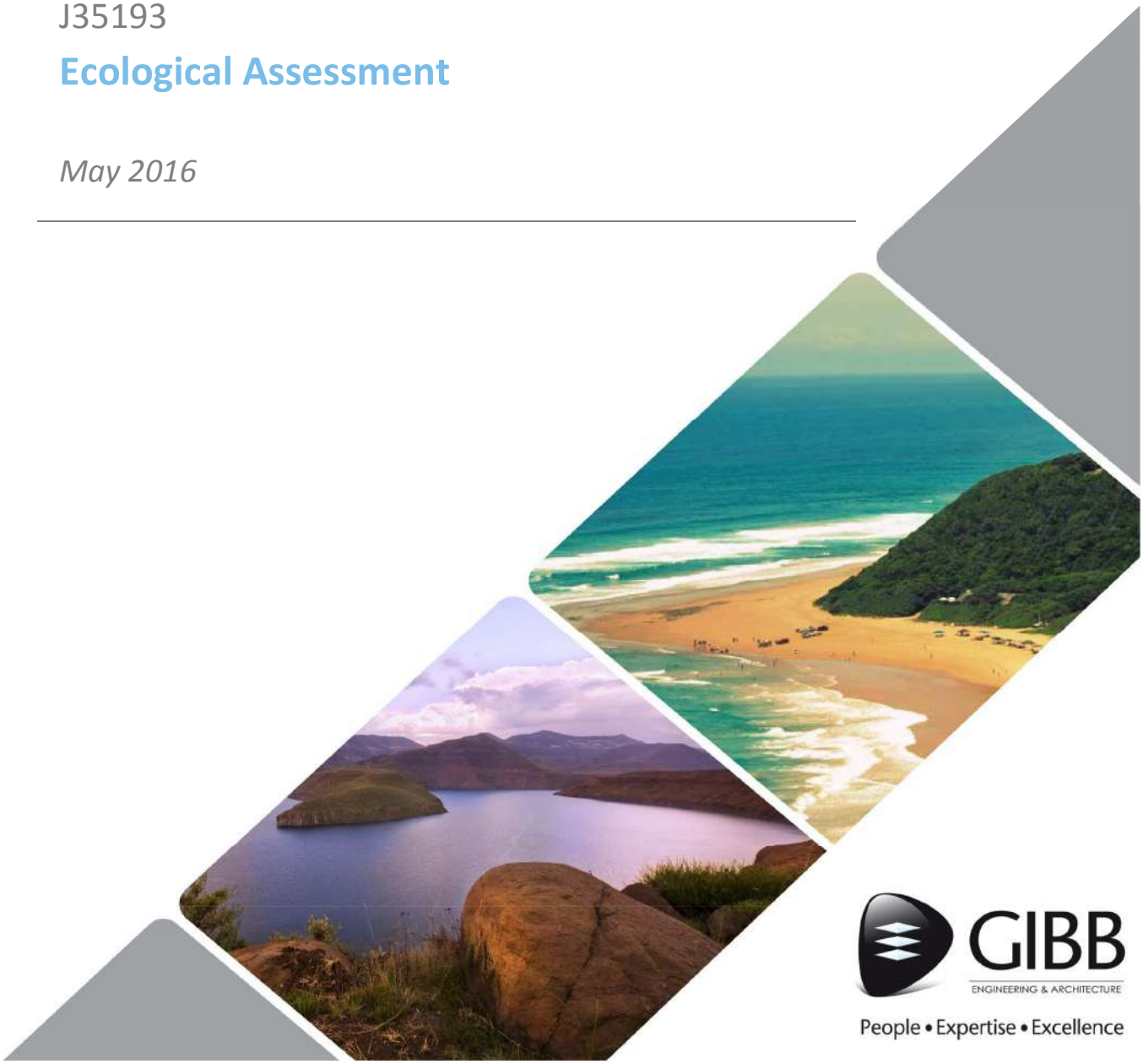
Rehabilitation of National Route R56 Section 8 from Matatiele (KM 130.15) to the KZN border (KM 168.71)

J35193

Ecological Assessment

May 2016



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Specialist Declaration of Independence

I, **Robyn Phillips**, in my capacity as a specialist consultant, hereby declare that I –

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- Have and will not have vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- Will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not;
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member;
- Based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability;
- Reserve the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field; and
- Undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered.

7 June 2016

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Robyn Phillips *Pr.Sci.Nat.*
Senior Specialist
SACNASP Reg. No. 400401/12

Date

Executive Summary

The Environmental Specialist Unit at GIBB (Pty) Ltd was appointed by the South African National Roads Agency Ltd (SANRAL) to undertake an environmental sensitivity study for the proposed road rehabilitation project near Matatiele in the Eastern Cape Province. The project comprises of the rehabilitation and reseal of National Route R56 Section 8, from the intersection of East Street and the R56 in Matatiele to the KwaZulu-Natal border near Kokstad. The following report comprises an overview of the environmental features in the landscape and sensitivities associated with a 1km wide corridor (500m on either side of the centre line) around the proposed section of road to be upgraded.

The study site is located within the Grassland Biome, which is characterised by high summer rainfall and dry winters. A large number of Rare and Threatened plant species in the summer rainfall regions of South Africa are restricted to high-rainfall grassland, making this the vegetation type in most urgent need of conservation. Four vegetation types are associated with the study area, namely East Griqualand Grassland, Mabela Sandy Grassland, Eastern Temperate Freshwater Wetlands, and Highveld Alluvial Vegetation. East Griqualand Grassland and Mabela Sandy Grassland are both currently classified as Vulnerable, while Eastern Temperate Freshwater Wetlands and Highveld Alluvial Vegetation are currently classified as Least Threatened, although poorly protected. Eastern Temperate Freshwater Wetlands is however classified as a threatened ecosystem, and is currently listed as Vulnerable in terms of Section 52 of the National Environmental Management: Biodiversity Act (NEMBA) under criterion A1 Biome: Azonal.

The footprint of the proposed road rehabilitation project is relatively narrow (50m) and contained mainly the existing road reserve where little natural vegetation remained. It mostly comprised transformed areas, and secondary grassland disturbed by previous road-related construction activities. The greater study area comprised a mosaic of grassland and farmland, with watercourses, wetlands, pans and dams interspersed amongst agricultural fields and pastures. A few rocky outcrops and ridges occurred with associated rocky grassland. Stands of exotic trees were found in various places along the route.

While the habitats within the footprint of the proposed road reserve were generally transformed or disturbed, the areas surrounding Matatiele and Cedarville are recognised as important ecological habitat that supports many floral and faunal species of conservation concern. Bird species such as Blue Crane, Grey Crowned Crane, Wattled Crane, Secretarybird, Denham's Bustard and African Marsh Harrier frequent the grasslands, dams and wetlands in the area. Highly sensitive habitat associated with the study area therefore included any riparian or wetland habitat (including farm dams) within the 500m and within the road reserve. Rocky areas such as ridges and koppies were also classified as highly sensitive.

While the construction footprint will be relatively narrow, impacts on the greater study area may be high due to the sensitive nature of the landscape. In order to minimise impacts on the surrounding areas, the following activities must take place prior to construction:

1) A full wetland delineation and functional assessment must be undertaken by a suitably qualified wetland specialist. The report must include an assessment of impacts with mitigation measures and rehabilitation plans.

2) Prior to construction, a walk-down of the entire route must be undertaken by a suitably qualified ecologist or botanist to identify plant species present in the road reserve that may require rescue and relocation. This must be undertaken in the summer months during the peak flowering period **between** November and March.

3) Prior to construction, night-time surveys must be undertaken by a suitably qualified ecologist or herpetologist to identify the presence of chameleon species of conservation concern along the route. If found, individuals will need to be rescued and relocated to suitable habitat away from the site, by a suitably qualified specialist, prior to construction commencing.

4) Furthermore, as construction commences along the route, regular searches of the construction footprint should take place for chameleons. If animals are encountered by construction staff during construction, the ECO must be notified immediately. No animals are to be harmed, handled, or interfered with by construction staff. A suitably qualified ecologist or herpetologist should therefore be on stand-by throughout the duration of the project.

5) It is recommended that construction begin in the dry winter months so as to minimise disturbance to breeding fauna, especially amphibian species breeding in temporary road-side pools.

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1 Introduction

1.1 Project Description

The Environmental Specialist Unit at GIBB (Pty) Ltd (GIBB) was appointed by the South African National Roads Agency Ltd. (SANRAL) to undertake an ecological sensitivity assessment for the proposed road rehabilitation project along the National Route 56 (R56) Section 8, in the Eastern Cape Province. The project extends from the intersection of East Street and the R56 in Matatiele through to the KwaZulu-Natal border near Kokstad, via the small town of Cedarville.

The proposed road improvement will comprise of an upgrade by offsetting the existing centreline by 7m to the right hand side (travelling east) and constructing half of the new road while traffic utilises the existing road. After this has been completed the traffic will be transferred to the newly constructed half road (7.6m) while the old road is upgraded to the same width. The shoulder of the road will be widened by 3m in each side. While this will require widening of existing structures, including demolishing the old structures and constructing new bridges/culverts, the Mzimvubu River Bridge at Km 155 will not be altered in any way.

The following report comprises an overview of the ecological sensitivities associated with the road reserve and the ecological features within a 1km wide corridor (500m on either side of the centre line) around the proposed section of road to be upgraded.

1.2 Scope of Work

The scope of work for this component of the study was to conduct an ecological assessment that will cover both the floral and faunal components of the study area. The aim was to provide a description of the dominant species occurring in the area as well as those expected to occur, including floral composition and faunal habitat diversity. The assessment would distinguish clearly between areas containing predominantly exotic and predominantly natural vegetation and also describe the endemic, threatened, rare or protected plant and animal species, and/or potential habitats that occur on the study site for these species.

1.3 Location

The study area is located on the R56 between Matatiele at Km 130.15 and the KZN Border at Km 168.71 in the Eastern Cape Province, within Alfred Nzo District Municipality and Matatiele Local Municipality. The study area falls within Quarter Degree Grid Cells (QDGC) 3028BD and 3029AC and lies between 30°20'49.54"– 30°26'39.79" south and 28°49'18.00"– 29°11'50.58" east (Figure 1).

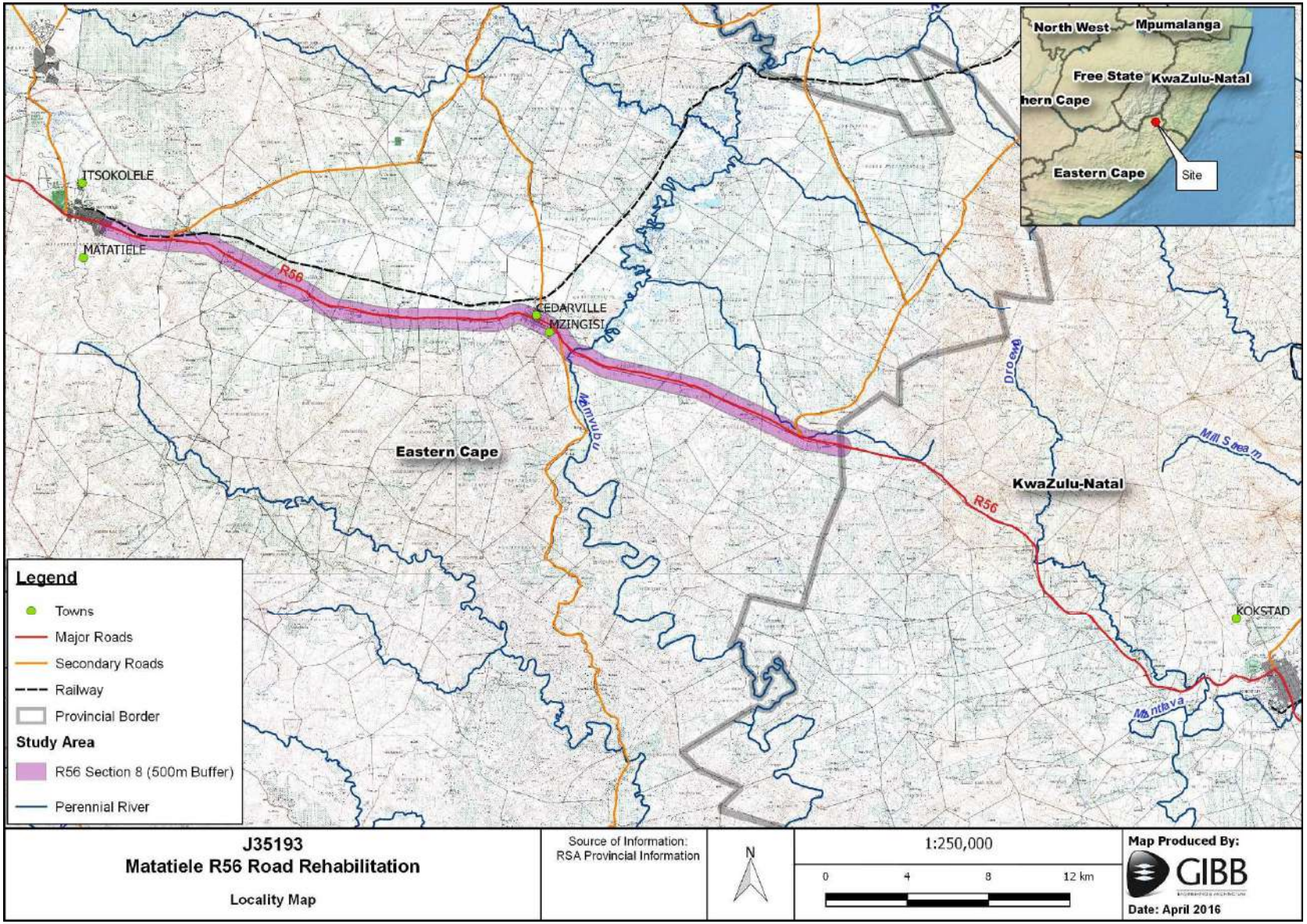

Figure 1: Location of the proposed road rehabilitation project

1.4 Methodology

Methodology involved both a desktop analysis and field visit.

1.4.1 Desktop analysis and literature review

Flora

The floral desktop component entailed a literature search of all plant species occurring in QDGCs 3028BD and 3029AC according to the Plants of Southern Africa (POSA) online checklist (POSA, 2012). Additional data such as habitat preference and species descriptions were gathered for all plants of conservation concern using the latest update of the South African National Red List status (SANBI, 2014). The distribution of regional vegetation types was obtained from the National Vegetation Map of South Africa, Lesotho and Swaziland (VegMap2012 *beta update*, SANBI, 2012), and the description of the regional vegetation followed Mucina and Rutherford (2006).

Avifauna

A comprehensive list of bird species occurring in the area was compiled using electronic databases within Roberts VII Multimedia Birds of Southern Africa (SA Birding, 2011) where distribution maps have been interpreted and updated from the Atlas of Southern African Birds (Harrison *et al*., 1997), and supplemented with current Southern African Bird Atlas Project 2 (SABAP2, 2016) data. Species of conservation concern that could potentially occur on site were noted and their habitat requirements were determined by consulting the relevant literature. Bird names follow Hockey *et al*. (2005) while conservation status follows Taylor *et al*. (2015).

The likelihood of occurrence of bird species was determined using geographical distribution and the presence of suitable habitat on site. High likelihood of occurrence would pertain to species that occur within the QDGC, have a distribution range within the geographic locality of the study site as well as the presence of suitable habitat occurring on the study site. Medium likelihood of occurrence refers to species that occur within the QDGC, have a distribution range that is marginal to the study site or its habitat is found to be within the surroundings of the study area. Medium likelihood of occurrence is also applied to species whose distribution range falls within the geographic locality of the study site, with the presence of suitable habitat occurring on the study site, but the level of degradation or disturbance in the surrounding landscape renders the species unlikely to utilise the site. Low likelihood of occurrence indicates that while the species may occur within the QDGC, its distribution range may or may not fall within the geographic locality of the study site and/or unsuitable habitat for the species exists on site.

Mammals

A list of the mammal species occurring in the area was compiled using data provided by the IUCN and supplemented using the recently established electronic database MammalMap (2016) provided by the Animal Demography Unit's (ADU) Virtual Museum. Geographical distribution and the presence of suitable habitat were also used to determine the likelihood of

occurrence of mammal species. High likelihood of occurrence would pertain to species with areas of occupancy within the geographic locality of the study site as well as the presence of suitable habitat occurring on the study site. Medium likelihood of occurrence refers to species whose area of occupancy is marginal to the study site or its habitat is found to be within the surroundings of the study area. Medium likelihood of occurrence is also applied to species whose distribution range falls within the geographic locality of the study site, with the presence of suitable habitat occurring on the study site, but the level of degradation or disturbance in the surrounding landscape renders the species unlikely to utilise the site. Low likelihood of occurrence indicates that the species occupies an area surrounding the study area and/or that unsuitable habitat exists on site. Information was obtained from Skinner and Chimimba (2005), Stuart and Stuart (2007) and Monadjem et al. (2010).

Herpetofauna

A list of the reptile and amphibian species occurring in the area was compiled using the electronic databases provided by the ADU's Virtual Museum including FrogMAP (2016) and ReptileMAP (2016), as well as the IUCN (2015). Geographical distribution and the presence of suitable habitat were also used to determine the likelihood of occurrence of herpetofauna. High likelihood of occurrence would pertain to species with areas of occupancy within the geographic locality of the study site as well as the presence of suitable habitat occurring on the study site. Medium likelihood of occurrence refers to species whose area of occupancy is marginal to the study site or its habitat is found to be within the surroundings of the study area. Medium likelihood of occurrence is also applied to species whose distribution range falls within the geographic locality of the study site, with the presence of suitable habitat occurring on the study site, but the level of degradation or disturbance in the surrounding landscape renders the species unlikely to utilise the site. Low likelihood of occurrence indicates that the species occupy an area surrounding the study area and/or that unsuitable habitat exists on site. Information was obtained from Alexander and Marais (2010), Du Preez and Carruthers (2009) and Measey (2011).

1.4.2 Field survey

The field investigation was undertaken from the 18th to the 20th of April 2016 when both the floral and faunal elements within the study area were surveyed. Daytime surveys were conducted by moving slowly along the road reserve to observe changes in land cover, vegetation category and ecological habitat.

Flora

Changes in land cover type were noted while moving slowly along the road reserve. Areas comprising predominantly natural vegetation were differentiated from areas of alien and invasive infestations and/or cultivation, as well as transformed areas such as settlement or mining. Plants of interest, especially those of conservation concern, were noted as they were encountered. The locations of such species were recorded using a hand-held Garmin GPSMAP 62sc GPS receiver. Waypoint localities are accurate to within 4m using the WGS 84 map datum.

