradation and as such more species would occur on or near the MPNE than near the residential areas. Settlement areas have negated the possibility of encountering any medium to large mammals. The presence of dogs in the study area, especially on the western route, poses a threat to the presence of mammals on sites. Table 24 indicates 11 mammals actually observed in the study area. No sensitive or endangered mammals were visually recorded during the site visits.

Table 24: Mammals recorded on the proposed transmission lines

Common name	Species	Route alternative
Impala	<i>Aepyceros melampus</i>	Eastern Route Alternative
Kudu	<i>Tragelaphus strepsiceros</i>	Eastern Route Alternative, Western Route Alternative
Scrub Hare	<i>Lepus saxatilis</i>	Eastern Route Alternative, Western Route Alternative
African Mole-rat	<i>Cryptomys hottentotus</i>	Eastern Route Alternative, Western Route Alternative
Springhare	<i>Pedetes capensis</i>	Eastern Route Alternative, Western Route Alternative
Bushveld Gerbil	<i>Tatera leucogaster</i>	Eastern Route Alternative, Western Route

Common name	Species	Route alternative
		Alternative
Yellow Mongoose	<i>Cynictis penicillata</i>	Eastern Route Alternative, Western Route Alternative
Common Duiker	<i>Sylvicapra grimmia</i>	Eastern Route Alternative, Western Route Alternative
Chacma Baboon	<i>Papio ursinus</i>	Eastern Route Alternative, Western Route Alternative
Vervet Monkey	<i>Cercopithecus aethiops pygerythrus</i>	Eastern Route Alternative, Western Route Alternative
Blesbok	<i>Damaliscus pygargus phillipsi</i>	Western route-West Alternative

The proposed construction of the access roads, construction camps, tower sites and other associated infrastructure has the potential to affect the fauna along the route, however most of the species are mobile and it is assumed that as a result of the existing disturbances, the sensitive fauna would be located closer to the MPNE areas. As such caution must be taken when working in those sensitive areas not to disturb any faunal species. Furthermore provided that all recommended mitigation measures are adhered to, the potential impacts are anticipated to be minimal.

9.7.2 Avifauna (Phampe, 2012)

Human activities have transformed habitats in South Africa to a point where few pristine examples remain (Low & Rebelo, 1996). Continuing pressure on sensitive ridges is largely responsible for the decline of avifaunal species. Observations regarding the number and diversity of birds will provide valuable input to sound management practices for the fast changing environment.

Loss of habitat remains one of the biggest threats to birds and the environment in South Africa and the rest of the world. A number of distinct ecological systems occur in the study area. These include mountainous areas, streams and river courses, indigenous woodland and grassland floral communities. Sensitive ecological and natural systems also occur along the MPNE. Table 25 lists bird species recorded in the study area. The species marked with an asterisk (*) were based on anecdotal information provided by the land owners of potentially affected properties.

Table 25: Bird species recorded in the study area

Species	Common name	Route alternative
<i>Apus barbatus</i>	African black swift	Eastern Route Alternative, Western Route Alternative
<i>Ardea melanocephala</i>	Black-headed heron	Eastern Route Alternative, Western Route Alternative
<i>Bostrychia hagedash</i>	Hadedda ibis	Eastern Route Alternative, Western Route Alternative
<i>Bubulcus ibis</i>	Cattle Egret	Eastern Route Alternative, Western Route Alternative
<i>Cercomela familiaris</i>	Familiar Chat	Eastern Route Alternative, Western Route Alternative

Species	Common name	Route alternative
<i>Charadrius pallidus</i>	Three-banded plover	Eastern Route Alternative, Western Route Alternative
<i>Cisticola juncidis</i>	Zitting Cisticola	Eastern Route Alternative, Western Route Alternative
<i>Columba guinea</i>	(Speckled) Rock pigeon	Eastern Route Alternative, Western Route Alternative
<i>Corythaixoides concolor</i>	Grey go-away-Bird (Lourie)	Eastern Route Alternative, Western Route Alternative
<i>Corvus albus</i>	Pied Crow	Eastern Route Alternative, Western Route Alternative
<i>Elanus caeruleus</i>	Black-shouldered Kite	Eastern Route Alternative, Western Route Alternative
<i>Euplectes orix</i>	Southern Red Bishop	Eastern Route Alternative, Western Route Alternative
<i>Gyps africanus</i>*	White-backed vulture	Eastern Route Alternative, Western Route Alternative
<i>Gyps coprotheres</i>*	Cape vulture	Eastern Route Alternative, Western Route Alternative
<i>Hirundo cucullata</i>	Greater Striped Swallow	Eastern Route Alternative, Western Route Alternative
<i>Lanius collaris</i>	Common Fiscal	Eastern Route Alternative, Western Route Alternative
<i>Lamprotornis nitens</i>	Cape Glossy Starling	Eastern Route Alternative, Western Route Alternative
<i>Numida meleagris</i>	Helmeted guineafowl	Eastern Route Alternative, Western Route Alternative
<i>Mirafra africana</i>	Rufous-naped Lark	Eastern Route Alternative, Western Route Alternative
<i>Phylloscopus trochilus</i>	Willow Warbler	Eastern Route Alternative, Western Route Alternative
<i>Ploceus velatus</i>	Southern masked-Weaver	Eastern Route Alternative, Western Route Alternative
<i>Polemaetus bellicosus</i>*	Martial eagle	Eastern Route Alternative, Western Route Alternative
<i>Pternistes swainsonii</i>	Swainson's spurfowl (francolin)	Eastern Route Alternative, Western Route Alternative
<i>Pycnonotus tricolor</i>	Dark-capped (Blackeyed) Bulbul	Eastern Route Alternative, Western Route Alternative
<i>Sigelus silens</i>	Fiscal Flycatcher	Eastern Route Alternative
<i>Struthio camelus</i>	Common Ostrich	Eastern Route Alternative
<i>Streptopelia senegalensis</i>	Laughing Dove	Eastern Route Alternative, Western Route Alternative
<i>Streptopelia capicola</i>	Cape Turtle-Dove	Eastern Route Alternative, Western Route Alternative
<i>Streptopelia semitorquata</i>	Red-eyed Dove	Eastern Route Alternative, Western Route Alternative

In terms of avifauna, the study area falls within the Magaliesberg and Witwatersberg (ZA018) Important Bird Area (IBA). IBAs form a network of sites, at a biogeographic scale, which are critical for the long-term viability of naturally occurring bird populations. The MPNE provides a suitable habitat for Red data bird species that are known to occur in the area. The proposed transmission lines fall within the savanna biome. The savanna biome is rich in large raptors, such as the white-backed vulture, Cape vulture, Martial eagle, Tawny eagle, Lappet-faced vulture, Brown Snake Eagle, Black-chested Snake Eagle, Steppe Buzzard, African Harrier Hawk, and African Hawk Eagle.

Negative interactions between wildlife and electrical infrastructures take many forms, but the two most familiar problems in southern Africa are electrocution of birds and collision of birds with transmission lines (Van Rooyen, 2004). Initial destruction and then the maintenance of vegetation clearing within servitudes have a greater impact within savanna areas than in grassland-dominated areas. Grasslands are allowed to re-establish within the servitudes following completion of the construction phases, whereas savanna areas are not allowed to re-establish. It is anticipated that provided the

relevant mitigation measures are adhered to especially during the operational, the potential impacts can be mitigated against.

It is also important to note that there are positive interactions between overhead powerlines and avifauna as well (van Rooyen, 2004):

1. Pylons can provide a safe nesting and perching sites away from predators. Some Lesser kestrel colonies have been shown to use overhead lines almost exclusively as perching sites;
2. Pylons can also provide nesting sites within areas devoid of tall trees. This has enabled certain species to expand their range.

According to African Centre for Energy and Environment (2003), Bird Flappers have proven to be more effective than the Bird Flight Diverter. In South Africa, It has been found that more collisions are common with shield wire than collisions with the overhead conductor and birds usually avoid the highly visible bundled conductor on higher voltage overhead lines but fail to recognise the smaller shield wire (Alonso & Alonso, 1999a).

9.7.3 **Reptiles (Cook, 2012)**

Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Large areas surrounding the site have resulted in increased habitat modification and transformation as well as increased human presence and associated disturbances (illegal reptile collecting, indiscriminate killing of all snake species, frequent fires) surrounding the site coupled with increased habitat destruction and disturbances on the neighbouring properties are all causal factors in the alteration and disappearance of reptile diversity in the area.

The Magaliesburg mountainous ridge contains large rocky outcrops and cliffs around the crests and provides favourable refuges for certain snake and lizard species (rupicolous species). Termite mounds were present on the lower rocky lower slopes of the Magaliesburg increasing in abundance along the mid slope. Most of the termite mounds were small but some larger mounds were also present on the plains extending northwards towards Brits. Some large mounds were moribund or had been damaged by previous foraging by Antbears as well as gouging by cattle. This resulted in the exposing of tunnels into the interior of the termite mound. Moribund (old) termite mounds offer important refuges especially during veld fires as well as cold winter months for numerous frog, lizard, snake and smaller mammal species. Large number of species of mammal, birds, reptiles and amphibians feed on the emerging alates (winged termites). These mass emergences coincide with the first heavy summer rains and the emergence of the majority of herpetofauna. No termite mounds

were destroyed during the brief field survey. All overturned rock material was carefully replaced in its original position.



