BIODIVERSITY AND WETLAND BASELINE & ASSESSMENT FOR THE RE-INSTATEMENT AND DEVELOPMENT OF VBC08 WETLAND SYSTEM, SECUNDA SYNFUELS OPERATIONS

Secunda, Mpumalanga

June 2021

CLIENT

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**BIODIVERSITY AND WETLAND BASELINE & ASSESSMENT FOR THE RE-INSTATEMENT AND DEVELOPMENT OF VBC08 WETLAND SYSTEM, SECUNDA SYNFUELS OPERATIONS**
Submitted to	
Report Writer	**Martinus Erasmus** 
	Martinus Erasmus (Cand Sci Nat) obtained his B-Tech degree in Nature Conservation in 2016 at the Tshwane University of Technology. Martinus has been conducting environmetnal assessments and assisting specialists in field during his studies since 2015.
Report Writer	**Lindi Steyn** 
	Lindi Steyn has a PhD in Biodiversity and Conservation from the University of Johannesburg. She specialises in avifauna and has worked in this specialisation since 2013.
Report Writer / Reviewer	**Andrew Husted** 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	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.

DECLARATION

I, Martinus Erasmus, 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 in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Martinus Erasmus

Terrestrial Ecologist

The Biodiversity Company

June 2021

DECLARATION

I, Andrew Husted, 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 in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Andrew Husted

Wetland Ecologist

The Biodiversity Company

June 2021

Table of Contents

Tables

Figures

1 Introduction

The Biodiversity Company (TBC) was appointed to conduct a biodiversity and wetland baseline and impact assessment for the re-instatement and development of VBC08 wetland system project, Secunda Synfuels Operations. The wetland has been previously delineated and assessed, for which a background description is provided in the subsequent section of this report.

Golder Associates (2018) determined the merit for improving the functionality of the VBC08 system by exploring the possibility of developing an instream constructed/artificial wetland (passive system) which could augment the existing natural wetland system. According to Golder Associates (2018) the following motivation for the project is provided, "*The purpose of this project is to reduce nutrient and salt load into the Groot Bossiespruit by specifically addressing nitrate releases upstream. This will allow the wetland to break down the releases and eliminate the flow of nitrate during floods and rainy seasons. The rehabilitation of the wetland will also prohibit the wetland from further scouring and deteriorating to a possible health category F (critically modified). The project scope entails the installation of eighteen wetland rehabilitation structures throughout wetland system VBC08*".

A dry season survey was conducted on the 17th of June 2020. The survey primarily focussed on the accessible extent of the VBC08 wetland system, referred to as the project area herein.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (No. 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation". The National Web based Environmental Screening Tool has characterised the aquatic and terrestrial biodiversity for the project area as "very high sensitivity".

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 with regards to the proposed project.

2 Background

The Secunda Synfuels Operation, a division of Sasol South Africa, commissioned Wet-Earth Eco-Specs (April, 2019) to conduct a re-assessment of the wetlands within the Secunda Industrial Complex (SIC). The re-assessment included previously assessed wetlands, and also any new wetland areas found.

The wetland system considered for the re-instatement and development of the VBC08 wetland system project, was identified, delineated and assessed by Wet-Earth Eco-Specs (2019). The Wet-Earth Eco-Specs (2019) reference for the system was D1VBC and Table 2-1 presents the general information sourced from the Wet-Earth Eco-Specs (2019) report. The following

information pertaining to the ecological significance of the system is summarised from the re-assessment report:

- The hydrology of the system was determined to be critically modified (class F), with the geomorphology and vegetation status of the system determined to be seriously modified (class E), with an overall ecological status classified as class E;
- An intermediate level (score 1.56) of ecosystem services are provided by the system; and
- No Ecological Importance and Sensitivity (EIS) assessment was completed for the re-assessment.

Table 2-1 Wetland D1VBC general wetland information (Wet-Earth Eco-Specs, 2019)

Classification	**Valley bottom wetland with no channel**		
Wetland size	173ha	Relative to Catchment	7%
Catchment size (estimate)	2451ha		
Wetland slope	1.2%		
Soil	The wetland soils are mainly of the Rensburg and Arcadia soil forms. In the south-eastern section of the wetland, the G-horizons, situated at depths between 15 and 50 cm, are rich in carbonate mineral. (Wet Earth, 2017).		
Vegetation	The vegetation is dominated by: *Phragmites australis, Typha capensis, Schoenoplectus brachyceras, Leersia hexandra, Persicaria officinalis, Juncus lomatifolius*, etc. Vast areas are dominated by exotic species such as: *Verbena bonariensis, Bidens pilosa, Pennisetum clandestinum, Cosmos bipinnatus, Conyza sumatrensis*.		
Impacts	• Grazing and trampling, • Exotic vegetation (mainly pioneers), • Road crossings and conveyor belt crossings, which impound and concentrate flow in the wetland and the causeway in the upper reaches, which have severely compromised the hydrological functioning of the wetland (Golder, 2016), • A powerline and servitude crossing, • A series of small dams, • The Groot-Bossiespruit could be impacted by a coal conveyor (from Twistdraai East Mine), coal stockyard, coal beneficiation area, and the coal discard dump, • Seepage from fertiliser dams 2,3,4,5,6, 8a and 8b, as well as stormwater/surface run-off from the SNF plant, • Excessive growth of *Phragmites australis* due to the enrichment of water, and • Severe eutrophication was noted in the section of the wetland below and to the east of the Sasol Nitro Plant and Fertiliser Dams Complex, etc.		

Wet-Earth Eco-Specs (May, 2020) was commissioned compile a wetland management plan for wetland watercourses within the SIC, which included the D1VBC system. For the purposes of the plan, the valley bottom wetland was divided into two habitat areas and referred to as D1(a)VBC and D1(b)VBC (Figure 2-1). The following is summarised from the Wet-Earth Eco-Specs (2020) report:

- The Present Ecological State (PES) of D1(a)VBC and D1(b)VBC was determined to be seriously modified (class E) and moderately modified (class C) respectively; and
- The EIS of D1(a)VBC and D1(b)VBC was determined to be moderate (class C) and high (class B) respectively.

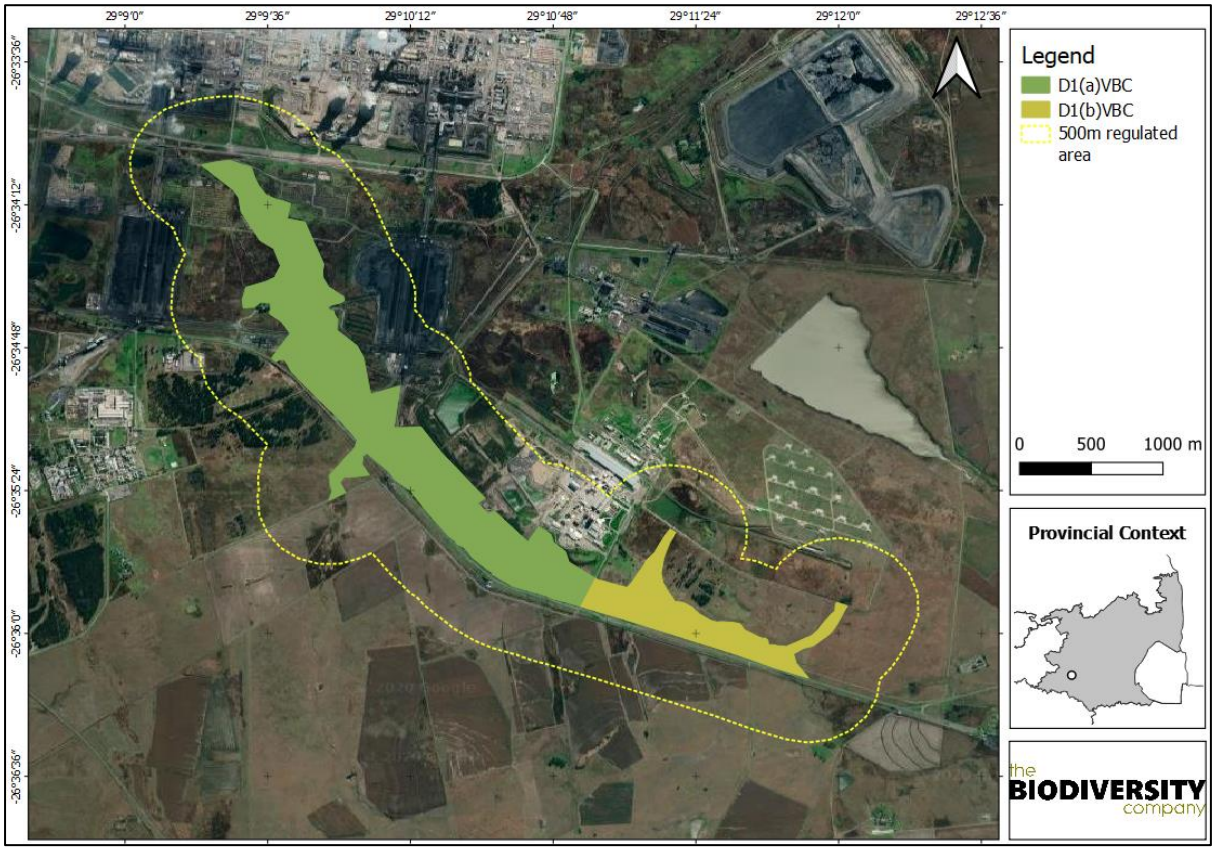

Figure 2-1 The general extent of D1(a)VBC and D1(b)VBC considered for the project

3 Project Area

The project area is situated 6.6 km south west of Secunda city centre and adjacent to the existing Nitro Fertiliser Plant. Also surrounding the project area is a number of industries and industrial developments. The location of the project area is presented in Figure 3-1. Wetlands that has been found in the 500 m regulated area as delineated by Golder Associates (2018) is shown in Figure 3-2.

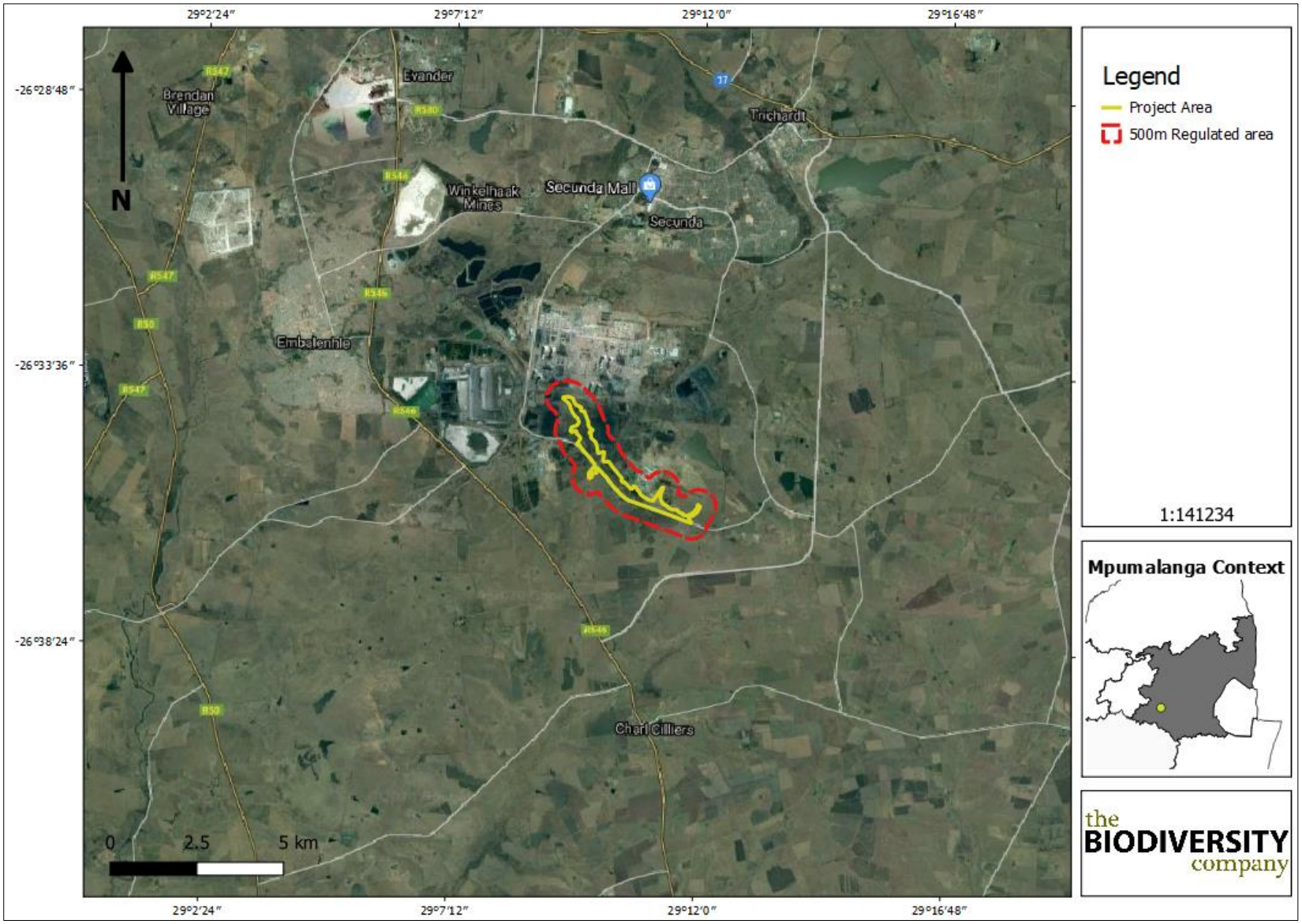

Figure 3-1 The general location of the proposed project area

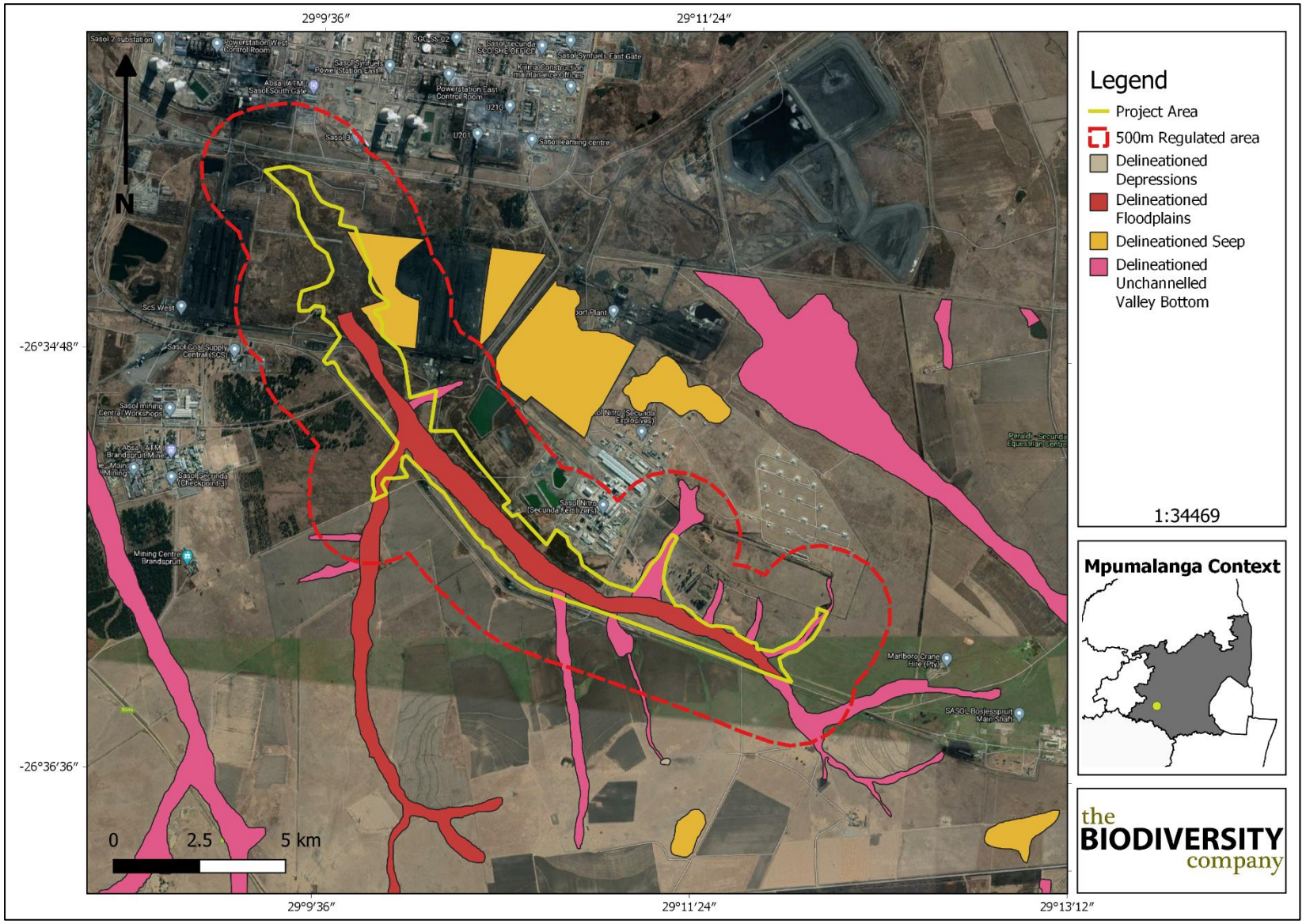

Figure 3-2 Wetlands delineated by Golder Associates (2018) in the 500 m regulated area

4 Terms of Reference

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 project 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 rehabilitation areas;
- Identification of conservation significant habitats around the project area which might be impacted by the proposed rehabilitation;
- Site visit to verify desktop information;
- Provide a map to identify sensitive receptors in the project area, based on available maps, database information & site visit verification;
- The delineation, classification and assessment of wetlands within 500 m of the project area;
- Implementation of WET-Health for determination of Present Ecological State (PES) of wetland areas;
- Implementation of WET-EcoServices for determination of ecosystem services for the wetland areas;
- Determine the Ecological Importance and Sensitivity (EIS) of wetland systems;
- Provide a map to identify sensitive receptors in the project area, based on available maps and database information;
- Suggest possible impacts, mitigation and rehabilitation measures to prevent or reduce the possible impacts; and
- Identification of risk factors associated with the developments.

5 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 5-1). The list below, although extensive, may not be exhaustive and other legislation, policies and guidelines may apply in addition to those listed below.

Table 5-1	A list of key legislative requirements relevant to biodiversity and conservation within the project area
INTERNATIONAL	Convention on Biological Diversity (CBD, 1993)
	The United Nations Framework Convention on Climate Change (UNFCC,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)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
PROVINCIAL	Mpumalanga Parks Board Act 6 of 1995
	Mpumalanga Conservation Act, 1998 (Act 10 of 1998)
	Mpumalanga Tourism and Parks Agency Act, No 5 of 2005
	Mpumalanga Conservation Plan (C-plan 2)
	Mpumalanga Biodiversity Sector Plan

6 Limitations

The following limitations should be noted for the project:

- It is assumed the shapefiles of the delineated wetlands are accurate;

- Access to the VBC08 was restricted in selected reaches, with no access gained to D1(b)VBC. Previous assessments have been considered to address this limitation and to supplement the findings for this assessment;
- As per the scope of work, the fieldwork component of the assessment comprised of one assessment only, which was conducted during the dry season;
- This project has not assessed any temporal trends for the respective seasons, but merely commented on the ecological trends of the wetland; and
- Despite these limitations, a comprehensive desktop assessment was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.
- The VBC08 wetland system was the priority and focus for the assessment. The ecological significance and risks posed to the system were only determined for this wetland. Wetlands located within a 500 m radius of the project area but not in a position within the landscape to be measurably affected by the project were only delineated at a desktop level;
- Field assessments were completed to assess as much of the project area as possible with focus on the proposed directly impacted areas;
- The impact / risk assessment was conducted for an 18 structure scenario;
- The GPS used for delineations is accurate to within five meters. Therefore, the delineation plotted digitally may be offset by at least five meters to either side; and
- The information regarding the activities to be completed on the site, only allowed for the completion of a general assessment on the impacts and the buffer requirement.

7 Methodologies

7.1 Terrestrial Assessment

7.1.1 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 (SANBI, 2018);
- Important Bird and Biodiversity 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 project 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.

7.1.2 Botanical Assessment

The botanical assessment 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. 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).

7.1.3 Literature Study

A literature review was conducted as part of the desktop assessment 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:

- 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);

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).

7.1.4 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 project 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); and
- A Field Guide to the Tracks and Signs of Southern, Central and East African Wildlife (Stuart & Stuart, 2013).

While the Avifauna distribution and other pertinent data was obtained from:

- Southern African Bird Atlas Project 2 (SABAP2, 2019);
- Birdlife South Africa (2015);
- Birdlife. (2017). Important Bird Areas Factsheets;
- Checklist of the Birds of the World (Del Hoyo *et al.,* 1996);
- Book of birds of South Africa, Lesotho and Swaziland (Taylor *et al.,* 2015); and
- Roberts – Birds of Southern Africa (Hockey *et al.,* 2005).

7.1.5 Herpetology (Reptiles & Amphibians)

A herpetofauna desktop assessment of the possible species in the area was done and attention was paid to the SCCs, sources used included the IUCN (2017) and ADU (2019).

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).

A herpetofauna field assessment were conducted in each habitat or vegetation type within the project area, as identified from the desktop assessment, with a focus on those areas which will be most impacted by the proposed development (i.e. the infrastructure development and waste dumping areas).

The herpetological field survey comprised the following techniques:

- Hand searching is used for reptile species that shelter in or under particular habitats. Visual searches, typically undertaken for species with activities that occur on surfaces or for species that are difficult to detect by hand-searches or trap sampling.

7.1.6 Dry Season Fieldwork

The dry season fieldwork was conducted, and sample sites were placed within specific 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 vegetation and ecological habitat assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with proposed development areas.

Notes were made regarding current impacts (e.g. erosion, alien plants, etc.), and subjective recording of dominant vegetation species was noted. 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.

7.2 Wetland Assessment

The following information sources were considered for the desktop assessment:

- Wet-Earth Eco-Specs (2019 & 2020);
- Aerial imagery (Google Earth Pro);

- Vegetation and climate information (Mucina & Rutherford, 2006);
- Land Type Data (Land Type Survey Staff, 1972 – 2006).
- Topographical river line data (Topographical Data, 2012);
- Mpumalanga Highveld wetlands dataset;
- The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al*., 2018); and
- Contour data (5m).

7.2.1 Identification and Mapping

The wetland areas are delineated in accordance with the Department of Water Affairs and Forestry (DWAF, 2005) guidelines, a cross section is presented in Figure 7-1. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991 & 2018), which are associated with prolonged and frequent saturation.
    - The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

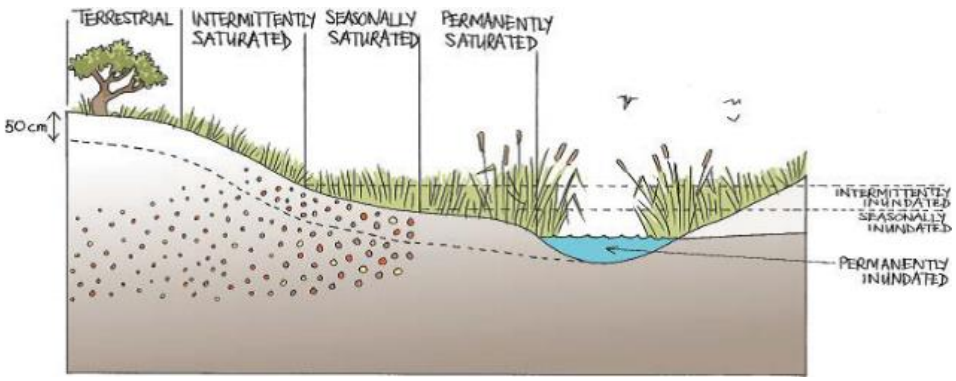

Figure 7-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)

7.2.2 Delineation

The wetland indicators described above are used to determine the boundaries of the wetlands within the project area. These delineations are then illustrated by means of maps accompanied by descriptions.

7.2.3 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as humans. EcoServices serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted as per the guidelines as described in WET-EcoServices (Kotze *et al.,* 2008). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 7-1).

Table 7-1 Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

7.2.4 Present Ecological Status

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 7-2.

Table 7-2 The Present Ecological Status categories (Macfarlane et al., 2009)

Impact Category	Description	Impact Score Range	PES
None	Unmodified, natural	0 to 0.9	A
Small	**Largely Natural** with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	**Moderately Modified.** A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	**Largely Modified.** A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	**Seriously Modified.** The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	**Critical Modification.** The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

7.2.5 Importance and Sensitivity

The importance and sensitivity of water resources is determined in order establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) as listed in Table 7-3, (Rountree and Kotze., 2013).

Table 7-3 Description of Ecological Importance and Sensitivity categories

IS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	**A**
High	2.1 to 3.0	**B**
Moderate	1.1 to 2.0	**C**
Low Marginal	< 1.0	**D**

7.2.6 Ecological Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this assessment. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and then also includes structural features at the lower levels of classification (Ollis *et al.,* 2013).

7.2.7 Buffer Requirements

The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane *et al.,* 2014) was used to determine the appropriate buffer zone for the proposed activity.

7.2.8 Risk Assessment

The risk assessment will be completed in accordance with the requirements of the DWS General Authorisation (GA) in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 2016). The significance of the impact is calculated according to Table 7-4.

Table 7-4 Significance ratings matrix

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s)impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

8 Project Area

8.1 Desktop Spatial Assessment

The following features represent a summary of various spatial datasets analysed in regard to the project area with an emphasis on those aspects which are deemed to have a possible impact on the receiving environment. This assessment is based on spatial data that are

provided by various sources such as the provincial environmental authority and SANBI. The desktop analysis and their relevance to this project are listed in Table 8-1.

