ENVIRONMENTAL IMPACT ASSESSMENT FOR THE

PROPOSED ESKOM SHONGWENI SUBSTATION, POWERLINE AND ASSOCIATED INFRASTRUCTURE,

ETHEKWINI METROPOLITAN MUNICIPALITY, WARDS 4 AND 103, KWAZULU NATAL PROVINCE

FAUNA & FLORA SPECIALIST REPORT FOR EIA

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BY

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1 INTRODUCTION

Eskom Holdings SOC Limited (hereafter referred as Eskom) proposes the construction of the Shongweni 2 X 500 MVA 400/132kV substation, ±40 km Hector-Shongweni 400kV Powerline and associated infrastructure in order to meet growing demand in the area. The proposed project will traverse various farms within the jurisdiction of Ethekwini Metropolitan Municipality, Wards 4 and 103 in Kwazulu-Natal. A full EIA process is required for the development and Nsovo Environmental Consultants has appointed Simon Todd Consulting to contribute the terrestrial biodiversity component of the EIA.

As part of the EIA process, this ecological specialist study details the ecological characteristics of the site and provides an assessment of the likely ecological impacts likely to be associated with the development of the proposed power supply development. Impacts are assessed for the preconstruction, construction, operation, and decommissioning phases of the development. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development which should be included in the EMPr for the development. The full scope of study is detailed below.

1.1 SCOPE OF STUDY

The scope of the study includes the following activities:

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project
- a description and evaluation of environmental issues and potential impacts (including using direct, indirect and cumulative impacts) that have been identified
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- an indication of the methodology used in determining the significance of potential environmental impacts
- an assessment of the significance of direct indirect and cumulative impacts in terms of the following criteria :
    - the nature of the impact, which shall include a description of what causes the effect, what will be affected and how it will be affected
    - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
    - the duration of the impact, indicating whether the lifetime of the impact will be of a short-term duration (0-5 years), medium-term (5- 15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity) or permanent

  - the probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (Impact will occur regardless of any preventable measures)
  - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit) severe/beneficial (long-term impact that could be mitigated/long-term benefit) moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight or have no effect
  - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
  - the status which will be described as either positive, negative or neutral
  - the degree to which the impact can be reversed
  - the degree to which the impact may cause irreplaceable loss of resources
  - the degree to which the impact can be mitigated

- a description and comparative assessment of all alternatives
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr)
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- a description of any assumptions uncertainties and gaps in knowledge
- an environmental impact statement which contains :
  - a summary of the key findings of the environmental impact assessment;
  - an assessment of the positive and negative implications of the proposed activity; and
  - a comparative assessment of the positive and negative implications of identified alternatives.

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the 2017 amended EIA Regulations as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic

conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should.

    - In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and
    - Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy.The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

Species level

- Red Data Book species (giving location if possible using GPS)
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of

information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)

- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species); and
    - or, are of cultural significance.
- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries).
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.

- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The development alternatives are illustrated below (Figure 1) and would consist of the following elements:

- A new substation, which would occupy an area of up 800m x 800m.
- Three different location alternatives were included for the substation.
- Three different corridor routes were considered for the powerline.

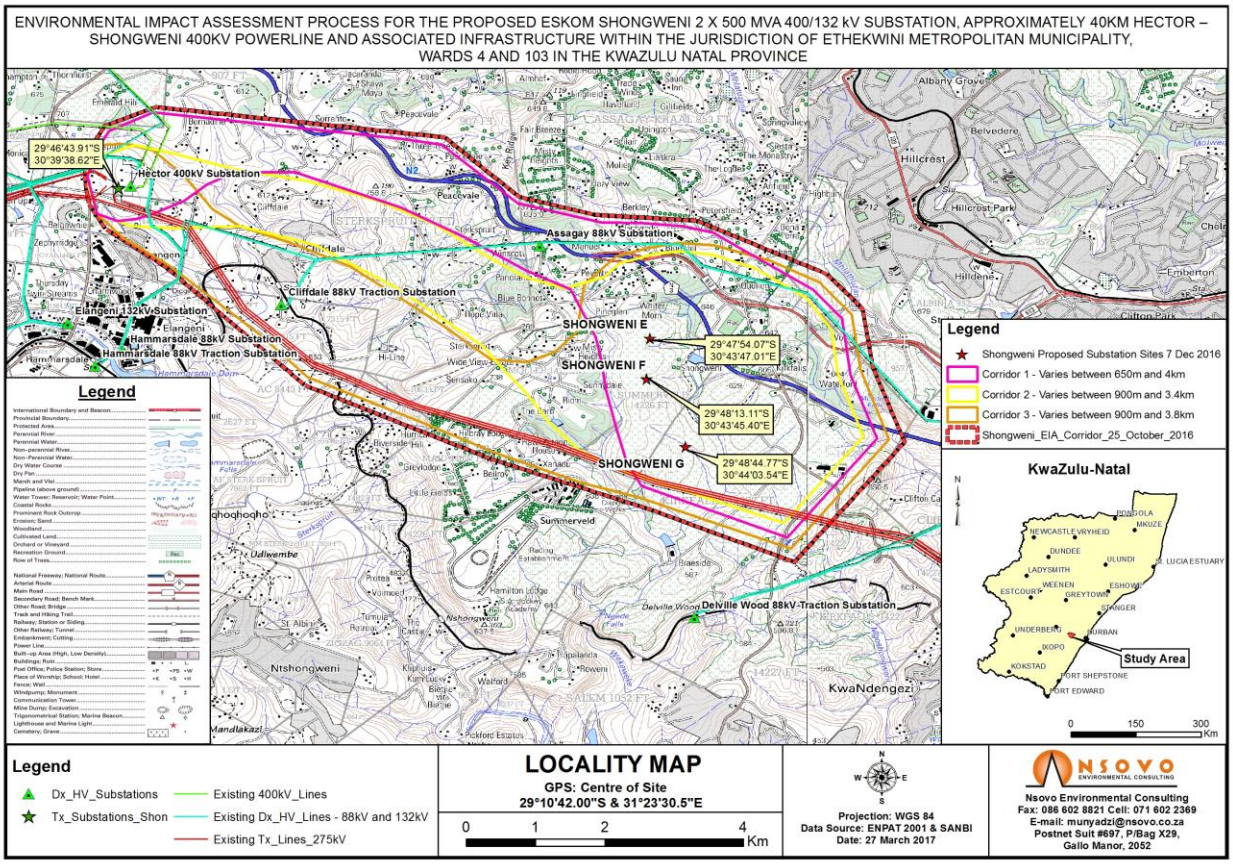

Figure 1. Map of the Shongweni-Hector study area showing the proposed power line corridor and substation alternatives.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

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

Vegetation:

The data sources consulted and used where necessary in the study includes the following:

- Information on plant and animal species recorded for the Quarter Degree Square (QDS) 2930DD and 2930CD was extracted from the SABIF/SIBIS database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach given the development's length stretches across the QDSes.
- Critical Biodiversity Areas for the site and surroundings were extracted from the KwaZulu-Natal CBA Map (2016)
- The IUCN conservation status (Table 1) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2016).
- Threatened Ecosystem data was extracted from the NEM:BA listed ecosystems layer (SANBI 2008).
- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2012) as well as the National List of Protected Ecosytems (2011).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystems Protection Assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (ADU, SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004), EWT & SANBI (2016) for the South African Red Data List of mammals, and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.

- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 2017 (See Figure 2) and where species have not been assessed under these criteria, the CITES status is reported where possible.

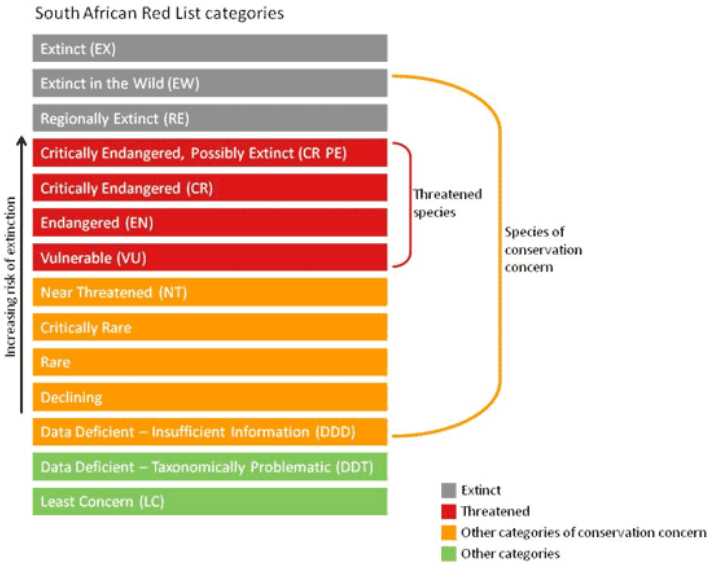

Figure 2. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

2.2 Site Visit

The site was visited in May 2017 during autumn, following a good season with late rains leading to favourable conditions at the time of the site visit. The study area was sampled from the air as well from the ground. The study area was flown with a helicopter to gain a better picture of the routes and the major features present across the study area and along each of the proposed routes. Features were mapped onto aerial photography or recorded with a GPS where necessary and photographs taken of relevant features. This was then followed by two days of on the ground driving around the site and field investigation of specific features and areas that warranted additional attention to confirm their sensitivity or better characterise the affected ecosystems. This included visits to the substation alternatives to confirm the features present in the vicinity of the selected sites and the potential for secondary impacts such as erosion or disruption of landscape connectivity.

2.3 Sampling Limitations and Assumptions

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant and animal species present are captured.

However, this is rarely possible due to time and cost constraints and therefore, the representivity of the species sampled at the time of the site visit should be critically evaluated. The site was however sampled during a favourable season and the combined approach of aerial and on the ground sampling resulted in the study area being well covered and it is not likely that there are any significant features present that were not observed and mapped. The lists of amphibians, reptiles and mammals for the study area are based on those observed in the vicinity of the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach which takes the study limitations into account.