Figure 54: A collage of photographs displaying the granitic outcrops and low-lying rocky sheets to the north-east of Brits

Several granite mines within the area are an immediate threat for remaining rupicolous reptile species. The rocky crests and slopes of the Magaliesburg ridge contain low-lying rocky outcrops as well as large granitic outcrops towards Brits and offer favourable habitat for several rupicolous reptile species. Reptile species recorded from under loosely embedded rocks or low-lying rocky areas included Yellow-Throated Plated Lizard (*Gerrhosaurus flavigularis*), Montane Speckled Skink (*Trachylepis (Mabuya) punctatissima*), Variable Skink (*Trachylepis (Mabuya) varia*) Ground Agama (*Agama aculeate distanti*) and Transvaal Thick-toed Gecko (*Pachydactylus affinis*). Trees including stumps; bark and holes in trees are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors). Reptile species recorded in the open and closed *Acacia caffra* woodland areas included Flap-neck Chameleon (*Chamaeleo dilepis*) and Cape Dwarf Gecko (*Lygodactylus capensis*). Limited logs and stumps were observed in the closed and open woodland areas opposite the proposed alignment. Reptiles recorded under logs included Wahlberg's Snake Eyed Skink (*Panapsis walbergii*) and Variable Skink (*Trachylepis varia*).

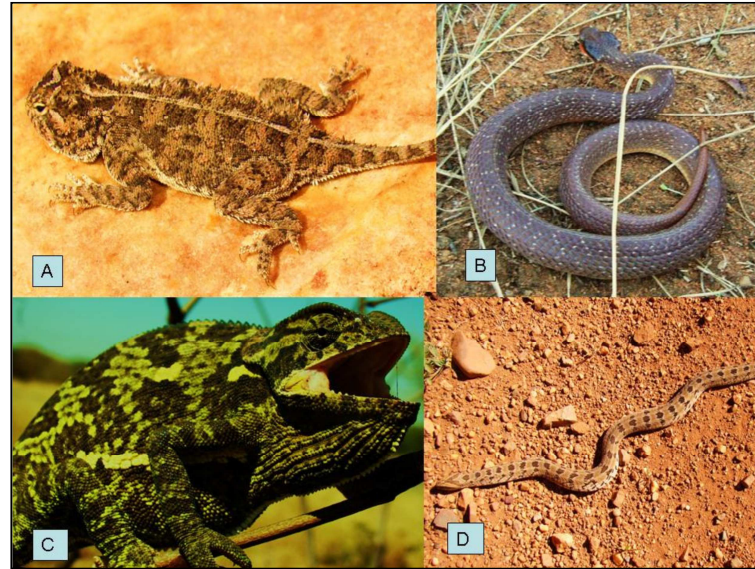


Figure 55: Reptile species recorded along the alignment included A: Distant's Ground Agama; B Herald Snake; Flap-necked Chameleon; Rhombi Night Adder

A list of reptile species observed on the site as well as species likely to occur on the site using habitat as an indicator of presence; is presented in the Herpetological specialist report (Appendix D).

There is a potential for the reptiles and their habitats to be impacted on mainly during the construction phase of this project. As indicated above reptiles are mostly found in the rocky crests and slopes of the Magaliesburg ridge contain low-lying rocky outcrops as well as large granitic outcrops towards Brits. Due to the terrain, it is not likely that many construction activities will occur in these areas however measures must be put in place to ensure that minimal disturbance occurs to these areas.

9.7.4 Amphibians (Cook, 2012)

Amphibians are an important component of South Africa's exceptional biodiversity (Siegfried 1989, cited in Cook, 2012) and are such worthy of both research and conservation effort. This is made additionally relevant by international concern over globally declining amphibian populations, a phenomenon currently undergoing intensive investigation but as yet is poorly understood (Wyman 1990; Wake 1991 cited in Cook, 2012). Frogs are useful environmental bio-monitors (bio-indicators) and may acts as an early warning system for the quality of the environment.

The Giant Bullfrog (*Pyxicephalus adspersus*) has been chosen as a flagship species for the grassland eco-region (Cook in le Roux 2002 cited in Cook, 2012) Breeding in African frogs is strongly dependent

on rain, especially in the drier parts of the country where surface water only remains for a short duration. The majority of frog species

in Gauteng and North-West Provinces can be classified as explosive breeders. Explosive breeding frogs utilise ephemeral pans or inundated grasslands for their short duration reproductive cycles. The general type of reproductive habitat chosen has a strong influence on the entire developmental strategy followed by many species. Most anuran larvae within Gauteng and North-West provinces inhabit temporary habitats that range from small pools to larger artificial dams/pans situated in lower lying areas or depressions. Unpredictable temporal and spatial distributions and cyclic patterns of nutrient availability are common features of these habitats. Others develop in more complex permanent aquatic habitats as temporary invaders in established communities such as rivers (Crocodile and Swartspuit), streams and the artificially created dams.

During survey undertaken by the specialist; fieldwork was augmented with species lists compiled from personal records (1999- 2012); data from the Brits-Magaliesburg area collected for the South African Frog Atlas Project (SAFAP) (1999-2003) and published data, and the list provided in Table 26 below is therefore regarded as likely to be fairly comprehensive.

Table 26: Frog species recorded by the Southern African Frog Atlas Project (SAFAP) for the combined locus 2527DB and 2527DD quarter degree grid squares

Family	Genus	Species	Common name	Red list category	Atlas region endemic
Brevipectidae	<i>Breviceps</i>	<i>adpersus</i>	Bushveld Rain Frog	Least Concern	0
Bufoidea	<i>Amietophrynus</i>	<i>garmani</i>	Eastern Olive Toad	Least Concern	0
Bufoidea	<i>Amietophrynus</i>	<i>gutturalis</i>	Guttural Toad	Least Concern	0
Bufoidea	<i>Poyntonophrynus</i>	<i>fenoulheti</i>	Northern Pygmy Toad	Least Concern	0
Bufoidea	<i>Schismaderma</i>	<i>carens</i>	Red Toad	Least Concern	0
Hyperoliidae	<i>Kassina</i>	<i>senegalensis</i>	Bubbling Kassina	Least Concern	0
Microhylidae	<i>Phrynomantis</i>	<i>bifasciatus</i>	Banded Rubber Frog	Least Concern	0
Phrynobatrachidae	<i>Phrynobatrachus</i>	<i>natalensis</i>	Snoring Puddle Frog	Least Concern	0
Ptychadenidae	<i>Ptychadena</i>	<i>anchietae</i>	Plain Grass Frog	Least Concern	0
Pyxicephalidae	<i>Amietia</i>	<i>angolensis</i>	Common or Angola River Frog	Least Concern	0
Pyxicephalidae	<i>Cacosternum</i>	<i>boettgeri</i>	Common or Boettger's Caco	Least Concern	0
Pyxicephalidae	<i>Pyxicephalus</i>	<i>edulis</i>	African Bullfrog	Least Concern	0

Pyxicephalidae	<i>Tomopterna</i>	<i>cryptotis</i>	Tremelo Sand Frog	Least Concern	0
Pyxicephalidae	<i>Tomopterna</i>	<i>natalensis</i>	Natal Sand Frog	Least Concern	0

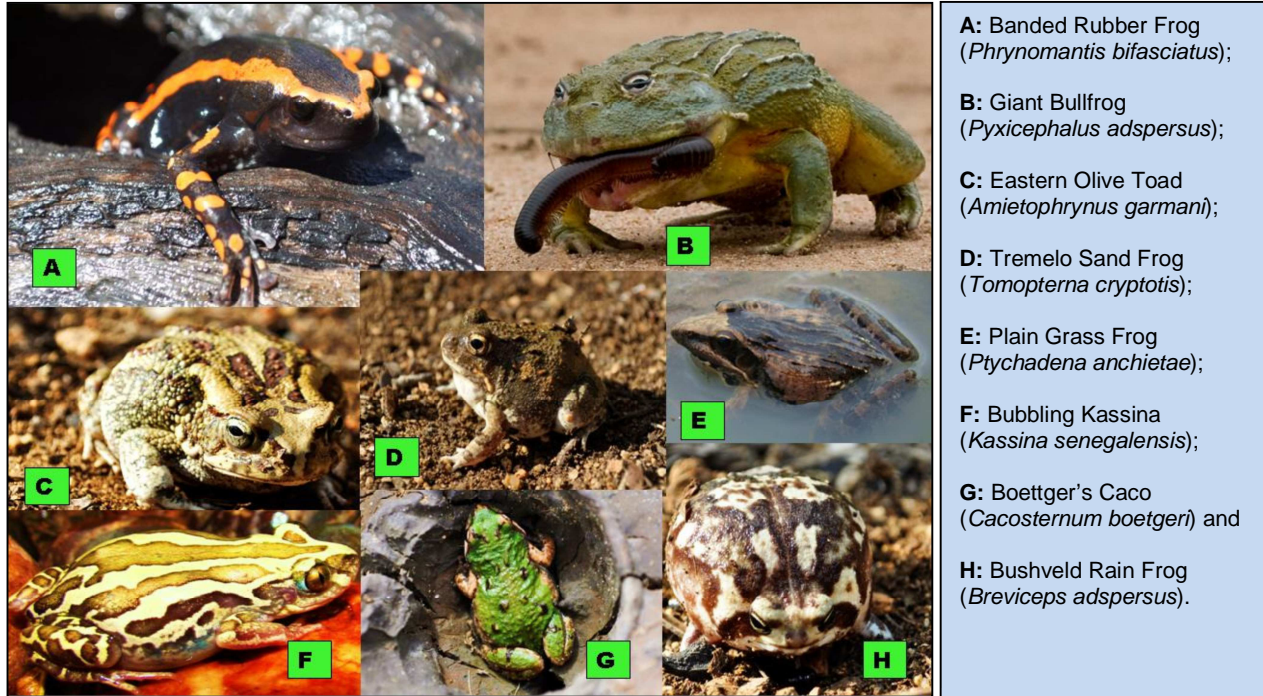


Figure 56: A conglomerate of photographs displaying frog species likely to occur along the alignments in a suitable habitat

According to The North West Biodiversity Site Inventory and Database Development (2003), the following Red Data amphibian is recorded for the North West Province (Table 27).