Table 8-1 Desktop spatial features examined

Desktop Information Considered	Relevant/Not relevant	Section
Conservation Plan	The project area will overlap with: • Critical Biodiversity Area[1] (CBA); • Other Natural Area (ONA); and • Moderately or Heavily Modified Areas (MMA's or HMA's).	8.2
Rocky Ridges	Irrelevant: Mpumalanga does not have legislation regarding rocky ridges.	-
Ecosystem Threat Status	Falls within a *VU* ecosystem[2]	8.3.1
Ecosystem Protection Level	Falls in a *not protected* ecosystem	8.3.2
Protected Areas	Irrelevant: Closest SAPAD or SACAD is more than 54km away from the project area: Nicolaas Private Nature Reserve	-
Mpumalanga Protected Areas Expansion Strategy (MPAES)	The southern portion of the project area overlaps with an MPAES area[3]	8.4
NBA Rivers and Wetlands	The wetland that runs across the project area is *CR* and classified as a *"not protected" and "poorly protected"* system. A CR river which is "*poorly protected*" also runs through the 500 m regulated area	8.5
Mining and Biodiversity Guidelines	Irrelevant: No mining component	-
Important Bird and Biodiversity Areas	Irrelevant: Project area is situated more than 26 km away from the Devon Grassland IBA.	-
Mpumalanga Highveld Grasslands	The project area intersects with wetland areas classified as EF, which means that these areas have been classified as heavily to critically modified. Some dams also occur in the 500 m regulated area.	8.6
Soil and Geology	The project area is characterised by the Ea17 land type.	8.7
Strategic Water Source Areas (SWSA)	Irreplaceable the closest SWSA (Upper Vaal) is 16 km from the project area	-
NPAES	Irreplaceable the closest NPAES is 66 km from the project area	-

8.2 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

[1] The Environmental Screening Tool has characterised the aquatic biodiversity as "very high sensitivity" due to the presence of aquatic CBAs and wetlands. The terrestrial biodiversity is also classified as "very high sensitivity" due to the presence of CBAs.
[2] The Environmental Screening Tool has terrestrial biodiversity is also classified as "very high sensitivity" due to the presence of a Vulnerable ecosystem.
[3] The Environmental Screening Tool has characterised the terrestrial biodiversity is also classified as "very high sensitivity" due to the presence of focus areas for expansion.

- 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 8-1 shows the project area superimposed on the MBSP Terrestrial CBA map. Based on this, the project area will overlap with:

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

Figure 8-2 shows the project area superimposed on the MBSP Freshwater CBA map. Based on this, the project area will overlap with:

- The area is dominated by ONA and HMA's);
- A single ESA wetland is within the footprint are of the wetland system; and
- A single CBA wetland is not directly within the wetland footprint area, but within the 500 m regulation area.

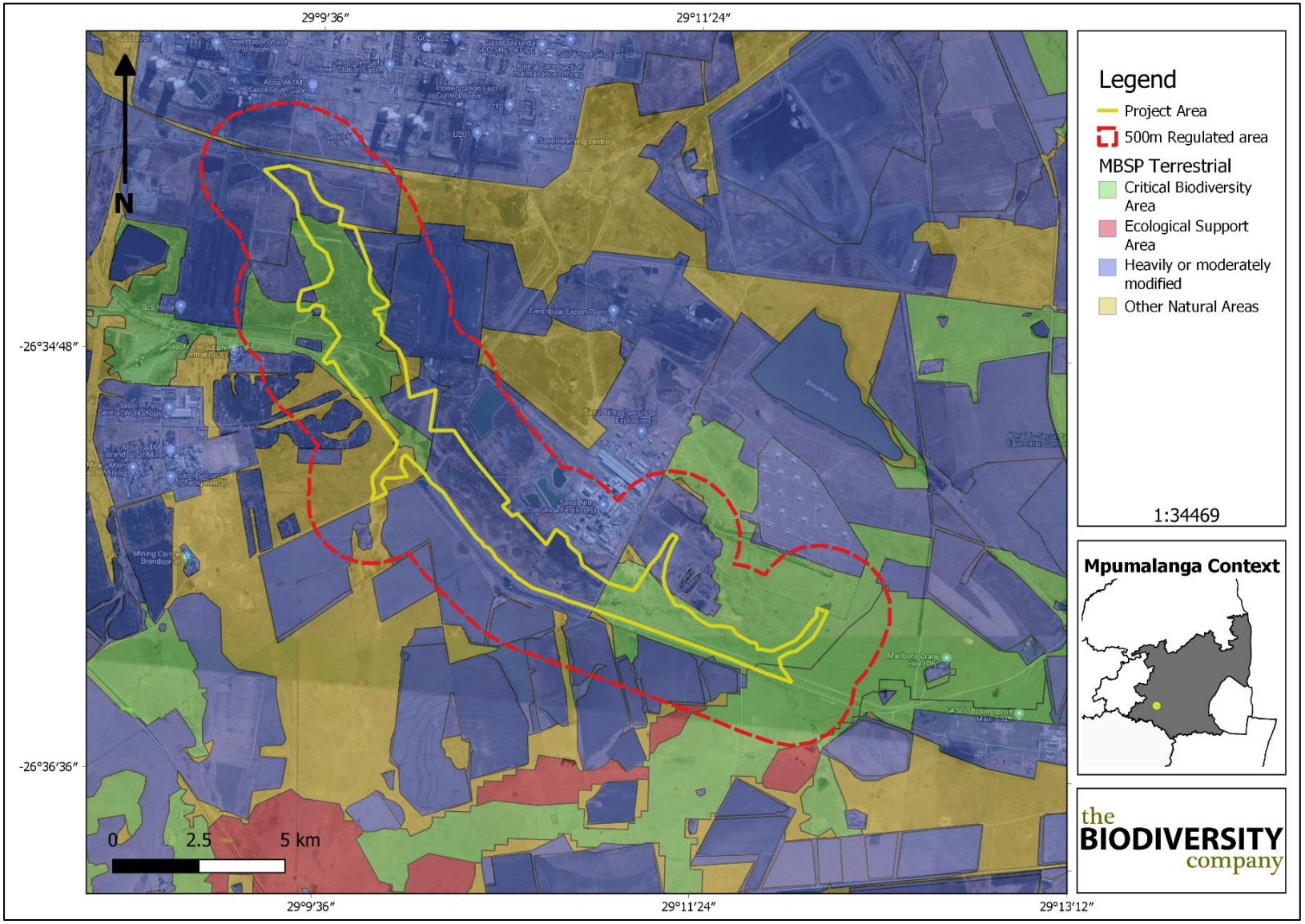

Figure 8-1 Project area in relation to the MBSP Terrestrial

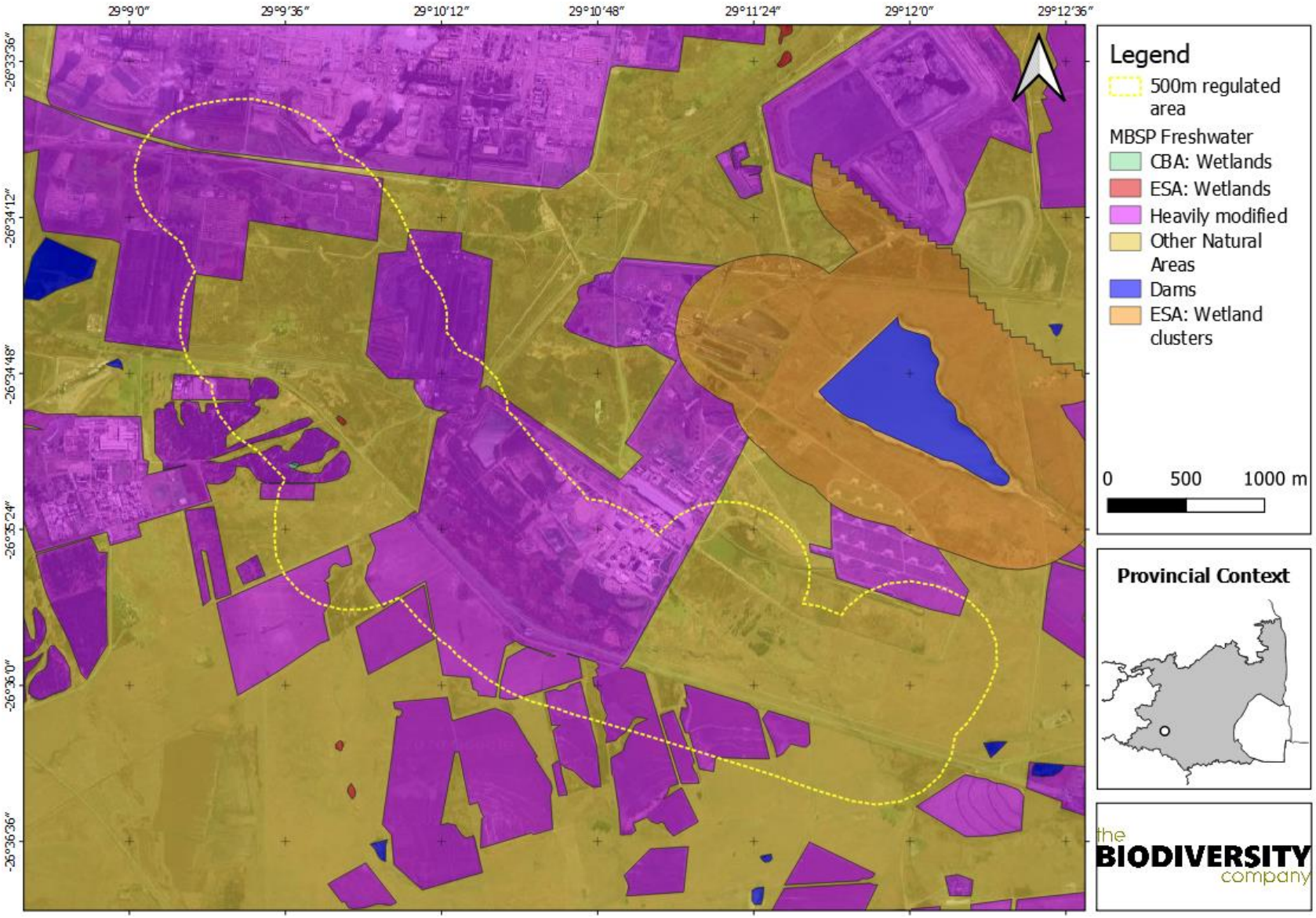

Figure 8-2 Project area in relation to the MBSP Freshwater

8.3 National Biodiversity Assessment

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the DEA and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Skowno *et al.,* 2019).

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 (Skowno *et al.,* 2019).

The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level.

8.3.1 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 (Skowno *et al.*, 2019).

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 (Skowno *et al.*, 2019).

The proposed project area was superimposed on the terrestrial ecosystem threat status (Figure 8-3). As seen in this figure the project area falls across one ecosystem, which is listed VU.

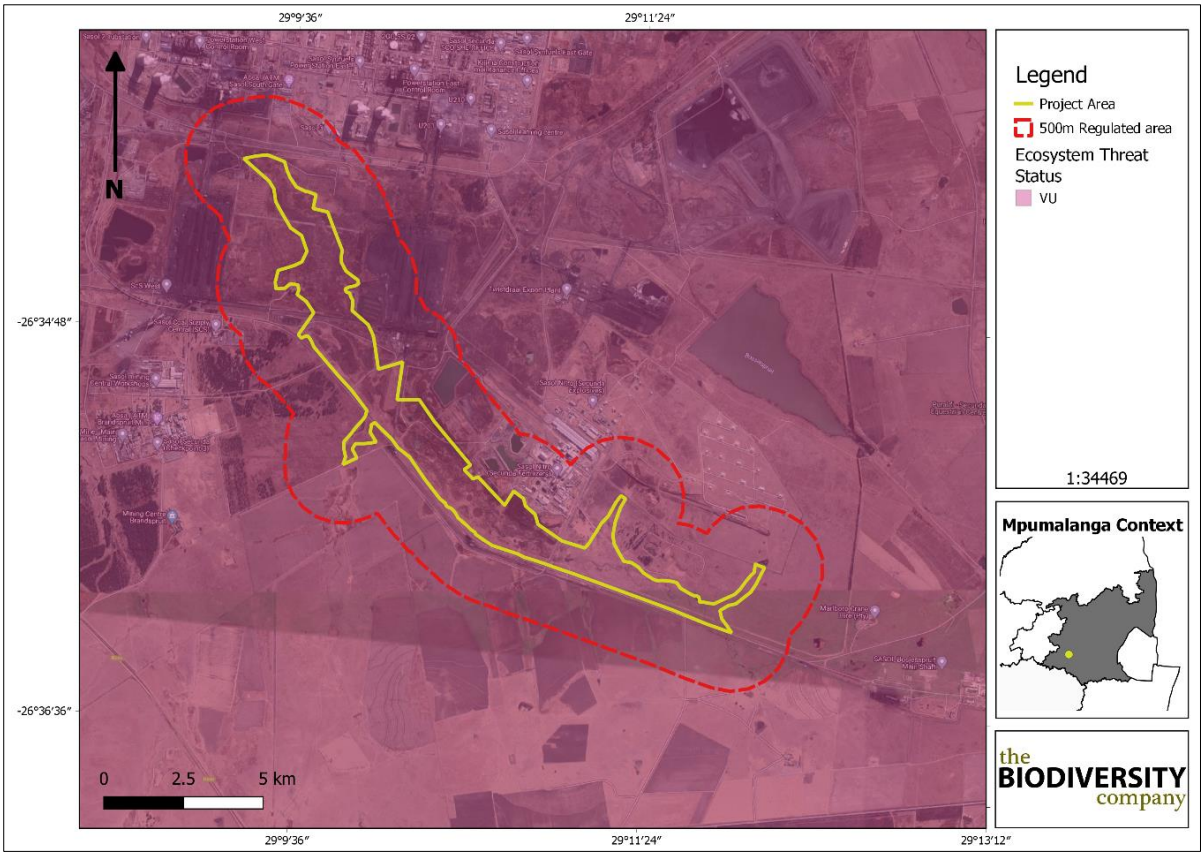

Figure 8-3 The project area showing the ecosystem threat status of the associated terrestrial ecosystems (NBA, 2018)

8.3.2 Ecosystem Protection Level

Ecosystem protection level details whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as either 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 (Skowno *et al.*, 2019).

The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 8-4). Based on this the terrestrial ecosystems associated with the proposed project area are rated as *not protected*. This means that these ecosystem types (and associated habitats) are not protected anywhere in the country (such as in nationally protected areas).

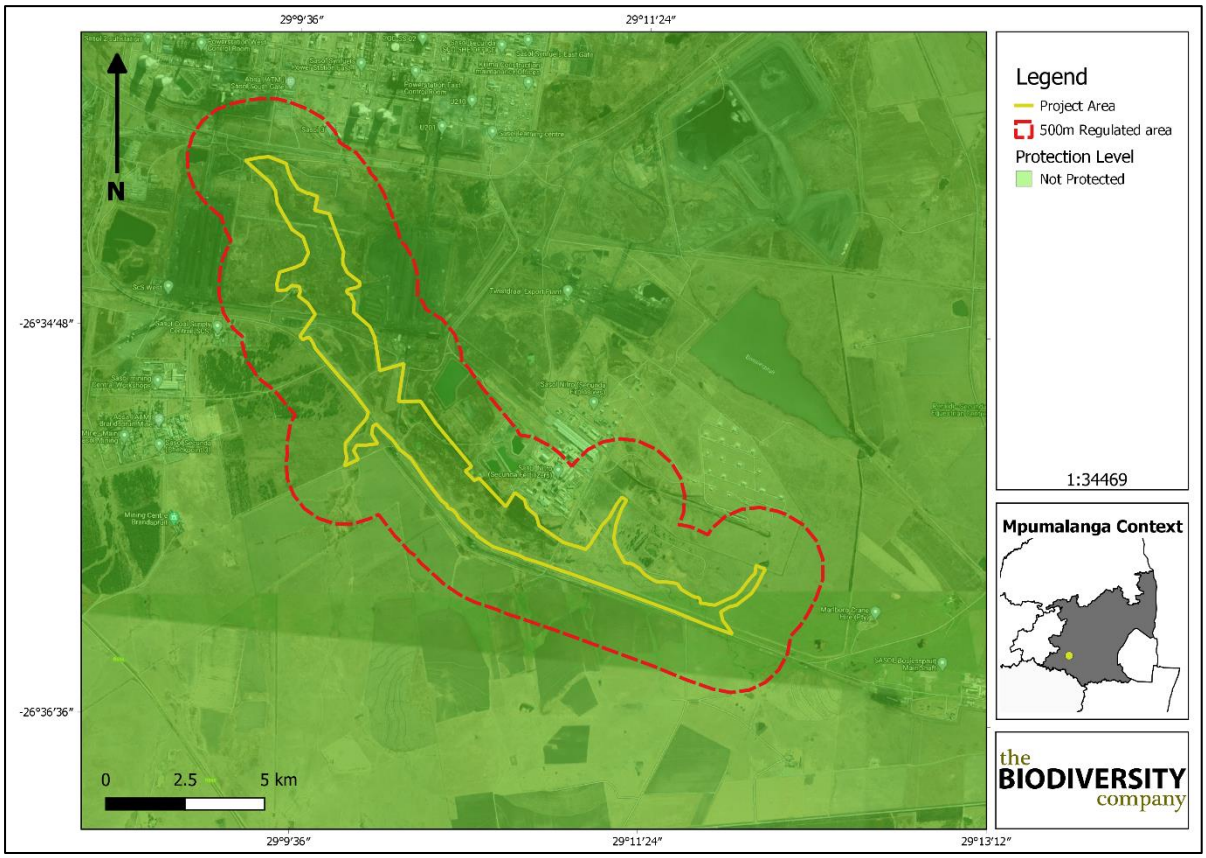

Figure 8-4 The project area showing the level of protection of terrestrial ecosystems (NBA, 2018)

8.4 Mpumalanga Protected Areas Expansion Strategies

The Mpumalanga Protected Area Expansion Strategy (MPAES, 2013), commissioned by the MTPA, serves to function as a provincial framework for an integrated, co-ordinated and uniform approach in the expansion and consolidation of the Provincial PAS, in line with the requirements of the NPAES.

The priority areas for PA Expansion within Mpumalanga were spatially established based on the premise that the primary goal of these areas is to protect biodiversity targets. Several biodiversity data sources were used for the assessment, namely the: Threatened Ecosystems, MBCP Terrestrial Assessment, MBCP Aquatic Assessment, MBCP Irreplaceability, C-plan Irreplaceability, and the National Spatial Biodiversity Assessment Priority areas. A combination of all these were used, together with the spatial priorities established within the NPAES, to establish the spatial priority areas that will guide the MPAES over the next 20 years as reflected below (Figure 8-5).

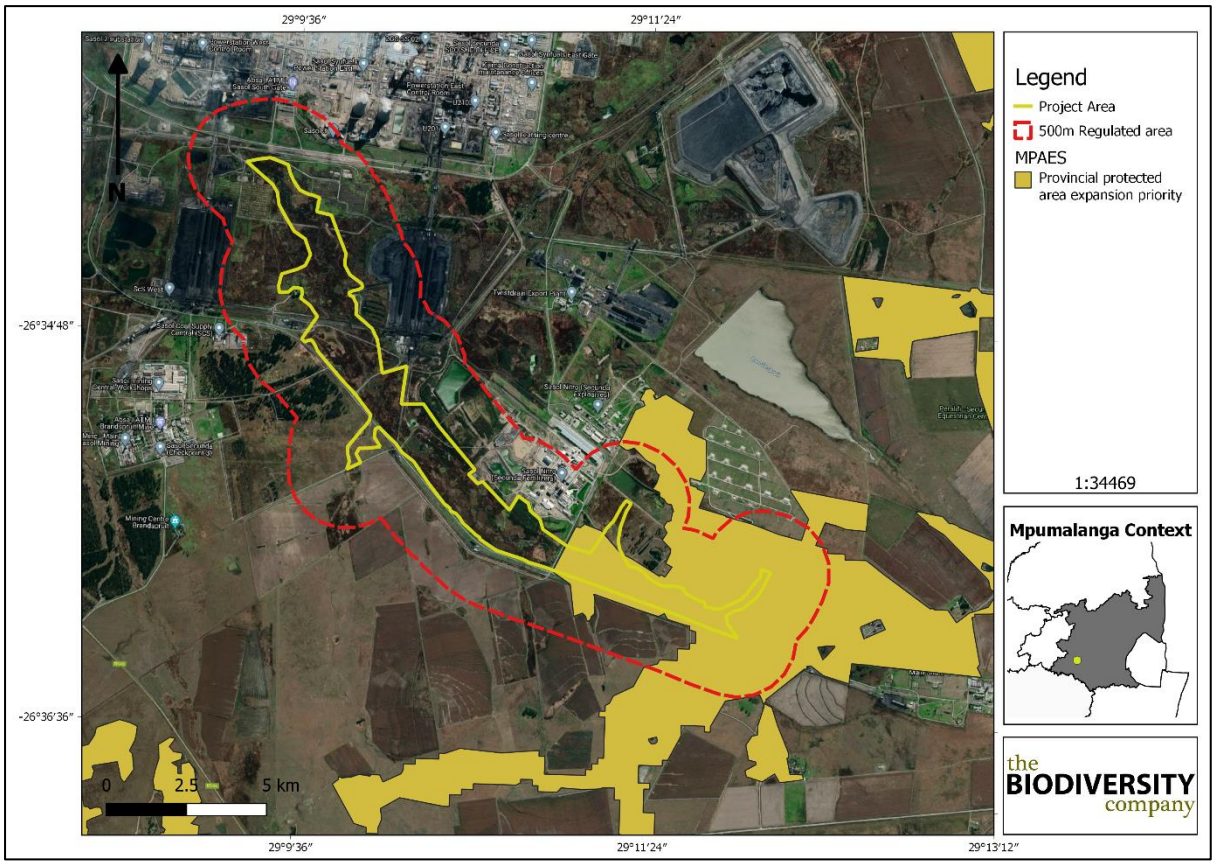

Figure 8-5 The project area in relation to the Mpumalanga Protected Areas Expansion Strategy areas

8.5 National Biodiversity Assessment Wetlands

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018.

Ecosystem threat status (ETS) of river ecosystem types is based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LC, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al*., 2019).

Figure 8-6 shows that the wetland that runs across the project area is *CR*, while Figure 8-7 shows this is a *"not protected" and "poorly protected"* system. A CR river which is "*poorly protected*" also runs through the 500 m regulated area (Figure 8-6 and Figure 8-7)

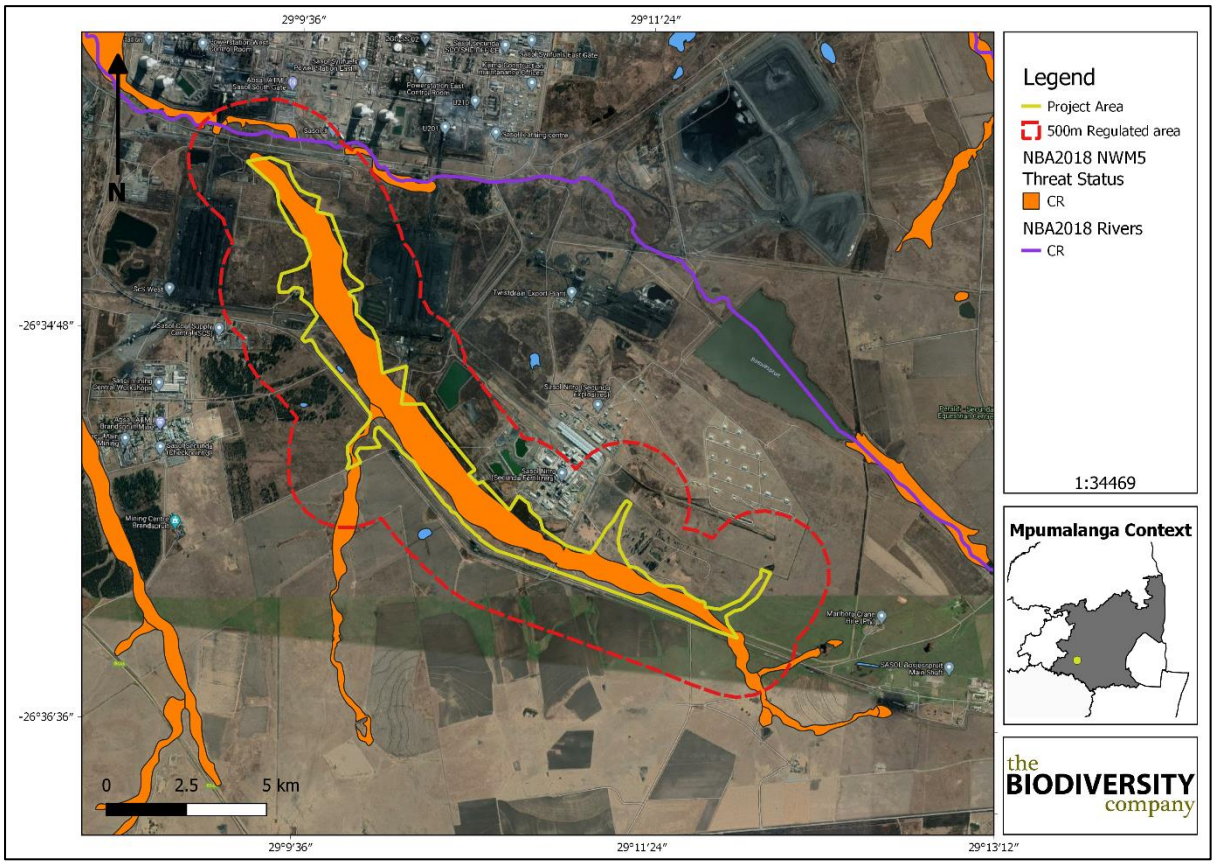

Figure 8-6 The project area in relation to the threat status of the wetlands and rivers (NBA, 2018).