Avifauna

Bird species were detected by sight, call, and field evidence such as nests, feathers and droppings by moving slowly along the road reserve. Species were verified using Chittenden (2007) as well as Roberts VII Multimedia Birds of Southern Africa (SA Birding, 2011). Habitats for bird species, especially those of conservation concern were noted.

Mammals

Mammal species were identified by sightings as well as field evidence such as spoor, droppings, roosting sights and burrows. Species identification was verified using Stuart and Stuart (2000; 2007).

Herpetofauna

Reptiles and amphibians were noted and identified as they were encountered. Possible burrows or suitable micro-habitats were noted. Identification of reptiles was confirmed using Alexander and Marais (2010) while identification of amphibians was confirmed using Du Preez and Carruthers (2009).

1.5 Limitations

Please note the following regarding the present study:

- In order to obtain a comprehensive understanding of the dynamics of the biota on a site, including species of conservation concern, studies should include investigations through the different seasons of the year, over a number of years, and extensive sampling of the area. Due to project time constraints, such long term research was not feasible and information contained within this report is based on a single field survey.
- The time of the field assessment is generally considered late in the summer season, many of the plant species had completed flowering, and some migratory bird species may have left the area. This may have had an effect on detectability of such species.
- Detailed surveys of floral canopy cover and plant community structure were not undertaken due to the limited time available in the field. Furthermore, the field investigation was cut short by political protests in the Cedarville area, where the road was closed on the last day of assessment.

2 Results

2.1 Climate

The area between Matatiele and Kokstad (including Cedarville) normally receives between 600mm and 620mm of rain per year, with most rainfall occurring in mid-summer, peaking in January with a monthly average of around 110mm. Average daily maximum temperatures for the region range between 16°C in June and 25°C in January. The region is the coldest during July when the mercury drops to around 1°C on average during the night, while temperatures can reach over 30°C in summer (SA Explorer, 2014). The site ranges in elevation from 1440m to 1550m above mean sea level.

2.2 Regional Vegetation

The study site is located within the Grassland Biome, which is characterised by high summer rainfall and dry winters (Rutherford and Westfall, 1994). Frost during the winter nights and marked diurnal temperature variations are unfavourable for tree growth resulting in the Grassland Biome consisting mainly of grasses and plants with perennial underground storage organs, such as bulbs and tubers (Mucina and Rutherford, 2006). A large number of Rare and Threatened plant species in the summer rainfall regions of South Africa are restricted to high-rainfall grassland, making this the vegetation type in most urgent need of conservation.

The biomes within South Africa are divided into smaller units known as vegetation types. According to Mucina and Rutherford (2012), four vegetation types are associated with the study area, East Griqualand Grassland, Mabela Sandy Grassland, Eastern Temperate Freshwater Wetlands, and Highveld Alluvial Vegetation (Figure 2).

East Griqualand Grassland occurs in the KwaZulu-Natal and Eastern Cape Provinces, with Kokstad and Matatiele as centres, in an altitudinal range of 920-1740m above mean sea level (a.m.s.l.). It is characterised by hilly country with slopes covered by grassland, with patches of bush clumps in lower lying areas (Mucina and Rutherford, 2006).

Important taxa include **graminoids** such as *Aristida congesta*, *A. junciformis*, *Digitaria tricholaenoides*, *Elionurus muticus*, *Eragrostis chloromelas*, *E. plana*, *E. racemosa*, *E. capensis*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Melinus nerviglumis*, *Paspalum dilatatum*, *Sporobolus africanus*, *Themeda triandra*, *Tristachya leucothrix*, *Andropogon appendiculatus*, *Cynodon incompletus*, *Cyperus obtusiflorus* var. *obtusiflorus*, *Setaria nigrirostris*, and *Trachypogon spicatus*. Important **herbaceous species, geophytic herbs, and low shrubs** include *Alepidea duplidens*, *Berkheya griquana*, *Wahlenbergia dentata*, *W. ingrata*, *Acanthospermum australe*, *Conyza podocephala*, *Helichrysum herbaceum* var. *ovatus*, *Ipomoea crassipes*, *Pentanisia prunelloides* subsp. *latifolia*, *Vernonia natalensis*, *Haemanthus humilis* subsp. *hirsutus*, *Ledebouria sandersonii*, *Watsonia pillansii*, *Erica caffrorum* var. *caffrorum*, *Felicia filifolia* subsp. *filifolia*, *Helichrysum dregeanum*, *Rubus rigidus*, and *Euphorbia clavarioides* var. *clavarioides*.

According to Mucina and Rutherford (2006), this vegetation type is classified as Vulnerable and is poorly protected with only a small extent (0.2%) conserved in statutory reserves. Over a quarter of the area has been transformed by cultivation (maize), plantations and urban expansion.

Mabela Sandy Grassland occurs in the KwaZulu-Natal and Eastern Cape Provinces, mainly in the Mzimvubu River basin (known as Cedarville Flats) in the region of Cedarville and Matatiele. It occurs in an altitudinal range of 1440-1500m a.m.s.l. It is characterised by flat valley basins with a relatively high proportion of poorly drained soils with generally low nutrient status. It is dominated by species-poor, low-tussock, sour grasses with no indigenous trees. *Sporobolus pyramidalis* and *Aristida junciformis* are indicator species. Much of the bottomlands are subject to floods and therefore extensive sites of Eastern Temperate Freshwater Wetlands are embedded in this vegetation unit (Mucina and Rutherford, 2006).

Important taxa include **graminoids** such as *Andropogon eucomus, Aristida bipartita, A. congesta, A. junciformis* subsp. *galpinii, Brachiaria eruciformis, Cynodon dactylon, C. incompletus, Cymbopogon pospischilii, Digitaria argyrograpta, D. tricholaenoides, Elionurus muticus, Eragrostis capensis, E. gummiflua, E. plana, E. racemosa, E. patentissima, Heteropogon contortus, Hyparrhenia hirta, Imperata cylindrica, Paspalum distichum, Pennisetum clandestinum, P. thunbergii, Setaria sphacelata, Sporobolus pyramidalis, Themeda triandra* and *Tristachya leucothrix*. Important **herbaceous species** include *Acanthospermum australe*, *Monopsis decipiens* and *Psammotropha mucronata* var. *foliosa*. Important **geophytic herbs** include *Bulbine narcissifolia* and *Zantedeschia albomaculata* subsp. *albomaculata*, and the **geoxylic suffrutex** *Elephantorrhiza elephantina*.

According to Mucina and Rutherford (2006), this vegetation type is also classified as Vulnerable and is poorly protected with only a very small part conserved in statutory reserves. More than 20% has been transformed by cultivation (maize) and urban expansion, and overgrazing is a major threat, which increases risk of local erosion.

Eastern Temperate Freshwater Wetlands vegetation occurs in the Northern Cape, Eastern Cape, North West, Gauteng, Mpumalanga and KwaZulu-Natal Provinces, around water bodies with stagnant water such as pans, lakes, vleis, and edges of calmly flowing rivers. The vegetation type is embedded within the Grassland Biome and is characterised by a flat landscape and shallow depressions filled with water supporting zoned systems of aquatic and hygrophilous vegetation of temporary flooded grassland and ephemeral herblands. It occurs in an altitudinal range of 750-2000m above mean sea level (Mucina and Rutherford, 2006).

Important taxa include **graminoids** such as *Agrostis lachnantha*, *Andropogon appendiculatus*, *A. eucomus*, *Aristida aequiglumis*, *Carex acutiformis*, *C. austro-africana*, *C. cernua, Cyperus congestus, C. cyperoides*, *C. marginatus*, *Eleocharis palustris*, *Eragrostis plana*, *Echinochloa holubii*, *Eragrostis micrantha*, *Fuirena pubescens*, *Helictotrichon turgidulum*, *Hemarthria altissima*, *Hyparrhenia dregeana*, *Imperata cylindrica*, *Leersia hexandra*, *Panicum schinzii*, *Paspalum dilatatum*, *Pennisetum thunbergii*, *P. sphacelatum*, *Pycreus macranthus*, *Scleria dieterlenii*, *Setaria sphacelata* and *Xyris gerrardii*. Important **reeds and sedges** include

Phragmites australis, *Schoenoplectus corymbosus*, *Typha capensis* and *Cyperus immensus*. Important **herbaceous species** include *Berkheya radula*, *B. speciosa*, *Centella asiatica*, *C. coriacea*, *Chironia palustris*, *Falckia oblonga, Helichrysum difficile*, *H. dregeanum*, *Hydrocotyle verticillata*, *Lindernia conferta*, *Lobelia angolensis, Mentha aquatica*, *Monopsis decipiens*, *Pulicaria scabra*, *Pycnostachys reticulata*, *Ranunculus multifidus*, *Rumex lanceolatus*, *Senecio inornatus*, *Sium repandum*, *Thelypteris confluens*, *Wahlenbergia banksiana*. Important **geophytic herbs** include *Cordylogyne globosa*, *Crinum bulbispermum*, *Gladiolus papilio*, *Kniphofia ensifolia*, *K. fluviatilis*, *K. linearifolia*, *Neobolusia tysonii, Nerine gibsonii* and *Satyrium hallackii* subsp. *hallackii*. While important **aquatic species** include *Aponogeton junceus*, *Ceratophyllum demersum*, *Lagarosiphon major*, *Marsilea capensis*, *Myriophyllum spicatum, Nymphaea lotus*, *Nymphoides thunbergiana*, *Potamogeton thunbergii* and *Utricularia inflexa*.

According to Mucina and Rutherford (2006), this vegetation type is classified as Least Threatened with approximately 85% remaining, however it is poorly protected with around 5% protected in statutory reserves. Intensive grazing and use of lake and pans as drinking pools for livestock cause major damage to the wetland vegetation.

Highveld Alluvial Vegetation occurs in the Free State, North West, Mpumalanga, Eastern Cape, Gauteng, and Lesotho and Swaziland, in alluvial drainage lines and floodplains along rivers embedded within the Grassland Biome. It occurs in an altitudinal range of 1000-1500m above mean sea level and is characterised by a flat topography supporting riparian thickets, seasonally flooded grasslands and disturbed herblands often dominated by alien plants (Mucina and Rutherford, 2006). This vegetation is found on deep, sandy to clayey alluvial soils developed over Quaternary alluvial (fluviatile) sediments. Soils are Oakleaf, Dundee, Shortlands, Glenrosa and Mispah Forms. Rivers are perennial and often in flood in summer. Erosion of banks and deposition of new fine soil on alluvium can be extensive (Mucina and Rutherford, 2006).

Important taxa in **riparian thickets** include *Acacia karroo*, *Salix mucronata*, *Gymnosporia buxifolia*, *Rhus pyroides*, *Diospyros lycioides*, *Ehretia rigida*, *Grewia flava, Asparagus laricinus*, *Clematis brachiata, Lycium hirsutum*, *Setaria verticillata*, *Panicum maximum* and *Pollichia campestris*. Important taxa in **reed beds and flooded grasslands** include *Phragmites australis, Gomphocarpus fruticosus*, *Felicia muricata, Agrostis lachnantha*, *Chloris virgata*, *Cynodon dactylon*, *Eragrostis plana*, *Imperata cylindrica*, *Ischaemum fasciculatum*, *Miscanthus junceus*, *Paspalum distichum*, *Andropogon appendiculatus*, *Cyperus denudatus*, *Eragrostis obtusa*, *Fimbristylis ferruginea, Panicum coloratum*, *Sporobolus africanus*, *Themeda triandra*, *Urochloa panicoides, Persicaria lapathifolia*, *Barleria macrostegia*, *Corchorus asplenifolius*, *Equisetum ramosissimum*, *Galium capense*, *Hibiscus pusillus*, *Lobelia angolensis, Nidorella resedifolia*, *Persicaria amphibia, Pulicaria scabra, Senecio inornatus*, *Stachys hyssopoides*, *Vahlia capensis, Crinum bulbispermum*, *Haplocarpha lyrata* and **aquatic herb** *Myriophyllum spicatum*.

According to Mucina and Rutherford (2006), this vegetation type is classified as Least Threatened with approximately 10% conserved in statutory reserves. More than a quarter has been transformed by cultivation and dam building. Intensive grazing and alien invasive vegetation are major threats this vegetation type.

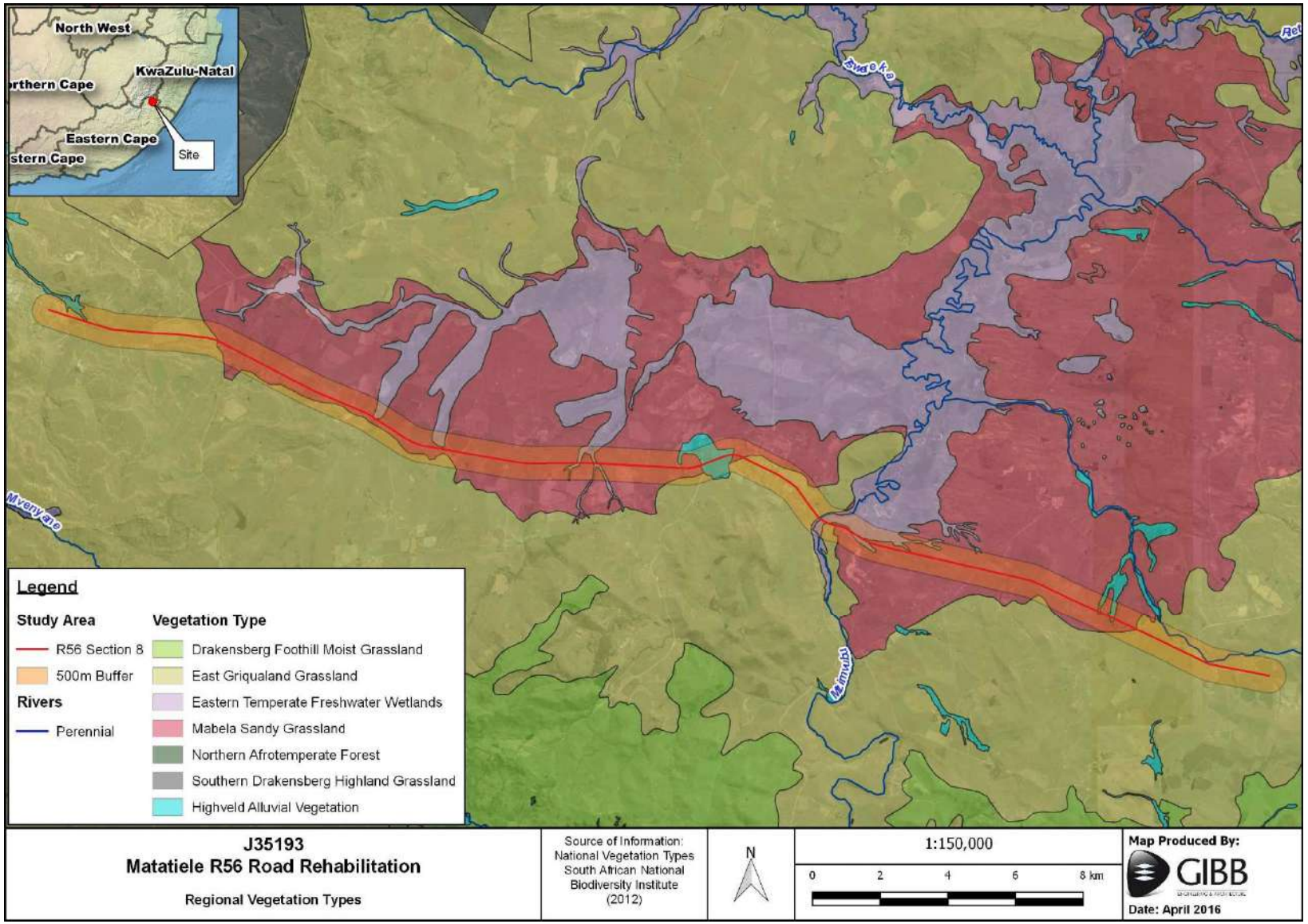

Figure 2: The study area in relation to national vegetation types

2.3 Ecological Habitat

The footprint of the proposed road rehabilitation project is relatively narrow (50m) and contained mainly the existing road reserve where little natural vegetation remained. It mostly comprised transformed areas, and secondary grassland disturbed by previous road-related construction activities. For the purpose of the ecological assessment, the areas immediately adjacent to the road reserve were also assessed and are generally referred to as the greater study area.

The greater study area comprised a mosaic of grassland and farmland, with watercourses, wetlands, pans and dams interspersed amongst agricultural fields and pastures. A few rocky outcrops and ridges occurred with associated rocky grassland. Stands of exotic trees were found in various places along the route.

Photo Plate 1: Mowed grass within the road reserve, and secondary grassland and agricultural fields within the greater study area

Important habitat in the greater study area included riparian and wetland habitat such as reed beds associated with rivers and drainage lines, pans, farm dams, open grassland, rocky grassland and rocky ridges. Please see Figure 3 for the distribution of habitats within the 500m buffer of the study area.

Please note that in the context of this report, wetland habitat refers to the physical habitat features associated with moist areas that are utilised by fauna for shelter, foraging and breeding, and does note denote the extent of any wetland. Please refer to the wetland delineation report for details pertaining to the extent of wetlands within the area of study.

