



**BIODIVERSITY BASELINE & IMPACT ASSESSMENT FOR
THE GREYLINGSTAD/NTHORWANE WWTW AND
RETICULATION NETWORK BA**

Mpumalanga, South Africa

July 2018

CLIENT



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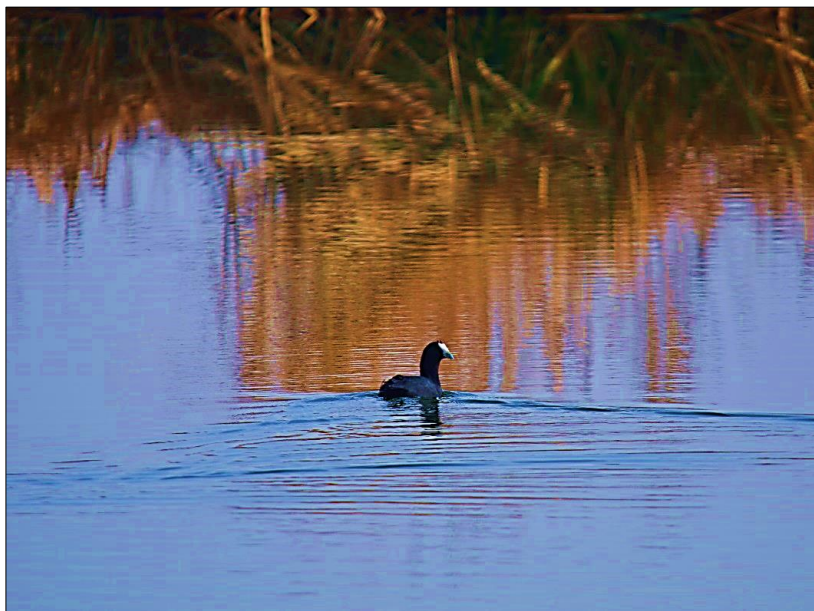
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Submitted to	Ecosphere Environmental Management Services
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Declaration	<p>The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2014 (as amended). We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principles of science.</p>



DECLARATION

I, Michael Adams, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence and is punishable in terms of Section 24F of the Act.



Michael Adams

Terrestrial Ecologist

The Biodiversity Company

July 2018



EXECUTIVE SUMMARY

The completion of a study, in conjunction with the detailed results from the survey means that there is a high confidence in the information provided. The survey which was completed, and the corresponding studies resulted in good site coverage, within the proposed footprint area, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area is an assembly of different conditions and some that have been altered both historically and presently. Current impacts include secondary roads, agriculture and associated human activity, including: agricultural fields, dumping of rubble, livestock, litter and infringement by people and livestock into natural areas. Untreated sewerage is currently leaking from the existing WWTW directly in to the nearby stream. This needs to be rectified as a matter of urgency.

However, despite these impacts, the remaining natural habitats (mostly the northern (rocky ridge / CBA) and south-eastern portions of the project area) exhibit healthy ecological functionality, integrity and provide habitat for some threatened species. This diversity is indicative of the importance of these systems to collectively provide refugia, food and corridors for dispersal in and through the surrounding area.

The proposed Waste Water Treatment Works (WWTW) and reticulation pipeline development is situated within, and near, to areas identified as Critical Biodiversity Areas (CBAs). Field surveys confirmed the ecological integrity of some portions of this CBA – especially the CBA east of Nthorwane and the rocky ridge. However, extensive human encroachment is evident across much of the proposed development area and these disturbed areas were generally given a lower sensitivity rating.

If possible, access to the CBA and wetland areas east of Nthorwane should be prevented. Human encroachment into this area is severely altering the state of this important area. Multiple grassland bird species, including one Species of Conservation Concern was recorded here and this shows the importance of this grassland system. The feasibility of fencing this area off to prevent access should be investigated.

According to the Mpumalanga Highveld Wetlands data, the proposed infrastructure footprint areas in both the southern, central and northern portions of the project area intersect or cross wetland areas classified as natural or good. It is recommended that the current pipeline layouts which intersect with these areas be re-examined and the feasibility of other layout scenarios be investigated. Alternatively, a wetland assessment should be conducted to confirm the extent of the wetland area (delineation) and determine the ecological integrity of the system.

The following further conclusions were reached based on the results of this assessment:

- Based on the MBSP Terrestrial CBA map, the proposed development footprint area will potentially overlap with:
 - Critical Biodiversity Areas (CBA's);
 - Ecological Support Areas (ESA's);
 - Other Natural Area (ONA's); and
 - Moderately or Heavily Modified Areas (MMA's or HMA's).



- The majority of the project area overlaps with areas that are categorised as HMA's or MMA's. However, some of the northern sections of the reticulation network intersect with CBA areas and a grassland CBA is situated east of Nthorwane;
- The proposed project was superimposed on the terrestrial ecosystem threat status spatial data. According to this, the project area falls across several ecosystems, which are listed as either Endangered (EN), Vulnerable (VU) and/or Least Threatened (LT). The majority of the project area is classed as VU or EN, and only a small portion of the reticulation network intersects with a LT ecosystem;
- The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development. Based on this the terrestrial ecosystems associated with the proposed project area are rated as *poorly protected or not protected*;
- Based on the NFEPA wetland and river guidelines several non-FEPA wetlands are situated adjacent to the project area. No non-FEPA or true-FEPA rivers or wetlands occur within the defined project footprint area. However, various non-perennial water courses occur within and adjacent to the proposed footprint area. Two non-perennial rivers merge close to the existing WWTW;
- According to the Mpumalanga Highveld Wetlands data, the proposed infrastructure footprint areas in both the southern, central and northern portions of the project area intersect or cross wetland areas classified as natural or good;
- The project area is situated across two primary vegetation types; Soweto Highveld Grassland (Gs4) and Tsakane Clay Grassland (Gm9) vegetation types. Both of which are classed as Endangered vegetation types;
- Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 290 plant species are expected to occur in the project area. Of the 385-plant species, three (4) species are listed as being SCC;
- One significant Important Bird and Biodiversity Areas (IBAs) occurs adjacent to the proposed project area, namely the Devon Grasslands IBA and is situated 5.2 km north of the project area;
- Forty-seven (47) bird species were recorded in the project area during the July 2018 survey. One avifaunal SCC were recorded during the survey, namely, Secretary bird (*Sagittarius serpentarius*). Based on the presence of suitable grassland habitat, there is a moderate to high probability that other bird SCC occur within the project area – especially grassland bird species; and
- One mammal SCC was recorded, namely the Cape Clawless Otter which is listed as Near Threatened on a regional and a global scale.

Impact Statement

An impact statement is required as per the NEMA EIA regulations (as amended) with regards to the proposed development.



Based on the findings of this report, and the outcomes of the field surveys, it is the opinion of the specialists that the proposed development can be favourably considered. Field surveys confirmed the ecological integrity of this some of the CBA's present, as well as the presence of some threatened species and the presence of wetlands. Therefore, it is imperative that the recommendations and mitigations in this report be strictly adhered to and that the feasibility of moving some of the pipelines which intersect with wetlands be investigated. Furthermore, untreated sewerage is currently leaking from the existing WWTW directly into the surrounding environment and nearby stream. This needs to be rectified as a matter of urgency.



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1 Introduction

The Biodiversity Company (TBC) was appointed to conduct a baseline biodiversity and impact assessment for the proposed Greylingstad/Nthorwane Waste Water Treatment Works (WWTW) and Reticulation Network. The WWTW is located in the town of Greylingstad/Nthorwane, a small farming town west of Standerton in Mpumalanga, situated along the R23.

A dry season terrestrial biodiversity survey was conducted on the 4th July 2018 by two terrestrial ecologists. The survey primarily focussed on the development footprint area, referred to as the project area herein.

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed development.

1.1 Project Description

The proposed activity to commence on site entails the upgrading of the WWTW and specifically the installation of the reticulation network providing Greylingstad and Nthorwane with the necessary basic services.

The development triggers various environmental authorisations based on the following:

- The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.
- The development of
 - I. dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or
 - II. infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs:
 - a) within a watercourse;
 - b) in front of a development setback; or
 - c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;

The aim of the study will be to undertake and compile a biodiversity baseline and impact (risk) assessment for the proposed project. This biodiversity assessment will be informed by the National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004.

1.2 Fieldwork

A dry season terrestrial biodiversity survey was conducted on the 4th of July 2018 by two terrestrial ecologists. The survey primarily focussed on the development footprint area, referred to as the project area herein. Furthermore, the identification and description of any sensitive receptors were recorded across the project area, and the manner in which these sensitive receptors may be affected by the activity was also investigated.



2 Project Area

The WWTW is located in the town of Greylingstad/Nthorwane, a small farming town west of Standerton in Mpumalanga, situated along the R23. The coordinates for the WWTW are 26°45'44.16"S and 28°46'9.84"E. The proposed project area is outlined in Figure 1.

The land uses surrounding the project area consist mainly of the urban footprint of the town of Greylingstad/Nthorwane as well as surrounding rural or agricultural land with associated houses, planted agriculture and livestock grazing. Infrastructure such as rural housing, secondary tar roads, gravel roads and homesteads, occur within the proximity of the project area (Figure 1).

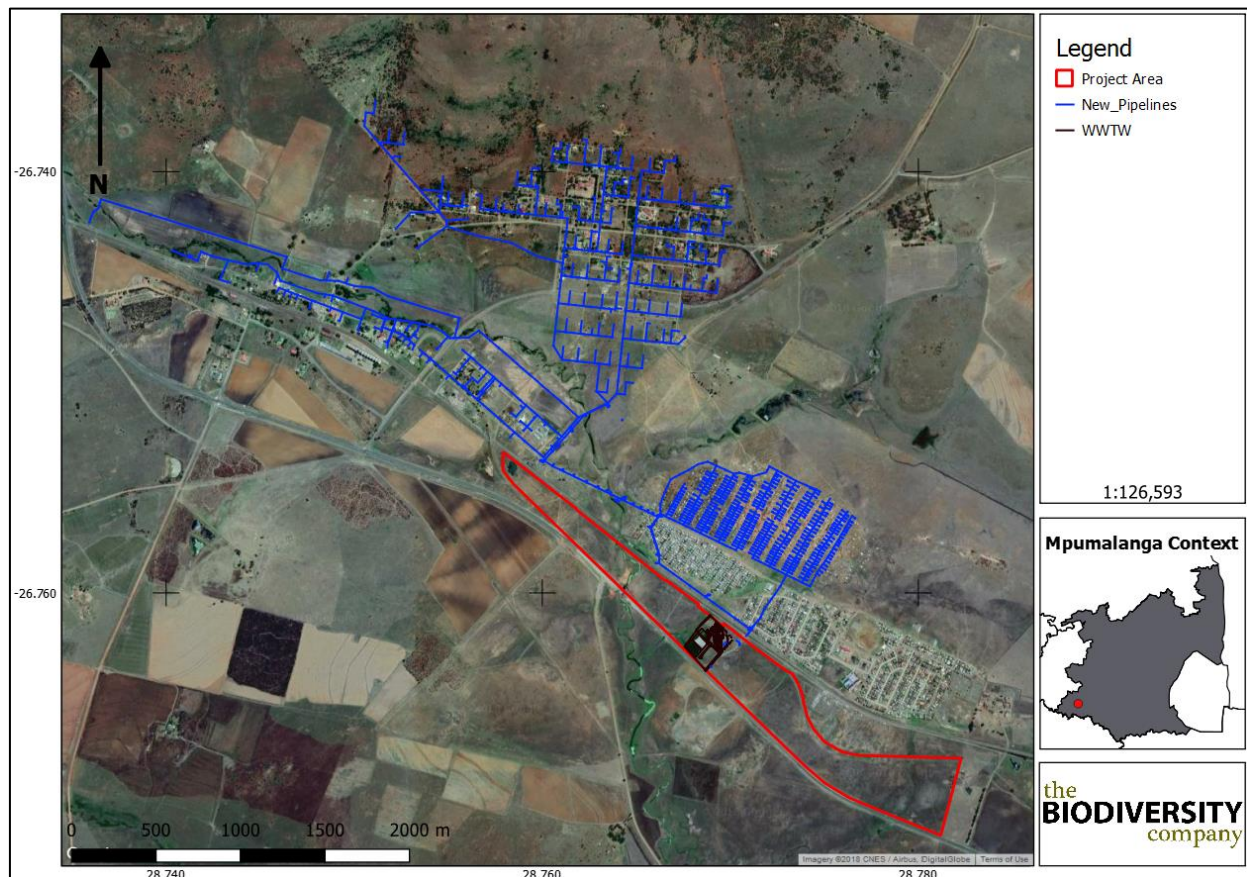


Figure 1: The general location of the proposed project area

3 Scope of Work

The Terms of Reference (ToR) included the following:

- Desktop description of the baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity) that occur in the study area, and the manner in which these sensitive receptors may be affected by the activity;
- Identify 'significant' ecological, botanical and faunal features within the proposed development areas;



- Identification of conservation significant habitats around the project area which might be impacted by the proposed development;
- Site visit to verify desktop information;
- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application;
- Provide a map to identifying sensitive receptors in the study area, based on available maps, database information & site visit verification;
- Suggest mitigation measures to prevent or reduce the impacts;
- Recommend the extent and type of monitoring that needs to be undertaken; and
- Design input where necessary to determine the preferred route.

4 Limitations

The following limitations should be noted for the study:

- As per the scope of work, the fieldwork component of the assessment comprised of one assessment only, which was conducted during the dry season. During the dry season many floral species are not flowering and thus it is not possible to identify all species present. Also, during this period, faunal activity is lower;
- This study has not assessed any temporal trends for the respective seasons;
- A large section of the project area was burned which eliminated the chance of floral identification in those areas;
- Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.

5 Methodologies

5.1 Geographic Information Systems (GIS) Mapping

Existing data layers were incorporated into GIS software to establish how the proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- Vegetation Map of South Africa, Lesotho and Swaziland (Mucina et al., 2006);
- Important Bird Areas 2015 – BirdLife South Africa (vector geospatial dataset); and
- Department of Environmental Affairs (DEA) National Landcover 2015.

Field surveys were conducted to confirm (or refute) the presence of species identified in the desktop assessment. The specialist disciplines completed for this study included:

- Botanical;



- Fauna (mammals and avifauna); and
- Herpetology (reptiles and amphibians).

Brief descriptions of the standardised methodologies applied in each of the specialist disciplines are provided below. More detailed descriptions of survey methodologies are available upon request.

5.2 Botanical Assessment

The botanical study encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on an ecological assessment of habitat types as well as identification of any Red Data species within the known distribution of the project area. Due to the survey being conducted in the dry season this represented a severe limitation to the number of species identified. Furthermore, much of the project area had been recently burnt which further limited the identification of floral species. The methodology included the following survey techniques:

- Sensitivity analysis based on available remaining natural structural habitat; and
- Identification of expected floral red-data species (desktop analysis).

5.3 Literature Study

A literature review was conducted as part of the desktop study to identify the potential habitats present within the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA), to access distribution records on southern African plants. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution.

The Red List of South African Plants website (SANBI, 2017) was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1997);
- A Field Guide to Wild Flowers (Pooley, 1998);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk et al., 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification Guide to Southern African Grasses. An identification manual with keys, descriptions and distributions. (Fish et al., 2015).



Additional information regarding ecosystems, vegetation types, and species of conservation concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012);
- Grassland Ecosystem Guidelines: landscape interpretation for planners and managers (SANBI, 2013); and
- Red List of South African Plants (Raimondo et al., 2009; SANBI, 2016).

5.4 Faunal Assessment (Mammals & Avifauna)

The faunal desktop assessment included the following:

- Compilation of expected species lists;
- Compilation of identified species lists;
- Identification of any Red Data or species of conservation concern (SCC) present or potentially occurring in the area; and
- Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.

The field survey component of the study utilised a variety of sampling techniques including, but not limited to, the following:

- Visual observations;
- Identification of tracks and signs; and
- Utilization of local knowledge.

Habitat types sampled included pristine, disturbed and semi-disturbed zones, drainage lines and wetlands.

Mammal distribution data were obtained from the following information sources:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Bats of Southern and Central Africa (Monadjem et al., 2010);
- The 2016 Red List of Mammals of South Africa, Lesotho and Swaziland (www.ewt.org.za) (EWT, 2016);
- Animal Demography Unit (ADU) - MammalMap Category (MammalMap, 2017) (mammalmap.adu.org.za);
- A Field Guide to the Tracks and Signs of Southern, Central and East African Wildlife (Stuart & Stuart, 2013); and
- The Smaller Mammals of KwaZulu-Natal (Taylor, 1998).



5.5 Herpetology (Reptiles & Amphibians)

A herpetofauna assessment of the project area was also conducted. The herpetological field survey comprised the following techniques:

- Diurnal hand searches - are used for reptile species that shelter in or under particular microhabitats (typically rocks, exfoliating rock outcrops, fallen timber, leaf litter, bark etc.);
- Visual searches - typically undertaken for species whose behaviour involves surface activity or for species that are difficult to detect by hand-searches or pitfall trapping. May include walking transects or using binoculars to view the species from a distance without the animal being disturbed;
- Amphibians – many of the survey techniques listed above will be able to detect species of amphibians. Over and above these techniques, vocalisation sampling techniques are often the best to detect the presence of amphibians as each species has a distinct call;
- Opportunistic sampling - reptiles, especially snakes, are incredibly elusive and difficult to observe. Consequently, all possible opportunities to observe reptiles are taken in order to augment the standard sampling procedures described above. This will include talking to local people and staff at the site and reviewing photographs of reptiles and amphibians that the other biodiversity specialists may come across while on site.

Herpetofauna distributional data was obtained from the following information sources:

- South African Reptile Conservation Assessment (SARCA) (sarca.adu.org);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Atlas and Red list of Reptiles of South Africa, Lesotho and Swaziland (Bates et al., 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009);
- Animal Demography Unit (ADU) - FrogMAP (frogmap.adu.org.za);
- Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland (Mintner et al., 2004); and
- Ensuring a future for South Africa's frogs (Measey, 2011).

5.6 Dry Season Fieldwork

The dry season fieldwork and sample sites were placed within targeted areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork.



The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological habitat assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with proposed development areas.

At each sample site notes were made regarding current impacts (e.g. livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area. Effort was made to cover all the different habitat types within the limits of time and access. The geographic location of sample sites and site coverage are shown under the Results section.

5.7 Key Legislative Requirements

The legislation, policies and guidelines listed below are applicable to the current project in terms of biodiversity and ecological support systems (Table 1). The list below, although extensive, may not be exhaustive and other legislation, policies and guidelines may apply in addition to those listed below.

Explanation of certain documents, organisations or legislation is provided (below Table 1) where these have a high degree of relevance to the project and/or are referred to in this assessment.

Table 1: A list of key legislative requirements relevant to biodiversity and conservation in Mpumalanga

INTERNATIONAL	Convention on Biological Diversity (CBD, 1993) The United Nations Framework Convention on Climate Change (UNFCCC, 1994) The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973) The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
NATIONAL	Constitution of the Republic of South Africa (Act No. 108 of 2006) The National Environmental Management Act (NEMA) (Act No. 107 of 1998) The National Environmental Management Protected Areas Act (Act No. 57 of 2003) The National Environmental Management Biodiversity Act (Act No. 10 of 2004) The National Environmental Management: Waste Act, 2008 (Act 59 of 2008); The Environment Conservation Act (Act No. 73 of 1989) National Environmental Management Air Quality Act (No. 39 of 2004) National Protected Areas Expansion Strategy (NPAES) Natural Scientific Professions Act (Act No. 27 of 2003) National Biodiversity Framework (NBF, 2009) National Forest Act (Act No. 84 of 1998) National Veld and Forest Fire Act (101 of 1998) National Water Act, 1998 (Act 36 of 1998) National Freshwater Ecosystem Priority Areas (NFEPA's) National Spatial Biodiversity Assessment (NSBA)



	<p>World Heritage Convention Act (Act No. 49 of 1999)</p> <p>National Heritage Resources Act, 1999 (Act 25 of 1999)</p> <p>Municipal Systems Act (Act No. 32 of 2000)</p> <p>Alien and Invasive Species Regulations, 2014</p> <p>South Africa's National Biodiversity Strategy and Action Plan (NBSAP)</p> <p>Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)</p> <p>Sustainable Utilisation of Agricultural Resources (Draft Legislation).</p> <p>White Paper on Biodiversity</p>
PROVINCIAL	<p>Mpumalanga Parks Board Act 6 of 1995</p> <p>Mpumalanga Conservation Act, 1998 (Act 10 of 1998)</p> <p>Mpumalanga Tourism and Parks Agency Act, No 5 of 2005</p> <p>Mpumalanga Conservation Plan (C-plan 2)</p> <p>Mpumalanga Biodiversity Sector Plan</p>

International Legislation and Policy

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival; and
- The IUCN (World Conservation Union). The IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

National Level

- Constitution of the Republic of South Africa (Act 108 of 1996). The Bill of Rights, in the Constitution of South Africa states that everyone has a right to a nonthreatening environment and requires that reasonable measures be applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development;
- The National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004: specifically, the management and conservation of biological diversity within the RSA and of the components of such biological diversity;
- National Forests Act, 1998 (Act 84 of 1998), specifically with reference to Protected Tree species;
- National Biodiversity Assessment (NBA): The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the Department of Environmental Affairs (DEA) and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Driver et al., 2011). The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Driver et al., 2011).



Provincial and Municipal Level

In addition to national legislation, South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996).

The Provincial Department responsible for environmental matters in Mpumalanga is the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET). Relevant provincial legislation includes, but is not limited to:

Mpumalanga Parks Board Act 6 of 1995

- The Mpumalanga Parks Board was established in terms of the Mpumalanga Parks Board Act 6 of 1995 as amended. The objectives of this Act are inter alia as follows:
 - To provide effective conservation management of natural resources of the Mpumalanga Province;
 - To promote the creation of economic and employment opportunities in pursuit of nature conservation and biodiversity;
 - To ensure that natural systems, biodiversity and ecological functions and processes in the Mpumalanga Province are maintained;
 - To determine and enforce limits to sustainable utilization of natural resources;
 - To contribute to the advancement of scientific knowledge, and facilitate technology transfer in respect of conservation; and
 - Provide information and extension services to the public on conservation management, problem species, legal aspects of conservation and other conservation matters.

Mpumalanga Conservation Act, 1998 (Act 10 of 1998)

The aim of this Act is to consolidate and amend the laws relating to nature conservation within the Province and to provide for matters connected therewith.

Mpumalanga Tourism and Parks Agency Act, No 5 of 2005

This act provides for the establishment of the Mpumalanga Tourism and Parks Agency (MTPA) and for the management thereof by a Board; to provide for the sustainable development and improvement of the tourism industry in Mpumalanga; to provide for conservation management of the natural resources of Mpumalanga; to confer powers and functions upon the Agency; to provide for the registration of certain persons and entities directly involved in tourism; to provide for transitional arrangements; and to provide for matters incidental thereto.

Mpumalanga Conservation Plan

Mpumalanga's Conservation Plan Version 2 (C-Plan 2) database (MPSB, 2006), is intended to guide conservation and land-use decisions in support of sustainable development at a strategic level, have been identified. The C-Plan 2 maps the distribution of the Province's



known biodiversity into categories according to ecological and biodiversity importance and their contribution to meeting the quantitative targets set for each biodiversity feature.

Mpumalanga Biodiversity Sector Plan

In 2006 the MTPA and the Department of Agriculture and Land Administration (DALA) initiated the development of the Mpumalanga Biodiversity Conservation Plan (MBSP). As the first such plan produced for the Province, it was intended to guide conservation and land-use decisions in support of sustainable development. The MBSP provided a spatial framework that supported land-use planning and helped to streamline and monitor environmental decision-making (Ferrar & Lotter, 2007).

Since 2007 several technical advances and land use changes necessitated the need for an update of the MBSP. The updated product is called the Mpumalanga Biodiversity Sector Plan (MBSP) and builds on the successes of the MBSP but incorporates improvements in science, technology and data, to provide a more comprehensive assessment of the biodiversity of the terrestrial and freshwater environment in Mpumalanga (MTPA, 2014).

National Biodiversity Assessment

The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the Department of Environmental Affairs (DEA) and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Driver et al., 2012).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Driver et al., 2012).

MTPA Guidelines for Biodiversity Assessment

To promote national uniform standards in Environmental Management Plans (EMP's) the Mpumalanga Tourism and Parks Agency (MTPA) have set minimum standards that need to be conformed to in terms of Biodiversity Assessments for development applications. These guidelines cover flora, fauna, aquatic and wetland systems.