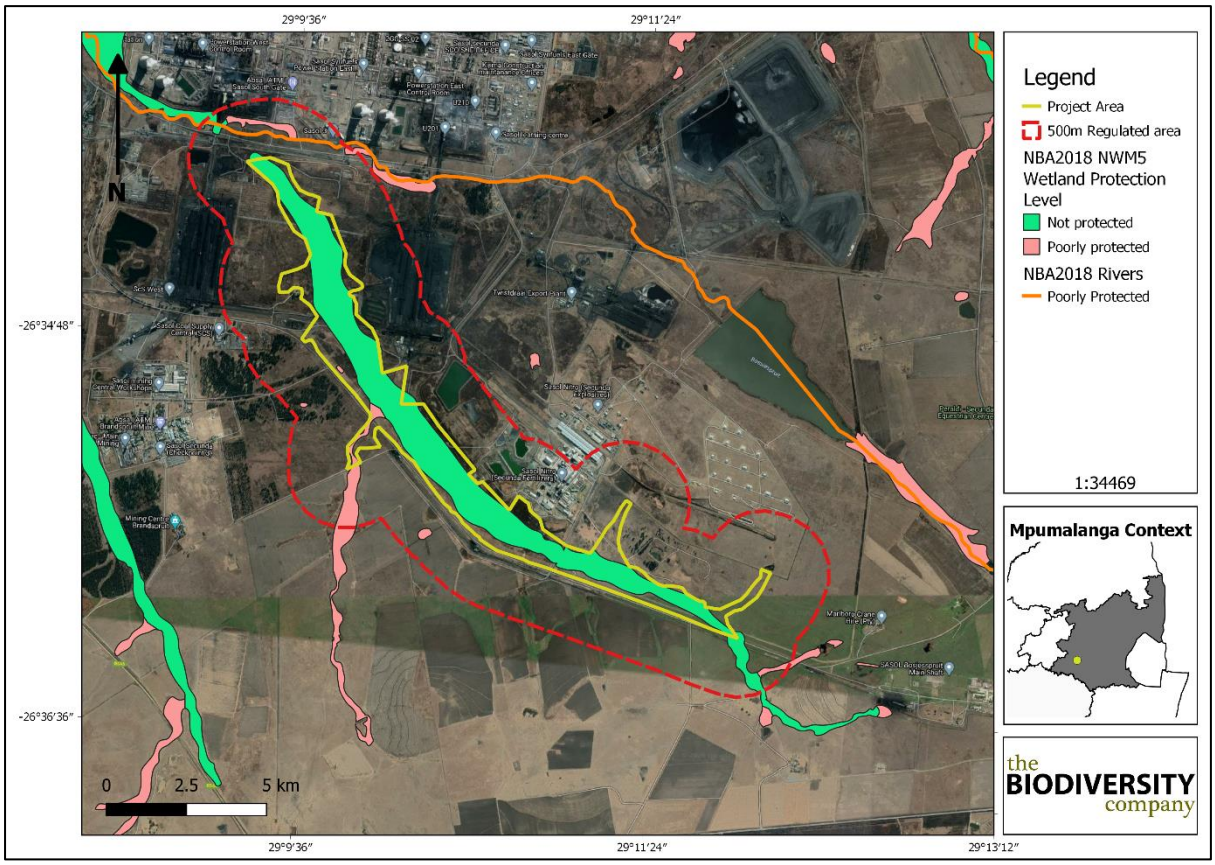

Figure 8-7 The project area in relation to the protection level of the wetlands and rivers (NBA, 2018).

Figure 8-8 shows that the wetland found in the project area is artificial, a natural wetland can however still be found in the 500 m regulated area.

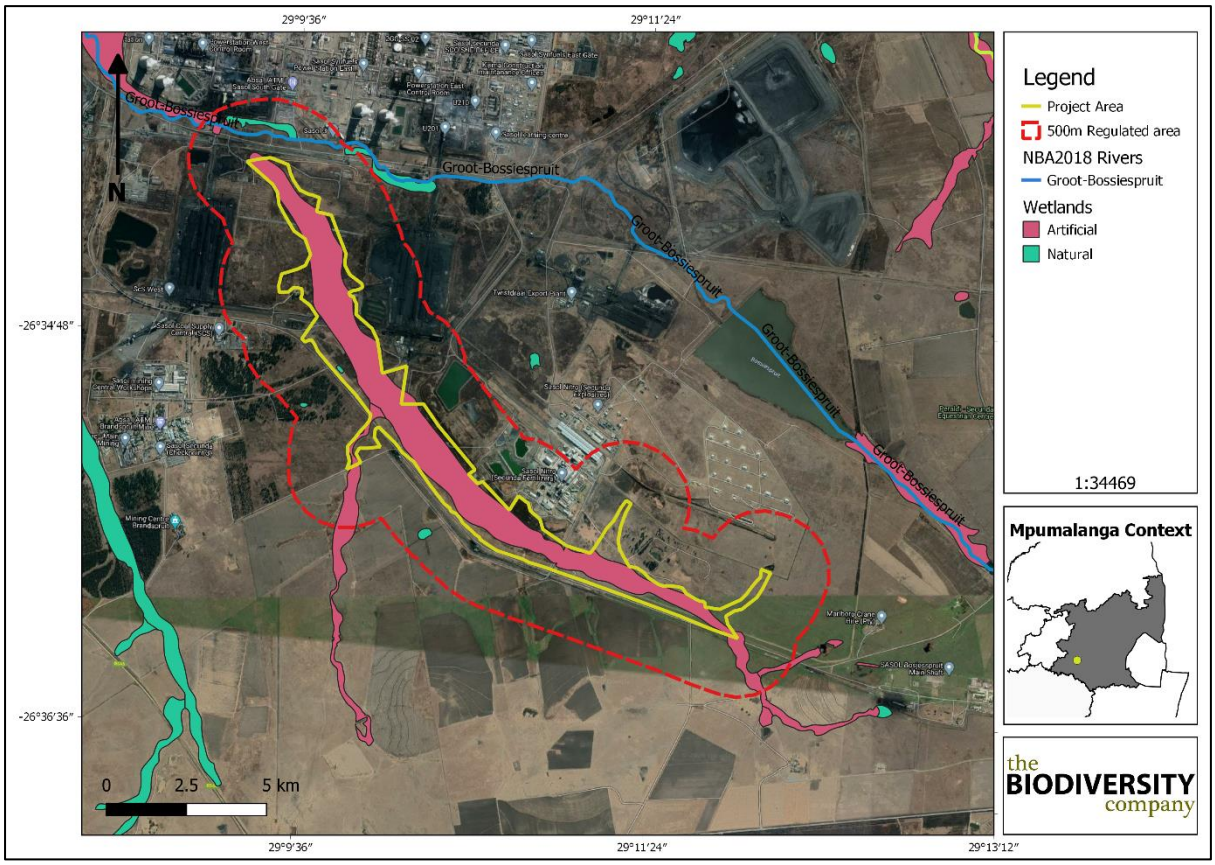

Figure 8-8 The project area in relation to the NBA rivers and rivers, divided as artificial and natural

8.6 Mpumalanga Highveld Wetlands

The purpose of the Mpumalanga Highveld Grasslands (MPHG) 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 and the coal mining industry in their planning and decision-making processes'' (SANBI, 2012).

The MPHG 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 Table 8-2 and are represented in relation to the project area in Figure 8-9.

Table 8-2 A breakdown of the NFEPA wetland condition categories as defined by the MH dataset

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 ≥ 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 8-9 shows the project area in relation to the Mpumalanga Highveld Wetlands data as provided by SANBI. The project area intersects with wetland areas classified as EF, which means that these areas have been classified as heavily to critically modified. Some dams also occur in the 500 m regulated area.

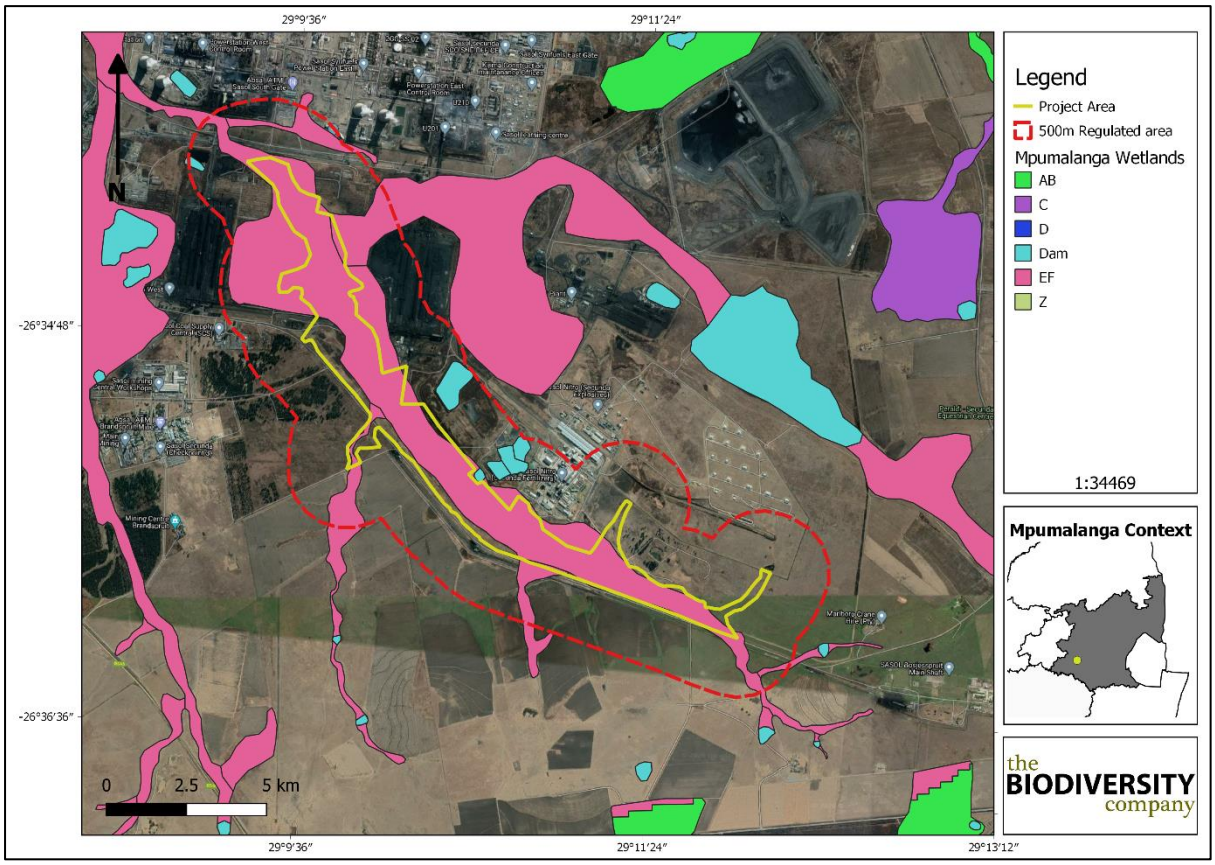

Figure 8-9 The project area in relation to the Mpumalanga Highveld Wetlands

8.7 Soil and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Ea17 land type. *Figure 8-10* illustrates the respective terrain units relevant to the Ea17 land. Shale, sandstone, or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites are prominent in the area. Soils are deep and reddish on flat plains(Mucina & Rutherford, 2006).

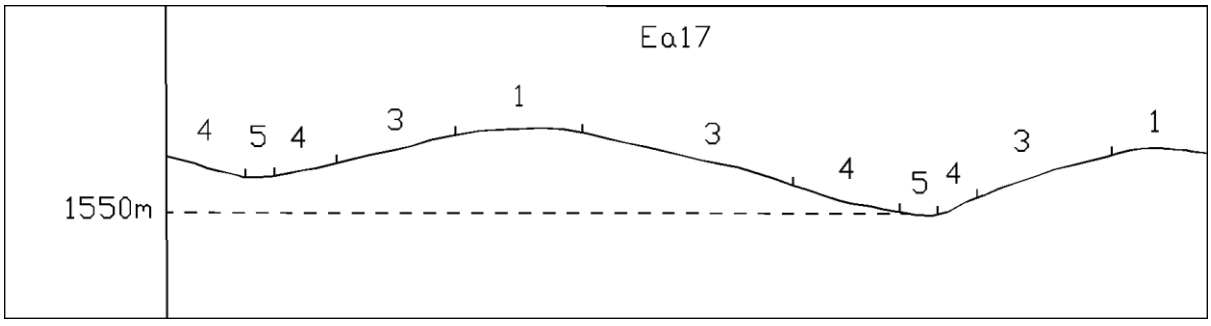

Figure 8-10 Illustration of land type Ea17 terrain unit (Land Type Survey Staff, 1972 - 2006)

8.8 Climate

The climate for the Soweto Highveld Grassland is characterised by a summer rainfall with a mean annual precipitation of 662mm (Figure 8-11). This area has a cool temperate climate

with thermic continentality, with extremes between maximum summer and minimum winter temperatures (Mucina & Rutherford, 2006).

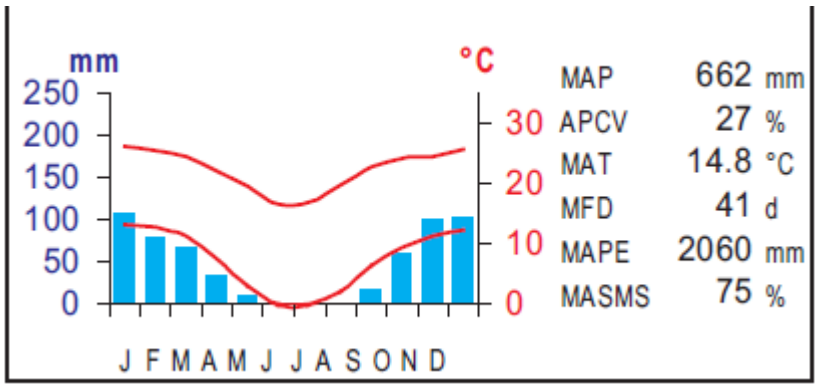

Figure 8-11 Climate for the Soweto Highveld Grassland (Mucina & Rutherford, 2006)

9 Results & Discussion

9.1 Desktop Assessment

9.1.1 Vegetation Assessment

The site is situated in 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.

9.1.1.1 Vegetation Types

The Grassland biome comprises of many different vegetation types. The proposed project area falls entirely within the Soweto Highveld Grassland (Figure 9-1) vegetation type (SANBI, 2019).

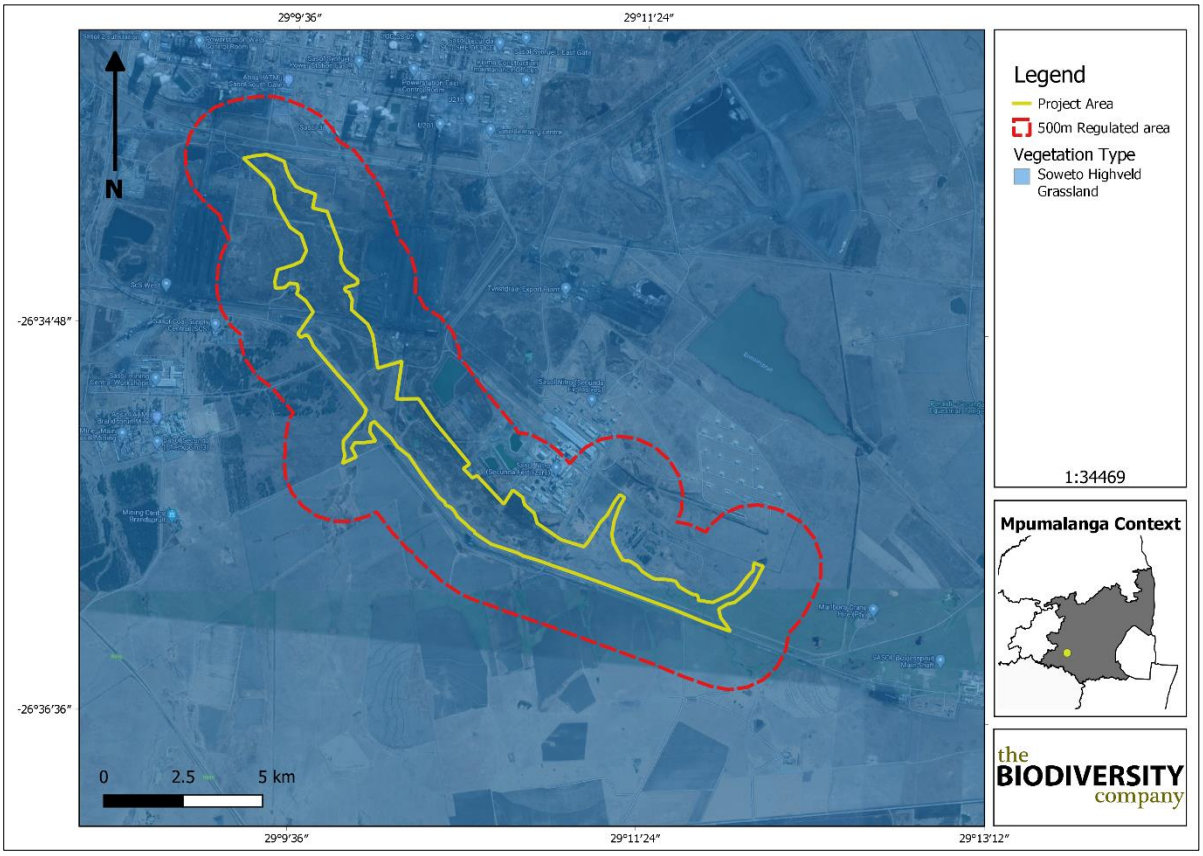

Figure 9-1 The project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2018)

9.1.1.2 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).

9.1.1.3 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 amplectens, 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).

9.1.1.4 Conservation Status of the Vegetation Type

According to Mucina and 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 and the 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.

9.1.1.5 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2019) database, 513 plant species are expected to occur in the project area. Figure 9-2 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 513-plant species, seven species are listed as being SCCs.

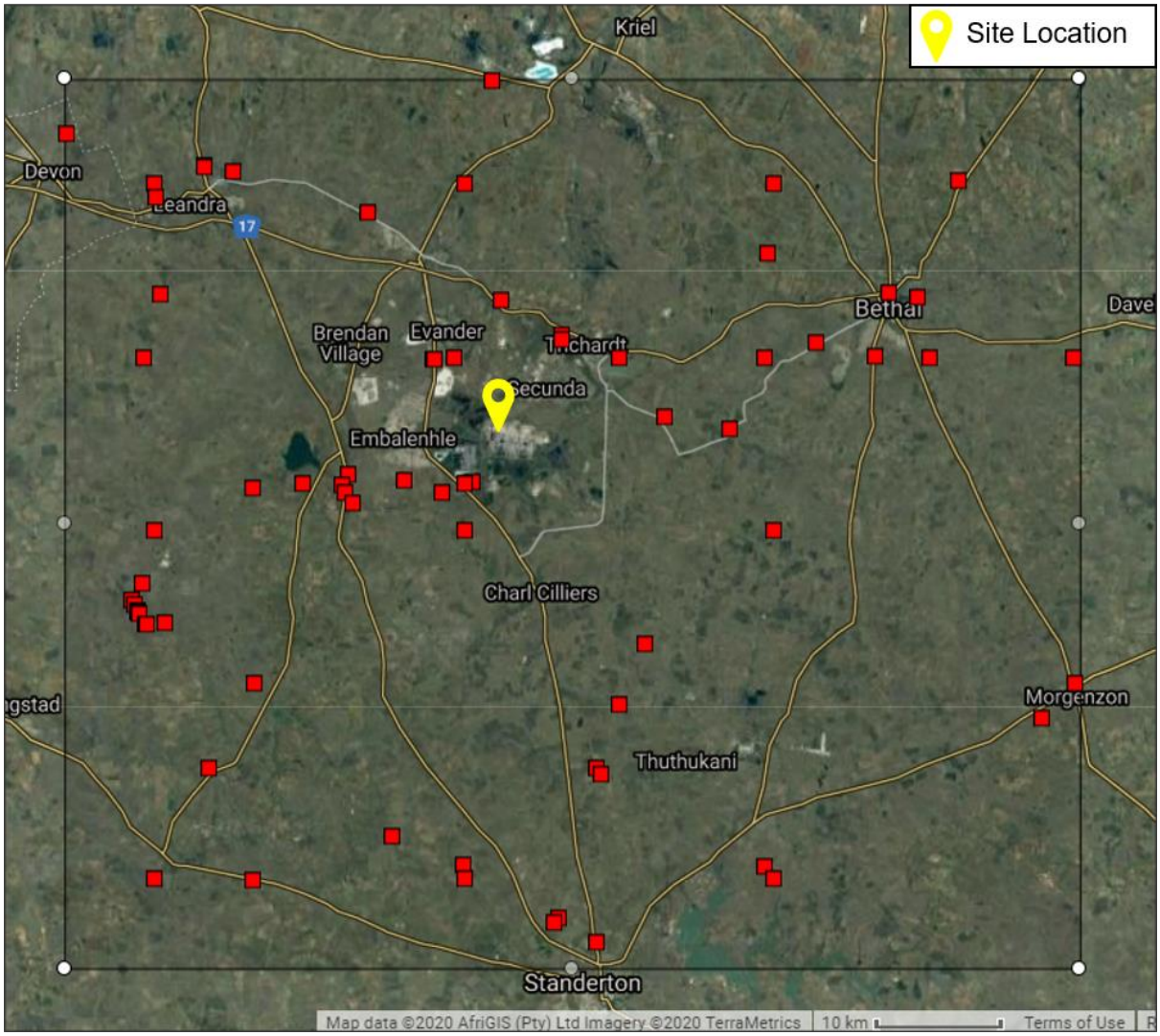

Figure 9-2 Map showing the grid drawn to compile an expected species list (BODATSA-POSA, 2019)

Table 9-1 Flora SCCs expected in the project area

Family	Taxon	Author	IUCN	Ecology	Habitat
Fabaceae	*Argyrolobium campicola*	Harms	NT	Indigenous; Endemic	Highveld grassland.
Asteraceae	*Cineraria austrotransvaalensis*	Cron	NT	Indigenous; Endemic	Amongst rocks on steep hills and ridges
Iridaceae	*Gladiolus robertsoniae*	F.Bolus	NT	Indigenous; Endemic	Found in wet, rocky sites, mostly dolerite outcrops, wedged in rock crevices
Asphodelaceae	*Kniphofia typhoides*	Codd	NT	Indigenous; Endemic	Low lying wetlands
Apocynaceae	*Miraglossum davyi*	(N.E.Br.) Kupicha	VU	Indigenous; Endemic	Open, gentle sloping grassland of high altitudes on sand or heavy black loam soils
Amaryllidaceae	*Nerine gracilis*	R.A.Dyer	VU	Indigenous; Endemic	Undulating grasslands in damp areas
Apocynaceae	*Stenostelma umbelluliferum*	(Schltr.) Bester & Nicholas	NT	Indigenous; Endemic	Deep black turf in open woodland mainly in the vicinity of drainage lines

9.1.2 Faunal Assessment

9.1.2.1 Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 299 bird species are expected to occur in the vicinity of the project area (pentads 2630_2900; 2630_2905; 2630_2910; 2635_2900; 2635_2905; 2635_2910; 2640_2900; 2640_2905; 2640_2910). The full list of potential bird species is provided in Appendix B.

Of the expected bird species, Sixteen (16) species are listed as SCC either on a regional scale or international scale (Table 9-2). The SCC include the following:

- One (1) species that are listed as EN on a regional basis;
- Three (3) species that are listed as VU on a regional basis; and
- Ten (10) species that are listed as NT on a regional basis.

Table 9-2 List of bird species of regional or global conservation importance that are expected to occur in pentads mentioned above (SABAP2, 2018, ESKOM, 2015; IUCN, 2017)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Anthropoides paradiseus	Crane, Blue	NT	VU	Low
Calidris ferruginea	Sandpiper, Curlew	LC	NT	Moderate
Charadrius pallidus	Plover, Chestnut-banded	NT	NT	Low
Circus macrourus	Harrier, Pallid	NT	NT	Moderate
Circus ranivorus	Marsh-harrier, African	EN	LC	Moderate
Coracias garrulus	Roller, European	NT	LC	Moderate
Eupodotis caerulescens	Korhaan, Blue	LC	NT	Low
Falco vespertinus	Falcon, Red-footed	NT	NT	Low
Geronticus calvus	Ibis, Southern Bald	VU	VU	Low
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Low
Oxyura maccoa	Duck, Maccoa	NT	NT	Low
Phoenicopterus minor	Flamingo, Lesser	NT	NT	Low
Phoenicopterus ruber	Flamingo, Greater	NT	LC	Low
Rostratula benghalensis	Painted-snipe, Greater	NT	LC	Moderate
Sagittarius serpentarius	Secretarybird	VU	VU	Low
Sterna caspia	Tern, Caspian	VU	LC	Low

Anthropoides paradiseus (Blue Crane) is listed as NT on a regional scale and as VU on a global scale. This species has declined, largely owing to direct poisoning, power-line collisions and loss of its grassland breeding habitat owing to afforestation, mining, agriculture and development (IUCN, 2017). This species breeds in natural grass- and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short. Due to the lack of open grassland areas within the project site the likelihood of occurrence is rated as low.

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 saltpans (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.

Charadrius pallidus (Chestnut-banded Plover) is listed as NT on a regional and a global scale. The species is found in salt lakes and estuaries, they do migrate inland when the coastal waters dry up. The likelihood of this species occurring in the project area is low.

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 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. The wetland habitat in the project area creates the likelihood of occurrence however due to the degraded state of the system the likelihood of occurrence is reduced.

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.

Eupodotis caerulescens (Blue Korhaan) is listed as NT 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 1 500 m (del Hoyo, *et al.* 1996). The specie nests in bare open ground, situated in thick grass or cropland. Based on the required habitat the likelihood of occurrence of this species is rated as low.

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. The proximity to industries reduces the likelihood of occurrence.

Geronticus calvus (Southern Bald Ibis) is listed as 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. No foraging or nesting habitat is present for this species in the project area as such the likelihood of occurrence is rated as low.

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 it's migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. Suitable habitat can be found in the project area however the polluted state of the system decrease decreases the likelihood of occurrence.

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 low.

Phoenicopterus 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). Suitable saline water sources cannot be found in the project area as such the likelihood of occurrence is rated as low.

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 may possibly exist within the project area, thus the likelihood of occurrence is moderate.

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 low due to the lack of grasslands present in the project area.

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 low and thus the likelihood of occurrence is low.

9.1.2.2 Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 81 mammal species that could be expected to occur within the vicinity of the project area (Appendix C). Of these species, 9 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 72 small to medium sized mammal species, fifteen (15) are listed as being of conservation concern on a regional or global basis (Table 9-3). The list of potential species includes:

- Two (2) that is listed as EN on a regional basis;
- Five (5) that are listed as VU on a regional basis; and
- Eight (8) that are listed as NT on a regional scale.

Table 9-3 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)	
Amblysomus septentrionalis	Highveld Golden Mole	NT	NT	**Low**
Aonyx capensis	Cape Clawless Otter	NT	NT	**Moderate**
Atelerix frontalis	South Africa Hedgehog	NT	LC	**Low**
Crocidura maquassiensis	Makwassie musk shrew	VU	LC	**Low**
Dasymys incomtus	African Marsh rat	NT	LC	**Low**
Felis nigripes	Black-footed Cat	VU	VU	**Low**
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	**Low**
Leptailurus serval	Serval	NT	LC	**Moderate**
Mystromys albicaudatus	White-tailed Rat	VU	EN	**Low**
Ourebia ourebi	Oribi	EN	LC	**Low**
Panthera pardus	Leopard	VU	VU	**Low**
Parahyaena brunnea	Brown Hyaena	NT	NT	**Low**
Pelea capreolus	Grey Rhebok	NT	NT	**Low**
Poecilogale albinucha	African Striped Weasel	NT	LC	**Low**
Redunca fulvorufula	Mountain Reedbuck	EN	LC	**Low**

Amblysomus septentrionalis (Highveld Golden Mole) is listed nationally and globally as NT (IUCN, 2017; SANBI, 2016). They are currently found in 12 localities in South Africa, with their range being threatened by habitat degradation associated with mining of shallow coal deposits. Based on the disturbed nature of the habitat the likelihood of occurrence is rated as low.