Table 27: Red Data Herpetofauna Species Recorded for the North West Province

Scientific name	English name	Status
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	Near Threatened

Due to the occurrence of various water bodies in the study area, the Giant Bullfrog is adapted to opportunistic breeding in pans and rainwater pools. According to Yetman (2004) (cited in Cook, 2012), the Giant Bullfrog is listed as “Near-Threatened” in Southern Africa and is considered a flagship species for southern African grasslands. There is also reason to believe that this species may be far more threatened within the sub-region, where Giant Bullfrogs are suffering a precipitous decline due to industrial and urban development. Although the destruction, degradation and

fragmentation of grasslands and wetlands contribute the most to the decline of the Giant Bullfrog, the high mortality of these frogs on roads (usually at night after heavy thunder showers) is also of great concern.

9.7.5 Invertebrates(van de Merwe, 2012)

The invertebrate assessment recorded a large number of insects representing 63 families and 15 orders during the survey period, a table has been included in the invertebrate specialist report for review, Appendix D. Data for those that were seen active on the surface or sampled by any of the collecting methods utilised are listed in the table below. Representatives from nine Arachnid families were collected or observed. All invertebrates sampled were stored in absolute ethanol and positively identified to family (or subfamily) level in the laboratory. When a particular specimen was found to belong to a family that contained invertebrates of conservation concern known to occur in the vicinity of the site, then further identification to genus or species level was carried out.

Invertebrate species of conservation concern known to occur in the vicinity of the site

Records indicate that six Red Data lepidopteran species of conservation concern are known to occur in the vicinity of the alternative routes for the proposed transmission line, namely *Spialia paula*, *Metisella meninx*, *Acraea machequena*, *Lepidochrysops hypopolia*, *Lepidochrysops praeterita* and *Platylesches dolomitica*. Two cetonid beetles of conservation concern are known to occur in the area, namely *Ichneustoma stobbiai* and *Trichocephala brincki*. *Hadogenes gunningi*, formerly listed as a scorpion species of conservation concern is also known to occur in the vicinity of the site.



1. *Spialia paula*, 2. *Metisella meninx*, 3. *Acraea machequena*, 4. *Lepidochrysops praeterita*, 5. *Platylesches dolomitica* and *Lepidochrysops hypopolia* (not observed since 1879), 6. *Ichneustoma stobbiai*, 7. *Trichocephala brincki* and 8. *Hadogenes gunningi*.

Figure 57: Species of concern known to occur in the vicinity of the alternative routes

9.8 Surface Water

9.8.1 Regional Description

The North West Province is situated within the Crocodile West - Marico Water Management Area (WMA 3) which borders on Botswana. This WMA includes two major river systems, the Crocodile and Groot Marico, which give rise to the Limpopo River at their confluence. Surface water in the North West Province occurs in the form of rivers, dams, pans, wetlands, as well as dolomitic eyes which is fed by aquifers. In the semi-arid western portion of the province surface water resources are generally scarce. The main rivers in the province include the Crocodile, Groot Marico, Hex, Elands, Vaal, Mooi, Harts and Molopo rivers. There are over 40 wetland areas in the province of which one, the Barbers Pan, is a Ramsar site (recognised as a wetland of international importance).

Surface water runoff from precipitation in the North West Province ranges from less than 1% in the semi-arid western area to approximately 7% in the eastern region, with the average runoff being 6%

which is below the national average of 9%. In order to meet water supply needs, the North West Province relies heavily on ground water resources.

Surface waters in the Gauteng Province comprise both flowing rivers and lakes or dams, with many of the smaller tributaries being seasonal in nature (i.e. dry in the winter). The Gauteng Province is situated within the upper reaches of three water management areas (WMAs). These WMAs includes the Crocodile West-Marico, Upper Vaal and Olifants River areas. Gauteng's natural water resources comes from surface water runoff as well as from ground water, however due to the high demand for water in the province, raw water is imported from outside the province. The province's main water supply comes from the Vaal River which receives input from the Lesotho Highlands Project. The main rivers and streams in the Tshwane (Pretoria) area are the Apies River, the Pienaars River and the Moreleta spruit. Approximately 2.1% of surface area in Pretoria is covered by wetlands. Figure 58 below shows the rivers found within the study area.

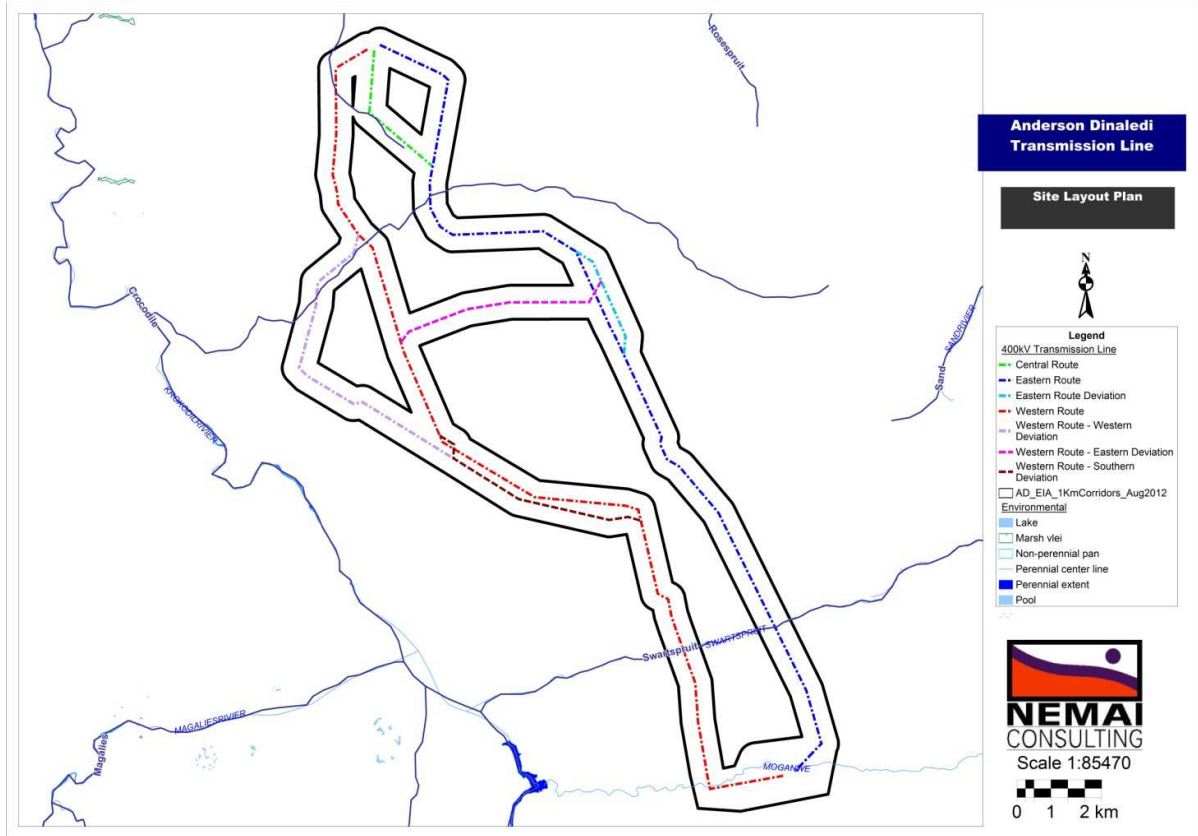


Figure 58: Rivers found within the study area

9.8.2 Site Description

The proposed alternative powerlines traverse various watercourses and associated riparian areas. Some wetland areas may also occur within the study area. Based on the desktop level through an appraisal of the topographical map and the National Wetlands Map II of the South African National Biodiversity Institute (SANBI), which was extracted from the National Land Cover 2000 dataset, no wetlands, including non-perennial pans were identified along any of the transmission line routes (see figure 57). The desktop analysis is not necessarily regarded as comprehensive and a more detailed identification of wetlands will be conducted during the walk-down survey, to ensure that these systems and adequate buffer zones are avoided during the siting of the towers. Streams in the area include many tributaries of the Crocodile River, as well as the Swartspruit, the Moganwe River, as well as many unnamed tributaries.