6 Project Area

6.1 General Land Use and Cover

The land uses surrounding the project area consist mainly of the urban footprint of the town of Greylingstad/Nthorwane as well as surrounding rural or agricultural land with associated houses, planted agriculture and livestock grazing. Infrastructure such as rural housing, secondary tar roads, gravel roads and homesteads, occur within the proximity of the project area. The overall project area is modified due to these activities, and few natural areas remain. Other impacts within the vicinity of the project area include access roads, erosion and alien or invasive plant species.

The following infrastructure exists within the project area and surroundings:

- Existing waste water treatment works and associated infrastructure;



- Formal and informal housing/dwellings;
- Dumping and litter;
- Various secondary tar and gravel access roads; and
- Electrical infrastructure.

6.2 Project Area in Relation to the Mpumalanga Biodiversity Sector Plan

The key output of this systematic biodiversity plan is a map of biodiversity priority areas (MTPA, 2014). The MBSP CBA map delineates Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas, Protected Areas, and areas that have been irreversibly modified from their natural state (MTPA, 2014). The MBSP uses the following terms to categorise the various land used types according to their biodiversity and environmental importance:

- Critical Biodiversity Area (CBA);
- Ecological Support Area (ESA);
- Other Natural Area (ONA);
- Protected Area (PA); and
- Moderately or Heavily Modified Areas (MMA's or HMA's).

CBAs are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (MTPA, 2014). Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (MTPA, 2014).

The Mpumalanga Biodiversity Sector Plan (MBSP) specifies two different CBA areas, **Irreplaceable CBA's and Optimal CBA's**. Irreplaceable CBA's include: (1) areas required to meet targets and with irreplaceability biodiversity values of more than 80%; (2) critical linkages or pinch-points in the landscape that must remain natural; or (3) critically Endangered ecosystems (MTPA, 2014).

ESAs are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic (SANBI-BGIS, 2017).

ONAs consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (SANBI-BGIS, 2017).



Moderately or Heavily Modified Areas (sometimes called ‘transformed’ areas) are areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets (MTPA, 2014). Some of these areas may still provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly, and in many cases irreversibly, compromised.

Figure 2 shows the project area superimposed on the MBSP Terrestrial CBA map. Based on this, the proposed development areas will potentially overlap with:

- Critical Biodiversity Area (CBA);
- Ecological Support Area (ESA);
- Other Natural Area (ONA); and
- Moderately or Heavily Modified Areas (MMA’s or HMA’s).

The majority of the project area overlaps with areas that are categorised as HMA’s or MMA’s. However, some of the northern sections of the reticulation network intersect with CBA areas.

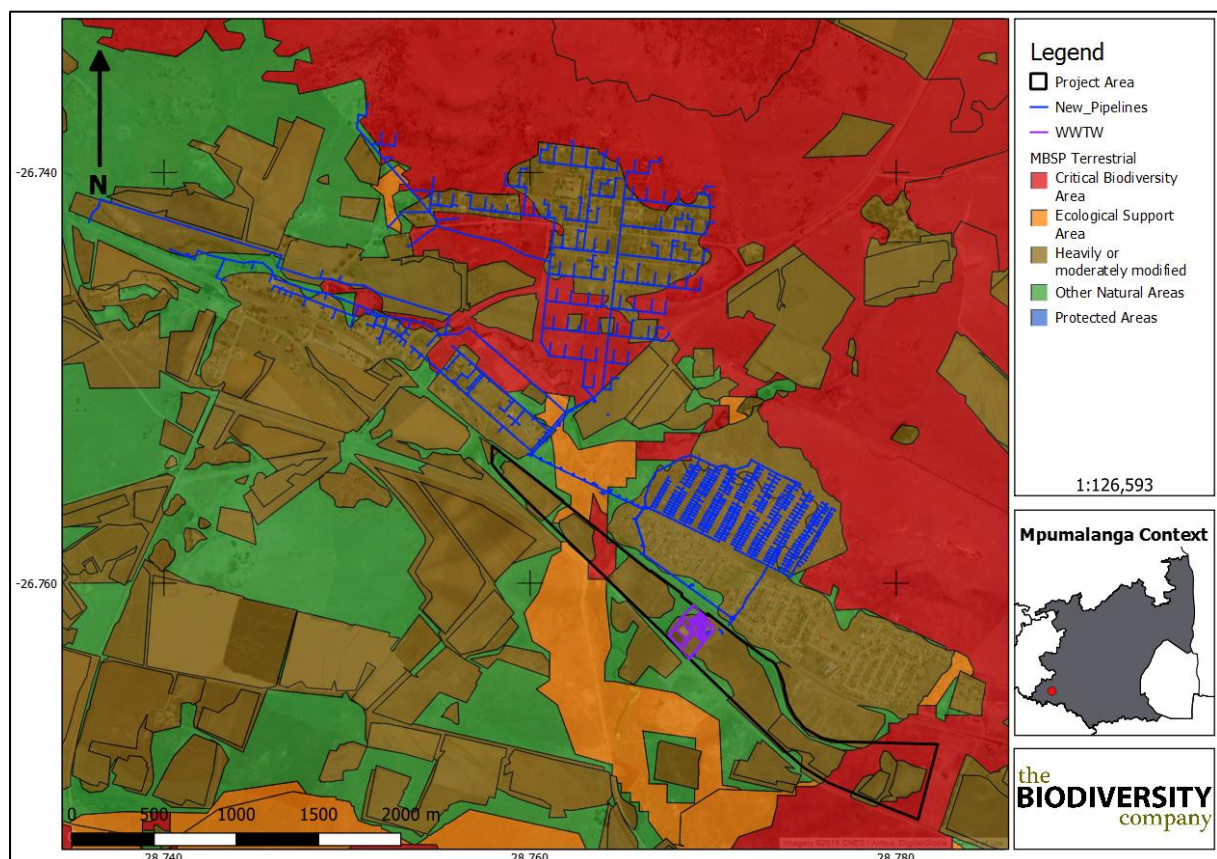


Figure 2: The project area superimposed on the MBSP (MTPA, 2014)

6.3 Mpumalanga Highveld Wetlands

The purpose of the Mpumalanga Highveld Wetlands project was to:



- Ground-truth and refine the current data layers of the extent, distribution, condition and type of freshwater ecosystems in the Mpumalanga Highveld coal belt, to support informed and consistent decision-making by regulators in relation to the water-biodiversity-energy nexus;
- To incorporate these revised data layers into the atlas of high-risk freshwater ecosystems and guidelines for wetland offsets, currently being developed by SANBI, to improve the scientific robustness of these tools; and
- To support the uptake, and development of the necessary capacity to apply the data, atlas and guidelines by regulators in their planning and decision-making processes” (SANBI, 2012).

The Mpumalanga Highveld Wetlands data also classifies NFEPA land cover based on the defined condition of each area. These are known as the NFEPA wetland conditions categories. The categories are listed in Figure 3 and are represented in relation to the project area in Figure 4.

Description of NFEPA wetland conditions categories.			
PES equivalent provides a description of the condition category that is broadly equivalent to that used by the Department of Water Affairs to describe Present Ecological State. Percentage of total area in each condition category is also provided.			
PES equivalent	NFEPA condition	Description	% of total wetland area*
Natural or Good	AB	Percentage natural land cover \geq 75%	47
Moderately modified	C	Percentage natural land cover 25-75%	18
Heavily to critically modified	DEF	Riverine wetland associated with a D, E, F or Z ecological category river	2
	Z1	Wetland overlaps with a 1:50,000 "artificial" inland water body from the Department of Land Affairs: Chief Directorate of Surveys and Mapping (2005-2007)	7
	Z2	Majority of the wetland unit is classified as "artificial" in the wetland delineation GIS layer	4
	Z3	Percentage natural land cover < 25%	20

* This percentage excludes the unmapped wetlands that have been irreversibly lost due to draining, ploughing and concreting

Figure 3: A breakdown of the NFEPA wetland condition categories as defined by the MH dataset

Figure 4 shows the project area in relation to the Mpumalanga Highveld Wetlands data as provided by SANBI. Infrastructure footprint areas in both the southern and northern portions of the project area intersect or cross wetland areas classified as AB – natural or good.



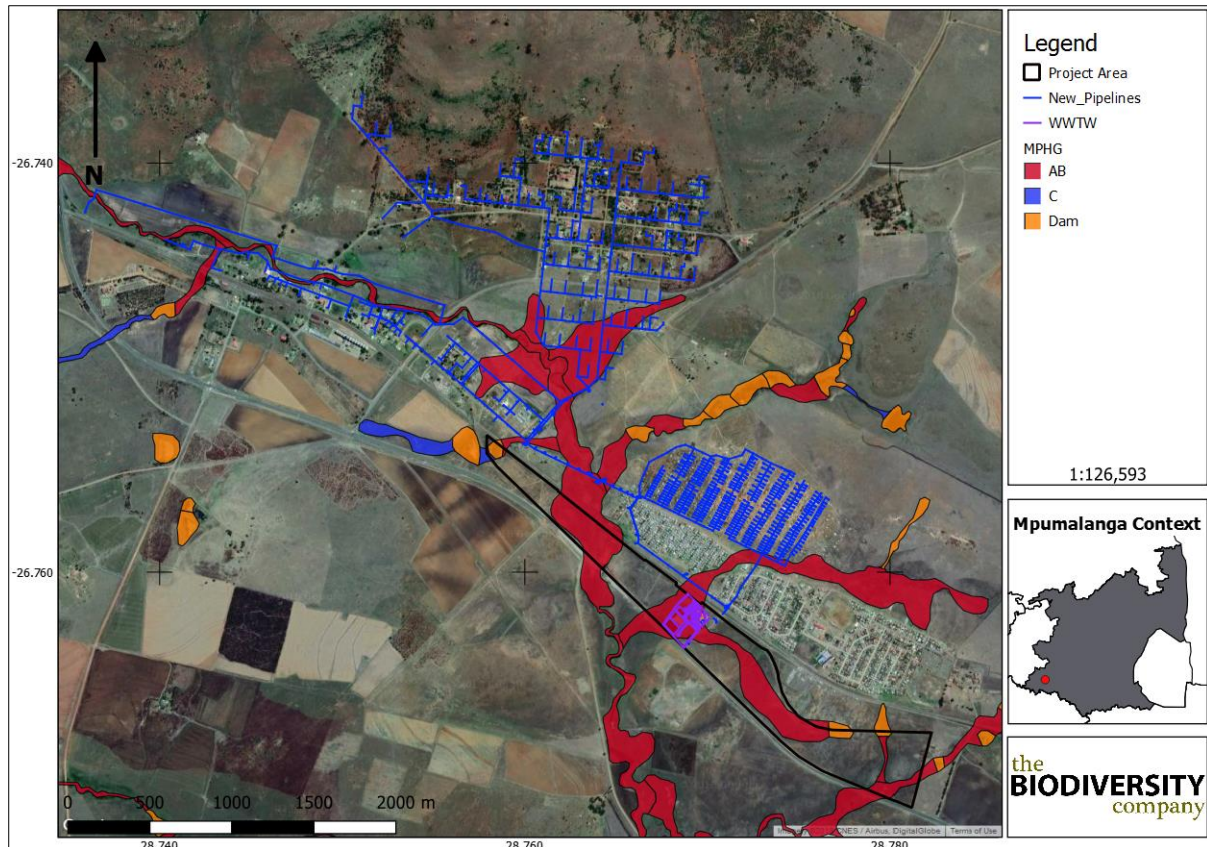


Figure 4: Shows the overall project area in relation to the Mpumalanga Highveld Wetlands (SANBI, 2012)

6.4 National Biodiversity Assessment

The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level (Driver et al., 2011).

6.4.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver et al., 2011).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver et al., 2011).

The proposed project was superimposed on the terrestrial ecosystem threat status (Figure 5). As seen in this figure the project area falls across several ecosystems, which are listed as either Endangered (EN), Vulnerable (VU) and/or Least Threatened (LT). The majority of the project area is classed as VU or EN, and only a small portion of the reticulation network intersects with a LT ecosystem.



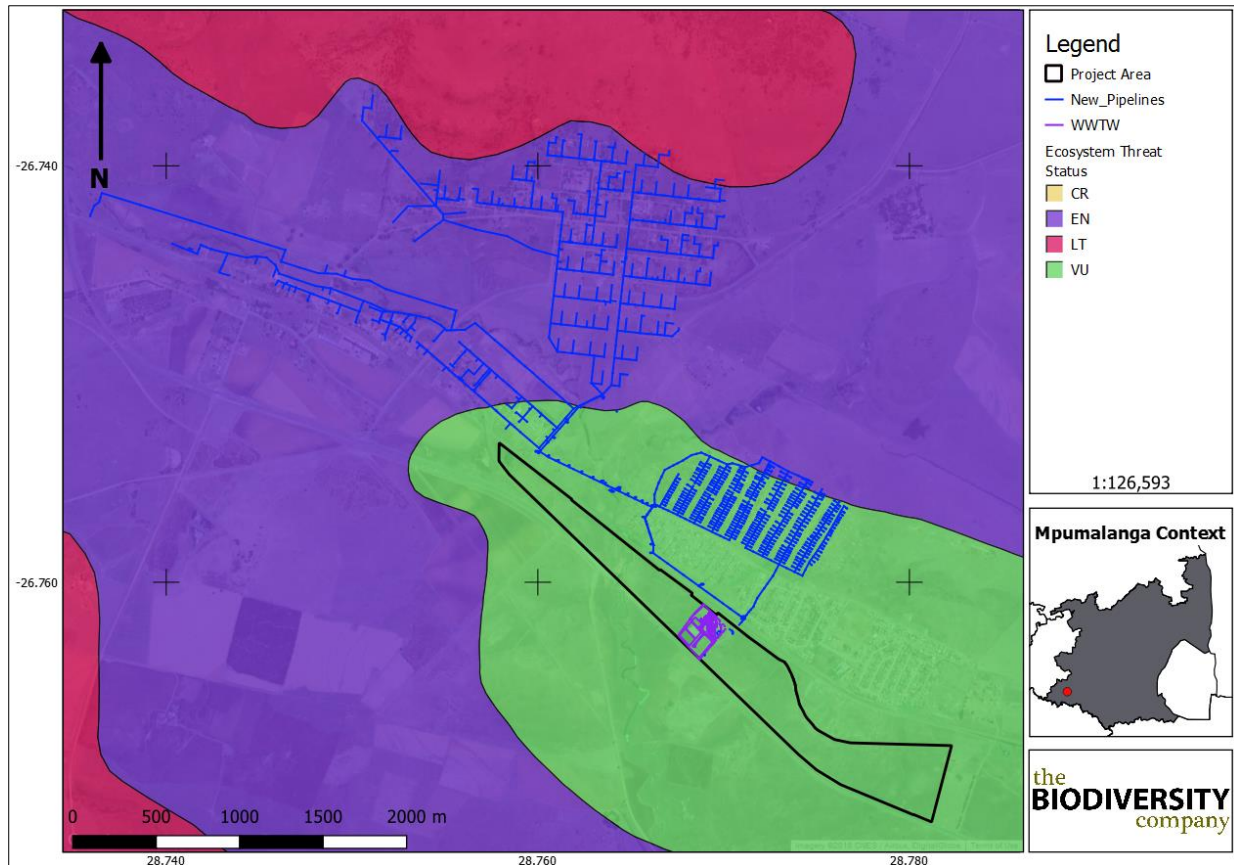


Figure 5: The project area showing the ecosystem threat status of the associated terrestrial ecosystems (NBA, 2012)

6.4.2 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Driver et al., 2011).

The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 6). Based on this the terrestrial ecosystems associated with the proposed project area are rated as *poorly protected* or *not protected*. This means that these ecosystem types (and associated habitats) are not well protected anywhere in the country (such as in nationally protected areas).



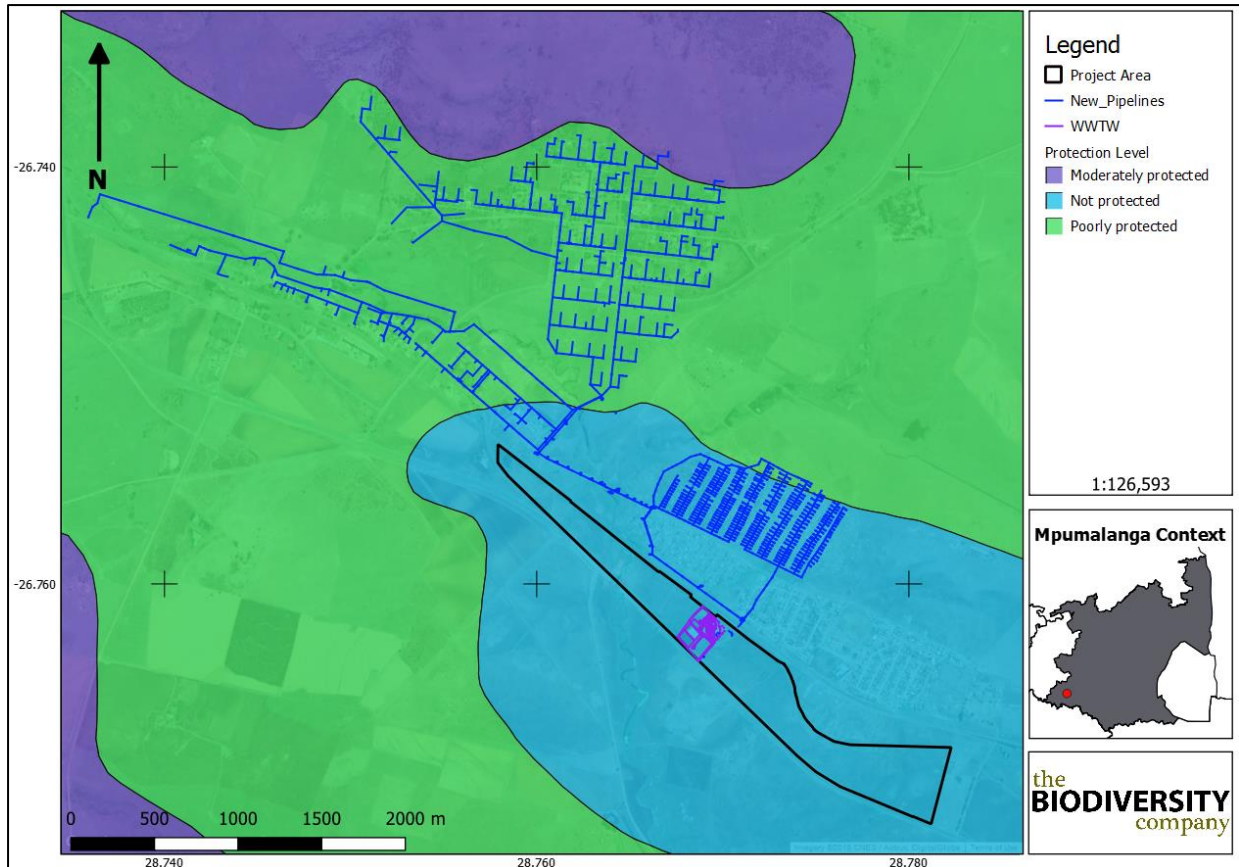


Figure 6: The project area showing the level of protection of terrestrial ecosystems (NBA, 2012)

6.5 Project Area in Relation to Protected Areas

Figure 7 shows the location of formally protected areas in relation to the project area. Formally protected areas refer to areas protected either by national or provincial legislation. Based on the SANBI (2010) Protected Areas Map and the National Protected Areas Expansion Strategy (NPAES) the project area does not overlap with, nor will it impact upon, any formally protected areas (Figure 7).



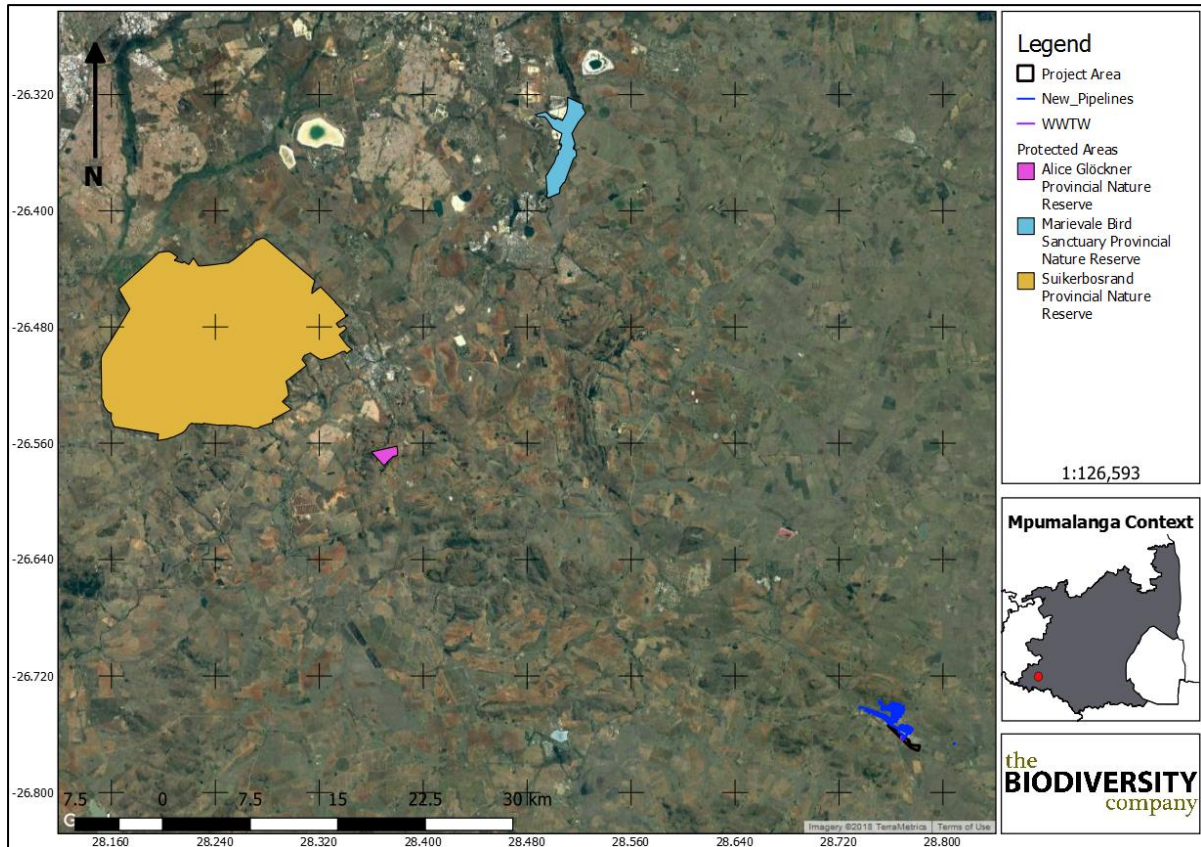


Figure 7: The project area in relation to the formally protected areas (NPAES, 2011)

6.6 National Freshwater Ecosystem Priority Area (NFEPA) Status

In an attempt to better conserve aquatic ecosystems, South Africa has recently categorised its river systems according to set ecological criteria (i.e. ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver et al. 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel et al. 2011). The NFEPA status mapping for the project area is depicted in Figure 8.



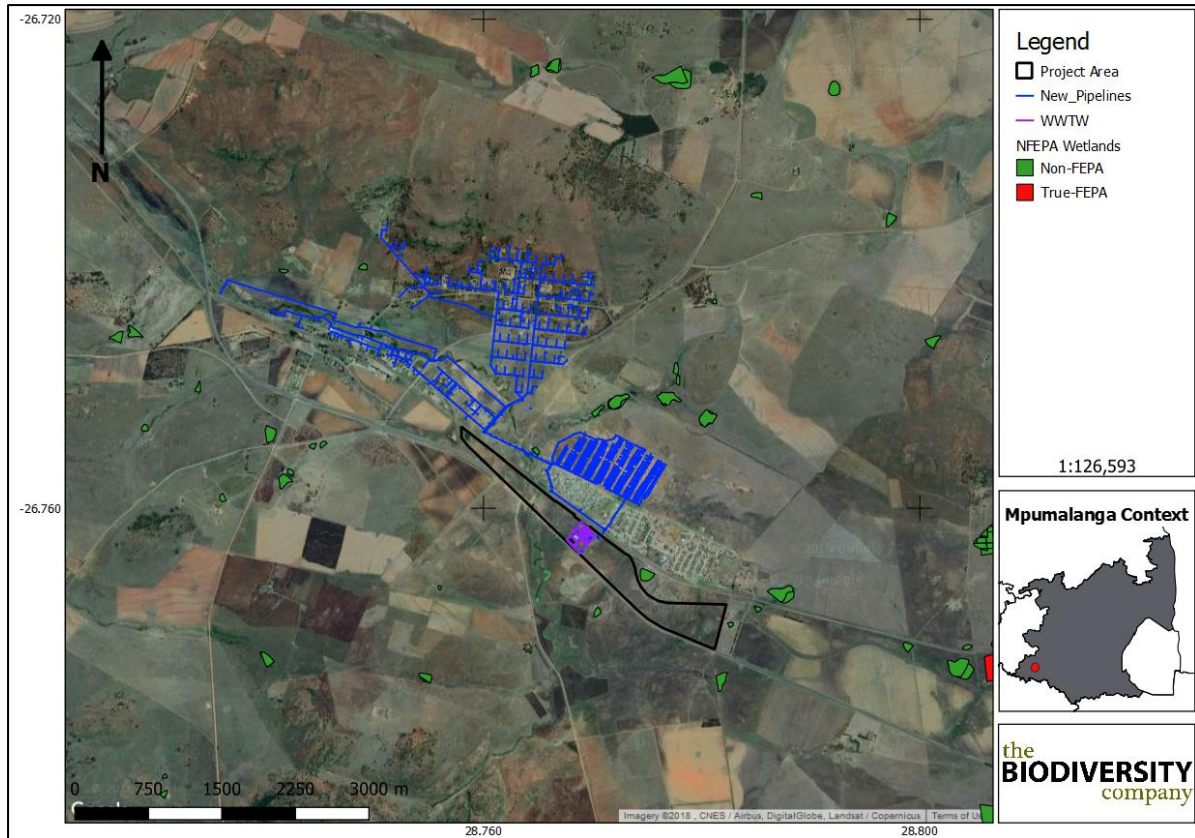


Figure 8: The project area in relation to the National Freshwater Ecosystem Priority Areas (2011)

Figure 8 shows the location of the project area in relation to wetland and river FEPAs. Based on this information several non-FEPA wetlands adjacent to the project area. No non-FEPA or true-FEPA rivers or wetlands occur within the project area.