2.4 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases. This includes delineating the different habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the observed presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium** - Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

In some situations, areas were also classified between the above categories, such as Medium-High, where it was deemed that an area did not fit well into a certain category but rather fell most appropriately between two sensitivity categories.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Mucina & Rutherford 2006 and 2012 update) (Figure 3), the following three vegetation types are mapped as being the dominant types within the study area: KwaZulu-Natal Sandstone Sourveld, and Dry and Moist Coast Hinterland Grassland vegetation types. There are however also smaller extents of three additional vegetation types present within the study area, with Highveld Alluvial Vegetation along the larger drainage systems, Northern Coastal Forest and Scarp Forest in some of the steeper valleys and lower-lying areas.

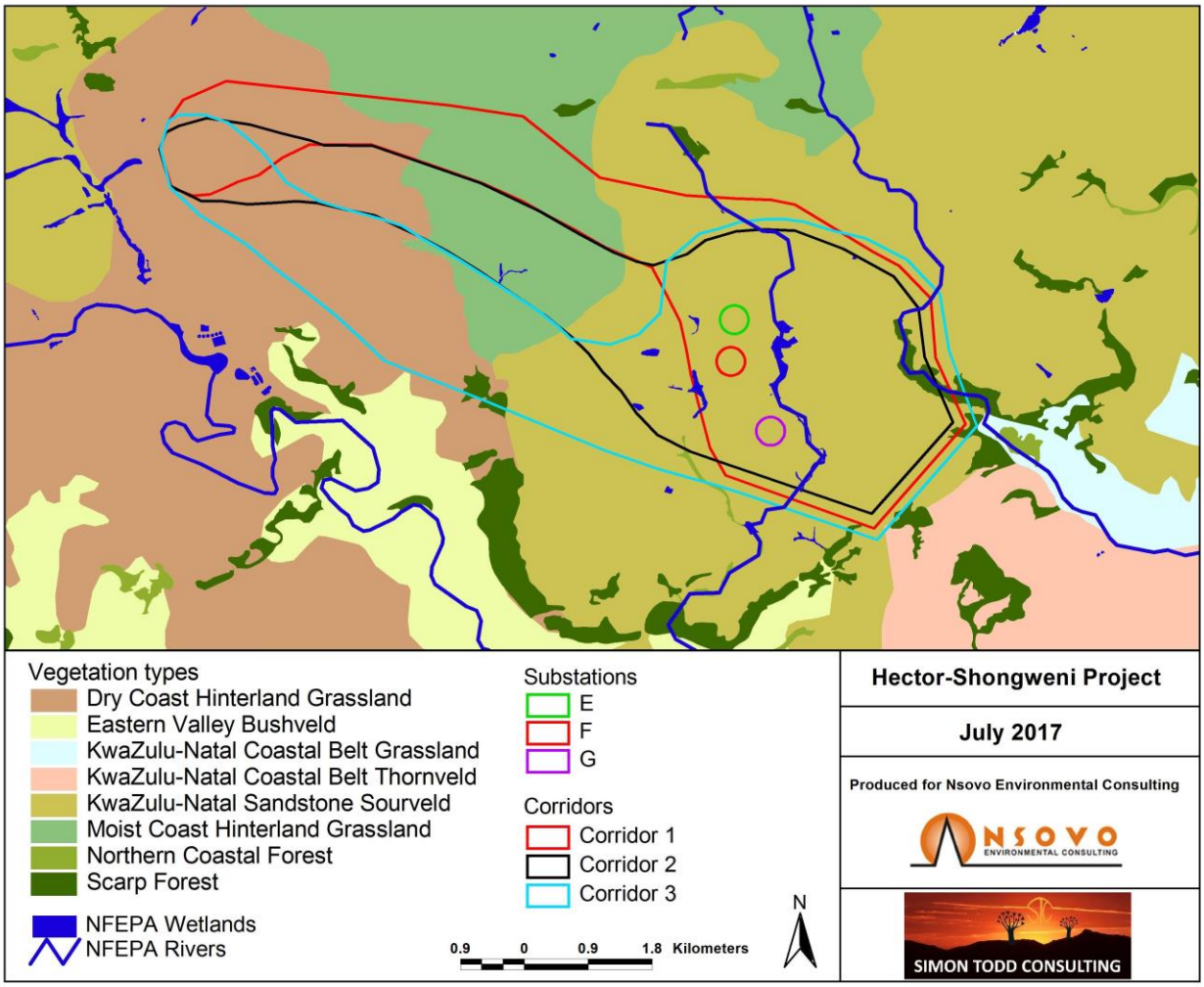

Figure 3. Vegetation map (2012 Update) of the Hector-Shongweni study area**.**

According to Mucina & Rutherford (2006), **KwaZulu-Natal Sandstone Sourveld** occurs on the elevated coastal inland sandstone plateaus from Mapumulo in the north to St Faiths near Port Shepstone in the south of KwaZulu-Natal, at altitudes of 500-1100m. The vegetation consists of short, species-rich grassland with scattered low shrubs and geoxylic

suffrutices. Proteaceae and trees can be locally common. Important small trees include *Protea caffra (*d); Tall Shrubs*: Aspalathus chortophila, Gnidia kraussiana*; Low Shrubs: *Acalypha glanduifolia, Agathisanthemum bojeri, Protea simplex; Rhus grandidens*; Graminoid: *Aristida junicformis subsp junciformis* (d),*Trachypogon spicautus* (d), *Tristachya leucothrix* (d); Geophytic herbs: *Asipodoglossum ovalifolium, Brachystelma perditum* (Mucina & Rutherford 2006). This vegetation type is **Endangered** and has a conservation target of 25%. Only 0,2% is statutorily conserved and 68% has been transformed for cultivation, plantations, urban development or road building (Mucina & Rutherford 2006). The vast majority of this vegetation type at the site has been lost to agricultural development and urbanisation and there are only small fragments left along the escarpment near Summerveld (Figure 4).

Figure 4. Remnant KwaZulu-Natal Sandstone Sourveld along the eastern edge of the Summerveld area, looking east along the existing Eskom power line corridor. Most of this vegetation has been lost to urbanization and agricultural transformation.

According to Mucina & Rutherford (2012 update) **Dry Coast Hinterland Grassland** occurs in KwaZulu-Natal and Eastern Cape Provinces, from Melmoth in the north to near Libode in the former Transkei, generally occurring from 450 - 900 m. The vegetation occurs on undulating plains and hilly landscape mainly associated with drier coast hinterland valleys in the rain-shadow of the rain-bearing frontal weather systems from the east coast. The vegetation consists of sour sparse wiry grassland dominated by unpalatable Ngongoni grass (*Aristida junciformis*) associated with low species diversity. In good condition, it is dominated by *Themeda triandra* and *Tristachya leucothrix*. Wooded areas are found in valleys at lower altitudes, where this vegetation unit grades into SVs 3 KwaZulu-Natal Hinterland Thornveld and SVs 7 Bisho Thornveld. Termitaria support bush clumps with *Acacia* species, *Cussonia spicata*, *Ehretia rigida, Grewia occidentalis* and *Coddia rudis*. Dry

Coast Hinterland Grassland has a far lower herbaceous species richness compared with the adjoining vegetation unit Moist Coast Hinterland Grassland and relatively few of its common species are shared with these. Originally these two vegetation types were considered part of the Vulnerable Ngoni Veld. Within the site the majority of the lower-lying areas in the west consist of this vegetation type and within the site, the density of trees is quite high indicating a transitional relationship with the adjacent Valley Bushveld areas (Figure 5).

Figure 5. Dry Coast Hinterland Grassland at the western end of the study area around the Hector substation. This area is generally degraded with a lot of historical disturbance and many areas dominated by aliens such as Eucalyptus and Wattle.

Moist Coast Hinterland Grassland is distributed in KwaZulu-Natal and Eastern Cape Provinces, from near Melmoth in the north to near Libode in the south, generally occurring at 450 - 900 m (Mucina & Rutherford 2012). The vegetation occurs on rolling and hilly landscape and consist of dense tall sour grassland dominated by unpalatable Ngongoni grass (*Aristida junciformis*) associated with low species diversity, when in good condition dominated by *Themeda triandra* and *Tristachya leucothrix*. The vegetation is statutorily conserved in the Vernon Crookes and Entumeni Nature Reserves. Within the site, a large proportion of this vegetation type has been transformed mostly as a result of rural development and agriculture. The western edge of the escarpment below Summerveld and the large hill in the central part of the site correspond to this vegetation unit (Figure 6).

These are generally considered fairly sensitive and the footprint within these areas should be minimised.

Figure 6. Moist Coast Hinterland Grassland in the central part of the study area north of Cliffdale, dominated by *Aristida junciformis* and *Tristachya leucothrix* with occasional Acacia and Cussonia spicata trees. Much of these areas also contain extensive areas of secondary grassland indicating that they were cultivated in the past but have recovered to a large degree.

Highveld Alluvial Vegetation, according to Mucina & Rutherford (2006), occurs in the Free State, North-West, Mpumulanga, and Gauteng Provinces and is distributed along alluvial drainage lies and floodplains along rivers in the Grasslands biome, at altitudes ranging from 100-1500m. The vegetation type occurs on flat topography supporting riparian thickets mostly dominated by *Acacia karroo*, accompanied by seasonally flooded grasslands and disturbed herblands (often dominated by alien plants)(Mucina & Rutherford 2006). Important taxa of this vegetation type include of the Riparian Thicket: *Acacai karroo (d), Salix mucronata subsp woodii (d), Celtis Africana*; Tall Shrubs include*: Gymnosporia buxifolia (d), Rhus pyroides (d), Diospyros lycioides*; Low Shrubs include: *Asparagus laricinus (d), A. suaveloens* (d); Woody Climbers include: *Clematis brachiate*, Succulent Herbs: *Lycium hirsutum* (d); Graminoids: *Setaria verticillata, Panicum maximum*. The flooded grasslands and herblands' important taxa include the Low Shrubs: *Gomphocarpus furticosus (d), Felicia muricata*; Succulent Shrubs*: Salsola rabiena*; Graminoids: *Agrostis lachnatha (d); Andropogon eucomus (d), Chloris virgate (d), Cynodon dactylon (d), Eragrostis plana* (d) (Mucina & Rutherford 2006).