9.9 Groundwater

9.9.1 Regional Description

The fractured aquifers and dolomitic compartments which occur within the North West Province have resulted in a large reservoir of subterranean water. Although this precious resource occurs in the province, the recharge to this reservoir is considered to be one of the lowest in South Africa with an average of less than 10 mm per annum in the western region of the province. In order to meet water supply needs, the North West Province relies heavily on ground water resources. Groundwater resources in the province are polluted by mining and industrial activities, as well as by agriculture and domestic use. High levels of dissolved minerals, nitrates and fluoride concentrations in certain areas in the province as a result of both natural and human-induced factors are the main groundwater water quality issues in the province.

Due to the varied and complex geology of the Gauteng Province, aquifers found within this province are diverse. Four main types of aquifers occur within the Gauteng Province. These aquifers are grouped into four hydrogeological types which includes intergranular (alluvial – found in valley bottoms); fractured aquifers; karstic (dolomitic) aquifers; and intergranular and fractured aquifers (in the weathered zone). The quality of water in these aquifers found in the Gauteng Province is highly variable depending on the geology, ecological setting and influence of man.

9.9.2 Site Description

In terms of the North West State of the Environment Report the groundwater storage rock types found within the study area is mainly comprised of fractured igneous rock/metamorphic rock and fractured compact sedimentary rock. No karstic aquifers occur within the study area. No dolomites occur along the section of the eastern route alternative which traverses the Tshwane Municipal area and therefore no karstic aquifers within the area.

9.10 Air Quality

9.10.1 Regional Description

Air quality in the majority of the North West Province is not considered to be a major problem. Areas where air quality in the province shows deterioration includes urban, mining and industrialised areas such as Brits, Rustenburg and Potchefstroom. Vehicular emissions in the urbanised and industrialised areas also contribute to deterioration in air quality in the province. Furthermore the use of wood and coal for heating and cooking purposes in informal areas contributes to poorer air quality.

The state of air quality in the Pretoria (Tshwane) area is influenced by industrial activities, petrol stations, vehicular emissions from nearby roads and highways, informal settlements, sewerage effluent, and waste dumping. All of these activities contribute to air emissions which deteriorates air quality in the area.

9.10.2 Area/Local Description

Land uses in the study area are comprised of many minor and major roads, agriculture, mining, conservation, industrial, commercial, recreational and residential. Emissions from mining activities, industrial activities as well as and vehicular emissions affects the status of air quality in the study area. Furthermore various informal settlements occur and air emissions as a result of coal and wood burning for heating and cooking purposes also impacts on the state of air quality in the study area.

9.11 Noise

9.11.1 Area/Local

As mentioned previously, land uses in the study area are comprised of many minor and major roads, agriculture, mining, conservation, industrial, commercial, recreational and residential. Noise levels in the study area are currently generated by vehicles traffic on the major and minor roads, by heavy vehicles used by the mines and industries in the area, as well as by operational activities undertaken by the mines, quarries and industries. There are various properties which is not located in close proximity to mining and industrial area, where noise levels are lower.

9.12 Visual

9.12.1 Area/Site Description

As mentioned in Section 5.1.2, the North West Province has one of the most uniform terrains of all South African Provinces with altitudes ranging from between 920-1782 metres above mean sea level (mamsl). The eastern part of the province is mountainous and includes the scenic Magaliesberg, while the western and central parts of the province is characterised by gently undulating plains. The surface topography of the area within the Gauteng Province which the proposed eastern route alternative will traverse is described as a rugged landscape with hills and slopes of the Magaliesberg and the Witwatersberg. Approximately 20 ridges occur in the Tshwane (Pretoria) area, of which the most sensitive ridges include the Bronberge, The Magaliesberg, Daspoort, Meintjieskop, Tuine Bult Koppies and the Witwatersberg

The study area consists of cultivated, residential areas, subsistence farming and mining. Extensive mining and farming is located more to the northern side of the study area with scattered farms in the central parts and southern parts. Residential development activities are more intense from the central to southern side of the study area where the cultural homelands is located. Human settlements are scattered throughout the study area and the landscape is degraded around these settlements.

The majority of the study area is considered to have a *moderate* landscape character sensitivity due to the relative undeveloped and high topographic variation of the landscape, the generally high visual quality and the related tourism value that is placed on the visual resource. High terrain variability occurs through of the study area where a moderate VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees covers which will provide visual screening for the proposed transmission line.

The landscape character is considered moderately susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is resilient and recovers very quickly from surface disturbances.

Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types. In this case the mines and existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses.

Within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the proposed project.

9.13 Traffic

Various major and minor roads occur within the study area. The proposed routes both eastern and western alternative traverse the following national and provincial roads as indicated in the figure 59 and 60 below:

- N4;

- R566;
- R513;
- R511; and
- R514.

The western alternative will traverse the R104. Little information is available on traffic volumes in the study area and whether major traffic issues occur. The North West Province has relatively good general infrastructure, including a roads, and a well developed network of tarred roads links the main urban centres in the Province. Many rural settlements in the province are serviced by gravel roads.

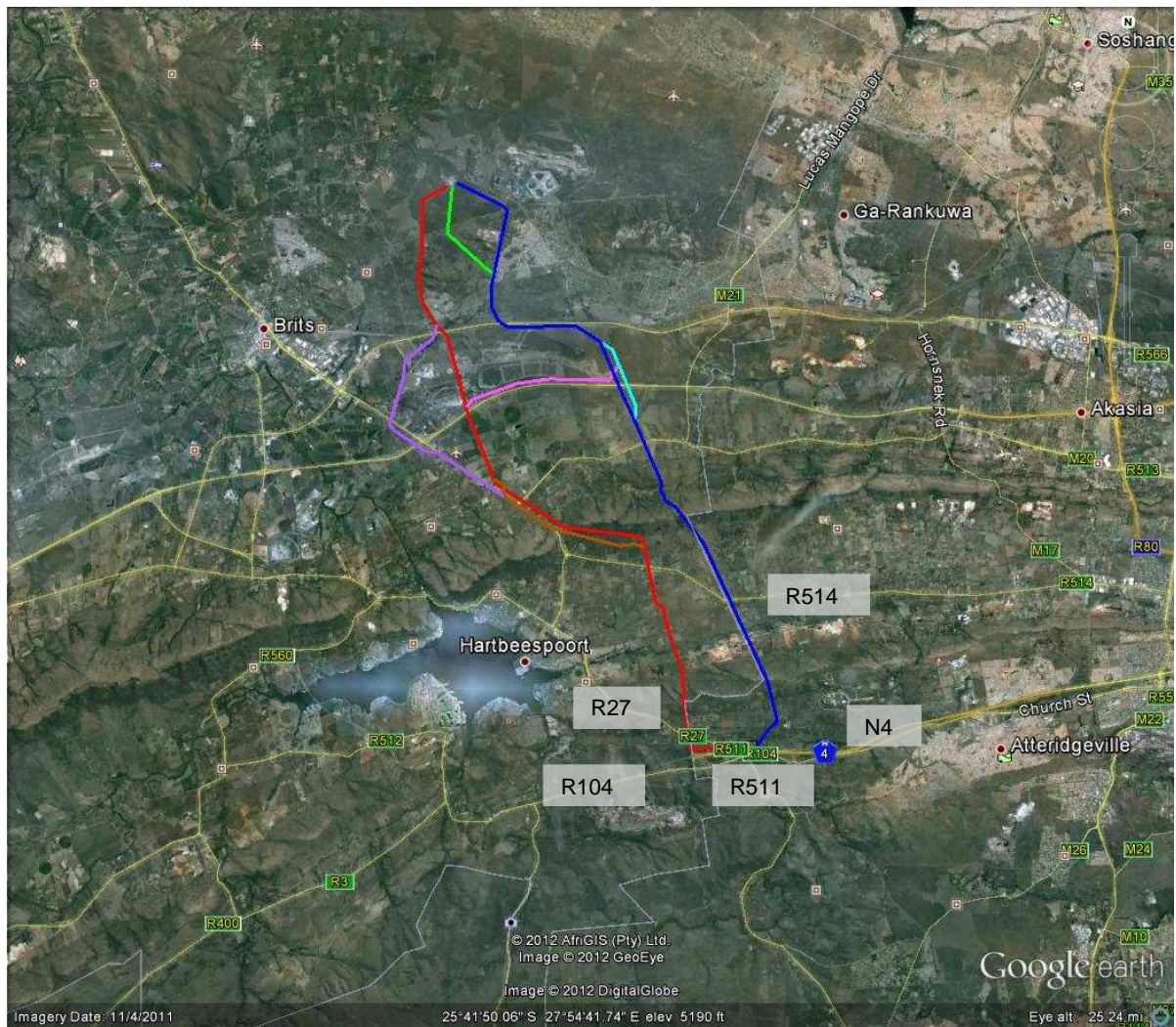


Figure 59: Aerial Map showing major traffic routes

The routes also cross a number internal roads, which grant access to farms and settlements.

The project will require the use of access roads during the construction and operational phases. Existing roads will be used as far as possible, and these roads (including river crossings) will be upgraded where deemed necessary. Where the transmission line runs parallel to existing powerlines, existing access / service roads will be used wherever possible. New roads may need to be created where required. All requisite access arrangements will be made with the affected landowners. At this stage it is not possible to identify which access roads will be affected by the project. However, the EMPr walk-down survey will identify sensitive environmental features that need to be avoided when creating these new roads and the EMPr will address the associated impacts.