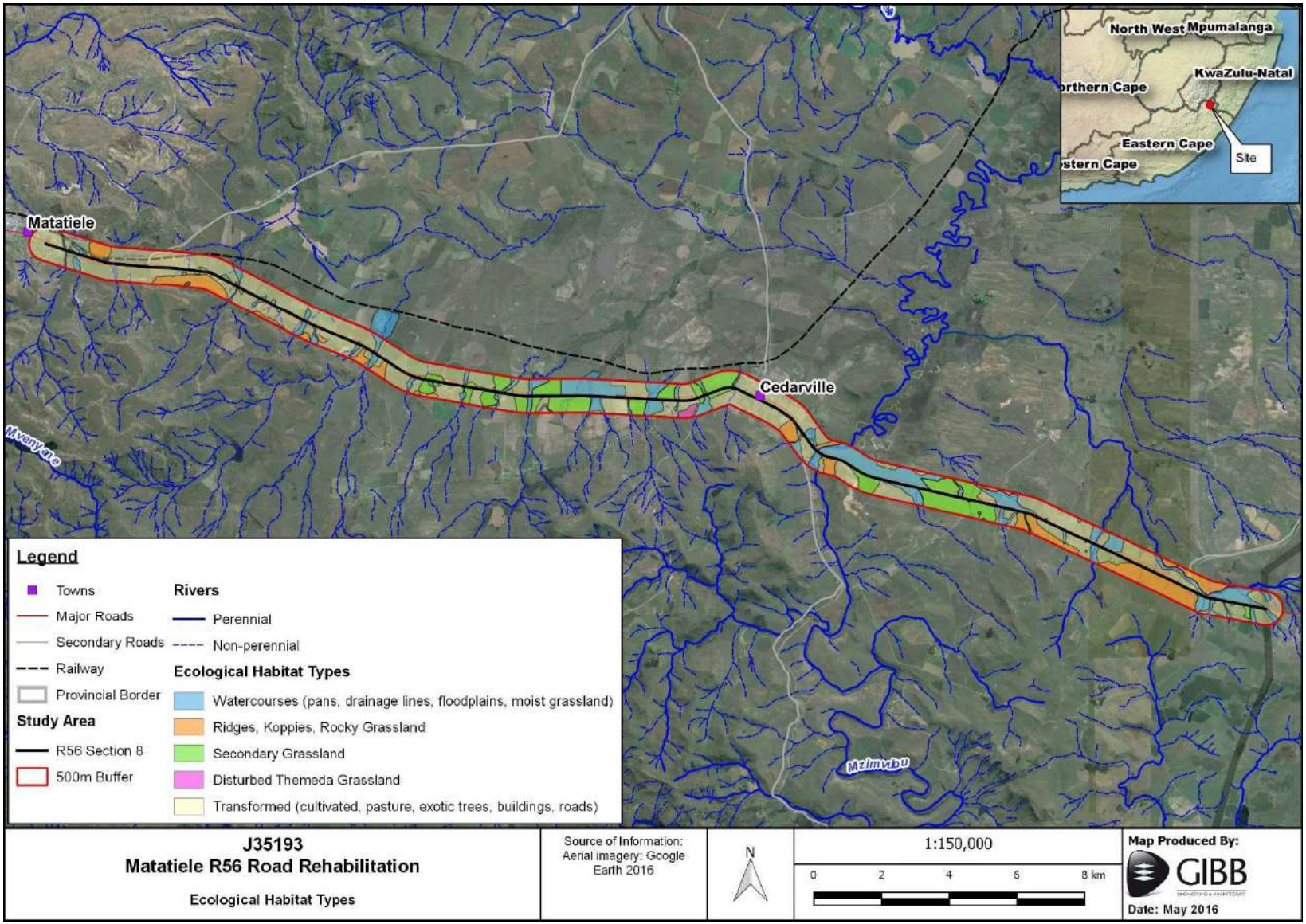

Figure 3: Ecological habitat types in the study area

2.3.1 Grassland

The grassland biome supports a wide variety of floral and faunal species, the occurrence of which depends on habitat and topographical features within the landscape. Grasslands are complex ecosystems that include rivers, wetlands, and rocky areas and may include a woody component associated with drainage lines. Only one in six plant species in grasslands are grasses, with the bulk being herbaceous and bulbous species (Cadman *et al*., 2013). These features create diverse shelter, foraging and breeding habitat for bird, mammal, reptile, amphibian and invertebrate species. Although disturbed in most areas, grassland on site occurred mostly on the periphery of the riparian and wetland areas, and provided habitat for fauna such as small mammals and many terrestrial bird species. Rocky grassland and a few small rocky outcrops occurred in the study area and in the surrounding landscape.

Rocky areas increase the habitat diversity of an area by providing predominantly a fire refuge for floral species and faunal species, thereby increasing the ecological diversity and habitat heterogeneity of the area. Rocky outcrops, cliffs and ridges are characterised by high spatial heterogeneity due to the range of differing aspects, slopes and altitudes all resulting in differing soil, light and hydrological conditions (Burnett *et al*., 1998). The varied topography of ridges is often recognised as the most powerful influence contributing to the high biodiversity of southern Africa (Samways and Hatton, 2000). Rocky areas within homogeneous landscapes provide a greater diversity of potential niches for plants and animals and in general, a large number of rare and endemic species are associated with rocky ridges as a result of the microclimatic conditions they offer (Burnett *et al*., 1998).

Photo Plate 2: Grassland (top) and rocky ridge (bottom) in the study area

2.3.2 Rivers, Wetlands and Waterbodies

Most of the faunal activity on site was detected around the riparian and wetland areas. Fauna observed within these areas included waterfowl and other wetland bird species, and small and medium sized mammals. Watercourses and wetlands are usually areas of high faunal diversity as the riparian environment and dense vegetation provides abundant cover, feeding and breeding habitat for many species of invertebrates, birds, mammals, reptiles and amphibians. When it is available, surface water provides drinking water, while the soft substrate provides perfect burrowing environments for fossorial animals. The increase in prey and vegetation attracts a high diversity of birds as well as terrestrial mammals and reptiles, including predators.

Watercourses and the associated riparian vegetation also tend to be corridors of movement through the landscape for fauna and flora. They are especially important in cultivated or transformed landscapes where most of the natural terrestrial habitat has been destroyed or transformed. The preservation of such ecological networks is imperative for the conservation of biodiversity and provision of ecosystem services (Samways *et al*., 2009).

Photo Plate 3: Pan (top left), dam and moist grassland (top right), and major culvert over drainage line (bottom)

Photo Plate 4: Watercourses are corridors for movement through the landscape

2.3.3 Agricultural Fields

As the human population continues to increase, so has the need for food and consequently the conversion of natural habitat to agriculture is currently the largest cause of anthropogenic habitat alteration, with around one third of the world's exploitable surface now dominated by agriculture (Ormerod and Watkinson, 2000). Conversion of natural grassland habitat has forced species to adapt and find alternative habitat options. Species that were once common in grasslands are now seen foraging in agricultural lands as fields and pastures provide feeding alternative habitat for many grassland species.

2.3.4 Stands of Exotic Trees

While these trees are alien and many species invasive, and while they are not normally considered important ecological habitat, they often provide shelter for many faunal species, especially birds and bats. Stands of exotic trees, especially in transformed landscapes, provide shelter for roosting, perching and nesting.

2.4 Floral Species Occurrence

Disturbed or secondary grassland in most parts of the study area comprised mono-dominant stands of grass species such *Hyparrhenia tamba*, *H. hirta*, and *Diheteropogon amplectens*. In other areas, pasture grasses such as *Panicum* sp., *Pennisetum clandestinum*, or naturalised exotic species such as *Cymbopogon pospischilii* were common.

Photo Plate 5: Secondary grassland along the road side comprised of mono-dominant stands of grass species

Remnant patches of dry grassland were observed where herbaceous, succulent and geophytic species such as *Hypoxis hemerocallidea* (Declining), *Aloe ecklonis*, *Ledebouria ovatifolia*, *Ledebouria revoluta* and *Boophone disticha* (Declining), occurred along the route within the road reserve. These species were likely maintained in these areas by the continual mowing along the road side. Other areas indicative of overgrazed grassland was observed where species such as *Bulbine narcissifolia* was very common in certain areas. This species often forms stands, especially in overgrazed areas and is very conspicuous during the flowering season.

Please refer to Appendix A for a list of plant species that have been confirmed to occur within QDGC 3028BD and 3029AC combined, along with their threat status according to the South African National Red List status (SANBI, 2014).

Photo Plate 6: Geophytic species observed along the road side, *Hypoxis hemerocallidea* (left) and *Boophone disticha* (right), both Declining species

Table 1: Some common plant species found adjacent to the road during the field visit

Taxonomic Name	Growth Form	Threat Status
Aloe ecklonis	Herb, succulent	LC
Aristida junciformis	Graminoid	LC
Boophone disticha	Geophyte, herb, succulent	Declining
Bulbine favosa	Geophyte, herb, succulent	LC
Bulbine narcissifolia	Geophyte, herb, succulent	LC
Eragrostis curvula	Graminoid	LC
Hermannia depressa	Herb	LC
Hyparrhenia hirta	Graminoid	LC
Hyparrhenia tamba	Graminoid	LC
Hypoxis hemerocallidea	Geophyte, herb, succulent	Declining
Hypoxis obtusa	Geophyte, herb, succulent	LC
Ledebouria ovatifolia	Geophyte	LC
Ledebouria revoluta	Geophyte	LC
Themeda triandra	Graminoid	LC

2.4.1 Alien and Invasive Plants

Declared weeds and invaders have the tendency to dominate or replace the herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that all these invaders be eradicated and controlled by means of an eradication and monitoring programmes. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

Many areas along the route were infested with alien and invasive plant species. The Alien and Invasive Species (AIS) Regulations published under the National Environmental Management Biodiversity Act (NEMBA: Act no. 10 of 2004) in the Government Gazette of 1 August 2014, regulate the control of weeds and invasive plants. The AIS Regulations list four different categories for the management, control or eradication of species from areas where they may cause harm. The four categories include:

- **Category 1a:** Invasive species which must be combated and eradicated. Any form of trade or planting is strictly prohibited.
- **Category 1b:** Invasive species which must be controlled and wherever possible, removed and destroyed. Any form of trade or planting is strictly prohibited.
- **Category 2:** Invasive species or species deemed to be potentially invasive, in that a permit is required to carry out a restricted activity. Category 2 species include commercially important species such as pine, wattle and gum trees. Plants in riparian areas are Category 1b.
- **Category 3:** Invasive species which may remain in prescribed areas or provinces. Further planting, propagation or trade is however prohibited. Plants in riparian areas are Category 1b.

Table 2: Most common alien invasive plant species found adjacent to the road

Taxonomic Name	Common Name	NEMBA Category
Acacia mearnsii	Black Wattle	2
Bidens pilosa	Blackjack	Not listed
Canna indica	Canna	1b
Cosmos bipinnatus	Cosmos	Not listed
Eucalyptus spp.	Gum	2
Lantana camara	Tickberry	1b
Melia azedarach	Syringa	1b
Opuntia ficus-indica	Prickly Pear	1b
Pennisetum clandestinum	Kikuyu	Not listed
Populus x *canescens*	Poplar	2
Robinia pseudoacacia	Black Locust	2
Rubus cuneifolius	American Bramble	1b
Salix babylonica	Weeping Willow	2
Solanum mauritianum	Bugweed	1b

2.5 Faunal Species Occurrence

Following is an account of the faunal species associated with area of study and those confirmed or likely to occur on the site. Please refer to the appendices for detailed lists of the species discussed below. Species of conservation concern are those with a Red List status (national and global) higher than Least Concern and includes protected species (national). Any conservation status reported in the text refers to the current national listing.

2.5.1 Avifauna

Approximately 318 bird species have been confirmed to occur within QDGC 3028BD and 3029AC combined. Of this total, approximately 244 species (76.7%) are associated with a grassland / farmland mosaic, including inland freshwater ecosystems. With rocky habitat added (as is the character of the study area), 262 (82.4%) species are accounted for. This implies that the habitat types found in the region of the study area are generally representative of the QDGCs, and therefore the area has the potential to support the majority of the species. During the field survey, 34 bird species were recorded along the route, which are listed in Table 3 along with their national (Taylor *et al*., 2015) and global (IUCN [World Conservation Union] Red List of Threatened Species, 2015) conservation status. Overall the bird species observed on site were mostly adapted to grassland and riparian / wetland habitats.

A high level of endemism exists in the area with 53 bird species endemic to southern Africa occurring in the QDGCs combined. A smaller proportion of species are of conservation concern, with a total of 29 bird species occurring in the QDGCs combined listed either nationally or globally as being of conservation concern (Appendix B).

Six bird species of conservation concern were recorded in the study area during the field visit, namely *Balearica regulorum* (Grey Crowned Crane), *Gyps coprotheres* (Cape Vulture) and *Circus ranivorus* (African Marsh-Harrier) currently listed as Endangered, *Neotis denhami* (Denham's Bustard) currently listed as Vulnerable, and *Anthropoides paradiseus* (Blue Crane) and *Anthropoides paradiseus* (Pallid Harrier) currently listed as Near Threatened. Three bird species endemic to southern Africa were recorded in the study area during the field survey, and included *Buteo rufofuscus* (Jackal Buzzard), *Oenanthe monticola* (Mountain Wheatear), and *Myrmecocichla formicivora* (Ant-eating Chat).

Although not recorded during the field survey, seven additional bird species of conservation concern were given a high likelihood of occurring in the vicinity of the study area due to the presence of suitable breeding and/or foraging habitat (see Methods). Such species included *Bugeranus carunculatus* (Wattled Crane; Critically Endangered), *Circus maurus* (Black Harrier; Endangered), *Geronticus calvus* (Southern Bald Ibis; Vulnerable), *Sagittarius serpentarius* (Secretarybird; Vulnerable), *Falco biarmicus* (Lanner Falcon; Vulnerable), *Oxyura maccoa* (Maccoa Duck; Near Threatened), and *Coracias garrulus* (European Roller; Near Threatened) (Appendix B).

The areas surrounding Matatiele and Cedarville are recognised as habitat that supports many faunal species of conservation concern. Species such as Blue Crane, Grey Crowned Crane,

Wattled Crane, Secretarybird, Denham's Bustard and African Marsh Harrier frequent the grasslands, dams and wetlands in the area. For this reason the Matatiele Nature Reserve was declared an internationally recognised Important Bird Area (IBA) and the Cedarville "Flats" was declared a Protected Environment in 2015 (see Annexure).

2.5.2 Mammals

The region includes a relatively high diversity of mammals with approximately 91 species expected to occur within QDGC 3028BD and 3029AC combined, according to the IUCN distribution ranges and the electronic database contained within MammalMap (ADU, 2016). These species are listed in Appendix C along with the likelihood of each species occurring in the study area as well as their national (Friedmann and Daly, 2004; DEAT, 2007) and global (IUCN, 2015) conservation status.

During the field survey, three mammal species were identified in the study area, namely *Aonyx capensis* (Cape Clawless Otter), *Atilax paludinosus* (Water Mongoose) and *Felis silvestris* (African Wildcat), their spoor recorded in the riparian areas at culverts and under bridges along the route. None of these species are currently of conservation concern except the Cape Clawless Otter, which is Protected under national legislation.

While unlikely to occur within the footprint of the proposed road rehabilitation project, many mammal species are highly likely to inhabit the surrounding grasslands and wetlands. Mammal species of conservation concern include *Leptailurus serval* (Serval), *Otomys auratus* (Vlei Rat), *Orycteropus afer* (Aardvark), *Ourebia ourebi* (Oribi), and *Dasymys incomtus* (African Marsh Rat).

2.5.3 Herpetofauna

Reptiles

According to ReptileMAP (Bates *et al*., 2014; ADU, 2016), the continuation of the Southern African Reptile Conservation Assessment (SARCA), only six reptile species have been confirmed to occur within QDGC 3028BD and 3029AC combined. The search was therefore extended to the surrounding QDGCs, which produced a total of 31 species. These are listed in Appendix D along with their national (Bates *et al*., 2014) and global (IUCN, 2015; CITES, 2016) conservation status.

While no reptiles were encountered during the field survey, seven species were given a high likelihood of occurring in the study area due to the presence of suitable habitat (Appendix D). Amongst these species are two endemic chameleon species *Bradypodion thamnobates* (Natal Midlands Dwarf Chameleon) and *Bradypodion melanocephalum* (KwaZulu Dwarf Chameleon), both currently listed as Vulnerable. Recent genetic studies show that the two species form a larger species complex (comprising *B. melanocephalum* and *B. thamnobates*). Genetically the two species are poorly differentiated however morphological differences are marked (Da Silva and Tolley, 2013). Further genetic studies are required to confirm the taxonomic status of the two forms within this complex (Tolley, 2014).

These species are known to inhabit seemingly disturbed areas, such as at road sides. Adults often inhabit small patches of structured habitat including exotic vegetation and the juveniles of *Bradypodion thamnobates* are often found in grassland (Bates *et al*., 2014). It is therefore recommended that (should the proposed project be authorised) night-time surveys for both species be conducted prior to construction mainly at sites containing grassland and structured habitat, even exotic vegetation. Surveys must be undertaken by a suitably qualified ecologist or herpetologist, and if found to occur within the construction footprint, they must be rescued and relocated by a suitably qualified specialist prior to construction commencing.

Amphibians

According to FrogMAP (Minter *et al.*, 2004; ADU, 2016), the continuation of the Southern African Frog Atlas Project (SAFAP), 12 amphibian species have been confirmed to occur within QDGC 3028BD and 3029AC combined, while a further nine possibly occur in the area according to IUCN species distribution ranges. These are listed in Appendix E along with their national (Measey, 2011) and global (IUCN, 2015) conservation status. All of these species are currently listed as Least Concern both nationally and globally, except for *Cacosternum striatum* (Striped Caco), which is currently listed as Data Deficient.

While no amphibians were encountered during the field survey, 13 species were given a high likelihood of occurring in the study area due to the presence of suitable habitat (Appendix E). Many amphibian species utilise small temporary pools, such as those often found on road sides or near culverts, for breeding. It is therefore recommended that construction for such a project begin in the dry winter months, so as to minimise disturbance to any amphibian species breeding in temporary road-side pools.

Table 3: Faunal species confirmed in the study area during the field visit (species are listed in taxonomic order)

Taxonomic Name	Common Name	Conservation Status*	
		RSA	IUCN
Birds			
Numida meleagris	Helmeted Guineafowl	LC	LC
Alopochen aegyptiaca	Egyptian Goose	LC	LC
Plectropterus gambensis	Spur-winged Goose	LC	LC
Anas capensis	Cape Teal	LC	LC
Anas undulata	Yellow-billed Duck	LC	LC
Apus caffer	White-rumped Swift	LC	LC
Spilopelia senegalensis	Laughing Dove	LC	LC
Streptopelia capicola	Cape Turtle-Dove	LC	LC
Neotis denhami	Denham's Bustard	VU	NT
Balearica regulorum	Grey Crowned Crane	EN	EN

Taxonomic Name	Common Name	Conservation Status*	
		RSA	IUCN
Anthropoides paradiseus	Blue Crane	NT	VU
Charadrius tricollaris	Three-banded Plover	LC	LC
Vanellus armatus	Blacksmith Lapwing	LC	LC
Elanus caeruleus	Black-shouldered Kite	LC	LC
Gyps coprotheres	Cape Vulture	EN; En	VU
Circus ranivorus	African Marsh-Harrier	EN	LC
Circus macrourus	Pallid Harrier	NT; NBM	NT
Buteo rufofuscus	Jackal Buzzard	LC; En	LC
Lophaetus occipitalis	Long-crested Eagle	LC	LC
Ardea cinerea	Grey Heron	LC	LC
Ardea melanocephala	Black-headed Heron	LC	LC
Bostrychia hagedash	Hadeda Ibis	LC	LC
Threskiornis aethiopicus	African Sacred Ibis	LC	LC
Lanius collaris	Common Fiscal	LC	LC
Corvus capensis	Cape Crow	LC	LC
Corvus albus	Pied Crow	LC	LC
Corvus albicollis	White-necked Raven	LC	LC
Saxicola torquatus	African Stonechat	LC	LC
Oenanthe monticola	Mountain Wheatear	LC; En	LC
Myrmecocichla formicivora	Ant-eating Chat	LC; En	LC
Lamprotornis nitens	Cape Glossy Starling	LC	LC
Riparia paludicola	Brown-throated Martin	LC	LC
Cecropis abyssinica	Lesser Striped Swallow	LC	LC
Euplectes orix	Southern Red Bishop	LC	LC
Mammals			
Aonyx capensis	Cape Clawless Otter	LC; Pr	LC
Atilax paludinosus	Water Mongoose	LC	LC
Felis silvestris	African Wildcat	LC	LC

*EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; En = Endemic; NBM = Non-breeding Migrant

3 Ecological Sensitivity

3.1 Criteria

The study area was assessed in terms of its ecological importance both on a local and regional scale, which took both ecological function and conservation importance (see definitions below) into account. Importance, and therefore sensitivity to the proposed development, was classified as follows:

High: Areas that contain predominantly natural habitat and/or are important in maintaining biodiversity in the region. These areas have either or both high ecological function and conservation importance. Destruction of this habitat may result in a regional loss of biodiversity. Examples of this habitat include rocky ridges and wetland areas including farm dams.