The vegetation type is considered Least Threatened and has a target of 31%. Nearly 10% is statutorily conserved. More than 25% has been transformed by cultivation and building dams. There is very little of this unit present within the study area with most of the original extent present having been lost to agricultural development, especially sugar cane which has been developed right up to the drainage lines in most areas with little remnant vegetation except on steep slopes and long the some of the larger drainage systems (Figure 7).

Figure 7. The eastern half of the site is largely transformed for sugarcane production, with remnant alluvial vegetation and Scarp Forest along the drainage systems.

Scarp Forest is distributed in the Eastern Cape, KwaZulu-Natal and Mpumalanga Provinces and consist of an archipelago of scattered patches spanning southern Mpumalanga (Crocodile River Gorge), the southern part of Lebombo Mountains (KwaZulu-Natal) and reaching nearly as far as Kei River Mouth on the Transkei coast (Mucina & Rutherford 2006). Patches of this forest lie as far as 140 km inland (Mpumalanga), but extend increasingly closer to the sea in a southward direction—in Pondoland, and southern Transkei they occur at the coast or in deep gorges, often associated with krantzes, scarps and coastal platforms (Mucina & Rutherford 2006) and occurs at low altitudes between 50 and 600 m. This vegetation consist of tall (15–25 m), species-rich and structurally diverse, multilayered forests, with well-developed canopy and understorey tree layers, but a poorly developed herb layer. The most conspicuous trees are *Buxus macowanii*, *B. natalensis*, *Drypetes gerrardii*, *Englerophytum natalense*, *Harpephyllum caffrum*, *Heywoodia lucens*, *Memecylon natalense*, *Millettia grandis*, *Oricia bachmannii*, *Philenoptera sutherlandii*, *Rinorea*

angustifolia, *Rothmannia globosa* and *Umtiza listeriana* (Mucina & Rutherford 2006). Important Taxa include: Tall Trees: *Buxus natalensis* (d), *Drypetes gerrardii* (d), *Englerophytum natalense* (d), *Harpephyllum caffrum* (d), *Heywoodia lucens* (d); Small Trees: *Buxus macowanii* (d), *Rinorea angustifolia* (d), *Dombeya cymosa*; Herbaceous Climbers: *Flagellaria guineensis, Thunbergia alata*; Tall Shrubs: *Memecylon natalense* (d), *Eugenia natalitia;* Low Shrub: *Stangeria eriopus*; Soft Shrub: *Piper capense;* Herbs: *Begonia dregei*, *B. homonyma*, and Geophytic Herb: *Clivia miniata*. Endemic Taxa include Tall Trees: *Millettia grandis* (d), *Philenoptera sutherlandii* (d), *Jubaeopsis caffra;* Small Trees: *Alberta magna*, *Albizia suluensis*, *Tarchonanthus trilobus* var. *trilobus*. Woody Climber: *Podranea ricasoliana* (d). Tall Shrubs: *Eugenia simii*, *E. verdoorniae*, *Gymnosporia bachmannii*, *Oxyanthus pyriformis*, *Putterlickia retrospinosa*. Soft Shrubs: *Heterosamara galpinii*, *Metarungia galpinii*. Herbs: *Impatiens flanaganiae*, *Plectranthus oribiensis*, *P. praetermissus*, *Streptocarpus fasciatus*, *S. kentaniensis*, *S. lupatanus*, *S. porphyrostachys*, *S. primulifolius* subsp. *formosus*. Geophytic Herbs: *Clivia robusta* (d), *C. gardenii*. Succulent Herbs: *Plectranthus ernstii.*

According to Mucina & Rutherford (2006), the vegetation type is Least Threatened in protected areas, but exposed to over-exploitation elsewhere and the target for conservation is 40%. More than 20% statutorily conserved in various conservation areas. Biogeographically (and from the point of view of biodiversity) this is probably the most valuable forest in South Africa housing many endemic species, six endemic genera and one endemic family (Rhynchocalycaceae) of trees and relict occurrences of small populations of *Encephalartos,* suggesting that this vegetation unit is biogeographically ancient (Mucina & Rutherford 2006). The endemism in the herbaceous understorey is also high, particularly in the genera *Plectranthus* and *Streptocarpus*. There is a limited extent of this unit present within the study area, mostly in inaccessible gorges and along steep drainage systems. It is not likely that it would be significantly affected by the development as the areas where it occurs would not be suitable for power lines or other infrastructure.

The Northern Coastal Forest is distributed in KwaZulu-Natal and (to a very small extent) Eastern Cape Province, especially along the seaboards of Indian Ocean of KwaZulu-Natal Province and particularly well-developed in Maputaland and occurs at low altitudes, from about 10 to 150 m (Mucina & Rutherford 2006). The forest consists of species-rich, tall/medium-height subtropical coastal forests which occurs on coastal (rolling) plains and stabilised coastal dunes. According to Mucina & Rutherford (2006), forests of the coastal plains are dominated by *Drypetes natalensis*, *Englerophytum natalense*, *Albizia adianthifolia*, *Diospyros inhacaensis*. The low-tree and shrubby understoreys are species-rich. On dunes, these forests have well-developed tree, shrub and herb layers. *Mimusops caffra*, *Sideroxylon inerme*, *Dovyalis longispina*, *Acacia kosiensis* and *Psydrax obovata* subsp. *obovata* are the most common constituents of the tree layer. *Brachylaena discolor* var. *discolor*, *Chrysanthemoides monilifera* subsp. *rotundata*, *Carissa bispinosa* subsp. *bispinosa*, *Euclea natalensis*, *E. racemosa*, *Eugenia capensis*, *Gymnosporia nemorosa*, *Kraussia*

floribunda, *Peddiea africana*, *Strelitzia nicolai* and *Dracaena aletriformis* are frequent in the understorey. The herb layer usually contains by *Asystasia gangetica*, *Isoglossa woodii*, *Microsorum scolopendria*, *Zamioculcas zamiifolia* and *Oplismenus hirtellus*. Herbaceous vines and woody climbers (*Acacia kraussiana*, *Artabotrys monteiroae*, *Dalbergia armata*, *Landolphia kirkii*, *Monanthotaxis caffra*, *Rhoicissus tomentosa*, *Rhus nebulosa*, *Scutia myrtina*, *Uvaria caffra*, *Gloriosa superba* etc.) are important structural determinants in these forests.

According to Mucina & Rutherford (2006), the vegetation type is considered Least threatened in general, but still under threat on coastal dunes of KwaZulu-Natal (due to mining) and the conservation target is 43%. About 68% of this vegetation type is conserved in formal conservation areas. The original extent of these forests has been diminished by agriculture and development on the KwaZulu-Natal coast (Mucina & Rutherford 2006). There is a very small extent of this unit present along the southern boundary of the site and it is not likely that this would be directly affected by the development.

3.2 CRITICAL BIODIVERSITY AREAS & BROAD SCALE ECOLOGICAL PROCESSES

The KwaZulu-Natal (2016) CBA map for the general area surrounding the site is depicted below in Figure 8. Although there are some irreplaceable CBAs within the study area, the overall density of these areas within the power line corridors is relatively low. This can be ascribed to the highly impacted and transformed nature of a significant proportion of the study area. While the majority of the CBAs can be avoided, some impact to these areas may occur as a result of the power lines. However, as these CBAs are considered irreplaceable and are not very extensive, they would be vulnerable to cumulative habitat loss. As a result these areas should be avoided as much as possible to avoid significant risk to the biodiversity of these areas.

The remaining extent of listed ecosystems layer indicates that there is significant remnant vegetation in the vicinity of substation Alternative F. However, there appear to have been significant changes since the layer was made as the site visit indicated that there was very little intact vegetation in this area apart from a narrow belt of vegetation along the drainage line that occurs north of the substation site. Although the drainage line is some distance from the substation site and would not be directly affected by the substation, access roads may be required to traverse the drainage line and as a result, this is not considered a favourable alternative compared to Alternative E and G which are confined to extensive areas of sugarcane with no sensitive features in their vicinity.