Figure 9 shows the watercourses in relation to the project area. According to this no perennial rivers occur within the project area, but various non-perennial water courses occur within and adjacent to the proposed footprint area. Two non-perennial rivers merge close to the existing WWTW.



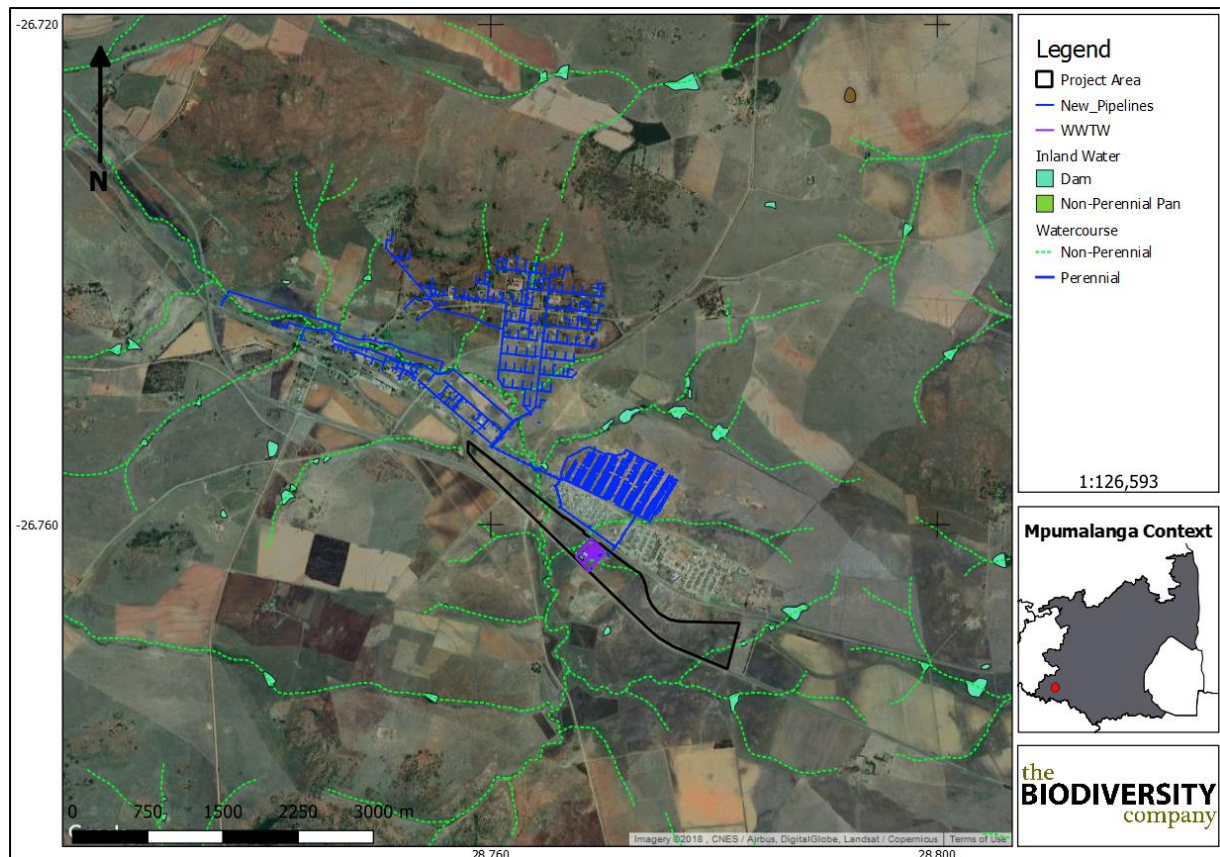


Figure 9: Project area in relation to the watercourses and inland water (Driver et al. 2011)

7 Results & Discussion

7.1 Desktop Assessment

7.1.1 Vegetation Assessment

The project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

- a) Seasonal precipitation; and
- b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.



7.1.1.1 Vegetation Types

The grassland biome comprises many different vegetation types. The project area is situated across two primary vegetation types; Soweto Highveld Grassland (Gs4) and Tsakane Clay Grassland (Gm9) vegetation types, according to Mucina & Rutherford (2006) (Figure 10). A very small portion of the northern reticulation network marginally enters an area classified as the Andesite Mountain Bushveld vegetation type.

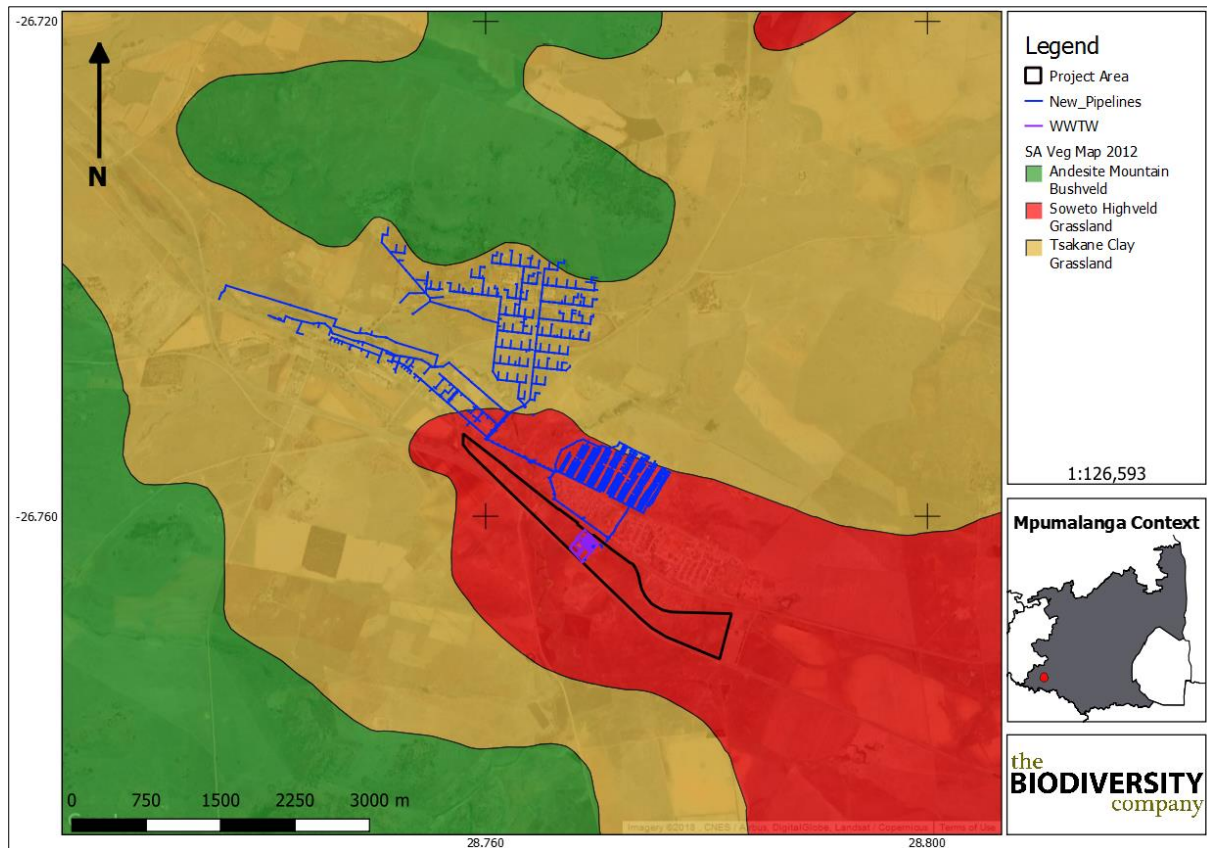


Figure 10: The project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2017)

7.1.1.2 Soweto Highveld Grassland

The Soweto Highveld Grassland vegetation type is found in Mpumalanga, Gauteng and to a little extent also in neighbouring Free State and North-West Provinces. This vegetation type typically comprises of an undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. Scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover (Mucina & Rutherford, 2006).



7.1.1.2.1 Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are important in the Soweto Highveld Grassland.

Graminoids: *Andropogon appendiculatus*, *Brachiaria serrata*, *Cymbopogon pospischilii*, *Cynodon dactylon*, *Elionurus muticus*, *Eragrostis capensis*, *E. chloromelas*, *E. curvula*, *E. plana*, *E. planiculmis*, *E. racemosa*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Setaria nigrirostris*, *S. sphacelata*, *Themeda triandra*, *Tristachya leucothrix*, *Andropogon schirensis*, *Aristida adscensionis*, *A. bipartita*, *A. congesta*, *A. junciformis* subsp. *galpinii*, *Cymbopogon caesius*, *Digitaria diagonalis*, *Diheteropogon amplexans*, *Eragrostis micrantha*, *E. superba*, *Harpochloa falx*, *Microchloa caffra*, *Paspalum dilatatum* (Mucina & Rutherford, 2006).

Herbs: *Hermannia depressa*, *Acalypha angustata*, *Berkheya setifera*, *Dicoma anomala*, *Euryops gilfillanii*, *Geigeria aspera* var. *aspera*, *Graderia subintegra*, *Haplocarpha scaposa*, *Helichrysum miconiifolium*, *H. nudifolium* var. *nudifolium*, *H. rugulosum*, *Hibiscus pusillus*, *Justicia anagalloides*, *Lippia scaberrima*, *Rhynchosia effusa*, *Schistostephium crataegifolium*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata* (Mucina & Rutherford, 2006).

Geophytic Herbs: *Haemanthus humilis* subsp. *hirsutus*, *H. montanus*. *Herbaceous Climber:* *Rhynchosia totta* (Mucina & Rutherford, 2006).

Low Shrubs: *Anthospermum hispidulum*, *A. rigidum* subsp. *pumilum*, *Berkheya annectens*, *Felicia muricata*, *Ziziphus zeyheriana* (Mucina & Rutherford, 2006).

7.1.1.2.2 Conservation Status of the Vegetation Type

According to Mucina & Rutherford (2006), the Soweto Highveld Grassland vegetation type is classified as Endangered. The national target for conservation protection for both these vegetation types is 24%, but only a few patches are statutorily conserved in Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe's Pan Nature Reserves or privately conserved in Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site.

By 2006 nearly half of the area of occupancy of this vegetation type had already been transformed by cultivation, urban sprawl, mining and building of road infrastructure. The amount of area transformed has most likely increased substantially. Some Soweto Grassland areas have been flooded by dams including Grootdraai, Leeukuil, Trichardtsfontein, Vaal and Willem Brummer.

7.1.1.3 Tsakane Clay Grassland

The Tsakane Clay Grassland vegetation type occurs in patches extending from Soweto and Springs, southwards to Nigel and Vereeniging. It also occurs north of the Vaal Dam and between the towns of Balfour and Standerton (Mucina & Rutherford 2006). According to Mucina & Rutherford (2006), the Tsakane Clay Grassland vegetation type is classified as Endangered.



7.1.1.3.1 Important Plant Taxa

Mucina & Rutherford (2006) list the following as important species in the Tsakane Clay Grassland vegetation type:

Graminoids: Grasses include *Andropogon schirensis*, *Brachiaria serrata*, *Cymbopogon caesius*, *Cynodon dactylon*, *Digitaria ternata*, *Diheteropogon amplexans*, *Elionurus muticus*, *Eragrostis racemosa*, *Eragrostis chloromelas*, *Eragrostis patentipilosa*, *Eragrostis plana*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Microchloa caffra*, *Setaria sphacelata*, *Themeda triandra* and *Trachypogon spicatus*;

Herbs: Herbs occurring in this vegetation type include *Acanthospermum australe*, *Ajuga ophrydis*, *Eriosema salignum*, *Euryops transvaalensis* subsp. *transvaalensis*, *Gerbera viridifolia*, *Helichrysum nudifolium*, *Helichrysum rugulosum*, *Hermannia depressa*, *Lotononis macrosepala*, *Nidorella hottentotica*, *Pentanisia prunelloides*, *Peucedanum caffrum*, *Rothea hirsuta*, *Selago paniculata*, *Senecio coronatus*, *Senecio inornatus*, *Sonchus nanus* and *Vernonia oligocephala*;

Geophytic Herbs: Geophytic herbs occurring in this vegetation type include *Aspidoglossum oligocephala*, *Hypoxis rigidula* var. *pilosissima*, and the semi-parasitic herb *Striga asiatica*;

Low Shrubs: Shrubs occurring in this vegetation type include *Anthospermum rigidum* subsp. *pumilum*, *Chaetacanthus setiger*, *Tephrosia capensis* var. *acutifolia* and *Thesium impeditum*.

7.1.1.4 Andesite Mountain Bushveld

The Andesite Mountain Bushveld vegetation type occurs in several separate patches across Gauteng, North-west, Mpumalanga and the Free State Provinces (Mucina & Rutherford, 2006).

7.1.1.4.1 Important Plant Taxa

Mucina & Rutherford (2006) list the following as important species in Andesite Mountain Bushveld:

Trees: *Vachellia caffra*, *Vachellia karroo*, *Celtis africana*, *Protea caffra*, *Zanthoxylum capense*, *Ziziphus mucronata*, *Asparagus laricinus*, *Euclea crispa*, *Rhus pyroides*, *Diospyros lycioides*, *Lippia javanica*, *Gymnosporia polyacantha* and *Rhamnus prinoides*;

Graminoids: Grasses include *Cymbopogon pospischilii*, *Digitaria eriantha*, *Elionurus muticus*, *Eragrostis racemosa*, *Eragrostis curvula*, *Eragrostis superba*, *Hyparrhenia hirta*, *Panicum maximum*, *Setaria sphacelata* and *Themeda triandra*; and

Herbs: Herbs occurring in this vegetation type *Commelina africana*, *Vernonia galpinii* and *Vernonia oligocephala*.

7.1.1.5 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 290 plant species are expected to occur in the project area. Figure 11 shows the extent of the grid that was used to compile the expected species list based on the Plants of Southern Africa (BODATSA-POSA, 2016) database. The list of expected plant species is provided in Appendix A.



Of the 385-plant species, three (4) species are listed as being Species of Conservation Concern (SCC) (Table 2).

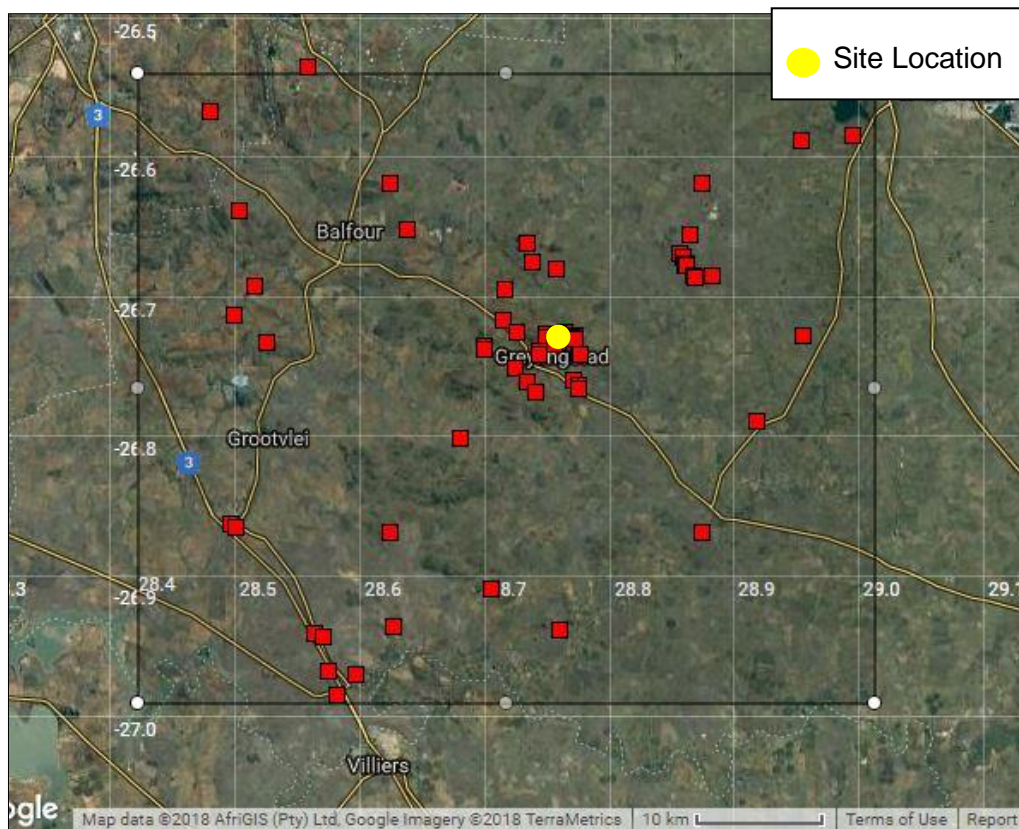


Figure 11: Map showing the grid drawn to compile an expected species list (BODATSA-POSA, 2016)

Table 2: Plant Species of Conservation Concern (SCC) expected to occur in the project area (BODATSA-POSA, 2016)

Family	Taxon	Author1	IUCN
Fabaceae	<i>Argyrolobium campicola</i>	Harms	NT
Iridaceae	<i>Gladiolus robertsoniae</i>	F.Bolus	NT
Orchidaceae	<i>Habenaria barbertoni</i>	Kraenzl. & Schltr.	NT
Asphodelaceae	<i>Kniphofia typhoides</i>	Codd	NT

7.1.2 Faunal Assessment

7.1.2.1 Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 317 bird species are expected to occur in the vicinity of the project area (pentads 2640_2835; 2640_2840; 2640_2845; 2645_2835; 2645_2840; 2645_2845; 2650_2835; 2650_2840; 2650_2845). The full list of potential bird species is provided in Appendix B.

Of the expected bird species, thirty (30) species are listed as SCC either on a regional scale or international scale (Table 3). The SCC include the following:

- One species which is listed as Critically Endangered (CR) on a regional basis;



- Eight (8) species that are listed as Endangered (EN) on a regional basis;
- Ten (10) species that are listed as Vulnerable (VU) on a regional basis; and
- Ten (10) species that are listed as Near Threatened (NT) on a regional basis.

Table 3: List of bird species of regional or global conservation importance that are expected to occur in pentads 2640_2835; 2640_2840; 2640_2845; 2645_2835; 2645_2840; 2645_2845; 2650_2835; 2650_2840; 2650_2845 (SABAP2, 2018, ESKOM, 2015; IUCN, 2017)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Afrotis afra</i>	Korhaan, Southern Black	VU	VU	Moderate
<i>Anthropoides paradiseus</i>	Crane, Blue	NT	VU	Moderate
<i>Anthus chloris</i>	Pipit, Yellow-breasted	VU	VU	Moderate
<i>Anthus crenatus</i>	Pipit, African Rock	NT	LC	Moderate
<i>Aquila verreauxii</i>	Eagle, Verreaux's	VU	LC	Moderate
<i>Balearica regulorum</i>	Crane, Grey Crowned	EN	EN	Moderate
<i>Bugeranus carunculatus</i>	Crane, Wattled	CR	VU	Moderate
<i>Calidris ferruginea</i>	Sandpiper, Curlew	LC	NT	Moderate
<i>Certhilauda brevirostris</i>	Lark, Agulhas Long-billed	NT	NE	High
<i>Ciconia nigra</i>	Stork, Black	VU	LC	Moderate
<i>Circus macrourus</i>	Harrier, Pallid	NT	NT	Moderate
<i>Circus maurus</i>	Harrier, Black	EN	VU	Moderate
<i>Circus ranivorus</i>	Marsh-harrier, African	EN	LC	Moderate
<i>Coracias garrulus</i>	Roller, European	NT	LC	Moderate
<i>Eupodotis caerulescens</i>	Korhaan, Blue	LC	NT	High
<i>Eupodotis senegalensis</i>	Korhaan, White-bellied	VU	LC	High
<i>Falco biarmicus</i>	Falcon, Lanner	VU	LC	High
<i>Falco vespertinus</i>	Falcon, Red-footed	NT	NT	High
<i>Geronticus calvus</i>	Ibis, Southern Bald	VU	VU	High
<i>Glareola nordmanni</i>	Pratincole, Black-winged	NT	NT	High
<i>Gyps coprotheres</i>	Vulture, Cape	EN	EN	Low
<i>Mycteria ibis</i>	Stork, Yellow-billed	EN	LC	Moderate
<i>Oxyura maccoa</i>	Duck, Maccoa	NT	NT	Moderate
<i>Phalacrocorax capensis</i>	Cormorant, Cape	EN	EN	Moderate
<i>Phoeniconaias minor</i>	Flamingo, Lesser	NT	NT	Moderate
<i>Polemaetus bellicosus</i>	Eagle, Martial	EN	VU	High
<i>Rostratula benghalensis</i>	Painted-snipe, Greater	NT	LC	High
<i>Sagittarius serpentarius</i>	Secretary bird	VU	VU	High
<i>Sterna caspia</i>	Tern, Caspian	VU	LC	High
<i>Tyto capensis</i>	Grass-owl, African	VU	LC	High

Some of the expected bird SCC from Table 3 are discussed below.



Afrotis afra (Southern Black Korhaan) is listed as Vulnerable (VU) on a regional and global scale (IUCN, 2017). They are endemic to the south-western portion of southern Africa. Their habitat varies from grassland areas to the Fynbos biome, Karoo biome and the western coastline of South Africa. The main threat to them is habitat loss, in an eight-year span 80% of their range has been lost, primarily due to agricultural developments. Their diet consists of insects, small reptiles and plant material, including seeds and green shoots (Hockey et al. 2005). There are few records of this species occurring in the vicinity of Greylingstad, but there is some suitable habitat and therefore it's likelihood of occurrence is rated as moderate.

Anthropoides paradiseus (Blue Crane) is listed as NT on a regional scale and as VU on a global scale, while *Balearica regulorum* (Grey Crowned Crane) is listed as EN both globally and regionally. *Bugeranus carunculatus* (Wattled Crane) is listed as CR regionally and VU globally. Populations of all three of these species have declined, largely owing to direct poisoning, power-line collisions and loss of their grassland breeding habitats owing to afforestation, mining, agriculture and development (IUCN, 2017). These species breed in natural grass and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short. There is extensive human-driven disturbances in the overall project area, however there is also patches of suitable open grassland and wetlands areas within the project site, and therefore the likelihood of occurrence is rated as moderate for all three of these crane species.

Anthus chloris (Yellow Breasted Pipit) is a resident and partial migrant of eastern South Africa and, marginally, eastern Lesotho. Globally and regionally they are listed as Vulnerable (VU) (IUCN, 2017). The species' population is suspected to have declined at a moderate rate, in line with the loss and degradation of its grassland habitat. Due to the presence of some suitable grassland habitat within the project area the likelihood of occurrence for this species is rated as moderate.

Anthus crenatus (African Rock Pipit) is endemic to South Africa and Lesotho (IUCN, 2017). They are classed as near threatened after undergoing a decline in habitat of 34% in the last 10 years (IUCN, 2017). The species is associated with rocky habitats that has abundant shrub and grassy areas. The presence of suitable rocky areas increases the likelihood of finding this species in the study area to a moderate level.