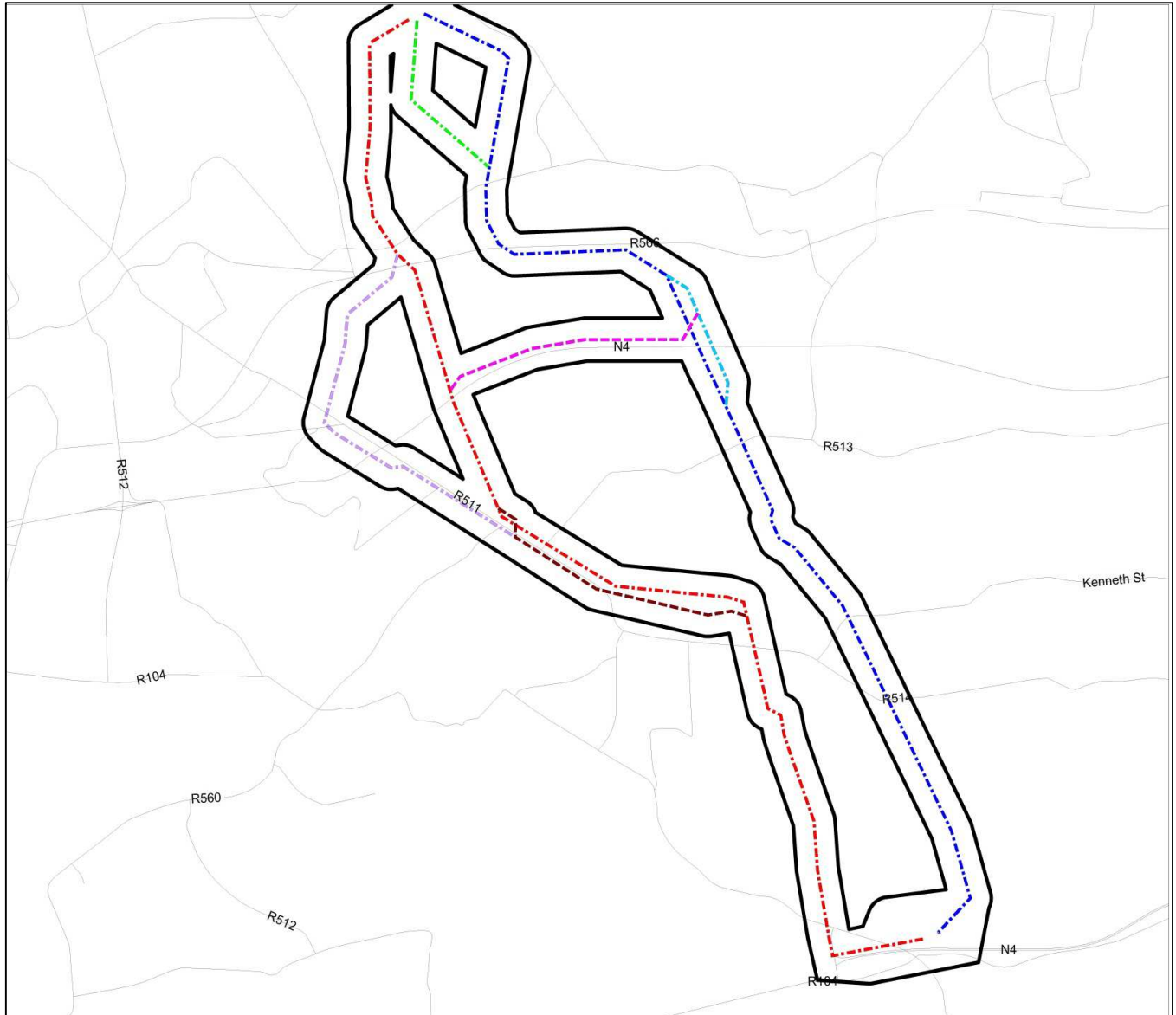


Figure 60: Map showing the major traffic routes

9.14 Socio-Economic Environment (Munshi, 2012)

9.14.1 Regional Description

9.14.1.1 North West Province

The Madibeng Local Municipality is located within the North West Province. The total population number of the North West Province is estimated at 3.043 million. The North West Province is home to 9.5% of South Africa's total population and has four district municipalities and twenty one local municipalities.

9.14.1.2 Gauteng Province

The City of Tshwane local municipality is located within the Gauteng Province, which is bounded to the north by the Limpopo Province; to the south by the Vaal River, which separates it from the Free State Province; to the east by the Mpumalanga Province and to the west by the North West Province.

The Gauteng Province is the smallest province in South Africa, with only 1.4% of the land area. The Gauteng Province covers an area of 16 548 km². The province is highly urbanised containing the cities of Johannesburg and Pretoria. Although it is South Africa's smallest province, the Gauteng Province has the largest population, in 2007, of nearly 10.5 million, almost 20% of the total South African population.

This province comprises of three metropolitan municipalities and three district municipalities which are further divided into nine local municipalities. In addition, this province is considered the fastest growing province, experiencing a population growth of over 20% between the 1996 and 2001 Censuses. The Gauteng Province is highly urbanised with 97% of its population living in urban centres.

9.14.2 Sub-Place Description

The proposed alternative powerlines and associated 1km study corridor are located within seven (7) sub-places in terms of the Census 2001 data. The sub-places and associated Local Municipality and Province are provided in the Table below (Table 28):

Table 28: Affected Sub-Places in terms of Census 2010

Sub-Place	Local Municipal Area	Province	Powerline Alternative Traversing the Sub-Place

Sub-Place	Local Municipal Area	Province	Powerline Alternative Traversing the Sub-Place
Brits NU	Madibeng Local Municipality	North West	All alternatives
Rankotia	Madibeng Local Municipality	North West	Eastern Route Alternative
Ga-Rankuwa SP	Madibeng Local Municipality	North West	Eastern Route Alternative
Mothutlung	Madibeng Local Municipality	North West	Eastern Route Alternative
Pretoria NU	City of Tshwane Local Municipality	North West	Eastern Route Alternative
Magalies Nature Reserve SP	Madibeng Local Municipality	North West	Western Route Alternative
Damonsville	Madibeng Local Municipality	North West	Western Route Alternative

Census data on each of these Sub-Places was used to describe the social and economic conditions of the study area.

9.14.3 Social Issues

The population in the study area totals 20 710. The Brits NU has the largest population of 12 188 while Ga-Rankuwa only has four persons.

Table 29: Population figures for the study area (Statistics South Africa, 2001)

Sub Place	Total
Mothotlung	2 727
Rankotia	144
Damonsville	415
Ga-Rankuwa	4
Brits NU	12 188
Magliesburg Nature Reserve	114
Pretoria NU	5 118
Total	20 710

Unemployment rates in some of the sub-places are quite high and influx of job seekers and workers could create a negative attitude under the unemployed community.

9.14.4 Economic Issues

The map below indicates the type of land use that occurs in the study. Please note that these are indicative locations of economic activity found:

- | | | |
|-----------------------|----------|---|
| ❖ Commercial activity | - Pink | ▲ |
| ❖ Tourism | - Blue | ▲ |
| ❖ Agriculture | - Green | ▲ |
| ❖ Mining | - Grey | ▲ |
| ❖ Industrial | - Yellow | ▲ |
| ❖ Residential | - Orange | ▲ |