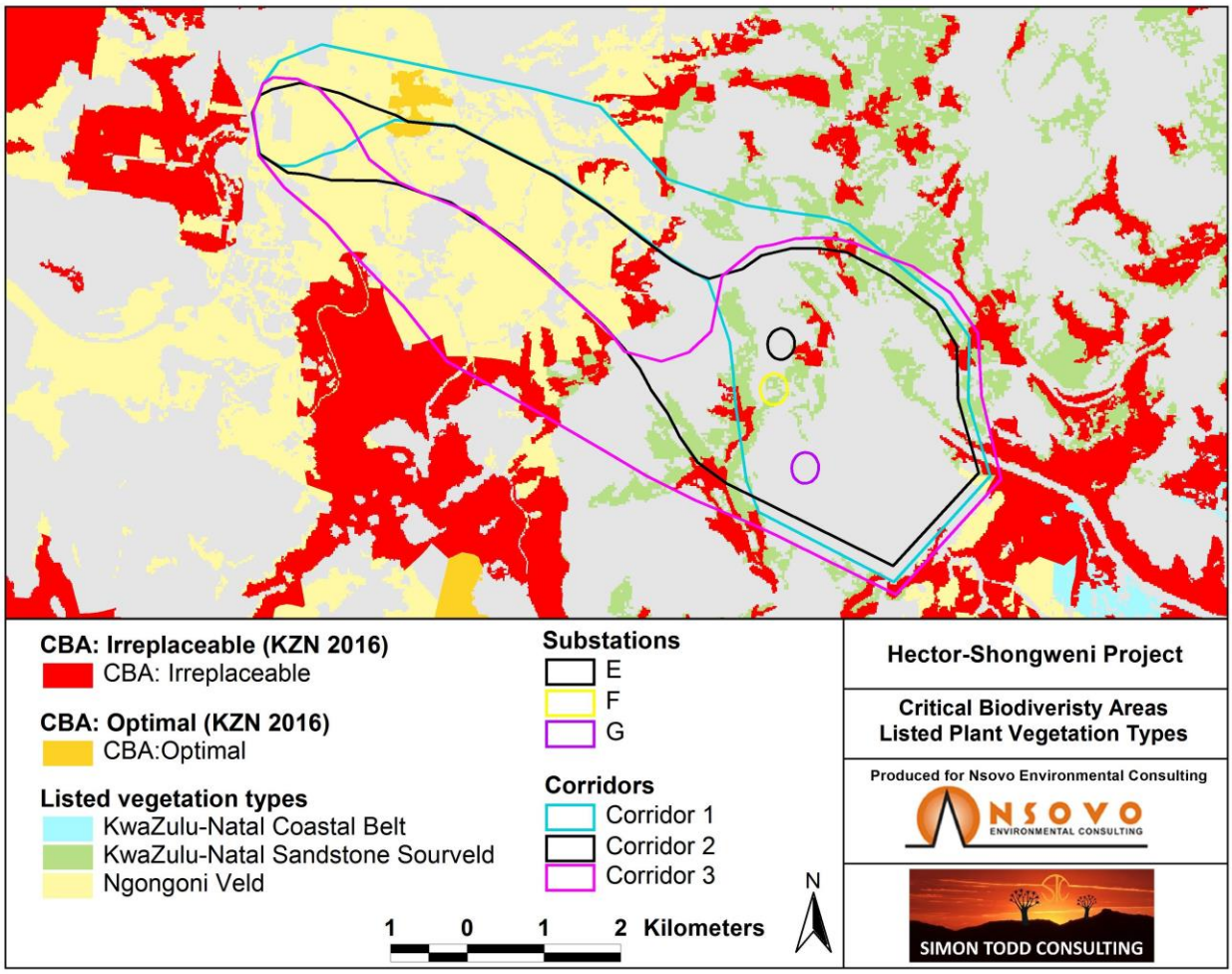

Figure 8. Critical Biodiversity Areas map of the areas within and around the Hector-Shongweni study site.

3.3 Listed & Protected Plant Species

According to the SANBI SIBIS database, more than 1300 indigenous species have been recorded from the two quarter degree squares containing the site. This includes 54 species of high conservation concern (Annex 1 and Table 1), illustrating the high diversity of the area and potential for impact on species of conservation concern. This impact can be minimized through avoidance of the sensitive features and habitats at the site, especially areas of forests, wetlands and drainage lines. The majority of the intact habitat that would be affected by the development would be in the western section of the site around the Hector Substation where the vegetation was in a generally poor state and the likely abundance of species of conservation concern would be low.

Table 1. Numbers of the species within the different conservation status categories as indicated below, data derived from the SANBI SIBIS database.

Status/ IUCN Red List Category	No. Species
Critically Endangered (CR)	**3**
Endangered (EN)	**6**
Vulnerable (VU)	**19**
Near Threatened (NT)	**10**
Rare	**2**
Declining	**10**
Data Deficient - Insufficient Information (DDD)	**0**
Data Deficient - Taxonomically Problematic (DDT)	**4**
Least Concern	**1336**
Total	**1390**

3.4 Site Description

A map of the habitats present within the study area is illustrated below in Figure 9. A significant proportion of the study area has been transformed due to agriculture and urban or rural development. In the east there is very little intact habitat due to extensive sugarcane production and the only remnant features include riparian vegetation along drainage lines and forest in very steep valleys or gorges (Figure 10). The high-lying central part of the site is largely transformed due to the urban sprawl of Shongweni, with very little remnant vegetation in this area (Figure 11). The western slopes of the escarpment are largely intact and consist of Moist Coast Hinterland Grassland with a fairly high abundance of trees. The lowlands to the west of this area have largely been transformed for intensive agriculture (Figure 12). The extensive rural sprawl of Cliffdale dominates a large proportion of the site in the south west (Figure 13**Error! Reference source not found.**). Although, there may be natural vegetation remaining between the houses in the less dense parts of Cliffdale, these areas are generally degraded and invaded by aliens or overgrazed by cattle and goats. North of Cliffdale, there is a large hill that is still mostly intact Moist Coast Hinterland Grassland that is considered relatively sensitive and should be avoided as much as possible by the power lines (Figure 6). Between this area and the Hector substation the vegetation consists of Dry Coastal Hinterland Grassland which is relatively disturbed and generally degraded and has many scattered homesteads across the area (Figure 5). The vegetation also has a relatively high proportion of woody species suggesting that it is to some extent transitional with the lower-lying Valley Bushveld areas to the south. These different features area illustrated and further described below.

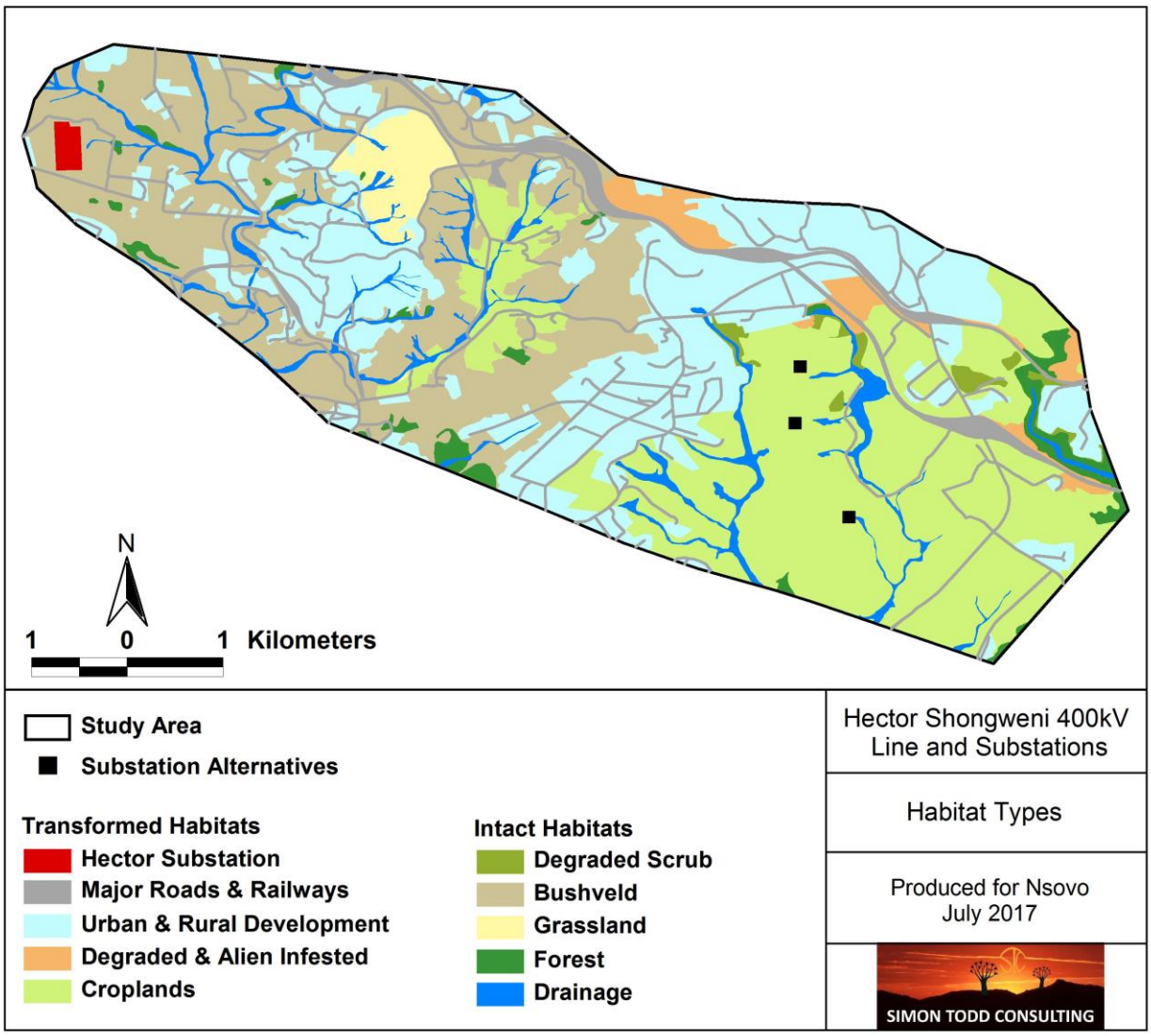

Figure 9. Habitat map for the study area, showing the high degree of transformation in the eastern half of the site and the relatively more intact western half of the site.

Figure 10. The eastern half of the site is largely transformed for sugarcane production. All three substation location alternatives are located within the sugarcane fields and not expected to generate significant impact. The dominant sensitive features of the landscape in this area are the drainage lines which retain woody alluvial vegetation and scattered patches of remnant forest.

Figure 11. The high-lying escarpment plateau area in the middle of the site has been transformed by urbanization, mostly the Summerveld area. This area was originally KwaZulu-Natal Sandstone Sourveld but there are only remnants along the margins of the escarpment.

Figure 12. Most of the lower-lying parts of the central and western sections of the site have been transformed for agriculture.

Figure 13. The Cliffdale area in the southwest of the site is a rapidly expanding rural area that is quickly becoming increasingly densely populated with consequent impacts on the environment.

3.5 FAUNAL COMMUNITIES

Mammals

According to the MammalMap database, 51 mammal species have been recorded from the area (Annex 2), including several conservation dependent species such as Blesbok, Nyala, and Plains Zebra, which would not be encountered in the study area outside of conservation areas. The study area has been significantly impacted by transformation and development with the result that the remnant areas of intact grassland or forest are high fragmented and exposed to anthropogenic influences. As a result, species that are not tolerant of human disturbance are not likely to be present and the remnant fauna consists largely of smaller and more wary nocturnal species.