Aquila verreauxii (Verreaux's Eagle) is listed as VU on a regional scale and LC on a global scale. This species is locally persecuted in southern Africa where it coincides with livestock farms, but because the species does not take carrion, is little threatened by poisoned carcasses. Where hyraxes are hunted for food and skins, eagle populations have declined (IUCN, 2017). Based on the expected habitat, the close proximity of the rocky ridges which may provide suitable prey items, the likelihood of occurrence of this species at the project site is rated as moderate.

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and salt pans (IUCN, 2017). Due to the presence of some of these habitat types within the project area the likelihood of occurrence of this species was rated as moderate.



Certhilauda brevirostris (Agulhas long-billed) is listed as Near Threatened (NT) on a regional scale but has not yet been evaluated by IUCN. The species is endemic to South Africa and generally they prefer recently ploughed fields, shrubland punctuated with Renosterbos (*Dicerothermus rhinocerotis*) and dwarf Karoo shrubland on clay substrate. Mainly eats insects supplemented with seeds. Due to the presence of some suitable grassland habitat within the project area the likelihood of occurrence for this species is rated as moderate.

Ciconia nigra (Black Stork) is native to South Africa, and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). It is unlikely that this species would breed in the project area due to the lack of forested areas, however some suitable foraging habitat remains in the form of the open grasslands and wetland areas, and as such the likelihood of occurrence is rated as moderate.

Circus macrourus (Pallid Harrier) is listed as NT on a regional and global scale, and overwinters in semi-desert, scrub, savanna and wetlands. The species is migratory, with most birds wintering in sub-Saharan Africa or south-east Asia (IUCN, 2017). The species is most likely only to use the area as a migratory route or a temporary overwintering location from August to March, the likelihood of occurrence is moderate.

Circus maurus (Black Harrier) is listed as Endangered (EN) on a local basis and is restricted to southern Africa, where it is mainly found in the fynbos and Karoo of the Western and Eastern Cape. It is also found in the grasslands of Free State, Lesotho and KwaZulu-Natal. Harriers breed close to coastal and upland marshes, damp sites, near vleis or streams with tall shrubs or reeds. South-facing slopes are preferred in mountain areas where temperatures are cooler, and vegetation is taller (IUCN, 2017). During the non-breeding season, they will also be found in dry grassland areas further north and they also visit coastal river floodplains in Namibia. This species will therefore not breed in the project area but may be a temporary resident based on the presence of suitable habitat and therefore the likelihood of occurrence is rated as moderate.

Circus ranivorus (African Marsh Harrier) is listed as EN in South Africa (ESKOM, 2014). This species has an extremely large distributional range in sub-equatorial Africa. South African populations of this species are declining due to the degradation of wetland habitats, loss of habitat through over-grazing and human disturbance and possibly, poisoning owing to over-use of pesticides (IUCN, 2017). This species breeds in wetlands and forages primarily over reeds and lake margins. There are some wetlands and marsh areas within the project area, however there is some human disturbance and the occurrence of *C. ranivorus* in the project area is therefore considered to be moderate.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a moderate chance of this species occurring in the project area as they prefer to forage in open/disturbed agricultural areas.

Eupodotis caerulescens (Blue Korhaan) is listed as near threatened according to the IUCN (2017). Their moderately rapid decline is accredited to habitat loss that is a result of intensive



agriculture. They are found in high grassveld in close proximity to water, usually above an altitude of 1 500m (del Hoyo, et al. 1996). The species nests in bare open ground, situated in thick grass or cropland. Based on the presence of the required habitat the likelihood of occurrence of this species is rated as moderate within the project area.

Eupodotis senegalensis (White-bellied Korhaan) is Near-endemic to South Africa, occurring from the Limpopo Province and adjacent provinces, south through Swaziland to KwaZulu-Natal and the Eastern Cape. It generally prefers tall, dense sour or mixed grassland, either open or lightly wooded, occasionally moving into cultivated or burnt land, which is present in the vicinity of the project area and thus the likelihood of occurrence was rated as high (Hockey et al, 2005).

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals, but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of incidental records of this species in the project area is rated as high due to the relatively natural veld condition and the presence of many bird species on which Lanner Falcons may predate.

Falco vespertinus (Red-footed Falcon) is known to breed from eastern Europe and northern Asia to north-western China, heading south in the non-breeding season to southern Angola and southern Africa. Within southern Africa it is locally uncommon to common in Botswana, northern Namibia, central Zimbabwe and the area in and around Gauteng, South Africa (Hockey et al, 2005). The habitat it generally prefers is open habitats with scattered trees, such as open grassy woodland, wetlands, forest fringes and croplands. Many of these habitats are present in the project area and thus the likelihood of occurrence is rated as high.

Geronticus calvus (Southern Bald Ibis) is listed as Vulnerable (VU) on a regional basis and prefers high rainfall (>700 mm p.a.), sour and alpine grasslands, with an absence of trees and a short, dense grass sward and also occurs in lightly wooded and relatively arid country. It forages on recently burned ground, also using unburnt natural grassland, cultivated pastures, reaped maize fields and ploughed areas. It has a varied diet, mainly consisting of insects and other terrestrial invertebrates (IUCN, 2017). It has high nesting success on safe, undisturbed cliffs. The likelihood of the species foraging within the project area is good and there is a possibility of potential nesting sites downstream of the site. The likelihood of occurrence is rated as moderate to high.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to its migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. There is a small amount of suitable habitat within the project area and adjacent to it and as such the likelihood of occurrence is rated as moderate.

Gyps coprotheres (Cape Vulture) is listed as Endangered (EN) on both a regional and global scale. Cape Vultures are long-lived carrion-feeders specialising on large carcasses, they fly long distances over open country, although they are usually found near steep terrain, where



they breed and roost on cliffs (IUCN, 2017). Individuals may be seen foraging within the area but are they are unlikely to be resident and therefore the likelihood of occurrence is rated as low.

Mycteria ibis (Yellow-billed Stork) is listed as EN on a regional scale and Least Concern (LC) on a global scale (Table 2). This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). The presence of a few water bodies within the project area creates a high possibility that this species may occur there.

Oxyura maccoa (Maccoa Duck) has a large northern and southern range, South Africa is part of its southern distribution. During the species' breeding season, it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds (*Phragmites* spp.) and cattails (*Typha* spp.) on which it relies for nesting (IUCN, 2017). The likelihood of occurrence of this species in the project area was rated as moderate due to the presence of multiple dams and also the presence of the WWTW ponds which this species may utilise.

Phalacrocorax capensis (Cape Cormorant) is endemic to the southwestern coast of Africa, but during the non-breeding season they spread inland and up the east coast of South Africa. The IUCN as well as Birdlife South Africa lists these birds as endangered, and the main cause of the decline is as a result of the decline of the epipelagic fish stock, oil spills and avian cholera. Due to the presence of suitable habitat, the likelihood of occurrence is rated as moderate.

Phoeniconaias minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). Due to the presence of some of its preferred habitat within the project area, the likelihood of occurrence is rated as moderate for this species.

Polemaetus bellicosus (Martial eagle) is listed as EN on a regional scale and VU on a global scale (Table 2). This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017). With the presence of good grassland habitat in the project area but an absence of large trees for roosting and nesting this species may only use the site for foraging and thus there is a moderate chance of this species occurring.

Rostratula benghalensis (Greater Painted-snipe) shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetland, it has a wide range of these freshwater habitats which they occur in, in this case, sewage pools, reservoirs, mudflats overgrown with marsh grass which do exist within the project area, thus the likelihood of occurrence is high.



Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as high due to the extensive grasslands and wetland areas present in the project area, as well as the agricultural areas present in which this species may forage.

Sterna caspia (Caspian Tern) is native to South Africa and are known to occur in inland freshwater systems such as large rivers, creeks, floodlands, reservoirs and sewage ponds. Habitat suitability was found to be moderate and thus the likelihood of occurrence is moderate.

Tyto capensis (African Grass-owl) is rated as Vulnerable (VU) on a regional basis. The distribution of the species includes the eastern parts of South Africa. The species is generally solitary, but it does also occur in pairs, in moist grasslands where it roosts (IUCN, 2017). The species prefers thick grasses around wetlands and rivers which are not present in the project area. Furthermore, this species specifically has a preference for nesting in dense stands of the grass species *Imperata cylindrica*. Some of this grass species may be evident within the project area and as such the likelihood of occurrence is rated as high.

7.1.2.1.1 Important Bird Areas

Important Bird Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of Important Bird and Biodiversity Areas (IBAs) is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

One significant IBAs occurs adjacent to the proposed project area, namely the Devon Grasslands IBA and is situated 5.2 km north of the project area (Figure 12). This IBA was established in 2014 due to the presence of a number of species of conservation concern. The IBA extends from the town of Devon in the north to an area 7 km east of Balfour and 5 km north of Greylingstad.

The area is well known for Blue Crane (*Anthropoides paradiseus*) and flocks totalling 250–300 birds are recorded most winters. A single Wattled Crane (*Bugeranus carunculatus*) forages with the Blue Cranes. Blue Korhaan (*Eupodotis caerulescens*) and Secretarybird (*Sagittarius serpentarius*) breed here and are commonly observed. Four harrier species occur regularly: African Marsh Harrier is resident, Black Harrier is a winter visitor and Pallid Harrier and Montagu's Harrier are summer migrants. African Grass Owl is probably under-recorded as there is suitable habitat for this species throughout the IBA. Waterbird numbers fluctuate considerably as water levels change on the numerous dams and streams in the area (Birdlife, 2017).



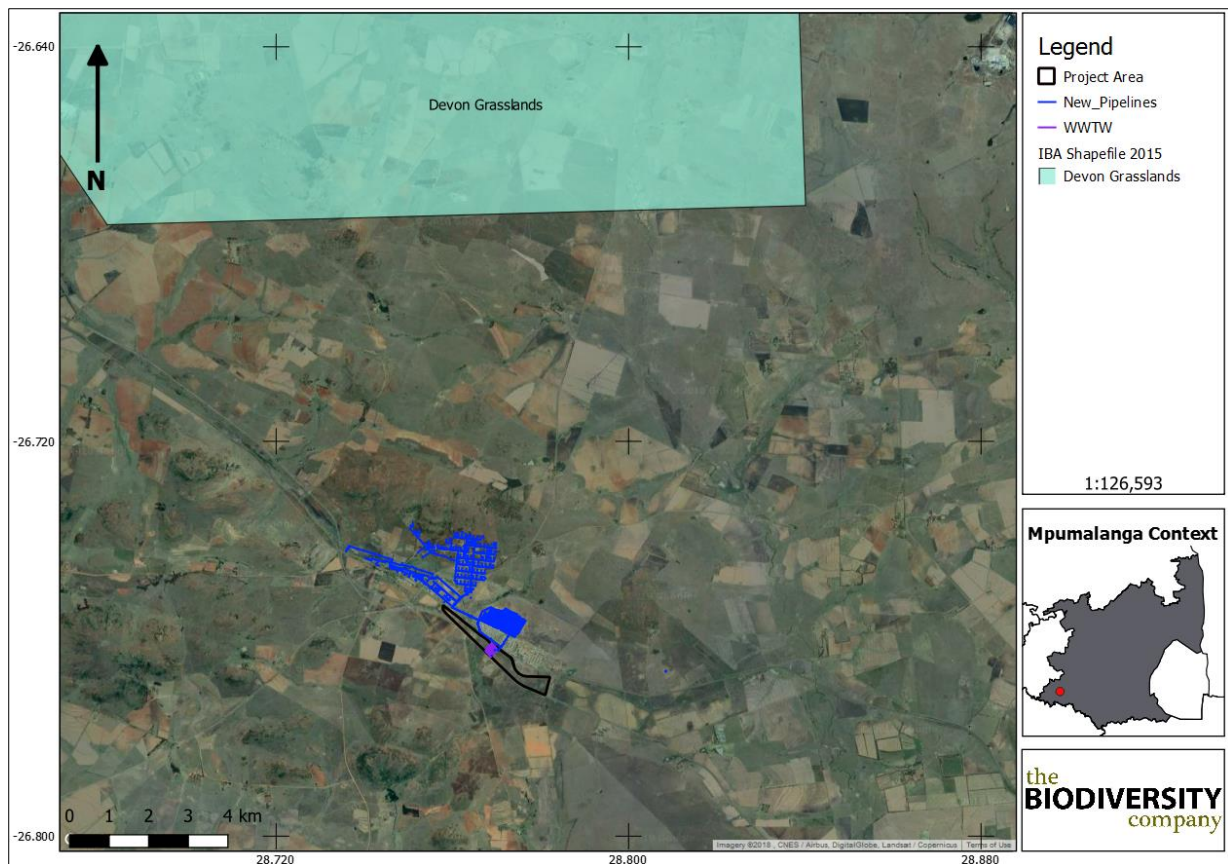


Figure 12: The project area in relation to defined IBAs (Birdlife, 2017)

7.1.2.2 Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 77 mammal species that could be expected to occur within the vicinity of the project area (Appendix C). Of these species, 10 are medium to large conservation dependant species, such as *Ceratotherium simum* (Southern White Rhinoceros) and *Equus quagga* (Plains Zebra) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area and are removed from the expected SCC list. They are however still included in Appendix C.

Of the remaining 67 small to medium sized mammal species, twelve (12) are listed as being of conservation concern on a regional or global basis (Table 4).

The list of potential species includes:

- Two (2) that is listed as Endangered (EN) on a regional basis;
- Five (5) that are listed as Vulnerable (VU) on a regional basis; and
- Six (6) that are listed as Near Threatened (NT) on a regional scale (Table 4).



Table 4: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT	Moderate
<i>Atelerix frontalis</i>	South Africa Hedgehog	NT	LC	Moderate
<i>Crocidura maquassiensis</i>	Makwassie Musk Shrew	VU	LC	Moderate
<i>Felis nigripes</i>	Black-footed Cat	VU	VU	Moderate
<i>Hydrictis maculicollis</i>	Spotted-necked Otter	VU	NT	Moderate
<i>Leptailurus serval</i>	Serval	NT	LC	High
<i>Mystromys albicaudatus</i>	White-tailed Rat	VU	EN	Moderate
<i>Ourebia ourebi</i>	Oribi	EN	LC	Moderate
<i>Panthera pardus</i>	Leopard	VU	VU	Low
<i>Parahyaena brunnea</i>	Brown Hyaena	NT	NT	Low
<i>Pelea capreolus</i>	Grey Rhebok	NT	LC	Low
<i>Poecilogale albinucha</i>	African Striped Weasel	NT	LC	Low
<i>Redunca fulvorufula</i>	Mountain Reedbuck	EN	LC	Moderate

Some of the expected mammal SCC are discussed below.

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. Based on the absence of some perennial rivers and dams within the project area the likelihood of occurrence of this species occurring in the project area is considered to be moderate.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is some suitable habitat in the project area and therefore the likelihood of occurrence is rated as moderate.

Crocidura maquassiensis (Maquassie Musk Shrew) is listed as Vulnerable (VU) on a regional basis and is known to be found in rocky, mountain habitats. It may tolerate a wider range of habitats and individuals have been collected in Kwa-Zulu Natal from a garden, and in mixed bracken and grassland alongside a river at 1,500 m (IUCN, 2017). There is some suitable habitat for this species in the project area and therefore the likelihood of occurrence is rated as moderate.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the more arid Karoo region of South Africa, the habitat in the project area can be considered to be sub-optimal for the species and the likelihood of occurrence is rated as moderate.



Hydrictis maculicollis (Spotted-necked Otter) inhabits freshwater habitats where water is unsilted, unpolluted, and rich in small to medium sized fishes (IUCN, 2017). Suitable habitat may be available in stream and wetland areas in the project area and therefore the likelihood of occurrence is moderate.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Due to the presence of extensive suitable natural grassland areas in the project area the likelihood of occurrence for this species is rated as high.

Mystromys albicaudatus (White-tailed Rat) is listed as Vulnerable (VU) on a regional basis and Endangered (EN) on a global scale. It is relatively widespread across South Africa and Lesotho; the species is known to occur in shrubland and grassland areas. A major requirement of the species is black loam soils with good vegetation cover. Although the vegetation type is suitable, no black loam seems to be present on site, therefore the likelihood of occurrence of this species is rated as moderate.

Ourebia ourebi (Oribi) has a patchy distribution throughout Africa and is known to occur in South Africa. Populations are becoming more fragmented as it is gradually eliminated from moderately to densely settled areas (IUCN, 2017). Oribi occur in a variety of habitats – from savannahs, floodplains and tropical grasslands with moderate to tall grasses, to montane grasslands at low altitudes. Suitable habitat exists within the project area and surrounding areas, but there is also fairly extensive human disturbance and therefore the likelihood of occurrence is rated as moderate.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low. The likelihood of occurrence in the project area which is in such close proximity to an urban area, and where they are likely to be persecuted, is regarded as low.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the project area is moderate to good. The absence of moderate to large herbivores within the project area and the nearby human settlement decreases the likelihood of occurrence of this species to a low level.

Pelea capreolus (Grey Rhebok) is endemic to a small region in southern Africa, inhabiting montane and plateau grasslands of South Africa, Swaziland, and Lesotho. In South Africa,



their distribution is irregular and patchy, and they no longer occur north of the Orange River in the Northern Cape, or in parts of the North-West Province (IUCN, 2017). Grey Rhebok can be found in suitable habitat which has rocky hills, grassy mountain slopes, and montane and plateau grasslands in southern Africa. They are predominantly browsers, and largely water independent, obtaining most of their water requirements from their food. Based on the lack of their favoured habitat within the project area and the human disturbance, the likelihood of occurrence of this species is rated as low.

Poecilogale albinucha (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wider habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas where it does occur. There is some suitable habitat for this species in the project area and the likelihood of occurrence of this species is therefore considered to be moderate.

Redunca fulvorufula (Mountain Reedbuck) is listed as EN both regionally and globally. The South African population has undergone a decline of 61-73% in the last three generations (15 years) (IUCN, 2017). Mountain Reedbuck live on ridges and hillsides in broken rocky country and high-altitude grasslands (often with some tree or bush cover). Although there is not extensive mountainous regions in the project area, there are a number of valleys and a rocky ridge north of town that this species may utilise and as such, the likelihood of occurrence for this species is rated as moderate to high.

7.1.2.3 Herpetofauna (Reptiles & Amphibians)

7.1.2.3.1 Reptiles

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2017) 20 reptile species are expected to occur in the project area (Appendix D). One (1) reptile species of conservation concern is expected to be present in the project area (Table 5).

Table 5: Expected reptile species of conservation concern that may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Crocodylus niloticus</i>	Nile Crocodile	VU	LC	Low



Crocodylus niloticus (Nile Crocodile) prefers permanent water bodies with suitable sandy banks for basking and egg-laying. This species is often persecuted by people. The likelihood of occurrence for this species within the overall project area is rated as low.

7.1.2.3.2 Amphibians

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2017) fifteen (15) amphibian species are expected to occur in the project area (Appendix E).



One (1) amphibian species of conservation concern could be present in the project area according to the above-mentioned sources (Table 6).

Table 6: Amphibian species of conservation concern which may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT	LC	Moderate



The Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that will possibly occur in the project area. The Giant Bull Frog is listed as near threatened on a regional scale. It is a species of drier savannahs. It is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017). There appears to be minimal suitable habitat for this species in the project area and therefore the likelihood of occurrence is regarded as low.

7.2 Field Survey

The field survey for the project area was conducted on the 4th of July 2018 by two terrestrial ecologists. During the surveys the floral and faunal communities within the project development footprint were assessed. The project area was ground-truthed on foot, which included spot checks in pre-selected areas to validate desktop data. Photographs were recorded during the site visits and some are provided in this section of the report. All site photographs are available on request.

7.3 Habitat Assessment

Habitats identified during the field visit can be seen in Figure 13. Due to the extent of the development, a general study area was created in order to delineate habitats. Three primary habitats were delineated for this assessment, namely: Disturbed, Natural and Stream habitats.

Disturbed habitats are those which were considered to have been extensively altered from their natural state and no longer provide ecosystem services or suitable habitat for indigenous species. Examples of these areas include the suburban footprint of the Greylingstad and Nthorwane areas.

Natural habitats were those areas which are considered to be in a relatively natural or pristine condition, and provide suitable habitat for various species, including possible species of conservation concern. The identified CBA area north of Nthorwane is included in this habitat type, although some of the grassland areas were disturbed due to the presence of people living nearby.

Stream habitats included the perennial stream areas that bisect the project area and flow past the existing WWTW. These areas, although somewhat disturbed, provide habitat for various waterfowl and act as important corridors for local wildlife.



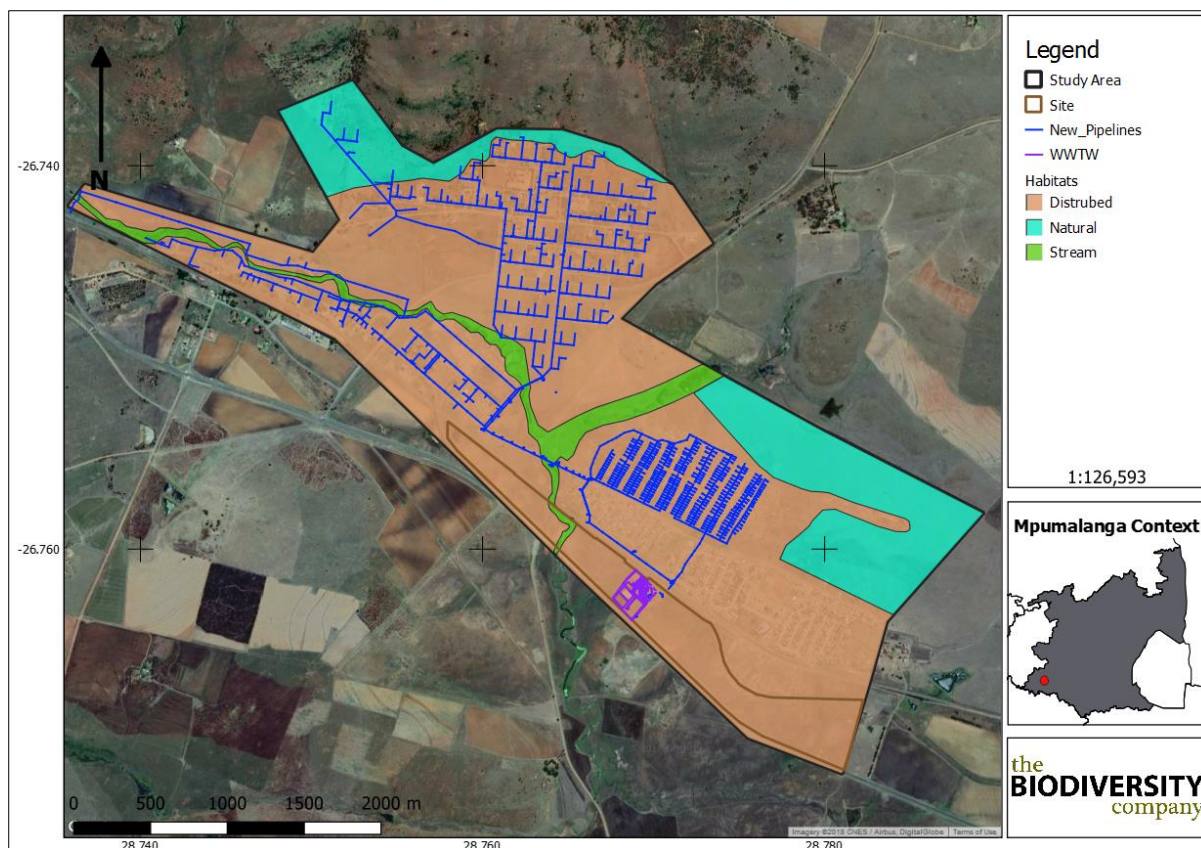


Figure 13: Habitats identified in a general study area

7.3.1 Vegetation Assessment

The vegetation assessment was conducted throughout the extent of the project area.

A total of 24 tree, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 7). Plants listed as Category 1 alien or invasive species under the National Environmental Management: Biodiversity Act (NEMBA) appear in green text. Plants listed in Category 2 or as ‘not indigenous’ or ‘naturalised’ according to NEMBA, appear in blue text.