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 presence of the Groot Bossiespruit in the 500 m regulated area of the project area the likelihood of occurrence is rated as 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. The likelihood of occurrence in the project area is rated as low.

Crocidura maquassiensis (Maquassie Musk Shrew) is listed as 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). Likelihood of occurrence is rated as low as suitable habitat is not present in the project area.

Dasymys incomtus (African Marsh Rat) is listed as NT on a regional scale and LC on a global scale. This species has a wide distributional range that includes Central Africa, East Africa and parts of Southern Africa. This species has been recorded from a wide variety of habitats, including forest and savanna habitats, wetlands and grasslands (IUCN, 2017). Based on the disturbed state of the wetland the likelihood of occurrence is rated as low.

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 low.

Hydrictis maculicollis (Spotted-necked Otter) inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes (IUCN, 2017). The Groot Bossiespruit does create suitable habitat for this species, however due to the disturbed nature the likelihood of occurrence is rated as low.

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. The habitat in the project area may be suitable for the species and the likelihood of occurrence is rated as moderate.

Mystromys albicaudatus (White-tailed Rat) is listed as VU on a regional basis and 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. The likelihood of occurrence is rated as low.

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. The proximity to urban and industrial area the likelihood of occurrence is rated as low.

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. The proximity to the urban area decreases the likelihood of occurrence.

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, 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. The likelihood of occurrence in the project area is low.

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). The likelihood of occurrence is regarded low due to the absence of rocky ridge habitat.

9.1.2.3 Herpetofauna (Reptiles & Amphibians)

9.1.2.3.1 Reptiles

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2017) 36 reptile species are expected to occur in the project area (Appendix D). Two (2) reptile SCC are expected to be present in the project area (Table 9-4).

Table 9-4 Expected reptile SCC that may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Crocodylus niloticus	Nile Crocodile	VU	LC	Low
Smaug giganteus	Giant Dragon Lizard	VU	VU	Low

Crocodylus niloticus (Nile Crocodile) is listed as VU on a regional basis. Based on the lack of a perennial river in the project area the likelihood of occurrence is rated as low.

Smaug giganteus (Giant Dragon Lizard) is categorised as VU on both a regional and an international scale. It is endemic to South Africa, where it is found only in the grasslands of the northern Free State and the southwestern parts of Mpumalanga (IUCN, 2017). Habitat loss due to agriculture is a continuing threat. Large portions of the grassland habitat are underlain by coal beds of varying quality and extent, and exploitation of coal for fuel has and will result in further habitat loss. The likelihood of finding the species in the project area is low due to the proximity to industrial development.

9.1.2.3.2 Amphibians

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the ADU (ADU, 2017) Twenty-two (22) amphibian species are expected to occur in the project area (Appendix E).

No amphibian SCC are expected to occur in the project area according to the above-mentioned sources.

9.2 Field Survey

9.2.1 Terrestrial Assessment

The field survey for the project area was conducted on the 17th of June 2020. During the survey 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 visit and some are provided in this section of the report. All site photographs are available on request.

9.2.1.1 Flora Assessment

The vegetation assessment was conducted throughout the extent of the project area. A total of 38 tree, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 9-5). 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 9-5 Trees, shrubs and weeds recorded at the project area

Scientific Name	Common Names	Threat Status (SANBI, 2017)	SA Endemic	Alien Category
Acacia mearnsii	Black wattle			NEMBA Category 2
Amaranthus hybridus	Smooth pigweed			Naturalized exotic weed
Arundo donax	Spanish reed			NEMBA Category 1b.
Berkheya echinacea	Iphungula	LC	Indigenous, Not Endemic	
Bidens pilosa	Black Jack			
Cirsium vulgare	Spear Thistle, Scotch Thistle			NEMBA Category 1b
Conyza bonariensis	Flax-leaf Fleabane			Naturalized exotic weed
Cosmos bipinnatus	Cosmos			Naturalized exotic weed
Crinum bulbispermum	Orange river lily	LC-Protected in MP	Not Endemic	
Cymbopogon caesius	Broad-leaved turpentine grass	LC	Not Endemic	
Cymbopogon nardus	Giant Turpentine Grass	LC	Not Endemic	
Cynodon dactylon	Couch Grass, Quick Grass	LC	Not Endemic	
Datura ferox	Large Thorn Apple			NEMBA Category 1b.
Datura stramonium	Jimsonweed			NEMBA Category 1b.
Eragrostis chloromelas	Blue Love Grass	LC	Not Endemic	
Eragrostis curvula	Weeping Love Grass	LC	Not Endemic	
Eucalyptus camaldulensis	Red River Gum			NEMBA Category 1b
Eucalyptus cinerea	Florist gum			Naturalized exotic
Flaveria bidentis	Smelter's-bush			NEMBA Category 1b.
Gomphocarpus fruticosus subsp. fruticosus		LC	Not Endemic	
Gomphrena celosioides	Bachelor's Button		Not Indigenous; Naturalised	
Hyparrhenia hirta	Thatch Grass	LC	Not Endemic	
Melinis repens	Natal Red Top	LC	Not Endemic	
Paspalum dilatatum	Dallis Grass	LC	Indigenous	
Pennisetum clandestinum	Kikuyu Grass		Not Endemic	NEMBA Category 1b in protected areas and wetlands.
Persicaria lapathifolia	Pale Persicaria	NE	Not Endemic	
Phragmites australis	Common Reed	LC	Not Endemic	
Prunus persica	Peach Tree		Not Endemic, Not Indigenous	
Robinia pseudoacacia	Black locust			NEMBA Category 1b.
Salix mucronata	African Willow	LC	Endemic	
Schkuhria pinnata	Dwarf Marigold		Not Indigenous; Naturalised	
Setaria sphacelata var. sphacelata	Common Bristle Grass	LC	Not Endemic	

Setaria verticillata	Bur Bristle Grass	LC	Not Endemic	
Sporobolus africanus	Ratstail Dropseed; Rush Grass	LC	Not Endemic	
Tagetes minuta				Naturalized exotic weed
Tamarix ramosissima	Pink tamarisk			NEMBA Category 1b.
Typha capensis	Bulrush	LC		
Verbena bonariensis	Purple Top			NEMBA Category 1b.

9.2.1.1.1 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 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, and was amended in February 2018 in the Government Gazette No. 41445. 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.

Ten (10) 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 9-5).

9.2.1.1.2 Protected plant species

One plant species (*Crinum bulbispermum*) that is protected by the Mpumalanga Nature Conservation Act 10 of 1998: Schedule 11 was recorded (Mpumalanga Tourism and Parks Agency, 1998). According to the list of protected species under Schedule 11; no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected plant unless he or she is the holder of a permit which authorises him or her to do so.

Figure 9-3 *Crinum bulbispermum observed* within the wetland area

9.2.1.2 Fauna

9.2.1.2.1 Avifauna

Nineteen (19) bird species were recorded in the project area during the June 2019 survey based on either direct observations, vocalisations, or the presence of visual tracks & signs (Table 9-6) (Figure 9-4). The low number of species can be attributed to the rainy and cold weather during the day of the survey which limited activity.

Table 9-6 A list of avifaunal species recorded for the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acridotheres tristis	Myna, Common	Unlisted	LC
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC

Figure 9-4 Black-headed Heron which occurred abundantly within the project area.

9.2.1.2.2 Mammals

Overall, mammal diversity in the project area was considered to be good, with 5 mammal species being recorded during the June 2019 survey based on direct observations and/or the presence of visual tracks & signs (Table 9-7 and Figure 9-5).

The habitat observed has a high likelihood of supporting SCC, especially Serval

Table 9-7 Mammal species recorded in the project area during the June 2019 survey .

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Sylvicapra grimmia	Common duiker	LC	LC

Figure 9-5 Signs and tracks of the mammal species recorded within the project area; A) *Canis mesomelas* (Black-backed Jackal) ,B) *Atilax paludinosus* (Water Mongoose) ,C & D) *Hystrix africaeaustralis* (Cape Porcupine) and E) *Sylvicapra grimmia* (Common duiker)

9.2.1.2.3 Herpetofauna (Reptiles & Amphibians)

Herpetofauna diversity was considered too low with no species recorded in the project area during the June 2020 survey. The lack of species observed could be attributed to the timing of the survey being a dry season survey, in winter months herpetofauna movement is lethargic/slow due to them being cold blooded.

9.2.1.3 Habitat Assessment and sensitivity

The wetland habitat is discussed below and visual representations from the field survey can be seen in Figure 9-6.

The wetland habitat includes a watercourse with the connected wetland areas and associated grasslands. The wetland habitat type is regarded as intact and therefore natural, but disturbed due to the surrounding land-use. The entire area has been infested with alien invasive plants including *Tagetes minuta*, *Bidens Pilosa* and *Cosmos bipinnatus*, the NEMBA Cat 1b *Pennisetum clandestinum* (Kikuyu) also occurred throughout. Even though somewhat degraded, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system and an important habitat for various fauna and flora. The preservation of this system is the most important aspect to consider for the proposed development, even more so due to the high sensitivity of the area according to the various ecological datasets. This habitat needs to be protected and improved due to the role of this habitat as a water resource. Thus, the proposed development is regarded as necessary if done correctly.

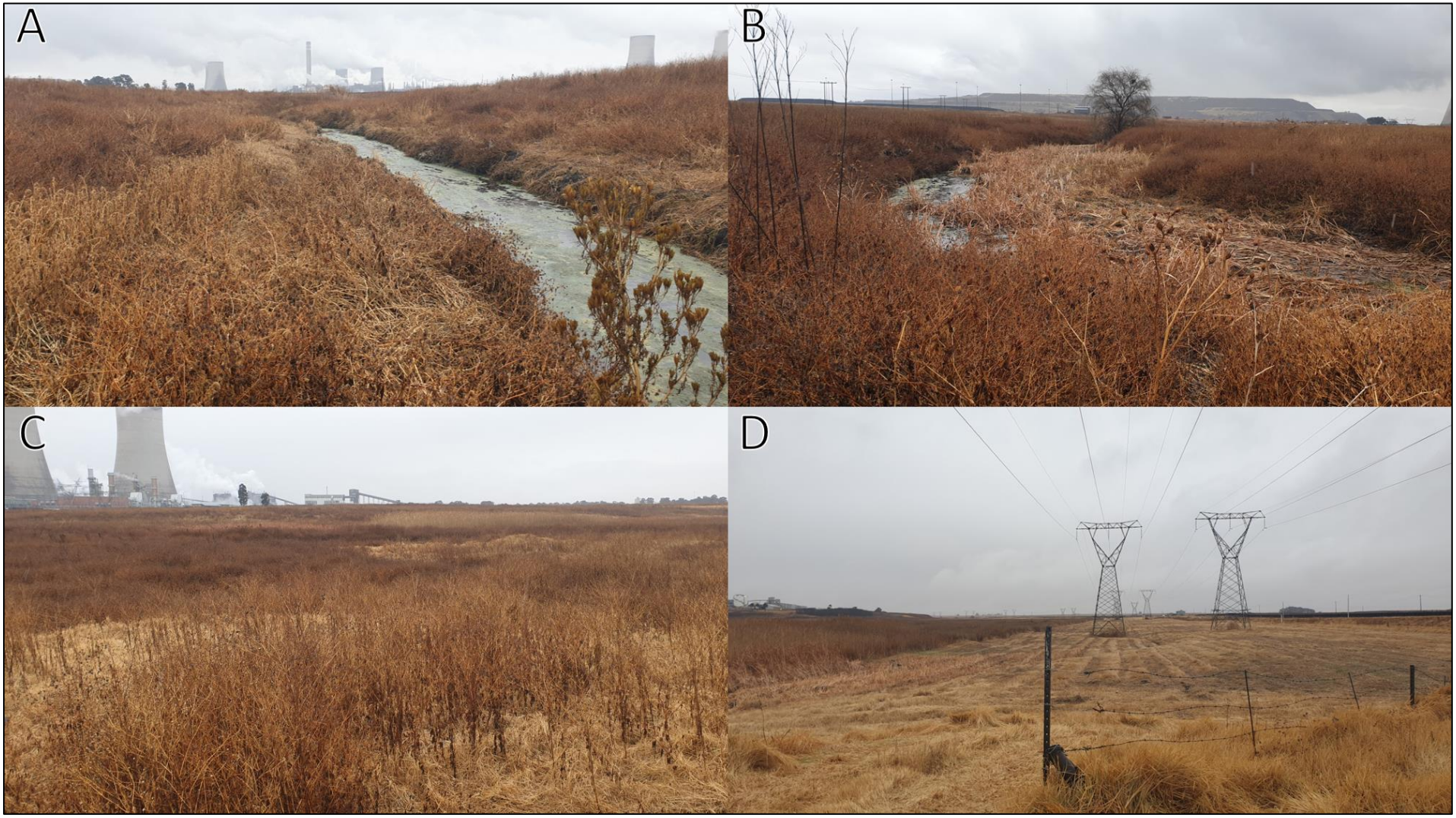

Figure 9-6 Pictures of the condition of the wetland habitat: A& B) Watercourse that flows into the Bessiesspruit, C)Image showing the extent of the alien vegetation within the wetland and D) Impacts within the wetland area; cutting of grass.

9.2.2 Wetland Assessment

9.2.2.1 Wetland Delineation

The wetland area (VBC08) was delineated and assessed for the Golder Associates (2018) study for the re-instatement of the system. The extent of the delineated system remains largely consistent from the 2018 study. Studies undertaken by Wet-Earth Eco-Specs (2019 & 2020) have also been considered to present the extent of the delineated system. Figure 9-7 presents the extent of wetland area within the 500 m regulation area, and also the two wetland habitat units identified and discussed by Wet-Earth Eco-Specs (2020).

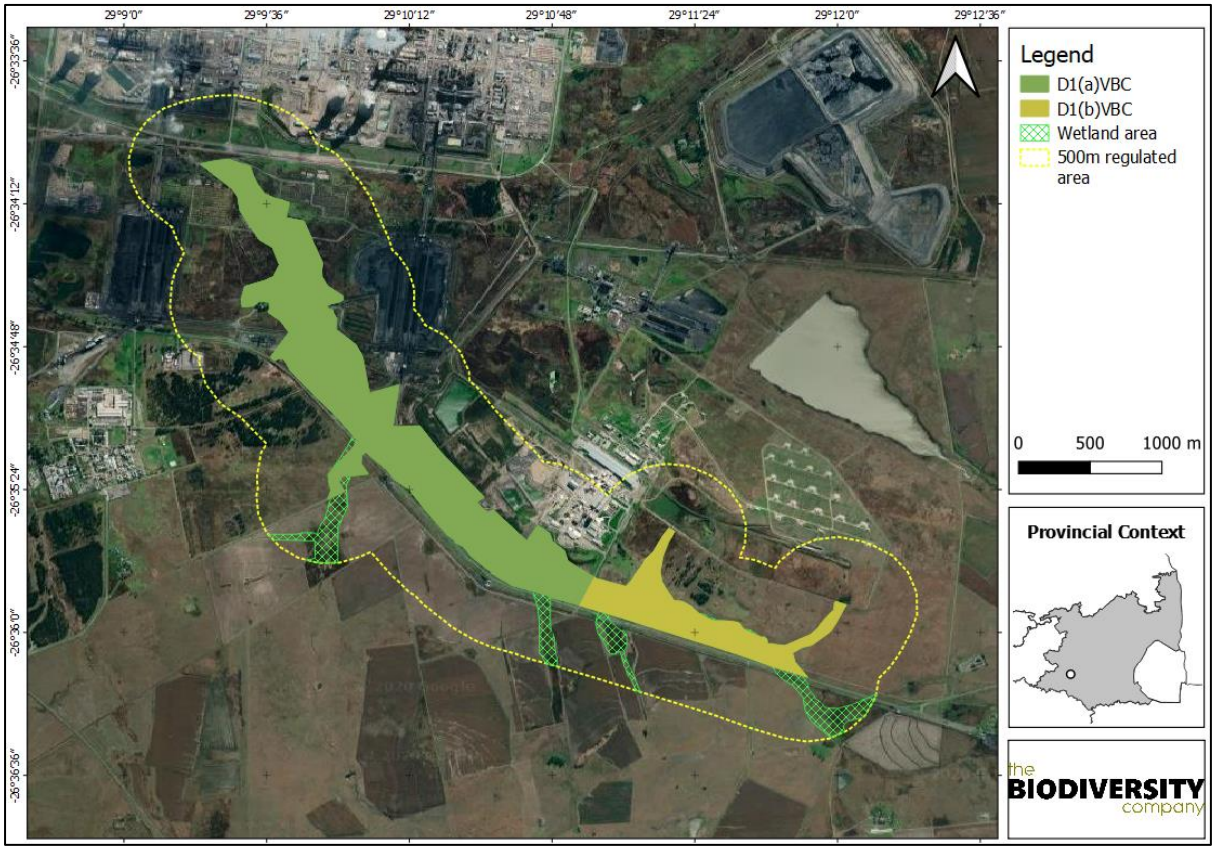

Figure 9-7 The extent of the delineated wetland system considered for the project

Figure 9-8 A photograph collage of the VBC08 wetland system (June 2020)

9.2.2.2 Wetland Unit Identification

The wetland classification as per SANBI guidelines (Ollis *et al.* 2013) is presented in Table 9-8. One wetland type was identified within the project assessment boundary, namely a channelled valley bottom system, comprising two habitat units.

Table 9-8 Wetland classification as per SANBI guideline (Ollis et al. 2013)

Wetland System	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
D1(a)VBC	Inland	Highveld	Mesic Highveld Grassland Group 3	Valley Floor	Channelled valley bottom	N/A	N/A
D1(b)VBC	Inland	Highveld	Mesic Highveld Grassland Group 3	Valley Floor	Channelled valley bottom	N/A	N/A

9.2.2.3 Functional Assessment

According to (Kotze *et al*. 2009), channelled valley bottom wetlands tend to contribute less to sediment trapping and flood attenuation than other systems. Channelled valley bottom wetlands are well known to improve the assimilation of toxicants, nitrates and sulphates, especially in cases where sub-surface flows contribute to the systems' water source (Kotze *et al*., 2009).

The ecosystem services provided by the HGM units identified on site were assessed and rated using the WET-EcoServices method (Kotze et al. 2009). Both HGM units are characterised by

an “Intermediate” score for ecosystem services (see *Table 9-9*). The most beneficial services are associated with regulation and supporting benefits.

Table 9-9 The EcoServices being provided by the identified HGM units

Wetland Unit					D1(a)VBC	D1(b)VBC
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation		2.1	2.2
			Streamflow regulation		3.1	3.3
			Water Quality enhancement benefits	Sediment trapping	2.2	2.3
				Phosphate assimilation	3.1	3.3
				Nitrate assimilation	3.1	3.2
				Toxicant assimilation	3.0	3.0
				Erosion control	2.1	2.2
			Carbon storage		1.4	1.5
	Direct Benefits	Biodiversity maintenance			1.2	1.2
		Provision benefits	Provisioning of water for human use		1.6	1.4
			Provisioning of harvestable resources		0.0	0.0
			Provisioning of cultivated foods		0.0	0.0
		Cultural benefits	Cultural heritage		0.0	0.0
			Tourism and recreation		0.0	0.0
			Education and research		0.5	0.3
Average					**1.56**	**1.59**

9.2.2.4 The Ecological Health Assessment

The PES for the assessed HGM units is presented in Table 9-10 and

Table *9-11*. Descriptions of aspects identified that are have contributed to the altered state of the systems are presented in the subsequent table. The scoring and ratings provided below are consistent with information provided in the Wet-Earth Eco-Specs (2019) report. Figure 9-9 presents photographs of some aspects identified as sources of impact on the wetland system.

Table 9-10 Summary of the scores for the wetland present ecological state (PES): D1(a)VBC

Component	PES Score	PES Rating	Description
Hydrology	8.0	F	**Critically Modified**: Aspects which have contributed to modifications include; i) impoundments within the system, impeding flow and altering the flooding regimes, ii) road routes and conveyors traversing the system causing concentrated flows, iii) encroachment of infrastructure, operational area into the wetland system.
Geomorphology	7.8	E	**Seriously Modified**: Due to the extent and the encroachment into the periphery of the wetland, and within the actual system in some reaches, the structure of the system is seriously modified. The inundation caused by dams have also contributed to the altered structure of the system. The system has also been landscaped in selected reaches.
Vegetation	7.7	E	**Seriously Modified:** The local land uses have resulted in the following: i) removal of plant / vegetation due to landscaping, ii) establishment of alien vegetation due to local disturbances.
Overall	**7.58**	**E**	**Seriously Modified.** The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable**.**

Table 9-11 Summary of the scores for the wetland present ecological state (PES): D1(b)VBC

Component	PES Score	PES Rating	Description
Hydrology	3.6	C	**Moderately Modified**: Aspects which have contributed to modifications include; i) road routes traversing the system causing concentrated flows, ii) encroachment of infrastructure into the wetland system.
Geomorphology	3.2	C	**Moderately Modified**: The altered flows have resulted in incisions in the channel at selected reaches. The development of the area has altered the catchment characteristics with some level of encroachment in close proximity to the system, with some services traversing the wetland.
Vegetation	2.8	C	**Moderately Modified:** The local land uses have resulted in the following; i) removal of plant / vegetation due to landscaping, ii) establishment of alien vegetation due to local disturbances.
Overall	**3.28**	**C**	**Moderately Modified.** A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.

Figure 9-9 Aspects contributing the modified state of the system. A: Crossings and causeways, B: Access routes and shoulders, C: Landscaping, D: Mining infrastructure and operation.

9.2.2.5 The Importance & Sensitivity

The IS assessment was applied to the HGM units described in the previous section in order to assess the levels of sensitivity and ecological importance of the wetlands. The results of the assessment are shown in Table 9-12. The EIS for the HGM units was calculated to be moderate (class C) and high (class B) level of importance for D1(a)VBC and D1(b)VBC respectively. The following findings were considered for the EIS classification:

- No priority NFEPA wetlands are directly associated with the VBC08 wetland system;
- The project area is located in an EN vegetation type;

- The wetland system within the Mesic Highveld Grassland Group 3 has a critical (CR) ecosystem threat status;
- A single ESA wetland is within the footprint are of the wetland system; and
- Evidence of *Leptailurus serval* (Serval) which is listed as NT have been recorded in the project area.

The Hydrological Functionality of the wetland was determined to have a high (class B) level of importance. The Direct Human Benefits were calculated to have a low (class D) level of importance.

Table 9-12 The EIS results for the delineated wetland units

Category	D1(a)VBC	D1(b)VBC
Ecological importance and sensitivity	1.4	2.7
Hydrological/functional importance	2.5	2.5
Direct human benefits	0.4	0.3

9.2.2.6 Buffer Requirements

The re-instatement of VBC08 will require the installation of rehabilitation structures throughout the system. This necessitates the requirement to construct the structures within the system, negating the need to calculate a suitable buffer width for the proposed activity. As a result of this, a minimum buffer width of 30 m is recommended for the project and this will be applicable for all supporting activities and aspects not required to be within the system. This recommended buffer width is based on the provincial requirements for assessing and mitigating environmental impacts.

9.2.2.7 Wetland sensitivity

A sensitivity map was produced to visually represent the sensitivity of the system proposed for the re-instatement and development of the VBC08 project (Figure 9-10). The wetland was classified as having a High sensitivity while the associated buffer was assigned a Medium sensitivity. All other non-wetland areas within the 500 m regulated area were assigned a Low sensitivity from a wetland perspective. According to Macfarlane *et al.* (2009) in Mpumalanga, the Mpumalanga Tourism and Parks Agency typically recommends buffers of 30 m in built up areas while buffers of 20 m are typically proposed in areas of open veld (Cowden, G., pers comm.). For the purposes of this project, a 20 m buffer has been sufficient and would only be applicable for all non-essential and supporting services not required to be within the wetland.

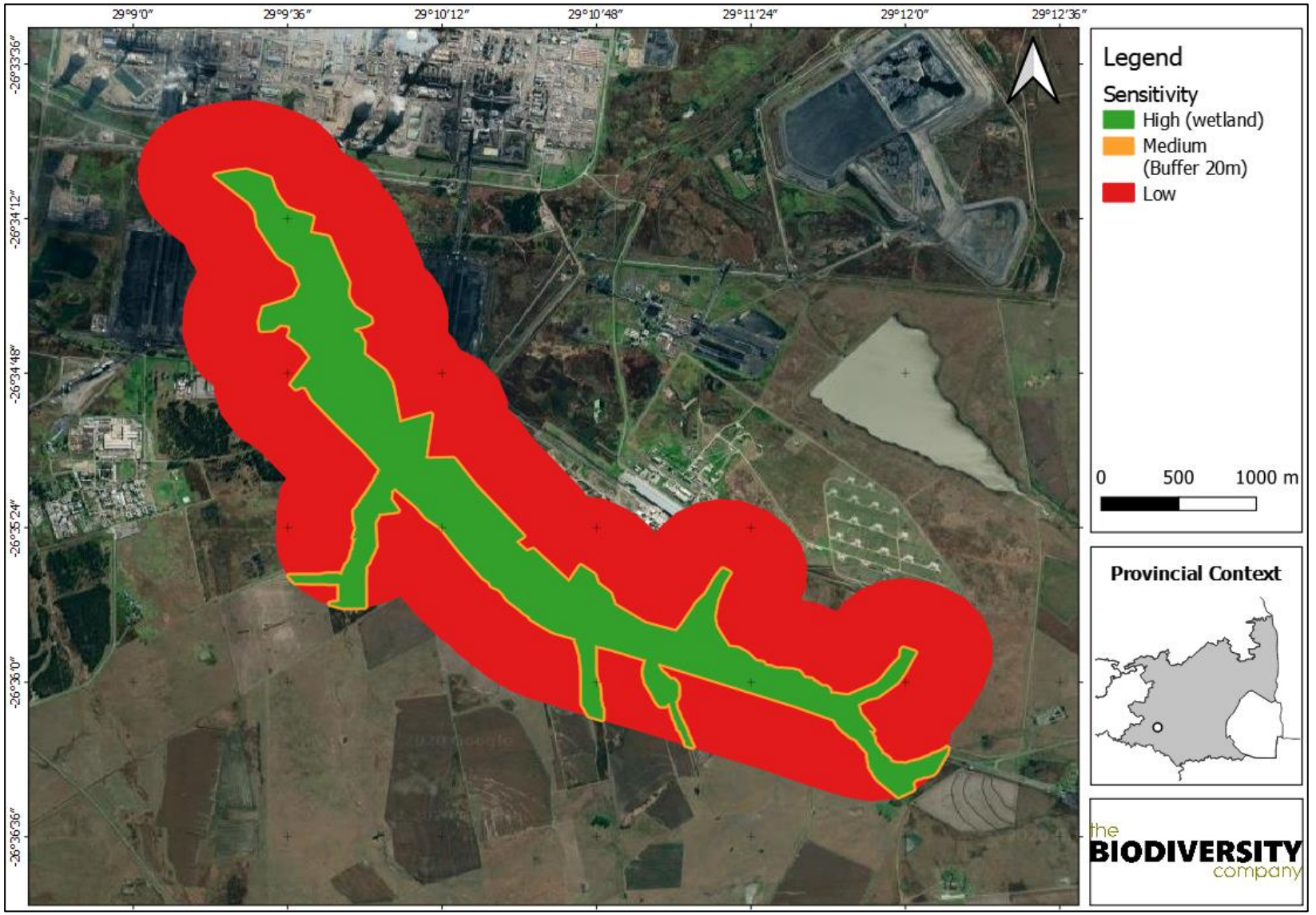

Figure 9-10 Water resource sensitivity map

10 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 rehabilitation 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).