In terms of listed species, Oribi *Ourebia ourebi* (Endangered), Blue Duiker *Philantomba monticola* (Vulnerable), Serval *Leptailurus serval* (Near Threatened), African Striped Weasel *Poecilogale albinucha* (Near Threatened) and Leopard *Panthera pardus* (Vulnerable) are species of conservation concern that occur in the wider area. However, of these only the African Striped Weasel and possibly the Blue Duiker are likely to be present as the area is too disturbed or no longer suitable for the other species due to habitat changes and fragmentation. The intact grasslands would originally have contained Serval and Oribi but the extent of intact grassland is not sufficient to support viable populations of these species and it is also likely that hunting pressure on these species would have extirpated them from the area some time ago. There are some relatively intact and inaccessible forests remaining at the site especially in the east and these potentially support remnant Blue Duiker populations (McLean et al. 2016).

As a result of the high levels of transformation of the area the development is likely to generate low levels of impact on mammals. All of the substation sites are within transformed habitat and it is likely that the power line can also be routed so as to minimize loss of currently intact habitat, with the result that overall impacts on fauna can be mitigated to low levels.

Reptiles

According to the ReptileMap database, 58 reptile species have been recorded from the quarter degrees covering the site (Annex 3), which indicates the high diversity of the area as this is not an exhaustive list. Five species are considered of conservation concern. The Durban Dwarf Burrowing Skink *Scelotes inornatus* (CE) is an endemic and McLean et al. (2016) recognize this species as a flagship species for the region. It occurs in coastal habitat on Berea red sands from Canelands in the north to Clansthal in the south (Marais 2011, in McLean et al. 2016). The KwaZulu Dwarf Chameleon *Bradypodion melanocephalum* (VU) is also endemic and has much of its range within the Ethekwini District Municipality, particularly more open habitat near the coast (McLean et al. 2016). The ranges of both species overlap built up areas and are thus susceptible to habitat transformation and

degradation. McLean et al. (2016) recommends that in order to conserve these species, a matrix of connected and genetically viable populations will need to be protected and managed.

The Green Mamba *Dendroaspis angusticeps* (VU) is considered an indicator of dune forest health and is fairly specialist in its habitat requirements with the result that it is not likely to be widely distributed within the study area and would potentially only occur in the far east of the site, but as a result of the near-total transformation of this area is not likely to be present. The Natal Black Snake *Macrelaps microlepidotus* (Near Threatened) and Large-scaled Grass Lizard *Chamaesaura macrolepis* (Near Threatened) are reptile species which also have more specialist than generalist habitat requirements (McLean et al. 2016) and are likely to still occur within the intact parts of the site.

The most important habitats in the area for reptiles would be the intact remnants of grassland and Thornveld in the west and the forests and drainage systems of the east. Provided that loss of currently intact habitat is kept to a minimum, then impacts on reptiles are likely to be relatively low and no significant long-term impacts are likely.

Amphibians

The broader area has exceptional frog species richness, with as many as thirty-two frog species known from the area. This includes four species of conservation concern. Pickersgill's Reed Frog *Hyperolius pickersgilli* (EN) inhabits densely vegetated, stagnant valley bottom wetlands from the coast to ca. 200 m above sea level (McLean et al. 2016). As this habitat is not present at the site which is almost all above 500m above sea level, it is highly unlikely that this species is present at the site and an impact on this species can be excluded as a likely outcome of the development. The Endangered Kloof Frog *Natalobatrachus bonebergi* is under threat due to the degradation of riverine gorge systems (Minter et al. 2004) as a result of over-exploitation and pollution. Other species of concern include the Spotted Shovel-nosed Frog *Hemisus guttatus* (VU), a potential flagship species that is endemic and occurs in wooded and open habitat adjacent wetlands, but is extremely difficult to locate due to its fossorial habits (McLean et al. 2016). It is not likely that there would be impact on the habitat of this species as the majority of the site is disturbed and there would be minimal impact on areas of good condition habitat. The Natal Leaf-folding Frog *Afrixalus spinifrons* (VU) is more likely to occur at the site as it is relatively tolerant of some landuse changes. However as it is associated with wetlands and water bodies, it is not likely to be impacted by the development as the power lines would specifically avoid these features.

Overall, impacts on amphibians are likely to be relatively as their most important habitats, wetlands and other drainage features are likely to be minimally impacted by the development and the major footprint areas would be in areas that are already heavily transformed.

3.6 SITE SENSITIVITY ASSESSMENT

The sensitivity map of the study area is illustrated below in Figure 14. The majority of the site is considered low sensitivity as it has been transformed for agriculture or urbanization. The power line would generate minimal impact in these areas as there is little remnant fauna or flora in these areas. There is more intact habitat in the central and western parts of the site, with the drainage lines being the most important feature of this area as well as the high lying areas of Mesic Grassland. There are also some scattered forest patches along the drainage lines and steep escarpment slopes that are considered sensitive habitats to be avoided. Although all of the substation locations are within transformed areas, Alternatives E and G are considered the preferred alternatives.

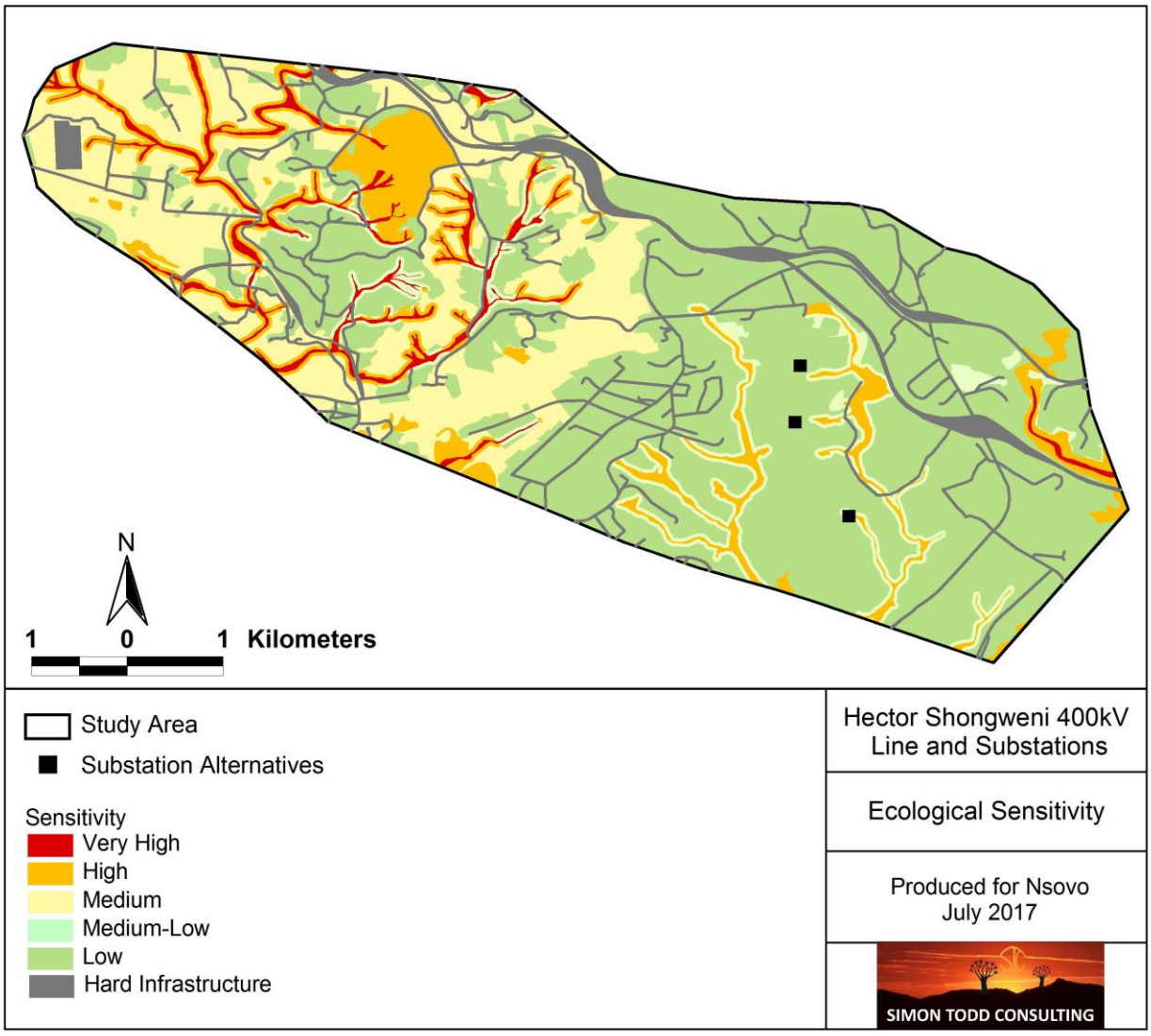

Figure 14. Ecological sensitivity map of the Hector-Shongweni study area.

4 IDENTIFICATION & NATURE OF IMPACTS

4.1 CONSTRUCTION PHASE IMPACTS

The likely impacts on the terrestrial ecology of the site resulting from the development of the Hector-Shongweni powerline and substation are identified and discussed below with reference to the characteristics and features of the study area.

Impacts on vegetation and listed or protected plant species

Vegetation clearing for pylons, access roads and other infrastructure would result in loss of currently intact vegetation and potential impact on plant species of conservation concern. Although this impact can be reduced through a preconstruction walk-through, some impact on currently intact areas is inevitable and cannot be entirely avoided.

Direct Faunal Impacts.

Increased levels of noise, pollution, disturbance and human presence during construction of the powerline and substation will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Slower types such as tortoises, snakes and amphibians would be most susceptible and the impact would be largely concentrated to the construction phase when vehicle activity was high. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

4.2 OPERATIONAL PHASE IMPACTS

Increased Erosion Risk

The large amount of disturbance created during construction would leave some of the areas in the footprint vulnerable to soil erosion. The eroded material may enter streams and rivers and may have significant impact on these systems through siltation of pools and changes in the chemistry and turbidity of the water. As this is a potential impact of the development, it is assessed for the operational phase.