Table 7: Trees, shrubs and weeds recorded at the proposed project area

Species	Threat status (SANBI, 2017)	SA Endemic	NEMBA Category
<i>Acacia mearnsii</i>			Category 2 NEMBA
<i>Asparagus sp</i>			
<i>Bidens pilosa</i>			Not Indigenous; Naturalised
<i>Cirsium vulgare</i>			NEMBA Category 1b
<i>Cymbopogon caesius</i>	LC	No	
<i>Cynodon dactylon</i>			NEMBA Category 2
<i>Datura ferox</i>			NEMBA Category 1b
<i>Eragrostis lehmanniana</i>	LC	No	
<i>Eucalyptus sp</i>			NEMBA Category 1b



<i>Euclea crispa</i>	LC	No	
<i>Gomphocarpus fruticosus</i>	LC	No	
<i>Heteropogon contortus</i>	LC	No	
<i>Hyparrhenia hirta</i>	LC	No	
<i>Olea europaea</i>	LC	No	
<i>Opuntia ficus-indica</i>			NEMBA Category 1b
<i>Pyracantha angustifolia</i>			NEMBA Category 1b
<i>Robinia pseudoacacia</i>			NEMBA Category 1b
<i>Searsia lancea</i>	LC	No	
<i>Searsia pyroides</i>	LC	No	
<i>Tagetes minuta</i>			Not Indigenous; Naturalised
<i>Themeda triandra</i>	LC	No	
<i>Typha capensis</i>	LC	No	
<i>Vachellia karroo</i>	LC	No	
<i>Verbena bonariensis</i>			NEMBA Category 1b

7.3.1.1 Alien and Invasive Plants

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

The National Environmental Management: Biodiversity Act (NEMBA) is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have



such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.

- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
 - Section 75 of the Act;
 - The relevant invasive species management programme developed in terms of regulation 4; and
 - Any directive issued in terms of section 73(3) of the Act.

Seven (7) Category 1b invasive plant species were recorded within the project area and it is recommended that an alien invasive plant management programme be implemented in compliance of section 75 of the Act as stated above. The NEMBA listed species identified within the project area are marked in green (Table 7).

7.3.2 Fauna

7.3.2.1 Avifauna

Forty-seven (47) bird species were recorded in the project area during the July 2018 survey based on either direct observations, vocalisations, or the presence of visual tracks & signs (Table 8) (Figure 14).

One avifaunal SCC were recorded during the survey, namely, Secretary bird (*Sagittarius serpentarius*). Based on the presence of suitable grassland habitat, there is a moderate to high probability that other bird SCC occur within the project area – especially grassland bird species.

Table 8: A list of avifaunal species recorded for the project area (species highlighted in red are listed species)

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Acridotheres tristis</i>	Myna, Common	Unlisted	LC



<i>Anas smithii</i>	Shoveler, Cape	Unlisted	LC
<i>Apus apus</i>	Swift, Common	Unlisted	LC
<i>Ardea melanocephala</i>	Heron, Black-headed	Unlisted	LC
<i>Bostrychia hagedash</i>	Ibis, Hadedda	Unlisted	LC
<i>Bubulcus ibis</i>	Egret, Cattle	Unlisted	LC
<i>Calandrella cinerea</i>	Lark, Red-capped	Unlisted	LC
<i>Columba guinea</i>	Pigeon, Speckled	Unlisted	LC
<i>Columba livia</i>	Dove, Rock	Unlisted	LC
<i>Corvus albus</i>	Crow, Pied	Unlisted	LC
<i>Corythaixoides concolor</i>	Go-away-bird, Grey	Unlisted	LC
<i>Cossypha caffra</i>	Robin-chat, Cape	Unlisted	LC
<i>Egretta intermedia</i>	<i>Egret, Yellow-billed</i>	<i>Unlisted</i>	<i>LC</i>
<i>Elanus caeruleus</i>	Kite, Black-shouldered	Unlisted	LC
<i>Elanus caeruleus</i>	Kite, Black-shouldered	Unlisted	LC
<i>Euplectes ardens</i>	Widowbird, Red-collared	Unlisted	LC
<i>Fulica cristata</i>	Coot, Red-knobbed	Unlisted	LC
<i>Gallinula chloropus</i>	Moorhen, Common	Unlisted	LC
<i>Lamprotornis nitens</i>	Starling, Cape Glossy	Unlisted	LC
<i>Laniarius ferrugineus</i>	Boubou, Southern	Unlisted	LC
<i>Lanius collaris</i>	Fiscal, Common (Southern)	Unlisted	LC
<i>Macronyx capensis</i>	Longclaw, Cape	Unlisted	LC
<i>Melierax canorus</i>	Goshawk, Southern Pale Chanting	Unlisted	LC
<i>Mirafrā africana</i>	Lark, Rufous-naped	Unlisted	LC
<i>Mirafrā cheniana</i>	Lark, Melodious	LC	LC
<i>Motacilla capensis</i>	Wagtail, Cape	Unlisted	LC
<i>Numida meleagris</i>	Guineafowl, Helmeted	Unlisted	LC
<i>Passer domesticus</i>	Sparrow, House	Unlisted	LC
<i>Passer melanurus</i>	Sparrow, Cape	Unlisted	LC
<i>Phalacrocorax africanus</i>	Cormorant, Reed	Unlisted	LC
<i>Platalea alba</i>	Spoonbill, African	Unlisted	LC
<i>Plocepasser mahali</i>	Sparrow-weaver, White-browed	Unlisted	LC
<i>Ploceus velatus</i>	Southern Masked-weaver	Unlisted	LC
<i>Pycnonotus tricolor</i>	Bulbul, Dark-capped	Unlisted	Unlisted
<i>Quelea quelea</i>	Quelea, Red-billed	Unlisted	LC
<i>Sagittarius serpentarius</i>	Secretary bird	VU	VU
<i>Saxicola torquatus</i>	Stonechat, African	Unlisted	LC
<i>Sigelus silens</i>	Flycatcher, Fiscal	Unlisted	LC
<i>Streptopelia capicola</i>	Turtle-dove, Cape	Unlisted	LC
<i>Streptopelia semitorquata</i>	Dove, Red-eyed	Unlisted	LC
<i>Streptopelia senegalensis</i>	Dove, Laughing	Unlisted	LC
<i>Tachybaptus ruficollis</i>	Grebe, Little	Unlisted	LC
<i>Telophorus zeylonus</i>	Bokmakierie	Unlisted	LC
<i>Threskiornis aethiopicus</i>	Ibis, African Sacred	Unlisted	LC



<i>Trachyphonus vaillantii</i>	Barbet, Crested	Unlisted	LC
<i>Uraeginthus angolensis</i>	Waxbill, Blue	Unlisted	LC
<i>Vanellus armatus</i>	Lapwing, Blacksmith	Unlisted	LC
<i>Vanellus coronatus</i>	Lapwing, Crowned	Unlisted	LC



Figure 14: Some of the avifauna recorded within the project area: A) Black-shouldered Kite *Elanus caeruleus*; B) Red-knobbed Coot *Fulica cristata*; C) Cape Shoveler *Anas smithii*; D) Secretary bird *Sagittarius serpentarius*; E) Melodious Lark *Mirafra cheniana*; F) Blacksmith Lapwing *Vanellus armatus*; G) Cape Longclaw *Macronyx capensis*; H) Yellow-billed Egret *Egretta intermedia* & African Spoonbill *Platalea alba* and I) African Sacred Ibis *Threskiornis aethiopicus*

7.3.2.2 Mammals

Overall, mammal diversity in the project area was moderate to low, with six mammal species being recorded during the July 2018 survey based on direct observations and/or the presence of visual tracks & signs (Table 9).

One mammal SCC was recorded, namely the Cape Clawless Otter which is listed as Near Threatened on a regional and a global scale.



Table 9: Mammal species recorded in the project area during the July 2018 survey (species highlighted in red are listed species)

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT
<i>Atilax paludinosus</i>	Water Mongoose	LC	LC
<i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC
<i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC
<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	LC
<i>Lepus saxatilis</i>	Scrub Hare	LC	LC

7.3.2.3 Herpetofauna (Reptiles & Amphibians)

Herpetofauna diversity was considered to be low with no reptile and amphibian species observed or recorded in the project area during the July 2018 survey. This was attributed to the seasonal timing of the survey which was sub-optimal for the presence of herpetofauna. Based on the presence of suitable grassland and rocky mountain habitat, reptile diversity in the area is expected to be moderate to high. Portions of reptile skin and various gecko eggs were discovered during the survey which confirms the presence of some reptile species. A survey conducted during the spring or summer months would produce more accurate results regarding herpetofauna.

8 Habitat Sensitivity Mapping

8.1 Development Area

As per the terms of reference for the project, a GIS sensitivity map is required in order to identify sensitive features in terms of the relevant specialist discipline/s within the project area, especially in reference to the development, and in this case the study area created which surrounds the proposed development. The sensitivity scores identified during the field survey for each habitat were then visually mapped (Figure 15).

Areas that were classified as having low or moderate sensitivities are those areas which were deemed by the specialists to have been most impacted upon and/or were modified from their original condition due to factors such as over-grazing, human activity and/or presence of alien invasive species.

The areas given a very high sensitivity rating are those areas with relatively high percentages of existing natural vegetation and/or are areas classified as functional CBAs or areas that have the capacity to serve as habitat or important corridors for various species (especially potential SCC) (Figure 15).

Freshwater ecosystems such as rivers and wetlands are generally the lowest point in a landscape, and therefore particularly vulnerable to pollution from waste, sedimentation and pollutants present in runoff. This combined with the strong connectivity of freshwater ecosystems makes them highly susceptible to upstream and downstream impacts. Vegetative buffers areas have a significant impact on pollution control and the associated water quality in



nearby water bodies, soil erosion control, and provide wildlife habitat and movement corridors for species such as Water Monitors and Otters. Therefore, such areas are typically given a higher sensitivity rating. Due to some of the perennial streams in the project area being impacted upon due to human encroachment and disturbance, these areas were given a moderate sensitivity.

For this project, the northern and south-eastern portions of the project area, although slightly altered, were given a high sensitivity rating due to the important role these areas have from an ecological point (as a corridor, rocky ridge and/or CBA) (Figure 15).

Much of the central portion of the project area is highly disturbed due to the town footprints, the presence of people and associated activities such as litter and illegal dumping and therefore these areas are given a low sensitivity rating.

It is important to note that this map does not replace any local, provincial or government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

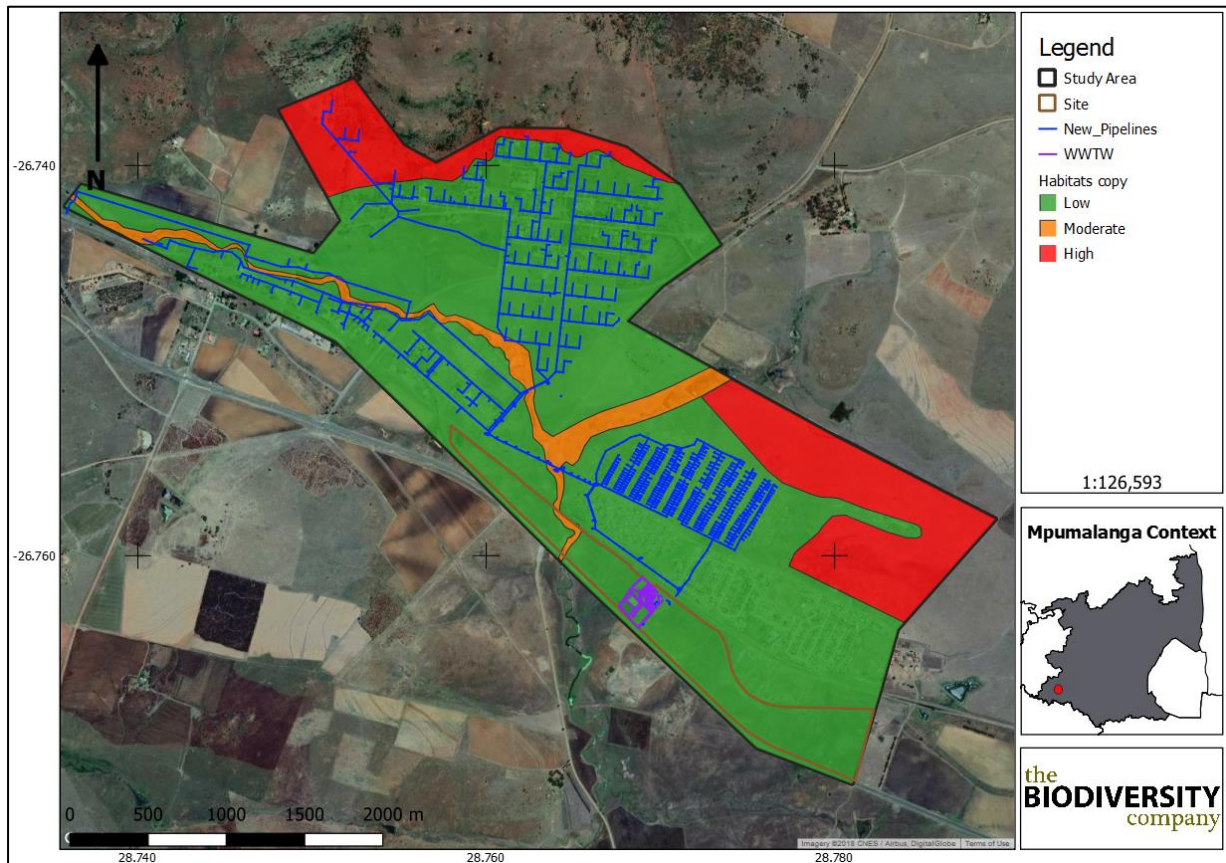


Figure 15: Habitat sensitivity map of the project area

9 Impact Assessment

Development-related activities can have significant impacts on biodiversity and ecosystem services, often causing irreversible and large-scale habitat loss across large areas or areas important for the provision of important ecosystem services.



Key impacts commonly associated with development activities are discussed below. The listed activities are merely indicative, and the proposed developments may either have additional or fewer activities depending on the circumstances. It should be noted that these categories, with associated impact descriptions is not exhaustive, and more impacts may be identified at a later stage as more information becomes available. The significance (quantification) of potential environmental impacts has been assessed in terms of the Guideline Documentation on EIA Regulation; Department of Environmental Affairs and Tourism, 2014 (Impact Assessment Methodology, Appendix 6).

9.1 Impact Assessment Methodology

Potential impacts were evaluated against the data captured during the desktop-and field assessment to identify relevance to the study area. The relevant impacts associated with the proposed sewerage reticulation network were then subjected to a prescribed impact assessment methodology which is described below.

Impacts were assessed in terms of the construction, operational, closure, rehabilitation and post-closure phases. The operational phase refers to that phase of the project where the area is being actively mined.

Mitigation measures were only applied to impacts deemed relevant based on the impact analysis. The likelihood and consequence descriptors are presented in Table 10 and Table 11. The significance rating matrix is presented in Table 12.

Table 10: Likelihood descriptors

Probability of impact	Rating
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	Rating
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

Table 11: Consequence Descriptors

Severity of impact	Rating
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	Rating



Activity specific/ < 5 ha impacted / Linear features affected < 100m	1
Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	5
Duration of impact	Rating
One day to one month: Temporary	1
One month to one year: Short Term	2
One year to five years: Medium Term	3
Life of operation or less than 20 years: Long Term	4
Permanent	5

Table 12: Significance Rating Matrix

LIKELIHOOD (Frequency of activity + Frequency of impact)	CONSEQUENCE (Severity + Spatial Scope + Duration)															Very Low
	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	Low	
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45		
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	Moderate	
5	10	15	20	25	30	35	40	45	50	55	60	65	70	75		
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	Moderately High	
7	14	21	28	35	42	49	56	63	70	77	84	91	98	105		
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	High	
9	18	27	36	45	54	63	72	81	90	99	108	117	126	135		
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	Critical	

9.2 Current Impacts

During the rapid field survey, the current impacts that are having a negative impact on the area were identified, and are listed below and some are shown in Figure 16;

- Dumping of rubble and litter in the project area;
- Overgrazing by livestock such as cattle and goats;
- Extensive sections of the project area were burnt;
- Presence of alien and invasive plant species;
- Sewage plant that is not functioning;
- Raw sewerage leaking into the surrounding environment;
- Adjacent secondary road; and
- Powerlines within the vicinity of the project area.





Figure 16: Some of the impacts identified in the project area; A) Goats and sheep; B) Cattle; C) Rural informal housings; D & E) Sewage works and the overflow of raw sewerage into the surrounding environment (including the stream) and F) Dumping and litter

9.3 Identification of Additional Potential Impacts

The proposed development is associated the development of a waste water reticulation network to serve Greylingstad and Nthorwane and the possible extension of the WWTW. The proposed activities are envisaged to last indefinitely and as such no rehabilitation or post closure impacts were considered.

The proposed activity may lead to the loss and destruction of habitats, direct mortalities and displacement of fauna and flora. The removal of natural vegetation to accommodate sewer



pipes may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area, at least temporarily.

Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features.

Most of the proposed development areas are situated within or directly adjacent to areas which have been previously disturbed. For example, many of the proposed pipelines will be situated along or within existing road verges – such areas are not considered to be in a natural state and the overall impact of construction in these areas is considered minimal. However, the overall environment is still considered sensitive and the proposed sewer pipes do cross certain sensitive areas such as CBAs and perennial rivers.

The potential impacts associated with the various project stages are discussed below.

9.3.1 Construction Phase

The following potential impacts were considered on terrestrial vegetation communities:

- Destruction of, and fragmentation of, portions of the vegetation community (including portions of two Endangered vegetation types, a rocky ridge and area classified as a CBA).

Potential impacts on faunal communities include:

- Displacement of faunal community (including possible threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration) and/or direct mortalities.

9.3.2 Operational Phase

The following potential impacts were considered on terrestrial vegetation communities:

- Continued disturbance of two Endangered vegetation communities (including portions of a CBA and encroachment by alien invasive plant species; and
- Potential leaks, discharges and/or pollutant from the sewerage works or broken sewer pipelines leaching into the surrounding environment.

Potential impacts on faunal communities include:

- Continued displacement and fragmentation of the faunal community (including threatened or protected species) due to ongoing anthropogenic disturbances and habitat degradation (litter, road mortalities and/or poaching).

10 Assessment of Significance

10.1 Construction Phase

Table 13 shows the significance of potential impacts associated with the development on vegetation communities before and after implementation of mitigation measures. Prior to



implementation of mitigation measures the significance of impacts were rated as moderate (Table 13). Implementation of avoidance measures as mitigation reduced the significance of potential impact on the vegetation community to a low level (Table 13).

The significance of potential impacts associated with the development on faunal communities before and after mitigation is presented in Table 13. Prior to implementation of mitigation measures the significance of impacts were rated as moderate. Implementation of avoidance measures as mitigation reduced the significance of potential impact on the faunal communities to a low level (Table 13).

10.2 Operational Phase

Table 14 shows the significance of potential operational phase impacts on vegetation communities before and after implementation of mitigation measures. The significance of the continued removal and fragmentation of a Vulnerable vegetation community (including portions of wetlands and areas classified as CBA: Irreplaceable) due to development and encroachment by alien invasive plant species was rated as moderately high prior to mitigation. Implementation of mitigation measures in the form an alien invasive plant management plan and rehabilitation of project footprint, reduced the significance of the impact to moderate levels (Table 14).

Table 14 the significance of potential operational phase impacts of potential leaks, discharges and/or pollutants into the surrounding environment. The significance of was rated as high pre-mitigation and moderate, post-mitigation (Table 14). Due to the nature of this type of development and the associated risk of untreated effluent entering the environment (as is currently happening), and due to the intact nature of some of the habitats, CBA areas, and ridges, the impacts of potential discharge on identified threatened faunal species and sensitive vegetation communities remains at a moderate level, even after mitigation.

The significance of operational phase impacts on terrestrial fauna communities was rated as moderate prior to mitigation and low post mitigation (Table 14)). This impact was attributed to the expected continued loss and fragmentation of the vegetation community in the project area and the associated loss of the faunal community which it supports unless definitive measures are taken. These measures include:

1. Awareness of the sensitivity of this community (in particular the Endangered vegetation types, rocky ridge habitats in Greylingstad, CBA areas and possibility of occurrence of certain threatened species);
2. A commitment to safely and properly relocate all fauna encountered during the operational phase, including invertebrate species such as scorpions, all reptiles, amphibian, bird and/or mammal species;
3. All access roads should make use of existing access roads where possible. Signs should also be erected that warn motorists of wildlife which may stray onto access roads and all relevant speed limits should be put in place to prevent road-mortalities;
4. Where possible, new reticulation pipes must be placed in areas that area already disturbed and should only cross CBAs, wetland areas, rivers or rocky ridge zones where it is unavoidable to do so otherwise;



5. Strict measures must be put in place to prevent the presence of any feral cats, dogs or livestock on site; and
6. Limiting the construction area to the defined project areas and only impacting those areas where it is unavoidable to do so otherwise.



Table 13: Assessment of significance of potential **construction impacts** on terrestrial biodiversity associated with the proposed WWTW and reticulation network upgrade pre- and post- mitigation:

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction of, and fragmentation of, the vegetation community (including portions of two Endangered vegetation types, a rocky ridge and area classified as a CBA).	3	2	2	4	4		3	2	2	4	4	
	Medium Term	Local Area	Small	Ecology Moderate to Highly Sensitive	Highly Likely	Moderate	Medium Term	Local Area	Small	Ecology Moderate to Highly Sensitive	Highly Likely	Low
Displacement of faunal community (including possible threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration) and/or direct mortalities.	3	2	2	4	4		3	2	2	4	4	
	Medium Term	Local Area	Small	Ecology Moderate to Highly Sensitive	Highly Likely	Moderate	Medium Term	Local Area	Small	Ecology Moderate to Highly Sensitive	Highly Likely	Low



Table 14: Assessment of significance of potential operational impacts on terrestrial biodiversity associated with the proposed WWTW and reticulation network upgrade pre- and post- mitigation:

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued disturbance of two Endangered vegetation communities (including portions of a CBA and encroachment by alien invasive plant species).	3	3	3	4	4		2	2	2	4	3	
	Medium Term	Local Area	Significant	Ecology Moderate to Highly Sensitive	Highly Likely	Moderate	Short Term	Development Specific	Small	Ecology Moderate to Highly Sensitive	Likely	Low
Potential leaks, discharges and/or pollutant from the sewerage works or broken sewer pipelines leaching into the surrounding environment.	4	4	4	4	4		3	2	3	4		
	Long Term	Regional	Great / Harmful	Ecology Moderate to Highly Sensitive	Highly Likely	High	Medium Term	Local Area	Significant	Ecology Moderate to Highly Sensitive	Likely	Moderate
Continued displacement and fragmentation of the faunal community (including threatened or protected species) due to ongoing anthropogenic disturbances and habitat degradation (litter, road mortalities and/or poaching).	3	2	3	4	4		2	2	2	4	4	
	Medium Term	Local Area	Significant	Ecology Moderate to Highly Sensitive	Highly Likely	Moderate	Short Term	Local Area	Small	Ecology Moderate to Highly Sensitive	Highly Likely	Low



10.3 Mitigation Measure Objectives

The focus of mitigation measures should be to reduce the significance of potential impacts associated with the WWTW and reticulation pipelines and thereby to:

- Prevent the unnecessary destruction of, and fragmentation, of the vegetation community (including portions of two Endangered vegetation types, sensitive rocky ridge areas and areas classified as a CBA).
- Prevent the loss of the faunal community (including potentially occurring species of conservation concern) associated with these vegetation communities.

10.3.1 Mitigation Measures for Impacts on Vegetation Communities & CBAs

From an ecological perspective the development is situated close to, and within, various natural and semi-disturbed habitats that play an important role within this area. Although somewhat disturbed, it has been shown that these areas support various faunal species, including SCC and there is a moderate likelihood that other SCC may occur there.

Recommended mitigation and rehabilitation measures include the following:

- As far as possible, the proposed WWTW and reticulation pipelines should be restricted to areas that have already been disturbed, and no further loss of primary or secondary vegetation, wetland areas, drainage lines or perennial streams should be permitted (unless it is unavoidable to do so otherwise);
- If possible, access to the CBA and wetland areas east of Nthorwane should be prevented. Human encroachment into this area is severely altering the state of this important area. Multiple grassland bird species, including one SCC, were recorded here and this shows the importance of this grassland system. The feasibility of fencing this area off to prevent access is strongly encouraged and should be investigated;
- Where pipelines cross stream areas or wetlands, special care must be taken to avoid excessive impacts on these systems such as minimising the time workers or machinery are present in these areas or investigating ways in which pipelines can traverse these areas without impact on these sensitive areas;
 - According to the Mpumalanga Highveld Wetlands data as provided by SANBI, the proposed infrastructure footprint areas in both the southern, central and northern portions of the project area intersect or cross wetland areas classified as AB – natural or good. It is recommended that the current pipeline layouts which intersect with these areas be re-examined to check the feasibility of other layout scenarios so that these pipelines do not intersect so heavily with these sensitive wetland areas;
- Restrict the placement of the reticulation pipelines to the designated footprint areas, avoiding the areas classified as highly sensitive where possible;



- It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon and preventing movement of workers into sensitive surrounding environments;
- The areas rated as highly sensitive in the project area (Figure 15) as defined in this report should be declared a 'no-go' area during the construction and operational phases and all efforts must be made to prevent access to this area from construction workers, machinery, domestic animals and the general public. This should be implemented with the exception of those areas in which authorisation for development has been granted;
- Where possible, existing access routes and walking paths must be made use of, and new routes limited;
- All laydown, storage areas etc should be restricted to within the project area;
- A qualified environmental control officer must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna/flora that is found during construction (including all reptiles and amphibians);
- Rehabilitation of the disturbed areas existing in the project area must be made a priority. Top soils must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type;
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species.