10.1 Project Information

The project is for the re-instatement and development of the VBC08 wetland system which requires the installation of eighteen wetland rehabilitation structures throughout wetland system (Figure 10-1). The proposed structures consist of a series of box weirs as depicted in Figure 10-2.

According to Golder Associates (2018) the purpose of the re-instatement project is to reduce nutrient and salt load into the Groot Bossiespruit. It was concluded that the proposed interventions would achieve a notable benefit and improvement in instream water quality, resulting in the existing poor water quality (especially in terms of nutrients) within the Groot Bossiespruit returning to background water quality (Golder Associates, 2018). The Golder Associates (2018) study confirmed that there is substantial benefit in improving the wetland systems to reduce the instream nutrient and salt load within the Groot Bossiespruit. Based on this, negative risks are only expected for the construction phase of the project, with predominantly positive risks expected for the operational phase of the project. Secondary benefits expected for the project include increased biodiversity in the area as a result of the improved wetland systems (Golder Associates, 2018). The Golder Associates (2018) study concluded that there would be an overall functional gain in the integrity of the system, with the overall status of the system likely to improve to a moderately modified (class C) state. No decommissioning phase has been considered for the risk assessment. The locations of the interventions proposed for the project in relation to the VBC08 system is presented in Figure 10-1.

The intention of the structure is to is weirs main raise the water table yet allow sufficient water to move through the weir to not cut off the water source completely (Golder Associates, 2018). The structure will also reduce water velocities which will decrease the erosion risk of the system.

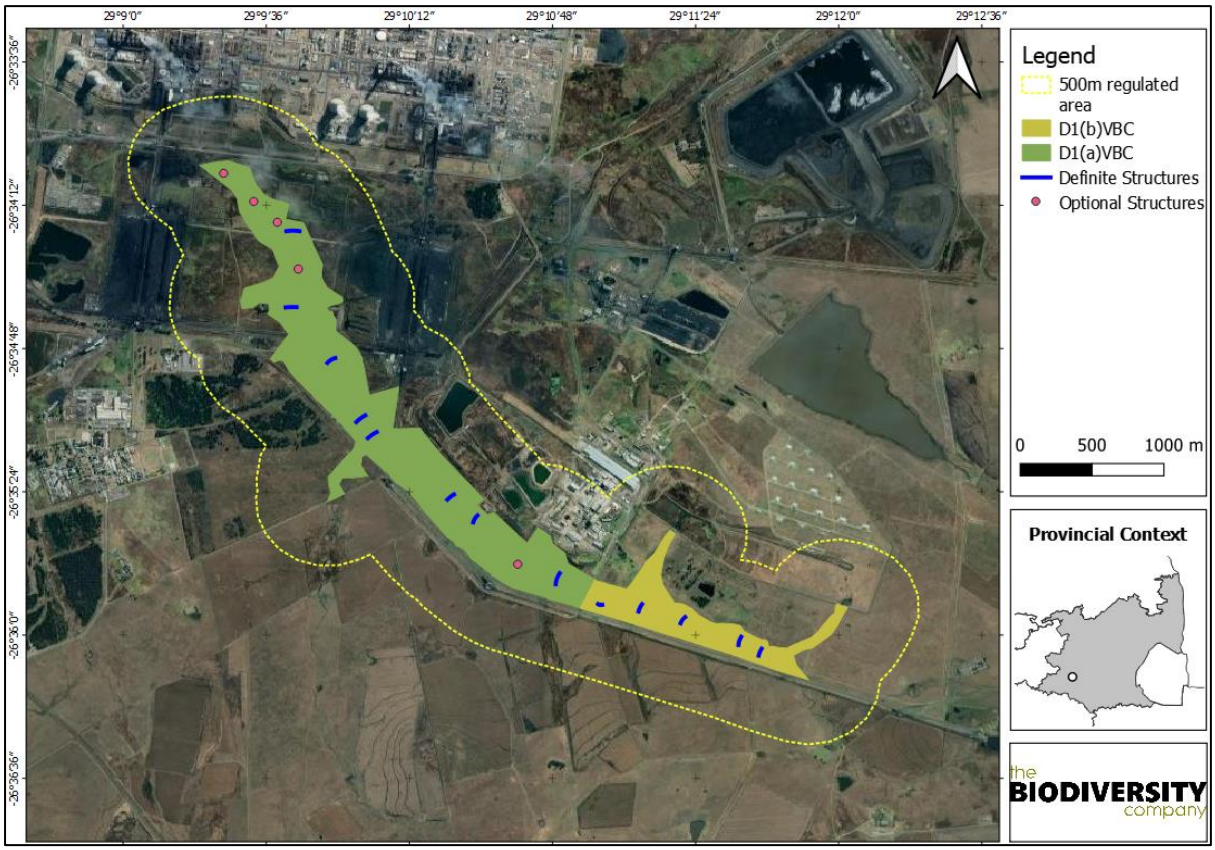

Figure 10-1 Locations of the intervention structures within the VBC08 wetland system

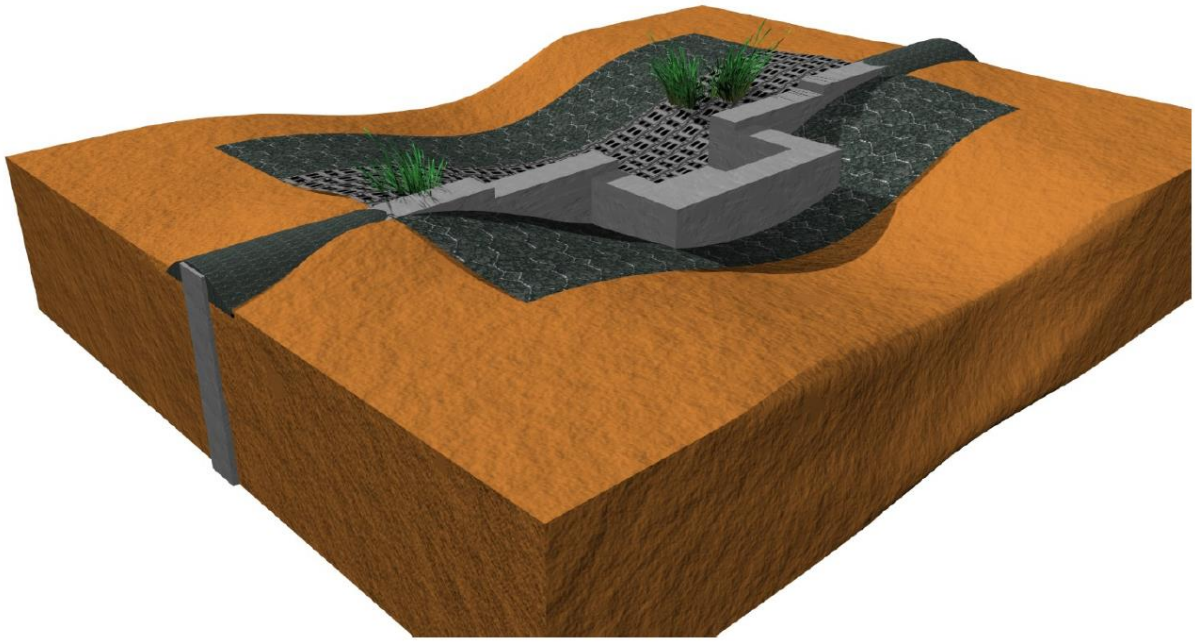

Figure 10-2 Box weir structure (Golder Associates, 2018)

10.2 Impact Assessment Methodology

Potential impacts were evaluated against the data captured during the desktop and field assessment to identify relevance to the project area. The methodology used in determining the significance of potential environmental impacts relating to project was supplied by WSP.

10.3 Methodology

The ESIA will utilise a methodological framework developed by WSP to meet the combined requirements of international best practice and the relevant EIA Regulations. The determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact;
- Significance of the Impact;
- Consequence of the Impact;
- Extent of the impact;
- Duration of the Impact;
- Probability if the impact;
- Degree to which the impact:
    - can be reversed;
    - may cause irreplaceable loss of resources; and
    - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- Magnitude: to what extent environmental resources are going to be affected;
- Sensitivity of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- Severity of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance will be assessed with and without mitigation measures in place. Impacts are assessed in terms of the following criteria:

a) The nature; a description of what causes the effect, what will be affected and how it will be affected.

Table 10-1 Nature or Type of Impact

Nature or Type of Impact	Definition
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

b) The physical extent.

Table 10-2 Physical Extent Rating of Impact

Score	Description
1	the impact will be limited to the site;
2	the impact will be limited to the local area;
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

c) The duration, wherein it is indicated whether the lifetime of the impact will be:

Table 10-3 Duration Rating of Impact

Score	Description
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

d) Reversibility: An impact is either reversible or irreversible. The level of reversibility is the ability of an environmental receptor to rehabilitate or restore itself after the activity has caused environmental change (i.e. how long before impacts on receptors cease to be evident).

Table 10-4 Reversibility of an Impact

Score	Description
1	The impact is immediately reversible.
3	The impact is reversible within 2 years after the cause or stress is removed; or
5	The activity will lead to an impact that is in all practical terms permanent.

e) The magnitude of impact on ecological processes, quantified on a scale from 0-10, where a score is assigned.

Table 10-5 Magnitude Rating of Impact

Score	Description
0	small and will have no effect on the environment.
1	minor and will not result in an impact on processes.
2	low and will cause a slight impact on processes.
3	moderate and will result in processes continuing but in a modified way.
4	high (processes are altered to the extent that they temporarily cease).
5	very high and results in complete destruction of patterns and permanent cessation of processes.

f) The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

Table 10-6 Probability Rating of Impact

Score	Description
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).
5	definite (impact will occur regardless of any prevention measures).

- The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The status, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and
- The degree to which the impact can be mitigated.

The significance is determined by combining the above criteria in the following formula:

$$Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$$

$$[S = (E + D + R + M) \times P]$$

Where the symbols are as follows:

Symbol	Criteria	Description
S	Significance Weighting	Refer to Table 10-7 Significance Weightings of an Impact
E	Extent	Refer to Table 10-2 Physical Extent Rating of Impact
D	Duration	Refer to Table 10-3 Duration Rating of Impact
R	Reversibility	Refer to Table 10-4 Reversibility of an Impact
M	Magnitude	Refer to Table 10-5 Magnitude Rating of Impact
P	Probability	Refer to Table 10-6 Probability Rating of Impact

The significance score can therefore range from 3 (minimum) to 100 (Maximum). The significance weightings are defined as Low, Medium and High, as such the scoring system

has been allocated accordingly to define the significance weighting, as identified in Table 10-7.

Table 10-7 Significance Weightings of an Impact

Overall Score	Significance Rating (Negative)	Significance Rating (Positive)	Description
< 30 points	Low	Low	where this impact would not have a direct influence on the decision to develop in the area
31 - 60 points	Medium	Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	High	High	where the impact must have an influence on the decision process to develop in the area

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in the ESIA.

10.3.1 Current Impacts

During the 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 10-3;

- Fencing;
- Anthropogenic activities in close proximity;
- Secondary roads and cleared areas;
- Invasive plant species;
- Water pollution;
- Sasol plant with associated air pollution; and
- Powerlines within the vicinity of the project area.

Figure 10-3 Impacts observed during the fieldwork A) Eskom Powerlines and fencing, B) Eskom powerlines, grass maintenance and connection line, C) Water pollution and, D) Air pollution

10.4 Terrestrial Impacts

10.4.1 Anticipated Impacts

The development is associated with the construction of rehabilitation structures instream constructed/artificial wetland (passive system) which could augment the existing natural wetland system. The activities may lead to the loss and destruction of certain habitats, direct mortalities and displacement of fauna and flora. Due to the nature of the development a closure and rehabilitation phase was not considered as the development is considered to be permanent, servicing the local area.

The potential impacts associated with the each of the project phases are discussed below and the expected impact pre-mitigation and post-mitigation can be seen in Table 10-8, Table 10-9 and Table 10-10.

10.4.1.1 Pre-construction Phase

The pre-construction phase activities are considered a low risk as they typically involve desktop assessments and initial site inspections. The site comprises areas that has already been altered. This phase of the assessment would include, amongst others, site visits of various contractors, environmental and social impact assessment and compiling of management plans. Only one minor impact was assessed regarding the planning phase:

- Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles.

Table 10-8 Terrestrial ecological assessment of impact significance for the planning phase.

Impact #	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						M+	E+	R+	Dx	P=	S	Rating	M+	E+	R+	Dx	P=	S	Rating
1	Flora and Fauna	Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles	Pre-Construction	Negative	Easy	3	3	3	2	3	**33**	**N2**	2	2	1	1	2	**14**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						

10.4.1.2 Construction Phase

The following potential impacts were considered on terrestrial biodiversity. This phase refers to the period when construction of the proposed infrastructure is built/installed. This phase usually has the largest direct impact on biodiversity:

- Destruction, further loss and fragmentation of the vegetation community;
- Displacement, direct mortalities and disturbance of faunal community (including potential threatened species) due to habitat loss and disturbances (such as site clearance, dust, vibrations, poaching and noise); and
- Spread and/or establishment of alien and/or invasive species, especially in areas that are cleared and not rehabilitated.

Table 10-9 Terrestrial ecological assessment of impact significance for the construction phase.

Impact #	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						M+	E+	R+	Dx	P=	S	Rating	M+	E+	R+	Dx	P=	S	Rating
1	Flora	Destruction, further loss, and fragmentation of the vegetation community.	Construction Phase	Negative	Moderate	3	2	4	4	4	52	N2	2	1	2	2	3	21	N1
					Significance	**N2 - Medium**							**N1 - Low**						
2	Fauna	Displacement, direct mortalities, and disturbance of faunal community (including potential threatened species) due to habitat loss and disturbances (such as site clearance, dust, vibrations, poaching and noise)	Construction Phase	Negative	Moderate	3	3	3	4	4	**52**	**N2**	2	1	2	2	2	**14**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
3	Flora	Proliferation and/or spread of alien and/or invasive species, especially in areas that are cleared and not rehabilitated.	Construction Phase	Negative	Moderate	4	3	3	4	4	**56**	**N2**	2	1	2	2	2	**14**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						

10.4.1.3 Operational Phase

The following potential impacts were considered on biodiversity (fauna and flora) during the operational phase. This phase refers to when construction has been completed and the proposed infrastructure has been built and is functional and rehabilitation is in progress.

- Continued displacement, disturbance and fragmentation due to ongoing habitat degradation.; and
- Ongoing displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbances (such as dust and noise mainly through the maintenance of the system);
- Continued alien vegetation encroachment;
- Recovery of vegetation community and reduction of alien invasive plant species; and
- Preservation and return of faunal communities due to habitat recovery and improvement

Table 10-10 Terrestrial ecological assessment of impact significance for the operational phase.

Impact #	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						M+	E+	R+	Dx	P=	S	Rating	M+	E+	R+	Dx	P=	S	Rating
1	Flora	Continued habitat degradation	Operational Phase	Negative	Moderate	3	2	4	4	4	52	N2	2	1	1	2	2	**12**	N1
					Significance	N2 - Medium							N1 - Low						
2	Fauna	Continued displacement, mortality, and fragmentation of the faunal community due to ongoing anthropogenic disturbances (noise, light, traffic, dust, pollution, and vibrations).	Operational Phase	Negative	Moderate	3	3	3	4	3	**39**	N2	2	1	2	2	2	**14**	N1
					Significance	N2 - Medium							N1 - Low						
3	Flora	Continued alien vegetation encroachment	Operational Phase	Negative	Moderate	4	3	4	4	4	**60**	N2	2	2	3	3	2	**20**	N1
					Significance	N2 - Medium							N1 - Low						
4	Flora	Recovery of vegetation community and reduction of alien invasive plant species	Operational Phase	Positive	High	2	2	3	2	2	**18**	P1	4	3	4	4	4	**60**	P2
					Significance	**P1 - Low**							**P2 - Medium**						
5	Fauna	Preservation and return of faunal communities due to habitat recovery and improvement	Operational Phase	Positive	High	2	1	3	2	2	**16**	P1	2	1	3	2	2	14	P2
					Significance	**P1 - Low**							**P2 - Medium**						

10.5 Wetland Risk Assessment

This assessment has been completed in accordance with the requirements of the published General Notice (GN) 509 by the Department of Water and Sanitation (DWS). This notice was published in the Government Gazette (no. 40229) under Section 39 of the National Water Act (Act no. 36 of 1998) in August 2016, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 509 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA). A water use (or potential) qualifies for a GA under GN 509 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM). This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation.

The construction of up to 18 structures within the wetland will have a direct impact on the delineated wetland system. The construction phase of the project is expected to be associated with a variety of negative risks which are necessary to achieve the net-positive “risks” expected for the operational phase of the project. The RAM does not allow for a positive outcome but for the purposes of this assessment all the aspects considered for the construction phase of the project are negative risks, whereas the aspect considered for the operational phase is regarded as a positive “risk” or outcomes for the project.

It is evident from the assessment that a variety of moderate risks (post-mitigation) have been identified for the project, but this is expected owing to the fact that the proposed structures will be located within the wetland, at 18 locations. A high positive risk is expected for the proposed structures, achieving the intended outcomes of improved water quality, attenuation and also the support of biodiversity for the area. Further, taking into consideration the predominantly seriously modified status of the system, the overall cumulative risks expected for the project is low. This is attributed to the fact that the integrity and functioning of the system is expected to improve over time.

Findings from the DWS aspect and impact register / risk assessment are provided in Table 10-11.

Table 10-11 DWS Risk Impact Matrix for the proposed project (Andrew Husted Pr Sci Nat 1400213/11)

Activity	Aspect	Impact	Mitigation Scenario	Severity: Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
Construction (Overall negative risks)																			
Site clearing and preparation	Clearing of vegetation and stripping and stockpiling topsoil as well as storage of equipment.	Direct loss, disturbance, and degradation of wetlands.	Without	3	2	3	3	5	3	2	10	3	2	5	1	11	110	**M**	• Begin construction of the structures furthest down the system, working up the catchment. • Restrict all construction related activities to the structure footprint area. • Access construction areas by means of the shorted or least intrusive route through the wetland. Prioritize existing routes where possible. • Adhere to the prescribed wetland buffers. Restrict all non-essential activities (e.g. cement mixing and equipment wetland machinery storage) to outside of wetlands and their prescribed buffers. • Request the wetland spatial data, load it onto a GPS and use it to mark out the positions to plan for the required activities to reduce the disturbance footprint and the unnecessary clearing of vegetation. • Demarcate the 10 m construction area as well as the prescribed m buffer on the ground (e.g. pained wooden poles). • Construct as far as possible during winter when flow volumes are lowest. This will reduce impacts to wetlands due to soil poaching and vegetation trampling under peak saturation levels. Additionally, the risk of vehicles getting stuck and further degrading the vegetation integrity is lowest during this time.
			With	2	2	2	2	5	2	1	8	2	2	5	1	10	80	**M**	
		Increased bare surfaces, runoff and potential for erosion	Without	3	3	3	3	3	3	2	8	3	3	5	1	12	96	**M**	• Keep cleared and excavated area neat and tidy. Separate topsoil and sub-soil, and backfill in same order. • Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash. • Mixing of concrete must under no circumstances take place in any wetland or their buffers. Scrape the area where mixing and storage of sand and concrete occurred

Activity	Aspect	Impact	Mitigation Scenario	Severity: Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
			With	2	3	2	2	2.3	2	2	6.3	3	2	5	1	11	69	M	to clean once finished. • Do not situate any of the construction material laydown areas within any wetland. • No machinery should be allowed to parked in any wetlands. Only machinery and equipment required to be in the wetlands is permitted, and must be operational. • Ensure topsoil is spread back over the cleared area. • Flatten and lightly till (no deeper than 30 cm) excavated / cleared areas to encourage vegetation establishment as soon as possible.
		Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	Without	1	1	3	2	1.8	3	2	6.8	3	3	5	1	12	81	M	• Promptly remove all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed. • The use of herbicides is not recommended in or near wetlands (opt for mechanical removal). • Appropriately stockpile topsoil cleared from the project area. This can be used for rehabilitation of the intervention areas. • Clearly demarcate construction footprint, and limit all activities to within this area. • Minimize unnecessary clearing of vegetation. • Landscape and re-vegetate all denuded areas as soon as possible.
			With	1	1	2	1	1.3	2	2	5.3	3	1	5	1	10	53	L	
Installation of infrastructure	Site excavation and installation of material and structures	Increased sediment loads to downstream reaches and altered hydrology	Without	4	4	3	3	5	3	2	10	3	3	5	3	14	140	M	• See mitigation for increased bare surfaces, runoff, and potential for erosion • Re-instate topsoil and lightly till disturbance footprint. • Prioritise construction during the dry season, starting with the structure furthest down the system. • Excavations must only be made on a need basis and not left open. Excavations must preferably be either filled with gabions or backfilled within a day of the cut. • Structure should be dredged as construction progresses up the catchment and excessive sediment deposition is evident at a structure. • Implement rehabilitation of the areas as soon as possible for each structure, prioritise that vegetation has re-established.
			With	2	3	2	2	5	2	2	9	3	2	5	2	12	108	M	

Activity	Aspect	Impact	Mitigation Scenario	Severity: Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
		Contamination of wetlands with hydrocarbons due to machinery leaks and eutrophication of wetland systems with human sewerage and other waste.	Without	2	3	2	3	2.5	3	2	7.5	3	3	5	3	14	105	M	• Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the wetland. • Regularly maintain stormwater infrastructure, pipes, pumps and machinery to minimise the potential for leaks. Check for oil leaks, keep a tidy operation, install bins and promptly clean up any spills or litter. • Provide appropriate sanitation facilities during construction and service them regularly. Alternatively provide off-site facilities for staff. No indiscriminate use of the wetland area for ablutions may be permitted.
			With	1	2	1	2	1.5	2	2	5.5	3	2	5	2	12	66	M	
		Contamination of wetlands with concrete.	Without	2	4	2	3	2.8	2	2	6.8	3	3	5	1	12	81	M	• It is preferable that pre-fabricated materials be used, with no pouring of concrete within the wetland areas. All manufacturing must be undertaken beyond the buffer area. • All materials and structures must be stored beyond the buffer, and only brought into the wetland for installation. Short-term storage (, 1 day) in a cleared area is permissible.
			With	1	2	1	2	1.5	2	2	5.5	3	2	5	1	11	61	M	
	Backfilling of excavations	Disruption of wetland soil profile and alteration of hydrological regime	Without	3	2	2	2	5	2	3	10	3	3	5	3	14	140	M	• Ensure that topsoil is appropriately stored and re-applied during backfilling and landscaping of the area. • Make sure that the soil is backfilled and compacted to accepted geotechnical standards to avoid conduit formation around the structures i.e. gabion baskets
			With	1	1	1	1	5	2	3	10	2	2	5	2	11	110	M	
Operation (Overall positive risks)																			
Routine operation and monitoring	Structural integrity	Improved water quality, attenuation and biodiversity	Without	3	4	3	3	3.3	5	5	13	4	4	5	2	15	199	H	• Conduct regular inspections of the structures, particularly after high rainfall events. All weak issues such as non-vegetated areas, erosion gullies forming etc must be addressed immediately.
			With	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Activity	Aspect	Impact	Mitigation Scenario	Severity: Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
		maintenance for the system.																	• Monitor water quality regularly to determine if the intended outcome is being achieved. • Monitor the prevalence of biodiversity diversity and abundances for the area. • Due to the proximity of powerline, bird flappers should be attached to the lines. In the event waterfowl frequent the area, these lines could result in collisions.
Cumulative (Overall positive risks)																			
Cumulative Impact	Wetland integrity	Deterioration in wetland integrity beyond the construction of the structures	Without	2	2	3	2	2.25	1	3	6.25	3	2	2	1	8	50	L	• Adhere to the mitigation listed above
			With	2	2	2	2	2	1	2	5	3	1	2	1	7	35	L	

10.6 Terrestrial Mitigation Measures

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

- Prevent the unnecessary destruction of, and fragmentation, of the vegetation community (including the wetlands);
- Prevent the loss of the faunal community (including potentially occurring species of conservation concern) associated with these vegetation communities; and
- Limiting the extent of the construction areas to the proposed locations and restricting impacts to those areas where it is unavoidable to do so otherwise.

10.6.1 General mitigation measures

The following general mitigation measures are provided:

- The wetland areas outside of the specific rehabilitation structures area must be avoided where possible;
- The construction vehicles and machinery must make use of existing access routes as much as possible, before adjacent areas are considered for access;
- Laydown yards, camps and storage areas must be beyond the buffer area;
- The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly;
- It is preferable that construction takes place during the dry season as much is feasible to reduce the erosion potential of the exposed surfaces;
- Temporary storm water channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion;
- Prevent uncontrolled access of vehicles through the system that can cause a significant adverse impact on the hydrology and alluvial soil structure of these areas;
- All chemicals, construction materials and toxicants to be used for the construction must be stored beyond the buffer area;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced in a designated area;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;
- Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation);

- Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the system;
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil;
- No dumping of construction material on-site may take place;
- All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported; and
- An alien invasive plant management plan needs to be compiled and implemented post construction to control current invaded areas and prevent further infestation.

10.6.2 Specialist Terrestrial Management Plan

The aim of the management outcomes is to present the mitigations in such a way that the can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring guidelines. Table 10-12 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the terrestrial assessment.