Faunal Impacts

During the operational phase of the development, impacts on fauna are likely to be very low and with standard mitigation and avoidance, no significant impacts on fauna during operation are anticipated. This impact is therefore not assessed for the Operational Phase.

Impact on Critical Biodiversity Areas

The footprint potentially includes areas that have been demarcated as CBAs and the loss of habitat within the CBAs would potentially result in a loss of biodiversity as well as a

potential loss in ecosystem function within the CBA, with negative consequences for biodiversity maintenance in the long-term.

4.3 CUMULATIVE IMPACTS

Cumulative impacts on broad-scale ecological processes

Habitat loss due to construction of the power line would result in cumulative impacts on listed vegetation types. This would also increase habitat fragmentation and potentially result in a loss of broad-scale landscape connectivity.

5 ASSESSMENT METHODOLOGY

Assessment & Significance Criteria

Direct, indirect and cumulative impacts of the issues identified in this report are assessed in terms of the following criteria:

- The **nature** which includes a description of what causes the effect what will be affected and how it will be affected.
- The **extent** wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 is assigned as appropriate (with 1 being low and 5 being high):
- The **duration** wherein it is indicated whether:
    - the lifetime of the impact will be of a very short du ration (0- 1 years) - assigned a score of 1.
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2.
    - medium-term (5-15 years) - assigned a score of 3
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5
- The **magnitude** quantified on a scale from 0-10 where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way 8 is high (processes are altered to the extent that they temporarily cease) and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** of occurrence, which shall describe the (likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but of low likelihood) , 3 is probable (distinct possibility) , 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

The **significance** which shall be determined through a syntheses of the characteristics described above and can be assessed as low, medium or high;
and;
the status, which will be described as either positive, negative or neutral.
the degree to which the impact can be reversed.
the degree to which the impact may cause irreplaceable loss of resources.
the degree to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:

S = (E + D + M)P
Where
S = significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The significance weightings for each potential impact are as follows:

- **<30** points : **Low** (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- **30-60** points : **Medium** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
- **>60** points : **High** (i.e. where the impact must have an influence on the decision process to develop in the area).

6 IMPACT ASSESSMENT

Impacts are assessed below for the construction and operational phases of the development. A single assessment is currently provided as while there are 3 corridors, these are very broad and an actual associated line has not yet been identified.

6.1 CONSTRUCTION PHASE IMPACTS

Impacts on vegetation and protected plant species

Vegetation clearing for powerlines and substations and their service areas will impact on vegetation and species of conservation concern.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Vegetation Impacts		No	Negative	3	4	4	4	44 = Medium

During Construction		Yes	Negative	3	4	3	3	30 = Low
Corrective Actions	• The route should be designed so as to avoid areas of high sensitivity and CBAs. • There should be a preconstruction walk-through of the power line route and substation site to identify species of conservation concern that should be avoided or translocated. • Existing roads and access routes should be used wherever possible.							

Faunal Impacts During Construction

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna resident or utilising the site. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals and reptiles would also be vulnerable to illegal collection or poaching.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Fauna Impacts During Construction		No	Negative	2	1	3	4	24 = Low
		Yes	Negative	2	1	2	3	15 = Low
Corrective Actions	• Sensitive faunal habitats such as wetlands should be avoided by the final route. • Any fauna threatened by construction activities should be removed to safety by the ECO or other suitably qualified person. • Existing roads and access routes should be used wherever possible. • During construction all vehicles should adhere to demarcated tracks or roads and the speed limit should not exceed 40km/h on larger roads and should be 20-30km/h on smaller access tracks. • All construction staff should undergo environmental induction before construction commences in order to raise awareness and reduce potential faunal impacts. • To avoid impacts on amphibians, all spills of hazardous material should be cleared in the appropriate manner according to the nature and identity of the spill and all contaminated soil removed from the site. • Avoid sensitive faunal habitats such as drainage lines and wetlands.							

6.2 OPERATIONAL PHASE IMPACTS

Increased Erosion Risk

Operational phase disturbance may result in large amounts of erosion and silt movement into drainage lines with negative consequences for fauna and flora in these areas. Disturbance along the power line route is likely to increase the vulnerability of the disturbed areas to erosion.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Erosion risk during Operation Phase		No	Negative	3	3	4	3	30 = Medium
		Yes	Negative	2	2	2	2	12 = Low
Corrective Actions	• Disturbance within or near the drainage lines should be kept to a minimum. No pylons should be located within drainage lines or the adjacent floodplains. • Any roads along slopes should have water diversion structures placed at regular intervals to ensure that they do not capture overland flow and become eroded. • Any erosion problems observed along the power line servitude should be rectified as soon as possible using the appropriate revegetation and erosion control works.							

Impact on Critical Biodiversity Areas

The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the country's future ability to meet its conservation targets.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Impacts on CBAs		No	Negative	3	4	4	5	55 = Medium-High
		Yes	Negative	2	4	3	4	36 = Medium
Corrective Actions	• CBAs should be avoided by the final power line route as much as possible, especially where these related to sensitive habitats such as forest or wetlands. • The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas as far as possible. • The options containing the least sensitive vegetation types should be selected.							

6.3 CUMULATIVE IMPACTS

Cumulative impacts on broad-scale ecological processes

Habitat loss due to construction of the power line would result in cumulative impacts on listed vegetation types. This would also increase habitat fragmentation and potentially result in a loss of broad-scale landscape connectivity.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	

Impacts on CBAs		No	Negative	3	4	3	3	30 = Medium
		Yes	Negative	3	4	2	3	27 = Low
Corrective Actions	• Avoid development within the High sensitivity parts of the site. • The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas. • Avoid impact to potential corridors such as the riparian corridors associated with the larger drainage lines within the area.							

7 IDENTIFICATION OF PREFERRED ALTERNATIVES

The comparative assessment is provided below.

Key

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Hector-Shongweni Grid Connection

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
Substation Option E	Preferred	The footprint is within transformed habitat and there are no significant features within 200m of the proposed site.
Substation Option F	Not Preferred	There is a drainage system in close proximity of the footprint and as a result, this option is not preferred compared to the other options.
Substation Option G	Preferred	The footprint is within transformed habitat and there are no significant features within 200m of the proposed site.
GRID LINE CORRIDOR ALTERNATIVES		
Grid Line Option 1	Not Preferred	There are several areas of mesic grassland along the route that cannot easily be avoided. As a result this not a preferred alternative.
Grid Line Option 2	Preferred	This route has potentially the lowest

Alternative	Preference	Reasons (incl. potential issues)
		abundance of habitats of concern and has the greatest scope to avoid impact to the sensitive features present.
Grid Line Option 3	Favourable	There are several areas of high sensitivity along the route that would need to be avoided to make this a viable alternative. It is also steeper than the other options and so access may be difficult along some sections of the route.

8 CONCLUSIONS & RECOMMENDATIONS

A large proportion of the study area has been transformed by agriculture and urbanization. These areas are low sensitivity and no significant ecological impacts in these areas can be expected. The western half of the site is less impacted and significant tracks of intact grassland remain in this area. There are also some forest patches and drainage features present which are considered sensitive features that should be avoided. All three substation options are within transformed sugarcane fields. However Alternative F is not preferred as it is near to an intact drainage line that may be impacted. As a result, Alternative E and G are considered preferable but are not distinguished from one another in terms of preference as they are both in transformed areas with no significant features in their proximity.

In terms of the power line corridors, these are very wide and no routes have been identified, making it difficult to make firm recommendations in this regard. However, it appears that the central corridor is the preferred alternative as it has the least extent of CBAs and sensitive features. The other two options are considered less preferable on account of sensitive features that would be hard to avoid.

With the suggested planning stage avoidance mitigation actions, the impacts of the power line and substation can be reduced to an acceptably low level. As such there are no fatal flaws or unacceptably high impacts likely to be associated with the development.

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10 ANNEX 1. LIST OF PLANT SPECIES

List of listed and protected plant species which are known to occur in the broad vicinity of the Hector-Shongweni site, according to the SANBI SIBIS database. The main purpose of this table is to illustrate the high numbers of listed species in the area.

Family	Species	Threat status	Growth forms
Amaryllidaceae	*Clivia gardenii Hook.*	VU	Geophyte
	Clivia miniata (Lindl.) Regel var. miniata	VU	Geophyte
	Crinum moorei Hook.f.	VU	Geophyte
	Haemanthus deformis Hook.f.	VU	Geophyte, succulent
	Boophone disticha (L.f.) Herb.	Declining	Geophyte, succulent
Apiaceae	*Alepidea peduncularis A.Rich.*	DDT	Herb
Apocynaceae	*Brachystelma pulchellum (Harv.) Schltr.*	NT	Geophyte, succulent
	Brachystelma sandersonii (Oliv.) N.E.Br.	VU	Herb, succulent
Asphodelaceae	*Aloe linearifolia A.Berger*	NT	Herb, succulent
	Aloe thraskii Baker	NT	Shrub, succulent, tree
	Kniphofia littoralis Codd	NT	Herb
	Gasteria croucheri (Hook.f.) Baker subsp. croucheri	VU	Herb, succulent
	Kniphofia pauciflora Baker	CR	Herb
	Aloe cooperi Baker subsp. cooperi	Declining	Herb, succulent
Asteraceae	*Cineraria atriplicifolia DC.*	VU	Herb
Asteraceae	*Helichrysum pannosum DC.*	EN	Herb
Asteraceae	*Senecio exuberans R.A.Dyer*	EN	Herb
Begoniaceae	*Begonia homonyma Steud.*	EN	Herb, succulent
Callitrichaceae	*Callitriche compressa N.E.Br.*	DDT	Herb, hydrophyte
Celastraceae	*Elaeodendron croceum (Thunb.) DC.*	Declining	Tree
Colchicaceae	*Sandersonia aurantiaca Hook.*	Declining	Climber, geophyte, herb
Cucurbitaceae	*Gerrardanthus tomentosus Hook.f.*	VU	Climber, succulent
Cyperaceae	*Cyperus sensilis Baijnath*	NT	Cyperoid, emergent hydrophyte
Cyperaceae	*Fimbristylis aphylla Steud.*	VU	Cyperoid, helophyte, herb
Ericaceae	*Erica pannosa Salisb.*	Rare	Dwarf shrub
Euphorbiaceae	*Euphorbia bupleurifolia Jacq.*	Declining	Dwarf shrub, succulent
Fabaceae	*Crotalaria dura J.M.Wood & M.S.Evans subsp. dura*	NT	Dwarf shrub, herb
Fabaceae	*Argyrolobium longifolium (Meisn.) Walp.*	VU	Dwarf shrub
Geraniaceae	*Geranium ornithopodioides Hilliard & B.L.Burtt*	EN	Herb
Gesneriaceae	*Streptocarpus molweniensis Hilliard subsp. molweni*	VU	Herb, lithophyte
Gunneraceae	*Gunnera perpensa L.*	Declining	Herb, hydrophyte
Hyacinthaceae	*Merwilla plumbea (Lindl.) Speta*	NT	Geophyte
Hyacinthaceae	*Drimia elata Jacq.*	DDT	Geophyte
Hypoxidaceae	*Hypoxis hemerocallidea Fisch., C.A.Mey. & Avé-Lall.*	Declining	Geophyte
Iridaceae	*Watsonia inclinata Goldblatt*	VU	Geophyte, herb