10.3.2 Mitigation Measures for Impacts on Faunal Communities

Recommended mitigation and rehabilitation measures for faunal community's hinge largely on protecting their habitats and ensuring it remains intact.

The following measures are recommended:

- If any indigenous faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action;
- If possible, access to the CBA and wetland areas east of Nthorwane should be prevented. Human encroachment into this area is severely altering the state of this important area. Multiple grassland bird species, including one SCC, were recorded here and this shows the importance of this grassland system. The feasibility of fencing this area off to prevent access is strongly encouraged and should be investigated;
- The duration of the construction should be minimized to as short term as possible, in order to reduce the period of disturbance on fauna and flora;
- Prior and during vegetation clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery;



- Fauna species such as frogs and reptiles that have not moved away should be carefully and safely removed to a suitable location beyond the extent of the development footprint by a suitably qualified ECO trained in the handling and relocation of animals;
- Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site;
- No trapping, killing or poisoning of any wildlife is to be allowed on site, including snakes, birds, lizards, frogs, insects or mammals;
- During the construction phase noise and vibrations must be kept to a minimum to reduce the impact of the development on the fauna residing on the site;
- Furthermore, during the construction phase, noise must be kept to an absolute minimum during the evenings and at night to minimise all possible disturbances to amphibian species and nocturnal mammals;
- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process;
 - The avoidance and protection of the sensitive CBA areas and ridges must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the sensitive areas to be avoided.
- Long-term water quality monitoring of all adjacent streams and rivers must be implemented as soon as possible to monitor any potential negative effects of the WWTW and potential spillages on nearby watercourses and aquatic fauna;
- Construction activities and vehicles could cause spillages of lubricants, fuels and construction material which could then be transported to the river, impacting on the water quality and potentially the functioning of the systems. All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area; and
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the surrounding environment.

11 Conclusion

The completion of a study, in conjunction with the detailed results from the survey means that there is a high confidence in the information provided. The survey which was completed, and the corresponding studies resulted in good site coverage, within the proposed footprint area, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area is an assembly of different conditions and some that have been altered both historically and presently. Current impacts include secondary roads, agriculture and associated human activity, including: agricultural fields, dumping of rubble, livestock, litter and



infringement by people and livestock into natural areas. Untreated sewerage is currently leaking from the existing WWTW directly in to the nearby stream. This needs to be rectified as a matter of urgency.

However, despite these impacts, the remaining natural habitats (mostly the northern (rocky ridge / CBA) and south-eastern portions of the project area) exhibit healthy ecological functionality, integrity and provide habitat for some threatened species. This diversity is indicative of the importance of these systems to collectively provide refugia, food and corridors for dispersal in and through the surrounding area.

The proposed WWTW and reticulation pipeline development is situated within, and near, to areas identified as CBAs. Field surveys confirmed the ecological integrity of some portions of this CBA – especially the CBA east of Nthorwane and the rocky ridge. However, extensive human encroachment is evident across much of the proposed development area and these disturbed areas were generally given a lower sensitivity rating.

If possible, access to the CBA and wetland areas east of Nthorwane should be prevented. Human encroachment into this area is severely altering the state of this important area. Multiple grassland bird species, including one SCC, were recorded here and this shows the importance of this grassland system. The feasibility of fencing this area off to prevent access should be investigated.

According to the Mpumalanga Highveld Wetlands data as provided by SANBI, the proposed infrastructure footprint areas in both the southern, central and northern portions of the project area intersect or cross wetland areas classified as AB – natural or good. It is recommended that the current pipeline layouts which intersect with these areas be re-examined and the feasibility of other layout scenarios be investigated. Alternatively, a wetland assessment should be conducted to confirm the extent of the wetland area (delineation) and determine the ecological integrity of the system.

The following further conclusions were reached based on the results of this assessment:

- Based on the MBSP Terrestrial CBA map, the proposed development footprint area will potentially overlap with:
 - Critical Biodiversity Areas (CBA's);
 - Ecological Support Areas (ESA's);
 - Other Natural Area (ONA's); and
 - Moderately or Heavily Modified Areas (MMA's or HMA's).
- The majority of the project area overlaps with areas that are categorised as HMA's or MMA's. However, some of the northern sections of the reticulation network intersect with CBA areas and a grassland CBA is situated east of Nthorwane;
- The proposed project was superimposed on the terrestrial ecosystem threat status spatial data. According to this, the project area falls across several ecosystems, which are listed as either Endangered (EN), Vulnerable (VU) and/or Least Threatened (LT). The majority of the project area is classed as VU or EN, and only a small portion of the reticulation network intersects with a LT ecosystem;
- The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development. Based



on this the terrestrial ecosystems associated with the proposed project area are rated as *poorly protected or not protected*;

- Based on the NFEPA wetland and river guidelines several non-FEPA wetlands are situated adjacent to the project area. No non-FEPA or true-FEPA rivers or wetlands occur within the defined project footprint area. However, various non-perennial water courses occur within and adjacent to the proposed footprint area. Two non-perennial rivers merge close to the existing WWTW;
- According to the Mpumalanga Highveld Wetlands data as provided by SANBI, the proposed infrastructure footprint areas in both the southern, central and northern portions of the project area intersect or cross wetland areas classified as AB – natural or good;
- The project area is situated across two primary vegetation types; Soweto Highveld Grassland (Gs4) and Tsakane Clay Grassland (Gm9) vegetation types. Both of which are classed as Endangered vegetation types;
- Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 290 plant species are expected to occur in the project area. Of the 385-plant species, three (4) species are listed as being SCC;
- One significant IBAs occurs adjacent to the proposed project area, namely the Devon Grasslands IBA and is situated 5.2 km north of the project area;
- Forty-seven (47) bird species were recorded in the project area during the July 2018 survey. One avifaunal SCC were recorded during the survey, namely, Secretary bird (*Sagittarius serpentarius*). Based on the presence of suitable grassland habitat, there is a moderate to high probability that other bird SCC occur within the project area – especially grassland bird species; and
- One mammal SCC was recorded, namely the Cape Clawless Otter which is listed as Near Threatened on a regional and a global scale.

12 Impact Statement

An impact statement is required as per the NEMA EIA regulations (as amended) with regards to the proposed development.

Based on the findings of this report, and the outcomes of the field surveys, it is the opinion of the specialists that the proposed development can be favourably considered. Field surveys confirmed the ecological integrity of this some of the CBA's present, as well as the presence of some threatened species and the presence of class AB wetlands. Therefore, it is imperative that the recommendations and mitigations in this report be strictly adhered to and that the feasibility of moving some of the pipelines which intersect with class AB wetlands be investigated. Furthermore, untreated sewerage is currently leaking from the existing WWTW directly into the surrounding environment and nearby stream. This needs to be rectified as a matter of urgency.



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APPENDIX A: *Floral species expected to occur in the project area*

Family	Scientific name	Author1	IUCN	Ecology
Amaranthaceae	<i>Achyranthes aspera</i> var. <i>aspera</i>	L.		Not Indigenous; Naturalised
Lamiaceae	<i>Acrotome inflata</i>	Benth.	LC	Indigenous
Lamiaceae	<i>Aeollanthus buchnerianus</i>	Briq.	LC	Indigenous
Apiaceae	<i>Afroscidium magalismsontanum</i>	(Sond.) P.J.D.Winter	LC	Indigenous
Lamiaceae	<i>Ajuga ophrydis</i>	Burch. ex Benth.	LC	Indigenous
Hyacinthaceae	<i>Albuca virens</i> subsp. <i>arida</i>	(Ker Gawl.) J.C.Manning & Goldblatt		Indigenous
Orobanchaceae	<i>Alectra orobanchoides</i>	Benth.	LC	Indigenous
Orobanchaceae	<i>Alectra pumila</i>	Benth.	LC	Indigenous
Poaceae	<i>Alloteropsis semialata</i> subsp. <i>semialata</i>	(R.Br.) Hitchc.	LC	Indigenous
Poaceae	<i>Andropogon schirensis</i>	Hochst. ex A.Rich.	LC	Indigenous
Rubiaceae	<i>Anthospermum rigidum</i> subsp. <i>pumilum</i>	Eckl. & Zeyh.	LC	Indigenous
Rubiaceae	<i>Anthospermum</i> sp.			
Aponogetonaceae	<i>Aponogeton junceus</i>	Lehm.	LC	Indigenous
Aponogetonaceae	<i>Aponogeton rehmannii</i>	Oliv.	LC	Indigenous
Fabaceae	<i>Argyrolobium campicola</i>	Harms	NT	Indigenous; Endemic
Fabaceae	<i>Argyrolobium molle</i>	Eckl. & Zeyh.	LC	Indigenous; Endemic
Fabaceae	<i>Argyrolobium tuberosum</i>	Eckl. & Zeyh.	LC	Indigenous
Iridaceae	<i>Aristea torulosa</i>	Klatt	LC	Indigenous
Poaceae	<i>Aristida adscensionis</i>	L.	LC	Indigenous
Poaceae	<i>Aristida bipartita</i>	(Nees) Trin. & Rupr.	LC	Indigenous
Poaceae	<i>Aristida congesta</i> subsp. <i>congesta</i>	Roem. & Schult.	LC	Indigenous
Poaceae	<i>Aristida diffusa</i> subsp. <i>burkei</i>	Trin.	LC	Indigenous
Poaceae	<i>Aristida junciformis</i> subsp. <i>junciformis</i>	Trin. & Rupr.	LC	Indigenous
Poaceae	<i>Aristida scabrivalvis</i> subsp. <i>scabrivalvis</i>	Hack.	LC	Indigenous
Asteraceae	<i>Artemisia afra</i> var. <i>afra</i>	Jacq. ex Willd.	LC	Indigenous
Apocynaceae	<i>Asclepias albens</i>	(E.Mey.) Schltr.	LC	Indigenous
Apocynaceae	<i>Asclepias eminens</i>	(Harv.) Schltr.	LC	Indigenous
Apocynaceae	<i>Asclepias gibba</i> var. <i>gibba</i>	(E.Mey.) Schltr.	LC	Indigenous
Apocynaceae	<i>Asclepias gibba</i> var. <i>media</i>	(E.Mey.) Schltr.	LC	Indigenous
Apocynaceae	<i>Asclepias meyeriana</i>	(Schltr.) Schltr.	LC	Indigenous
Apocynaceae	<i>Asclepias stellifera</i>	Schltr.	LC	Indigenous
Asparagaceae	<i>Asparagus angusticladus</i>	(Jessop) J.-P.Lebrun & Stork	LC	Indigenous
Asparagaceae	<i>Asparagus devenishii</i>	(Oberm.) Fellingham & N.L.Mey.	LC	Indigenous; Endemic
Asparagaceae	<i>Asparagus setaceus</i>	(Kunth) Jessop	LC	Indigenous
Apocynaceae	<i>Aspidoglossum biflorum</i>	E.Mey.	LC	Indigenous
Apocynaceae	<i>Aspidoglossum interruptum</i>	(E.Mey.) Bullock	LC	Indigenous



Apocynaceae	<i>Aspidoglossum lamellatum</i>	(Schltr.) Kupicha	LC	Indigenous
Apocynaceae	<i>Aspidoglossum ovalifolium</i>	(Schltr.) Kupicha	LC	Indigenous
Aspleniaceae	<i>Asplenium aethiopicum</i>	(Burm.f.) Bech.	LC	Indigenous
Salviniaceae	<i>Azolla filiculoides</i>	Lam.	NE	notIndigenous; Naturalised; Invasive
Iridaceae	<i>Babiana bainesii</i>	Baker	LC	Indigenous
Asteraceae	<i>Berkheya pinnatifida</i> subsp. <i>ingrata</i>	(Thunb.) Thell.	LC	Indigenous; Endemic
Asteraceae	<i>Berkheya radula</i>	(Harv.) De Wild.	LC	Indigenous
Asteraceae	<i>Berkheya seminivea</i>	Harv. & Sond.	LC	Indigenous; Endemic
Apiaceae	<i>Berula repanda</i>	(Hiern) Spalik & S.R.Downie	LC	Indigenous
Orchidaceae	<i>Bonatea porrecta</i>	(Bolus) Summerh.	LC	Indigenous
Amaryllidaceae	<i>Boophone disticha</i>	(L.f.) Herb.	LC	Indigenous
Poaceae	<i>Brachiaria advena</i>	Vickery	NE	notIndigenous; Naturalised
Bryaceae	<i>Brachymerium acuminatum</i>	Harv.		Indigenous
Apocynaceae	<i>Brachystelma foetidum</i>	Schltr.	LC	Indigenous
Pottiaceae	<i>Bryoerythrophyllum</i> <i>campylocarpum</i>	(Müll.Hal.) H.A.Crum		Indigenous
Bryaceae	<i>Bryum argenteum</i>	Hedw.		Indigenous
Asphodelaceae	<i>Bulbine abyssinica</i>	A.Rich.	LC	Indigenous
Asphodelaceae	<i>Bulbine frutescens</i>	(L.) Willd.	LC	Indigenous
Asphodelaceae	<i>Bulbine narcissifolia</i>	Salm-Dyck	LC	Indigenous
Cyperaceae	<i>Bulbostylis contexta</i>	(Nees) M.Bodard	LC	Indigenous
Cyperaceae	<i>Carex spartea</i>	Wahlenb.		Indigenous
Icacinaceae	<i>Cassinopsis ilicifolia</i>	(Hochst.) Kuntze	LC	Indigenous
Poaceae	<i>Catalepis gracilis</i>	Stapf & Stent	LC	Indigenous
Dipsacaceae	<i>Cephalaria oblongifolia</i>	(Kuntze) Szabó	LC	Indigenous
Scrophulariaceae	<i>Chaenostoma leve</i>	(Hiern) Kornhall	LC	Indigenous
Scrophulariaceae	<i>Chaenostoma patrioticum</i>	(Hiern) Kornhall	LC	Indigenous
Pteridaceae	<i>Cheilanthes hirta</i> var. <i>brevipilosa</i>	Sw.		Indigenous; Endemic
Pteridaceae	<i>Cheilanthes hirta</i> var. <i>hirta</i>	Sw.	LC	Indigenous
Poaceae	<i>Chloris virgata</i>	Sw.	LC	Indigenous
Asteraceae	<i>Chrysocoma ciliata</i>	L.	LC	Indigenous
Asteraceae	<i>Cineraria aspera</i>	Thunb.	LC	Indigenous
Asteraceae	<i>Cineraria geraniifolia</i>	DC.	LC	Indigenous; Endemic
Cleomaceae	<i>Cleome monophylla</i>	L.	LC	Indigenous
Euphorbiaceae	<i>Clutia monticola</i> var. <i>monticola</i>	S.Moore	LC	Indigenous
Euphorbiaceae	<i>Clutia natalensis</i>	Bernh.	LC	Indigenous
Euphorbiaceae	<i>Clutia pulchella</i> var. <i>pulchella</i>	L.	LC	Indigenous
Colchicaceae	<i>Colchicum striatum</i>	(Hochst. ex A.Rich.) J.C.Manning & Vinn.		Indigenous
Commelinaceae	<i>Commelina africana</i> var. <i>africana</i>	L.	LC	Indigenous
Convolvulaceae	<i>Convolvulus multifidus</i>	Thunb.	LC	Indigenous; Endemic



Convolvulaceae	<i>Convolvulus ocellatus var. ocellatus</i>	Hook.f.	LC	Indigenous
Convolvulaceae	<i>Convolvulus sagittatus</i>	Thunb.	LC	Indigenous
Asteraceae	<i>Cotula sp.</i>			
Crassulaceae	<i>Crassula setulosa var. setulosa</i>	Harv.	NE	Indigenous
Amaryllidaceae	<i>Crinum bulbispermum</i>	(Burm.f.) Milne-Redh. & Schweick.	LC	Indigenous
Amaryllidaceae	<i>Crinum lugardiae</i>	N.E.Br.	LC	Indigenous
Cucurbitaceae	<i>Cucumis hirsutus</i>	Sond.	LC	Indigenous
Cucurbitaceae	<i>Cucumis zeyheri</i>	Sond.	LC	Indigenous
Convolvulaceae	<i>Cuscuta campestris</i>	Yunck.		notIndigenous; Naturalised; Invasive
Poaceae	<i>Cymbopogon caesius</i>	(Hook. & Arn.) Stapf	LC	Indigenous
Poaceae	<i>Cymbopogon pospischilii</i>	(K.Schum.) C.E.Hubb.	NE	Indigenous
Poaceae	<i>Cymbopogon prolixus</i>	(Stapf) E.Phillips	LC	Indigenous
Cyperaceae	<i>Cyperus capensis</i>	(Steud.) Endl.	LC	Indigenous; Endemic
Cyperaceae	<i>Cyperus congestus</i>	Vahl	LC	Indigenous
Cyperaceae	<i>Cyperus esculentus var. esculentus</i>	L.	LC	Indigenous
Cyperaceae	<i>Cyperus longus var. tenuiflorus</i>	L.	NE	Indigenous
Cyperaceae	<i>Cyperus marginatus</i>	Thunb.	LC	Indigenous
Amaryllidaceae	<i>Cyrtanthus stenanthus var. stenanthus</i>	Baker	LC	Indigenous
Solanaceae	<i>Datura ferox</i>	L.		notIndigenous; Naturalised; Invasive
Aizoaceae	<i>Delosperma sp.</i>			
Asteraceae	<i>Denekia capensis</i>	Thunb.	LC	Indigenous
Caryophyllaceae	<i>Dianthus basuticus subsp. basuticus</i>	Burt Davy		Indigenous
Fabaceae	<i>Dichilus lebeckioides</i>	DC.	LC	Indigenous
Iridaceae	<i>Dierama mossii</i>	(N.E.Br.) Hilliard	LC	Indigenous
Poaceae	<i>Digitaria argyrograpta</i>	(Nees) Stapf	LC	Indigenous
Poaceae	<i>Digitaria eriantha</i>	Steud.	LC	Indigenous
Poaceae	<i>Digitaria sanguinalis</i>	(L.) Scop.	NE	notIndigenous; Naturalised
Poaceae	<i>Digitaria ternata</i>	(A.Rich.) Stapf	LC	Indigenous
Poaceae	<i>Diheteropogon amplexens var. amplexens</i>	(Nees) Clayton	LC	Indigenous
Asteraceae	<i>Dimorphotheca caulescens</i>	Harv.	LC	Indigenous
Ebenaceae	<i>Diospyros lycioides subsp. querkei</i>	Desf.		Indigenous
Orchidaceae	<i>Disa aconitoides subsp. aconitoides</i>	Sond.	LC	Indigenous
Orchidaceae	<i>Disa cooperi</i>	Rchb.f.	LC	Indigenous
Fabaceae	<i>Dolichos linearis</i>	E.Mey.	LC	Indigenous
Hyacinthaceae	<i>Drimia depressa</i>	(Baker) Jessop		Indigenous
Hyacinthaceae	<i>Drimia intricata</i>	(Baker) J.C.Manning & Goldblatt		Indigenous
Fabaceae	<i>Elephantorrhiza elephantina</i>	(Burch.) Skeels	LC	Indigenous



Poaceae	<i>Eragrostis chloromelas</i>	Steud.	LC	Indigenous
Poaceae	<i>Eragrostis curvula</i>	(Schrad.) Nees	LC	Indigenous
Poaceae	<i>Eragrostis micrantha</i>	Hack.	LC	Indigenous
Poaceae	<i>Eragrostis planiculmis</i>	Nees	LC	Indigenous
Poaceae	<i>Eragrostis trichophora</i>	Coss. & Durieu	LC	Indigenous
Fabaceae	<i>Eriosema salignum</i>	E.Mey.	LC	Indigenous
Brassicaceae	<i>Erucastrum austroafricanum</i>	Al-Shehbaz & Warwick	LC	Indigenous
Ebenaceae	<i>Euclea crispa subsp. crispa</i>	(Thunb.) Gürke		Indigenous
Orchidaceae	<i>Eulophia hians var. inaequalis</i>	Spreng.	LC	Indigenous
Orchidaceae	<i>Eulophia hians var. nutans</i>	Spreng.	LC	Indigenous
Euphorbiaceae	<i>Euphorbia inaequilatera var. inaequilatera</i>	Sond.	NE	Indigenous
Asteraceae	<i>Euryops laxus</i>	(Harv.) Burt Davy	LC	Indigenous
Asteraceae	<i>Euryops transvaalensis subsp. transvaalensis</i>	Klatt	LC	Indigenous
Convolvulaceae	<i>Falkia oblonga</i>	Bernh. ex C.Krauss		Indigenous
Asteraceae	<i>Felicia filifolia subsp. filifolia</i>	(Vent.) Burt Davy	LC	Indigenous
Iridaceae	<i>Freesia grandiflora subsp. grandiflora</i>	(Baker) Klatt	LC	Indigenous
Cyperaceae	<i>Fuirena pubescens var. pubescens</i>	(Poir.) Kunth	LC	Indigenous
Asteraceae	<i>Garuleum woodii</i>	Schinz	LC	Indigenous
Asteraceae	<i>Geigeria aspera var. aspera</i>	Harv.	LC	Indigenous
Asteraceae	<i>Geigeria burkei subsp. burkei</i>	Harv.	NE	Indigenous
Asteraceae	<i>Geigeria burkei subsp. burkei</i>	Harv.	NE	Indigenous; Endemic
Asteraceae	<i>Gerbera ambigua</i>	(Cass.) Sch.Bip.	LC	Indigenous
Asteraceae	<i>Gerbera viridifolia</i>	(DC.) Sch.Bip.	LC	Indigenous
Iridaceae	<i>Gladiolus crassifolius</i>	Baker	LC	Indigenous
Iridaceae	<i>Gladiolus permeabilis subsp. edulis</i>	D.Delaroche	LC	Indigenous
Iridaceae	<i>Gladiolus robertsoniae</i>	F.Bolus	NT	Indigenous; Endemic
Iridaceae	<i>Gladiolus sericeovillosus subsp. calvatus</i>	Hook.f.	LC	Indigenous
Iridaceae	<i>Gladiolus sp.</i>			
Thymelaeaceae	<i>Gnidia gymnostachya</i>	(C.A.Mey.) Gilg	LC	Indigenous
Thymelaeaceae	<i>Gnidia sp.</i>			
Apocynaceae	<i>Gomphocarpus fruticosus subsp. fruticosus</i>	(L.) Aiton f.	LC	Indigenous
Apocynaceae	<i>Gomphocarpus physocarpus</i>	E.Mey.	LC	Indigenous
Apocynaceae	<i>Gomphocarpus rivularis</i>	Schltr.	LC	Indigenous
Orchidaceae	<i>Habenaria barbertoni</i>	Kraenzl. & Schltr.	NT	Indigenous; Endemic
Orchidaceae	<i>Habenaria epipactidea</i>	Rchb.f.	LC	Indigenous
Amaryllidaceae	<i>Haemanthus montanus</i>	Baker	LC	Indigenous
Poaceae	<i>Harpochloa falx</i>	(L.f.) Kuntze	LC	Indigenous
Scrophulariaceae	<i>Hebenstretia angolensis</i>	Rolfe	LC	Indigenous
Asteraceae	<i>Helichrysum aureonitens</i>	Sch.Bip.	LC	Indigenous
Asteraceae	<i>Helichrysum caespitium</i>	(DC.) Harv.	LC	Indigenous