Medium: Habitat recorded on site that has medium ecological importance. These areas contain secondary vegetation / semi-natural habitat or modified habitat (may include alien vegetation). These areas either have the potential for conservation (if rehabilitated for example) and moderate ecosystem function, or may have high ecological function and low conservation importance. Destruction of this habitat will not result in significant loss of biodiversity from a regional perspective.

Low: Habitat recorded within the study area that has low ecological importance. These areas have little or no ecological function and conservation importance due to the high level of transformation and/or degradation.

Please note that areas may be classified by a combination of the above categories, e.g. medium-high, if for example an area is disturbed and has moderate ecosystem function but if rehabilitated may provide habitat for species of conservation concern and/or important biodiversity features and the site could contribute to reaching conservation targets for these features. Alternatively an area may have high ecological function but is fragmented and too small to offer high conservation value.

Definitions:

Ecological Function: Ecological function describes the intactness of the structure and function of the vegetation communities which in turn support faunal communities. It also refers to the degree of ecological connectivity between the identified habitats and other systems within the landscape. Therefore, systems with a high degree of landscape connectivity among each other are perceived to be more sensitive.

High: Natural areas with no or low evidence of human impact are considered to have intact ecosystem function and are considered important for the maintenance of ecosystem integrity. Most of these habitats are represented by vegetation communities in late succession and ecosystems with connectivity to other important ecological

systems, or are specialised habitats for fauna. These areas also offer valuable ecosystem services.

Medium: Habitat that occurs at disturbances of medium intensity and is representative of vegetation communities in secondary succession stages with some degree of connectivity with other ecological systems. These areas, although often disturbed, are usually utilised by fauna.

Low: Degraded and highly disturbed habitat or modified vegetation with little or no ecological function.

Conservation Importance: The conservation importance of the site gives an indication of the necessity to conserve areas based on factors such as the importance of the site on a regional, provincial or national scale and on the ecological state of the area (degraded or pristine). This is determined by the presence of high diversity, rare, threatened or endemic species, threatened ecosystems and areas that are protected by legislation.

High: Habitats with high species diversity and usually provide suitable habitat for species of conservation concern, or habitats representative of a threatened ecosystem. These areas should be maintained for the persistence of biodiversity.

Medium: Habitats with intermediate levels of species diversity without any species of conservation concern.

Low: Areas with little or no conservation potential and are usually species poor or contain transformed and/or degraded habitat.

3.2 Ecological Sensitivity Map

Based on the findings of the ecological assessment and the above criteria, importance of habitats pertaining to flora and fauna (and thus sensitivity to the proposed development) was mapped. For clarity, the sensitivity categories were extended to the 500m buffer surrounding the route and proposed road reserve. For ease of reference, the route was split into segments (Figures 5 – 12); please refer to Figure 4 for the map plan.

3.2.1 Highly Sensitive Areas

Highly sensitive areas included riparian and wetland habitat associated with rivers and drainage lines, including pans and farm dams. Especially important is the floodplain associated with the Mzimvubu River in the Cedarville area (known as the Cedarville Flats). Wetland and riparian areas are known to support a higher biodiversity, and tend to be important ecological corridors of movement for flora and fauna through the landscape. Due to the wet substrate they are not easily cultivated and they form a network of untransformed habitat through a landscape dominated by agriculture. Other highly sensitive habitat in the study area included rocky ridges, disturbed primary grassland, rocky grassland and rocky outcrops. All areas

deemed highly sensitive will need to be assessed for impacts and carefully mitigated during construction.

3.2.2 Areas with Medium Sensitivity

Areas with medium sensitivity in the study area included secondary or degraded grassland. This included areas within the mowed road reserve where a few important herbaceous and geophytic species were observed in some areas. Some of these species will need to be relocated before construction commences.

3.2.3 Areas with Low Sensitivity

Areas of low sensitivity in the study area include all transformed habitat such as settlement, farm buildings, roads, cultivated fields, and pasture fields.