Family	Species	Threat status	Growth forms
Iridaceae	*Gladiolus cruentus T.Moore*	CR	Geophyte, herb
Lauraceae	*Dahlgrenodendron natalense (J.H.Ross) J.J.M.van d Merwe & A.E.van Wyk*	EN	Tree
Malvaceae	*Hermannia sandersonii Harv.*	VU	Dwarf shrub
Meliaceae	*Turraea pulchella (Harms) T.D.Penn.*	VU	Dwarf shrub
Myrsinaceae	*Rapanea melanophloeos (L.) Mez*	Declining	Tree
Myrtaceae	*Eugenia erythrophylla Strey*	NT	Shrub, tree
Myrtaceae	*Eugenia simii Dummer*	VU	Shrub
Orchidaceae	*Cynorkis compacta (Rchb.f.) Rolfe*	VU	Geophyte, herb
Orchidaceae	*Eulophia speciosa (R.Br. ex Lindl.) Bolus*	Declining	Geophyte, herb, succulent
Orchidaceae	*Zeuxine africana Rchb.f.*	EN*	Geophyte, herb
Rhizophoraceae	*Cassipourea gummiflua Tul. var. verticillata (N.E.Br J.Lewis*	VU*	Tree
Rhizophoraceae	*Cassipourea malosana (Baker) Alston*	Declining	Shrub, tree
Santalaceae	*Thesium polygaloides A.W.Hill*	VU	Herb, parasite
Scrophulariaceae	*Zaluzianskya pilosa Hilliard & B.L.Burtt*	DDT	Herb
Stangeriaceae	*Stangeria eriopus (Kunze) Baill.*	VU	Geophyte, herb
Stilbaceae	*Kogelbergia verticillata (Eckl. & Zeyh.) Rourke*	Rare	Dwarf shrub
Vitaceae	*Cyphostemma flaviflorum (Sprague) Desc.*	NT	Climber, succulent
Zamiaceae	*Encephalartos natalensis R.A.Dyer & I.Verd.*	NT	Shrub, tree
Zingiberaceae	*Siphonochilus aethiopicus (Schweinf.) B.L.Burtt*	CR	Geophyte, herb

11 ANNEX 2. LIST OF MAMMALS

List of mammals which have been recorded in the region of the Hector-Shongweni site.

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Bathyergidae	*Cryptomys*	*hottentotus*		Southern African Mole-rat	Least Concern	2
Bovidae	*Cephalophus*	*natalensis*		Red Duiker	Least Concern	11
Bovidae	*Ourebia*	*ourebi*		Oribi	Endangered	17
Bovidae	*Philantomba*	*monticola*		Blue Duiker	Vulnerable	33
Bovidae	*Redunca*	*arundinum*		Southern Reedbuck	Least Concern	6
Bovidae	*Sylvicapra*	*grimmia*		Bush Duiker	Least Concern	7
Cercopithecidae	*Chlorocebus*	*pygerythrus*		Vervet Monkey	Not listed	3
Chrysochloridae	*Amblysomus*	*hottentotus*		Hottentot Golden Mole	Data Deficient	10
Felidae	*Caracal*	*caracal*		Caracal	Least Concern	2
Felidae	*Leptailurus*	*serval*		Serval	Near Threatened	4
Felidae	*Panthera*	*pardus*		Leopard	Vulnerable	12
Gliridae	*Graphiurus*	*murinus*		Forest African Dormouse	Least Concern	1
Herpestidae	*Atilax*	*paludinosus*		Marsh Mongoose	Least Concern	5
Herpestidae	*Herpestes*	*ichneumon*		Egyptian Mongoose	Least Concern	2
Herpestidae	*Herpestes*	*sanguineus*		Slender Mongoose	Least Concern	9
Herpestidae	*Ichneumia*	*albicauda*		White-tailed Mongoose	Least Concern	2
Herpestidae	*Mungos*	*mungo*		Banded Mongoose	Least Concern	6
Molossidae	*Chaerephon*	*pumilus*		Little Free-tailed Bat	Least Concern	29
Molossidae	*Mops*	*condylurus*		Angolan Free-tailed Bat	Least Concern	1
Molossidae	*Otomops*	*martiensseni*		Large-eared Free-Tailed Bat	Least Concern	36
Molossidae	*Tadarida*	*aegyptiaca*		Egyptian Free-tailed Bat	Least Concern	2
Muridae	*Aethomys*	*ineptus*		Tete Veld Aethomys	Least Concern	19
Muridae	*Gerbilliscus*	*brantsii*		Highveld Gerbil	Least Concern	1
Muridae	*Grammomys*	*dolichurus*		Common Grammomys	Least Concern	3
Muridae	*Lemniscomys*	*rosalia*		Single-Striped Lemniscomys	Least Concern	9
Muridae	*Mastomys*	*natalensis*		Natal Mastomys	Least Concern	51
Muridae	*Mus*	*minutoides*		Southern African Pygmy Mouse	Least Concern	5
Muridae	*Otomys*	*angoniensis*		Angoni Vlei Rat	Least Concern	18
Muridae	*Otomys*	*auratus*		Southern African Vlei Rat	Least Concern	2
Muridae	*Rhabdomys*	*pumilio*		Xeric Four-striped Grass Rat	Least Concern	3
Mustelidae	*Poecilogale*	*albinucha*		African Striped Weasel	Near Threatened	1
Nesomyidae	*Dendromus*	*mystacalis*		Chestnut African Climbing Mouse	Least Concern	5
Procaviidae	*Procavia*	*capensis*		Rock Hyrax	Least Concern	13
Pteropodidae	*Epomophorus*	*wahlbergi*		Epomophorus wahlbergi	Least Concern	1

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Soricidae	*Crocidura*	*cyanea*		Reddish-gray Musk Shrew	Least Concern	1
Soricidae	*Crocidura*	*flavescens*		Greater Red Musk Shrew	Least Concern	26
Soricidae	*Crocidura*	*hirta*		Lesser Red Musk Shrew	Least Concern	1
Soricidae	*Myosorex*	*cafer*		Dark-footed Mouse Shrew	Least Concern	7
Soricidae	*Myosorex*	*varius*		Forest Shrew	Least Concern	8
Soricidae	*Suncus*	*infinitesimus*		Least Dwarf Shrew	Least Concern	1
Suidae	*Potamochoerus*	*porcus*		Red River Hog	Least Concern	4
Thryonomyidae	*Thryonomys*	*swinderianus*		Greater Cane Rat	Least Concern	1
Vespertilionidae	*Eptesicus*	*hottentotus*		Long-tailed Serotine	Least Concern	2
Vespertilionidae	*Hypsugo*	*anchietae*		Anchieta's Pipistrelle	Least Concern	1
Vespertilionidae	*Miniopterus*	*fraterculus*		Lesser Long-fingered Bat	Least Concern	1
Vespertilionidae	*Miniopterus*	*natalensis*		Natal Long-fingered Bat	Least Concern	3
Vespertilionidae	*Neoromicia*	*capensis*		Cape Serotine	Least Concern	2
Vespertilionidae	*Neoromicia*	*nanus*		Banana Pipistrelle	Least Concern	12
Vespertilionidae	*Pipistrellus*	*hesperidus*		Dusky Pipistrelle	Least Concern	8
Vespertilionidae	*Scotophilus*	*dinganii*		Yellow-bellied House Bat	Least Concern	6
Viverridae	*Genetta*	*maculata*		Rusty-spotted Genet	Least Concern	3
Viverridae	*Genetta*	*tigrina*		Cape Genet	Least Concern	3

Conservation-dependent mammal species

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Bovidae	*Aepyceros*	*melampus*		Impala	Least Concern	11
Bovidae	*Damaliscus*	*pygargus*	*phillipsi*	Blesbok	Least Concern	1
Bovidae	*Tragelaphus*	*angasii*		Nyala	Least Concern	2
Bovidae	*Tragelaphus*	*scriptus*		Bushbuck	Least Concern	18
Equidae	*Equus*	*quagga*		Plains Zebra	Least Concern	27
Hippopotamidae	*Hippopotamus*	*amphibius*		Common Hippopotamus	Least Concern	27

12 ANNEX 3. LIST OF REPTILES

List of reptiles which are likely to occur in the vicinity of the Hector-Shongweni study area. Conservation status is from Bates et al. (2014).