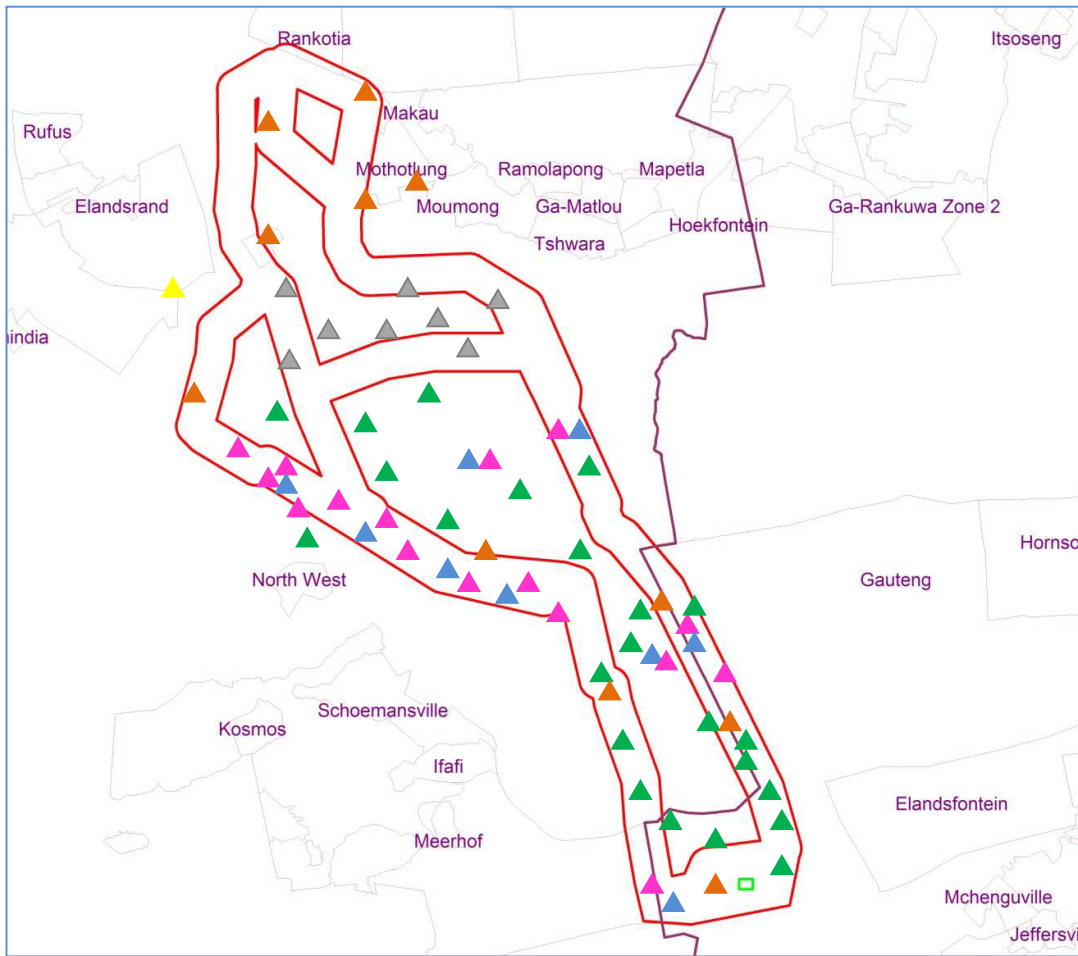


Figure 61: Land Use Map

The key economic activity of North West Province is mining. This economic activity generates more than half of the North West Province gross domestic product and provides jobs for more than a quarter of the workforce. The main minerals are gold, mined at Orkney and Klerksdorp; uranium, mined at Klerksdorp; platinum, mined at Rustenburg and Brits; and diamonds, mined at Lichtenburg,

Christiana, and Bloemhof. The northern and western parts of the North West Province are characterised by sheep farming and cattle and game ranches. The eastern and southern parts of the North West Province, including the study area, are characterised by crop-growing regions producing maize, sunflowers, tobacco, cotton and citrus fruits.

The key economic activities of the Gauteng Province are financial and business services, logistics and communications, and mining. Gauteng is the financial capital of Africa and is home to a high number of foreign and South African banks; stockbrokers and insurance corporations.

9.15 Infrastructure and Services

9.15.1 Regional Description

In terms of the North West State of the Environment Report, infrastructure in the Province is described as being relatively good. Infrastructure in the Province includes a road and rail network, air transport, post and telecommunication, electricity and bulk water supply. Major infrastructure issues in the province include development and delivery of infrastructure services to areas that did not have such infrastructure in the past. The Province has inherited a considerable amount of backlogs in meeting basic infrastructure delivery standards.

9.15.2 Site Description

Exiting roads, railway lines, telecommunication infrastructure and a few centre pivots occur within the study area which the proposed powerline will traverse.

9.16 Archaeology and Cultural Historical

9.16.1 Regional Description

Many important cultural heritage sites occur within the North West Province. These sites includes well represented Stone Age and Iron Age sites, including the Kruger Cave; the Bosworth Rock Engraving site, Thaba Sione near Mafikeng and the stone-walled settlement of Kaditshwene in the Madikwe area. Furthermore, battlefields from the South African War occur in this province such as the Battle of Silikaatsnek (1900), and a number of forts, graves and blockhouses from this period also occur within the province. A small portion of the Cradle of Humankind World Heritage Site (COHWHS) is located within the province. The condition of the known cultural heritage resources found within North West Province is considered to be relatively good.

Various important cultural assets are found within the City of Tshwane area, and some of these places are of high archaeological value. The Schurveberg area in the Centurion area has many valuable cultural and historical assets, which could be restored and conserved. Another important cultural asset in the study area includes the Tswaing Crater. Furthermore the section of the Magaliesberg in the Crocodile River area has a rich settlement history from the time of Mzilikasi, and British stone blockhouses occur within this area which dates back from the Boer war.

9.16.2 Site Description (Marais-Botes, 2011)

Based on the regional/provincial description it is clear that many areas of cultural and historical value occur in the province.

There are a few structures scattered in the study area older than 60 years. But none of these structures are of a particular cultural significance. The main types and ranges of heritage resources that were identified in the greater study area were:

- Graves
- Structures
- Historic Trees

The following heritage sites that are protected by legislation were identified along the Eastern and Western Routes:

Table 30: List of Heritage Sites along the Western and Eastern Routes

Western Route	Eastern Route
<ul style="list-style-type: none"> • Rietfontein Pinoeer Dwelling and Cemetery • Silkaatsnek Anglo-Boer War Sites • Military Cemetery and 4 Outlaying Graves (Ifafi) • Old Mine Schurveberg • Vredesboom (Peace Treaty Tree) • Skurweberg 	<ul style="list-style-type: none"> • De Wildt Tree • Margaret Roberts Herb Centre • Jo Roos Studio

10 SUMMARY OF SPECIALIST STUDIES

A crucial element of the Plan of Study for the EIA prepared during the Scoping phase was to provide the Terms of Reference for the requisite specialist studies triggered during Scoping. According to Minister of Environmental Affairs (2005), a 'trigger' is "*a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input*". The necessary specialist studies triggered by the findings of the Anderson-Dinaledi 400kV Scoping process, aimed at addressing the identified key issues and compliance with legal obligations, include the following:

- Ecological Study (termed Faunal, Floral and Avifaunal Ecological Surveys);
- Invertebrate Impact Assessment;
- Herpetological Impact Assessment;
- Heritage Impact Assessment;
- Agricultural Potential Assessment;
- Visual Impact Assessment; and
- Socio-economic Assessment.

For the inclusion of the findings of the specialist studies into the EIA report, the following guideline was used: *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005).

Key considerations included:

- Ensuring that the specialists have adequately addressed any potential issues;
- Ensuring that the specialists' input is relevant, appropriate and unambiguous; and
- Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

The information obtained from the respective specialist studies was incorporated into the EIA report in the following manner:

- The information was used to complete the description of the receiving environment (**Section 9**) in a more detailed and site-specific manner;
- A summary of each specialist study is contained in the sub-sections to follow, focusing on the approach to the study, key findings and conclusions drawn;
- The evaluations performed by the specialists on the alternative routes were included in the comparative analysis (**Section 12**) to identify the most favourable option;
- The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment contained in **Section 11**; and

- Salient recommendations made by the specialists were taken forward to the final EIA Conclusions and Recommendations (**Section 14**).

10.1 Fauna, Flora and Avifauna Survey

Details of the nominated specialist:

Specialist	
Organisation:	Nemai Consulting
Name:	Ronald Phamphe
Qualifications:	MSc Botany
No. of years experience:	8
Affiliation (if applicable):	<p>Professional Member of South African Institute of Ecologists and Environmental Scientists</p> <p>Candidate Natural Scientist: South African Council for Natural Scientific Professions</p> <p>Professional Member: South African Association of Botanists.</p>

This section provides a summary of the Fauna and Flora Surveys for the Anderson-Dinaledi 400kV power line project, as undertaken by Ronald Phamphe (2012), which is contained in **Appendix D1**.

Flora and Fauna surveys were carried out in October 2010, February 2011 and August 2012 to determine the impacts of the proposed construction of a new 400kV Transmission Line as part of Eskom's Tshwane Strengthening Scheme Project. The proposed transmission line will be constructed in Madibeng Local Municipality (North West) and the City of Tshwane Metropolitan Municipality (Gauteng Province). During the field surveys, it was observed that the majority of the survey area (with the exception of Magaliesberg Protected Natural Environment (MPNE)) had been transformed through agriculture, formal settlements and other forms of infrastructure development, such as powerlines, roads and Telkom lines. The three alternative routes (Eastern, Western and Central) incorporate habitat units that would support a variety of both floral and faunal biodiversity, particularly along the MPNE and riparian habitats.

According to North West State of Environment Report (2002), the North West Province encloses the Grassland Biome and the Savanna Biome. The study area falls within the following vegetation types: Andesite Mountain Bushveld; Gauteng Shale Mountain Bushveld; Gold Reef Mountain Bushveld; Marikana Thornveld; Moot Plains Bushveld and Norite Koppies Bushveld. Magaliesberg Pretoria Mountain Bushveld, Marikana Bushveld and Witwatersberg Pretoria Mountain Bushveld are listed as threatened terrestrial ecosystems occurring on site.

The proposed transmission lines will traverse the Magaliesberg mountain range, which is a unique mountain range of great ecological, geological and cultural importance and value. In order to preserve this unique area, a section of the Magaliesberg was proclaimed a Protected Natural Environment (PNE) in Administrator's Notice 126 of 4 May 1994 in accordance with section 16 of the Environment Conservation Act, 1989 (Act 73 of 1989). The two provincial departments responsible for controlling and managing the MPNE are the North West Department of Agriculture, Conservation and Environment (NW-DACE) and Gauteng Department of Agriculture, and Rural development (GDARD).

Two Red Data plant species, *Hypoxis hemerocallidea* (Star-flower or African potato) and *Boophane disticha* (Sore-eye flower) were observed in abundance on the study area. These species are listed as Declining and will have to be relocated to another area of the same habitat during construction. GDARD has developed a Plant and Rescue Policy which deals specifically with the management of Orange listed species and medicinal plants and this policy should be adopted during the construction of the transmission line. Exotic plant species *Melia azedarach* (Syringa trees), *Lantana camara* (Common lantana) and *Solanum mauritianum* (Bugweed) were common on the study area. Invader and weed species must be controlled to prevent further infestation and it is recommended that all individuals of the invader species be eradicated.