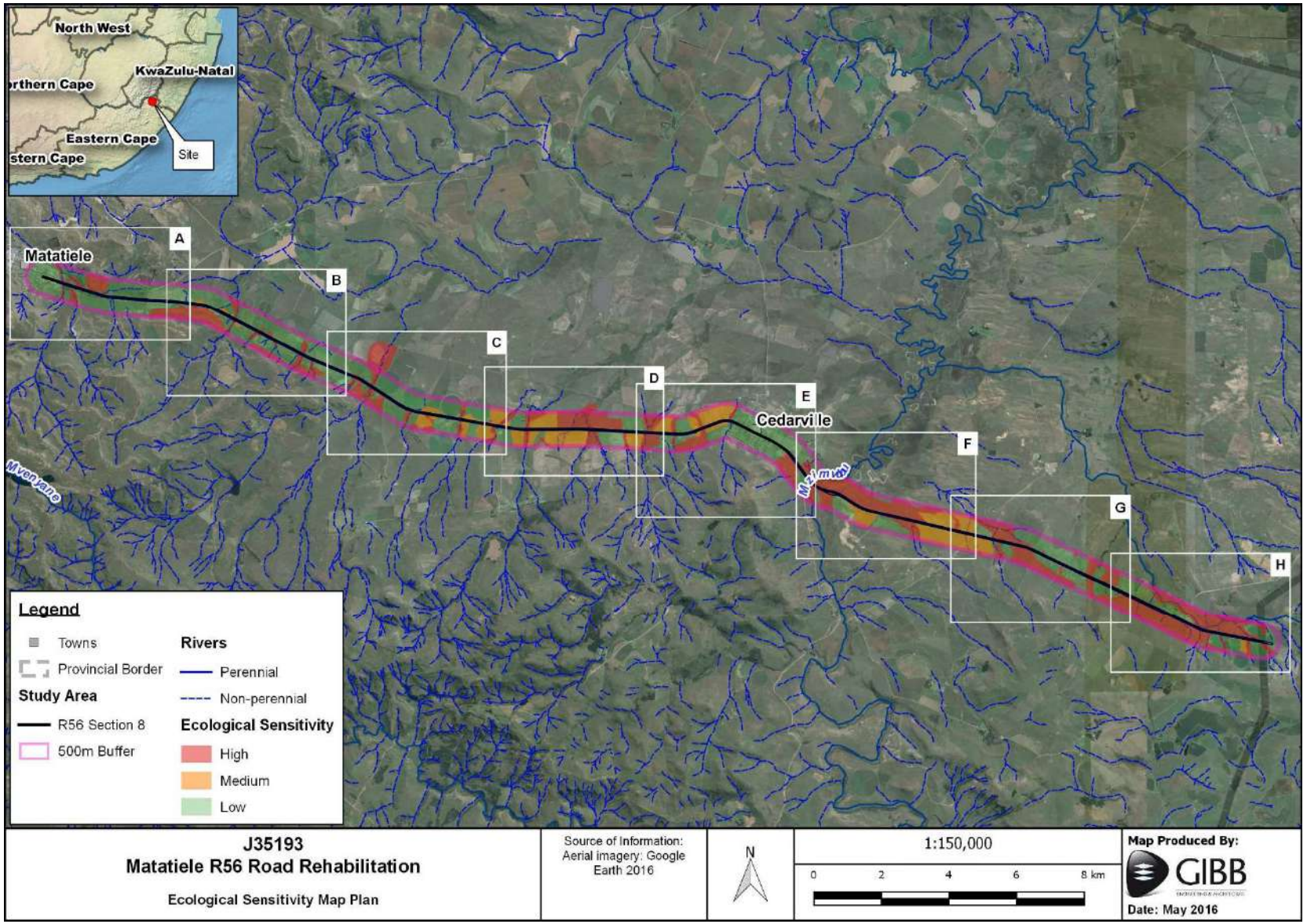

Figure 4: Ecological Sensitivity Map Plan

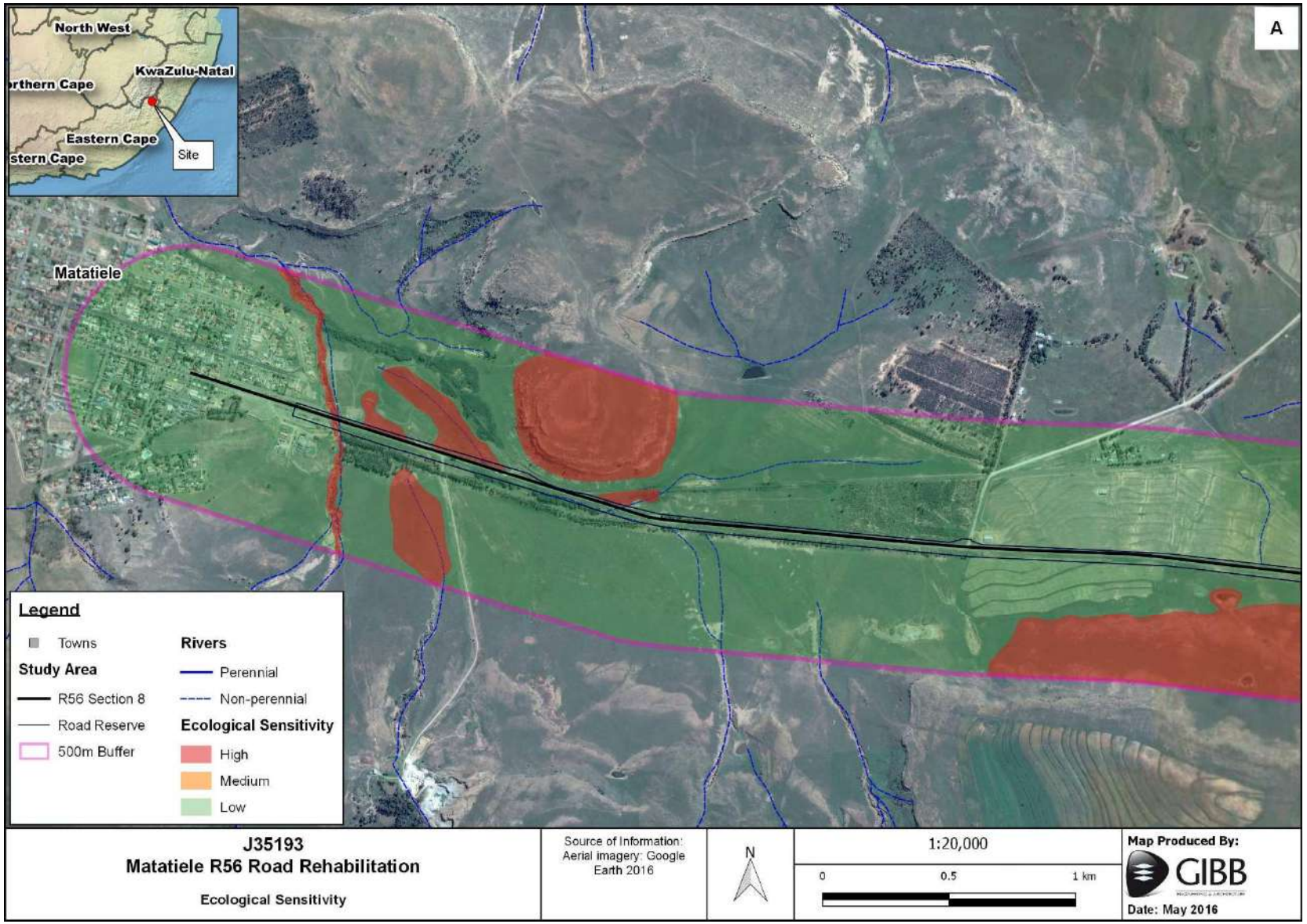

Figure 5: Ecological Sensitivity Map A

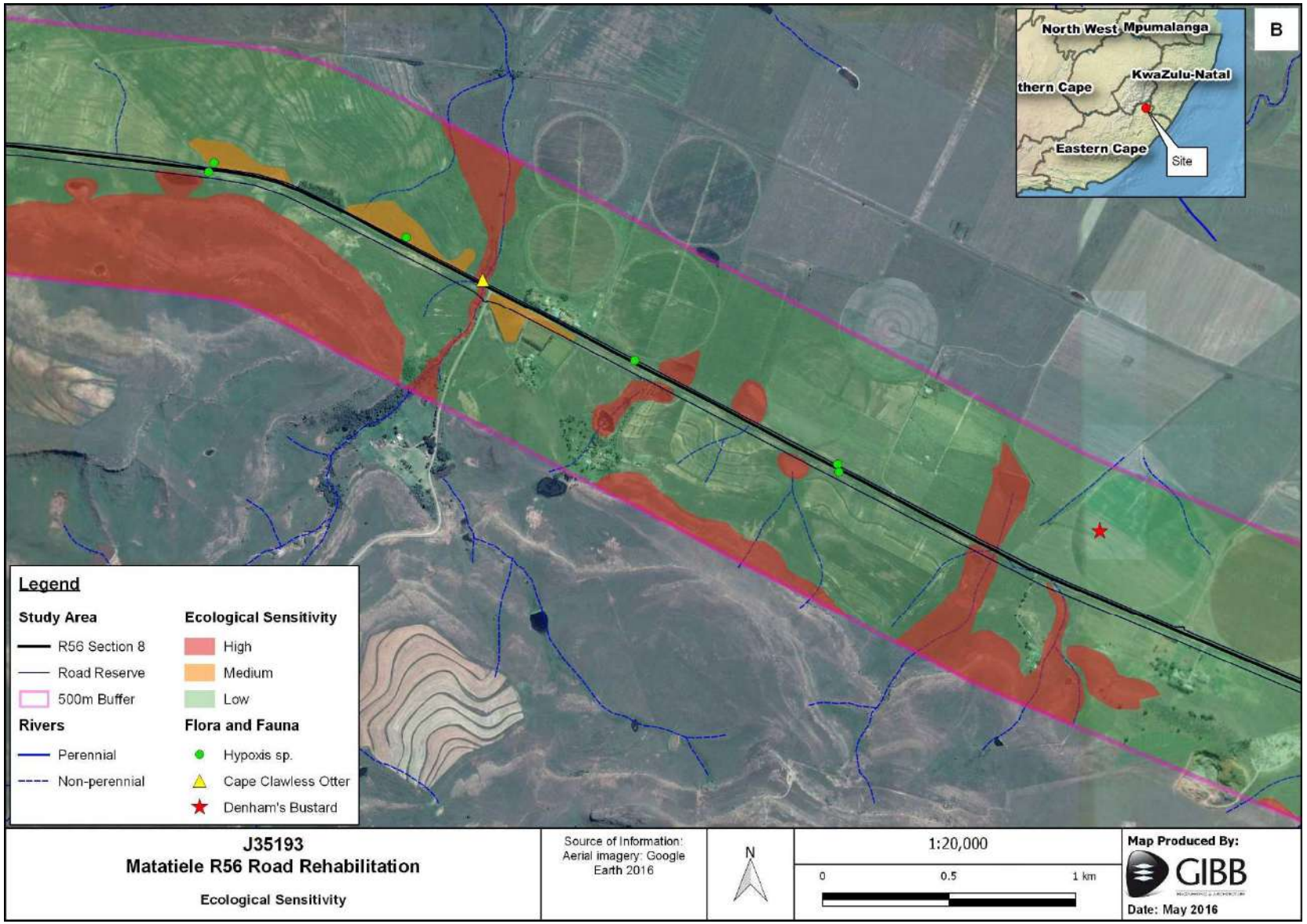

Figure 6: Ecological Sensitivity Map B

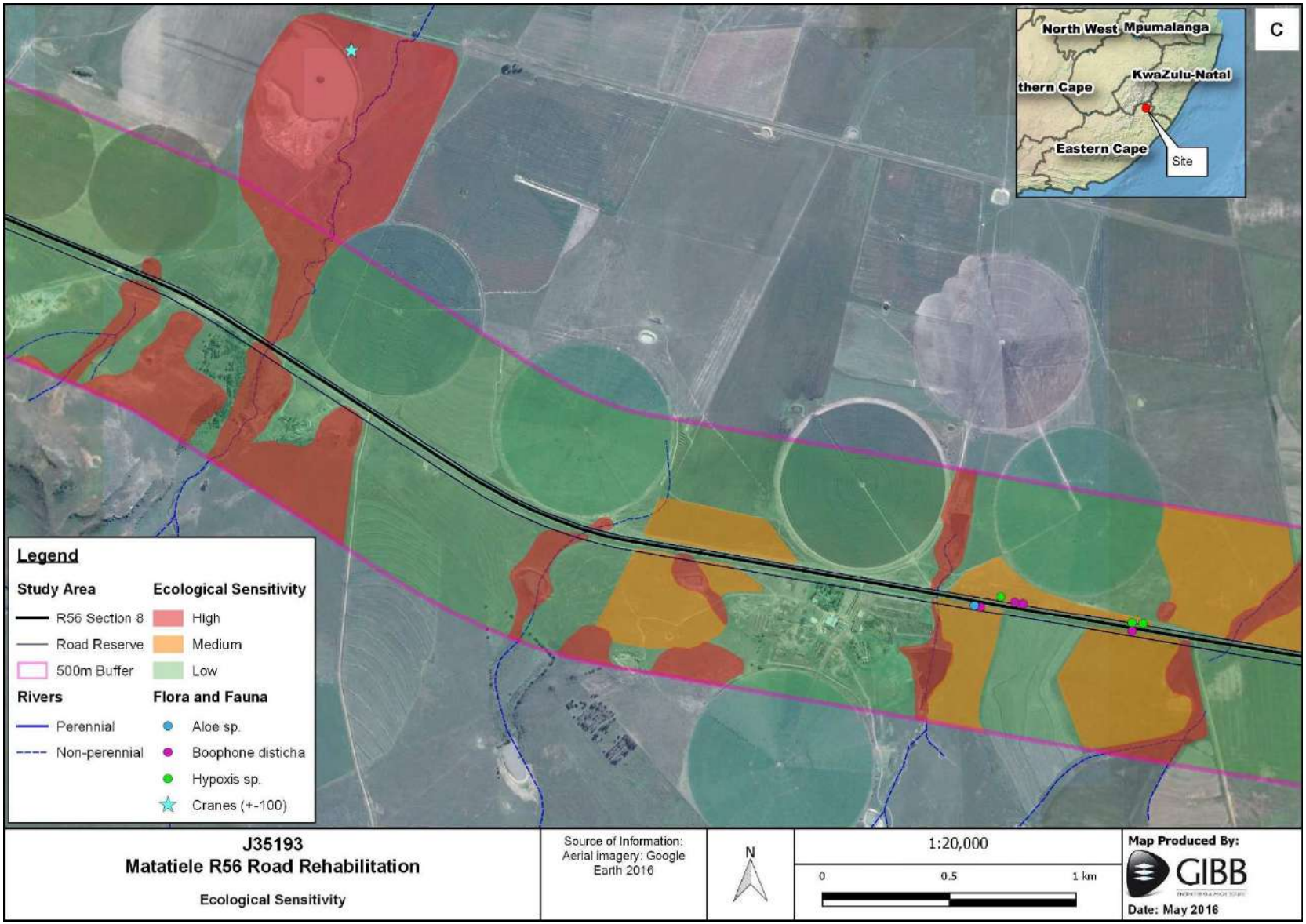

Figure 7: Ecological Sensitivity Map C

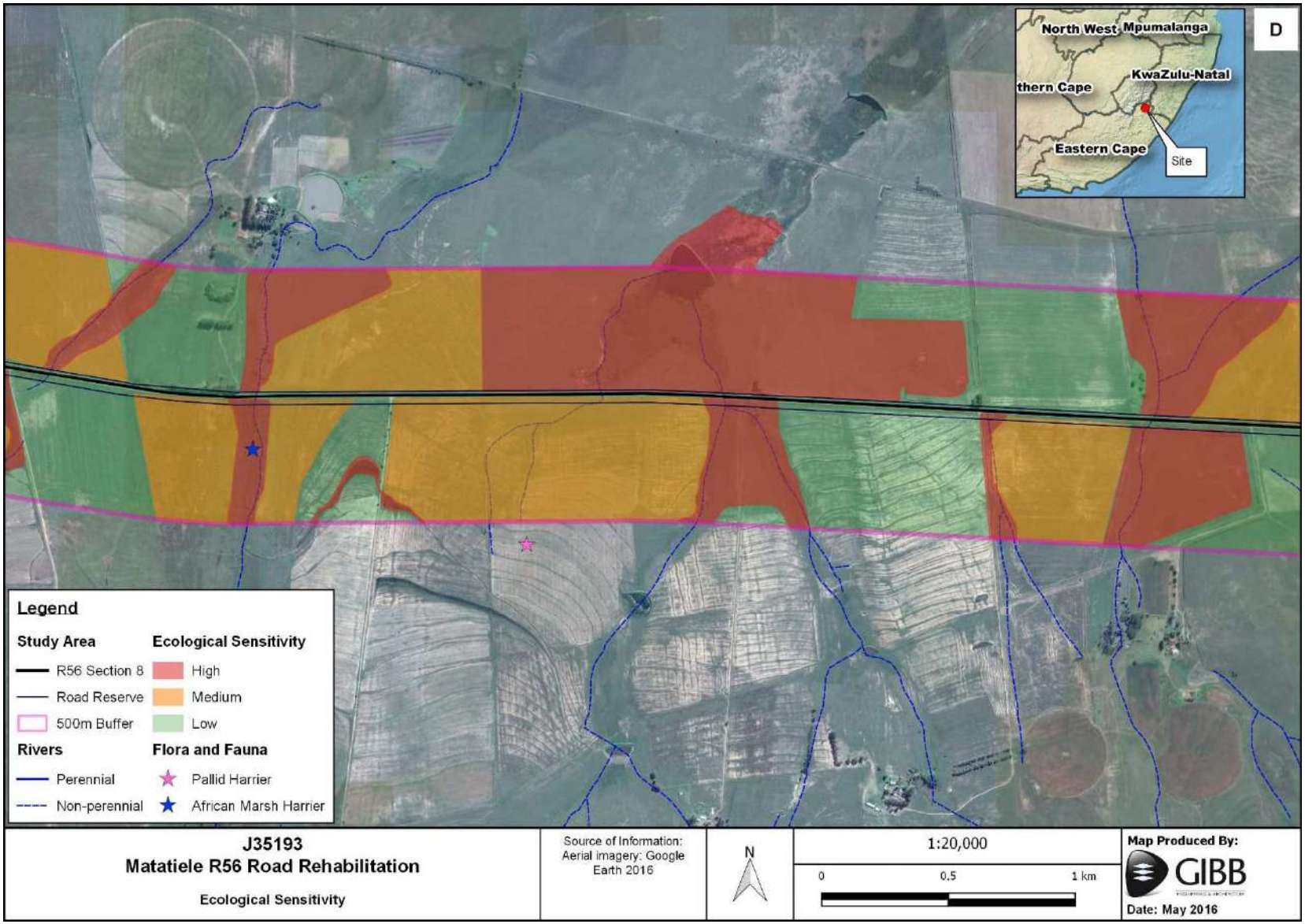

Figure 8: Ecological Sensitivity Map D

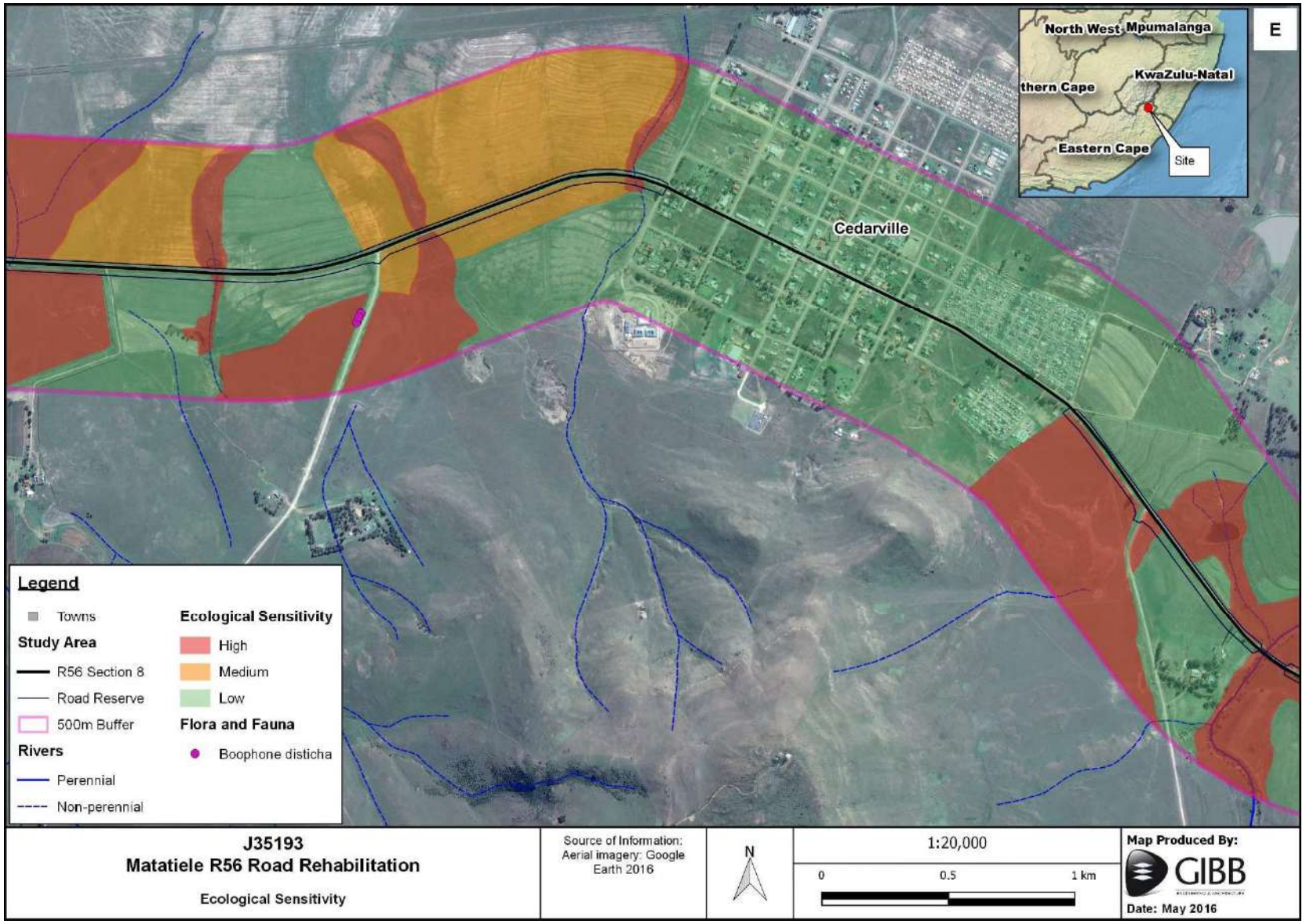

Figure 9: Ecological Sensitivity Map E

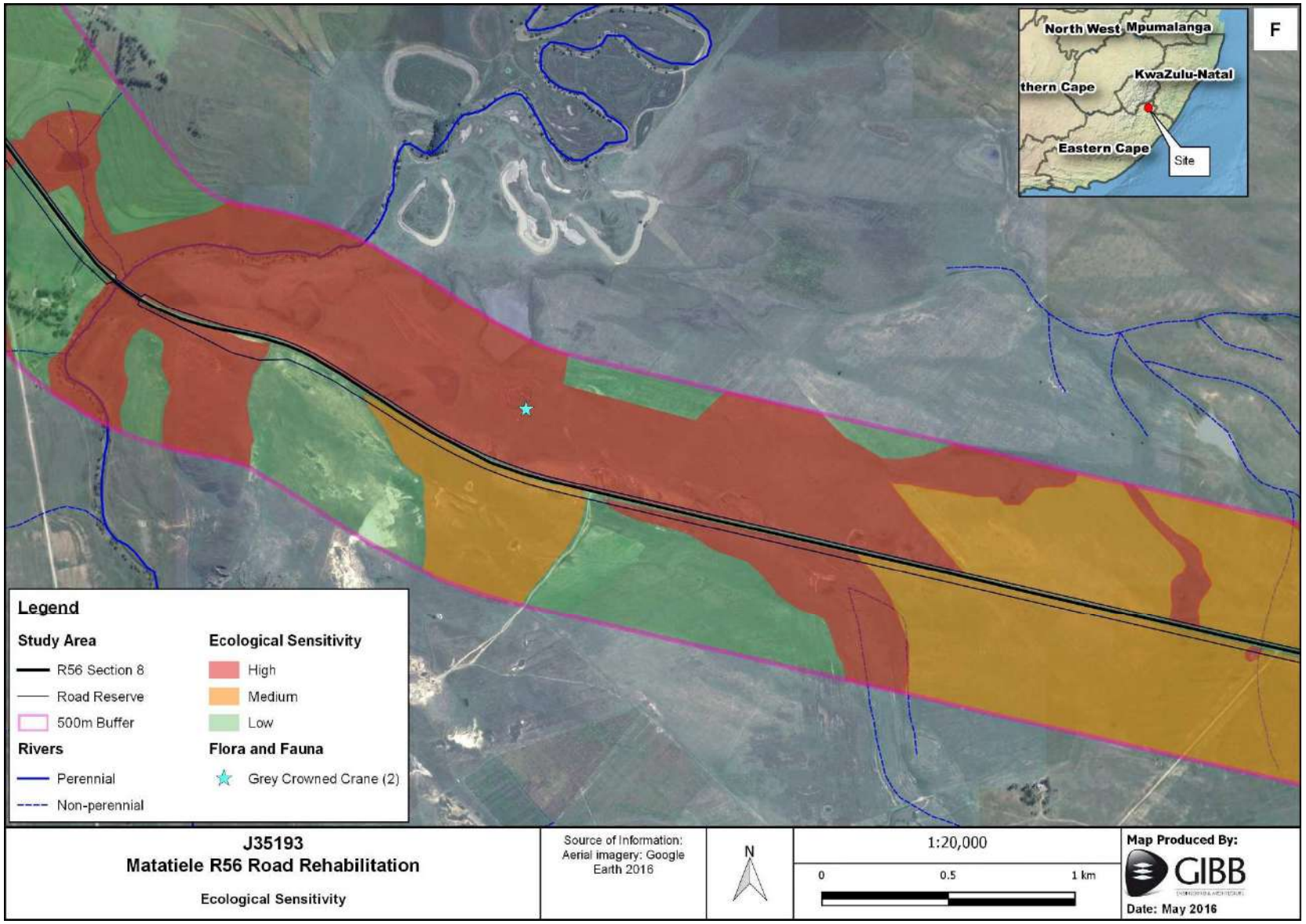

Figure 10: Ecological Sensitivity Map F

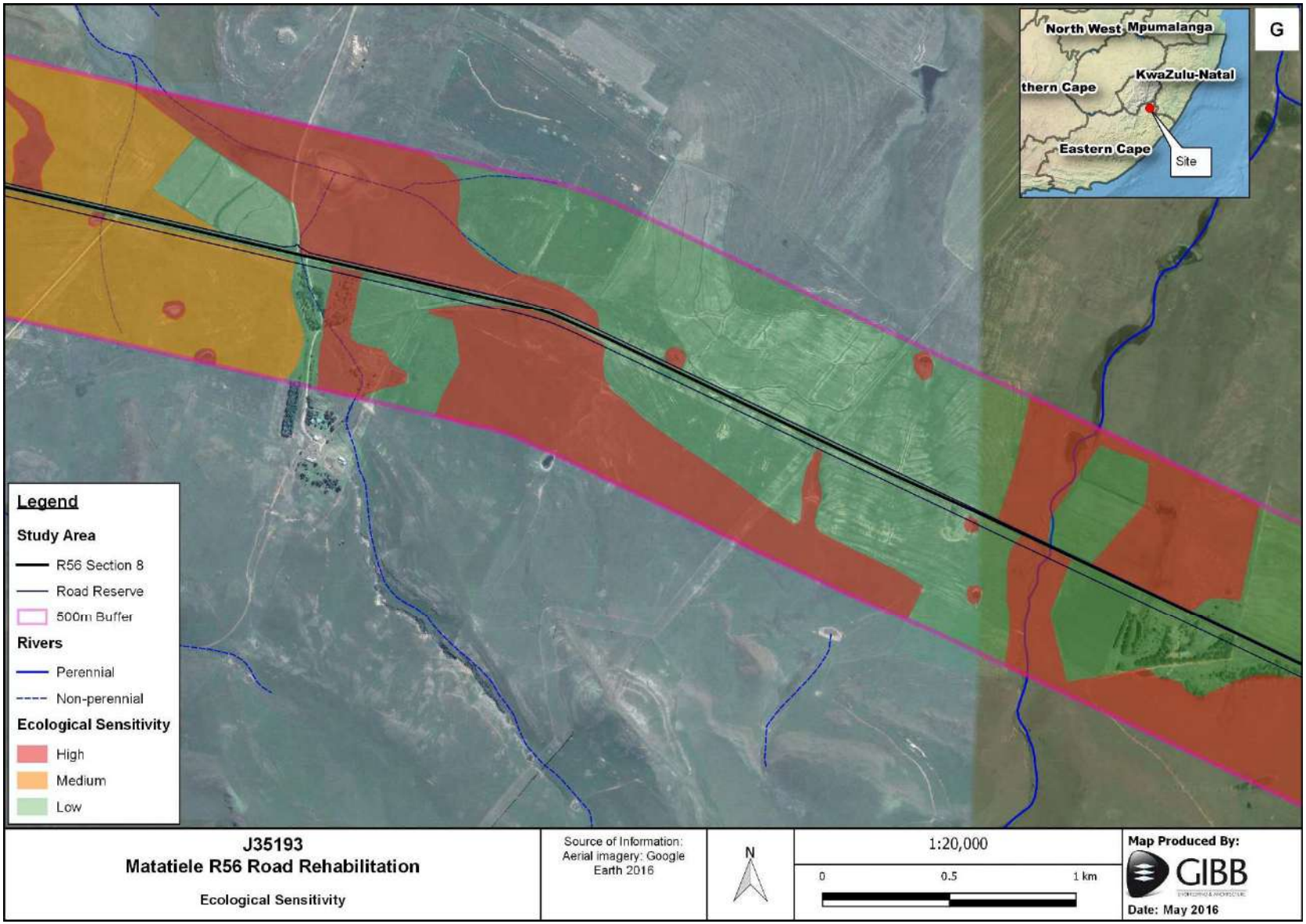

Figure 11: Ecological Sensitivity Map G

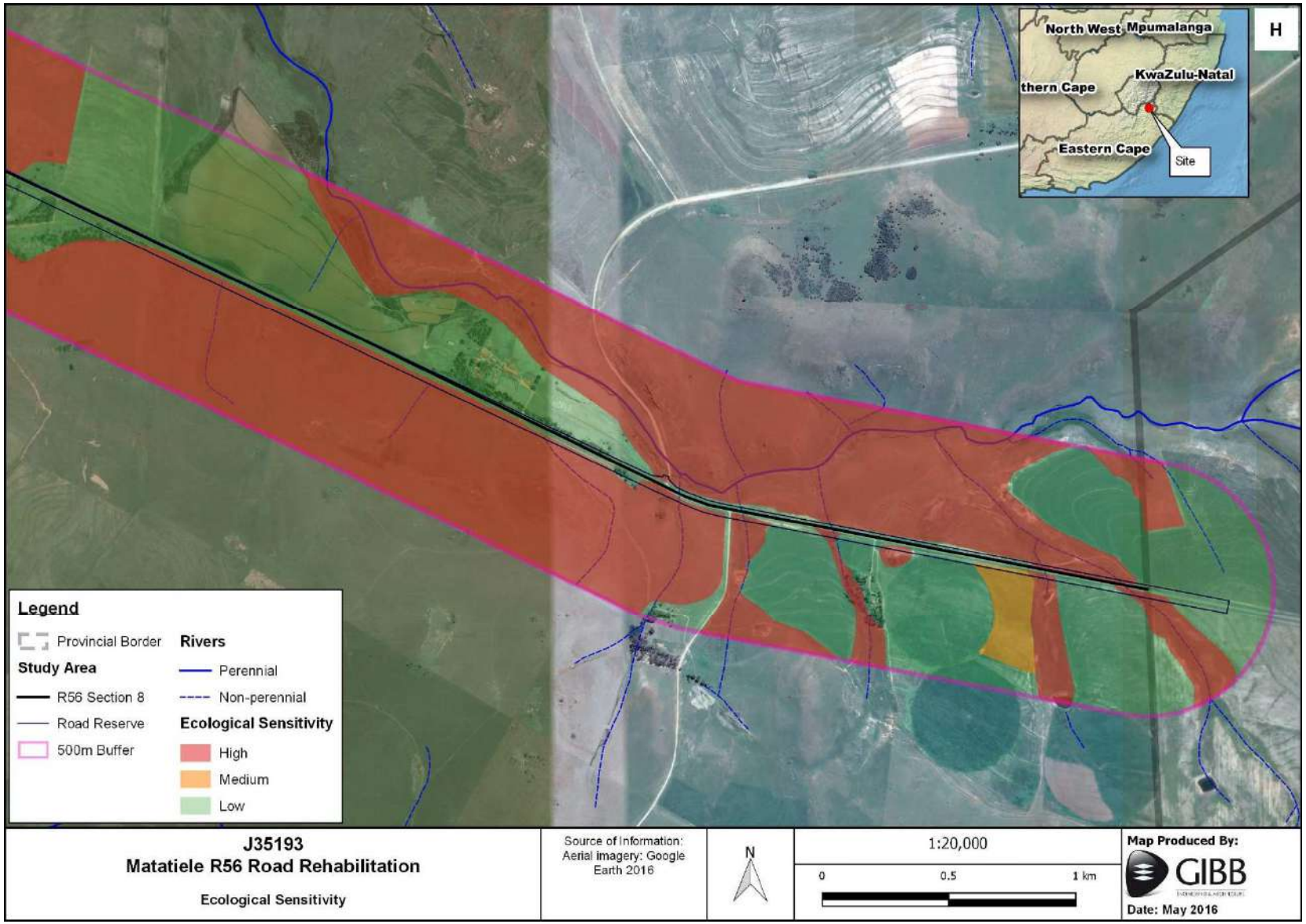

Figure 12: Ecological Sensitivity Map H

4 Conclusion and Recommendations

The study site is located within the Grassland Biome, which is characterised by high summer rainfall and dry winters. A large number of Rare and Threatened plant species in the summer rainfall regions of South Africa are restricted to high-rainfall grassland, making this the vegetation type in most urgent need of conservation. Four vegetation types are associated with the study area, namely East Griqualand Grassland, Mabela Sandy Grassland, Eastern Temperate Freshwater Wetlands, and Highveld Alluvial Vegetation. East Griqualand Grassland and Mabela Sandy Grassland are both currently classified as Vulnerable, while Eastern Temperate Freshwater Wetlands and Highveld Alluvial Vegetation are currently classified as Least Threatened, although poorly protected. Eastern Temperate Freshwater Wetlands is however classified as a threatened ecosystem, and is currently listed as Vulnerable in terms of Section 52 of NEMBA under criterion A1 Biome: Azonal.

The footprint of the proposed road rehabilitation project is relatively narrow (50m) and contained mainly the existing road reserve where little natural vegetation remained. It mostly comprised transformed areas, and secondary grassland disturbed by previous road-related construction activities. The greater study area comprised a mosaic of grassland and farmland, with watercourses, wetlands, pans and dams interspersed amongst agricultural fields and pastures. A few rocky outcrops and ridges occurred with associated rocky grassland. Stands of exotic trees were found in various places along the route.

While the habitats within the footprint of the proposed road reserve were generally transformed or disturbed, the areas surrounding Matatiele and Cedarville are recognised as important ecological habitat that supports many floral and faunal species of conservation concern. Bird species such as Blue Crane, Grey Crowned Crane, Wattled Crane, Secretarybird, Denham's Bustard and African Marsh Harrier frequent the grasslands, dams and wetlands in the area. Highly sensitive habitat associated with the study area therefore included any riparian or wetland habitat (including farm dams) within the 500m and within the road reserve. Rocky areas such as ridges and koppies were also classified as highly sensitive.

While the construction footprint will be relatively narrow, impacts on the greater study area may be high due to the sensitive nature of the landscape. In order to minimise impacts on the surrounding areas, the following activities must take place prior to construction:

1) A full wetland delineation and functional assessment must be undertaken by a suitably qualified wetland specialist. The report must include an assessment of impacts with mitigation measures and rehabilitation plans.
2) Prior to construction, a walk-down of the entire route must be undertaken by a suitably qualified ecologist or botanist to identify plant species present in the road reserve that may require rescue and relocation. This must be undertaken in the summer months during the peak flowering period **between** November and March.

3) Prior to construction, night-time surveys must be undertaken by a suitably qualified ecologist or herpetologist to identify the presence of chameleon species of conservation concern along the route. If found, individuals will need to be rescued and relocated to suitable habitat away from the site, by a suitably qualified specialist, prior to construction commencing.

4) Furthermore, as construction commences along the route, regular searches of the construction footprint should take place for chameleons. If animals are encountered by construction staff during construction, the ECO must be notified immediately. No animals are to be harmed, handled, or interfered with by construction staff. A suitably qualified ecologist or herpetologist should therefore be on stand-by throughout the duration of the project.

5) It is recommended that construction begin in the dry winter months so as to minimise disturbance to breeding fauna, especially amphibian species breeding in temporary road-side pools.

References

Alexander, G. and Marais, J. (2010): *A guide to the Reptiles of Southern Africa*, Cape Town: Struik Nature.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. and de Villiers, M.S. (Eds) (2014): Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland, *Suricata 1*, Pretoria: SANBI.

Berliner, D. (2005): *Systematic Conservation Planning for the forest biome of South Africa*, Department of Water Affairs and Forestry, South Africa.

Burnett, M. R., August, P. V., Brown, J. H. and Killingbeck, K. T. (1998): The influence of geomorphological heterogeneity on biodiversity. I. A patch-scale perspective, *Conservation Biology*, 12: 363-370.

Cadman, M., de Villiers, C., Lechmere-Oertel, R., and McCulloch, D. (2013): *Grasslands Ecosystem Guidelines: Landscape Interpretation for Planners and Managers*, Pretoria: South African National Biodiversity Institute.

Channing, A. and Baptista, N. (2013): *Amietia angolensis* and *A. fuscigula* (Anura: Pyxicephalidae) in southern Africa: A cold case reheated, *Zootaxa* 3640 (4): 501–520.

Chittenden, H. (2007): *Roberts Bird Guide. A comprehensive field guide to over 950 bird species in southern Africa*, Cape Town: John Voelcker Bird Book Fund.

Da Silva, J.M. and Tolley, K.A. (2013): Ecomorphological variation and sexual dimorphism in a recent radiation of dwarf chameleons (*Bradypodion*), *Biological Journal of the Linnean Society* **109**: 113-130.

Daehler, C. C. (2003): Performance comparisons of co-occurring native and alien invasive plants: implications for conservation and restoration, *Annual Review of Ecology, Evolution, and Systematics*, 34:183–211.

Department of Environmental Affairs and Tourism (2007): NEMBA 2004 (Act 10 of 2004): Critically Endangered, Endangered, Vulnerable and Protected Species, Regulation No. 151, *Government Gazette No. 29657*, 23 February 2007, Pretoria: DEAT.

Department of Environmental Affairs (2011): National Environmental Management: Biodiversity Act, 2004: National list of ecosystems that are threatened and in need of protection, *Government Gazette Number 34809*, Notice 1002, 9 December 2011, Pretoria: DEA.

Department Agriculture and Rural Development Gauteng Province. 2014. GDARD requirements for biodiversity assessments, Version 3.

Department of Environment Affairs and Tourism. 2002. Integrated Environmental Management Information Series 5, Department of Environmental Affairs and Tourism (DEAT). Pretoria.

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

Friedmann, Y. and Daly, B. (eds) (2004): *Red Data Book of the Mammals of South Africa: A Conservation Assessment*, Conservation Breeding Specialist Group (CBSG) Southern Africa (SSC/IUCN), Endangered Wildlife Trust, South Africa.

Harrison, J. A., Allan D. G., Underhill, L. G., Herremans, M., Tree, A. J., Parker, V. and Brown, C. J. (1997): *The Atlas of Southern African Birds*, Johannesburg: BirdLife South Africa.