Asteraceae	<i>Helichrysum callicomum</i>	Harv.	LC	Indigenous
Asteraceae	<i>Helichrysum chionosphaerum</i>	DC.	LC	Indigenous
Asteraceae	<i>Helichrysum lepidissimum</i>	S.Moore	LC	Indigenous
Asteraceae	<i>Helichrysum nudifolium</i> var. <i>nudifolium</i>	(L.) Less.	LC	Indigenous
Rhamnaceae	<i>Helinus integrifolius</i>	(Lam.) Kuntze	LC	Indigenous
Malvaceae	<i>Hermannia coccocarpa</i>	(Eckl. & Zeyh.) Kuntze	LC	Indigenous
Malvaceae	<i>Hermannia comosa</i>	Burch. ex DC.	LC	Indigenous
Malvaceae	<i>Hermannia cristata</i>	Bolus	LC	Indigenous
Malvaceae	<i>Hermannia floribunda</i>	Harv.	LC	Indigenous
Malvaceae	<i>Hermannia grandistipula</i>	(Buchinger ex Hochst.) K.Schum.	LC	Indigenous
Malvaceae	<i>Hermannia</i> sp.			
Malvaceae	<i>Hermannia stellulata</i>	(Harv.) K.Schum.	LC	Indigenous
Apiaceae	<i>Heteromorpha arborescens</i> var. <i>abyssinica</i>	(Spreng.) Cham. & Schtdl.	LC	Indigenous
Malvaceae	<i>Hibiscus aethiopicus</i> var. <i>ovatus</i>	L.	LC	Indigenous
Malvaceae	<i>Hibiscus microcarpus</i>	Garcke	LC	Indigenous
Asteraceae	<i>Hilliardiella aristata</i>	(DC.) H.Rob.	LC	Indigenous
Poaceae	<i>Hyparrhenia anamesa</i>	Clayton	LC	Indigenous
Poaceae	<i>Hyparrhenia dregeana</i>	(Nees) Stapf ex Stent	LC	Indigenous
Poaceae	<i>Hyparrhenia hirta</i>	(L.) Stapf	LC	Indigenous
Poaceae	<i>Hyparrhenia</i> sp.			
Hypoxidaceae	<i>Hypoxis argentea</i> var. <i>argentea</i>	Harv. ex Baker	LC	Indigenous
Hypoxidaceae	<i>Hypoxis iridifolia</i>	Baker	LC	Indigenous
Hypoxidaceae	<i>Hypoxis rigidula</i> var. <i>rigidula</i>	Baker	LC	Indigenous
Aquifoliaceae	<i>Ilex</i> sp.			
Fabaceae	<i>Indigofera confusa</i>	Prain & Baker f.	LC	Indigenous
Fabaceae	<i>Indigofera hedyantha</i>	Eckl. & Zeyh.	LC	Indigenous
Convolvulaceae	<i>Ipomoea crassipes</i> var. <i>crassipes</i>	Hook.	LC	Indigenous
Convolvulaceae	<i>Ipomoea oblongata</i>	E.Mey. ex Choisy	LC	Indigenous
Convolvulaceae	<i>Ipomoea oenotheroides</i>	(L.f.) Raf. ex Hallier f.	LC	Indigenous
Convolvulaceae	<i>Ipomoea ommanneyi</i>	Rendle	LC	Indigenous
Scrophulariaceae	<i>Jamesbrittenia aurantiaca</i>	(Burch.) Hilliard	LC	Indigenous
Juncaceae	<i>Juncus exsertus</i>	Buchenau	LC	Indigenous
Acanthaceae	<i>Justicia flava</i>	(Vahl) Vahl		Indigenous
Asphodelaceae	<i>Kniphofia ensifolia</i> subsp. <i>autumnalis</i>	Baker	EN	Indigenous; Endemic
Asphodelaceae	<i>Kniphofia typhoides</i>	Codd	NT	Indigenous; Endemic
Rubiaceae	<i>Kohautia amatymbica</i>	Eckl. & Zeyh.	LC	Indigenous
Verbenaceae	<i>Lantana rugosa</i>	Thunb.		Indigenous
Asteraceae	<i>Lasiospermum pedunculare</i>	Lag.	LC	Indigenous; Endemic
Asteraceae	<i>Launaea rarifolia</i> var. <i>rarifolia</i>	(Oliv. & Hiern) Boulos	LC	Indigenous
Hyacinthaceae	<i>Ledebouria burkei</i> subsp. <i>burkei</i>	(Baker) J.C.Manning & Goldblatt		Indigenous



Hyacinthaceae	<i>Ledebouria revoluta</i>	(L.f.) Jessop	LC	Indigenous
Fabaceae	<i>Leobordea divaricata</i>	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	<i>Leobordea mucronata</i>	(Conrath) B.-E.van Wyk & Boatwr.		Indigenous
Lobeliaceae	<i>Lobelia thermalis</i>	Thunb.	LC	Indigenous
Fabaceae	<i>Lotononis sp.</i>	N.E.Br.		
Asteraceae	<i>Macowania tenuifolia</i>	M.D.Hend.	LC	Indigenous; Endemic
Poaceae	<i>Melinis nerviglumis</i>	(Franch.) Zizka	LC	Indigenous
Fabaceae	<i>Melolobium wilmsii</i>	Harms	LC	Indigenous; Endemic
Phrymaceae	<i>Mimulus gracilis</i>	R.Br.	LC	Indigenous
Iridaceae	<i>Moraea pallida</i>	(Baker) Goldblatt	LC	Indigenous
Iridaceae	<i>Moraea simulans</i>	Baker	LC	Indigenous
Scrophulariaceae	<i>Nemesia fruticans</i>	(Thunb.) Benth.	LC	Indigenous
Scrophulariaceae	<i>Nemesia sp.</i>			
Scrophulariaceae	<i>Nemesia umbonata</i>	(Hiern) Hilliard & B.L.Burt	LC	Indigenous
Lythraceae	<i>Nesaea sagittifolia var. sagittifolia</i>	(Sond.) Koehne		Indigenous
Asteraceae	<i>Nidorella resedifolia subsp. resedifolia</i>	DC.	LC	Indigenous
Asteraceae	<i>Nolletia jeanettae</i>	P.P.J.Herman	LC	Indigenous; Endemic
Onagraceae	<i>Oenothera tetraptera</i>	Cav.		notIndigenous; Naturalised
Resedaceae	<i>Oligomeris dregeana</i>	(Müll.Arg.) Müll.Arg.	LC	Indigenous
Apocynaceae	<i>Orbea cooperi</i>	(N.E.Br.) L.C.Leach	LC	Indigenous
Apocynaceae	<i>Orbea tapscottii</i>	(I.Verd.) L.C.Leach	LC	Indigenous
Hyacinthaceae	<i>Ornithogalum flexuosum</i>	(Thunb.) U.Müll.-Doblies & D.Müll.-Doblies		Indigenous
Orchidaceae	<i>Orthochilus leontoglossus</i>	(Rchb.f.) Bytebier		Indigenous
Rubiaceae	<i>Pachystigma thamnus</i>	Robyns	LC	Indigenous; Endemic
Poaceae	<i>Panicum schinzii</i>	Hack.	LC	Indigenous
Poaceae	<i>Panicum stapfianum</i>	Fourc.	LC	Indigenous
Poaceae	<i>Panicum volutans</i>	J.G.Anderson	LC	Indigenous; Endemic
Papaveraceae	<i>Papaver aculeatum</i>	Thunb.	LC	Indigenous
Poaceae	<i>Paspalum notatum</i>	Flüggé	NE	notIndigenous; Naturalised
Fabaceae	<i>Pearsonia sessilifolia subsp. filifolia</i>	(Harv.) Dümmer	LC	Indigenous
Geraniaceae	<i>Pelargonium alchemilloides</i>	(L.) L'Hér.	LC	Indigenous
Geraniaceae	<i>Pelargonium luridum</i>	(Andrews) Sweet	LC	Indigenous
Geraniaceae	<i>Pelargonium minimum</i>	(Cav.) Willd.	LC	Indigenous
Geraniaceae	<i>Pelargonium nelsonii</i>	Burt Davy	LC	Indigenous; Endemic
Pteridaceae	<i>Pellaea calomelanos var. calomelanos</i>	(Sw.) Link	LC	Indigenous
Rubiaceae	<i>Pentanisia angustifolia</i>	(Hochst.) Hochst.	LC	Indigenous
Polygonaceae	<i>Persicaria madagascariensis</i>	(Meisn.) S.Ortiz & Paiva		Indigenous
Phyllanthaceae	<i>Phyllanthus glaucophyllus</i>	Sond.	LC	Indigenous



Phyllanthaceae	<i>Phyllanthus parvulus</i> var. <i>garipensis</i>	Sond.	LC	Indigenous
Aytoniaceae	<i>Plagiochasma rupestre</i> var. <i>rupestre</i>	(J.R.Forst. & G.Forst.) Steph.		Indigenous
Lamiaceae	<i>Plectranthus ramosior</i>	(Benth.) Van Jaarsv.	LC	Indigenous; Endemic
Polygalaceae	<i>Polygala albida</i> subsp. <i>albida</i>	Schinz	LC	Indigenous
Polygonaceae	<i>Polygonum plebeium</i>	R.Br.	LC	Indigenous
Potamogetonaceae	<i>Potamogeton nodosus</i>	Poir.	LC	Indigenous
Verbenaceae	<i>Priva meyeri</i> var. <i>meyeri</i>	Jaub. & Spach		Indigenous
Proteaceae	<i>Protea welwitschii</i>	Engl.	LC	Indigenous
Molluginaceae	<i>Psammotropha myriantha</i>	Sond.	LC	Indigenous
Orchidaceae	<i>Pterygodium nigrescens</i>	(Sond.) Schltr.	LC	Indigenous
Ranunculaceae	<i>Ranunculus multifidus</i>	Forssk.	LC	Indigenous
Fabaceae	<i>Rhynchosia calvescens</i>	Meikle	LC	Indigenous; Endemic
Fabaceae	<i>Rhynchosia totta</i> var. <i>totta</i>	(Thunb.) DC.	LC	Indigenous
Salicaceae	<i>Salix mucronata</i> subsp. <i>woodii</i>	Thunb.	LC	Indigenous
Orchidaceae	<i>Satyrium stenopetalum</i> subsp. <i>brevicalcaratum</i>	Lindl.	LC	Indigenous; Endemic
Dipsacaceae	<i>Scabiosa columbaria</i>	L.	LC	Indigenous
Asteraceae	<i>Schistostephium crataegifolium</i>	(DC.) Fenzl ex Harv.	LC	Indigenous
Apocynaceae	<i>Schizoglossum periglossoides</i>	Schltr.	LC	Indigenous; Endemic
Asteraceae	<i>Schkuhria pinnata</i>	(Lam.) Kuntze ex Thell.		notIndigenous; Naturalised
Anacardiaceae	<i>Searsia discolor</i>	(E.Mey. ex Sond.) Moffett		Indigenous
Anacardiaceae	<i>Searsia magalismontana</i> subsp. <i>magalismontana</i>	(Sond.) Moffett		Indigenous
Anacardiaceae	<i>Searsia pyroides</i> var. <i>gracilis</i>	(Burch.) Moffett		Indigenous
Anacardiaceae	<i>Searsia pyroides</i> var. <i>pyroides</i>	(Burch.) Moffett		Indigenous
Anacardiaceae	<i>Searsia rigida</i> var. <i>margaretae</i>	(Mill.) F.A.Barkley		Indigenous
Anacardiaceae	<i>Searsia rigida</i> var. <i>rigida</i>	(Mill.) F.A.Barkley		Indigenous
Gentianaceae	<i>Sebaea erosa</i>	Schinz	LC	Indigenous
Gentianaceae	<i>Sebaea leiostyla</i>	Gilg	LC	Indigenous
Asteraceae	<i>Senecio discodregeanus</i>	Hilliard & B.L.Burt	LC	Indigenous
Asteraceae	<i>Senecio erubescens</i> var. <i>erubescens</i>	Aiton	NE	Indigenous; Endemic
Asteraceae	<i>Senecio hieracioides</i>	DC.	LC	Indigenous
Asteraceae	<i>Senecio inaequidens</i>	DC.	LC	Indigenous
Poaceae	<i>Setaria pumila</i>	(Poir.) Roem. & Schult.	LC	Indigenous
Poaceae	<i>Setaria</i> sp.			
Poaceae	<i>Setaria sphacelata</i> var. <i>torta</i>	(Schumach.) Stapf & C.E.Hubb. ex M.B.Moss	LC	Indigenous
Solanaceae	<i>Solanum pseudocapsicum</i>	L.		notIndigenous; Naturalised; Invasive
Solanaceae	<i>Solanum retroflexum</i>	Dunal	LC	Indigenous
Solanaceae	<i>Solanum rubetorum</i>	Dunal	LC	Indigenous; Endemic



Solanaceae	<i>Solanum sisymbriifolium</i>	Lam.		notIndigenous; Naturalised; Invasive
Orobanchaceae	<i>Sopubia cana var. cana</i>	Harv.	LC	Indigenous
Poaceae	<i>Sporobolus natalensis</i>	(Steud.) T.Durand & Schinz	LC	Indigenous
Poaceae	<i>Sporobolus pyramidalis</i>	P.Beauv.	LC	Indigenous
Orobanchaceae	<i>Striga asiatica</i>	(L.) Kuntze	LC	Indigenous
Orobanchaceae	<i>Striga bilabiata subsp. bilabiata</i>	(Thunb.) Kuntze	LC	Indigenous
Fabaceae	<i>Tephrosia capensis</i>	(Jacq.) Pers.		Indigenous
Lamiaceae	<i>Teucrium trifidum</i>	Retz.	LC	Indigenous
Poaceae	<i>Themeda triandra</i>	Forssk.	LC	Indigenous
Asphodelaceae	<i>Trachyandra erythrorrhiza</i>	(Conrath) Oberm.	LC	Indigenous; Endemic
Asphodelaceae	<i>Trachyandra saltii var. saltii</i>	(Baker) Oberm.	LC	Indigenous
Poaceae	<i>Trachypogon spicatus</i>	(L.f.) Kuntze	LC	Indigenous
Asteraceae	<i>Tragopogon dubius</i>	Scop.		notIndigenous; Naturalised
Poaceae	<i>Tragus racemosus</i>	(L.) All.	LC	Indigenous
Poaceae	<i>Tristachya leucothrix</i>	Trin. ex Nees	LC	Indigenous
Poaceae	<i>Tristachya rehmannii</i>	Hack.	LC	Indigenous
Plantaginaceae	<i>Veronica anagallis-aquatica</i>	L.	LC	Indigenous
Campanulaceae	<i>Wahlenbergia denticulata var. denticulata</i>	(Burch.) A.DC.	LC	Indigenous
Solanaceae	<i>Withania somnifera</i>	(L.) Dunal	LC	Indigenous
Apocynaceae	<i>Woodia mucronata</i>	(Thunb.) N.E.Br.	LC	Indigenous; Endemic
Asteraceae	<i>Xanthium strumarium</i>	L.		notIndigenous; Naturalised; Invasive
Apocynaceae	<i>Xysmalobium undulatum var. undulatum</i>	(L.) Aiton f.	LC	Indigenous
Araceae	<i>Zantedeschia albomaculata subsp. albomaculata</i>	(Hook.) Baill.	LC	Indigenous



APPENDIX B: Avifaunal species expected to occur in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Accipiter melanoleucus</i>	Sparrowhawk, Black	Unlisted	LC
<i>Acridotheres tristis</i>	Myna, Common	Unlisted	LC
<i>Acrocephalus baeticatus</i>	Reed-warbler, African	Unlisted	Unlisted
<i>Acrocephalus gracilirostris</i>	Swamp-warbler, Lesser	Unlisted	LC
<i>Acrocephalus palustris</i>	Warbler, Marsh	Unlisted	LC
<i>Acrocephalus schoenobaenus</i>	Warbler, Sedge	Unlisted	LC
<i>Actitis hypoleucos</i>	Sandpiper, Common	Unlisted	LC
<i>Actophilornis africanus</i>	Jacana, African	Unlisted	LC
<i>Afrotis afra</i>	Korhaan, Southern Black	VU	VU
<i>Afrotis afraoides</i>	Korhaan, Northern Black	Unlisted	LC
<i>Alcedo cristata</i>	Kingfisher, Malachite	Unlisted	Unlisted
<i>Alopochen aegyptiaca</i>	Goose, Egyptian	Unlisted	LC
<i>Amadina erythrocephala</i>	Finch, Red-headed	Unlisted	LC
<i>Amandava subflava</i>	Waxbill, Orange-breasted	Unlisted	Unlisted
<i>Amaurornis flavirostris</i>	Crake, Black	Unlisted	LC
<i>Anas capensis</i>	Teal, Cape	Unlisted	LC
<i>Anas erythrorhyncha</i>	Teal, Red-billed	Unlisted	LC
<i>Anas hottentota</i>	Teal, Hottentot	Unlisted	LC
<i>Anas smithii</i>	Shoveler, Cape	Unlisted	LC
<i>Anas sparsa</i>	Duck, African Black	Unlisted	LC
<i>Anas undulata</i>	Duck, Yellow-billed	Unlisted	LC
<i>Anastomus lamelligerus</i>	Openbill, African	Unlisted	LC
<i>Anhinga rufa</i>	Darter, African	Unlisted	LC
<i>Anomalospiza imberbis</i>	Finch, Cuckoo	Unlisted	LC
<i>Anthropoides paradiseus</i>	Crane, Blue	NT	VU
<i>Anthus chloris</i>	Pipit, Yellow-breasted	VU	VU
<i>Anthus cinnamomeus</i>	Pipit, African	Unlisted	LC
<i>Anthus crenatus</i>	Pipit, African Rock	NT	LC
<i>Anthus leucophrys</i>	Pipit, Plain-backed	Unlisted	LC
<i>Anthus lineiventris</i>	Pipit, Striped	Unlisted	LC
<i>Anthus similis</i>	Pipit, Long-billed	Unlisted	LC
<i>Anthus vaalensis</i>	Pipit, Buffy	Unlisted	LC
<i>Apalis thoracica</i>	Apalis, Bar-throated	Unlisted	LC
<i>Apaloderma narina</i>	Trogon, Narina	Unlisted	LC
<i>Apus affinis</i>	Swift, Little	Unlisted	LC
<i>Apus apus</i>	Swift, Common	Unlisted	LC
<i>Apus barbatus</i>	Swift, African Black	Unlisted	LC
<i>Apus caffer</i>	Swift, White-rumped	Unlisted	LC
<i>Apus horus</i>	Swift, Horus	Unlisted	LC
<i>Aquila pennatus</i>	Eagle, Booted	Unlisted	LC



<i>Aquila verreauxii</i>	Eagle, Verreaux's	VU	LC
<i>Aquila wahlbergi</i>	Eagle, Wahlberg's	Unlisted	LC
<i>Ardea cinerea</i>	Heron, Grey	Unlisted	LC
<i>Ardea goliath</i>	Heron, Goliath	Unlisted	LC
<i>Ardea melanocephala</i>	Heron, Black-headed	Unlisted	LC
<i>Ardea purpurea</i>	Heron, Purple	Unlisted	LC
<i>Ardeola ralloides</i>	Heron, Squacco	Unlisted	LC
<i>Asio capensis</i>	Owl, Marsh	Unlisted	LC
<i>Balearica regulorum</i>	Crane, Grey Crowned	EN	EN
<i>Batis molitor</i>	Batis, Chinspot	Unlisted	LC
<i>Bostrychia hagedash</i>	Ibis, Hadedda	Unlisted	LC
<i>Bradypterus baboecala</i>	Rush-warbler, Little	Unlisted	LC
<i>Bubo africanus</i>	Eagle-owl, Spotted	Unlisted	LC
<i>Bubo capensis</i>	Eagle-Owl, Cape	Unlisted	LC
<i>Bubulcus ibis</i>	Egret, Cattle	Unlisted	LC
<i>Bugeranus carunculatus</i>	Crane, Wattled	CR	VU
<i>Buphagus erythrorhynchus</i>	Oxpecker, Red-billed	Unlisted	Unlisted
<i>Burhinus capensis</i>	Thick-knee, Spotted	Unlisted	LC
<i>Buteo rufufuscus</i>	Buzzard, Jackal	Unlisted	LC
<i>Buteo vulpinus</i>	Buzzard, Steppe	Unlisted	Unlisted
<i>Butorides striata</i>	Heron, Green-backed	Unlisted	LC
<i>Calandrella cinerea</i>	Lark, Red-capped	Unlisted	LC
<i>Calidris ferruginea</i>	Sandpiper, Curlew	LC	NT
<i>Calidris minuta</i>	Stint, Little	LC	LC
<i>Campethera abingoni</i>	Woodpecker, Golden-tailed	Unlisted	LC
<i>Caprimulgus europaeus</i>	Nightjar, European	Unlisted	LC
<i>Caprimulgus tristigma</i>	Nightjar, Freckled	Unlisted	LC
<i>Centropus burchellii</i>	Coucal, Burchell's	Unlisted	Unlisted
<i>Centropus superciliosus</i>	Coucal, White-browed	Unlisted	LC
<i>Cercomela familiaris</i>	Chat, Familiar	Unlisted	LC
<i>Certhilauda benguelensis</i>	Lark, Benguela Long-billed	Unlisted	Unlisted
<i>Certhilauda brevirostris</i>	Lark, Agulhas Long-billed	NT	NR
<i>Certhilauda curvirostris</i>	Lark, Cape Long-billed	Unlisted	LC
<i>Certhilauda semitorquata</i>	Lark, Eastern Long-billed	Unlisted	LC
<i>Certhilauda subcoronata</i>	Lark, Karoo Long-billed	Unlisted	LC
<i>Ceryle rudis</i>	Kingfisher, Pied	Unlisted	LC
<i>Chalcomitra amethystina</i>	Sunbird, Amethyst	Unlisted	LC
<i>Charadrius hiaticula</i>	Plover, Common Ringed	Unlisted	LC
<i>Charadrius pecuarius</i>	Plover, Kittlitz's	Unlisted	LC
<i>Charadrius tricollaris</i>	Plover, Three-banded	Unlisted	LC
<i>Chersomanes albofasciata</i>	Lark, Spike-heeled	Unlisted	LC
<i>Chlidonias hybrida</i>	Tern, Whiskered	Unlisted	LC
<i>Chlidonias leucopterus</i>	Tern, White-winged	Unlisted	LC
<i>Chrysococcyx caprius</i>	Cuckoo, Diderick	Unlisted	LC



<i>Ciconia ciconia</i>	Stork, White	Unlisted	LC
<i>Ciconia nigra</i>	Stork, Black	VU	LC
<i>Cinnyricinclus leucogaster</i>	Starling, Violet-backed	Unlisted	LC
<i>Cinnyris talatala</i>	Sunbird, White-bellied	Unlisted	LC
<i>Circaetus cinereus</i>	Snake-eagle, Brown	Unlisted	LC
<i>Circaetus pectoralis</i>	Snake-eagle, Black-chested	Unlisted	LC
<i>Circus macrourus</i>	Harrier, Pallid	NT	NT
<i>Circus maurus</i>	Harrier, Black	EN	VU
<i>Circus pygargus</i>	Montagu's Harrier	Unlisted	LC
<i>Circus ranivorus</i>	Marsh-harrier, African	EN	LC
<i>Cisticola aberrans</i>	Cisticola, Lazy	Unlisted	LC
<i>Cisticola aridulus</i>	Cisticola, Desert	Unlisted	LC
<i>Cisticola ayresii</i>	Cisticola, Wing-snapping	Unlisted	LC
<i>Cisticola cinnamomeus</i>	Cisticola, Pale-crowned	Unlisted	LC
<i>Cisticola fulvicapilla</i>	Neddicky, Neddicky	Unlisted	LC
<i>Cisticola juncidis</i>	Cisticola, Zitting	Unlisted	LC
<i>Cisticola lais</i>	Cisticola, Wailing	Unlisted	LC
<i>Cisticola textrix</i>	Cisticola, Cloud	Unlisted	LC
<i>Cisticola tinniens</i>	Cisticola, Levallant's	Unlisted	LC
<i>Clamator jacobinus</i>	Cuckoo, Jacobin	Unlisted	LC
<i>Colius colius</i>	Mousebird, White-backed	Unlisted	LC
<i>Colius striatus</i>	Mousebird, Speckled	Unlisted	LC
<i>Columba arquatrix</i>	Olive-pigeon, African	Unlisted	LC
<i>Columba guinea</i>	Pigeon, Speckled	Unlisted	LC
<i>Columba livia</i>	Dove, Rock	Unlisted	LC
<i>Coracias caudatus</i>	Roller, Lilac-breasted	Unlisted	LC
<i>Coracias garrulus</i>	Roller, European	NT	LC
<i>Corvus albus</i>	Crow, Pied	Unlisted	LC
<i>Corvus capensis</i>	Crow, Cape	Unlisted	LC
<i>Corythaixoides concolor</i>	Go-away-bird, Grey	Unlisted	LC
<i>Cossypha caffra</i>	Robin-chat, Cape	Unlisted	LC
<i>Coturnix coturnix</i>	Quail, Common	Unlisted	LC
<i>Coturnix delegorguei</i>	Quail, Harlequin	Unlisted	LC
<i>Creatophora cinerea</i>	Starling, Wattled	Unlisted	LC
<i>Crithagra atrogularis</i>	Canary, Black-throated	Unlisted	LC
<i>Crithagra flaviventris</i>	Canary, Yellow	Unlisted	LC
<i>Crithagra gularis</i>	Seedeater, Streaky-headed	Unlisted	LC
<i>Crithagra mozambica</i>	Canary, Yellow-fronted	Unlisted	LC
<i>Cuculus solitarius</i>	Cuckoo, Red-chested	Unlisted	LC
<i>Cursorius temminckii</i>	Courser, Temminck's	Unlisted	LC
<i>Cypsiurus parvus</i>	Palm-swift, African	Unlisted	LC
<i>Delichon urbicum</i>	House-martin, Common	Unlisted	LC
<i>Dendrocygna bicolor</i>	Duck, Fulvous	Unlisted	LC
<i>Dendrocygna viduata</i>	Duck, White-faced Whistling	Unlisted	LC