Table 10-12 Mitigation measures including requirements for timeframes, roles and responsibilities for the terrestrial assessment

Management outcome: Vegetation and Habitats				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Reduce the amount of unnecessary people and restrict vehicle access as much as possible on the property by making use of spatial data.	Planning	Project manager, Environmental Officer	Number of contractors within the area	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
When vegetation is cleared, hand cutting techniques should be used as far possible in order to avoid the use of heavy machinery.	Construction/Operational Phase	Environmental Officer	Clearing method	Daily
All construction/operational and access must make use of the existing roads;	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
Apply for a permit to destroy protected plant species or relocate the species *in situ* as necessary per rehabilitation structure. Plants can be collected from the construction area and transplanted into bags that should be housed in a nursery onsite or nearby. Removal of the bulb and intact root system as far as possible and then kept in moistened clear plastic bags until they can be replanted;	Life of operation	Environmental Officer	Relocation/destruction of protected plant species	Ongoing
All laydown, chemical toilets etc. should be restricted to outside the wetland areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. No permanent structures should be permitted at construction sites. Buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated project areas.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas and material storage & placement.	Ongoing
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	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
All structure footprints to be rehabilitated and landscaped after prospecting is complete. Rehabilitation of the disturbed areas existing in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type;	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Site footprint rehabilitation	Quarterly monitoring

Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Site footprint rehabilitation	During Phase
A spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair	Life of operation	Environmental Officer & Contractor	Leaks and spills	Ongoing
Storm Water run-off & Discharge Water Quality needs to be monitored	Life of operation	Environmental Officer & Design Engineer	Water Quality	Monthly
It should be made an offence for any staff to /take bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation	Construction/Operational Phase	Project manager, Environmental Officer	Topsoil removal and storage	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire might have on the rehabilitated areas.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Fauna				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
A qualified environmental control officer must be on site when construction begins to identify SCC that will be directly disturbed and to relocate fauna/flora that are found during the activities. The area must be walked though prior to construction to ensure no faunal species remain in the habitat and get killed. Should animals not move out of the area on their own	Life of operation	Environmental Officer, Contractor	Presence of any floral or faunal SCC.	Ongoing

relevant specialists must be contacted to advise on how the species can be relocated.				
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas such as the wetland. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule any activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
All excavations such as holes need to be sealed as soon as possible to ensure that no fauna species can fall in.	Construction/Operational Phase	Environmental Officer & Design Engineer	Sealing of holes	After each site, progressively.
Management outcome: Alien Vegetation				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Compilation of and implementation of an alien vegetation management plan.	Life of operation	Project manager, Environmental Officer & Contractor	Assess presence and encroachment of alien vegetation	Quarterly monitoring
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation
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	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation

A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the likely presence of SCCs	Life of operation	Environmental Officer & Health and Safety Officer	Evidence or presence of pests	Ongoing
Management outcome: Dust				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and dumps especially. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated.	Life of operation	Contractor	Dustfall	As per the air quality report and the dust monitoring program.
Management outcome: Waste management				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored effectively.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Litter, spills, fuels, chemicals and human waste in and around the project area.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing
Refuse bins will be emptied and secured Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing
Management outcome: Environmental awareness training				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing

project area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr.	

11 Landscape Management Plan

The following landscaping measures are derived from the DWS document titled “Specifications DWS 2410 Landscaping”. Only pertinent items have been considered and concise descriptions provided. These items include aspects for ecological functions and purposes. The area will need to be rehabilitated, the following will include species to be planted to restrict the overall impact of erosion and to improve the ecology of the area.

11.1 Contractor

A reputable Contractor must be appointed to undertake the specified work. This contractor must have a proven track record that displays gross competence.

11.2 Environmental Management

The Contractor shall make every effort to preserve the zones area, to minimise environmental disturbance and to inform employees as to the ecological sensitivity and importance of the area. The Contractor shall be responsible for any avoidable damages to the environment resulting from the actions of any employees. In order to minimize disturbances, the following must be considered:

11.3 Rehabilitation workers and the project area

The Contractor shall be responsible for workers insofar as they shall be made aware of the seriousness of disregarding orders which relate to:

- Hunting, poisoning, trapping or disturbing fauna.
- Damaging of natural flora.
- Littering on the rehabilitation area.
- The use of supplied toilet facilities.
- The use of the areas provided for eating.

Furthermore, no exotic plant material or domestic animal of any kind will be allowed to be brought onto the project area.

The Contractor shall also be responsible for ensuring the wetland system and buffer area is free of erosion, pollution and/or any other unwanted materials. Nontoxic materials may not be dumped and buried in the spoil dumps. All other unwanted materials shall be collected and disposed of in a satisfactory manner.

All imported construction material shall also be checked for the importation of exotic seeds and/or any other foreign matter through these materials.

11.4 Marker fences

All activities by the Contractor shall be contained within the fenced areas. The Contractor shall be liable for any damages which may result from trespassing outside these areas.

11.5 Surface water management

The Contractor shall submit a Surface Water Management Plan by which any surface water, be it from rain, excavations or any other source, is controlled and led through settling and treatment ponds where necessary. Before any water is permitted to enter the wetland system the quality of the water shall comply standards for aquatic ecosystems.

11.6 Time of planting

All planting shall be carried out as far as is practicable during the period most likely to produce beneficial results but as soon as possible after completion of a section of earthworks. The seasonal period is from the beginning of September to the end of February

11.7 Erosion

During rehabilitation, the Contractor shall protect all areas susceptible to erosion by installing all necessary temporary and permanent drainage works and by taking such other measures as may be necessary to prevent the concentration of surface water and scouring of slopes, banks and other areas. All erosion, such as runnels, channels or sheet erosion, that develops during the project phase shall be backfilled and consolidated and the areas restored to their proper condition at the Contractor's expense. The Contractor shall not allow erosion to develop on a large scale before effecting repairs and all erosion damage shall be repaired as soon as possible and, in any case, not later than two months before the termination of the Period of Maintaining. All topsoil or other material accumulated inside drains shall be removed at the same time. Topsoil washed away shall be replaced.

11.8 . Responsibility for establishing an acceptable cover

The Contractor shall be solely responsible for establishing an acceptable grass cover and for the cost of replanting or re-hydroseeding when an acceptable cover is not obtained. However, where in the opinion of the Contractor, it is doubtful from the outset that it will be possible to establish an acceptable cover this must be communicated to the authorities.

11.9 Fire

The Contractor shall take adequate precautions to prevent and control veld fires of the wetland and buffer area. The Contractor shall take all steps to ensure that the fire hazard on and near the project area is reduced to a minimum. The Contractor shall be held responsible for any damage to property adjoining the project area as a result of any fire caused by one of his employees.

The Contractor shall take immediate steps to extinguish any fire which breaks out, and shall comply with all statutory provisions which may be in force from time to time in relation to fire danger or to restrictions on the lighting of fires in the open. The Contractor shall have a supply of beaters to use in the extinguishing of bush fires to which this area is susceptible.

11.10 Shaping

Areas requiring shaping involving bulk earthworks shall be excavated, filled, compacted when required, and shaped to the correct contours to within a tolerance of plus or minus 150 mm. Shaping will be to roughly round off cuts and fills and any other earthworks to stable forms,

sympathetic to the natural surrounding landscape. Such work shall be considered as earthworks and measurement.

11.11 Trimming

Trimming shall consist of bringing the existing or previously shaped ground to an even surface with the final levels generally following the original surface. Where machine operations are not practicable trimming shall be done using hand tools.

Trimmed surfaces shall be left slightly rough to facilitate binding with topsoil or the natural establishment of vegetation. During trimming all stones with any dimension in excess of 30 mm in areas to be mowed by machine, all stones with dimensions in excess of 150 mm in other areas and all other excess material shall be removed to selected dumping sites.

11.12 Soiling and seeding to follow earthworks

The Contractor shall undertake all soiling, seeding and grass establishment, with particular emphasis in the buffer area, taking into account the climatic conditions prevalent in order to maximise growth of vegetation and therefore reduce erosion.

11.12.1 Watering, weeding, cutting and replanting

All grassed areas shall be maintained during the rehabilitation of the area by adequate watering at frequent and regular intervals in order to ensure proper germination of seeds and growth of grass until an acceptable cover has been established and thereafter until the end of the rehabilitation phase. The amount and frequency of watering shall be at the discretion of the Contractor.

Weeds shall be controlled by means of extraction, cutting or other approved means.

The Contractor shall mow or cut all grassed areas to promote adequate coverage, until the end of the rehabilitation phase. All grass cuttings shall be collected and disposed of.

11.12.2 Watering, weeding, cutting and replanting

Any plants not immediately replanted are the responsibility of the Contractor and shall be kept under approved nursery conditions. All plants shall be maintained by regular watering and fertilizer applications, as well as by providing protection against wind, frost and direct sunlight until such time as they are to be replanted.

11.12.3 Transplanting natural vegetation

Natural vegetation such as trees, shrubs, groundcovers, grass sods, grass runners and perennials which have been identified (Table 11-1) in the project area can be transplanted. Only trees with a maximum height of 1,5 m shall be transplanted unless otherwise specified. Transplanting shall take place in late winter before new leaves appear. The large indigenous trees, as well as several other indigenous plants existing within the habitats should be conserved/stored as they are suitable for the landscaping. The protected plant species observed, namely Crinum bulbispermum can be relocated on site without a permit, and temporarily stored until they can be re-planted in the operational phase. In Table 11-1 plant species recommended for the rehabilitation of the instream interventions is provided.

Table 11-1 Plant species recommended for the rehabilitation structures instream.

Andropogon eucomus (Banks)	*Phragmites australis*
Imperata cylindrica (Banks)	*Salix mucronata (Banks)*
Leptochloa fusca	*Setaria incrassata*
Monocymbium ceresiiforme (Banks)	*Setaria sphacelata var. sericea (Banks)*
Paspalum dilatatum	*Sporobolus africanus (Banks)*
Paspalum urvillei	*Stiburus alopecuroides (Banks)*
Persicaria lapathifolia	*Typha capensis*

11.12.4 Alien Vegetation

The removal of all alien vegetation, especially NEMBA category 1b is recommended.

12 Recommendations

The following recommendations are suggested, and are to be implemented if not already being undertaken for the area:

- A vegetation alien invasive management plan should be implemented. This plan must be implemented during the construction phase of the project;
- The presence of *Crinum bulbispermum* (and other SCC) must be determined for each construction site and the necessary action taken for the removal / relocation of these species; and
- A rehabilitation plan needs to be implemented per intervention structure.

13 Conclusion

The survey, which was completed, and the corresponding studies resulted in good site coverage, 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 much of the project area has been altered, both historically and at present due to the surrounding land use and the mismanagement of the wetland area. Even though somewhat degraded, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system and as important habitat for various fauna and flora. The rehabilitation of this system is the most important aspect to consider for the proposed development.

The construction phase of the project is expected to be associated with a variety of negative risks which are necessary to achieve the net-positive “risks” expected for the operational phase of the project. A high positive risk is expected for the proposed structures, achieving the intended outcomes of improved water quality, attenuation and also the support of biodiversity for the area. Further, taking into consideration the predominantly seriously modified status of the system, the overall cumulative risks expected for the project is low. This is attributed to the fact that the integrity and functioning of the system is expected to improve over time.

13.1 Impact Statement

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

Considering the findings of the respective studies, no fatal flaws were identified for the proposed project. Should the avoidance and mitigation measures prescribed be implemented, the significance of the considered impacts for all negative aspects pertaining to the terrestrial ecology is expected to be low, whereas due to the nature of the project, the activities may lead to an overall positive impact if done correctly. Similarly, for the wetlands, despite a number of moderate risks being identified for the construction phase of the project, a net-positive high risk is expected for the operational phase of the project. Due to the identified moderate risks for this project, a WUL will be required. It is thus the opinion of the specialists that the project can proceed, and that all the prescribed mitigation measures and recommendations are considered by the issuing authority.

14 References

ADU (Animal Demography Unit). (2019). Virtual Museum. (Accessed: June 2020).

Alexander, G. & Marais, J. (2007). A guide to the Reptiles of Southern Africa. Struik, Cape Town.

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

BGIS. (Biodiversity GIS) (2017). http://bgis.sanbi.org/. (Accessed: June 2020).

Birdlife South Africa. (2015). Checklist of Birds - List of Threatened Species. https://www.birdlife.org.za/publications (Accessed: June 2020

BODATSA-POSA (2019). Plants of South Africa - an online checklist. POSA ver. 3.0. http://newposa.sanbi.org/. (Accessed: June 2020).

Branch, W.R. (1998) Field Guide to Snakes and Other Reptiles of Southern Africa. Struik, Cape Town.

CBD (Convention on Biological Diversity). (1993). https://www.cbd.int/doc/legal/cbd-en.pdf. (Accessed: June 2018).

CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) (1973). www.cites.org. (Accessed: June 2018).

Del Hoyo, J., Collar, N.J., Christie, D.A., Elliott, A., Fishpool, L.D.C., Boesman, P. & Kirwan, G.M. (1996). HBW and BirdLife International Illustrated Checklist of the Birds of the World. Volume 2: Passerines. Lynx Editions and BirdLife International, Barcelona, Spain and Cambridge, UK.

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

Eskom. (2014). Taylor, M.R., Peacock, F. & Wanless, R.M. (Eds). The 2015 Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

EWT. (2016). Mammal Red List 2016. www.ewt.org.za (Accessed: June 2020).

FrogMap (2017). The Southern African Frog Atlas Project (SAFAP, now FrogMAP). http://vmus.adu.org.za (Accessed in June 2020).

Golder Associates. 2018. SASOL SYNFUELS OPERATIONS. Re-instatement and Development of existing VBC08 Wetland System. Report Number: 1772759-318477-1

Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. (Eds). (2005). Roberts – Birds of Southern Africa, VIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.

IUCN (2017). The IUCN Red List of Threatened Species. www.iucnredlist.org (Accessed: November 2017).

Johnson, S. & Bytebier, B. (2015). Orchids of South Africa: A Field Guide. Struik publishers, Cape Town.

Macfarlane, D.M., Dickens, J. and Von Hase, F. 2009. Development of a methodology to determine the appropriate buffer zone width and type for developments associated with wetlands, watercourses and estuaries Deliverable 1: Literature Review. INR Report No: 400/09

MammalMap (2017). http://mammalmap.adu.org.za/ (Accessed: June 2020).

Measey, G.J. (2011). Ensuring a Future for South Africa's Frogs: A Strategy for Conservation Research. South African National Biodiversity Institute, Pretoria.

Minter, L., Burger, M., Harrison, J.A. & Kloepfer, D. (2004). Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. Smithsonian Institute Avian Demography Unit, Washington; Cape Town.

Monadjem, A., Taylor, P.J., Coterrill, F.D.P. & Schoeman, C. (2010). Bats of southern and central Africa: a biogeographic and taxonomic synthesis. Wits University Press, Johannesburg.

MTPA. (2014). Mpumalanga Biodiversity Sector Plan Handbook. Lötter, M.C., Cadman, M.J. & Lechmere-Oertel, R.G. (Eds.). Mpumalanga Tourism and Parks Agency, Mbombela (Nelspruit).

Mpumalanga Tourism and Parks Agency (1998). Mpumalanga Nature Conservation Act 10 of 1998.https://cer.org.za/wp-content/uploads/2016/03/10-of-1998-Mpumalanga-Nature-Conservation-Act.pdf (Accessed: June 2020).

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

Mucina, L., Rutherford, M.C. & Powrie, L.W. (Eds.). (2007). Vegetation map of South Africa, Lesotho and Swaziland. 1:1 000 000 scale sheet maps. 2nd ed. South African National Biodiversity Institute, Pretoria.

NBA. (2018). Terrestrial Ecosystem Threat Status 2018. http://bgis.sanbi.org/. (Accessed: June 2020)

NBF (2009). National Biodiversity Framework. www.environment.gov.za (Accessed: June 2018).

NPAES (2011). National Protected Areas Expansion Strategy. www.environment.gov.za (Accessed: June 2018).

Pooley, E. (1998): A Field Guide to Wild Flowers: KwaZulu-Natal and Eastern Region. The Flora Publications Trust; ABC Bookshop, Durban.

Raimonde, D. (2009). Red list of South African Plants. SANBI, Pretoria.

Rountree, M.W. and Kotze, D.C. (2013) Specialist Appendix A3: EIS Assessment. In: Rountree MW, Malan HL and Weston BC (eds.); Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0); WRC Report No. 1788/1/13. Water Research Commission, Pretoria, pp. 42-46.

SABAP2 (Bird Atlas Project). (2019). http://vmus.adu.org.za/. (Accessed: June 2020).

SAPAD (South Africa Protected Areas Database) (2019). http://egis.environment.gov.za

SANBI (2018). South African National Biodiversity Institute (2006-2018). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/Projects/Detail/186, Version 2018.

SANBI (2014).South African National Biodiversity Institute. Mpumalanga Highveld Wetlands 2012 [vector geospatial dataset] 2014. Available from the Biodiversity GIS website, downloaded on June 2020

SANBI. (2016). Red List of South African Plants version 2017.1. Redlist.sanbi.org (Accessed: June 2020).

SANBI. (2017). Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. Driver, A., Holness, S. & Daniels, F. (Eds). 1st Edition. South African National Biodiversity Institute, Pretoria.

SARCA. (2018). South African Reptile Conservation Assessment. http://sarca.adu.org.za/ (Accessed: June 2020).

Skinner J.D. & Chimimba, C.T. (2005). The Mammals of the Southern African Subregion (New Edition). Cambridge University Press. South Africa.

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). (2019). South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria.

Stuart, C. & Stuart, T. (1994). A field guide to the tracks and signs of Southern, Central East African Wildlife. Struik Nature, Cape Town.

Taylor, M.R., Peacock, F. & Wanless, R.M. (Eds). (2015). The 2015 Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

UNFCC. (1994). The United Nations Framework Convention on Climate Change. unfccc.int/resource/docs/convkp/conveng.pdf. (Accessed: June 2018).

Van Oudtshoorn, F. (2004). Gids tot die Grasse van Suider-Afrika. Second Edition. Briza Publikasies, Pretoria.

Van Wyk, B. & Van Wyk, P. (1997). Field guide to Trees of Southern Africa. Struik Publishers, Cape Town.

Van Wyk, B. & Malan, S. (1997). Field Guide to the Wild Flowers of the Highveld: Also Useful in Adjacent Grassland and Bushveld, Struik Publishers, Cape Town.

Van Wyk, B-E., Van Oudtshoorn, B. & Gericke, N. (2013). Medicinal Plants of South Africa. Briza Publications, Pretoria.

Van Wyk, B-E. & Smith, G.F. (2014). Guide to the Aloes of South Africa. Briza Publishers, Pretoria.

Wet Earth Eco-Specs. 2019. Sasol Secunda Industrial Complex: Wetland Assessment Review 2019. PO number: 45058836637.

Wet Earth Eco-Specs. 2020. Wetland Management Plan for Sasol Secunda Industrial Complex and Surroundings. PO No. 4506230934

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

Family	Taxon	Author	IUCN	Ecology
Cyperaceae	*Abildgaardia ovata*	(Burm.f.) Kral	LC	Indigenous
Euphorbiaceae	*Acalypha angustata*	Sond.	LC	Indigenous
Amaranthaceae	*Achyranthes aspera var. aspera*	L.		Not indigenous; Naturalised
Lamiaceae	*Aeollanthus buchnerianus*	Briq.	LC	Indigenous
Asteraceae	*Afroaster serrulatus*	(Harv.) J.C.Manning & Goldblatt	LC	Indigenous
Apiaceae	*Afrosciadium magalismontanum*	(Sond.) P.J.D.Winter	LC	Indigenous
Rosaceae	*Agrimonia procera*	Wallr.	LC	Not indigenous; Naturalised; Invasive
Lamiaceae	*Ajuga ophrydis*	Burch. ex Benth.	LC	Indigenous
Hyacinthaceae	*Albuca baurii*	Baker	LC	Indigenous; Endemic
Hyacinthaceae	*Albuca setosa*	Jacq.	LC	Indigenous
Hyacinthaceae	*Albuca sp.*			
Hyacinthaceae	*Albuca virens subsp. virens*	(Ker Gawl.) J.C.Manning & Goldblatt	LC	Indigenous
Orobanchaceae	*Alectra orobanchoides*	Benth.	LC	Indigenous
Orobanchaceae	*Alectra vogelii*	Benth.	LC	Indigenous
Poaceae	*Alloteropsis semialata subsp. semialata*	(R.Br.) Hitchc.	LC	Indigenous
Asphodelaceae	*Aloe davyana*	Schonland		Indigenous; Endemic
Asphodelaceae	*Aloe ecklonis*	Salm-Dyck	LC	Indigenous
Amaranthaceae	*Alternanthera pungens*	Kunth		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus hybridus subsp. hybridus*	L.		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus hybridus subsp. hybridus*	L.		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus thunbergii*	Moq.	LC	Indigenous
Boraginaceae	*Anchusa riparia*	A.DC.	LC	Indigenous
Poaceae	*Andropogon appendiculatus*	Nees	LC	Indigenous
Rubiaceae	*Anthospermum rigidum subsp. rigidum*	Eckl. & Zeyh.	LC	Indigenous
Aponogetonaceae	*Aponogeton junceus*	Lehm.	LC	Indigenous
Asteraceae	*Arctotis arctotoides*	(L.f.) O.Hoffm.	LC	Indigenous
Fabaceae	*Argyrolobium campicola*	Harms	NT	Indigenous; Endemic
Fabaceae	*Argyrolobium harveyanum*	Oliv.	LC	Indigenous
Poaceae	*Aristida bipartita*	(Nees) Trin. & Rupr.	LC	Indigenous
Poaceae	*Aristida canescens subsp. canescens*	Henrard	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	Roem. & Schult.	LC	Indigenous
Poaceae	*Aristida diffusa subsp. burkei*	Trin.	LC	Indigenous
Poaceae	*Aristida junciformis subsp. junciformis*	Trin. & Rupr.	LC	Indigenous
Asteraceae	*Artemisia afra var. afra*	Jacq. ex Willd.	LC	Indigenous
Apocynaceae	*Asclepias aurea*	(Schltr.) Schltr.	LC	Indigenous
Apocynaceae	*Asclepias gibba var. gibba*	(E.Mey.) Schltr.	LC	Indigenous
Apocynaceae	*Asclepias gibba var. media*	(E.Mey.) Schltr.	LC	Indigenous
Apocynaceae	*Asclepias multicaulis*	(E.Mey.) Schltr.	LC	Indigenous

Apocynaceae	*Asclepias stellifera*	Schltr.	LC	Indigenous
Asparagaceae	*Asparagus cooperi*	Baker	LC	Indigenous
Asparagaceae	*Asparagus setaceus*	(Kunth) Jessop	LC	Indigenous
Apocynaceae	*Aspidoglossum interruptum*	(E.Mey.) Bullock	LC	Indigenous
Apocynaceae	*Aspidoglossum lamellatum*	(Schltr.) Kupicha	LC	Indigenous
Aspleniaceae	*Asplenium adiantum-nigrum var. solidum*	L.	LC	Indigenous; Endemic
Aspleniaceae	*Asplenium cordatum*	(Thunb.) Sw.	LC	Indigenous
Salviniaceae	*Azolla filiculoides*	Lam.	NE	Not indigenous; Naturalised; Invasive
Iridaceae	*Babiana bainesii*	Baker	LC	Indigenous
Asteraceae	*Berkheya discolor*	(DC.) O.Hoffm. & Muschl.	LC	Indigenous
Asteraceae	*Berkheya onopordifolia var. onopordifolia*	(DC.) O.Hoffm. ex Burtt Davy	LC	Indigenous
Asteraceae	*Berkheya pinnatifida subsp. ingrata*	(Thunb.) Thell.	LC	Indigenous; Endemic
Asteraceae	*Berkheya radula*	(Harv.) De Wild.	LC	Indigenous
Asteraceae	*Berkheya setifera*	DC.	LC	Indigenous
Asteraceae	*Berkheya zeyheri subsp. zeyheri*	Oliv. & Hiern	LC	Indigenous
Apiaceae	*Berula repanda*	(Hiern) Spalik & S.R.Downie	LC	Indigenous
Asteraceae	*Bidens pilosa*	L.		Not indigenous; Naturalised
Acanthaceae	*Blepharis subvolubilis*	C.B.Clarke	LC	Indigenous
Amaryllidaceae	*Boophone disticha*	(L.f.) Herb.	LC	Indigenous
Poaceae	*Brachiaria advena*	Vickery	NE	Not indigenous; Naturalised
Poaceae	*Brachiaria eruciformis*	(Sm.) Griseb.	LC	Indigenous
Poaceae	*Brachiaria serrata*	(Thunb.) Stapf	LC	Indigenous
Apocynaceae	*Brachystelma foetidum*	Schltr.	LC	Indigenous
Apocynaceae	*Brachystelma praelongum*	S.Moore	LC	Indigenous
Apocynaceae	*Brachystelma pygmaeum subsp. pygmaeum*	(Schltr.) N.E.Br.	LC	Indigenous; Endemic
Brassicaceae	*Brassica rapa*	L.		Not indigenous; Naturalised
Bryaceae	*Bryum argenteum*	Hedw.		Indigenous
Asphodelaceae	*Bulbine capitata*	Poelln.	LC	Indigenous
Cyperaceae	*Bulbostylis humilis*	(Kunth) C.B.Clarke	LC	Indigenous
Cyperaceae	*Carex glomerabilis*	V.I.Krecz.	LC	Indigenous
Cyperaceae	*Carex spartea*	Wahlenb.		Indigenous
Poaceae	*Catalepis gracilis*	Stapf & Stent	LC	Indigenous
Apiaceae	*Centella asiatica*	(L.) Urb.	LC	Indigenous
Dipsacaceae	*Cephalaria oblongifolia*	(Kuntze) Szabo	LC	Indigenous
Dipsacaceae	*Cephalaria pungens*	Szabo	LC	Indigenous
Dipsacaceae	*Cephalaria zeyheriana*	Szabo	LC	Indigenous
Caryophyllaceae	*Cerastium capense*	Sond.	LC	Indigenous
Scrophulariaceae	*Chaenostoma patrioticum*	(Hiern) Kornhall	LC	Indigenous
Aizoaceae	*Chasmatophyllum musculinum*	(Haw.) Dinter & Schwantes	LC	Indigenous
Pteridaceae	*Cheilanthes hirta var. hirta*	Sw.	LC	Indigenous
Amaranthaceae	*Chenopodium hircinum*	Schrad.		Not indigenous; Naturalised