Henderson, L., (2001): *Alien Weeds and Invasive Plants. A complete guide to declared weeds and invaders in South Africa*, Plant Protection Research Institute Handbook No. 12, Agricultural Research Council, South Africa.

Hockey, P. A. R., Dean, W. R. J. and Ryan P. G. (2005): *Roberts Birds of Southern Africa, 7th Edition*, Cape Town: John Voelcker Bird Book Fund.

Measey, G. J. (ed.) (2011): Ensuring a future for South Africa's frogs: a strategy for conservation research, *SANBI Biodiversity Series* 19, Pretoria: South African National Biodiversity Institute.

Minter, L. R., Burger, M., Harrison, J. A., Braack, H. H., Bishop, P. J. and Kloepfer, D. (eds) (2004): Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland, *SI/MAB Series no. 9*, Washington, D.C.: Smithsonian Institution.

Monadjem, A., Taylor, P. J., Cotterill, F. P. D., and Schoeman, M. C. (2010): *Bats of Southern and Central Africa. A Biogeographic and Taxonomic Synthesis*, Johannesburg: Wits University Press.

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

Ohler, A. and Dubois A. (2016): The identity of the South African toad *Sclerophrys capensis* Tschudi, 1838 (Amphibia, Anura), *PeerJ 4:e1553; DOI 10.7717/peerj.1553*.

Ormerod, S. J. and Watkinson, A. R. (2000): Birds and agriculture - Editor's introduction, *Journal of Applied Ecology* 37: 699-705.

Rutherford, M. C. and Westfall, R. H. (1994): *Biomes of Southern Africa: an objective categorisation*, Pretoria: National Botanical Institute.

Samways, M. J., Bazelet, C. S. and Pryke, J. S. (2009): Provision of ecosystem services by large scale corridors and ecological networks, *Biodiversity and Conservation* 19: 2949-2962.

Samways, M. J. and Hatton, M. J. (2000): The third dimension: conservation on hills and mountains, *Palmnut News* 3(2): 9-11.

Samways, M. J., Bazelet, C. S. and Pryke, J. S. (2009): Provision of ecosystem services by large-scale corridors and ecological networks, *Biodiversity and Conservation* 19: 2949-2962.

Skinner, J. D. and Chimimba, C. T. (2005): *The Mammals of the Southern African Subregion*, London: Cambridge.

Stuart, C. and Stuart, T. (2000): *A Field Guide to the Tracks & Signs of Southern and East African Wildlife*, Cape Town: Struik.

Stuart, C. and Stuart, T. (2007): *Field Guide to Mammals of Southern Africa*, Cape Town: Struik Nature.

Tainton, N. (1999): *Veld management in South Africa*, Pietermaritzburg: University of Natal Press.

Taylor, M. R., Peacock, F. and Wanless, R. M. (eds.) (2015): *Eskom Red Data Book of Birds of South Africa Lesotho and Swaziland*, Johannesburg: BirdLife South Africa.

Tolley, K.A. (2014): *Bradypodion melanocephalum* (Gray, 1865) and *B. thamnobates* (Raw, 1976), In M.F. Bates, W.R. Branch, A.M. Bauer, M. Burger, J. Marais, G.J. Alexander and M.S. de Villiers (eds), Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland, *Suricata 1*, Pretoria: SANBI.

Van Oudtshoorn, F. (2004): *A Guide to Grasses of Southern Africa*, Pretoria: Briza Publications.

Van Wyk, B. and Malan, S. (1997): *Field Guide to the Wild Flowers of the Highveld*, Cape Town: Struik Publishers.

Van Wyk, B. and Van Wyk, P. (1997): *Field Guide to Trees of Southern Africa*, Cape Town: Struik.

Van Wyk, B-E., Van Oudtshoorn, B. and Gericke, N. (1997): *Medicinal Plants of South Africa*, Pretoria: Briza Publications.

Von Maltitz, G., Mucina, L., Geldenhuys, C., Lawes, M., Eeley, H., Adie, H., Vink, D., Flemming, G. and Bailey, C. (2003): Classification system for South African Indigenous Forests. An objective classification for the Department of Water Affairs and Forestry, *Environmentek Report ENV-P-C 2003-017*, Pretoria: CSIR.

Digital References

Animal Demography Unit: FrogMAP – South African Frog Atlas Project (SAFAP) (2016): http://vmus.adu.org.za

Animal Demography Unit: MammalMAP – The Mammal Atlas of Africa (2016): http://vmus.adu.org.za

Animal Demography Unit: ReptileMAP – South African Reptile Conservation Assessment (SARCA) (2016): http://sarca.adu.org.za

CITES (2016): CITES Appendices I, II and III: https://cites.org/eng/app/appendices.php

IUCN (2015): IUCN Red List of Threatened Species, Version 2015-4: http://www.iucnredlist.org

Plants of Southern Africa (POSA) (2012): http://posa.snabi.org

SANBI (2012): Vegetation Map of South Africa, Lesotho and Swaziland [*vector geospatial dataset*], Pretoria: South African National Biodiversity Institute.

South African National Red List (2014): http://redlist.sanbi.org

South African Bird Atlas Project 2 (SABAP2) (2016): http://sabap2.adu.org.za/index.php/

Southern African Birding cc. (2011): Roberts VII Multimedia, Birds of Southern Africa, Computer Software

Annexure: Cedarville Protected Environment Declared

(Media Release supplied in separate document)

Appendices

APPENDIX A: Plant species confirmed to occur within QDGC 3028BD and 3029AC

VU = Vulnerable; LC = Least Concern

Species are listed by threat status and then family and genus

Family	Taxonomic Name	Threat Status	Life Cycle and Growth Form
IRIDACEAE	*Dierama tysonii*	VU	Perennial Geophyte, herb
PROTEACEAE	*Protea subvestita*	VU	Perennial Shrub
SCROPHULARIACEAE	*Selago griquana*	Threatened	Perennial Herb
IRIDACEAE	*Gladiolus oppositiflorus*	Declining	Perennial Geophyte, herb
ORCHIDACEAE	*Schizochilus bulbinella*	Rare	Perennial Geophyte, herb
ASTERACEAE	*Gnaphalium griquense*	Rare	Perennial Herb
ACANTHACEAE	*Crabbea hirsuta*	LC	Perennial Herb
ACANTHACEAE	*Crabbea nana*	LC	Perennial Dwarf shrub, herb
ACHARIACEAE	*Kiggelaria africana*	LC	Perennial Shrub, tree
AGAPANTHACEAE	*Agapanthus campanulatus*	LC	Perennial Geophyte, herb
AMARANTHACEAE	*Cyathula uncinulata*	LC	Perennial Climber, herb
AMARYLLIDACEAE	*Nerine appendiculata*	LC	Perennial Geophyte
ANACARDIACEAE	*Searsia rigida*	LC	Perennial Shrub, tree
APIACEAE	*Afrosciadium platycarpum*	LC	Perennial Herb
APIACEAE	*Alepidea cirsiifolia*	LC	Perennial Herb
APIACEAE	*Pimpinella caffra*	LC	Perennial Herb
APOCYNACEAE	*Asclepias gibba*	LC	Perennial Herb
APOCYNACEAE	*Pachycarpus grandiflorus*	LC	Perennial Herb, succulent
APOCYNACEAE	*Pachycarpus macrochilus*	LC	Perennial Herb, succulent
APOCYNACEAE	*Schizoglossum flavum*	LC	Perennial Herb, succulent

Family	Taxonomic Name	Threat Status	Life Cycle and Growth Form
APOCYNACEAE	*Xysmalobium undulatum*	LC	Perennial Herb, succulent
ASPHODELACEAE	*Aloe ecklonis*	LC	Perennial Herb, succulent
ASPHODELACEAE	*Bulbine abyssinica*	LC	Perennial Geophyte, herb, succulent
ASPHODELACEAE	*Bulbine narcissifolia*	LC	Perennial Geophyte, herb, succulent
ASPHODELACEAE	*Kniphofia fluviatilis*	LC	Perennial Herb
ASPHODELACEAE	*Kniphofia linearifolia*	LC	Perennial Herb
ASPHODELACEAE	*Kniphofia triangularis*	LC	Perennial Herb
ASTERACEAE	*Berkheya setifera*	LC	Perennial Herb
ASTERACEAE	*Berkheya sphaerocephala*	LC	Perennial Herb
ASTERACEAE	*Conyza podocephala*	LC	Perennial Herb
ASTERACEAE	*Dimorphotheca caulescens*	LC	Perennial Herb
ASTERACEAE	*Dimorphotheca jucunda*	LC	Perennial Herb
ASTERACEAE	*Geigeria aspera*	LC	Perennial Herb
ASTERACEAE	*Helichrysum aureonitens*	LC	Perennial Herb
ASTERACEAE	*Helichrysum chionosphaerum*	LC	Perennial Herb
ASTERACEAE	*Helichrysum nudifolium*	LC	Perennial Herb
ASTERACEAE	*Helichrysum pallidum*	LC	Perennial Herb
ASTERACEAE	*Helichrysum psilolepis*	LC	Perennial Herb
ASTERACEAE	*Helichrysum tenax*	LC	Perennial Herb, shrub
ASTERACEAE	*Hilliardiella nudicaulis*	LC	Perennial Geophyte, herb
ASTERACEAE	*Metalasia densa*	LC	Perennial Shrub
ASTERACEAE	*Nidorella anomala*	LC	Annual (occ. perennial) Herb
ASTERACEAE	*Pseudognaphalium luteo-album*		Annual Herb
ASTERACEAE	*Relhania pungens*	LC	Perennial Dwarf shrub
ASTERACEAE	*Relhania pungens*	LC	Perennial Dwarf shrub
ASTERACEAE	*Schistostephium heptalobum*	LC	Perennial Shrub