<i>Dendropicos fuscescens</i>	Woodpecker, Cardinal	Unlisted	LC
<i>Dryoscopus cubla</i>	Puffback, Black-backed	Unlisted	LC
<i>Egretta alba</i>	Egret, Great	Unlisted	LC
<i>Egretta ardesiaca</i>	Heron, Black	Unlisted	LC
<i>Egretta garzetta</i>	Egret, Little	Unlisted	LC
<i>Egretta intermedia</i>	Egret, Yellow-billed	Unlisted	LC
<i>Elanus caeruleus</i>	Kite, Black-shouldered	Unlisted	LC
<i>Emberiza capensis</i>	Bunting, Cape	Unlisted	LC
<i>Emberiza flaviventris</i>	Bunting, Golden-breasted	Unlisted	LC
<i>Emberiza impetuani</i>	Bunting, Lark-like	Unlisted	LC
<i>Emberiza tahapisi</i>	Bunting, Cinnamon-breasted	Unlisted	LC
<i>Eremopterix leucotis</i>	Sparrowlark, Chestnut-backed	Unlisted	LC
<i>Estrilda astrild</i>	Waxbill, Common	Unlisted	LC
<i>Euplectes afer</i>	Bishop, Yellow-crowned	Unlisted	LC
<i>Euplectes albonotatus</i>	Widowbird, White-winged	Unlisted	LC
<i>Euplectes ardens</i>	Widowbird, Red-collared	Unlisted	LC
<i>Euplectes axillaris</i>	Widowbird, Fan-tailed	Unlisted	LC
<i>Euplectes capensis</i>	Bishop, Yellow	Unlisted	LC
<i>Euplectes orix</i>	Bishop, Southern Red	Unlisted	LC
<i>Euplectes progne</i>	Widowbird, Long-tailed	Unlisted	LC
<i>Eupodotis caeruleus</i>	Korhaan, Blue	LC	NT
<i>Eupodotis senegalensis</i>	Korhaan, White-bellied	VU	LC
<i>Falco amurensis</i>	Falcon, Amur	Unlisted	LC
<i>Falco biarmicus</i>	Falcon, Lanner	VU	LC
<i>Falco naumanni</i>	Kestrel, Lesser	Unlisted	LC
<i>Falco rupicoloides</i>	Kestrel, Greater	Unlisted	LC
<i>Falco rupicolus</i>	Kestrel, Rock	Unlisted	LC
<i>Falco subbuteo</i>	Hobby, Eurasian	Unlisted	LC
<i>Falco vespertinus</i>	Falcon, Red-footed	NT	NT
<i>Fulica cristata</i>	Coot, Red-knobbed	Unlisted	LC
<i>Gallinago nigripennis</i>	Snipe, African	Unlisted	LC
<i>Gallinula chloropus</i>	Moorhen, Common	Unlisted	LC
<i>Geocolaptes olivaceus</i>	Woodpecker, Ground	Unlisted	NT
<i>Geronticus calvus</i>	Ibis, Southern Bald	VU	VU
<i>Glareola nordmanni</i>	Pratincole, Black-winged	NT	NT
<i>Granatina granatina</i>	Waxbill, Violet-eared	Unlisted	LC
<i>Gyps coprotheres</i>	Vulture, Cape	EN	EN
<i>Haliaeetus vocifer</i>	Fish-eagle, African	Unlisted	LC
<i>Himantopus himantopus</i>	Stilt, Black-winged	Unlisted	LC
<i>Hippolais icterina</i>	Warbler, Icterine	Unlisted	LC
<i>Hirundo abyssinica</i>	Swallow, Lesser Striped	Unlisted	LC
<i>Hirundo albigularis</i>	Swallow, White-throated	Unlisted	LC
<i>Hirundo cucullata</i>	Swallow, Greater Striped	Unlisted	LC
<i>Hirundo dimidiata</i>	Swallow, Pearl-breasted	Unlisted	LC



<i>Hirundo fuligula</i>	Martin, Rock	Unlisted	Unlisted
<i>Hirundo rustica</i>	Swallow, Barn	Unlisted	LC
<i>Hirundo semirufa</i>	Swallow, Red-breasted	Unlisted	LC
<i>Hirundo spilodera</i>	Cliff-swallow, South African	Unlisted	LC
<i>Indicator indicator</i>	Honeyguide, Greater	Unlisted	LC
<i>Indicator minor</i>	Honeyguide, Lesser	Unlisted	LC
<i>Jynx ruficollis</i>	Wryneck, Red-throated	Unlisted	LC
<i>Lagonosticta rubricata</i>	Firefinch, African	Unlisted	LC
<i>Lagonosticta senegala</i>	Firefinch, Red-billed	Unlisted	LC
<i>Lamprotonis nitens</i>	Starling, Cape Glossy	Unlisted	LC
<i>Laniarius ferrugineus</i>	Boubou, Southern	Unlisted	LC
<i>Lanius collaris</i>	Fiscal, Common (Southern)	Unlisted	LC
<i>Lanius collurio</i>	Shrike, Red-backed	Unlisted	LC
<i>Lanius minor</i>	Shrike, Lesser Grey	Unlisted	LC
<i>Larus cirrocephalus</i>	Gull, Grey-headed	Unlisted	LC
<i>Lonchura cucullata</i>	Mannikin, Bronze	Unlisted	LC
<i>Lophaetus occipitalis</i>	Eagle, Long-crested	Unlisted	LC
<i>Lybius torquatus</i>	Barbet, Black-collared	Unlisted	LC
<i>Macronyx capensis</i>	Longclaw, Cape	Unlisted	LC
<i>Megaceryle maximus</i>	Kingfisher, Giant	Unlisted	Unlisted
<i>Melierax canorus</i>	Goshawk, Southern Pale Chanting	Unlisted	LC
<i>Merops apiaster</i>	Bee-eater, European	Unlisted	LC
<i>Merops bullockoides</i>	Bee-eater, White-fronted	Unlisted	LC
<i>Merops hirundineus</i>	Bee-eater, Swallow-tailed	Unlisted	LC
<i>Milvus aegyptius</i>	Kite, Yellow-billed	Unlisted	Unlisted
<i>Milvus migrans</i>	Kite, Black	Unlisted	LC
<i>Mirafra africana</i>	Lark, Rufous-naped	Unlisted	LC
<i>Mirafra apiata</i>	Lark, Cape Clapper	Unlisted	LC
<i>Mirafra cheniana</i>	Lark, Melodious	LC	LC
<i>Mirafra fasciolata</i>	Lark, Eastern Clapper	Unlisted	LC
<i>Mirafra marjoriae</i>	Lark, Agulhas Clapper	Unlisted	Unlisted
<i>Monticola explorator</i>	Rock-thrush, Sentinel	Unlisted	LC
<i>Monticola rupestris</i>	Rock-thrush, Cape	Unlisted	LC
<i>Motacilla capensis</i>	Wagtail, Cape	Unlisted	LC
<i>Motacilla flava</i>	Wagtail, Western Yellow	Unlisted	LC
<i>Muscicapa striata</i>	Flycatcher, Spotted	Unlisted	LC
<i>Mycteria ibis</i>	Stork, Yellow-billed	EN	LC
<i>Myrmecocichla formicivora</i>	Chat, Anteating	Unlisted	LC
<i>Nectarinia famosa</i>	Sunbird, Malachite	Unlisted	LC
<i>Netta erythrophthalma</i>	Pochard, Southern	Unlisted	LC
<i>Nilaus afer</i>	Brubru	Unlisted	LC
<i>Numida meleagris</i>	Guineafowl, Helmeted	Unlisted	LC
<i>Nycticorax nycticorax</i>	Night-Heron, Black-crowned	Unlisted	LC
<i>Oena capensis</i>	Dove, Namaqua	Unlisted	LC



<i>Oenanthe monticola</i>	Wheatear, Mountain	Unlisted	LC
<i>Oenanthe pileata</i>	Wheatear, Capped	Unlisted	LC
<i>Onychognathus morio</i>	Starling, Red-winged	Unlisted	LC
<i>Oriolus larvatus</i>	Oriole, Black-headed	Unlisted	LC
<i>Oriolus oriolus</i>	Oriole, Eurasian Golden	Unlisted	LC
<i>Ortygospiza atricollis</i>	Quailfinch, African	Unlisted	LC
<i>Oxyura maccoa</i>	Duck, Maccoa	NT	NT
<i>Parisoma subcaeruleum</i>	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
<i>Parus cinerascens</i>	Tit, Ashy	Unlisted	LC
<i>Passer diffusus</i>	Sparrow, Southern Grey-headed	Unlisted	LC
<i>Passer domesticus</i>	Sparrow, House	Unlisted	LC
<i>Passer griseus</i>	Sparrow, Northern Grey-headed	Unlisted	LC
<i>Passer melanurus</i>	Sparrow, Cape	Unlisted	LC
<i>Pernis apivorus</i>	Honey-buzzard, European	Unlisted	LC
<i>Petronia superciliaris</i>	Petronia, Yellow-throated	Unlisted	LC
<i>Phalacrocorax africanus</i>	Cormorant, Reed	Unlisted	LC
<i>Phalacrocorax capensis</i>	Cormorant, Cape	EN	EN
<i>Philomachus pugnax</i>	Ruff	Unlisted	LC
<i>Phoeniconaias minor</i>	Flamingo, Lesser	NT	NT
<i>Phoeniculus purpureus</i>	Wood-hoopoe, Green	Unlisted	LC
<i>Phylloscopus trochilus</i>	Warbler, Willow	Unlisted	LC
<i>Platalea alba</i>	Spoonbill, African	Unlisted	LC
<i>Plectropterus gambensis</i>	Goose, Spur-winged	Unlisted	LC
<i>Plegadis falcinellus</i>	Ibis, Glossy	Unlisted	LC
<i>Plocepasser mahali</i>	Sparrow-weaver, White-browed	Unlisted	LC
<i>Ploceus capensis</i>	Weaver, Cape	Unlisted	LC
<i>Ploceus velatus</i>	Southern Masked-weaver, Southern	Unlisted	LC
<i>Podiceps cristatus</i>	Grebe, Great Crested	Unlisted	LC
<i>Polemaetus bellicosus</i>	Eagle, Martial	EN	VU
<i>Polyboroides typus</i>	Harrier-Hawk, African	Unlisted	LC
<i>Porphyrio madagascariensis</i>	Swamphen, African Purple	Unlisted	Unlisted
<i>Porzana pusilla</i>	Crake, Baillon's	Unlisted	LC
<i>Prinia flavicans</i>	Prinia, Black-chested	Unlisted	LC
<i>Prinia subflava</i>	Prinia, Tawny-flanked	Unlisted	LC
<i>Prionops plumatus</i>	Helmet-shrike, White-crested	Unlisted	LC
<i>Prodotiscus regulus</i>	Honeybird, Brown-backed	Unlisted	LC
<i>Pternistis swainsonii</i>	Spurfowl, Swainson's	Unlisted	LC
<i>Pterocles bicinctus</i>	Sandgrouse, Double-banded	Unlisted	LC
<i>Pycnonotus nigricans</i>	Bulbul, African Red-eyed	Unlisted	LC
<i>Pycnonotus tricolor</i>	Bulbul, Dark-capped	Unlisted	Unlisted
<i>Pytilia melba</i>	Pytilia, Green-winged	Unlisted	LC
<i>Quelea quelea</i>	Quelea, Red-billed	Unlisted	LC
<i>Rallus caerulescens</i>	Rail, African	Unlisted	LC



<i>Recurvirostra avosetta</i>	Avocet, Pied	Unlisted	LC
<i>Rhinoptilus africanus</i>	Courser, Double-banded	Unlisted	LC
<i>Rhinoptilus chalcopterus</i>	Courser, Bronze-winged	Unlisted	LC
<i>Riparia cincta</i>	Martin, Banded	Unlisted	LC
<i>Riparia paludicola</i>	Martin, Brown-throated	Unlisted	LC
<i>Riparia riparia</i>	Martin, Sand	Unlisted	LC
<i>Rostratula benghalensis</i>	Painted-snipe, Greater	NT	LC
<i>Sagittarius serpentarius</i>	Secretarybird	VU	VU
<i>Sarkidiornis melanotos</i>	Duck, Comb	Unlisted	LC
<i>Saxicola torquatus</i>	Stonechat, African	Unlisted	LC
<i>Scleroptila afra</i>	Francolin, Grey-winged	Unlisted	LC
<i>Scleroptila levaillantii</i>	Francolin, Red-winged	Unlisted	LC
<i>Scleroptila levaillantoides</i>	Francolin, Orange River	Unlisted	LC
<i>Scopus umbretta</i>	Hamerkop, Hamerkop	Unlisted	LC
<i>Serinus canicollis</i>	Canary, Cape	Unlisted	LC
<i>Sigelus silens</i>	Flycatcher, Fiscal	Unlisted	LC
<i>Sphenoeacus afer</i>	Grassbird, Cape	Unlisted	LC
<i>Spizocorys conirostris</i>	Lark, Pink-billed	Unlisted	LC
<i>Spreo bicolor</i>	Starling, Pied	Unlisted	LC
<i>Stenostira scita</i>	Flycatcher, Fairy	Unlisted	LC
<i>Sterna caspia</i>	Tern, Caspian	VU	LC
<i>Streptopelia capicola</i>	Turtle-dove, Cape	Unlisted	LC
<i>Streptopelia semitorquata</i>	Dove, Red-eyed	Unlisted	LC
<i>Streptopelia senegalensis</i>	Dove, Laughing	Unlisted	LC
<i>Struthio camelus</i>	Ostrich, Common	Unlisted	LC
<i>Sylvia borin</i>	Warbler, Garden	Unlisted	LC
<i>Sylvietta rufescens</i>	Crombec, Long-billed	Unlisted	LC
<i>Tachybaptus ruficollis</i>	Grebe, Little	Unlisted	LC
<i>Tachymarptis melba</i>	Swift, Alpine	Unlisted	LC
<i>Tadorna cana</i>	Shelduck, South African	Unlisted	LC
<i>Tchagra australis</i>	Tchagra, Brown-crowned	Unlisted	LC
<i>Telophorus sulfureopectus</i>	Bush-shrike, Orange-breasted	Unlisted	LC
<i>Telophorus zeylonus</i>	Bokmakierie	Unlisted	LC
<i>Terpsiphone viridis</i>	Paradise-flycatcher, African	Unlisted	LC
<i>Thalassornis leuconotus</i>	Duck, White-backed	Unlisted	LC
<i>Thamnolaea cinnamomeiventris</i>	Cliff-chat, Mocking	Unlisted	LC
<i>Threskiornis aethiopicus</i>	Ibis, African Sacred	Unlisted	LC
<i>Trachyphonus vaillantii</i>	Barbet, Crested	Unlisted	LC
<i>Tricholaema leucomelas</i>	Barbet, Acacia Pied	Unlisted	LC
<i>Tringa glareola</i>	Sandpiper, Wood	Unlisted	LC
<i>Tringa nebularia</i>	Greenshank, Common	Unlisted	LC
<i>Tringa stagnatilis</i>	Sandpiper, Marsh	Unlisted	LC
<i>Turdus olivaceus</i>	Thrush, Olive	Unlisted	LC
<i>Turdus smithi</i>	Thrush, Karoo	Unlisted	LC



<i>Turnix sylvaticus</i>	Buttonquail, Kurrichane	Unlisted	LC
<i>Tyto alba</i>	Owl, Barn	Unlisted	LC
<i>Tyto capensis</i>	Grass-owl, African	VU	LC
<i>Upupa africana</i>	Hoopoe, African	Unlisted	LC
<i>Uraeginthus angolensis</i>	Waxbill, Blue	Unlisted	LC
<i>Urocolius indicus</i>	Mousebird, Red-faced	Unlisted	LC
<i>Vanellus armatus</i>	Lapwing, Blacksmith	Unlisted	LC
<i>Vanellus coronatus</i>	Lapwing, Crowned	Unlisted	LC
<i>Vanellus senegallus</i>	Lapwing, African Wattled	Unlisted	LC
<i>Vidua chalybeata</i>	Indigobird, Village	Unlisted	LC
<i>Vidua macroura</i>	Whydah, Pin-tailed	Unlisted	LC
<i>Vidua paradisaea</i>	Paradise-whydah, Long-tailed	Unlisted	LC
<i>Zosterops pallidus</i>	White-eye, Orange River	Unlisted	LC
<i>Zosterops virens</i>	White-eye, Cape	Unlisted	LC



APPENDIX C: Mammals species expected to occur in the project area

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Aethomys ineptus</i>	Tete Veld Rat	LC	LC
<i>Aethomys namaquensis</i>	Namaqua rock rat	LC	LC
<i>Alcelaphus buselaphus</i>	Hartebeest	LC	LC
<i>Antidorcas marsupialis</i>	Sclater's Shrew	LC	LC
<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT
<i>Atelerix frontalis</i>	South Africa Hedgehog	NT	LC
<i>Atilax paludinosus</i>	Water Mongoose	LC	LC
<i>Canis mesomelas</i>	Black-backed Jackal	LC	LC
<i>Caracal caracal</i>	Caracal	LC	LC
<i>Ceratotherium simum</i>	White Rhinoceros	NT	NT
<i>Connochaetes gnou</i>	Black Wildebeest	LC	LC
<i>Connochaetes taurinus</i>	Blue Wildebeest	LC	LC
<i>Crocidura cyanea</i>	Reddish-grey Musk Shrew	LC	LC
<i>Crocidura maquassiensis</i>	Makwassie musk shrew	VU	LC
<i>Cryptomys hottentotus</i>	Common Mole-rat	LC	LC
<i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC
<i>Damaliscus pygargus</i>	Blesbok	LC	LC
<i>Diceros bicornis</i>	Black Rhinoceros	EN	CR
<i>Eidolon helvum</i>	African Straw-coloured Fruit Bat	LC	NT
<i>Elephantulus myurus</i>	Eastern Rock Sengi	LC	LC
<i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat	LC	LC
<i>Equus quagga</i>	Plains Zebra	LC	NT
<i>Felis nigripes</i>	Black-footed Cat	VU	VU
<i>Felis silvestris</i>	African Wildcat	LC	LC
<i>Genetta genetta</i>	Small-spotted Genet	LC	LC
<i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC
<i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	LC
<i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC
<i>Hydrictris maculicollis</i>	Spotted-necked Otter	VU	NT
<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	LC
<i>Ichneumia albicauda</i>	White-tailed Mongoose	LC	LC
<i>Ictonyx striatus</i>	Striped Polecat	LC	LC
<i>Leptailurus serval</i>	Serval	NT	LC
<i>Lepus saxatilis</i>	Scrub Hare	LC	LC
<i>Lepus victoriae</i>	African Savanna Hare	LC	LC
<i>Mastomys coucha</i>	Multimammate Mouse	LC	LC
<i>Mastomys natalensis</i>	Natal Multimammate Mouse	LC	LC
<i>Mellivora capensis</i>	Honey Badger	LC	LC
<i>Mungos mungo</i>	Banded Mongoose	LC	LC
<i>Mus musculus</i>	House Mouse	Unlisted	LC
<i>Myotis welwitschii</i>	Welwitsch's Hairy Bat	LC	LC



<i>Mystromys albicaudatus</i>	White-tailed Rat	VU	EN
<i>Neoromicia capensis</i>	Cape Serotine Bat	LC	LC
<i>Neoromicia zuluensis</i>	Aloe Bat	LC	LC
<i>Nycteris thebaica</i>	Egyptian Slit-faced Bat	LC	LC
<i>Orycteropus afer</i>	Aardvark	LC	LC
<i>Otomys angoniensis</i>	Angoni Vlei Rat	LC	LC
<i>Otomys irroratus</i>	Vlei Rat (Fynbos type)	LC	LC
<i>Ourebia ourebi</i>	Oribi	EN	LC
<i>Panthera pardus</i>	Leopard	VU	VU
<i>Papio ursinus</i>	Chacma Baboon	LC	LC
<i>Parahyaena brunnea</i>	Brown Hyaena	NT	NT
<i>Pedetes capensis</i>	Springhare	LC	LC
<i>Pelea capreolus</i>	Grey Rhebok	NT	LC
<i>Phacochoerus africanus</i>	Common Warthog	LC	LC
<i>Poecilogale albinucha</i>	African Striped Weasel	NT	LC
<i>Procavia capensis</i>	Rock Hyrax	LC	LC
<i>Pronolagus saundersiae</i>	Hewitt's Red Rock Rabbit	LC	LC
<i>Proteles cristata</i>	Aardwolf	LC	LC
<i>Raphicerus campestris</i>	Steenbok	LC	LC
<i>Rattus rattus</i>	House Rat	Exotic (Not listed)	LC
<i>Redunca fulvorufula</i>	Mountain Reedbuck	EN	LC
<i>Rhabdomys pumilio</i>	Xeric Four-striped Mouse	LC	LC
<i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat	LC	LC
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	LC
<i>Scotophilus dinganii</i>	Yellow House Bat	LC	LC
<i>Steatomys krebsii</i>	Krebs's Fat Mouse	LC	LC
<i>Steatomys pratensis</i>	Fat Mouse	LC	LC
<i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	LC
<i>Suricata suricatta</i>	Suricate	LC	LC
<i>Sylvicapra grimmia</i>	Common Duiker	LC	LC
<i>Syncerus caffer</i>	African Buffalo	LC	LC
<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC	LC
<i>Taphozous mauritanus</i>	Mauritian Tomb Bat	LC	LC
<i>Thryonomys swinderianus</i>	Greater Cane Rat	LC	LC
<i>Tragelaphus oryx</i>	Eland	LC	LC
<i>Vulpes chama</i>	Cape Fox	LC	LC



APPENDIX D: Reptile species expected to occur within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Acontias gracilicauda</i>	Thin-tailed Legless Skink	LC	LC
<i>Afroedura nivaria</i>	Drakensberg Flat Gecko	LC	LC
<i>Agama atra</i>	Southern Rock Agama	LC	LC
<i>Aparallactus capensis</i>	Black-headed Centipede-eater	LC	LC
<i>Chamaeleo dilepis</i>	Common Flap-neck Chameleon	LC	LC
<i>Cordylus vittifer</i>	Common Girdled Lizard	LC	LC
<i>Crocodylus niloticus</i>	Nile Crocodile	VU	LC
<i>Dasypeltis scabra</i>	Common egg eater	LC	LC
<i>Duberria lutrix lutrix</i>	South African Slug-eater	LC	LC
<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	LC	Unlisted
<i>Hemachatus haemachatus</i>	Rinkhals	LC	LC
<i>Lamprophis aurora</i>	Aurora House Snake	LC	LC
<i>Leptotyphlops scutifrons scutifrons</i>	Peters' Thread Snake	LC	Unlisted
<i>Lycodonomorphus inornatus</i>	Olive House Snake	LC	LC
<i>Prosymna ambigua</i>	Angolan Shovel-snout	Unlisted	LC
<i>Psammophylax rhombeatus rhombeatus</i>	Spotted Grass Snake	LC	Unlisted
<i>Psammophylax tritaeniatus</i>	Striped Grass Snake	LC	LC
<i>Pseudocordylus melanotus melanotus</i>	Common Crag Lizard	LC	LC
<i>Trachylepis punctatissima</i>	Speckled Rock Skink	LC	LC
<i>Trachylepis varia</i>	Variable Skink	LC	LC



APPENDIX E: *Amphibian species expected to occur within the project area*

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Amietia angolensis</i>	Angola River Frog	LC	LC
<i>Amietia delalandii</i>	Delalande's River Frog	LC	Unlisted
<i>Amietia fuscigula</i>	Cape River Frog	LC	LC
<i>Cacosternum boettgeri</i>	Common Caco	LC	LC
<i>Kassina senegalensis</i>	Bubbling Kassina	LC	LC
<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	LC	LC
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT	LC
<i>Sclerophrys capensis</i>	Raucous Toad	LC	LC
<i>Sclerophrys gutturalis</i>	Guttural Toad	LC	LC
<i>Semnodactylus wealii</i>	Rattling Frog	LC	LC
<i>Strongylopus fasciatus</i>	Striped Stream Frog	LC	LC
<i>Tomopterna cryptotis</i>	Tremelo Sand Frog	LC	LC
<i>Tomopterna natalensis</i>	Natal Sand Frog	LC	LC
<i>Tomopterna tandyi</i>	Tandy's Sand Frog	LC	LC
<i>Xenopus laevis</i>	Common Platanna	LC	LC