According to National Forests Act 1998 (Act No 84 of 1998), the protected trees that have a geographical distribution that includes the study area are *Acacia erioloba*, *Boscia albitrunca*, *Combretum imberbe*, *Pittosporum viridiflorum*, *Prunus africana* and *Sclerocarya birrea* subsp *caffra*. Only one protected tree was recorded (*Sclerocarya birrea* subsp *caffra*). Under the Act, "No person may (a) cut, disturb, damage, destroy or remove any protected tree; or (b) collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister." The Act does not distinguish between dead and live trees, and so removal of dead wood is also against the law.

Mammals are sensitive to disturbances and habitat destruction and degradation. As such more mammal species would occur on or near the MPNE than near the residential areas. Thirteen mammals were recorded in the study area and records of certain species including Black-backed Jackal and Honey Badger were based on anecdotal information provided by the land owners of affected properties. No sensitive or endangered mammals were visually recorded during the site visits.

In terms of avifauna, the study area falls within the Magaliesberg and Witwatersberg (ZA018) Important Bird Area (IBA). IBAs form a network of sites, at a biogeographic scale, which are critical for the long-term viability of naturally occurring bird populations. The MPNE provides a suitable habitat for Red data bird species that are known to occur in the area. Cape Vultures and eagles are known to occur in the MPNE.

Of the three proposed routes, the Eastern route is regarded as the route alternative that would pose the greatest threat to the overall biodiversity of the area during construction of the proposed transmission line as it traverses through the sensitive areas such as MPNE, and the number of Orange Listed plant species recorded on this route were higher than the other route alternatives. **The preferred route in terms of flora and fauna sensitivity would be the Western route-Western deviation**, as most parts of the route are along the main road and existing powerline and are considered less sensitive than the alternative routes in terms of biodiversity. Resident birds in an area become accustomed to a power line that crosses their flight paths, and learn to avoid it during their everyday activities and hence adding a new power line adjacent to an existing line would probably have less impact than putting it in totally new area, where the resident birds are not yet accustomed to overhead lines. The use of existing degraded habitat is preferable and habitat units known to be highly productive in supporting breeding, foraging and roosting sites, such as wetlands and ridges should be avoided.

10.2 Invertebrate Assessment

Details of the nominated specialist:

Specialist	
Organisation:	Endangered Wildlife Trust
Name:	Mr Vincent van der Merwe
Qualifications:	BSc Entomology (UP), BSc (Hons) Zoology (UP), MSc Conservation Biology (UCT)
No. of years experience:	7 years
Affiliation (if applicable):	Endangered Wildlife Trust, Percy FitzPatrick Institute of Ornithology, Scarab Research Unit, Lepidopterists Society

This section provides a summary of the Invertebrate Impact Assessment for the Anderson-Dinaledi 400kV power line project, as undertaken by Mr Vincent van der Merwe (2012), which is contained in **Appendix D2**

An invertebrate impact assessment for the proposed Anderson-Dinaledi 400kV transmission line was carried out in accordance with regulations stated in *DEAT (2005) Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.*

The aim of this report was to provide the client with a description of potential status of Red Data Invertebrate species and habitat that could be potentially suitable for their presence along the alternative routes for the proposed 40km Anderson-Dinaledi transmission line and to recommend a preferred route from the 7 alternative routes identified for the proposed transmission line.

The proposed transmission line will traverse land currently utilised for mining, conservation, tourism, commercial, recreational and residential purposes, as well as vacant land. Results obtained from the sensitivity scan are considered sufficient to highlight sensitive habitat types and potential Red Data habitat. None of the eight invertebrate species of conservation concern known to occur in the vicinity of the site were observed during site visits. It must however be mentioned that surveys were not carried out during the known flight period of *Trichocephala brincki* and *Acraea machequena*. Although *Lepidochrysops praeterita* is known to be on the wing from early September, there is a possibility that this species may have emerged after the time of surveying. The sensitivity scan was conducted just before and just after the first spring rains. Initial site visits were carried out during a very dry time of the year when invertebrate activity is greatly reduced. Follow up surveys are recommended in late October 2012 in order to confidently establish the absence of *Trichocephala brincki*, *Lepidochrysops praeterita* and *Lepidochrysops hypopolia*. Additional surveys are also recommended in late summer to confidently establish the absence of *Acraea machequena* from area that the transmission line will traverse.

The site was visited on the 25th of August 2012 by Vincent van der Merwe and Clayton Cook. Follow up site visits were carried out on the 8th, 9th and 10th of September by Vincent van der Merwe. The proposed transmission line will traverse two mountainous areas (Magaliesberg and Witwatersberg) that have not been heavily impacted by anthropogenic activities and are in a largely natural state. There is a strong possibility that invertebrate species of conservation concern are present in these natural areas. There are a large number of Norite koppies in the close vicinity of the existing Dinaledi substation. Although heavily impacted by granite mining, these koppies may constitute suitable habitat for the presence of invertebrate species of conservation concern.

It is recommended that the transmission line follow the Western route. The possible southern, eastern or western deviations do not need to be followed. The main reason for the recommendation is that this route has been most impacted by anthropogenic activities. The establishment of a transmission line along a route heavily impacted by the development of roads and existing powerlines will have reduced impact on invertebrate diversity compared to its establishment along a route that has been considerably less impacted by anthropogenic activities. The existing Lomondt De Wildt 88kV line (with a servitude of 22m) that traverses the eastern route will be decommissioned by Eskom in 2014. Relatively natural areas currently traversed by these powerlines could then return to a healthier level of ecosystem functioning with reduced anthropogenic disturbance. It is preferable to have multiple transmission lines following a single route rather than several transmission lines following several routes. This makes sense from an environmental and a transmission line maintenance point of view. Environmental disturbance could then be focused in the same areas rather than disturbance along multiple routes. The western route also traverses less natural Marikana Thornveld, the most threatened vegetation type transverse by the alternative routes.

10.3 Herpetological Assessment

Details of the nominated specialist:

Specialist	
Organisation:	N/A
Name:	Mr Clayton Cook
Qualifications:	MSc. Zool. U.P
No. of years experience:	15
Affiliation (if applicable):	Registered professional member of The South African Council for Natural Scientific Professions (Zoological Science), registration number 400084/04

This section provides a summary of the Herpetological Impact Assessment for the Anderson-Dinaledi 400kV power line project, as undertaken by Mr Clayton Cook (2012), which is contained in **Appendix D3**.

Eskom Holdings Limited is proposing the construction of a new 400kV Transmission Line as part of their Tshwane Strengthening Scheme Project. The proposed powerline will be approximately 40km in length and will run between the proposed new Anderson Substation, which will be located to the north of the N4 highway), located in Flora Park, to the existing Dinaledi Substation which is located approximately 8km North East of Brits. The proposed powerline will be constructed in the following two Municipal Areas: Madibeng Local Municipality (North West) and the City of Tshwane Metropolitan Municipality (Gauteng Province).

The Dinaledi Substation is located on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ, which is located approximately 8km North East of Brits. Three alternative powerline routes have been identified for the proposed transmission lines. A 1km buffer area has been placed around each alternative route, which will form the study area/corridor to be investigated. According to Mucina and Rutherford (2006), the North West Province encloses two major biomes, viz. the Grassland Biome and the Savanna Biome. The study area falls within the following vegetation types, namely Andesite Mountain Bushveld, Gauteng Shale Mountain Bushveld, Gold Reef Mountain Bushveld, Marikana Thornveld, Moot Plains Bushveld, and Norite Koppies Bushveld.

The proposed transmission lines will traverse through the Magaliesberg mountain range, which is a very unique mountain range of great ecological, geological and cultural importance and value. In order to preserve this uniqueness of the mountain, a section of the Magaliesberg was proclaimed a Protected Natural Environment (PNE) in Administrator's Notice 126 of 4 May 1994 in accordance with section 16 of the Environment Conservation Act, 1989 (Act 73 of 1989) and the two provincial departments responsible for controlling and managing the MPNE are the North West Department of Agriculture, Conservation and Environment (NW-DACE) and Gauteng Department of Agriculture, and Rural development (GDARD).

The preliminary herpetological survey/ habitat assessment focused on the description of the available and sensitive habitats along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives as well as new Anderson substation; with special reference to the current status of threatened amphibian and reptile species occurring, or likely to utilize the areas within and surrounding the proposed alignment. It must be stressed that no actual amphibian or reptile surveys were conducted due incorrect timing of survey (late winter months August). Access was also restricted due to several fenced off private properties.

According to the Southern African Frog Atlas Project (SAFAP) fourteen frog species have been recorded for the combined locus 2527DB and 2527DD quarter degree grid squares. Giant Bullfrogs have been recorded around the Magaliesburg-Brits area during the South African Frog Atlas Project as well as by the consultant. The majority of records are of road fatalities of migrating or dispersing males. There is a high occurrence of suitable habitat for Giant Bullfrogs in North-west Province and although they appear to be relatively abundant in the province; the Giant Bullfrog is severely impacted on by the degradation of the wetland habitat in the province. The Giant Bullfrog (*Pyxicephalus adspersus*) is a protected frog species whose conservation status is currently listed as “**near threatened**” (Minter et al. 2004 cited in Cook, 2012).