Family	Taxonomic Name	Threat Status	Life Cycle and Growth Form
ASTERACEAE	*Senecio coronatus*	LC	Perennial Herb
ASTERACEAE	*Senecio laevigatus*	LC	Annual Herb
ASTERACEAE	*Senecio othonniflorus*	LC	Perennial Herb
ASTERACEAE	*Ursinia montana*	LC	Perennial Herb
BORAGINACEAE	*Lithospermum cinereum*	LC	Perennial Herb
BRYACEAE	*Bryum torquescens*		Perennial Bryophyte, epiphyte
CAMPANULACEAE	*Wahlenbergia undulata*	LC	Perennial Herb
CELASTRACEAE	*Mystroxylon aethiopicum*	LC	Perennial Shrub, tree
CRASSULACEAE	*Crassula setulosa*		Perennial Herb, succulent
CYPERACEAE	*Bulbostylis hispidula*	LC	Annual Cyperoid, herb, mesophyte
CYPERACEAE	*Bulbostylis scleropus*	LC	Perennial Cyperoid, herb, mesophyte
CYPERACEAE	*Carex glomerabilis*	LC	Perennial Cyperoid, helophyte, herb
CYPERACEAE	*Cyperus fastigiatus*	LC	Perennial Cyperoid, helophyte, herb
CYPERACEAE	*Dracoscirpoides ficinioides*	LC	Perennial Cyperoid
CYPERACEAE	*Pycreus mundii*	LC	Perennial Cyperoid, emergent hydrophyte, helophyte, herb
CYPERACEAE	*Pycreus unioloides*	LC	Perennial Cyperoid, helophyte, herb
DIPSACACEAE	*Cephalaria pungens*	LC	Perennial Herb
EBENACEAE	*Diospyros lycioides*	LC	Perennial Shrub
EBENACEAE	*Diospyros lycioides*	LC	Perennial Shrub, tree
EQUISETACEAE	*Equisetum ramosissimum*	LC	Perennial Herb, hydrophyte
EUPHORBIACEAE	*Acalypha depressinerva*	LC	Perennial Dwarf shrub, herb
EUPHORBIACEAE	*Euphorbia clavarioides*	LC	Perennial Dwarf shrub, succulent
EUPHORBIACEAE	*Euphorbia epicyparissias*	LC	Perennial Dwarf shrub, herb
EUPHORBIACEAE	*Euphorbia pulvinata*	LC	Perennial Dwarf shrub, succulent
EUPHORBIACEAE	*Euphorbia tuberosa*	LC	Perennial Dwarf shrub, succulent
FABACEAE	*Acacia caffra*	LC	Perennial Shrub, tree

Family	Taxonomic Name	Threat Status	Life Cycle and Growth Form
FABACEAE	*Bauhinia natalensis*	LC	Perennial Shrub
FABACEAE	*Crotalaria globifera*	LC	Annual (occ. perennial) Herb, shrub
FABACEAE	*Dolichos falciformis*	LC	Perennial Herb
FABACEAE	*Eriosema kraussianum*	LC	Perennial Herb
FABACEAE	*Indigofera longibarbata*	LC	Perennial Dwarf shrub
FABACEAE	*Lotononis carnosa*	LC	Perennial Dwarf shrub, shrub
FABACEAE	*Rhynchosia pentheri*	LC	Perennial Herb
FABACEAE	*Vigna schlechteri*	LC	Perennial Climber, herb
GENTIANACEAE	*Chironia palustris*	LC	Annual Herb
GENTIANACEAE	*Sebaea sedoides*	LC	Annual Herb
GERANIACEAE	*Pelargonium alchemilloides*	LC	Perennial Dwarf shrub
GERANIACEAE	*Pelargonium pseudofumarioides*	LC	Annual Herb, scrambler
HYDROCHARITACEAE	*Lagarosiphon muscoides*	LC	Perennial Herb, hydrophyte
IRIDACEAE	*Dierama reynoldsii*	LC	Perennial Geophyte, herb
IRIDACEAE	*Gladiolus crassifolius*	LC	Perennial Geophyte, herb
IRIDACEAE	*Gladiolus ochroleucus*	LC	Perennial Geophyte, herb
LEMNACEAE	*Wolffia arrhiza*	LC	Perennial Herb, hydrophyte, pleustophyte
LOBELIACEAE	*Monopsis stellarioides*	LC	Perennial Herb
MALVACEAE	*Hermannia geniculata*	LC	Perennial Dwarf shrub
MESEMBRYANTHEMACEAE	*Psilocaulon granulicaule*	LC	Perennial (occ. annual) Succulent
MOLLUGINACEAE	*Mollugo cerviana*	LC	Annual Herb
MOLLUGINACEAE	*Psammotropha mucronata*	LC	Perennial Herb
ONAGRACEAE	*Epilobium tetragonum*	LC	Perennial Herb
OPHIOGLOSSACEAE	*Ophioglossum polyphyllum*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Brownleea parviflora*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Disa crassicornis*	LC	Perennial Geophyte, herb

Family	Taxonomic Name	Threat Status	Life Cycle and Growth Form
ORCHIDACEAE	*Disa fragrans*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Disa nervosa*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Disa nivea*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Disa oreophila*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Disa patula*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Disperis weelei*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Eulophia aculeata*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Eulophia streptopetala*	LC	Perennial Geophyte, herb, succulent
ORCHIDACEAE	*Habenaria filicornis*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Neobolusia tysonii*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Satyrium macrophyllum*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Satyrium parviflorum*	LC	Perennial Geophyte, herb
ORCHIDACEAE	*Satyrium sphaerocarpum*	LC	Perennial Geophyte, herb
OROBANCHACEAE	*Striga bilabiata*	LC	Annual (occ. perennial) Herb, parasite
POACEAE	*Aristida junciformis*	LC	Perennial Graminoid
POACEAE	*Cynodon hirsutus*	LC	Perennial Graminoid
POACEAE	*Cynodon transvaalensis*	LC	Perennial Graminoid
POACEAE	*Digitaria tricholaenoides*	LC	Perennial Graminoid
POACEAE	*Diheteropogon filifolius*	LC	Perennial Graminoid
POACEAE	*Echinochloa crus-galli*	LC	Annual Graminoid
POACEAE	*Echinochloa jubata*	LC	Perennial Graminoid
POACEAE	*Eragrostis chloromelas*	LC	Perennial Graminoid
POACEAE	*Eragrostis curvula*	LC	Perennial Graminoid
POACEAE	*Eragrostis micrantha*	LC	Perennial Graminoid
POACEAE	*Eragrostis plana*	LC	Perennial Graminoid
POACEAE	*Hemarthria altissima*	LC	Perennial Graminoid

Family	Taxonomic Name	Threat Status	Life Cycle and Growth Form
POACEAE	*Imperata cylindrica*	LC	Perennial Graminoid
POACEAE	*Koeleria capensis*	LC	Perennial Graminoid
POACEAE	*Panicum natalense*	LC	Perennial Graminoid
POACEAE	*Paspalum distichum*	LC	Perennial Graminoid
POACEAE	*Setaria pumila*	LC	Annual Graminoid
POACEAE	*Sporobolus stapfianus*	LC	Perennial Graminoid
POTAMOGETONACEAE	*Potamogeton pusillus*	LC	Annual (occ. perennial) Herb, hydrophyte
POTTIACEAE	*Bryoerythrophyllum campylocarpum*		Perennial Bryophyte
POTTIACEAE	*Pseudocrossidium crinitum*		Perennial Bryophyte
POTTIACEAE	*Trichostomum brachydontium*		Perennial Bryophyte
PROTEACEAE	*Protea caffra*	LC	Perennial Shrub, tree
PROTEACEAE	*Protea repens*	LC	Perennial Shrub, tree
PROTEACEAE	*Protea roupelliae*	LC	Perennial Tree
ROSACEAE	*Alchemilla woodii*	LC	Perennial Herb
ROSACEAE	*Geum capense*	LC	Perennial Herb
ROSACEAE	*Leucosidea sericea*	LC	Perennial Shrub
RUBIACEAE	*Pygmaeothamnus chamaedendrum*	LC	Perennial Dwarf shrub
RUTACEAE	*Diosma acmaeophylla*	LC	Perennial Dwarf shrub, shrub
RUTACEAE	*Zanthoxylum capense*	LC	Perennial Shrub, tree
RUTACEAE	*Zanthoxylum davyi*	LC	Perennial Tree
SCROPHULARIACEAE	*Jamesbrittenia filicaulis*	LC	Perennial Dwarf shrub
SCROPHULARIACEAE	*Limosella longiflora*	LC	Annual Herb, hydrophyte
SCROPHULARIACEAE	*Phygelius aequalis*	LC	Perennial Dwarf shrub, herb, shrub
SCROPHULARIACEAE	*Zaluzianskya microsiphon*	LC	Perennial Herb
THYMELAEACEAE	*Gnidia gymnostachya*	LC	Perennial Dwarf shrub
ZYGOPHYLLACEAE	*Tribulus terrestris*	LC	Annual Herb

APPENDIX B: Bird species of conservation concern occurring within QDGC 3028BD and 3029AC, likelihood of occurring on site and habitat preference

CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; En = Endemic; NBM = Non-breeding Migrant

Species are listed by likelihood of occurring on site and conservation status

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Balearica regulorum	Grey Crowned Crane	EN	EN	Confirmed	Breeds in marshes, pans and dams with fairly tall emergent vegetation; forages in short to medium-height open grassland, sometimes lightly wooded areas; also extensively in cultivated fields and pastures
Gyps coprotheres	Cape Vulture	EN; En	VU	Confirmed	Wide habitat range; cliffs
Circus ranivorus	African Marsh-Harrier	EN	LC	Confirmed	Almost exclusively inland and coastal wetlands
Neotis denhami	Denham's Bustard	VU	NT	Confirmed	High-lying, open, sour grassland, often in rocky areas and on plateau grassland; occasionally uses cultivated fields, especially in winter and during droughts; attracted to burnt ground, especially in winter; avoids heavily grazed grassland
Anthropoides paradiseus	Blue Crane	NT	VU	Confirmed	Open grassland and grassland/Karoo ecotone; wetlands, cultivated pastures and crop lands; tolerant of intensively grazed and burnt grassland
Circus macrourus	Pallid Harrier	NT; NBM	NT	Confirmed	Grasslands associated with pans or floodplains; also croplands
Bugeranus carunculatus	Wattled Crane	CR	VU	High	Fairly shallow wetlands with extensive short, emergent vegetation, especially sedges; farm dams, vleis, natural dryland habitats and cultivated fields
Circus maurus	Black Harrier	EN; En	VU	High	Dry grassland, Karoo scrub, agricultural fields and high-altitude grasslands; intolerant of burnt areas
Geronticus calvus	Southern Bald Ibis	VU; En	VU	High	High-altitude, high-rainfall, sour and alpine treeless grasslands, characterised by short, dense grass sward;

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
					favours recently burnt, ploughed, mowed or heavily grazed fields, also cultivated land with short grass or stubble
Sagittarius serpentarius	Secretarybird	VU	VU	High	Open grassland (< 0.5 m) with scattered trees, shrubland, open *Acacia* and bushwillow (*Combretum* spp) savanna; absent from dense woodland and rocky hills
Falco biarmicus	Lanner Falcon	VU	LC	High	Most frequent in open grassland, open or cleared woodland, and agricultural areas. Breeding pairs favour habitats where cliffs available as nest and roost sites, but will use alternative sites (e.g. trees, electricity pylons, buildings) if cliffs absent
Oxyura maccoa	Maccoa Duck	NT	NT	High	Permanent wetlands in open grassland and semi-arid country
Coracias garrulus	European Roller	NT; NBM	NT	High	Open, broadleaved and *Acacia* woodlands with grassy clearings
Gypaetus barbatus	Bearded Vulture	CR	LC	Medium	Alpine and mixed grasslands on rugged mountains and escarpments
Bucorvus leadbeateri	Southern Ground-Hornbill	EN	VU	Medium	Inhabits wide range of grassland, savanna and woodland, from montane grassland with forest patches and gorges in which to roost and nest, to extensive stands of tall broad-leaved woodlands, where understorey fairly open
Polemaetus bellicosus	Martial Eagle	EN	VU	Medium	Open woodland, arid and mesic savanna, forest edges
Mycteria ibis	Yellow-billed Stork	EN; NBM	LC	Medium	Wetlands, including alkaline and freshwater lakes, rivers, dams, pans, flood plains, marshes, flooded grassland and small pools or streams
Turnix nanus	Black-rumped Buttonquail	VU	LC	Medium	Short, open grassland with bare ground between grass tufts on dark, clay soils; also open savanna and cultivated fields

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Tyto capensis	African Grass-Owl	VU	LC	Medium	Treeless areas associated with damp substrata, mainly marshes and vleis. Favours patches of tall, rank grass, sedges or weeds
Rostratula benghalensis	Greater Painted-snipe	VU	LC	Medium	Waterside habitats with substantial cover
Aquila verreauxii	Verreaux's Eagle	VU	LC	Medium	Mountains and rocky areas with cliffs
Ciconia nigra	Black Stork	VU	LC	Medium	Dams, pans, floodplains, flooded grassland, associated with mountainous areas
Alcedo semitorquata	Half-collared Kingfisher	NT	LC	Medium	Clear, fast-flowing perennial streams, rivers and estuaries, usually narrow and secluded, with dense marginal vegetation; often near rapids
Heteromirafra ruddi	Rudd's Lark	EN; En	VU	Low	High-rainfall grassland on hilltops, plateaux and ridges; avoids valley bottoms. Largely restricted to Highland Sourveld and North-eastern Sandy Highveld veld types. Favours short, dense grass cover; optimal habitat formed by annual burning and heavy winter grazing. Avoids tall grass and dense cover; absent from old croplands
Anthus chloris	Yellow-breasted Pipit	VU; En	VU	Low	Breeds in lush montane grasslands, favouring flat or gently sloping topography
Lioptilus nigricapillus	Bush Blackcap	VU; En	NT	Low	Afromontane and mist-belt forest patches, particularly those fringed by Ouhout *Leucosidea sericea* and Sagewood (*Buddleja* spp) thickets, and adjacent scrubby hillsides; in winter also in coastal forests and valley bushveld
Stephanoaetus coronatus	African Crowned Eagle	VU	NT	Low	Forest, including gallery forest, dense woodland and forested gorges in savanna and grassland; also in Eucalyptus and pine (Pinus spp) plantations
Sarothrura affinis	Striped Flufftail	VU	LC	Low	Dry upland grassland, including sites with bracken and brambles, with woody vegetation such as *Protea* spp, Oldwood (*Leucosidea sericea*) and Sagewood (*Buddleja* spp), or close to forest fringes

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Anthus crenatus	African Rock Pipit	NT; En	LC	Low	Mountains, Karoo hills, and escarpment, favouring open areas with rocky outcrops, grass clumps, and low bushes; in east of range, usually > 1 000 m, up to 3 000 m in Lesotho
Zoothera gurneyi	Orange Ground-Thrush	NT	LC	Low	Moist Afromontane evergreen forest; favours small linear escarpment forest patches along deeply incised drainage lines with perennial streams; avoids areas of dense undergrowth; does not range into adjacent woodland or softwood plantations

APPENDIX C: Mammal species occurring within QDGC 3028BD and 3029AC, likelihood of occurring on site and habitat preference

CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient; En = Endemic; Pr = Protected

Species are listed by likelihood of occurring on site and conservation status

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Aonyx capensis	Cape Clawless Otter	LC; Pr	LC	Confirmed	Permanent streams and rivers, coastline, rocky shores, freshwater and marine, eats crustaceans and fish
Felis silvestris	African Wild Cat	LC	LC	Confirmed	Savanna, shrubland, desert, broad habitat, eats small mammals, reptiles, birds and invertebrates
Atilax paludinosus	Water Mongoose	LC	LC	Confirmed	Coastline, rocky shores, intertidal, estuarine, brackish, bogs, marshes, swamps, freshwater and saltwater, eats invertebrates and small vertebrates
Leptailurus serval	Serval	NT; Pr	LC	High	Savanna, grassland, bogs, marshes, swamps, moist savanna, tall grass, eats small mammals, reptile, fruit, invertebrates, fish
Cryptomys hottentotus	Common Mole-rat	LC	LC	High	Subterranean, widespread
Sylvicapra grimmia	Common Duiker	LC	LC	High	Widespread, thickets, savanna, widespread, karroid, forest and savanna
Canis mesomelas	Black-backed Jackal	LC	LC	High	Savanna, shrubland, grassland, drier areas, omnivore, extreme generalist
Caracal caracal	Caracal	LC	LC	High	Savanna, shrubland, eats small mammals and birds
Herpestes ichneumon	Large Grey Mongoose	LC	LC	High	Permanent rivers and streams, rocky shores, savannas, shrubland, eats rodents, reptiles, frogs birds, invertebrates, crabs and crayfish
Herpestes pulverulentus	Small Grey Mongoose	LC	LC	High	Shrubland, grassland, desert, coastline, rocky shores, eats invertebrates and small vertebrates
Hystrix africaeaustralis	Cape Porcupine	LC	LC	High	Arable land, savanna, grassland, temperate, desert, throughout southern Africa
Lepus saxatilis	Scrub Hare	LC	LC	High	Arable land, savanna, grassland, desert, grazer

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC	High	Savanna, urban areas, all vegetation types
Mastomys coucha	Southern Multimammate Mouse	LC	LC	High	Widespread, nocturnal
Rhabdomys pumilio	Four-striped Grass Mouse	LC	LC	High	Temperate, grassland with good cover, diurnal
Procavia capensis	Rock Hyrax	LC	LC	High	Krantzes and rocky outcrops throughout the fynbos, karroid habitats, generalist herbivore
Neoromicia capensis	Cape Serotine	LC	LC	High	Urban areas, aerial insectivore, roosts in man-made structures, crevices of plants
Chlorocebus pygerythrus	Vervet Monkey	LC	LC	High	Savanna, forest, riparian vegetation, forest edge, omnivore
Herpestes sanguineus	Slender Mongoose	LC	LC	High	Savanna, desert, urban areas, eats invertebrates and small vertebrates
Ichneumia albicauda	White-tailed Mongoose	LC	LC	High	Savanna, urban areas, grasslands, eats invertebrates and small vertebrates
Ictonyx striatus	Striped Polecat	LC	LC	High	Savanna, grasslands, desert, forest, eats insects, mince and reptiles
Mastomys natalensis	Natal Multimammate Mouse	LC	LC	High	Cosmopolitan, nocturnal
Pipistrellus hesperidus	African Pipistrelle	LC	LC	High	Savanna, urban areas, riparian forests, aerial insectivore, roosts in trees and man-made structures
Crocidura cyanea	Reddish-grey Musk Shrew	DD	LC	High	Broad habitat tolerance, terrestrial, nocturnal
Crocidura flavescens	Greater Red Musk Shrew	DD	LC	High	Urban areas, disturbed habitats
Otomys auratus	Montane Vlei Rat	NT	VU	Medium	Mesic mid-elevation grasslands and vleis within alpine, montane and sub-montane regions
Hyaena brunnea	Brown Hyaena	NT; Pr	NT	Medium	Savanna, grasslands, urban areas, scavenger
Vulpes chama	Cape Fox	NT; Pr	LC	Medium	Savanna, shrubland, grassland, desert, omnivorous, eats small vertebrates and invertebrates
Orycteropus afer	Aardvark	NT; Pr	LC	Medium	Savanna, shrubland, grassland, vital association between ants and termites