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Agamidae	*Acanthocercus*	*atricollis*	*atricollis*	Southern Tree Agama	Least Concern	30
Agamidae	*Agama*	*atra*		Southern Rock Agama	Least Concern	1
Chamaeleonidae	*Bradypodion*	*melanocephalum*		KwaZulu Dwarf Chameleon	Vulnerable	314
Chamaeleonidae	*Chamaeleo*	*dilepis*	*dilepis*	Common Flap-neck Chameleon	Least Concern	50
Colubridae	*Crotaphopeltis*	*hotamboeia*		Red-lipped Snake	Least Concern	48
Colubridae	*Dasypeltis*	*inornata*		Southern Brown Egg-eater	Least Concern	6
Colubridae	*Dasypeltis*	*scabra*		Rhombic Egg-eater	Least Concern	1
Colubridae	*Dispholidus*	*typus*	*typus*	Boomslang	Least Concern	12
Colubridae	*Philothamnus*	*hoplogaster*		South Eastern Green Snake	Least Concern	27
Colubridae	*Philothamnus*	*natalensis*	*natalensis*	Eastern Natal Green Snake	Least Concern	4
Colubridae	*Philothamnus*	*natalensis*	*occidentalis*	Western Natal Green Snake	Least Concern	1
Colubridae	*Philothamnus*	*semivariegatus*		Spotted Bush Snake	Least Concern	50
Colubridae	*Thelotornis*	*capensis*	*capensis*	Southern Twig Snake	Least Concern	8
Cordylidae	*Chamaesaura*	*macrolepis*		Large-scaled Grass Lizard	Near Threatened	4
Cordylidae	*Cordylus*	*vittifer*		Common Girdled Lizard	Least Concern	1
Elapidae	*Dendroaspis*	*angusticeps*		Green Mamba	Vulnerable	1
Elapidae	*Dendroaspis*	*polylepis*		Black Mamba	Least Concern	11
Elapidae	*Hemachatus*	*haemachatus*		Rinkhals	Least Concern	1
Elapidae	*Naja*	*mossambica*		Mozambique Spitting Cobra	Least Concern	17
Gekkonidae	*Afroedura*	*pondolia*		Pondo Flat Gecko	Least Concern	11
Gekkonidae	*Hemidactylus*	*mabouia*		Common Tropical House Gecko	Least Concern	86
Gekkonidae	*Homopholis*	*wahlbergii*		Wahlberg's Velvet Gecko	Least Concern	1
Gekkonidae	*Lygodactylus*	*capensis*	*capensis*	Common Dwarf Gecko	Least Concern	38
Gekkonidae	*Pachydactylus*	*maculatus*		Spotted Gecko	Least Concern	2
Gerrhosauridae	*Gerrhosaurus*	*flavigularis*		Yellow-throated Plated Lizard	Least Concern	5
Lamprophiidae	*Amblyodipsas*	*polylepis*	*polylepis*	Common Purple-glossed Snake	Least Concern	1
Lamprophiidae	*Aparallactus*	*capensis*		Black-headed Centipede-eater	Least Concern	22
Lamprophiidae	*Atractaspis*	*bibronii*		Bibron's Stiletto Snake	Least Concern	3
Lamprophiidae	*Boaedon*	*capensis*		Brown House Snake	Least Concern	27
Lamprophiidae	*Duberria*	*lutrix*	*lutrix*	South African Slug-eater	Least Concern	3
Lamprophiidae	*Lamprophis*	*guttatus*		Spotted House Snake	Least Concern	7
Lamprophiidae	*Lycodonomorphus*	*inornatus*		Olive House Snake	Least Concern	2
Lamprophiidae	*Lycodonomorphus*	*laevissimus*		Dusky-bellied Water Snake	Least Concern	4
Lamprophiidae	*Lycodonomorphus*	*rufulus*		Brown Water Snake	Least Concern	13
Lamprophiidae	*Lycophidion*	*capense*	*capense*	Cape Wolf Snake	Least Concern	12
Lamprophiidae	*Macrelaps*	*microlepidotus*		Natal Black Snake	Near Threatened	12
Lamprophiidae	*Psammophis*	*brevirostris*		Short-snouted Grass Snake	Least Concern	6
Lamprophiidae	*Psammophis*	*crucifer*		Cross-marked Grass Snake	Least Concern	1

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Lamprophiidae	*Psammophylax*	*rhombeatus*	*rhombeatus*	Spotted Grass Snake	Least Concern	1
Leptotyphlopidae	*Leptotyphlops*				Not listed	1
Leptotyphlopidae	*Leptotyphlops*	*scutifrons*	*conjunctus*	Eastern Thread Snake	Not listed	1
Leptotyphlopidae	*Leptotyphlops*	*scutifrons*	*scutifrons*	Peters' Thread Snake	Not listed	22
Pelomedusidae	*Pelomedusa*	*galeata*		South African Marsh Terrapin	Not evaluated	1
Pelomedusidae	*Pelomedusa*	*subrufa*		Central Marsh Terrapin	Least Concern	1
Pythonidae	*Python*	*natalensis*		Southern African Python	Least Concern	2
Scincidae	*Acontias*	*plumbeus*		Giant Legless Skink	Least Concern	1
Scincidae	*Panaspis*	*wahlbergii*		Wahlberg's Snake-eyed Skink	Least Concern	37
Scincidae	*Scelotes*	*inornatus*		Durban Dwarf Burrowing Skink	Critically Endangered	34
Scincidae	*Scelotes*	*mossambicus*		Mozambique Dwarf Burrowing Skink	Least Concern	10
Scincidae	*Trachylepis*	*homalocephala*		Red-sided Skink	Least Concern	1
Scincidae	*Trachylepis*	*striata*		Striped Skink	Least Concern	17
Scincidae	*Trachylepis*	*varia*		Variable Skink	Least Concern	24
Typhlopidae	*Afrotyphlops*	*bibronii*		Bibron's Blind Snake	Least Concern	5
Typhlopidae	*Indotyphlops*	*braminus*		Brahminy Blind Snake	Not listed	9
Typhlopidae	*Rhinotyphlops*	*lalandei*		Delalande's Beaked Blind Snake	Least Concern	1
Varanidae	*Varanus*	*niloticus*		Water Monitor	Least Concern	6
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern	7
Viperidae	*Causus*	*rhombeatus*		Rhombic Night Adder	Least Concern	24

13 ANNEX 3. LIST OF AMPHIBIANS

List of amphibians which are likely to occur in the vicinity of the Hector-Shongweni study site.

Family	Genus	Species	Common name	Red list category	No. records
Arthroleptidae	*Arthroleptis*	*wahlbergi*	Bush Squeaker	Least Concern	52
Arthroleptidae	*Leptopelis*	*mossambicus*	Brownbacked Tree Frog	Least Concern	1
Arthroleptidae	*Leptopelis*	*natalensis*	Forest Tree Frog	Least Concern	57
Brevicepitidae	*Breviceps*	*adspersus*	Bushveld Rain Frog	Least Concern	8
Brevicepitidae	*Breviceps*	*mossambicus*	Mozambique Rain Frog	Least Concern	1
Brevicepitidae	*Breviceps*	*verrucosus*	Plaintive Rain Frog	Least Concern	6
Bufonidae	*Schismaderma*	*carens*	Red Toad	Least Concern	16
Bufonidae	*Sclerophrys*	*capensis*	Raucous Toad	Least Concern	4
Bufonidae	*Sclerophrys*	*gutturalis*	Guttural Toad	Least Concern	77
Heleophrynidae	*Hadromophryne*	*natalensis*	Natal Ghost Frog	Least Concern	11
Hemisotidae	*Hemisus*	*guttatus*	Spotted Shovel-nosed Frog	Vulnerable	8
Hyperoliidae	*Afrixalus*	*fornasinii*	Greater Leaf-folding Frog	Least Concern	13
Hyperoliidae	*Afrixalus*	*spinifrons*	Natal Leaf-folding Frog	Vulnerable	14
Hyperoliidae	*Hyperolius*	*argus*	Argus Reed Frog	Least Concern	8
Hyperoliidae	*Hyperolius*	*marmoratus*	Painted Reed Frog	Least Concern	55
Hyperoliidae	*Hyperolius*	*microps*	Sharp-headed Long Reed Frog	Least Concern	1
Hyperoliidae	*Hyperolius*	*pickersgilli*	Pickersgill's Reed Frog	Endangered	6
Hyperoliidae	*Hyperolius*	*pusillus*	Water Lily Frog	Least Concern	15
Hyperoliidae	*Hyperolius*	*semidiscus*	Yellowstriped Reed Frog	Least Concern	8
Hyperoliidae	*Hyperolius*	*tuberilinguis*	Tinker Reed Frog	Least Concern	13
Hyperoliidae	*Kassina*	*senegalensis*	Bubbling Kassina	Least Concern	9
Phrynobatrachidae	*Phrynobatrachus*	*mababiensis*	Dwarf Puddle Frog	Least Concern	1
Phrynobatrachidae	*Phrynobatrachus*	*natalensis*	Snoring Puddle Frog	Least Concern	24
Pipidae	*Xenopus*	*laevis*	Common Platanna	Least Concern	16
Ptychadenidae	*Ptychadena*	*oxyrhynchus*	Sharpnosed Grass Frog	Least Concern	8
Pyxicephalidae	*Amietia*	*delalandii*	Delalande's River Frog	Least Concern	49
Pyxicephalidae	*Anhydrophryne*	*hewitti*	Hewitt's Moss Frog	Least Concern	1
Pyxicephalidae	*Cacosternum*	*boettgeri*	Common Caco	Least Concern	4
Pyxicephalidae	*Cacosternum*	*nanum*	Bronze Caco	Least Concern	13
Pyxicephalidae	*Natalobatrachus*	*bonebergi*	Kloof Frog	Endangered	31
Pyxicephalidae	*Strongylopus*	*grayii*	Clicking Stream Frog	Least Concern	2
Pyxicephalidae	*Tomopterna*	*natalensis*	Natal Sand Frog	Least Concern	10