AMPHIBIANS

No major breeding habitats ((hydrophilic grass and sedge dominated seasonal pans) of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives. The majority of the wetland habitats along the alternative alignments are artificially created dams. These dams offer marginally suitable breeding habitat for Giant Bullfrogs in the form of the shallow seasonally inundated margins but often contain permanent fish predators which restrict the breeding success). The open thornveld and grassland plains with several termite mounds offer suitable foraging as well as dispersal areas for remaining Giant Bullfrogs. The alluvial sand deposits along certain sections of the servitude have soft sandy soils suitable for burrowing and aestivation. Burrowing generally takes place some distance away from the breeding site with females travelling further to burrow (up to 1km).

REPTILES

Southern African Python (*Python natalensis*)

Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE). The granitic outcrops to the north of the Magaliesburg offers favorable habitat for Southern African Pythons in the form of the rocky mountainous areas, wetland habitats as well as open and closed woodland vegetation units. The present granite mining activities as well as surrounding human settlements severely restricts the likelihood of significant populations remaining. Several private properties and farms have electric fences with low-lying strands approximately 15cm from the ground which severely restricts the likelihood of any large adult pythons on the site.

No Southern African Pythons or evidence of pythons was observed during the brief field survey. Remaining Python populations would have been impacted on during the previous agricultural activities. According to the information provided by a landowner, a python was recorded two years ago at the Farm Rietfontein 484 JQ. The python was unfortunately killed. As a precautionary measure an educational programme on

Southern African Pythons should be implemented for all staff and contractors working on the project. If any pythons are discovered on the site during construction activities the relevant conservation authorities should be informed and the python relocated in suitable habitat away from the site (Magaliesburg Protected Natural Environment (MPNE)).

Striped Harlequin Snake (*Homoroselaps dorsalis*)

The Striped Harlequin Snake (*Homoroselaps dorsalis*), which is categorised as Rare in the outdated Red Data List (Branch 1988) has been recorded from the grid squares in which the alignments are situated (SARCA). According to the habitat description (moribund/old termite mounds and scattered loose rock) provided for this species by Broadley (1990) and Branch (1988) (cited in Cook 2012); suitable habitat exists in the form of moribund termite mounds along the alignment as well as loosely embedded rocks on the mid to lower slopes on the Magaliesburg for the Striped Harlequin Snake.

All large and especially moribund or abandoned termite mounds and any major rocky outcrops should ideally be conserved. This is especially pertinent during the construction phase. The towers should ideally be erected away from any rocky outcrops or moribund termite mounds. If however any moribund termite mounds have to be destroyed; a rescue and relocation project should be implemented for any termite mounds and loosely embedded rocky material in the areas proposed for the towers or access roads. This is especially pertinent for the towers on the grassy hills where termite mounds and rock outcrops remain. Specimens discovered can be relocated away from the disturbances as well as increasing the information basis of what reptile species are utilising the moribund termite mounds along the alignment.

Blunt-tailed Worm Lizard (*Dalophium pistillum*)

By far the largest local worm lizard with a broad horizontal 'spade' that is covered by a single horny shield. Only known for a few localities in South Africa near Vryheid in the Northern Cape Province and between Vaalwater and the Waterberg in Limpopo Province (Branch 1988). A fossorial species occurring in varied habitats from Kalahari Sand to coastal alluvium. As minimal soil disturbances should occur mainly around the pylons no significant impact is expected on any Blunt-tailed Worm Lizard populations.

Nile Crocodile (*Crocodylus niloticus*)

Although Nile Crocodiles (*Crocodylus niloticus*) historically (in the early 19th century) occurred in abundance in the rivers around Magaliesburg; none remain today. Crocodile farms are however growing in popularity (Carruthers 1990, cited in Cook 2012).

Preferred Alignment

During the preliminary herpetological habitat assessment or sensitivity scan the majority of habitats and vegetation along the proposed western alignment; except for the Magaliesburg Natural Protected Environment and a few scattered granitic hills and outcrops; has been transformed through agriculture, formal settlements and other forms of infrastructure development, such as powerlines, roads (R511) and Telkom lines. The Eastern route is regarded as the route alternative that would pose the great threat to the

overall biodiversity of the area during construction of the proposed transmission line as it traverses through the sensitive areas (rocky cliffs) of the Magaliesburg Natural Protected Environment, Wonderboom Municipal Nature reserve. **It is recommended that the transmission line follow the Western route.** The southern, eastern or western deviations will not ameliorate any potential impacts on the herpetofauna. The main reason for the recommendation of the western alignment is that there are existing powerlines along the majority of the proposed alignment and higher levels of anthropogenic disturbances along this route. The establishment of new transmission line servitudes along a formerly undisturbed area will have greater impact on herpetofauna diversity than if following adjacent to existing servitudes. From an ecological perspective the Western route is considerably more degraded than the Eastern route. The Western route also traverses less natural Marikana Thornveld, the most threatened vegetation type transverse than the alternative alignments.

General Faunal Mitigatory Measures

The construction of the proposed Anderson-Dinaledi 400kV Transmission line will most likely result in limited opening-up of the vegetal cover during the construction phase. The opening up of existing vegetated areas, thereby creating corridors along which animals can move, may result in increased predation levels on small mammals, reptiles, amphibians, arachnids and scorpions along these corridors. The limitation of the disturbance of vegetation cover as well as rocky outcrops, logs, stumps, termite mounds within sensitive areas will ameliorate this impact. Impact will be short-long term depending on the amount of vegetation to be cleared. Excessive habitat destruction during construction could reduce the amount of habitat available. This impact is anticipated to be localised, of a long-term nature and of low significance, provided that appropriate mitigation measures are implemented (e.g. the limitation of vegetation clearance within sensitive areas). Prior to construction and vegetation clearance a suitably qualified zoologist (herpetologist) should undertake a walk-through of the preferred alignment and closely examine the proposed tower/pylon construction areas (concrete supports) for the presence of any animal burrows (including spiders and scorpions), rocky outcrops, logs, stumps and other debris and relocate any affected animals to appropriate habitat away from the servitude or tower.

10.4 Visual Impact Assessment

Details of the nominated specialist:

Specialist

Organisation:	Axis Landscape Architect
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Organisation:	i-Scape
Name:	Mr Mader van den Berg
Qualifications:	Masters in Landscape Architecture (University of Pta)
No. of years experience:	7 years
Affiliation (if applicable):	N/A

This section provides a summary of the Visual Impact Assessment for the Anderson-Dinaledi 400kV power line project, as undertaken by Axis Landscape Architect (2011), which is contained in **Appendix D4**. An addendum was undertaken to assess the amended transmission line route) as undertaken by Mr Mader van den Berg (2012) contained in **Appendix D4**.

Three alternative alignments have been proposed to connect to the two substations. The proposed alignments stretch over approximately 40km. The study area contains the extent of the alignments and includes an approximate 5 km buffer area around the alignments.

The following project components will occur during the construction and operational phases of the project and are identified as elements that may cause a potential landscape and/or visual impact:

- Construction camps and lay-down yards;
- Access roads; and
- Transmission line.

Of the three project components, the towers of the transmission line and the substation are expected to cause the greatest impacts.

Study Area

The area is characterised by a rolling, undulating landscape with high topographic variation. Drainage lines meander through to the study area and cause shallow incisions where it meets up with rivers. The study area is characterised by the Hartebeestpoort dam, the surrounding Magaliesberg Mountains with a rolling, undulating landscape with high topographic variation. Drainage lines meander through to the study area and cause shallow incisions where it meets up with rivers.

The study area consists of cultivated, residential areas, subsistence farming and mining. Extensive mining and farming is located more to the northern side of the study area with scattered farms in the central parts and southern parts. Residential development activities are more intense from the central to southern side of

the study area where the cultural homelands is located. Human settlements are scattered throughout the study area and the landscape is degraded around these settlements.

The majority of the study area is considered to have a moderate landscape character sensitivity due to the relative undeveloped and high topographic variation of the landscape, the generally high visual quality and the related tourism value that is placed on the visual resource. High terrain variability occurs through of the study area where a moderate VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees covers which will provide visual screening for the proposed transmission line.

The landscape character is considered moderately susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is resilient and recovers very quickly from surface disturbances.

Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types. In this case the mines and existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.

Potential Impacts

The two alternative routes and their deviations have been evaluated against international accepted criteria to determine the impact they will have on the landscape character and the viewers that have been identified in the study area.

Landscape impacts: The greatest landscape impact of the proposed alignments is in the construction phase on sensitive landscape types. The operational phase is characterised by a moderate landscape impact on a regional scale on the proposed alignments.

Impacts on residents: The severity can be reduced in both the construction and operational phases through mitigation measures.

Impacts on tourists: The tourism value for the study area is very high. Both the construction and operational phases are characterised with a moderate visual impact reduced to low with mitigation.

Impacts on motorist: Low impacts on motorists are expected in both the construction and operational phases.

The Routes are rated according to preference by using a two-point rating system, one (1) being the most preferred, to two (2) being the least preferred. The deviations of the Routes will be rated as a, b or c where (a) being the most preferred. The preference rating is informed by the impact assessment discussions in