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Rhinolophus darlingi	Darling's Horseshoe Bat	NT	LC	Medium	Grassland, caves and subterranean habitats, savanna, woodland savanna, aerial insectivore
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	NT	LC	Medium	Grassland, caves and subterranean habitats, savanna, shrubland, fynbos, woodland, succulent and Nama karoo, aerial insectivore
Dasymys incomtus	African Marsh Rat	NT	LC	Medium	Bogs, marshes, swamps, fens, peatlands, nocturnal, semi-aquatic
Kerivoula lanosa	Lesser Woolly Bat	NT	LC	Medium	Savanna, riparian woodland, insectivore, roosts in old weaver nests
Mellivora capensis	Honey Badger	NT	LC	Medium	Habitat varied, rain forests to arid deserts, solitary carnivores
Tragelaphus scriptus	Bushbuck	LC; Pr	LC	Medium	Closed canopy forests, thickets and woodlands, coastal sand forests
Otomys laminatus	Laminate Vlei Rat	LC; En	LC	Medium	Bogs, marshes, swamps, fens, peatlands
Dendromus mystacalis	Chestnut Climbing Mouse	LC	LC	Medium	Grassland with rank vegetation with high coarse grasses
Genetta tigrina	South African Large-spotted Genet	LC	LC	Medium	Savanna, forest, shrubland, urban areas, omnivore
Otomys irroratus	Vlei Rat	LC	LC	Medium	Mesic grassland and mountain fynbos habitat
Pronolagus saundersiae	Hewitt's Red Rock Rabbit	LC	LC	Medium	Grassland, restricted to the top of rocky outcrops
Scotophilus dinganii	Yellow-bellied House Bat	LC	LC	Medium	Urban areas, savanna, mixed bushland, aerial insectivore, roosts in roofs/crevices
Georychus capensis	Cape Mole Rat	LC; En	LC	Medium	Subterranean, sandy soils, coastal sand dunes and montane regions
Graphiurus murinus	Woodland Dormouse	LC	LC	Medium	Woodland, terrestrial arboreal
Aethomys ineptus	Tete Veld Rat	LC	LC	Medium	Rocky crevices and piles of boulders
Micaelamys namaquensis	Namaqua Rock Mouse	LC	LC	Medium	Rocky outcrops and koppies
Gerbilliscus brantsii	Highveld Gerbil	LC	LC	Medium	Temperate, grassland and scrub in sandy soils
Mus minutoides	Pygmy Mouse	LC	LC	Medium	Ground cover in shrubland, grassland, temperate areas

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Dendromus melanotis	Grey Climbing Mouse	LC	LC	Medium	Tall grass and bushes in bogs, marshes, swamps, fens, peatlands
Grammomys dolichurus	Woodland Thicket Rat	DD	LC	Medium	Riverine forest, thickets and woodland, terrestrial-arboreal
Otomys sloggetti	Sloggett's Vlei Rat	DD	LC	Medium	Bogs, marshes, swamps, fens, peatlands, Rocky barren areas, usually solitary
Poecilogale albinucha	African Striped Weasel	DD	LC	Medium	Grassland, savanna, shrubland, eats birds and eggs
Suncus infinitesimus	Least Dwarf Shrew	DD	LC	Medium	Terrestrial, nocturnal
Suncus varilla	Lesser Dwarf Shrew	DD	LC	Medium	Terrestrial, nocturnal, broad tolerance but may be dependent on termite mounds
Mystromys albicaudatus	White-tailed Mouse	EN; En	EN	Low	Temperate, sandy soils with good cover
Ourebia ourebi	Oribi	EN	LC	Low	Grassland, Lowlands and montane grasslands, open grasslands with gentle topography at lower altitudes, selective feeders
Chrysospalax trevelyani	Giant Golden Mole	VU	EN	Low	Semi-subterranean, coastal forest, Afromontane forest
Dendrohyrax arboreus	Tree Hyrax	VU; En	LC	Low	Arboreal browser, confined to forest habitats and dense thickets
Philantomba monticola	Blue Duiker	VU	LC	Low	Subtropical, Afromontane forests, coastal thickets, selective forager on litter and fruit
Miniopterus natalensis	Natal Long-fingered Bat	NT	NT	Low	Caves
Raphicerus melanotis	Cape Grysbok	NT; Pr	LC	Low	Shrubland, fynbos, thicket
Otocyon megalotis	Bat-eared Fox	NT; Pr	LC	Low	Savanna, shrubland, grassland, cold grassland, invertebrates
Lutra maculicollis	Spotted-necked Otter	NT	LC	Low	Aquatic areas, natural and man-made, fish, crab, frogs, in low densities
Miniopterus fraterculus	Lesser Long-fingered Bat	NT	LC	Low	Forest, savanna, shrubland, Afromontane and coastal forest, aerial insectivore

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Myotis tricolor	Temminck's Myotis	NT	LC	Low	Forest, shrubland, savanna, grassland, mountains, aerial insectivore, lives in caves
Myotis welwitschii	Welwitsch's Myotis	NT	LC	Low	Savanna, insectivore, roosts in shrubs and trees
Eidolon helvum	African Straw-coloured Fruit Bat	NBM	NT	Low	Wide distribution; dependent on intact fruit producing woodlands
Damaliscus pygargus	Blesbok	LC; Pr; En	LC	Low	Grassland, grazers with a preference for short grass
Pelea capreolus	Grey Rhebok	LC; Pr; En	LC	Low	Savanna, grassveld and renosterveld, hilly and mountainous terrain, ecotonal
Redunca arundinum	Common Reedbuck	LC; Pr	LC	Low	Savannas with tall grasses, some herbaceous cover and woody species, reedbeds close to water, grazer
Pronolagus crassicaudatus	Natal Red Rock Rabbit	LC; En	LC	Low	Grassland, rocky grass slopes
Pronolagus rupestris	Smith's Red Rock Rabbit	LC; En	LC	Low	Grassland, desert, restricted to the top of rocky outcrops
Antidorcas marsupialis	Springbok	LC	LC	Low	Arid regions and dry open grassland, savanna, open plains, mixed feeder
Redunca fulvorufula	Mountain Reedbuck	LC	LC	Low	Temperate grassland habitats, selective grazer
Tragelaphus oryx	Eland	LC	LC	Low	Woodlands and woodland mosaics, grasslands and thickets
Papio ursinus	Savanna Baboon	LC	LC	Low	Savanna and grassland, forest edges, omnivore
Elephantulus myurus	Eastern Rock Sengi	LC	LC	Low	Shrubland, grassland, crevices and crannies
Eptesicus hottentotus	Long-tailed Serotine	LC	LC	Low	Savanna, Nama karoo, riverine forest, aerial insectivore, roosts in rock crevices, caves and mine tunnels
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC	Low	Caves and subterranean habitats, savanna, fynbos, aerial, man-made structures, insectivore
Neoromicia nana	Banana Bat	LC	LC	Low	Savanna, plantations, close to water, insectivore, roosting in banana and *Strelitzia* leaves
Neoromicia zuluensis	Zulu Serotine	LC	LC	Low	Savanna, insectivore, found roosting amongst dead *Aloe* leaves

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Proteles cristata	Aardwolf	LC	LC	Low	Savanna, shrubland, grassland, eats termites
Rousettus aegyptiacus	Egyptian Rousette	LC	LC	Low	Fruiting trees; roosts gregariously in caves; cave dependent
Amblysomus hottentotus	Hottentot Golden Mole	DD; En	LC	Low	Subterranean, savanna, fynbos, gardens
Myosorex cafer	Dark-footed Forest Shrew	DD	LC	Low	Terrestrial, nocturnal, forest, damp habitats
Myosorex varius	Forest Shrew	DD	LC	Low	Terrestrial, nocturnal, bogs, marshes, swamps, fens, peatlands, forest, marginally in grasslands and boggy fynbos
Chlorotalpa sclateri	Sclater's Golden Mole	DD	LC	Low	Restricted to high altitude grasslands, scrub and forested kloofs in the Nama-Karoo
Diceros bicornis	Black Rhinoceros	EN	CR	Zero	Savanna, bushveld habitats of Limpopo, Mpumalanga and KZN, prefers dense cover and permanent water, browser
Ceratotherium simum	White Rhinoceros	NT; Pr	NT	Zero	Temperate grasslands, short grass areas in savanna and bushveld, prefers woody cover, water, bulk grazer
Alcelaphus buselaphus	Red Hartebeest	LC; Pr	LC	Zero	Grassland, temperate areas, shrubland, karroid semi-arid areas and coastal shrubland
Connochaetes gnou	Black Wildebeest	LC; Pr	LC	Zero	Temperate grasslands, selective grazer in open areas with short grass, open plains
Equus quagga	Plains Zebra	LC	LC	Zero	Savanna, temperate grasslands, grasslands or open woodlands near water Prefers short grasses and flat to gentle hills

APPENDIX D: Reptile species occurring within QDGC 3028BD and 3029AC, likelihood of occurring on site and habitat preference

VU = Vulnerable; NT = Near Threatened; LC = Least Concern; NE = Not Evaluated; En = Endemic

CITES Appendix II = species may become threatened with extinction if the trade or utilisation of the species is not carefully regulated

Species are listed by likelihood of occurring on site and conservation status

Taxonomic Name	Common Name	Conservation Status			Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN	CITES		
Bradypodion thamnobates	Natal Midlands Dwarf Chameleon	VU; En	NT	App II	High	Lowland forest and bush
Bradypodion melanocephalum	KwaZulu Dwarf Chameleon	VU; En	NE	App II	High	Coastal bush and reed beds around vleis
Hemachatus haemachatus	Rinkhals	LC; En	LC		High	Grassland
Trachylepis punctatissima	Montane Speckled Skink	LC	LC		High	Variety of habitats, wet and dry, from grassland and savanna to shrubland, including rock outcrops
Trachylepis varia	Variable Skink	LC	NE		High	Varied, grassland to arid mesic savanna
Varanus niloticus	Water Monitor	LC	NE	App II	High	Rivers, pans and major lakes
Bitis arietans	Puff Adder	LC	NE		High	Absent only from desert, dense forest and mountain tops
Philothamnus natalensis	Natal Green Snake	LC; En	NE		Medium	Varied, wet montane and dry forest, miombo woodland
Cordylus cordylus	Cape Girdled Lizard	LC; En	NE	App II	Medium	Diverse, coastal cliffs, rock plateaus in fynbos, montane grassland, mesic thickets
Pseudocordylus melanotus	Drakensberg Crag Lizard	LC; En	NE	App II	Medium	Rock outcrops on mountain plateaus and rolling grassland
Nucras lalandii	Delalande's Sandveld Lizard	LC; En	NE		Medium	Montane and temperate grassland
Pedioplanis burchelli	Burchell's Sand Lizard	LC; En	NE		Medium	Rocky montane grassland, succulent karroid veld and coastal fynbos
Tropidosaura essexi	Essex's Mountain Lizard	LC; En	NE		Medium	Rocky montane grassland
Amplorhinus multimaculatus	Many-spotted Snake	LC; En	NE		Medium	Mountain streams and vleis

Taxonomic Name	Common Name	Conservation Status			Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN	CITES		
Lamprophis guttatus	Spotted Rock Snake	LC; En	NE		Medium	Fynbos, karoo scrub, grassland, moist savanna and lowveld forest; usually in rocky areas
Lycodonomorphus inornatus	Olive Ground Snake	LC; En	LC		Medium	Moist coastal bushveld and fynbos, grassland
Lycodonomorphus rufulus	Common Water Snake	LC; En	NE		Medium	Small streams, pans and vleis
Agama atra	Southern Rock Agama	LC	NE		Medium	Semi-desert to fynbos
Cordylus vittifer	Transvaal Girdled Lizard	LC	NE	App II	Medium	Rock outcrops in grassland
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	NE		Medium	Varied, montane grassland, savanna, bushveld
Lycophidion capense	Common Wolf Snake	LC	NE		Medium	Variety of habitats incl. lowland forest, fynbos, moist savanna, grassland and karoo scrub
Psammophis crucifer	Crossed Whip Snake	LC	NE		Medium	Highveld and montane grassland, entering fynbos
Psammophylax rhombeatus	Spotted Skaapsteker	LC	NE		Medium	Highveld grassland, mesic thicket, fynbos, karroid areas
Pseudaspis cana	Mole Snake	LC	NE		Medium	Sandy scrubland in SW Cape, Highveld grassland, mountainous and desert areas
Tropidosaura cottrelli	Cottrell's Mountain Lizard	NT; En	NT		Low	Montane grassland
Chamaesaura aenea	Coppery Grass Lizard	NT; En	NE		Low	Grass covered mountain slopes and plateaus
Acontias breviceps	Short-headed Legless Skink	LC; En	NT		Low	Prefers montane grassland
Duberria lutrix	Common Slug-eater	LC; En	LC		Low	Savanna, coastal bush and fynbos
Lycodonomorphus laevissimus	Dusky-bellied Water Snake	LC; En	NE		Low	Pools in slow-moving, well-wooded streams, grassland streams in Swaziland
Homopus femoralis	Greater Padloper	LC; En	NE	App II	Low	Grasslands of mountain plateaus, old escarpment
Pachydactylus maculatus	Large-spotted Gecko	LC	LC		Low	Varied, fynbos and coastal bush to arid karroid veld

APPENDIX E: Amphibian species occurring within QDGC 3028BD and 3029AC, likelihood of occurring on site and habitat preference

LC = Least Concern; DD = Data Deficient; En = Endemic

Species are listed by likelihood of occurring on site and conservation status

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
*Amietia quecketti**	Queckett's River Frog	LC; En	LC	High	Banks of slow-moving streams or other permanent bodies of water in a wide variety of wetland habitats in grassland, savanna and forest edge
*Sclerophrys capensis***	Raucous Toad	LC	LC	High	Rivers and streams in grassland and fynbos; frequently in gardens and farmland
Kassina senegalensis	Bubbling Kassina	LC	LC	High	Grassland around vleis and pans; breeds in temporary and permanent water bodies including vleis, marshes, pans, ponds and dams
Xenopus laevis	Common Platanna	LC	LC	High	Restricted to aquatic habitats but opportunistic and can be found in any form of wetland
Amietia fuscigula	Cape River Frog	LC	LC	High	Widespread around permanent rivers and streams in grassland, fynbos and Karoo scrub including farm dams and other artificial water bodies
Cacosternum boettgeri	Boettger's Caco	LC	LC	High	Variety of habitats in Nama Karoo, succulent Karoo, grassland and thicket favouring open areas and especially abundant in grassland areas; occasionally forest clearings
Cacosternum nanum	Bronze Caco	LC	LC	High	Areas with relatively high rainfall in a variety of vegetation types including fynbos, savanna, grassland, thicket and forest; breeds in small ponds, dams, vleis, streams, roadside pools or flooded grassland
Strongylopus grayii	Clicking Stream Frog	LC	LC	High	Winter and summer rainfall areas in fynbos, succulent Karoo, Nama Karoo, savanna, grassland, thicket and forest from sea level to 3000m

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Tomopterna tandyi	Tandy's Sand Frog	LC	LC	High	Nama Karoo, grassland and savanna; breeds in small streams, pans and farm dams as well as temporary rain pools
Amietophrynus gutturalis	Guttural Toad	LC	LC	High	Around open pools, dams, vleis and other semi-permanent bodies of water in grassland, thicket and savanna; suburban gardens and farmland
Hyperolius marmoratus	Painted Reed Frog	LC	LC	High	Reeds and other vegetation types around edges of a wide variety of waterbodies in savanna, grassland and forest; occasionally in fynbos
Phrynobatrachus mababiensis	Dwarf Puddle Frog	LC	LC	High	Open wooded savanna, sometimes grassland at high and low altitudes; survives in agricultural land; breeds among emergent vegetation in permanent and temporary marshy areas, vleis, ponds, slow-flowing streams, stagnant pools
Tomopterna natalensis	Natal Sand Frog	LC	LC	High	Variety of habitats in savanna and grassland; breeds in shallow permanent furrows, canals or streams in grassland and agricultural land
Semnodactylus wealii	Rattling Frog	LC	LC	Medium	Summer and winter rainfall areas in well-vegetated areas around pans and vleis in grassland or fynbos heath in south of range
Ptychadena porosissima	Striped Grass Frog	LC	LC	Medium	Variety of vegetation types from sea level to 2300m including subtropical coastal areas, temperate and wooded grassland along escarpment and Highveld
Strongylopus fasciatus	Striped Stream Frog	LC	LC	Medium	Open, grassy areas near dams, ponds or streams in forest, thicket, grassland and savanna, sometimes parks and gardens
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC	Medium	Margins of permanent and temporary water bodies including shallow marshes, lakes, rivers, streams and pools; also semi-desert scrub, arid and humid savanna, agricultural land and forest clearings

Taxonomic Name	Common Name	Conservation Status		Likelihood of Occurrence	Preferred Habitat
		RSA	IUCN		
Cacosternum striatum	Striped Caco	DD; En	LC	Medium	Limited distribution in grassland
Breviceps verrucosus	Plaintive Rain Frog	LC; En	LC	Low	Breed in forest and adjacent grassland along the eastern escarpment, also found in suburban gardens
Vandijkophrynus gariepensis	Karoo Toad	LC	LC	Low	Dry thornbush areas in the catchment of the Orange River; arid Karoo scrub, fynbos and grassland occurring up to high altitudes; well adapted to the arid and cold conditions of the central hinterland in both summer and winter rainfall regions
Hadromophryne natalensis	Natal Cascade Frog	LC	LC	Low	Low and high altitudes in cold, clear, fast flowing, densely vegetated mountain streams in kloofs, forest and grassland

* *Amietia quecketti* split from *A. angolensis* (Channing and Baptista, 2013)

** *Sclerophrys capensis* revised from *Amietophrynus rangeri* (Ohler and Dubois, 2016)

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