Amaranthaceae	*Chenopodium phillipsianum*	Aellen		Indigenous
Amaranthaceae	*Chenopodium schraderianum*	Roem. & Schult.		Not indigenous; Naturalised
Gentianaceae	*Chironia palustris subsp. palustris*	Burch.	LC	Indigenous
Gentianaceae	*Chironia purpurascens subsp. humilis*	(E.Mey.) Benth. & Hook.f.	LC	Indigenous
Poaceae	*Chloris virgata*	Sw.	LC	Indigenous
Agavaceae	*Chlorophytum cooperi*	(Baker) Nordal	LC	Indigenous
Agavaceae	*Chlorophytum fasciculatum*	(Baker) Kativu	LC	Indigenous
Asteraceae	*Cineraria austrotransvaalensis*	Cron	NT	Indigenous; Endemic
Asteraceae	*Cineraria lyratiformis*	Cron	LC	Indigenous
Cleomaceae	*Cleome monophylla*	L.	LC	Indigenous
Peraceae	*Clutia natalensis*	Bernh.	LC	Indigenous
Colchicaceae	*Colchicum striatum*	(Hochst. ex A.Rich.) J.C.Manning & Vinn.	LC	Indigenous
Commelinaceae	*Commelina africana var. africana*	L.	LC	Indigenous
Commelinaceae	*Commelina africana var. krebsiana*	L.	LC	Indigenous
Commelinaceae	*Commelina africana var. lancispatha*	L.	LC	Indigenous
Commelinaceae	*Commelina benghalensis*	L.	LC	Indigenous
Apiaceae	*Conium chaerophylloides*	(Thunb.) Sond.	LC	Indigenous
Convolvulaceae	*Convolvulus arvensis*	L.		Not indigenous; Naturalised; Invasive
Convolvulaceae	*Convolvulus multifidus*	Thunb.	LC	Indigenous; Endemic
Convolvulaceae	*Convolvulus sagittatus*	Thunb.	LC	Indigenous
Asteraceae	*Conyza podocephala*	DC.		Indigenous
Apocynaceae	*Cordylogyne globosa*	E.Mey.	LC	Indigenous
Asteraceae	*Cosmos bipinnatus*	Cav.		Not indigenous; Naturalised
Asteraceae	*Cotula sp.*			
Acanthaceae	*Crabbea acaulis*	N.E.Br.	LC	Indigenous
Acanthaceae	*Crabbea hirsuta*	Harv.	LC	Indigenous
Crassulaceae	*Crassula alba var. alba*	Forssk.	NE	Indigenous
Crassulaceae	*Crassula lanceolata subsp. lanceolata*	(Eckl. & Zeyh.) Endl. ex Walp.	LC	Indigenous
Crassulaceae	*Crassula natans var. natans*	Thunb.	LC	Indigenous
Crassulaceae	*Crassula setulosa var. setulosa*	Harv.	NE	Indigenous
Amaryllidaceae	*Crinum bulbispermum*	(Burm.f.) Milne-Redh. & Schweick.	LC	Indigenous
Amaryllidaceae	*Crinum graminicola*	I.Verd.	LC	Indigenous; Endemic
Amaryllidaceae	*Crinum lugardiae*	N.E.Br.	LC	Indigenous
Cucurbitaceae	*Cucumis myriocarpus subsp. myriocarpus*	Naudin	LC	Indigenous
Convolvulaceae	*Cuscuta campestris*	Yunck.		Not indigenous; Naturalised; Invasive
Commelinaceae	*Cyanotis speciosa*	(L.f.) Hassk.	LC	Indigenous
Orobanchaceae	*Cycnium tubulosum subsp. tubulosum*	(L.f.) Engl.	LC	Indigenous
Poaceae	*Cymbopogon caesius*	(Hook. & Arn.) Stapf	LC	Indigenous
Poaceae	*Cymbopogon pospischilii*	(K.Schum.) C.E.Hubb.	NE	Indigenous
Poaceae	*Cynodon dactylon*	(L.) Pers.	LC	Indigenous

Boraginaceae	*Cynoglossum hispidum*	Thunb.	LC	Indigenous
Boraginaceae	*Cynoglossum lanceolatum*	Forssk.	LC	Indigenous
Cyperaceae	*Cyperus albostriatus*	Schrad.	LC	Indigenous
Cyperaceae	*Cyperus congestus*	Vahl	LC	Indigenous
Cyperaceae	*Cyperus esculentus var. esculentus*	L.	LC	Indigenous
Cyperaceae	*Cyperus fastigiatus*	Rottb.	LC	Indigenous
Cyperaceae	*Cyperus longus var. longus*	L.	NE	Indigenous
Cyperaceae	*Cyperus longus var. tenuiflorus*	L.	NE	Indigenous
Cyperaceae	*Cyperus marginatus*	Thunb.	LC	Indigenous
Cyperaceae	*Cyperus obtusiflorus var. flavissimus*	Vahl	LC	Indigenous
Cyperaceae	*Cyperus schlechteri*	C.B.Clarke	LC	Indigenous
Cyperaceae	*Cyperus semitrifidus*	Schrad.	LC	Indigenous
Amaryllidaceae	*Cyrtanthus breviflorus*	Harv.	LC	Indigenous
Amaryllidaceae	*Cyrtanthus stenanthus var. stenanthus*	Baker	LC	Indigenous
Amaryllidaceae	*Cyrtanthus tuckii var. tuckii*	Baker	LC	Indigenous; Endemic
Solanaceae	*Datura stramonium*	L.		Not indigenous; Naturalised; Invasive
Asteraceae	*Denekia capensis*	Thunb.	LC	Indigenous
Caryophyllaceae	*Dianthus basuticus subsp. basuticus*	Burtt Davy	NE	Indigenous
Caryophyllaceae	*Dianthus mooiensis subsp. mooiensis*	F.N.Williams	NE	Indigenous; Endemic
Scrophulariaceae	*Diclis reptans*	Benth.	LC	Indigenous
Scrophulariaceae	*Diclis rotundifolia*	(Hiern) Hilliard & B.L.Burtt	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. gerrardii*	Sond.	LC	Indigenous
Poaceae	*Digitaria eriantha*	Steud.	LC	Indigenous
Poaceae	*Digitaria sanguinalis*	(L.) Scop.	NE	Not indigenous; Naturalised
Poaceae	*Digitaria ternata*	(A.Rich.) Stapf	LC	Indigenous
Asteraceae	*Dimorphotheca caulescens*	Harv.	LC	Indigenous
Ebenaceae	*Diospyros austro-africana var. microphylla*	De Winter	LC	Indigenous
Hyacinthaceae	*Dipcadi marlothii*	Engl.	LC	Indigenous
Hyacinthaceae	*Dipcadi viride*	(L.) Moench	LC	Indigenous
Fabaceae	*Dolichos falciformis*	E.Mey.	LC	Indigenous
Fabaceae	*Dolichos linearis*	E.Mey.	LC	Indigenous
Hyacinthaceae	*Drimia multisetosa*	(Baker) Jessop	LC	Indigenous
Hyacinthaceae	*Drimia pauciflora*	Baker		Indigenous
Acanthaceae	*Dyschoriste burchellii*	(Nees) Kuntze	LC	Indigenous
Amaranthaceae	*Dysphania ambrosioides*	(L.) Mosyakin & Clemants		Not indigenous; Naturalised; Invasive
Amaranthaceae	*Dysphania multifida*	(L.) Mosyakin & Clemants		Not indigenous; Naturalised; Invasive
Amaranthaceae	*Dysphania pumilio*	(R.Br.) Mosyakin & Clemants		Not indigenous; Naturalised; Invasive
Cyperaceae	*Eleocharis dregeana*	Steud.	LC	Indigenous
Cyperaceae	*Eleocharis limosa*	(Schrad.) Schult.	LC	Indigenous
Cyperaceae	*Eleocharis sp.*			

Fabaceae	*Elephantorrhiza elephantina*	(Burch.) Skeels	LC	Indigenous
Poaceae	*Eleusine coracana*	(L.) Gaertn.		Indigenous
Poaceae	*Eleusine coracana subsp. africana*	(L.) Gaertn.	LC	Indigenous
Poaceae	*Eleusine multiflora*	A.Rich.	NE	Not indigenous; Naturalised
Poaceae	*Elionurus muticus*	(Spreng.) Kunth	LC	Indigenous
Hypoxidaceae	*Empodium elongatum*	(Nel) B.L.Burtt	LC	Indigenous
Poaceae	*Eragrostis capensis*	(Thunb.) Trin.	LC	Indigenous
Poaceae	*Eragrostis chloromelas*	Steud.	LC	Indigenous
Poaceae	*Eragrostis cilianensis*	(All.) Vignolo ex Janch.	LC	Indigenous
Poaceae	*Eragrostis curvula*	(Schrad.) Nees	LC	Indigenous
Poaceae	*Eragrostis micrantha*	Hack.	LC	Indigenous
Poaceae	*Eragrostis obtusa*	Munro ex Ficalho & Hiern	LC	Indigenous
Poaceae	*Eragrostis plana*	Nees	LC	Indigenous
Poaceae	*Eragrostis planiculmis*	Nees	LC	Indigenous
Poaceae	*Eragrostis racemosa*	(Thunb.) Steud.	LC	Indigenous
Poaceae	*Eragrostis tef*	(Zuccagni) Trotter	NE	Not indigenous; Naturalised
Asteraceae	*Erigeron bonariensis*	L.		Not indigenous; Naturalised; Invasive
Asteraceae	*Erigeron canadensis*	L.		Not indigenous; Naturalised; Invasive
Fabaceae	*Eriosema nutans*	Schinz	LC	Indigenous
Fabaceae	*Eriosema salignum*	E.Mey.	LC	Indigenous
Fabaceae	*Eriosema simulans*	C.H.Stirt.	LC	Indigenous
Ruscaceae	*Eriospermum corymbosum*	Baker	LC	Indigenous
Brassicaceae	*Erucastrum austroafricanum*	Al-Shehbaz & Warwick	LC	Indigenous
Fabaceae	*Erythrina zeyheri*	Harv.	LC	Indigenous
Myrtaceae	*Eucalyptus sideroxylon*	A.Cunn. ex Woolls		Not indigenous; Cultivated; Naturalised; Invasive
Hyacinthaceae	*Eucomis autumnalis subsp. clavata*	(Mill.) Chitt.	NE	Indigenous
Orchidaceae	*Eulophia ovalis var. ovalis*	Lindl.	LC	Indigenous
Euphorbiaceae	*Euphorbia clavarioides*	Boiss.	LC	Indigenous
Euphorbiaceae	*Euphorbia inaequilatera*	Sond.	LC	Indigenous
Euphorbiaceae	*Euphorbia inaequilatera var. inaequilatera*	Sond.	NE	Indigenous
Euphorbiaceae	*Euphorbia striata*	Thunb.	LC	Indigenous
Asteraceae	*Euryops laxus*	(Harv.) Burtt Davy	LC	Indigenous
Asteraceae	*Euryops transvaalensis subsp. transvaalensis*	Klatt	LC	Indigenous
Polygonaceae	*Fagopyrum esculentum*	Moench		Not indigenous; Naturalised
Convolvulaceae	*Falkia oblonga*	Bernh. ex C.Krauss	LC	Indigenous
Polygonaceae	*Fallopia convolvulus*	(L.) Holub		Not indigenous; Naturalised
Asteraceae	*Felicia muricata subsp. muricata*	(Thunb.) Nees	LC	Indigenous
Cyperaceae	*Fimbristylis complanata*	(Retz.) Link	LC	Indigenous
Poaceae	*Fingerhuthia africana*	Lehm.	LC	Indigenous
Poaceae	*Fingerhuthia sesleriiformis*	Nees	LC	Indigenous

Cyperaceae	*Fuirena pubescens var. pubescens*	(Poir.) Kunth	LC	Indigenous
Rubiaceae	*Galium capense subsp. capense*	Thunb.	LC	Indigenous
Asteraceae	*Gazania krebsiana subsp. serrulata*	Less.	LC	Indigenous
Asteraceae	*Gazania sp.*			
Asteraceae	*Geigeria aspera var. aspera*	Harv.	LC	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei*	Harv.	NE	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei*	Harv.	NE	Indigenous
Geraniaceae	*Geranium multisectum*	N.E.Br.	LC	Indigenous
Asteraceae	*Gerbera ambigua*	(Cass.) Sch.Bip.	LC	Indigenous
Asteraceae	*Gerbera viridifolia*	(DC.) Sch.Bip.	LC	Indigenous
Gisekiaceae	*Gisekia pharnaceoides var. pharnaceoides*	L.	LC	Indigenous
Iridaceae	*Gladiolus crassifolius*	Baker	LC	Indigenous
Iridaceae	*Gladiolus dalenii subsp. dalenii*	Van Geel	LC	Indigenous
Iridaceae	*Gladiolus elliotii*	Baker	LC	Indigenous
Iridaceae	*Gladiolus longicollis subsp. longicollis*	Baker	LC	Indigenous
Iridaceae	*Gladiolus longicollis subsp. platypetalus*	Baker	LC	Indigenous
Iridaceae	*Gladiolus robertsoniae*	F.Bolus	NT	Indigenous; Endemic
Iridaceae	*Gladiolus sericeovillosus subsp. calvatus*	Hook.f.	LC	Indigenous
Iridaceae	*Gladiolus sericeovillosus subsp. sericeovillosus*	Hook.f.	LC	Indigenous
Asteraceae	*Gnaphalium filagopsis*	Hilliard & B.L.Burtt	LC	Indigenous
Thymelaeaceae	*Gnidia gymnostachya*	(C.A.Mey.) Gilg	LC	Indigenous
Apocynaceae	*Gomphocarpus fruticosus subsp. fruticosus*	(L.) W.T.Aiton	LC	Indigenous
Apocynaceae	*Gomphocarpus rivularis*	Schltr.	LC	Indigenous
Scrophulariaceae	*Gomphostigma virgatum*	(L.f.) Baill.	LC	Indigenous
Amaranthaceae	*Gomphrena celosioides*	Mart.		Not indigenous; Naturalised
Malvaceae	*Grewia flava*	DC.	LC	Indigenous
Melianthaceae	*Greyia sutherlandii*	Hook. & Harv.	LC	Indigenous
Caryophyllaceae	*Gypsophila vaccaria*	(L.) Sm.		Not indigenous; Naturalised
Orchidaceae	*Habenaria epipactidea*	Rchb.f.	LC	Indigenous
Orchidaceae	*Habenaria falcicornis subsp. caffra*	(Burch. ex Lindl.) Bolus	LC	Indigenous
Amaryllidaceae	*Haemanthus humilis subsp. hirsutus*	Jacq.	LC	Indigenous
Amaryllidaceae	*Haemanthus montanus*	Baker	LC	Indigenous
Asteraceae	*Haplocarpha lyrata*	Harv.	LC	Indigenous; Endemic
Asteraceae	*Haplocarpha nervosa*	(Thunb.) Beauverd	LC	Indigenous
Asteraceae	*Haplocarpha scaposa*	Harv.	LC	Indigenous
Poaceae	*Harpochloa falx*	(L.f.) Kuntze	LC	Indigenous
Scrophulariaceae	*Hebenstretia rehmannii*	Rolfe	LC	Indigenous; Endemic
Asteraceae	*Helichrysum aureonitens*	Sch.Bip.	LC	Indigenous
Asteraceae	*Helichrysum chionosphaerum*	DC.	LC	Indigenous
Asteraceae	*Helichrysum nudifolium var. nudifolium*	(L.) Less.	LC	Indigenous
Asteraceae	*Helichrysum nudifolium var. pilosellum*	(L.) Less.	LC	Indigenous
Asteraceae	*Helichrysum psilolepis*	Harv.	LC	Indigenous
Asteraceae	*Helichrysum rugulosum*	Less.	LC	Indigenous
Poaceae	*Helictotrichon turgidulum*	(Stapf) Schweick.	LC	Indigenous

Malvaceae	*Hermannia coccocarpa*	(Eckl. & Zeyh.) Kuntze	LC	Indigenous
Malvaceae	*Hermannia cordata*	(E.Mey. ex E.Phillips) De Winter	LC	Indigenous; Endemic
Malvaceae	*Hermannia cristata*	Bolus	LC	Indigenous
Malvaceae	*Hermannia depressa*	N.E.Br.	LC	Indigenous
Malvaceae	*Hermannia oblongifolia*	(Harv.) Hochr.	LC	Indigenous; Endemic
Malvaceae	*Hermannia sp.*			
Caryophyllaceae	*Herniaria erckertii subsp. erckertii*	Herm.	LC	Indigenous
Iridaceae	*Hesperantha longicollis*	Baker	LC	Indigenous
Poaceae	*Heteropogon contortus*	(L.) Roem. & Schult.	LC	Indigenous
Malvaceae	*Hibiscus aethiopicus var. ovatus*	L.	LC	Indigenous
Malvaceae	*Hibiscus microcarpus*	Garcke	LC	Indigenous
Malvaceae	*Hibiscus trionum*	L.		Not indigenous; Naturalised
Asteraceae	*Hilliardiella aristata*	(DC.) H.Rob.	LC	Indigenous
Asteraceae	*Hilliardiella elaeagnoides*	(DC.) Swelank. & J.C.Manning		Indigenous
Poaceae	*Hyparrhenia hirta*	(L.) Stapf	LC	Indigenous
Poaceae	*Hyparrhenia sp.*			
Hypoxidaceae	*Hypoxis acuminata*	Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis argentea var. argentea*	Harv. ex Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis hemerocallidea*	Fisch., C.A.Mey. & Ave-Lall.	LC	Indigenous
Hypoxidaceae	*Hypoxis multiceps*	Buchinger ex Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis rigidula var. rigidula*	Baker	LC	Indigenous
Poaceae	*Imperata cylindrica*	(L.) Raeusch.	LC	Indigenous
Fabaceae	*Indigofera dimidiata*	Vogel ex Walp.	LC	Indigenous
Fabaceae	*Indigofera dregeana*	E.Mey.	LC	Indigenous
Fabaceae	*Indigofera evansiana*	Burtt Davy	LC	Indigenous
Fabaceae	*Indigofera hedyantha*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Indigofera hilaris var. hilaris*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Indigofera longibarbata*	Engl.	LC	Indigenous
Fabaceae	*Indigofera melanadenia*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Indigofera obscura*	N.E.Br.	LC	Indigenous
Fabaceae	*Indigofera zeyheri*	Spreng. ex Eckl. & Zeyh.	LC	Indigenous
Convolvulaceae	*Ipomoea crassipes var. crassipes*	Hook.	LC	Indigenous
Convolvulaceae	*Ipomoea oblongata*	E.Mey. ex Choisy	LC	Indigenous
Convolvulaceae	*Ipomoea ommanneyi*	Rendle	LC	Indigenous
Convolvulaceae	*Ipomoea pellita*	Hallier f.	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia aurantiaca*	(Burch.) Hilliard	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia montana*	(Diels) Hilliard	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia sp.*			
Scrophulariaceae	*Jamesbrittenia stricta*	(Benth.) Hilliard	LC	Indigenous
Juncaceae	*Juncus dregeanus subsp. dregeanus*	Kunth	LC	Indigenous
Juncaceae	*Juncus exsertus*	Buchenau	LC	Indigenous
Juncaceae	*Juncus oxycarpus*	E.Mey. ex Kunth	LC	Indigenous
Asphodelaceae	*Kniphofia albescens*	Codd	LC	Indigenous; Endemic

Asphodelaceae	*Kniphofia typhoides*	Codd	NT	Indigenous; Endemic
Poaceae	*Koeleria capensis*	(Steud.) Nees	LC	Indigenous
Rubiaceae	*Kohautia amatymbica*	Eckl. & Zeyh.	LC	Indigenous
Rubiaceae	*Kohautia caespitosa subsp. brachyloba*	Schnizl.	LC	Indigenous
Cyperaceae	*Kyllinga erecta var. erecta*	Schumach.	LC	Indigenous
Asteraceae	*Lactuca inermis*	Forssk.	LC	Indigenous
Hydrocharitaceae	*Lagarosiphon major*	(Ridl.) Moss ex Wager	LC	Indigenous
Verbenaceae	*Lantana rugosa*	Thunb.	LC	Indigenous
Thymelaeaceae	*Lasiosiphon burchellii*	Meisn.	LC	Indigenous
Thymelaeaceae	*Lasiosiphon capitatus*	(L.f.) Burtt Davy	LC	Indigenous
Thymelaeaceae	*Lasiosiphon kraussianus*	(Meisn.) Meisn.		Indigenous
Hyacinthaceae	*Ledebouria cooperi*	(Hook.f.) Jessop	LC	Indigenous
Hyacinthaceae	*Ledebouria ovatifolia*	(Baker) Jessop		Indigenous
Hyacinthaceae	*Ledebouria revoluta*	(L.f.) Jessop	LC	Indigenous
Hyacinthaceae	*Ledebouria sp.*			
Poaceae	*Leersia hexandra*	Sw.	LC	Indigenous
Fabaceae	*Leobordea adpressa subsp. adpressa*	(N.E.Br.) B.-E.van Wyk & Boatwr.	LC	Indigenous
Fabaceae	*Leobordea mucronata*	(Conrath) B.-E.van Wyk & Boatwr.		Indigenous
Brassicaceae	*Lepidium bonariense*	L.		Not indigenous; Naturalised
Brassicaceae	*Lepidium transvaalense*	Marais	LC	Indigenous
Fabaceae	*Lessertia affinis*	Burtt Davy	LC	Indigenous; Endemic
Fabaceae	*Lessertia frutescens subsp. microphylla*	(L.) Goldblatt & J.C.Manning	LC	Indigenous
Limeaceae	*Limeum viscosum subsp. viscosum*	(J.Gay) Fenzl	NE	Indigenous
Scrophulariaceae	*Limosella longiflora*	Kuntze	LC	Indigenous
Scrophulariaceae	*Limosella maior*	Diels	LC	Indigenous
Plantaginaceae	*Linaria vulgaris*	Mill.	NE	Not indigenous; Naturalised; Invasive
Linderniaceae	*Linderniella nana*	(Engl.) Eb.Fisch., Schaferh. & Kai Mull.		Indigenous
Fabaceae	*Listia heterophylla*	E.Mey.	LC	Indigenous
Boraginaceae	*Lithospermum cinereum*	A.DC.	LC	Indigenous
Lobeliaceae	*Lobelia sonderiana*	(Kuntze) Lammers	LC	Indigenous
Scrophulariaceae	*Manulea paniculata*	Benth.	LC	Indigenous
Scrophulariaceae	*Manulea rhodantha subsp. aurantiaca*	Hilliard	LC	Indigenous; Endemic
Fabaceae	*Medicago laciniata var. laciniata*	(L.) Mill.	NE	Not indigenous; Naturalised
Fabaceae	*Medicago sativa*	L.	NE	Not indigenous; Cultivated; Naturalised; Invasive
Fabaceae	*Melolobium alpinum*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Melolobium calycinum*	Benth.	LC	Indigenous
Fabaceae	*Melolobium candicans*	(E.Mey.) Eckl. & Zeyh.	LC	Indigenous
Lamiaceae	*Mentha longifolia subsp. polyadena*	(L.) Huds.	LC	Indigenous
Phrymaceae	*Mimulus gracilis*	R.Br.	LC	Indigenous

Apocynaceae	*Miraglossum davyi*	(N.E.Br.) Kupicha	VU	Indigenous; Endemic
Lobeliaceae	*Monopsis decipiens*	(Sond.) Thulin	LC	Indigenous
Geraniaceae	*Monsonia brevirostrata*	R.Knuth	LC	Indigenous
Iridaceae	*Moraea pallida*	(Baker) Goldblatt	LC	Indigenous
Iridaceae	*Moraea simulans*	Baker	LC	Indigenous
Brassicaceae	*Nasturtium officinale*	W.T.Aiton		Not indigenous; Naturalised; Invasive
Scrophulariaceae	*Nemesia fruticans*	(Thunb.) Benth.	LC	Indigenous
Scrophulariaceae	*Nemesia sp.*			
Scrophulariaceae	*Nemesia umbonata*	(Hiern) Hilliard & B.L.Burtt	LC	Indigenous
Amaryllidaceae	*Nerine gracilis*	R.A.Dyer	VU	Indigenous; Endemic
Amaryllidaceae	*Nerine krigei*	W.F.Barker	LC	Indigenous; Endemic
Amaryllidaceae	*Nerine laticoma*	(Ker Gawl.) T.Durand & Schinz	LC	Indigenous
Lythraceae	*Nesaea sagittifolia var. sagittifolia*	(Sond.) Koehne	LC	Indigenous
Lythraceae	*Nesaea schinzii*	Koehne	LC	Indigenous
Asteraceae	*Nidorella anomala*	Steetz	LC	Indigenous
Asteraceae	*Nidorella hottentotica*	DC.	LC	Indigenous
Asteraceae	*Nidorella resedifolia subsp. resedifolia*	DC.	LC	Indigenous
Asteraceae	*Nolletia jeanettae*	P.P.J.Herman	LC	Indigenous; Endemic
Onagraceae	*Oenothera jamesii*	Torr. & A.Gray		Not indigenous; Naturalised; Invasive
Onagraceae	*Oenothera tetraptera*	Cav.		Not indigenous; Naturalised; Invasive
Apocynaceae	*Orbea cooperi*	(N.E.Br.) L.C.Leach	LC	Indigenous
Hyacinthaceae	*Ornithogalum flexuosum*	(Thunb.) U.Mull.-Doblies & D.Mull.-Doblies	LC	Indigenous
Orchidaceae	*Orthochilus foliosus*	(Lindl.) Bytebier	LC	Indigenous
Orchidaceae	*Orthochilus welwitschii*	Rchb.f.	LC	Indigenous
Asteraceae	*Osteospermum scariosum var. scariosum*	DC.	NE	Indigenous
Asteraceae	*Othonna natalensis*	Sch.Bip.	LC	Indigenous
Oxalidaceae	*Oxalis corniculata*	L.		Not indigenous; Naturalised; Invasive
Oxalidaceae	*Oxalis obliquifolia*	Steud. ex A.Rich.	LC	Indigenous
Apocynaceae	*Pachycarpus schinzianus*	(Schltr.) N.E.Br.	LC	Indigenous
Poaceae	*Panicum schinzii*	Hack.	LC	Indigenous
Poaceae	*Panicum sp.*			
Poaceae	*Panicum volutans*	J.G.Anderson	LC	Indigenous; Endemic
Papaveraceae	*Papaver aculeatum*	Thunb.	LC	Indigenous
Poaceae	*Paspalum distichum*	L.	LC	Not indigenous; Naturalised; Invasive
Fabaceae	*Pearsonia sessilifolia subsp. sessilifolia*	(Harv.) Dummer	LC	Indigenous
Geraniaceae	*Pelargonium luridum*	(Andrews) Sweet	LC	Indigenous
Geraniaceae	*Pelargonium nanum*	L'Her.	LC	Indigenous

Geraniaceae	*Pelargonium sidoides*	DC.	LC	Indigenous
Pteridaceae	*Pellaea calomelanos var. calomelanos*	(Sw.) Link	LC	Indigenous
Rubiaceae	*Pentanisia angustifolia*	(Hochst.) Hochst.	LC	Indigenous
Rubiaceae	*Pentanisia prunelloides subsp. prunelloides*	(Klotzsch ex Eckl. & Zeyh.) Walp.	LC	Indigenous
Polygonaceae	*Persicaria amphibia*	(L.) Delarbre	LC	Not indigenous; Naturalised
Polygonaceae	*Persicaria hystricula*	(J.Schust.) Sojak	LC	Indigenous
Polygonaceae	*Persicaria lapathifolia*	(L.) Delarbre		Not indigenous; Naturalised; Invasive
Polygonaceae	*Persicaria madagascariensis*	(Meisn.) S.Ortiz & Paiva		Indigenous
Poaceae	*Phalaris canariensis*	L.	NE	Not indigenous; Naturalised
Solanaceae	*Physalis angulata*	L.		Not indigenous; Naturalised; Invasive
Solanaceae	*Physalis viscosa*	L.		Not indigenous; Naturalised; Invasive
Phytolaccaceae	*Phytolacca heptandra*	Retz.	LC	Indigenous
Pinaceae	*Pinus halepensis*	Mill.		Not indigenous; Naturalised; Invasive
Plantaginaceae	*Plantago lanceolata*	L.	LC	Indigenous
Asteraceae	*Platycarphella parvifolia*	(S.Moore) V.A.Funk & H.Rob.	LC	Indigenous; Endemic
Lamiaceae	*Plectranthus ramosior*	(Benth.) Van Jaarsv.	LC	Indigenous; Endemic
Caryophyllaceae	*Pollichia campestris*	Aiton	LC	Indigenous
Polygalaceae	*Polygala africana*	Chodat	LC	Indigenous
Polygalaceae	*Polygala albida subsp. albida*	Schinz	LC	Indigenous
Polygalaceae	*Polygala gracilenta*	Burtt Davy	LC	Indigenous
Polygalaceae	*Polygala hottentotta*	C.Presl	LC	Indigenous
Polygalaceae	*Polygala transvaalensis*	Chodat		Indigenous
Polygalaceae	*Polygala transvaalensis subsp. transvaalensis*	Chodat	LC	Indigenous
Polygonaceae	*Polygonum aviculare*	L.		Not indigenous; Naturalised
Poaceae	*Polypogon viridis*	(Gouan) Breistr.	NE	Not indigenous; Naturalised
Pontederiaceae	*Pontederia cordata*	L.		Not indigenous; Naturalised
Portulacaceae	*Portulaca oleracea*	L.		Not indigenous; Naturalised
Potamogetonaceae	*Potamogeton richardii*	Solms	LC	Indigenous
Molluginaceae	*Psammotropha myriantha*	Sond.	LC	Indigenous
Asteraceae	*Pseudognaphalium luteoalbum*	(L.) Hilliard & B.L.Burtt	LC	cryptogenic
Asteraceae	*Pseudognaphalium oligandrum*	(DC.) Hilliard & B.L.Burtt	LC	Indigenous
Asteraceae	*Pulicaria scabra*	(Thunb.) Druce	LC	Indigenous
Cyperaceae	*Pycreus chrysanthus*	(Boeck.) C.B.Clarke	LC	Indigenous
Cyperaceae	*Pycreus cooperi*	C.B.Clarke	LC	Indigenous
Ranunculaceae	*Ranunculus dregei*	J.C.Manning & Goldblatt	LC	Indigenous
Ranunculaceae	*Ranunculus multifidus*	Forssk.	LC	Indigenous
Ranunculaceae	*Ranunculus trichophyllus*	Chaix	LC	Indigenous

Fabaceae	*Rhynchosia adenodes*	Eckl. & Zeyh.	LC	Indigenous
Fabaceae	*Rhynchosia reptabunda*	N.E.Br.	LC	Indigenous
Fabaceae	*Rhynchosia sordida*	(E.Mey.) Schinz	LC	Indigenous
Fabaceae	*Rhynchosia sp.*			
Fabaceae	*Rhynchosia totta var. totta*	(Thunb.) DC.	LC	Indigenous
Brassicaceae	*Rorippa fluviatilis var. fluviatilis*	(E.Mey. ex Sond.) R.A.Dyer	LC	Indigenous
Polygonaceae	*Rumex acetosella subsp. angiocarpus*	L.		Not indigenous; Naturalised
Polygonaceae	*Rumex crispus*	L.		Not indigenous; Naturalised; Invasive
Polygonaceae	*Rumex lanceolatus*	Thunb.	LC	Indigenous
Lamiaceae	*Salvia repens var. repens*	Burch. ex Benth.	LC	Indigenous
Lamiaceae	*Salvia repens var. transvaalensis*	Burch. ex Benth.	LC	Indigenous
Lamiaceae	*Salvia runcinata*	L.f.	LC	Indigenous
Rosaceae	*Sanguisorba minor subsp. muricata*	Scop.		Not indigenous; Naturalised
Dipsacaceae	*Scabiosa columbaria*	L.	LC	Indigenous
Asteraceae	*Schistostephium crataegifolium*	(DC.) Fenzl ex Harv.	LC	Indigenous
Hyacinthaceae	*Schizocarphus nervosus*	(Burch.) Van der Merwe	LC	Indigenous
Asteraceae	*Schkuhria pinnata*	(Lam.) Kuntze ex Thell.		Not indigenous; Naturalised
Cyperaceae	*Schoenoplectus decipiens*	(Nees) J.Raynal	LC	Indigenous
Cyperaceae	*Schoenoplectus leucanthus*	(Boeck.) J.Raynal	LC	Indigenous
Cyperaceae	*Schoenoplectus muriculatus*	(Kuk.) Browning	LC	Indigenous
Cyperaceae	*Schoenoplectus pulchellus*	(Kunth) J.Raynal	LC	Indigenous
Cyperaceae	*Scirpoides burkei*	(C.B.Clarke) Goetgh., Muasya & D.A.Simpson	LC	Indigenous
Anacardiaceae	*Searsia dentata*	(Thunb.) F.A.Barkley	LC	Indigenous
Anacardiaceae	*Searsia discolor*	(E.Mey. ex Sond.) Moffett	LC	Indigenous
Anacardiaceae	*Searsia gerrardii*	(Harv. ex Engl.) Moffett	LC	Indigenous
Anacardiaceae	*Searsia magalismontana subsp. magalismontana*	(Sond.) Moffett	LC	Indigenous
Anacardiaceae	*Searsia rigida var. margaretae*	(Mill.) F.A.Barkley	LC	Indigenous; Endemic
Anacardiaceae	*Searsia rigida var. rigida*	(Mill.) F.A.Barkley	LC	Indigenous; Endemic
Gentianaceae	*Sebaea leiostyla*	Gilg	LC	Indigenous
Gentianaceae	*Sebaea repens*	Schinz	LC	Indigenous
Selaginellaceae	*Selaginella caffrorum var. caffrorum*	(Milde) Hieron.	LC	Indigenous
Scrophulariaceae	*Selago cucullata*	Hilliard	LC	Indigenous
Scrophulariaceae	*Selago densiflora*	Rolfe	LC	Indigenous
Asteraceae	*Senecio affinis*	DC.	LC	Indigenous
Asteraceae	*Senecio bupleuroides*	DC.	LC	Indigenous
Asteraceae	*Senecio burchellii*	DC.	LC	Indigenous; Endemic
Asteraceae	*Senecio coronatus*	(Thunb.) Harv.	LC	Indigenous
Asteraceae	*Senecio erubescens var. erubescens*	Aiton	NE	Indigenous; Endemic
Asteraceae	*Senecio hieracioides*	DC.	LC	Indigenous
Asteraceae	*Senecio inaequidens*	DC.	LC	Indigenous
Asteraceae	*Senecio inornatus*	DC.	LC	Indigenous

Asteraceae	*Senecio laevigatus var. laevigatus*	Thunb.	LC	Indigenous; Endemic
Asteraceae	*Senecio othonniflorus*	DC.	LC	Indigenous
Asteraceae	*Senecio sp.*			
Asteraceae	*Senecio subcoriaceus*	Schltr.	LC	Indigenous
Asteraceae	*Senecio venosus*	Harv.	LC	Indigenous
Fabaceae	*Senna occidentalis*	(L.) Link	NE	Not indigenous; Naturalised; Invasive
Asteraceae	*Seriphium plumosum*	L.		Indigenous
Poaceae	*Setaria incrassata*	(Hochst.) Hack.	LC	Indigenous
Poaceae	*Setaria italica*	(L.) P.Beauv.	NE	Not indigenous; Naturalised
Poaceae	*Setaria nigrirostris*	(Nees) T.Durand & Schinz	LC	Indigenous
Poaceae	*Setaria sp.*			
Poaceae	*Setaria sphacelata var. sericea*	(Schumach.) Stapf & C.E.Hubb. ex M.B.Moss	LC	Indigenous
Poaceae	*Setaria sphacelata var. sphacelata*	(Schumach.) Stapf & C.E.Hubb. ex M.B.Moss	LC	Indigenous
Malvaceae	*Sida rhombifolia subsp. rhombifolia*	L.	LC	Indigenous
Caryophyllaceae	*Silene burchellii subsp. pilosellifolia*	Otth ex DC.		Indigenous
Caryophyllaceae	*Silene undulata*	Aiton		Indigenous
Brassicaceae	*Sinapis arvensis*	L.		Not indigenous; Naturalised
Brassicaceae	*Sisymbrium capense*	Thunb.	LC	Indigenous
Brassicaceae	*Sisymbrium turczaninowii*	Sond.	LC	Indigenous
Solanaceae	*Solanum campylacanthum*	Hochst. ex A.Rich.		Indigenous
Solanaceae	*Solanum capense*	L.	LC	Indigenous
Solanaceae	*Solanum lichtensteinii*	Willd.	LC	Indigenous
Solanaceae	*Solanum retroflexum*	Dunal	LC	Indigenous
Asteraceae	*Sonchus asper subsp. asper*	(L.) Hill		Not indigenous; Naturalised; Invasive
Asteraceae	*Sonchus nanus*	Sond. ex Harv.	LC	Indigenous
Orobanchaceae	*Sopubia cana var. cana*	Harv.	LC	Indigenous
Poaceae	*Sporobolus africanus*	(Poir.) Robyns & Tournay	LC	Indigenous
Lamiaceae	*Stachys hyssopoides*	Burch. ex Benth.	LC	Indigenous
Apocynaceae	*Stenostelma periglossoides*	(Schltr.) Bester & Nicholas		Indigenous; Endemic
Apocynaceae	*Stenostelma umbelluliferum*	(Schltr.) Bester & Nicholas	NT	Indigenous; Endemic
Poaceae	*Stipagrostis zeyheri subsp. sericans*	(Nees) De Winter	LC	Indigenous
Gesneriaceae	*Streptocarpus pentherianus*	Fritsch	LC	Indigenous
Orobanchaceae	*Striga bilabiata subsp. bilabiata*	(Thunb.) Kuntze	LC	Indigenous
Orobanchaceae	*Striga elegans*	Benth.	LC	Indigenous
Lamiaceae	*Syncolostemon canescens*	(Gurke) D.F.Otieno	LC	Indigenous
Asteraceae	*Tagetes minuta*	L.		Not indigenous; Naturalised; Invasive
Fabaceae	*Tephrosia capensis var. capensis*	(Jacq.) Pers.	LC	Indigenous
Fabaceae	*Tephrosia multijuga*	R.G.N.Young	LC	Indigenous
Poaceae	*Themeda triandra*	Forssk.	LC	Indigenous

Santalaceae	*Thesium goetzeanum*	Engl.	LC	Indigenous
Santalaceae	*Thesium lesliei*	N.E.Br.	LC	Indigenous
Santalaceae	*Thesium scirpioides*	A.W.Hill	LC	Indigenous
Acanthaceae	*Thunbergia atriplicifolia*	E.Mey. ex Nees	LC	Indigenous
Asteraceae	*Tolpis capensis*	(L.) Sch.Bip.	LC	Indigenous
Asphodelaceae	*Trachyandra erythrorrhiza*	(Conrath) Oberm.	LC	Indigenous; Endemic
Asphodelaceae	*Trachyandra saltii var. saltii*	(Baker) Oberm.	LC	Indigenous
Poaceae	*Trachypogon spicatus*	(L.f.) Kuntze	LC	Indigenous
Poaceae	*Tragus berteronianus*	Schult.	LC	Indigenous
Poaceae	*Tragus racemosus*	(L.) All.	LC	Indigenous
Zygophyllaceae	*Tribulus terrestris*	L.	LC	Indigenous
Fabaceae	*Trifolium africanum var. africanum*	Ser.	NE	Indigenous
Fabaceae	*Trifolium burchellianum subsp. burchellianum*	Ser.	LC	Indigenous
Fabaceae	*Trifolium pratense var. pratense*	L.	NE	Not indigenous; Naturalised
Alliaceae	*Tulbaghia acutiloba*	Harv.	LC	Indigenous
Alliaceae	*Tulbaghia leucantha*	Baker	LC	Indigenous
Alliaceae	*Tulbaghia sp.*			
Typhaceae	*Typha capensis*	(Rohrb.) N.E.Br.	LC	Indigenous
Asteraceae	*Ursinia nana subsp. leptophylla*	DC.	LC	Indigenous
Asteraceae	*Ursinia nana subsp. nana*	DC.	LC	Indigenous
Valerianaceae	*Valeriana capensis var. capensis*	Thunb.	LC	Indigenous
Verbenaceae	*Verbena brasiliensis*	Vell.		Not indigenous; Naturalised; Invasive
Verbenaceae	*Verbena rigida*	Spreng.		Not indigenous; Naturalised; Invasive
Plantaginaceae	*Veronica anagallis-aquatica*	L.	LC	Indigenous
Fabaceae	*Vigna luteola var. luteola*	(Jacq.) Benth.	LC	Indigenous
Fabaceae	*Vigna oblongifolia var. oblongifolia*	A.Rich.	LC	Indigenous
Fabaceae	*Vigna vexillata var. vexillata*	(L.) A.Rich.	LC	Indigenous
Campanulaceae	*Wahlenbergia undulata*	(L.f.) A.DC.	LC	Indigenous
Solanaceae	*Withania somnifera*	(L.) Dunal	LC	Indigenous
Apocynaceae	*Xysmalobium undulatum var. undulatum*	(L.) W.T.Aiton	LC	Indigenous
Asteraceae	*Zinnia peruviana*	(L.) L.		Not indigenous; Naturalised; Invasive
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	Willd.	LC	Indigenous
Rhamnaceae	*Ziziphus zeyheriana*	Sond.	LC	Indigenous
Fabaceae	*Zornia capensis subsp. capensis*	Pers.	LC	Indigenous

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus arundinaceus	Reed-warbler, Great	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Unlisted	LC
Acrocephalus palustris	Warbler, Marsh	Unlisted	LC
Acrocephalus schoenobaenus	Warbler, Sedge	Unlisted	LC
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC
Alcedo cristata	Kingfisher, Malachite	Unlisted	Unlisted
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Amadina erythrocephala	Finch, Red-headed	Unlisted	LC
Amandava subflava	Waxbill, Orange-breasted	Unlisted	Unlisted
Amaurornis flavirostris	Crake, Black	Unlisted	LC
Anas capensis	Teal, Cape	Unlisted	LC
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC
Anas hottentota	Teal, Hottentot	Unlisted	LC
Anas platyrhynchos	Duck, Mallard	Unlisted	LC
Anas smithii	Shoveler, Cape	Unlisted	LC
Anas sparsa	Duck, African Black	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anastomus lamelligerus	Openbill, African	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Anomalospiza imberbis	Finch, Cuckoo	Unlisted	LC
Anser anser	Goose, Domestic	Unlisted	LC
Anthropoides paradiseus	Crane, Blue	NT	VU
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus leucophrys	Pipit, Plain-backed	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC
Apus apus	Swift, Common	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea goliath	Heron, Goliath	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Ardeola ralloides	Heron, Squacco	Unlisted	LC
Arenaria interpres	Turnstone, Ruddy	Unlisted	LC
Asio capensis	Owl, Marsh	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC
Bubo africanus	Eagle-owl, Spotted	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Buteo rufofuscus	Buzzard, Jackal	Unlisted	LC
Buteo vulpinus	Buzzard, Common	Unlisted	Unlisted

Calandrella cinerea	Lark, Red-capped	Unlisted	LC
Calidris ferruginea	Sandpiper, Curlew	LC	NT
Calidris minuta	Stint, Little	LC	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Charadrius hiaticula	Plover, Common Ringed	Unlisted	LC
Charadrius marginatus	Plover, White-fronted	Unlisted	LC
Charadrius pallidus	Plover, Chestnut-banded	NT	NT
Charadrius pecuarius	Plover, Kittlitz's	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chersomanes albofasciata	Lark, Spike-heeled	Unlisted	LC
Chlidonias hybrida	Tern, Whiskered	Unlisted	LC
Chlidonias leucopterus	Tern, White-winged	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Ciconia ciconia	Stork, White	Unlisted	LC
Circus macrourus	Harrier, Pallid	NT	NT
Circus pygargus	Montagu's Harrier	Unlisted	LC
Circus ranivorus	Marsh-harrier, African	EN	LC
Cisticola aridulus	Cisticola, Desert	Unlisted	LC
Cisticola ayresii	Cisticola, Wing-snapping	Unlisted	LC
Cisticola cinnamomeus	Cisticola, Pale-crowned	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Cisticola textrix	Cisticola, Cloud	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Coracias garrulus	Roller, European	NT	LC
Corvus albus	Crow, Pied	Unlisted	LC
Corvus capensis	Crow, Cape	Unlisted	LC
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Coturnix coturnix	Quail, Common	Unlisted	LC
Creatophora cinerea	Starling, Wattled	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Crithagra flaviventris	Canary, Yellow	Unlisted	LC
Crithagra gularis	Seedeater, Streaky-headed	Unlisted	LC
Crithagra mozambicus	Canary, Yellow-fronted	Unlisted	LC
Cuculus solitarius	Cuckoo, Red-chested	Unlisted	LC
Cypsiurus parvus	Palm-swift, African	Unlisted	LC
Delichon urbicum	House-martin, Common	Unlisted	LC
Dendrocygna bicolor	Duck, Fulvous	Unlisted	LC
Dendrocygna viduata	Duck, White-faced Whistling	Unlisted	LC
Egretta alba	Egret, Great	Unlisted	LC
Egretta ardesiaca	Heron, Black	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Egretta intermedia	Egret, Yellow-billed	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC

Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC
Euplectes ardens	Widowbird, Red-collared	Unlisted	LC
Euplectes axillaris	Widowbird, Fan-tailed	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Eupodotis caerulescens	Korhaan, Blue	LC	NT
Falco amurensis	Falcon, Amur	Unlisted	LC
Falco rupicoloides	Kestrel, Greater	Unlisted	LC
Falco rupicolus	Kestrel, Rock	Unlisted	LC
Falco vespertinus	Falcon, Red-footed	NT	NT
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinago nigripennis	Snipe, African	Unlisted	LC
Gallinula angulata	Moorhen, Lesser	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Geronticus calvus	Ibis, Southern Bald	VU	VU
Glareola nordmanni	Pratincole, Black-winged	NT	NT
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Hirundo fuligula	Martin, Rock	Unlisted	Unlisted
Hirundo rustica	Swallow, Barn	Unlisted	LC
Hirundo spilodera	Cliff-swallow, South African	Unlisted	LC
Ixobrychus minutus	Bittern, Little	Unlisted	LC
Jynx ruficollis	Wryneck, Red-throated	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lanius minor	Shrike, Lesser Grey	Unlisted	LC
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC
Larus fuscus	Gull, Lesser Black-backed	Unlisted	LC
Lophaetus occipitalis	Eagle, Long-crested	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC
Megaceryle maximus	Kingfisher, Giant	Unlisted	Unlisted
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Motacilla flava	Wagtail, Western Yellow	Unlisted	LC
Muscicapa striata	Flycatcher, Spotted	Unlisted	LC
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Netta erythrophthalma	Pochard, Southern	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Nycticorax nycticorax	Night-Heron, Black-crowned	Unlisted	LC

Oena capensis	Dove, Namaqua	Unlisted	LC
Oenanthe monticola	Wheatear, Mountain	Unlisted	LC
Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Onychognathus morio	Starling, Red-winged	Unlisted	LC
Ortygospiza atricollis	Quailfinch, African	Unlisted	LC
Oxyura maccoa	Duck, Maccoa	NT	NT
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	LC
Phalacrocorax carbo	Cormorant, White-breasted	LC	LC
Philomachus pugnax	Ruff	Unlisted	LC
Phoenicopterus minor	Flamingo, Lesser	NT	NT
Phoenicopterus ruber	Flamingo, Greater	NT	LC
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC
Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC
Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC
Podiceps cristatus	Grebe, Great Crested	Unlisted	LC
Podiceps nigricollis	Grebe, Black-necked	Unlisted	LC
Porphyrio madagascariensis	Swamphen, African Purple	Unlisted	Unlisted
Prinia flavicans	Prinia, Black-chested	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Psophocichla litsipsirupa	Thrush, Groundscraper	Unlisted	Unlisted
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Rallus caerulescens	Rail, African	Unlisted	LC
Recurvirostra avosetta	Avocet, Pied	Unlisted	LC
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Rostratula benghalensis	Painted-snipe, Greater	NT	LC
Sagittarius serpentarius	Secretarybird	VU	VU
Sarkidiornis melanotos	Duck, Comb	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Scleroptila africanus	Francolin, Grey-winged	Unlisted	LC
Scleroptila levaillantii	Francolin, Red-winged	Unlisted	LC
Scleroptila levaillantoides	Francolin, Orange River	Unlisted	LC
Scopus umbretta	Hamerkop	Unlisted	LC
Serinus canicollis	Canary, Cape	Unlisted	LC
Sigelus silens	Flycatcher, Fiscal	Unlisted	LC
Spizocorys conirostris	Lark, Pink-billed	Unlisted	LC

Spreo bicolor	Starling, Pied	Unlisted	LC
Sterna caspia	Tern, Caspian	VU	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Tadorna cana	Shelduck, South African	Unlisted	LC
Telophorus zeylonus	Bokmakierie, Bokmakierie	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Tringa glareola	Sandpiper, Wood	Unlisted	LC
Tringa nebularia	Greenshank, Common	Unlisted	LC
Tringa stagnatilis	Sandpiper, Marsh	Unlisted	LC
Turdus smithi	Thrush, Karoo	Unlisted	LC
Turnix sylvaticus	Buttonquail, Kurrichane	Unlisted	LC
Tyto alba	Owl, Barn	Unlisted	LC
Upupa africana	Hoopoe, African	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
Zosterops virens	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)
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Alcelaphus buselaphus	Hartebeest	LC	LC
Amblysomus septentrionalis	Highveld Golden Mole	NT	NT
Antidorcas marsupialis	Sclater's Shrew	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Ceratotherium simum	White Rhinoceros	NT	NT
Connochaetes gnou	Black Wildebeest	LC	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura maquassiensis	Makwassie musk shrew	VU	LC
Cryptomys hottentotus	Common Mole-rat	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus pygargus	Blesbok	LC	LC
Dasymys incomtus	African Marsh rat	NT	LC
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Diceros bicornis	Black Rhinoceros	EN	CR
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Equus quagga	Plains Zebra	LC	NT
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hydrictis maculicollis	Spotted-necked Otter	VU	NT
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ichneumia albicauda	White-tailed Mongoose	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Kerivoula lanosa	Lesser Woolly Bat	LC	LC
Leptailurus serval	Serval	NT	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC
Mastomys natalensis	Natal Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC

Mus musculus	House Mouse	Unlisted	LC
Myotis welwitschii	Welwitsch's Hairy Bat	LC	LC
Mystromys albicaudatus	White-tailed Rat	VU	EN
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Ourebia ourebi	Oribi	EN	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	NT	NT
Phacochoerus africanus	Common Warthog	LC	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Procavia capensis	Rock Hyrax	LC	LC
Pronolagus saundersiae	Hewitt's Red Rock Rabbit	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC
Redunca fulvorufula	Mountain Reedbuck	EN	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Steatomys krebsii	Krebs's Fat Mouse	LC	LC
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Suricate	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Syncerus caffer	African Buffalo	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC
Thryonomys swinderianus	Greater Cane Rat	LC	LC
Tragelaphus oryx	Common Eland	LC	LC
Vulpes chama	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)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afroedura nivaria	Drankensberg Flat Gecko	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Boaedon capensis	Brown House Snake	LC	LC
Bradypodion ventrale	Eastern Cape Dwarf Chameleon	LC	LC
Causus rhombeatus	Rhombic Night Adder	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Crocodylus niloticus	Nile Crocodile	VU	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Duberria lutrix	Common Slug-eater	LC	LC
Hemachatus haemachatus	Rinkhals	LC	LC
Homoroselaps lacteus	Spotted Harlequin Snake	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Leptotyphlops scutifrons scutifrons	Peters' Thread Snake	LC	Unlisted
Lycodonomorphus inornatus	Olive House Snake	LC	LC
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Naja mossambica	Mozambique Spitting Cobra	LC	Unlisted
Pachydactylus affinis	Transvaal Gecko	LC	LC
Pachydactylus vansoni	VAN Son's Gecko	LC	LC
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis crucifer	Cross-marked Grass Snake	LC	LC
Psammophylax rhombeatus	Spotted Grass Snake	LC	Unlisted
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Pseudocordylus melanotus melanotus	Common Crag Lizard	LC	LC
Smaug giganteus	Giant Dragon Lizard	VU	VU
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis varia	Variable Skink	LC	LC
Varanus niloticus	Water Monitor	LC	Unlisted

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Amietia fuscigula	Common River Frog	LC	LC
Amietia poyntoni	Poynton's River Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Cacosternum nanum nanum	Bronze Caco	LC	LC
Hyperolius marmoratus	Painted Reed Frog	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Poyntonophrynus vertebralis	Southern Pygmy Toad	LC	LC
Ptychadena porosissima	Striped Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	LC	LC
Schismaderma carens	African Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys pusilla	Flatbacked Toad	LC	LC
Semnodactylus wealii	Rattling Frog	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Strongylopus grayii	Clicking Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC