Terrestrial biodiversity assessment – Pakwe Richards Bay Gas Power 3 CCPP, KwaZulu-Natal Province

EIA Phase

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Date: 14 April 2022

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EXECUTIVE SUMMARY

Rautenbach Biodiversity Consulting was appointed by Savannah Environmental (Pty) Ltd to undertake a terrestrial biodiversity assessment (EIA phase) for the proposed development of the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure within Phase 1F of the Richards Bay Industrial Development Zone. The extent of the project site is approximately 11,8 ha.

Phase 1F is ~ 191 ha in extent and the area was authorised for industrial development in 2016. The Environmental Authorisation included amongst others the following activities:

- Physical alteration of undeveloped, vacant, or derelict land for residential, retail, commercial, recreational, industrial, or institutional use where the total area to be transformed is 20 hectares or more, except where such physical alteration takes place for linear development activities; or agriculture or afforestation where activity 16 in the Schedule will apply; and
- The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.

Phase 1F has a longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services (i.e., water, sewer, stormwater, electricity, roads, installation of artificial drainage canals, and the infilling of wetland habitat to prepare the Phase for future development. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO^2 Pilot plant which covers approximately a third of the Phase. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds.

A two-phased approach was used to determine the conservation significance of the project site and surrounding landscape and included a comprehensive desktop review followed by site inspections. Desktop environmental sensitivities identified during the desktop review included:

- The location of the site within the Kwambonambi Hygrophilous Grassland ecosystem listed as **Critically Endangered**.
- The location of the project site within the Maputaland Wooded Grassland vegetation type listed as **Endangered**.
- The location of the project site within Subtropical Freshwater Wetlands listed as **Vulnerable**.
- The location of the project site within a NPAES focus area.
- The location of the project site within National, Provincial and District scale **CBA areas.**
- The location of the project site on areas zoned for conservation and corridors/linkages regarded as important areas for biodiversity conservation on municipal scale.

The above areas listed are all areas of national, provincial, district or municipal conservation significance considered important in terms of habitats, species, ecosystems, and ecosystem services conservation required to meet national, provincial, district and municipal conservation targets.

Site inspections were conducted from 21 – 23 February 2022 and observations on current impacts, fauna and flora species composition, general habitat condition, and habitat connectivity were documented during meandering and transect walks. Major impacts specific to the project site included land clearance to accommodate services infrastructure, infilling, and fragmentation (drainage canal construction; roads) of the wetlands which historically covered ~ 44 % of the site.

Based on floristic composition, vegetation structure and level of degradation, four plant communities were identified, and included *Digitaria natalensis – Parinari capensis* Grassland, *Ischaemum fasciculatum* Hygrophilous Grassland, Degraded areas, and a *Typha capensis – Phragmites australis* dominated drainage canal.

Following the infilling of the wetlands as per the authorisation issued in 2016, partial natural regeneration of the vegetation occurred on the infill area but resulted in a mosaic of terrestrial vegetation interspersed within hygrophilous grassland vegetation. Due to the mosaic nature of the vegetation, the vegetation community boundaries delineated were not precise but followed broad patterns.

Of the 131 flora species recorded during the field surveys, 23% (Maputaland Wooded Grassland), and 19% (Subtropical Freshwater Wetlands) are regarded as important floristic elements of these vegetation types by Mucina & Rutherford (2006).

Noteworthy observations included one species listed as Declining and provincial protected, i.e., *Crinum* cf. *stuhlmanniii* present in the *Digitaria natalensis – Parinari capensis* Grassland vegetation community, and four RSA endemics of which three species (*Raphionacme palustris, Helichrysum ruderale, Selago tarachodes*) were present in the *D. natalensis - P. capensis* Grassland, one in the *I. fasciculatum* Hygrophilous Grassland (*Roella glomerata*). All the endemics are listed as of Least Concern, with stable populations and no risk of extinction and occurred at very low abundance on the project site.

C. cf. *stuhlmannnii* is a suitable candidate for translocation and must be removed from the development footprint prior to construction site establishment and vegetation clearance to a suitable habitat. This species may not be removed/translocated without permit authorisation from Ezemvelo KZN Wildlife.

Seventeen percent of flora species recorded consisted of invasive and naturalized plants. Of these, 7 species are listed as Cat 1b or Cat 2 invasives. The rest of the indigenous species documented are all widespread and common in South Africa, with a conservation status of Least Concern.

None of the sensitive environmental features associated with the CR ecosystem (i.e., *Hyperolius pickersgilli, Centrobolus fulgidus*, *Doratogonus zuluensis*, *Centrobolus richardi, C. rugulosus, Kniphofia leucocephala*) was present since the project site does not offer suitable habitat. The project site is also not representative of its CBA status and none of the important biodiversity features associated with this CBA area were observed.

Few fauna species were observed and included four mammal, two frog, one reptile and 18 bird species. All the species are listed as of Least Concern with stable population numbers and no risk of extinction. No provincial protected species were recorded.

Red Listed fauna potentially present included two species listed as NT (i.e., *Poecilogale albinucha* & *Hemisus guttatus*) and one species listed as VU (*Falco biarmicus*). Following infilling of the wetland, partial natural regeneration of the vegetation on the infill areas occurred and currently this area is occupied by the rodent species *Otomys* cf. *angoniensis*. The project site therefore offers sufficient prey items to the specialist small mammal predator *P. albinucha* as well as for the raptor *F. biarmicus* which feeds predominantly on birds and small mammals. Removal of vegetation will result in a direct impact on the prey species by causing a decline of the local population because of habitat loss and may indirectly affect the abundance and distribution of *P. albinucha* and *F. biarmicus* in the area.

Unassisted recolonisation by *H. guttatus* may have occurred on the project site on the infilled areas following partial natural regeneration. This species is known to be present in the Richards Bay area but due to its cryptic and fossorial nature it is rarely encountered. The mechanical removal of topsoil and excavations may unearth *H. guttatus* and individuals are likely to get killed during this process.

Based on the confirmed presence of the Declining and provincial protected flora species, the potential occurrence of Red Listed flora species recorded during previous surveys within Phase 1F, and the potential occurrence of three Red Listed fauna species it was concluded that the project site is of Medium ecological sensitivity.

Many of the anticipated project-specific impacts during the construction and operational phases can be successfully mitigated to moderate, low, and minor levels of significance. A summary of the potential ecological impacts, without and with mitigation is summarised below:

	WITHOUT MITIGATION	WITH MITIGATION
CONSTRUCTION PHASE		
Permanent loss of habitat in sensitive environmental areas	Low (33)	Minor (16)
Loss of SCC flora	Moderate (55)	Minor (4)
Loss of SCC fauna	Low (39)	Low (33)
Loss/disturbance of local fauna populations	Moderate (55)	Moderate (50)
Noise & artificial light disturbance	Low (30)	Low (21)
Spread of IAPs & weeds	Moderate (48)	Minor (2)
Soil erosion and sedimentation	Moderate (52)	Minor (2)
Pollution of soils and habitat	Moderate (56)	Minor (10)
OPERATIONAL PHASE		
Spread of IAPs & weeds	Low (39)	Minor (2)
Loss/disturbance of local fauna populations and accidental mortalities	Moderate (52)	Low (33)
Noise and artificial light disturbance	Low (33)	Low (24)
Pollution of soils and habitat	Moderate (48)	Minor (16)

Within the context of cumulative impacts, even minor project-specific impacts may contribute to significant cumulative impacts over time. The project under consideration is located within areas recognized as of national, provincial, district or municipal conservation significance (VECs) considered important in terms of habitats, species, ecosystems, and ecosystem services conservation that are required to meet and contribute to national, provincial, district and municipal conservation targets. By adding the project specific impacts to other past, present, and reasonably foreseeable future actions affecting the same VECs it may contribute to the cumulative or 'nibbling losses' of these VECs.

A summary of the anticipated cumulative impacts on VECs is provided below:

CUMULATIVE IMPACTS	PROJECT IN ISOLATION (Post-mitigation)	CUMULATIVE IMPACTS
Permanent loss of habitat in sensitive environmental areas	Minor (16)	High (76)
Loss of SCC flora and associated habitat	Minor (4)	High (70)
Loss of SCC fauna and associated habitat	Low (33)	High (60)
Loss/disturbance of local fauna populations	Moderate (50)	High (70)
Artificial light disturbance	Low (24)	High (70)

The assessment of cumulative impacts within the context of the EIA process is significantly constrained by the lack of information with regards to historical impacts as well as future development pressure and therefore cannot adequately evaluate these 'nibbling effects'. Information used to inform the CIA for this report was limited to publicly available information and represented only a small fraction of the anticipated large-scale developments planned for uMhlathuze Municipality. The most recent SDF (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021) identified several development opportunities for the Richards Bay area associated with urban and industrial expansion. The limited space to accommodate the growth demand in the area will thus increase the conflict between conservation and development.

To successfully assess the loss of VECs within uMhlathuze Municipality, a strategic level approach (SEA) will be more suitable to identify and minimize potential cumulative impacts on the VECs that are required to meet biodiversity conservation targets, and to implement a municipal scale cumulative impact management strategy. Such an assessment is not the responsibility of the project proponent but must be conducted by the municipal/district/provincial authorities.

Recommendations

- To meet national, provincial and district conservation targets, conservation of a substantial portion of the remaining natural areas in the Municipality is required. It is therefore recommended that a Strategic level approach (SEA) to cumulative impacts will be more suitable to identify and minimize potential cumulative impacts on the VECs in the municipal area. Municipal/district/provincial authorities responsible for strategic planning, together with other stakeholders such as eZemvelo KZN Wildlife are in a better position to quantify and evaluate the cumulative impacts of the gradual environmental degradation over time and future development pressure within the context of the remaining natural habitat currently present in uMhlathuze Municipality. Such an assessment is not the responsibility of the project proponent.
- To compensate for the loss of VECs in the municipal area, the identification of potential opportunities for municipal level mitigation (i.e., biodiversity offsets), should be investigated by municipal/district/provincial authorities responsible for strategic planning, together with stakeholders such as eZemvelo KZN Wildlife.
- Phase 1F was rezoned and approved for industrial development in 2016 despite the presence of VECs of national, provincial, district and municipal conservation importance. Going forward, it is recommended that considering the large-scale developments planned for the municipality, any proposed land-use change and transformation prior to authorisation be viewed within the context of cumulative impacts on VECs, and not on individual project-based impacts alone.
- It is further recommended that should the development be approved, all the mitigation measures referred to in this report be incorporated into an Environmental Management Programme and stipulated as part of the requirements for environmental authorisation.

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ACRONYMS AND ABBREVIATIONS

ADU	Animal Demography Unit (Cape Town)
BGIS	Biodiversity Geographic Information System
BRAHMS	Botanical Research and Herbarium Management Software
CBA	Critical Biodiversity Areas
CITES	Convention on International Trade in Endangered Species of Fauna and Flora
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KZN Wildlife
ESA	Ecological Support Areas
GIS	Geographic Information System
ha	Hectares

IBA	Important Bird Area
IUCN	International Union for the Conservation of Nature
LUDS	Land Use Decision Support
masl	Meters above sea level
NBA	National Biodiversity Assessment
NEMBA	National Environmental Management Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
NR	Nature Reserve
PNR	Private Nature Reserve
QDGS	Quarter degree grid square
RAMSAR	Ramsar Convention on Wetlands of International Importance
RLE	Red List Ecosystems
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African Biodiversity Institute
SANLC	South Africa National Land Cover
SARCA	South African Reptile Conservation Assessment
SCC	Species of conservation concern
TOPS	Threatened or Protected Species
WWF	World Wildlife Fund

GLOSSARY OF TERMS

fauna	Mammals; reptiles; frogs; birds (this report)
herpetofauna	Reptiles and frogs (this report)
pentad	Five minutes of latitude by five minutes of longitude – i.e., squares with sides of roughly 9 km, one ninth the size of quarter degree grid cells.
poikilothermic	Vertebrates having a body temperature that varies with the temperature of the surroundings.

1. INTRODUCTION

1.1 Project details and background

Rautenbach Biodiversity Consulting was appointed by Savannah Environmental (Pty) Ltd to undertake a terrestrial biodiversity assessment (EIA phase) for the proposed development of the Phakwe Richards Bay Gas Power 3 CCPP and associated infrastructure within Phase 1F of the Richards Bay Industrial Development Zone.

The power plant will operate at mid-merit to baseload duty and will include the following main infrastructure:

- Up to 4 gas turbines for the generation of electricity using natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 20% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- Up to 4 Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- Up to 4 steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the RB IDZ stormwater system.
- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water (potential sourcing of alternative water outside RB IDZ supply (Municipality)).
- Water retention pond.
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines.
- Gas generator Lubrication Oil System.
- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, wastewater.
- Fire water (FW) storage and FW system.
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
  - Roads (access and internal).
  - Warehousing and buildings.
  - Workshop building.
  - Fire water pump building.
  - Administration and Control Building.
  - Ablution facilities.
  - Storage facilities.
  - Guard house.
  - Fencing.
  - Maintenance and cleaning area.
  - Operational and maintenance control centre.
- Electrical facilities including:

  - Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.
  - Generators and auxiliaries.
- Service infrastructure including:
  - Stormwater channels.
  - Water pipelines
  - Temporary work areas during the construction phase (laydown areas).

A dedicated pipeline to connect into an on-site gas receiving and conditioning station will provide the natural gas or the mixture of natural gas and hydrogen. The pipeline will be connected to the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed), or it will extend directly to the Regasification facilities in the RB Harbour. A separate EIA process will be undertaken for the dedicated fuel-supply pipeline.

A summary of the project components is provided below:

COMPONENT	DESCRIPTION/ DIMENSIONS
Location of the project site	Erven 16820, 16819 1/16674 and a subdivision of Erf 17442 within the Richards Bay IDZ Phase 1F, KwaZulu-Natal.
Landowner	Richards Bay Industrial Development Zone (IDZ), Phase 1F.
Municipal jurisdiction	King Cetshwayo District Municipality and the City of uMhlathuze Local Municipality.
Electricity generating capacity	2 000 MW (installed).
Proposed technology	Combined Cycle Gas Turbine Technology with associated Balance of Plant.
Extent of preferred project site	11.8 ha
Extent of the 2000MW PRBGP3 CCPP	Up to 11 ha
Stack dimensions (Site elevation: 43 - 47 m above mean sea)	• Exhaust and bypass stack height will be a minimum of 45 m up to 90 m (1 stack per Heat Recovery Steam Generator (HRSG) and one additional bypass for each gas turbine. • Diameter of each stack is expected to be approximately 9m.
Fuel sources	• Natural gas (LNG or similar) -2,218,407,840 (i.e., 2,218 million) normal m^3. • Mixture of Natural gas and Hydrogen.
Site access	The site will be accessed via existing roads within the IDZ Phase 1F (already approved through an EIA undertaken for the Phase 1F infrastructure) and internal access roads (width of up to 6 m) which will be constructed.
Grid connection	• Onsite substation (275kV or 400kV) • The Phakwe Richards Bay Gas Power 3 CCPP will be connected to the national grid via a 275kV or 400kV Eskom Switching Station and underground transmission cables that will connect to the selected Eskom grid connection point. An EIA process will be undertaken for the switching station and transmission line.
Water requirements	• The construction phase of the PRBGP3 plant will require 25 000m^3 of water for a period of 36-48 months. The average consumption will be approximately 550-700 m^3/month. Potable water is to be sourced from RB IDZ as part of the lease agreement conditions. • Water volumes of approximately 1 130 000 m^3 per annum are expected to be required for the operation of the plant. This amount to between 2790 and 3100 m^3/day which will be provided by the RB IDZ. • Water provided by RB IDZ will be sourced from the uMhlathuze Municipality Water Works. If the potential construction of a Umhlathuze Water treatment plant makes industrial water available in the future, this water could be considered as an alternative source of water during the operation of the plant.

COMPONENT	DESCRIPTION/ DIMENSIONS
Associated infrastructure	• Temporary laydown areas • Warehousing and buildings • Workshop building • Fire water pump building • Administration and Control Building • Ablution facilities • Storage facilities • Guard House • Fencing • Maintenance and cleaning area • Operational and maintenance control centre
Services required	The proposed project will be located within the Richards Bay IDZ 1F under a long-term lease. The Zone Operator / Landlord (RBIDZ) is responsible for all services required by Phakwe Richards Bay Gas Power 3 (Pty) Ltd (the tenant) under the long-term lease agreement. The RBIDZ lease agreement states: "Undeveloped land which is to be serviced by the Landlord to include bulk water, sewer, and electrical connections and a road external to the leased premises but within the RBIDZ. The Landlord will be responsible for the development of the Property as vacant developed land with services in place to the supply points installed by the Landlord near the boundary of the Property." In this regard, the following engineering services will be provided by the Landlord: • Water • Sewage • Roads • Storm water • Electricity; and • Refuse removal on a weekly basis by the uMhlathuze Municipality. Confirmation of services from the IDZ is included in the EIA
Raw/process-water storage reservoir	Water storage facilities will be located on site. This will include a raw water and fire water tank, demineralisation water tank and a tank for partially treated water.

1.2 Location

The proposed development will be located within Phase 1F of the Richards Bay Industrial Development Zone (RBIDZ), located approximately 5 km northeast of Richards Bay and 1 km north of the suburb of Alton (Figure 1).

Phase 1F is bordered by industrial and residential developments on the east, south and southwest, and plantations on the northwest. Most of Phase 1F was authorized by DEA in 2016 and zoned for the development of noxious industries. Within Phase 1F, the proposed development will be located next to the existing Tata Steel factory (Figure 2).

TABLE 1: Geographic details of the project site.

GPS COORDINATES	QDGS
Lat: -28.74309; Long: 32.02950 (taken from the centre of the project site)	2832 CA

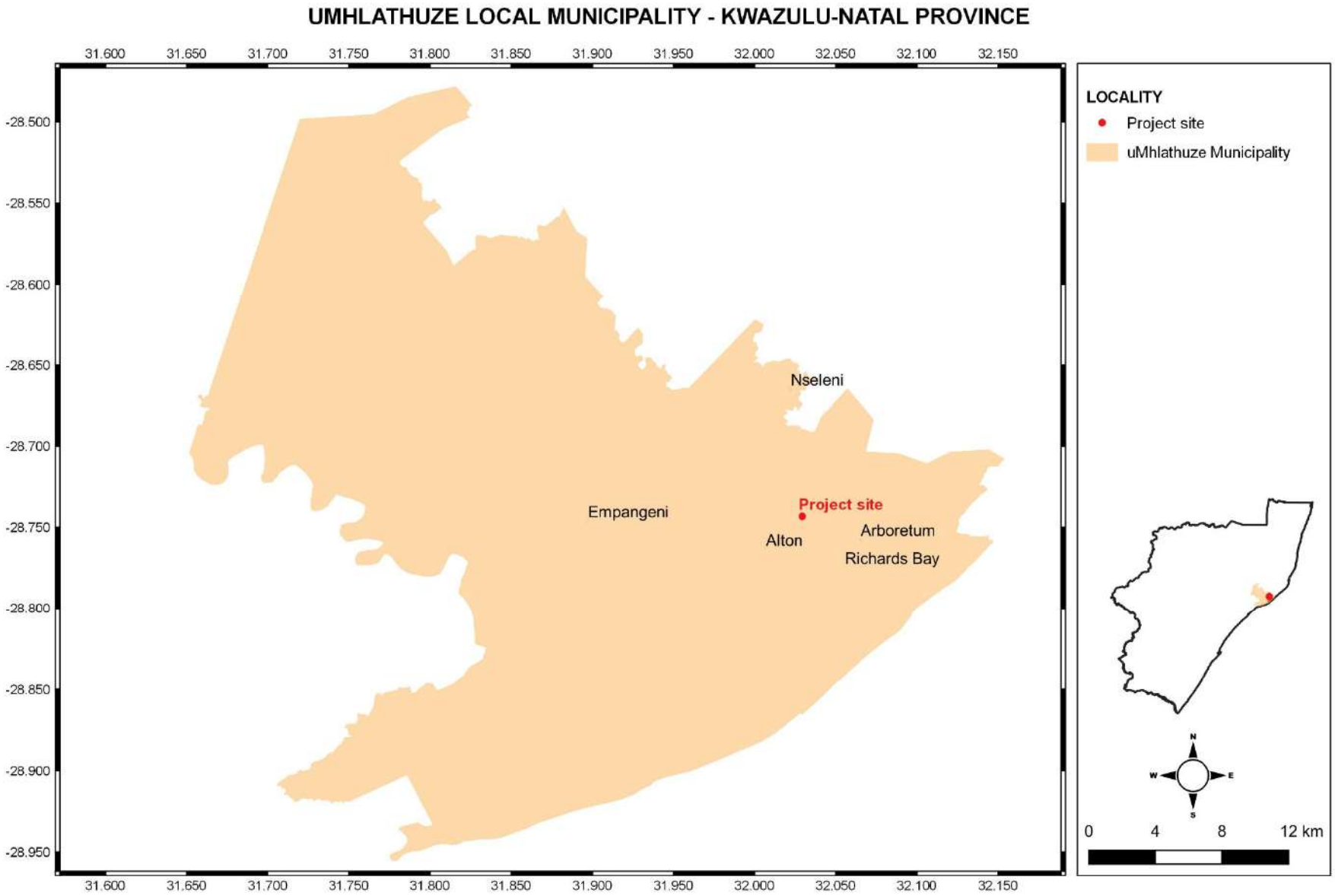


FIGURE 1: Locality of the project site in uMhlathuzi municipality in KwaZulu-Natal.

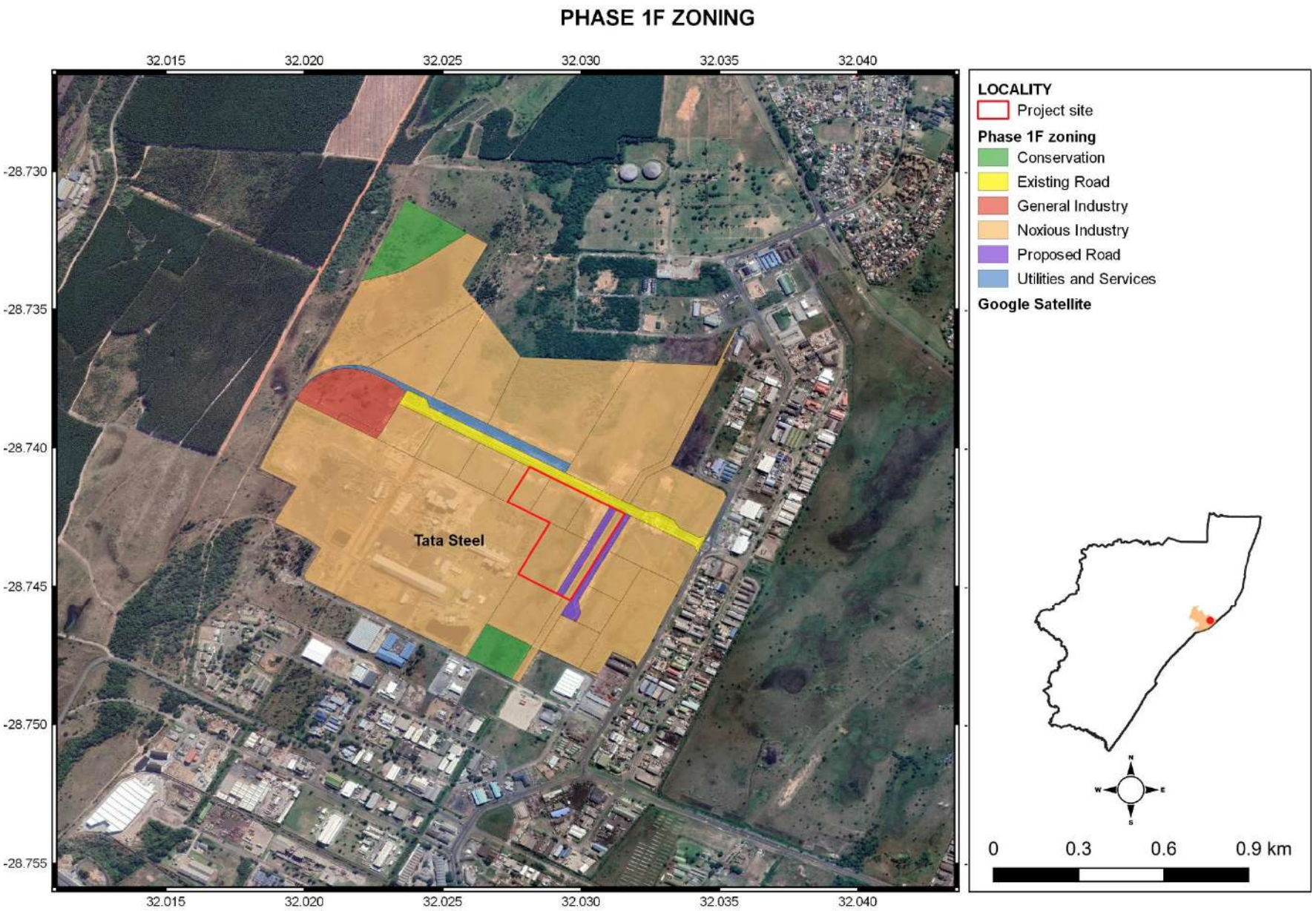


FIGURE 2: Location of the proposed development within Phase 1F.

1.3 Scope and objectives

Scope

- The purpose of this assessment was to determine the main issues and potential impacts the proposed development may have on the terrestrial biodiversity, vegetation, flora and fauna of the project site and surrounding landscape.

Objectives:

- To provide descriptions of the –
  - ecological drivers or processes of the area and how the proposed development will impact these.
  - significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas or freshwater ecosystem priority areas and sub-catchments.
  - main vegetation types of the area.
  - threatened ecosystems, as well as locally important habitat types.
  - ecological connectivity, habitat fragmentation, ecological processes, and
  - species, distribution, important habitats (e.g., feeding grounds, nesting sites, etc.).
- To conduct site inspections to –
  - identify any discrepancies with the current land use and the environmental *status quo* versus the environmental sensitivities identified on the national web based environmental screening tool, as well as provincial, district, and municipal scale conservation planning tools.
  - to provide lists of flora and fauna species that are present, and to identify species of conservation concern currently/potentially present.
  - the identification of no-go areas, where applicable; and
  - to determine the nature and extent of potential impacts (direct, indirect, cumulative) during the construction and operational phases.
- To provide mitigation measures and management recommendations to be included in the Environmental Management Programme.
- To identify any environmental fatal flaws or red flag issues.

2. APPROACH AND METHODOLOGY

A two-phased approach was used to determine the conservation significance of the project site and surrounding landscape which included a comprehensive desktop review followed by site inspections.

2.1 Desktop review

The purpose of the desktop review was to gather contextual information of the project site by using existing spatial information, information from past surveys, literature reviews, and database searches. This information was used to provide background information and assisted in the identification of sensitive terrestrial ecosystems, priority listed flora, vegetation and fauna occurring, or potentially occurring on the project site.

2.1.1 Legislative framework

It is widely recognised that it is of the utmost importance to conserve natural resources to maintain ecological processes and life support systems for plants, animals, and humans. To ensure that sustainable development takes place, it is therefore important that the environment is considered before the relevant authorities approve any development.

In South Africa, there are dedicated legal, policy and planning tools for biodiversity management and conservation, linked to broader environmental management on international, national, and provincial levels that secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and

social development. Table 2 lists key environmental legislation relevant to biodiversity conservation and management in KwaZulu-Natal that were taken into consideration during the assessment.

TABLE 2: Key legislation relevant to biodiversity and conservation management in KwaZulu-Natal.

INTERNATIONAL	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	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)
	National Environmental Management Act: Procedures for the assessment and minimum criteria for reporting of identified environmental themes when applying for environmental authorisation (G. 43310; GoN 320).
	Mountain Catchment Areas Act (Act No. 63 of 1970)
	National Forest Act (Act No. 84 of 1998)
	National Water Act (Act No. 36 of 1998)
	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
	National Environmental Management Biodiversity Act (No. 10 of 2004) Alien and Invasive Species Regulations, 2014
	Alien and Invasive Species Regulations (Act No 10. of 2004) Alien and Invasive Species Lists, 2016
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
PROVINCIAL	KwaZulu-Natal Nature Conservation Management Act (Act 29 of 1997)
	KwaZulu-Natal Nature Conservation Management Amendment Act (Act 5 of 1999)
	Natal Nature Conservation Ordinance 15 of 1974
MUNICIPAL	uMhlathuze Municipality SPLUM by-law April 2021

2.1.2 Biodiversity Plans and Guidelines

In addition to the legal requirements (Table 2), the following national and regional assessments, guidelines, draft notices, and bills were taken into consideration:

- South African National Biodiversity Assessment 2018: Technical Report. Volume 2b (van Deventer *et al.*, 2019).
- National Biodiversity Assessment 2018: Technical Report. Volume 1: Terrestrial Realm (Skowno *et al.*, 2019).
- Draft KwaZulu-Natal Biodiversity Spatial Planning Terms and Processes Version 3.3 (EKZNW 2016).
- Ezemvelo KZN Wildlife: Guideline: Biodiversity Impact Assessment in KwaZulu Natal (Version 2, February 2013).
- National Environmental Management Act (No. 107 of 1998): 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 [G 43310 – GB320]

- Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa Version 1 (2020).
- Ecosystem Environmental Assessment Guideline: Draft Guidelines for the implementation of the Terrestrial and Aquatic Ecosystem Protocols for environmental impact assessments in South Africa Draft – 5 July 2021.
- KwaZulu-Natal Systematic Conservation Plan (EKZNW 2012).
- UThungulu (now King Cetshwayo) District Municipality: Biodiversity Sector Plan, V2 (EKZNW 2014).
- King Cetshwayo District Municipality. Environmental Management Framework. Draft Baseline Report Public Review Version. June 2018. Prepared by EOH Coastal & Environmental Services.
- KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill, 2014 - Draft (KZNEBPA 2014)
- uMhlathuze Municipality Land-use Scheme Regulations (April 2021).
- uMhlatuze Municipality Spatial Development Framework (2017/2018 – 2021/2022).

2.1.3 Review of Past Surveys and Reports

The following research/reports relevant to the area under investigation was reviewed:

- Vegetation type conservation targets, status, and level of protection in KwaZulu-Natal in 2016 (Jewittt, 2018).
- Development of the Richards Bay combined cycle power plant (CCPP) and associated infrastructure on a site near Richards Bay, KwaZulu-Natal province (DEA reference number: 14/12/16/3/3/2/1123). Savannah Environmental Pty (Ltd).
- Vegetation and wetland status quo assessment for the proposed Nyanza Light Metals (Pty) Ltd. TiO_2 pilot plant within the RBIDZ Phase 1F, Richards Bay, KwaZulu-Natal. (DEDTEA Ref no: DC28/0011/2019 & KZN/EIA/0001161/2019). October 2019. Compiled by Exigent.
- Draft Scoping Report for the Richards Bay Industrial Development Zone – Phase 1F – Installation of Bulk Infrastructure Services, Richards Bay, KwaZulu-Natal (DEA Ref.no. 14/12/16/3/3/2/665). September 2014. Prepared by Nemai Consulting.
- Richards Bay Industrial Development Zone Phase 1F. Amended Environmental Impact Assessment Report (14/12/16/3/3/2/665). July 2016. Prepared by Nemai Consulting.
- Gas to Power Plant on a site within the Richards Bay Industrial Development Zone, KwaZulu-Natal Province. DEA Ref No: 14/12/16/3/3/2/867. Prepared by Savannah Environmental Pty Ltd.
- Phakwe Richards Bay Gas-To-Power 3 2000mw Combined Cycle Power Plant, Kwazulu Natal Province DFFE Ref. No.: 14/12/16/3/3/2/2117 Comments and Responses Report. January 2022.
- Terrestrial Biodiversity Assessment assessment for the development of a 2000 MW gas to power plant within Richards Bay IDZ phase 1F, KwaZulu-Natal. Scoping Phase. Prepared by Rautenbach Biodiversity Consulting.
- Application in terms of Section 27(1)(g) of the uMhlathuze Spatial Planning and Land Use Management By-Law, 2017, for: the consolidation of Erven 16672, 16675, and 17456, as Designated Erf 18554, and the consolidation of Erven 16786, 16787, 16788, 16789, as designated Erf 18575, Richards Bay. May 2021.

2.1.4 Terrestrial Biodiversity

A comprehensive desktop review was conducted to document all baseline biodiversity information for the project site. The conservation importance of the site was assessed on National, Provincial, District, and Municipal scales. Data sources reviewed is listed in Table 3.

TABLE 3: Data sources reviewed to inform the desktop assessment.

SPATIAL EXTENT	SOURCE	THEMES/FILE NAME	DESCRIPTION
NATIONAL	South African National Land-Cover 2020 (SANLC 2020)	Digital, GIS compatible South African National Land-Cover 2020 (SANLC 2020) dataset (final version) and associated metadata report.	Raster-based land-cover dataset representing the full South African landscape for the full year 2020. Derived from 20 m Sentinel 2 imagery acquired between 01 January 2020 and 31 December 2020.
	CDNGI Geospatial Portal	• NGI Aerial Photography	• The CD: NGI (Chief Directorate: National Geo-spatial Information) Geospatial Portal facility provides a Geographical User Interface (GUI) to view and download geospatial data. • The NGI Aerial Photography Tab Contains; Map Indexes, availability of digital photography (presented as photo centres and\or Flight Plans), WMS imagery and Map Mosaics, and Bing Maps. • The photography is arranged into three categories, i.e., Digital jobs (0.5 m and 0.25 m Colour imagery), 498 jobs (1:30 000 photography) Panchromatic imagery and Standard Jobs (Various photography scales).
	National Biodiversity Assessment 2018 (Volume 2b) Inland Aquatic (Freshwater) realm (www.sanbi.org)	• 2018 Artificial Wetlands [Vector] 2018, downloaded on 18 November 2019. • 2018 National Wetland Map 5 Confidence Map (Shapefile) [Vector] 2018, downloaded on 18 November 2019. • 2018 National Wetland Map 5 Ecosystem threat status and protection level [Vector] 2018, downloaded on 18 November 2019. • 2018 River ecosystem threat status and protection level (Shapefile) [Vector] 2018, downloaded on 18 November 2019.	• The NBA 2018 is the primary tool for reporting on the state of biodiversity in South Africa. It is used to inform policies, strategies, and activities for managing and conserving biodiversity more effectively. • The NBA showcases findings for the headline indicators of threat status and protection level for both ecosystems and species, and presents these findings across the terrestrial, inland aquatic, estuarine and marine realms, as well as for the coast and South Africa's sub-Antarctic territory. • New analyses in NBA 2018 include trend analyses for species threat status, an assessment of land cover change in the terrestrial environment, and an examination of potential ways to assess genetic diversity on a national scale.
	National Biodiversity Assessment 2018 (Terrestrial) (www.sanbi.org)	• 2018 Terrestrial ecosystem threat status and protection level - remaining extent [Vector] 2018, downloaded on 18 November 2019. • 2018 Terrestrial ecosystem threat status and protection level layer [Vector] 2018, downloaded on 18 November 2019.	

SPATIAL EXTENT	SOURCE	THEMES/FILE NAME	DESCRIPTION
	Threatened Terrestrial Ecosystems (2021 Red List of Ecosystems (RLE) for terrestrial realm for South Africa (www.sanbi.org)	• 2021 Red List of Ecosystems (RLE) for terrestrial realm for South Africa - remnants	• Polygon features, representing Red List of Ecosystems (RLE) for terrestrial realm for South Africa. This dataset contains the current remaining natural extent *(circa* 2018) of each of the 458 ecosystem types assessed.
	The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/SpatialDataset/Detail/18, Version 2018	National vegetation map (VEGMAP2018_AEA_V22_7_16 082019_Final)	• A map of all vegetation types within South Africa, Lesotho, and Swaziland. The National Vegetation Map Project (VEGMAP) is led and curated by the South African National Biodiversity Institute (SANBI), in collaboration with many experts and research institutes in the country. • In the latest update, there are 459 vegetation types, with a complete revision of the Thicket Biome, finer scale Forest and Succulent Karoo maps, removal of all wetlands, and coastal as well as estuarine integration included in the update. • Accompanying the map, are descriptions of each vegetation type, describing the vegetation characteristics, dominant taxa, and abiotic features of each vegetation type.
	South African protected and conservation areas (http://egis.environment.gov.za) South Africa Protected Areas Database (SAPAD_OR_2020_Q4). South Africa Conservation Areas Database (SACAD_OR_2020_Q4)	**Protected area types** • National parks • Nature Reserves • Special nature reserves • Mountain catchment areas • World heritage sites • Protected environments • Forest nature reserves • Forest wilderness areas • Marine protected areas **Conservation area types** • Biosphere reserves • Conservancies • RAMSAR sites • Botanical gardens	• GIS inventories of all protected and conservation areas in South Africa. • The database also includes data on privately owned protected areas. • The database is maintained and updated on a quarterly basis.
	DEA screening tool (https://screening.environment.gov.za/server/rest/services/screening/General_SensitivityLayers/MapServer/44)	• Aquatic biodiversity • Aquatic CBAs • Wetlands & Estuaries • Freshwater ecosystem priority areas • Rivers • Strategic water source areas • Plant species theme • Animal species theme • Terrestrial biodiversity theme • CBAs National	• The DEA screening tool is an online GIS screening tool that allows for the study of the environmental sensitivities of a chosen site with regards to a proposed activity or development. • This allows users to pre-screen a proposed development site for environmental impacts before applying for environmental authorisation.

SPATIAL EXTENT	SOURCE	THEMES/FILE NAME	DESCRIPTION
		• Indigenous forest patches • SA protected areas • Strategic water source areas • Threatened ecosystems (2011 dataset) • Freshwater ecosystems • Focus areas protected areas expansion (NPAES)	
	IBA areas	IBA Shapefile September 2015.shp	• Identification of important bird and biodiversity areas in South Africa.
	Threatened species no-go map (https://nogo.ewt.org.za/).	Interactive map (https://nogo.ewt.org.za/#shiny-tab-int_map	• A national scale application which informs prospective developers, Environmental Assessment practitioners and/or the general public about areas of very high sensitivity biodiversity importance based on threatened animal and plant data.
PROVINCIAL	2012 KwaZulu-Natal Systematic Conservation Plan (KZNSCP 2012 Terrestrial) (www.sanbi.org)	KZNSCP: Terrestrial Systematic Conservation Plan – EKZNW (2010) Minimum Selection Surface (MINSET). Unpublished GIS Coverage [tscp_minset_dist_2010_wll.zip].	• A provincial scale spatial biodiversity plan with the aim to guide conservation agencies in terms of protected area expansion by identifying priority areas for protected area expansion and consolidation, including priority areas for stewardship contracts with private and communal landowners, and to guide land-use planning and decision-making in other sectors by identifying critical biodiversity areas crucial for conserving a representative sample of biodiversity and maintaining ecosystem functioning.
DISTRICT	uThungulu Municipality (now King Cetshwayo) Biodiversity Sector Plan (KZNBPS 2014)	• KZN Proclaimed Stated protected areas not managed by Ezemvelo KZN Wildlife, 2016 • Local Corridors, 2014 • KZN CBA Irreplaceable, 2016 • KZN CBA Optimal, 2016 • KZN Community conservation areas, 2016 • KZN Ecological support areas, 2016 • KZN ESA for species, 2016 • KZN Ezemvelo Wildlife managed Protected Areas, 2016 • KZN Forest Wilderness area boundary, 2016 • KZN Landscape corridors, 2016 • KZN Private Nature Reserves, 2016 • KZN Stewardship sites, 2016 • KZN Vegetation types, 2011	• The Biodiversity Sector Plan that has been developed for the King Cetshwayo District as a precursor to a bioregional plan. • The purpose of a bioregional plan is to provide a map of biodiversity priorities (identified as Critical Biodiversity Areas and Ecological Support Areas) with accompanying land use planning and decision-making guidelines, to inform land use planning, environmental assessment, and authorisations as well as natural resource management by a range of sectors whose policies and decisions impact on biodiversity.

SPATIAL EXTENT	SOURCE	THEMES/FILE NAME	DESCRIPTION
MUNICIPAL	• City of uMhlathuze 2021 Land Use Scheme Viewer • City of uMhlathuze Spatial Viewer	• Land use zones • Rivers • Lakes • Dams • Rehabilitation areas • Vegetation • Wetlands • Natural forests	• A Municipal scale assessment that identifies areas, or landscapes, that are important for retaining habitat quality and connectivity simultaneously for multiple species or any other biodiversity features, thus providing a quantitative method for enhancing persistence of biodiversity in the long term.
	Land Use Decision Support (LUDS) Tools and Maps (https://bgis.sanbi.org/LUDS/Home/Municipality/117)	• Protected areas • Terrestrial ecosystems • Freshwater ecosystems	• An online tool available from SANBI's BGIS website created with the express intention of assisting environmental practitioners in performing a basic assessment. The user-friendly tool provides the user with the most relevant conservation plan or biodiversity dataset for each land parcel in South Africa.

2.1.5 Flora and Vegetation

Flora and vegetation distribution data for King Cetshwayo District were obtained from the following databases and information sources (Table 4).

TABLE 4: Literature sources and databases reviewed for flora and vegetation distributions and identifications.

The Vegetation of South Africa, Lesotho, and Swaziland	Mucina & Rutherford, 2006 vegetation descriptions; Mucina & Rutherford, 2006 - 2018 (vegetation delineation)
Spatial terrestrial biodiversity priority areas of South Africa	(priority.areas_shp) – ArcView shapefile
National Red List of Threatened Plants of South Africa	(Driver *et al.*, 2009)
Botanical database of Southern Africa	South African National Biodiversity Institute. 2016. Botanical Database of Southern Africa (BODATSA) [dataset]. doi: to be assigned.
The Global Biodiversity Information Facility (GBIF)	https://www.gbif.org/species/3577253
iNaturalist (KwaZulu-Natal checklist for plants)	https://www.inaturalist.org/
DEA screening tool (https://screening.environment.gov.za/server/rest/services/screening/General_SensitivityLayers/MapServer/44	Plant species theme
iSPOT nature	https://www.ispotnature.org/communities/southern-africa/observations
uThungulu Municipality Biodiversity Sector Plan (KZNBSP 2014)	District Municipalities: Biodiversity Sector Plan, V1.0 (www.sanbi.org)
Medicinal Plants traded on South Africa's Eastern Seaboard	von Ahleveldt *et al.*, 2003
A Field Guide to Wild Flowers of KwaZulu-Natal and the Eastern Region	Pooley, 2005
Guide to Grasses of Southern Africa	van Oudtshoorn, 2014
Identification guide to southern African grasses	Fish *et al.*, 2015
Problem Plants and Alien Weeds of South Africa	Bromilow, 2018
Trees of Southern Africa	Coates-Palgrave, 2002
Ferns of Southern Africa	Crouch *et al.*, 2011
Guide to trees introduced into Southern Africa	Glen *et al.*, 2016
People's Plants, a guide to useful plants of southern Africa	van Wyk *et al.*, 2018

2.1.6 Fauna

Fauna distribution data were obtained from various publications and field guides to ascertain which Red Listed species was historically recorded from King Cetshwayo District (Table 5).

Fauna

- **Mammals**

As many mammals are either secretive, nocturnal, hibernators and/or seasonal, distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of these species. This can be done with a high level of confidence, irrespective of season.

Since all mega-mammals and many of the large and medium sized ungulates and carnivores (i.e., elephants, rhino, buffalo, lions, sable antelope, roan antelope) have long since been extirpated by hunting, poaching, and anthropogenic disturbance, they can only be found in protected areas and was therefore not included in this assessment. In addition, all feral mammal species present/potentially present (e.g., house mice, house rats, dogs, and cats) were omitted from the assessment since these cannot be considered when estimating the conservation value of an area.

- **Herpetofauna (reptiles and frogs)**

As most reptiles and amphibians are secretive, poikilothermic, and/or nocturnal or seasonal; distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of species.

- **Avifauna**

Due to the inherent mobility of birds, it is important to consider avifauna not only on the project site, but also the avifauna beyond the site. The broader areas included bird distribution data from the following pentads: 2840_3155, 2840_3200, 2845_3155 and 2845_3200.

TABLE 5: Literature sources and databases reviewed for fauna distributions.

MAMMALS	HERPETOFAUNA	AVIFAUNA	INVERTEBRATES
The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005)	A *Guide to the Reptiles of Southern Africa* (Alexander & Marais, 2007)	Important Bird and Biodiversity Areas of South Africa (Marnewick *et al*., 2015)	DEA Screening Tool (https://screening.environment.gov.za/server/rest/services/screening/General_SensitivityLayers/MapServer/44) Animal species theme
Bats of Southern and Central Africa (Monadjem *et al*., 2010)	*A Complete guide to the Snakes of Southern Africa* (Marais, 2004)	*The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho, and Swaziland* (Taylor *et al*., 2015)	iNaturalist (https://www.inaturalist.org)
A Field Guide to the Tracks and Signs of Southern, Central and East African Wildlife (Stuart & Stuart, 2013)	*Atlas and Red List of Reptiles of South Africa, Lesotho, and Swaziland* (Bates *et al*., 2014)	Roberts VII Multimedia Birds of Southern Africa	Species Status Database SANBI - http://speciesstatus.sanbi.org
The 2016 Red List of Mammals of South Africa, Lesotho, and Swaziland (www.ewt.org.za)	*A Complete Guide to the Frogs of Southern Africa* (du Preez & Carruthers, 2009)	*Newman's Birds of Southern Africa* (Newman, 2010)	uThungulu Municipality Biodiversity Sector Plan (KZNBSP 2014)
ADU's MammalMap (mammalmap.adu.org.za)	*Atlas and Red Data Book of the Frogs of South Africa, Lesotho, and Swaziland* (Mintner *et al*., 2004)	*Roberts Birds of Southern Africa* (Hockey *et al.,* 2005)	MilliBase (https://www.millibase.org)
iNaturalist (https://www.inaturalist.org)	FrogMAP (frogmap.adu.org.za)	iNaturalist (https://www.inaturalist.org)	
iSPOT southern Africa (https://ispot.org.za/)	ReptileMAP (sarca.adu.org.za)	First and Second Southern African Bird Atlas Projects (http://sabap2.adu.org.za).	
DEA Screening Tool (https://screening.environment.gov.za/server/rest/services/screening/General_SensitivityLayers/MapServer/44) Animal species theme	iNaturalist (https://www.inaturalist.org)	iSPOT southern Africa (https://ispot.org.za/)	
uThungulu Municipality Biodiversity Sector Plan (KZNBSP 2014)	iSPOT southern Africa (https://ispot.org.za/)	DEA Screening Tool (https://screening.environment.gov.za/server/rest/services/screening/General_SensitivityLayers/MapServer/44) Animal species theme	
	DEA Screening Tool (https://screening.environment.gov.za/server/rest/services/screening/General_SensitivityLayers/MapServer/44) Animal species theme	Species Status Database SANBI - http://speciesstatus.sanbi.org	

MAMMALS	HERPETOFAUNA	AVIFAUNA	INVERTEBRATES
	Species Status Database SANBI - http://speciesstatus.sanbi.org	uThungulu Municipality Biodiversity Sector Plan (KZNBSP 2014)	
	uThungulu Municipality Biodiversity Sector Plan (KZNBSP 2014)		

2.1.7 Assessment methodology for species of conservation concern

The presence of species of conservation concern (SCC) is a measure of habitat quality and an indicator when setting conservation priorities. The conservation importance of species observed during the site inspections were evaluated according to the following categories:

Red List species

South Africa uses the internationally endorsed IUCN Red List categories and criteria to measure a species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action. Any species classified in the IUCN categories as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) is a threatened species. Threatened species are species that are facing a high risk of extinction. Species classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically/Extremely Rare, Rare, Declining and Data Deficient – Insufficient Information (DDD) have a high conservation importance in terms of preserving South Africa's high biodiversity. A summary of the South African Red List categories is provided below:

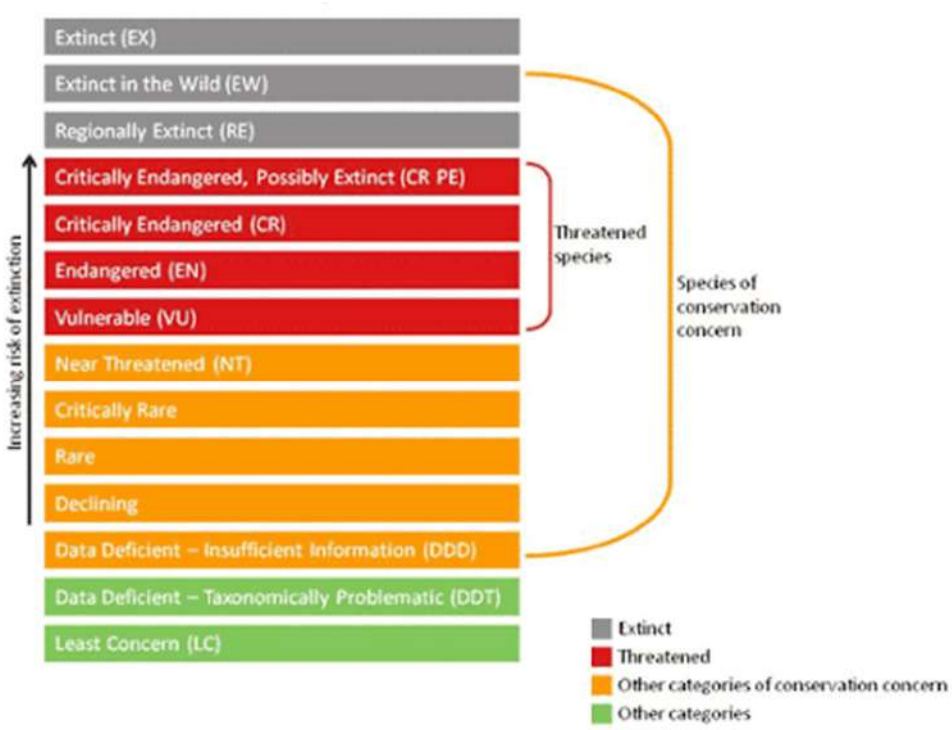


FIGURE 3: SA Red List categories.

Protected tree species under the National Forest Act (Act no 84 of 1998)

The list of protected tree species under the National Forest Act (Notice 155 of March 2021) was consulted. The listed species may not be cut, disturbed, damaged, or destroyed and no person may possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any

product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.

Provincial protected species

- **KZN Conservation Ordinance 15 of 1974**

Restrictions and requirements with regards to activities relating to the species listed is outlined in Sections 34 – 58 of the Ordinance.

- Schedule 2 – Protected game
- Schedule 3 – Specially protected game
- Schedule 7 – Protected amphibians, invertebrates, and reptiles
- Schedule 9 – Specially protected birds
- Schedule 11 – Protected Indigenous plants
- Schedule 12 – Specially protected indigenous plants

- **KZN Nature Conservation Management Amendment Act, 1999 (No. 5 of 1999)**
  - Schedule 4 – Specially protected indigenous animals
  - Schedule 5 – Protected indigenous animals
  - Schedule 6 – Specially protected indigenous plants
  - Schedule 7 – Protected indigenous plants

- **KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill (Draft - 2014)**
  - Schedule 3 – Protected animal species. Restricted activities include the following: Destroy, degrade or alter habitat in a way that causes or is likely to cause significant decline in the number of individuals of the species there; possess, breed, sell, make available for sale or otherwise trade in, buy, receive, give, donate or accept as a gift, or in any way acquire or dispose of, capture, collect, immobilise, kill, translocate, release, display, export, import or keep in captivity.
  - Schedule 4 – Restricted use protected animal species. Restricted activities include the following: Hunt, possess, breed, sell, make available for sale, or otherwise trade in, buy, receive, give, donate or accept as a gift, or in any way acquire or dispose of, capture, collect, immobilise, kill, translocate, release into the environment, display, export, import or keep in captivity.
  - Schedule 5 – Restricted use animal species. Restricted activities include the following: Hunt, release into the environment, keep in captivity, sell, make available for sale, or otherwise trade in, buy, receive, give, donate or accept as a gift, or in any way acquire or dispose of, capture, collect, immobilise, kill, translocate, display, export, import.
  - Schedule 7 – KwaZulu-Natal threatened plant species. Restricted activities involving wild or wild sourced specimens: Harvest, gather, collect, transport, convey, import, or export, have in possession or exercise physical control over or wilfully damage or destroy. Grow, breed or in any other way propagate or cause to multiply for commercial purposes, sell, trade in or buy Restricted activities requiring a permit involving artificially propagated specimens: Have in possession or exercise physical control over, transport, convey, import or export from the province. Sell or trade-in, grow, breed or in any other way propagate, for commercial purposes.
  - Schedule 8 – KwaZulu-Natal protected plant species. Restricted Activities requiring a permit involving wild or wild sourced plant specimens: harvest, gather, collect, transport, convey or export, sell, trade in.

Endemic/near-endemic species

Endemic and near-endemic species generally have restricted distributions and are often highly adapted to their home range; consequently, threats to endemics carry a higher risk of extinction than for broadly distributed species.

Although many of these species have wide distributional ranges within the region and have a conservation status of Least Concern, with some ranking among our most widespread and abundant (i.e., Cape White-eye), all endemic/near-endemic species require some vigilance to ensure that their population numbers stay stable.

Sensitive species

Species were also evaluated in terms of CITES agreements. CITES is an international agreement between governments that aims to ensure the international trade in specimens of wild fauna and flora does not threaten their survival. Appendices I, II and III of the Convention are lists of species afforded different levels of protection from over-exploitation. The CITES categories is summarized below:

Appendix I	Species threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial (see Article III of the Convention), for instance for scientific research. In these exceptional cases, trade may take place provided it is authorized by the granting of both an import permit and an export permit (or re-export certificate). Article VII of the Convention provides for several exemptions to this general prohibition.
Appendix II	Species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. It also includes so-called "look-alike species", i.e., species whose specimens in trade look like those species listed for conservation reasons (see Article II, paragraph 2 of the Convention). International trade in specimens of Appendix II species may be authorized by the granting of an export permit or re-export certificate. No import permit is necessary for these species under CITES (although a permit is needed in some countries that have taken stricter measures than CITES requires). Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, above all that trade will not be detrimental to the survival of the species in the wild (See Article IV of the Convention).
Appendix III	Species included at the request of a party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation (see Article II, paragraph 3, of the Convention). International trade in specimens of species listed in this Appendix is allowed only on presentation of the appropriate permits or certificates (See Article V of the Convention).

2.1.8 Alien and Invasive Plants

Invasive alien plants (IAPs) are widely considered as a major threat to biodiversity, human livelihoods, and economic development. On 1 August 2014, the Minister of Environmental Affairs published the Alien and Invasive Species Regulations which came into effect on the 1st of October 2014 in a bid to curb the negative effects of IAPs and other alien invasive species. An updated set of Invasive Species Lists (as per the NEMBA Regulations) was published on 18 September 2020.

The Regulations call on landowners and sellers of land alike to assist the Department of Environmental Affairs to conserve our indigenous fauna and flora and to foster sustainable land use. Non-adherence to the Regulations by a landowner or seller of land can result in a criminal offence punishable by a fine of up to R5 million (R10 million in the case of a second offence) and/or a period of imprisonment of up to 10 years. IAPs are classified into four different categories and are described below:

IAP CATEGORY	DESCRIPTION
1a	A person in control of a Category 1a listed invasive species must – • Comply with the provisions of Section 73(2) of the Act. • Immediately take steps to combat or eradicate listed invasive species in compliance with Sections 75(1), (2) and (3) of the Act. • Allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species. • If an Invasive Species Management Programme has been developed in terms of Section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
1b	• A person in control of a Category 1b listed invasive species must control the listed invasive species in compliance with Sections 75(1), (2) and (3) of the Act. • If an Invasive Species Management Programme has been developed in terms of Section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme. • A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in Section 75(4) of the Act.

2	• Species listed by notice in terms of Section 70(1) (a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. • Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 listed Invasive Species without a permit. • A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit must ensure that the specimens of the species do not spread outside of the land, or the area specified in the Notice or permit. • If an Invasive Species Management Programme has been developed in terms of Section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme. • Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, considered a Category 1b Listed Invasive Species and must be managed according to Regulation 3. • Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.
3	• Any plant species identified as a Category 3 listed invasive species that occurs in riparian areas, must, for the purposes of these regulations, consider it to be a Category 1b listed invasive species and must be managed according to Regulation 3. • If an Invasive Species Management Programme has been developed in terms of Section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

2.2 Site Inspections

Site inspections was conducted from 21 – 23 February 2022. Two survey techniques were used to sample the flora species composition and included random meanders and systematic transects. Random meanders covered areas that were likely to have rare taxa based on habitat condition and involved walking randomly through an area and noting each new species. This method is particularly useful for locating small habitat features. In addition to the random meanders, a series of roughly parallel transects (systematic transects) were walked to maximise the coverage of the area. During the meanders and transects, a floristic inventory was compiled while walking slowly through the area and documenting all taxa encountered.

Concurrent with the meanders and transects, observations were made on fauna species composition, and all direct (visual observations; call identification) and indirect (tracks, signs, scats) observations as well as observations on current impacts, general habitat condition, and habitat connectivity were documented. The area and surrounding natural landscape were also evaluated in terms of suitable habitat for Red Listed fauna and flora.

2.3 Potential Occurrences

Following the site inspections, this section involved collating current vegetation and habitat characteristics/condition and literature relevant to Red Listed flora and fauna habitat preferences and distributions to draw up lists of Red Listed flora and fauna likely to be present. Parameters used to assess likelihood of occurrence were evaluated according to the following criteria:

PARAMETER	DESCRIPTION
Habitat requirements	Most Red Listed species have specific habitat requirements; the presence of these habitats on the project site and surrounding landscape were evaluated.
Habitat status	The ecological condition of available habitat on the project site and surrounding landscape.
Habitat linkage	The connectivity of the project site to surrounding habitats and the adequacy of these linkages.
Geographic distribution of species	i.e., Municipal, provincial, national.

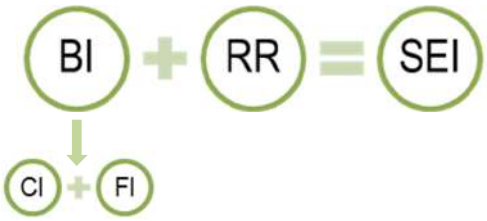
The estimated likelihood of occurrence was then presented in the following categories:

CATEGORY	DESCRIPTION
High (71–100%)	Applicable to Red Listed species with a distributional range overlying the project site and the surrounding landscape as well as the presence of prime habitat. A further consideration included in this category was for a species to be common, abundant, and widespread.
Medium (41-70%)	A species with its distributional range peripherally overlying the project site and the surrounding landscape; or required habitat on the project site and surrounding landscape being sub-optimal; the size of the areas as it relates to its likelihood to sustain a viable breeding population, as well as its geographical location. These species normally do not occur at high population numbers but cannot be considered as rare.
Low (0–40%)	Applicable to species with its distributional range peripheral to the project site and the surrounding landscape, and habitat that was sub-optimal. These species are rare.

2.4 Assessment of Site Ecological Importance

The evaluation of the ecological importance of the project site and surrounding landscape was evaluated according to the procedures for the assessment and reporting of impacts on terrestrial biodiversity, flora and fauna species for activities requiring environmental authorisation as published under the National Environmental Management Act, 1998 (Act No. 107 of 1998): *Procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of section 24(5)(a) and (h) of the National Environmental Management Act, 1998, when applying for environmental authorisation* [*G. 43855 – GoN 1150*]; SANBI's *Species Environmental Assessment Guidelines. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa*, and the *Draft Ecosystem Environmental Assessment Guidelines*. The methodology is outlined below:

The ecological importance of an area (i.e., site ecological importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC species, vegetation/flora, fauna communities present) and its resilience to impacts (Receptor Resilience). BI in turn is a function of the Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows:



CI refers to the importance of an area for supporting biodiversity features of conservation concern present, while the FI refers to the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts. The criteria for determining CI and FI are provided in Tables 6 and 7, respectively.

TABLE 6: Conservation importance (CI) criteria.

CONSERVATION IMPORTANCE	CRITERIA
Very High	**Fauna & flora:** • Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km^2. • Globally significant populations of congregatory species (> 10% of global population). **Terrestrial biodiversity:**

CONSERVATION IMPORTANCE	CRITERIA
	• Any area of natural habitat[1] of a CR ecosystem type; or a large area (> 0.1 % of the total ecosystem type extent) of natural habitat of EN ecosystem type. • Areas identified on the DEA screening tool as of Very High sensitivity for terrestrial biodiversity features.
High	**Fauna & flora:** • Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. • Presence of Rare species. • Globally significant populations of congregatory species (> 1% but < 10% of global population). **Terrestrial biodiversity:** • Small area (>0.01 % but < 0.1 % of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1 %) of natural habitat of VU ecosystem type.
Medium	**Fauna & flora:** • Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. • Presence of range-restricted species. • > 50% of receptor contains natural habitat with potential to support SCC. **Terrestrial biodiversity:** • Any area of natural habitat of threatened ecosystem type with status of VU.
Low	**Fauna & flora:** • No confirmed or highly likely populations of SCC. • No confirmed or highly likely populations of range-restricted species. **Terrestrial biodiversity:** • < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	**Fauna & flora:** • No confirmed and highly unlikely populations of SCC. • No confirmed and highly unlikely populations of range-restricted species. **Terrestrial biodiversity:** • No natural habitat remaining.

TABLE 7: Function integrity (FI) criteria.

FUNCTIONAL INTEGRITY	CRITERIA
Very High	• Very large (>100 ha) intact area for any conservation status of ecosystem type or >5 ha for CR ecosystem types. • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. • No or minimal current negative ecological impacts with no signs of major past disturbance (e.g., ploughing).
High	• Large (>20 ha but <100 ha) intact area for any conservation status of ecosystem type or >10 ha for EN ecosystem types. • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. • Only minor current negative ecological impacts (e.g., few livestock utilising area) with no signs of major past disturbance (e.g., ploughing) and good rehabilitation potential.
Medium	• Medium (>5 ha but <20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. • Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches.

[1] Excluding areas of transformed habitat within a defined ecosystem even if these are partially restored, e.g., Highveld grasslands that have been converted to maize fields and then abandoned so that some form of functional grassland is restored; this is not natural habitat as it does not and will not in the future have species composition representative of the original natural habitat.

	• Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien and invasive flora) and a few signs of minor past disturbance; moderate rehabilitation potential.
Low	• Small (>1 ha but <5 ha) area. • Almost no habitat connectivity but migrations still possible across some transformed or degraded natural habitat and a very busy used road network surrounds the area. • Low rehabilitation potential. • Several minor and major current negative ecological impacts.
Very Low	• Very small (<1 ha) area. • No habitat connectivity except for flying species or flora with wind-dispersed seeds. • Several major current negative ecological impacts

The Biodiversity Importance (BI) of the feature investigated was then derived from the following matrix:

BIODIVERSITY IMPORTANCE (BI)		**CONSERVATION IMPORTANCE (CI)**				
		Very High	**High**	**Medium**	**Low**	**Very Low**
FUNCTIONAL INTEGRITY (FI)	**Very High**	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

The Receptor Resilience was evaluated according to the following criteria:

TABLE 8: Receptor resilience (RR) criteria.

RECEPTOR RESILIENCE	**CRITERIA**
Very High	• Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality. • Species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring. • Species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	• Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor. • Species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring. • Species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	• Habitat that will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor. • Species that have a moderate likelihood of remaining at a site even when a disturbance or • impact is occurring. • Species that have a moderate likelihood of returning to a site once the disturbance or impact has • been removed.
Low	• Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor. • Species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring. • Species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	• Habitat that is unable to recover from major impacts. • Species that are unlikely to remain at a site even when a disturbance or impact is occurring. • Species that are unlikely to return to a site once the disturbance or impact has been removed.

Following the evaluation of the BI and the RR, the final SEI for the feature investigated was then derived from the following matrix:

SITE ECOLOGICAL IMPORTANCE (SEI)		BIODIVERSITY IMPORTANCE (BI)				
		Very High	**High**	**Medium**	**Low**	**Very Low**
RECEPTOR RESILIENCE (RR)	**Very Low**	Very High	Very High	High	Medium	Low
	Low	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	High	High	Medium	Low	Very Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

The SEI were subsequently interpreted according to the criteria provided in Table 9:

TABLE 9: SEI interpretation criteria

SITE ECOLOGICAL IMPORTANCE	INTERPRETATION
Very High	Avoidance mitigation - No destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages. Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimization mitigation – Changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimization & restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimization & restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimization mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required.

SEI for all receptors were combined and the maximum SEI per receptor was selected. The final combined SEI were mapped to indicate ecological sensitive areas.

2.5 Impact Assessment

The purpose of impact assessment was to determine the main issues and potential impacts the proposed development may have on the terrestrial biodiversity of the area and included:

- The identification of sensitive environmental features that may be impacted on by the proposed development.
- The identification of 'No-Go' areas where applicable.
- Direct, indirect and cumulative impacts of the issues identified during the scoping study, and other issues identified in the EIA phase were assessed in terms of the criteria provided in Appendix 1.

3. LIMITATIONS AND ASSUMPTIONS

The following limitations applied to the studies undertaken for this report:

- This report deals exclusively with the defined area and the potential impacts associated with the land use change on the terrestrial biodiversity, vegetation, flora, and fauna.
- Due to the dynamic nature of ecosystems, there is the likelihood that some aspects (of which some may be important) may have been overlooked. Terrestrial biodiversity assessments usually extend over several seasons or years to obtain long-term and significant ecological data that considers the impacts of

unusual/abnormal conditions prevailing on an area. Due to time and budget constraints such long-term studies are unrealistic for this project and conclusions are therefore drawn from data collected over a much shorter time period.

- The assessment of potential impacts was informed by site-specific environmental conditions at the time of the site visit and ecological concerns based on the investigator's working knowledge and experience with similar projects.
- This assessment excluded any assessments of wetlands or aquatic ecosystems.
- Information used to inform the assessment was limited to data and GIS coverage's available for the province at the time of the assessment.
- Information available from databases accessed (i.e KZN environmental data in particular) are outdated and may not be reflective of current environmental conditions.
- The LUDS maps and associated information for uMhlathuze Municipality (SANBIs BGIS LUDS tool) is limited to the 2011 municipal boundary. The municipality was enlarged at the time of the South African municipal election, 2016 when part of the disbanded Ntambanana Local Municipality was merged into it. The information provided in the LUDS analyses is thus outdated.

4. RESULTS

4.1 Desktop Assessment

4.1.1 Biophysical Environment

A summary of the general biophysical environment relevant to the project site is provided below:

Elevation	40 – 44 m asl.
Climate	• Hot and humid subtropical climate. • Average daily maximum temperatures range from 29º C in January to 23º in July. • Summer rainfall area, mostly from October – March. • Average rainfall ~ 1 228 mm annually.
Geology	Underlain by redistributed Quaternary sandy and clayey soils that blanket the coastal section.
Soils	Imperfectly drained sandy soils, with favourable water-holding properties, and high erodibility.
Biome	Indian Ocean Coastal Belt
National vegetation type	Maputaland Wooded Grassland
Provincial vegetation type	• Maputaland Wooded Grassland • Subtropical Freshwater wetlands

4.1.2 Baseline Environmental Sensitivities

Table 10 provides a summary of sensitive environmental features relevant to the project site and surrounding landscape that were identified during the desktop assessment. Significant themes are discussed and mapped below.

TABLE 10: Baseline desktop environmental sensitivities relevant to the project site.

THEME	RELEVANCE
Threatened Terrestrial Ecosystems	Present
Threatened Vegetation Types	Present
Protected/Conservation Areas	Present
Terrestrial CBA areas	Present
Sensitive aquatic ecosystems	Present
Landscape/Local Corridors	Limited

THEME	RELEVANCE
Municipal scale conservation zones	Present
Red Listed fauna and flora	Potential Occurrences

4.1.2.1 Threatened Terrestrial Ecosystems

The mapping of threatened ecosystems was informed by the first list of Threatened Terrestrial Ecosystems for South Africa that was gazetted on 9 December 2011 and which delineated the historical extent of threatened ecosystems. This ecosystem delineation was based on the 435 national vegetation types published in 2006 (Mucina & Rutherford, 2006 vegetation delineation); National Forest Types (DWAF), priority areas identified in provincial Systematic Biodiversity Plans, and high irreplaceability forest patches or clusters systematically identified by DWAF.

Since 2006, various refinements and changes were made to the national vegetation map and included numerous boundary changes. The NBA 2018 terrestrial ecosystem assessment focused purely on the latest update of the National Vegetation map (2018 vegetation delineations, i.e., 458 vegetation types delineated) and did not consider special habitats identified from various provincial fine scale planning projects as was done during the NBA 2011 assessment.

Updates of this list was published in 2020, together with a dataset containing only the remaining (remnants) natural areas of threatened ecosystems. In 2020 further updates were applied to this dataset and review comments by conservation authorities were incorporated. This version was approved for public comment (by the National Department of Forestry Fisheries and the Environment and the Provincial Environmental Departments) in June 2021.

Although the 2018 assessment of ecosystem threat status represents the best available science, the 2011 published list of threatened terrestrial ecosystems remains the official National List of Ecosystems that are Threatened and in Need of Protection. Important to understand is that the 2018 Red Listed Ecosystem assessment cannot be compared with the 2011 National List of Threatened Ecosystems due to different dataset inputs and threat assessment methodologies.

The data summarized in Table 11 and displayed in Figures 4 & 5 are extracts from the 2011 dataset, and the remnants dataset from 2018.

From a municipal scale perspective, the LUDS data available through the SANBI BGIS website was reviewed since this tool provide statistics for a selection of biodiversity features (i.e., extent of a feature such as threatened ecosystems within the municipal boundaries). Note that the LUDS map for the uMhlathuze Municipality and the associated information was based on the 2011 municipal demarcations for the Municipality. Data extracted for terrestrial ecosystem extent in the municipal area is presented in Table 11 and Figure 6.

TABLE 11: Threatened Terrestrial Ecosystems summary

DATASET	ECOSYSTEM NAME	THREAT STATUS	SENSITIVE BIODIVERSITY FEATURES	EXTENT OF ECOSYSTEM ON PROJECT SITE (ha)
List of Threatened and Terrestrial Ecosystems (2011; DEA Screening Tool)	Kwambonambi Hygrophilous Grassland (Ecosystem extent ~ 340 km^2).	**Critically Endangered**	• *Hyperolius pickersgilli* • *Centrobolus fulgidus* • *Centrobolus richardi* • *Centrobolus rugulosus* • *Doratogonus zuluensis* • *Kniphofia leucocephala* • KwaZulu-Natal Coastal Forest • KwaZulu-Natal Dune Forest • Mangrove Forest	~ 11,8

DATASET	ECOSYSTEM NAME	THREAT STATUS	SENSITIVE BIODIVERSITY FEATURES	EXTENT OF ECOSYSTEM ON PROJECT SITE (ha)
			• Maputaland Wooded Grassland • Maputaland Coastal Belt • Swamp Forest	
NBA 2018 – remnants (NBA 2018)	Maputaland Wooded Grassland (EOO ~ 4 879 km^2).	**Endangered**	None listed	~ 9,63
Threatened Terrestrial ecosystems (LUDS tool)	Kwambonambi Hygrophilous grassland (Ecosystem extent in uMhlathuze Municipality – 12 205,1 ha)	**Critically Endangered**	Kwambonambi Hygrophilous Grassland	~ 11,72

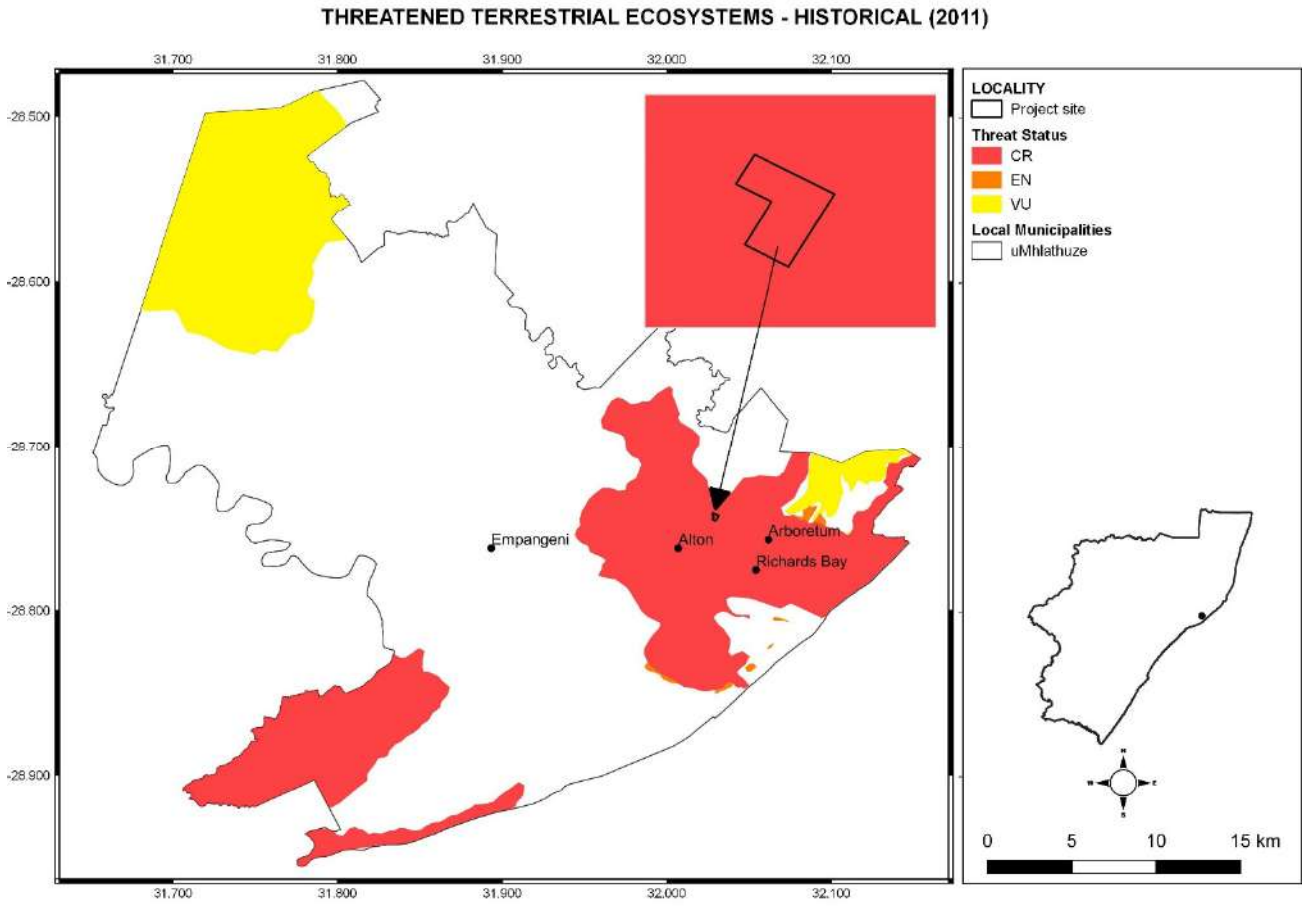


FIGURE 4: Historical extent of threatened terrestrial ecosystems in uMhlathuze Municipality.

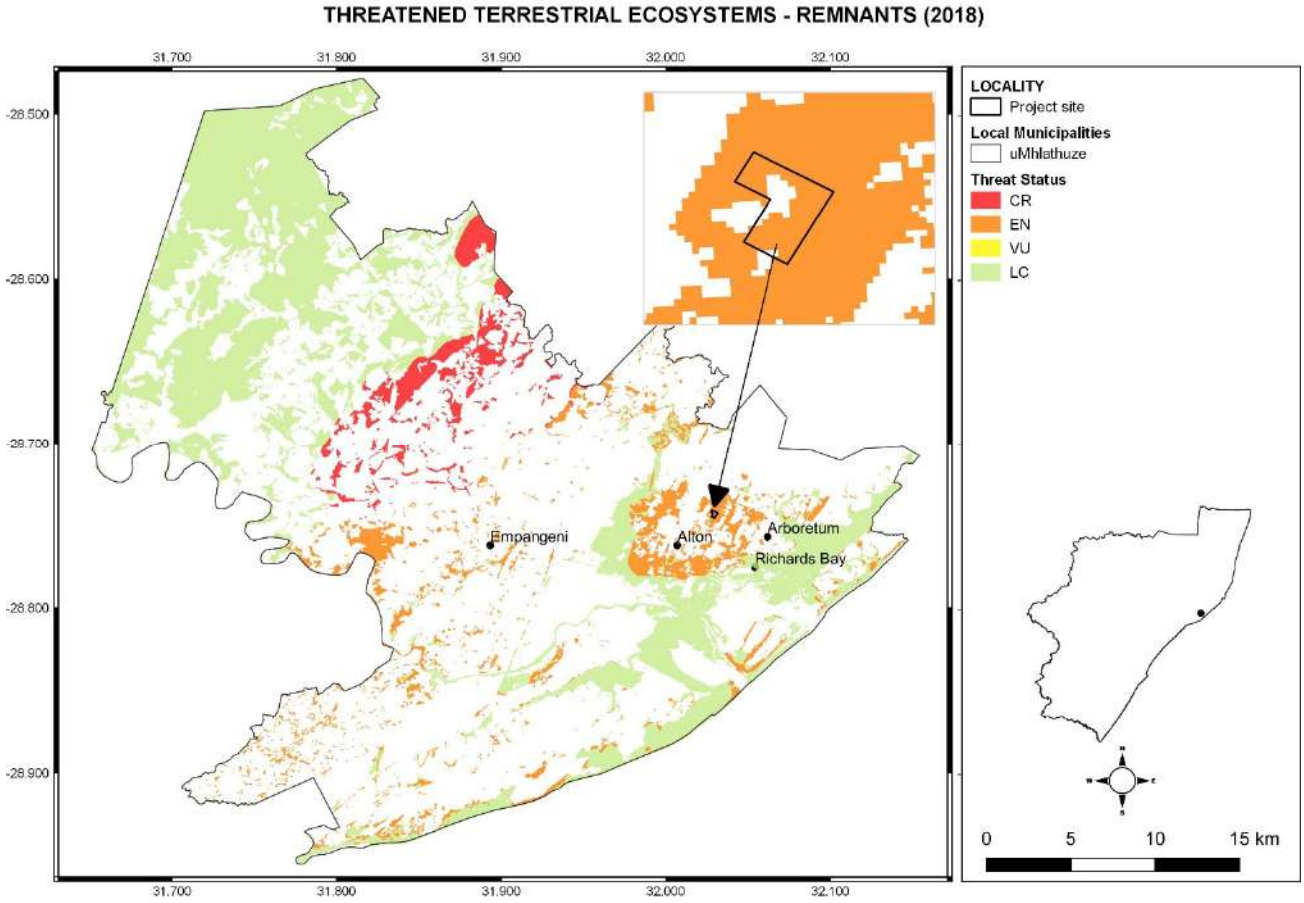


FIGURE 5: Remaining extent of threatened terrestrial ecosystems in uMhlathuze Municipality and the project site.

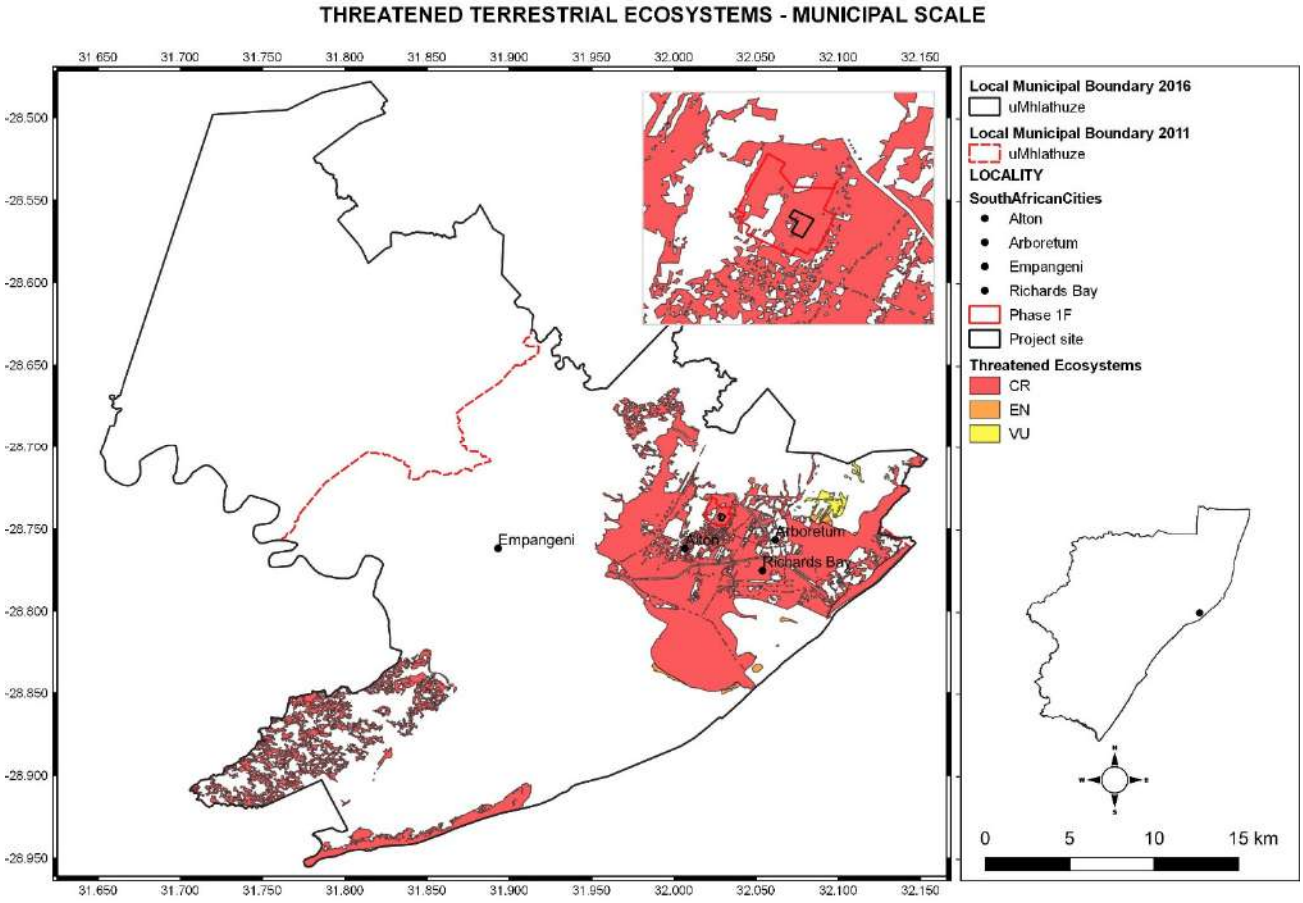


FIGURE 6: The extent of the Critically Endangered Kwambonambi Hygrophilous Grassland ecosystem in uMhlathuze Municipality (LUDS dataset.

4.1.2.2 Threatened Vegetation Types

The national vegetation map provides the historical extent of vegetation units of South Africa. The version of the map displayed in Figure 7 (SANBI 2006-2018) is an update of the 2012 version released in 2015. Based on the National vegetation map classifications, the project site falls within the **Endangered** Maputaland Wooded Grassland vegetation type (Table 12; Figure 7). Diagnostic features and taxa associated with this vegetation type is presented in Appendix 2.

The provincial vegetation map provides greater detail on vegetation types and is mapped at a finer scale than the National vegetation map and resulted in different vegetation type delineations. Based on the provincial vegetation map classifications, the project site intersects with two threatened vegetation types, i.e., the **Endangered** Maputaland Wooded Grassland and the **Vulnerable** Subtropical Freshwater wetlands vegetation types (Table 12; Figure 8).

Data extracted from the LUDS web tool classified the vegetation of the project site as Maputaland Coastal Belt vegetation as opposed to the provincial classification of Maputaland Wooded Grassland and Subtropical Freshwater Wetlands (Figure 9, Table 12).

TABLE 12: Summary and extent of the vegetation types on the project site.

SCALE	VEGETATION TYPE	BIOME	THREAT STATUS	PROTECTION LEVEL	EXTENT ON PROJECT SITE (ha)
National (2006-2018)	Maputaland Wooded Grassland (Veg code: CB2)	Indian Ocean Coastal Belt	**Endangered** (NBA 2018)	Moderately Protected	~ 11,8
Provincial (Jewitt, & Escott 2011 delineation)	Maputaland Wooded Grassland (Veg code: 18)	Indian Ocean Coastal Belt	**Endangered** (Jewitt 2018)	Moderately Protected	~ 6,51
	Subtropical Freshwater Wetlands (Veg code: 76.1)	Azonal Wetlands	**Vulnerable** (Jewitt 2018)	Moderately Protected	~ 5,29
Municipal (LUDS municipal data)	Maputaland Coastal Belt	Indian Ocean Coastal Belt	Not reported in LUMS results	Not reported in LUMS results	11,8

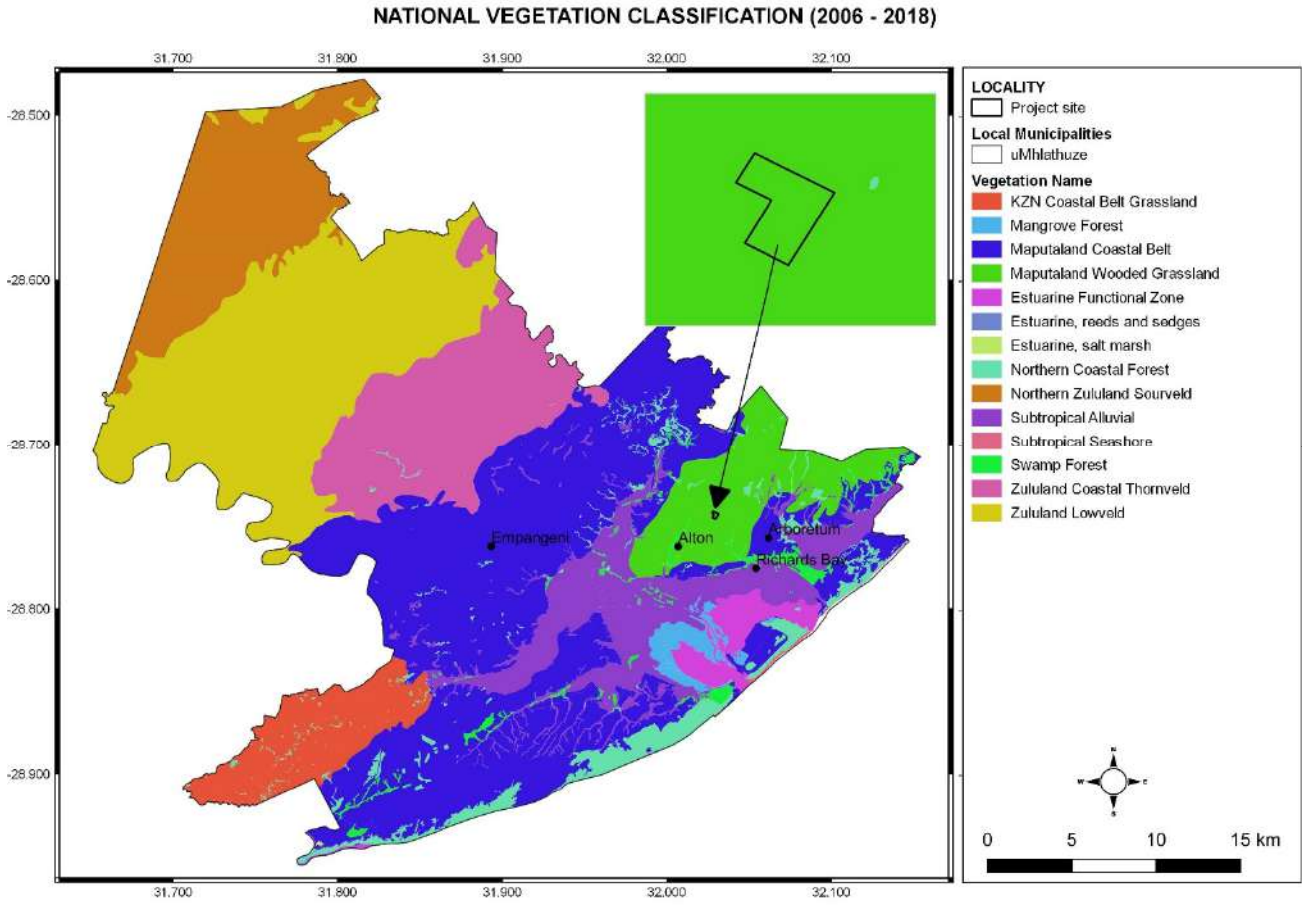


FIGURE 7: National vegetation classifications - uMhlathuze Municipality and the project site.

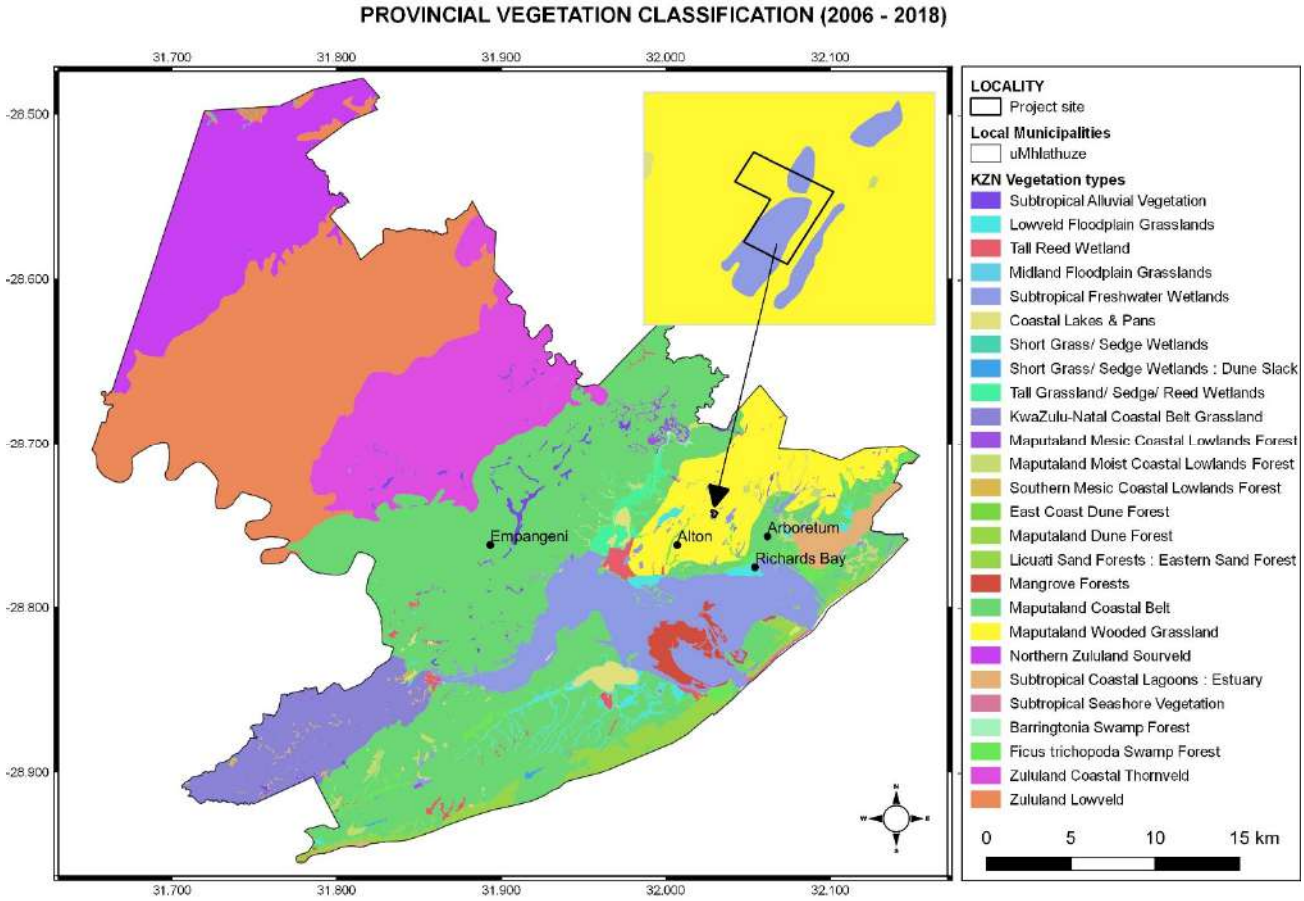


FIGURE 8: Provincial vegetation classifications - uMhlathuze Municipality and the project site.

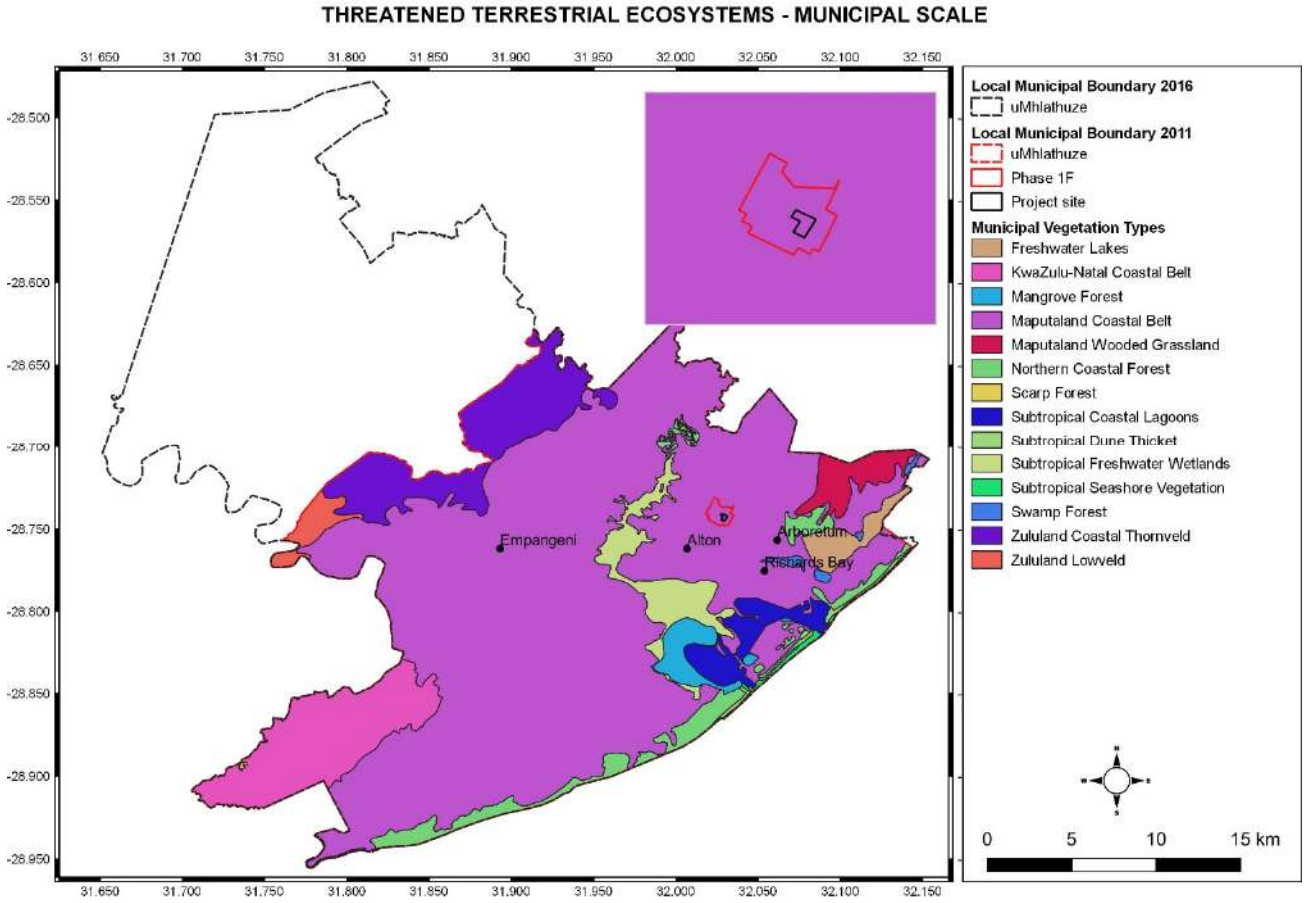


FIGURE 9: Municipal scale vegetation classification according to the LUDS data.

4.1.2.3 Protected Areas and other Conservation Areas

Protected areas and other conservation areas included national parks, nature reserves (i.e., provincial, and private game reserves, stewardship sites), mountain catchment areas; world heritage sites; protected environments; forest nature reserves; forest wilderness areas; biosphere reserves, transfrontier parks and conservation areas, conservancies; IBA areas; NPAES focus areas and RAMSAR sites.

These areas are amongst the best areas for the conservation of wildlife and habitats, and are important core areas, steppingstones, and corridors for wildlife in fragmented landscapes but are increasingly compromised by human encroachment.

The project site falls entirely within a NPAES focus area of very high sensitivity; an area important for land-based protected areas expansion (Figure 10; DEA screening tool). The NPAES presents a long-term, 20-year and 5-year strategy for the expansion of protected areas in South Africa.

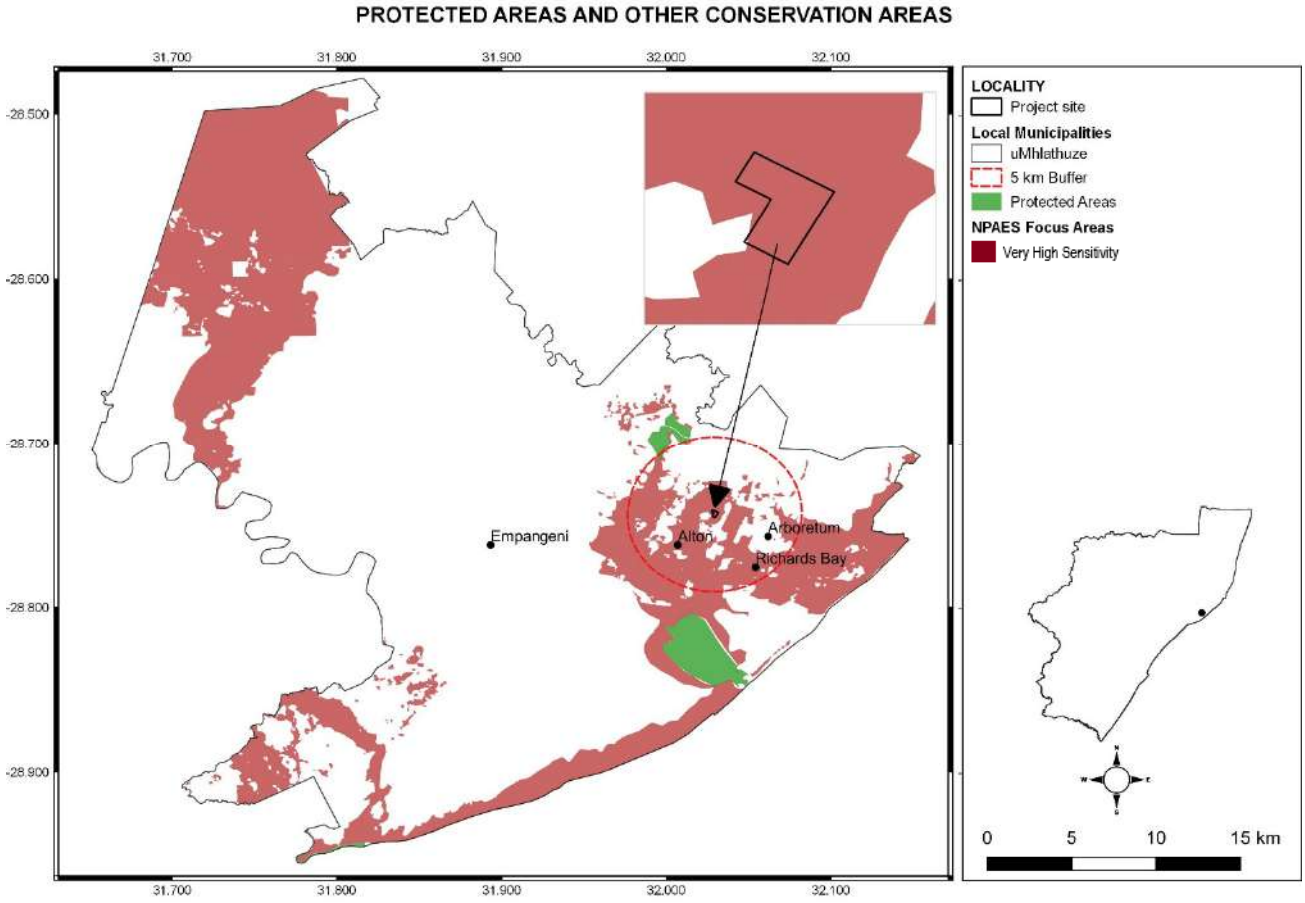


FIGURE 10: The extent of the NPAES focus areas in uMhlathuze Municipality and the project site.

4.1.2.4 Terrestrial CBA Areas

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity targets for ecosystems, species, and ecological processes as identified in systematic biodiversity plans. National, provincial and district scale biodiversity plans identified the project site as being in areas classified as CBA areas (Table 13; Figures 11-13).

TABLE 13: Summary of CBA areas on the project site.

SCALE	CBA CLASS	ASSOCIATED SENSITIVITY FEATURES	EXTENT ON PROJECT SITE (ha)
National (DEA Screening Tool)	CBA 1 (Very High sensitivity)	• Critically Endangered ecosystem • NPAES Focus Area	~ 11,50
Provincial (KZNSCP 2012)	• CBA 3 Optimal • Biodiversity Areas	• *Centrobolus fulgidus* (millipede) - **EN** • *Doratogonus zuluensis* (millipede) - **EN** • *Gulella zuluensis* (snail) – KZN Endemic • *Orthoporoides laccatus* (millipede) - NE • *Teriomima zuluana* (butterfly) - **VU** • *Centrobolus richardi* (millipede) - **VU** • *Centrobolus rugulosus* (millipede) – LC (KZN Endemic)	• CBA 3 Optimal ~ 1,38 • Biodiversity Areas ~ 10,42

SCALE	CBA CLASS	ASSOCIATED SENSITIVITY FEATURES	EXTENT ON PROJECT SITE (ha)
		• *Gulella aliciae* (snail) – KZN Endemic • Maputaland Coastal Grassland (18) - **EN** • KwaZulu-Natal Coastal Forests (62.4) - **EN** • Subtropical Freshwater Wetlands (76.1) - **VU**	
District (KZNBSP 2014)	CBA: Irreplaceable	Areas considered critical and irreplaceable for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.	~ 11,50

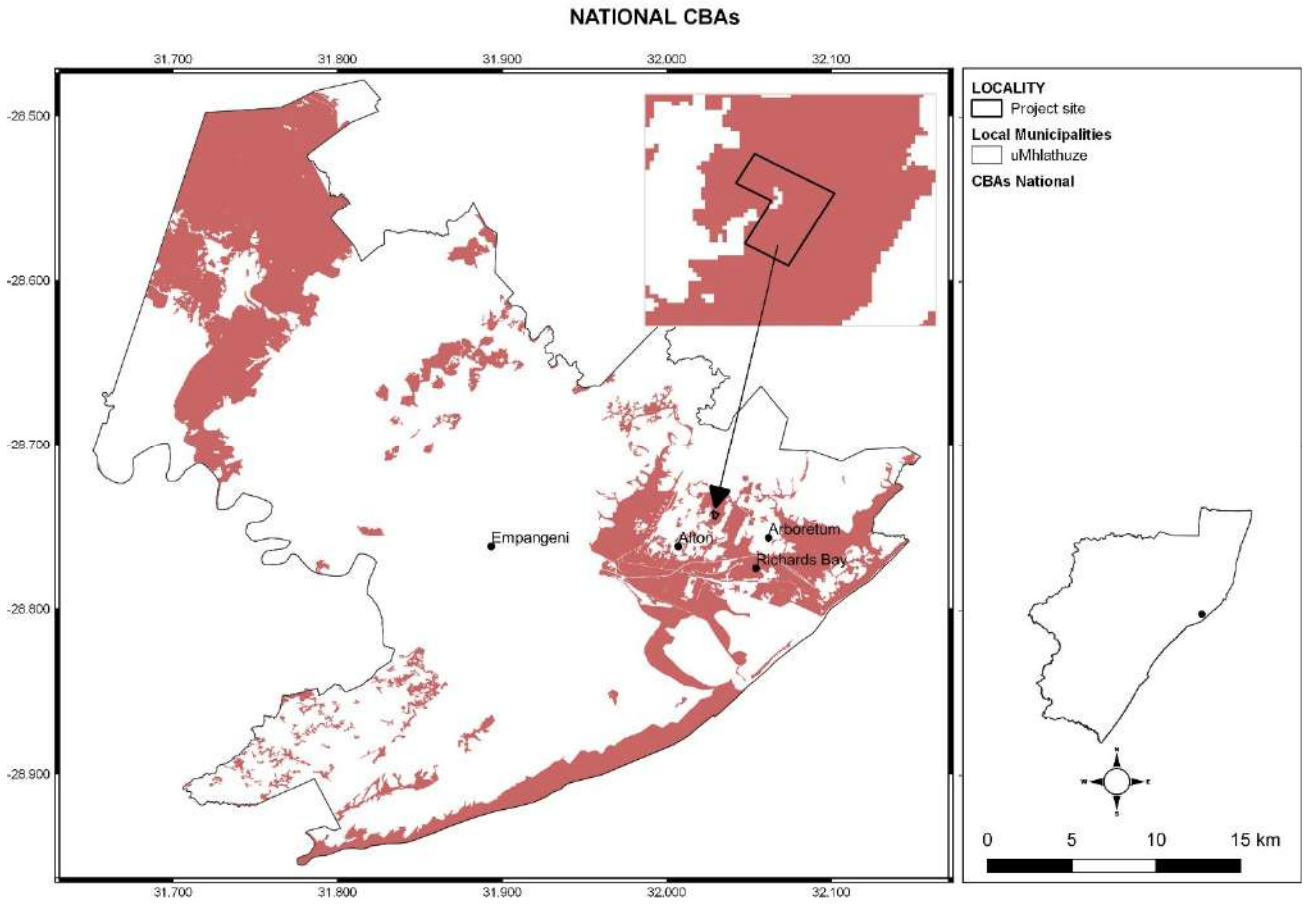


FIGURE 11: Extent of national CBA areas in uMhlathuze Municipality and the project site.

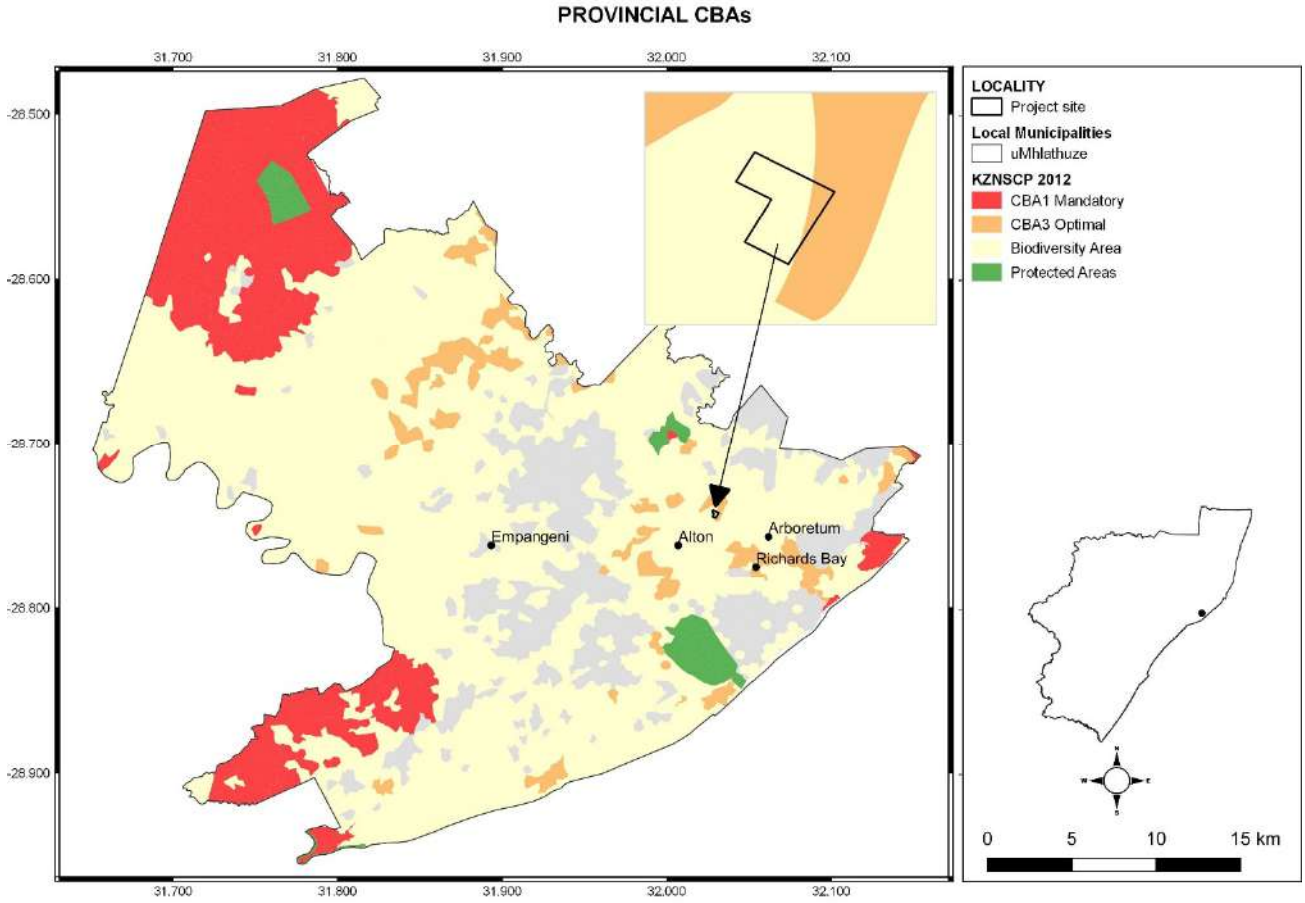


FIGURE 12: Extent of provincial CBAs in uMhlathuze Municipality and the project site.

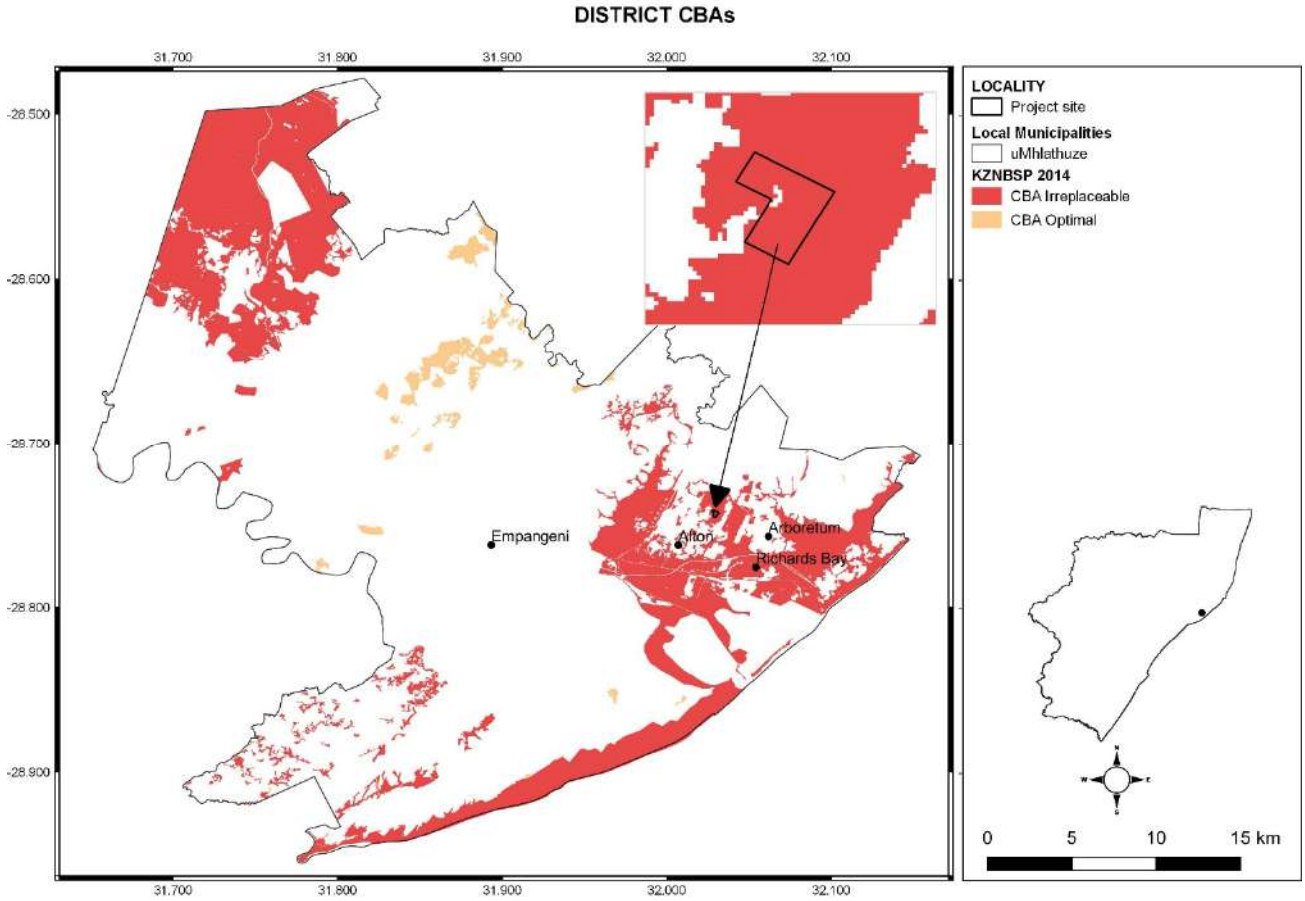


FIGURE 13: Extent of district scale CBA areas in uMhlathuze Municipality and the project site.

4.1.2.5 Sensitive Aquatic Ecosystems

The NBA 2018 (inland aquatic realm) datasets indicated the presence of 2 wetland units on the project site, and two in the vicinity of the project site (Figure 14; van Deventer *et al.*, 2018). A summary of the attributes associated with these wetlands was extracted from the NBA 2018 wetlands data layers and is presented below:

WETLAND UNIT ID	9065[2]	9067[3]	9063	9071
Subtype	Inland, Natural	Inland, Natural	Inland, Natural	Inland, Natural
Bioregion	Indian Ocean Coastal Belt	Indian Ocean Coastal Belt	Indian Ocean Coastal Belt	Indian Ocean Coastal Belt
Dominant Landform	Plain	Plain	Plain	Plain
Hydrogeomorphic Classification	Depression	Depression	Depression	Depression
Size	8,24 ha	1,85 ha	2,9 ha	2,3 ha
Existing Impacts	Roads	-	Roads	-
Ecological Condition	** D/E/F	* A/B	**D/E/F	*A/B
Ecosystem Threat Status	VU	VU	VU	VU
Ecosystem Protection Level	Well protected	Well protected	Well protected	Well protected

*** = Natural/Near natural**

[2] Total size of wetland unit = 8,24 ha. Size of wetland unit on project site = 4,56 ha.
[3] Total size of wetland unit = 1,85 ha. Size of wetland unit on project site = 0,76 ha.

**** = Heavily to critically modified**

The DEA screening tool identified the project site as falling within a strategic water source area (SWA) of Very High sensitivity.

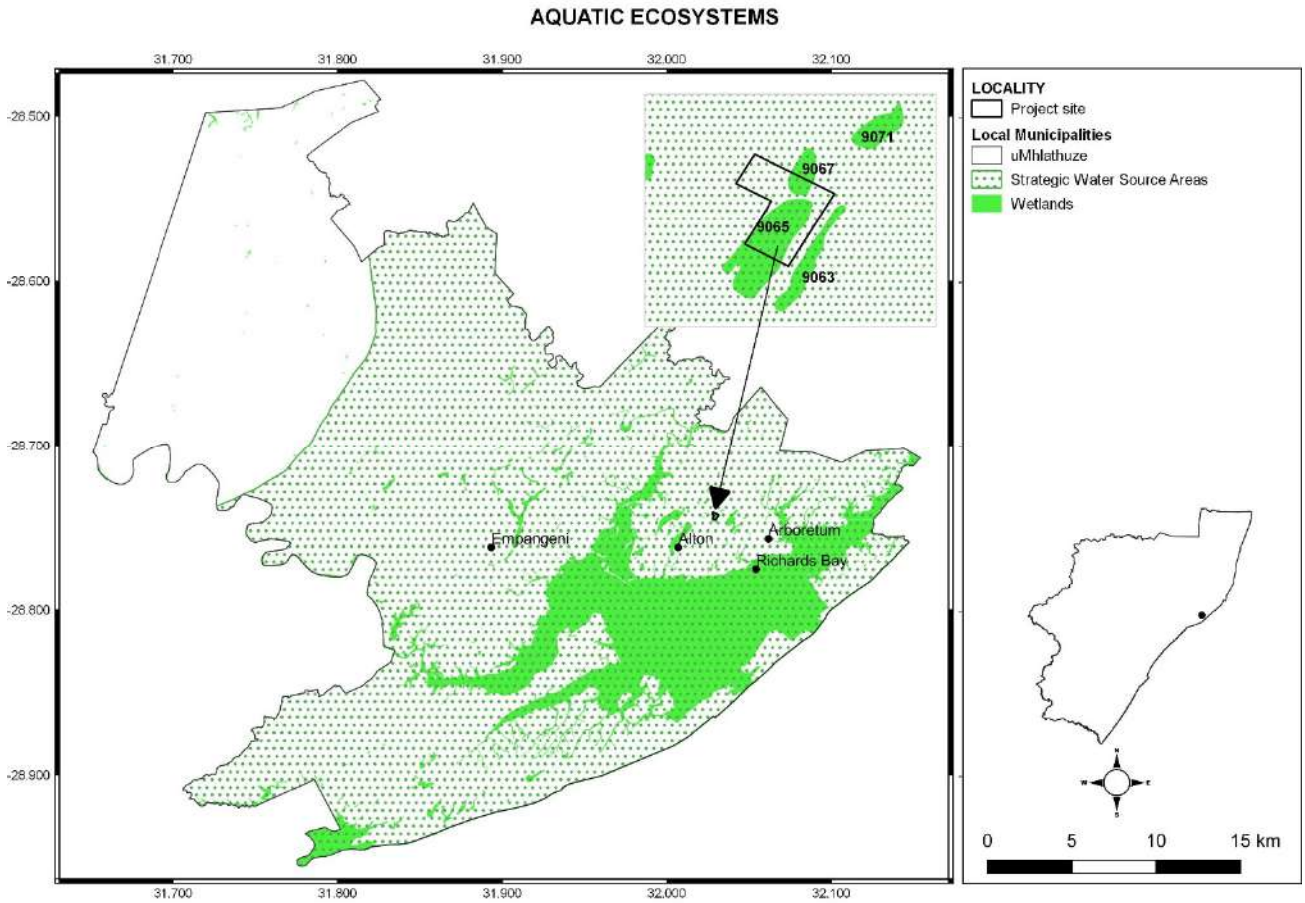


FIGURE 14: Extent of wetlands and SWAs in uMhlathuze Municipality and the project site.

During the initial development of Phase 1F, a detailed wetland assessment was conducted and the wetland ecosystems of Phase 1F were reclassified into three distinct wetland hydro-geomorphic units (Figure 15; Nemai Consulting 2016, Final EIA report).

The assessment concluded that wetland units in blue were largely undisturbed with relatively high functional values and should be considered as no-go areas, whereas the wetland units indicated in red were largely modified and could be developed.

A Wetland Mitigation plan and Wetland Environmental Management plan was compiled in line with discussions with Ezemvelo KZN Wildlife and it was concluded that the infilling of wetlands indicated in red would be acceptable and could be satisfactorily mitigated (i.e., conservation of wetland units indicated in blue, including its buffer amongst others) and that no wetland offset is required.

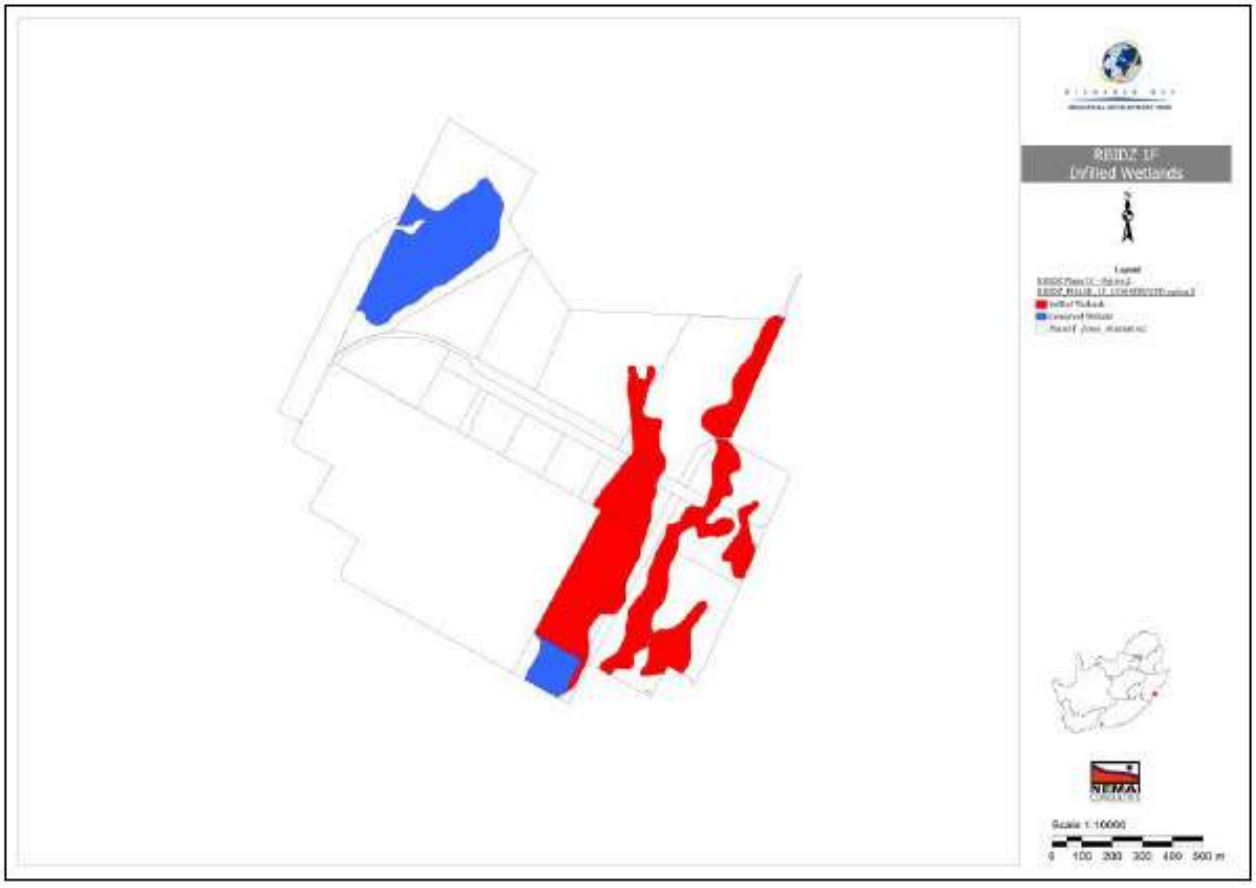


FIGURE 15: Local wetland delineations on Phase 1F (Nemai Consulting 2016).

4.1.2.6 Landscape and Local Connectivity

The project site does not intersect with important natural ecological corridors/linkages (KZNBSP 2014).

Phase 1F is approximately 191 ha in extent, with Tata Steel and Nyanza Light Metals occupying approximately one third of this area. The rest of Phase 1F is still undeveloped and migrations will still be possible on a local scale within Phase 1F. The perimeter fenceline of Phase 1F will however significantly restrict migrations, except for the more mobile species such as birds (Figure 16).

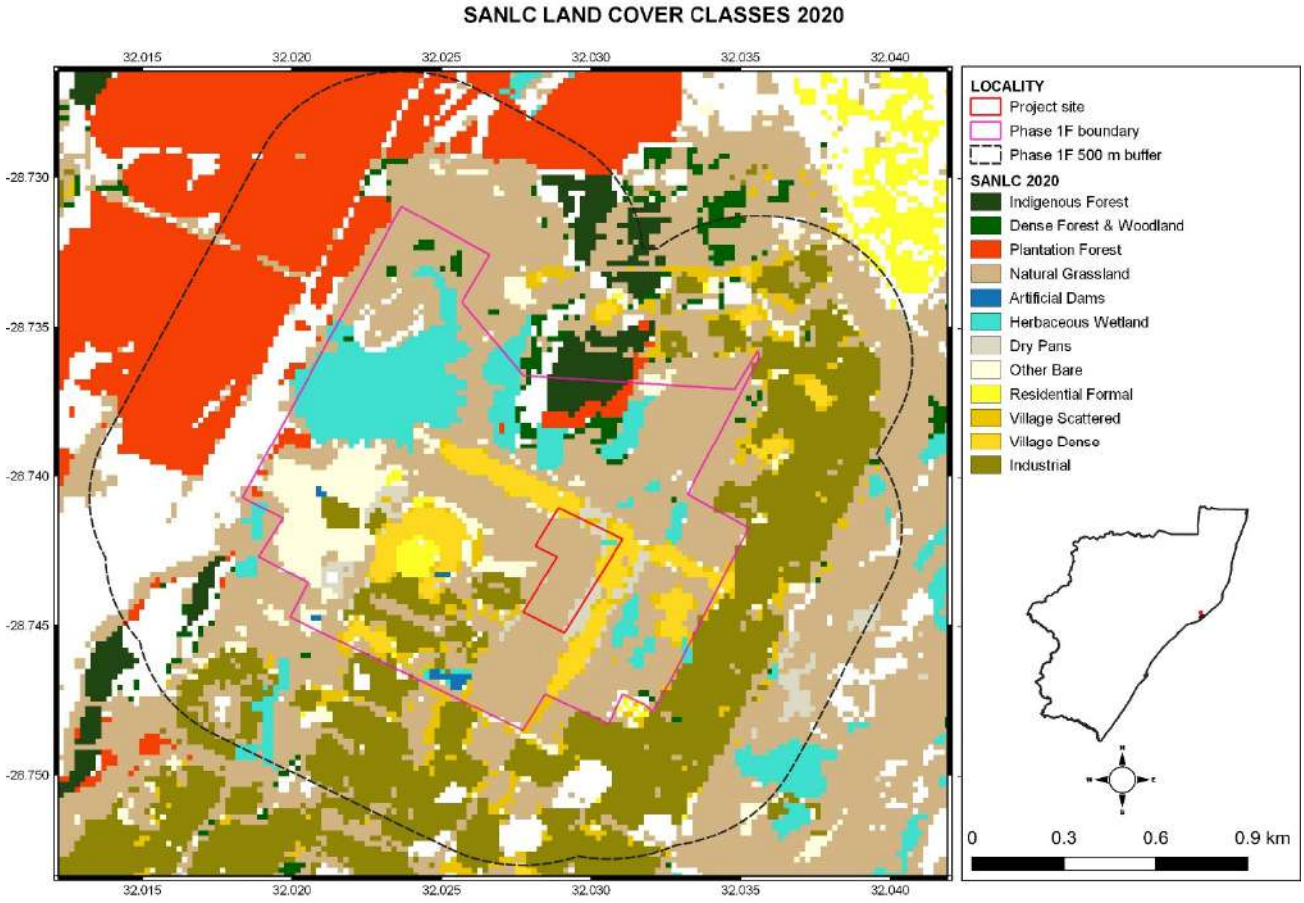


FIGURE 16: Land cover on Phase 1F and adjacent areas.

4.1.2.7 uMhlathuze Municipality Environmental Services Management Plan

uMhlathuze Municipality compiled an Environmental Services Management Plan (ESMP) as a tool to guide spatial development. The goal of the ESMP was to identify areas that provides key environmental services to the area, and to develop management plans for these areas to ensure the longterm supply of environmental services.

The map displayed in Figure 17 was generated with data extracted from the uMhlathuze Municipalitie's website and shows that the project site falls entirely within conservation areas and its associated buffers/linkages.

Conservation zones represents areas of environmental significance not viable for proclamation as nature reserves but that require some form of legal protection as it represents areas of unique or regionally important natural habitats protected in terms of national legislation. Development of these areas should be not be permitted.

Buffers/linkages are open space zones that provide natural buffers and linkages to conservation zones. Development of these areas should only be permitted under controlled conditions.

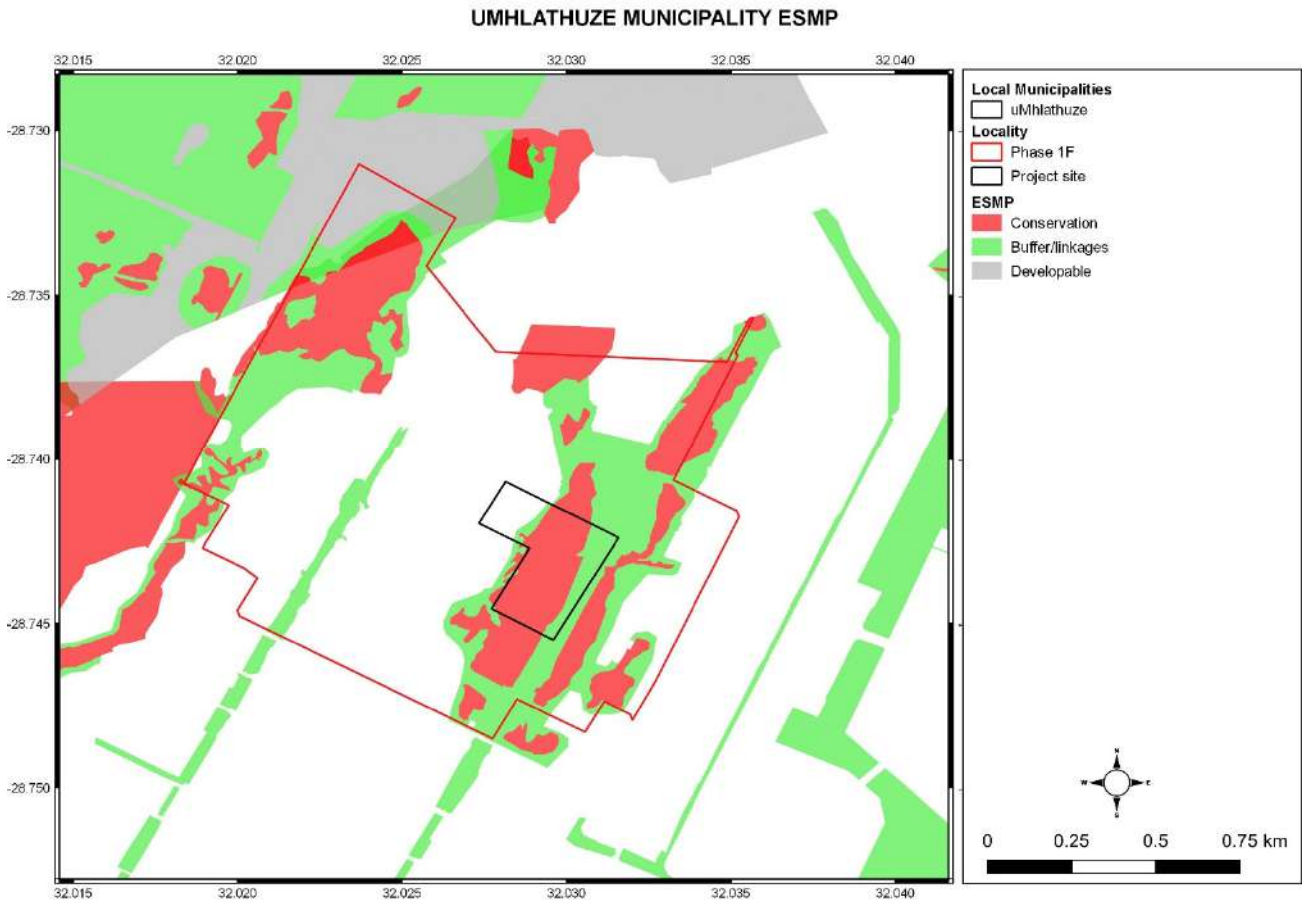


FIGURE 17: The extent of local conservation zones and buffers on Phase 1F and the project site.

4.1.2.8 Red Listed Fauna and Flora

Database searches (inclusive of the DEA Screening Tool's plant and animal species themes) identified 28 Red Listed flora and 44 Red Listed fauna species recorded from King Cetshwayo District. The number of species within each taxon and threat status is presented in Figure 18. Detailed species lists are provided in Appendices 3 & 4.

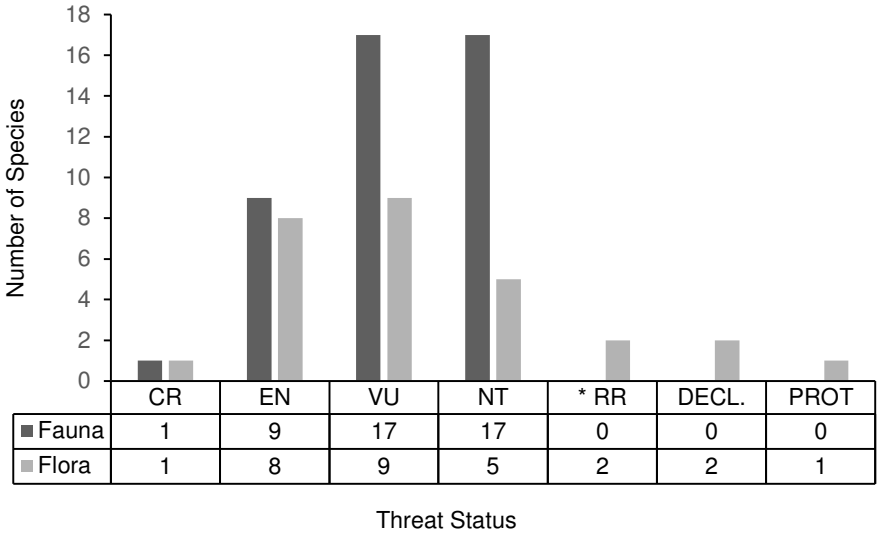


FIGURE 18: Red Listed fauna and flora in King Cetshwayo district.

The project site also falls entirely within the Maputaland-Pondoland biodiversity hotspot, an area recognized as the second richest floristic region in Africa (Figure 19).

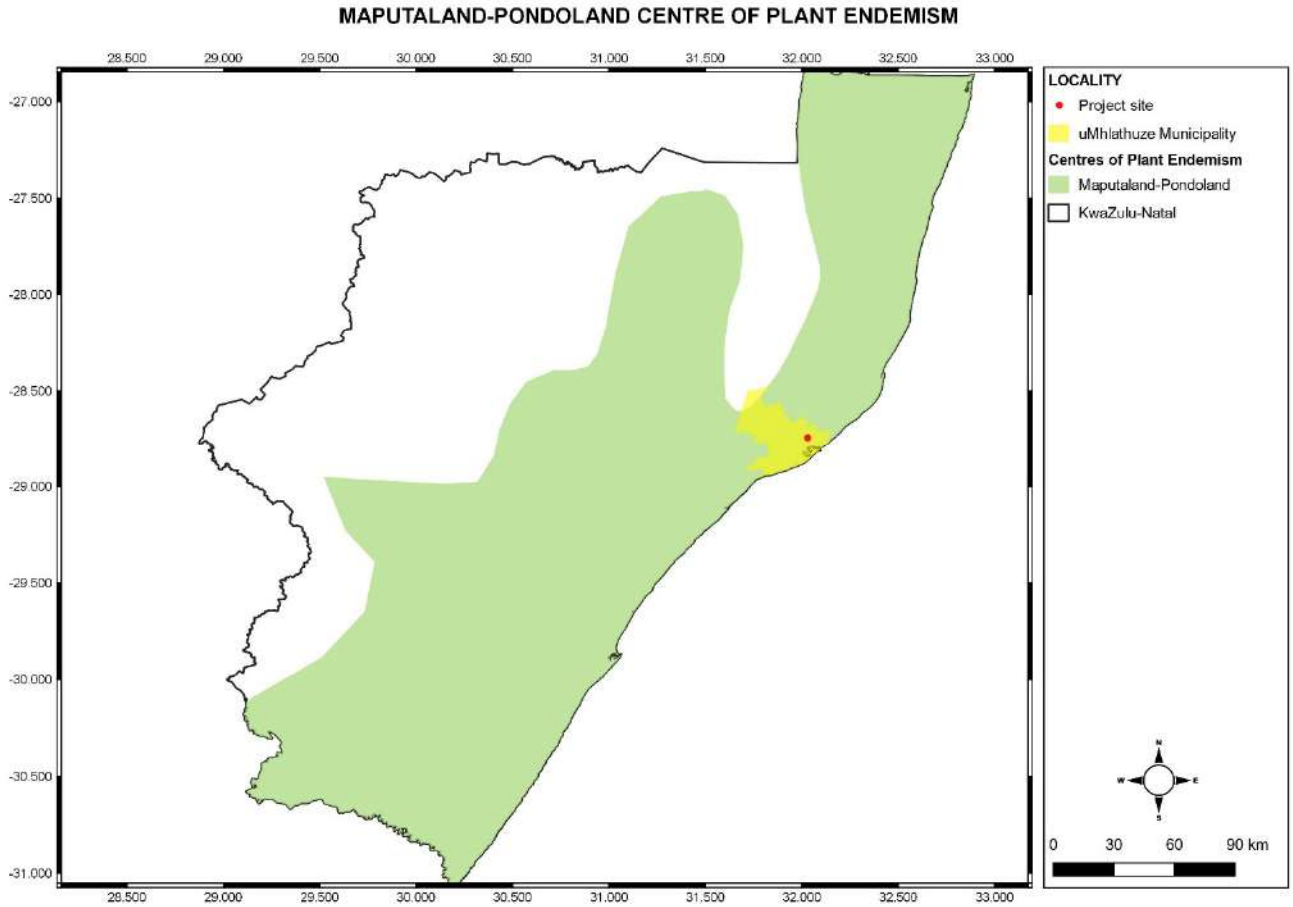


FIGURE 19: Extent of the Maputaland-Pondoland biodiversity hotspot in KwaZulu-Natal.

4.1.2.9 Existing Impacts

Phase 1F have a longstanding history of environmental disturbance. Selected images from Google Earth dating back to 2004 and photographs taken during a site visit in July 2020 displays the extent of anthropogenic disburbance (Figures 20 – 24).

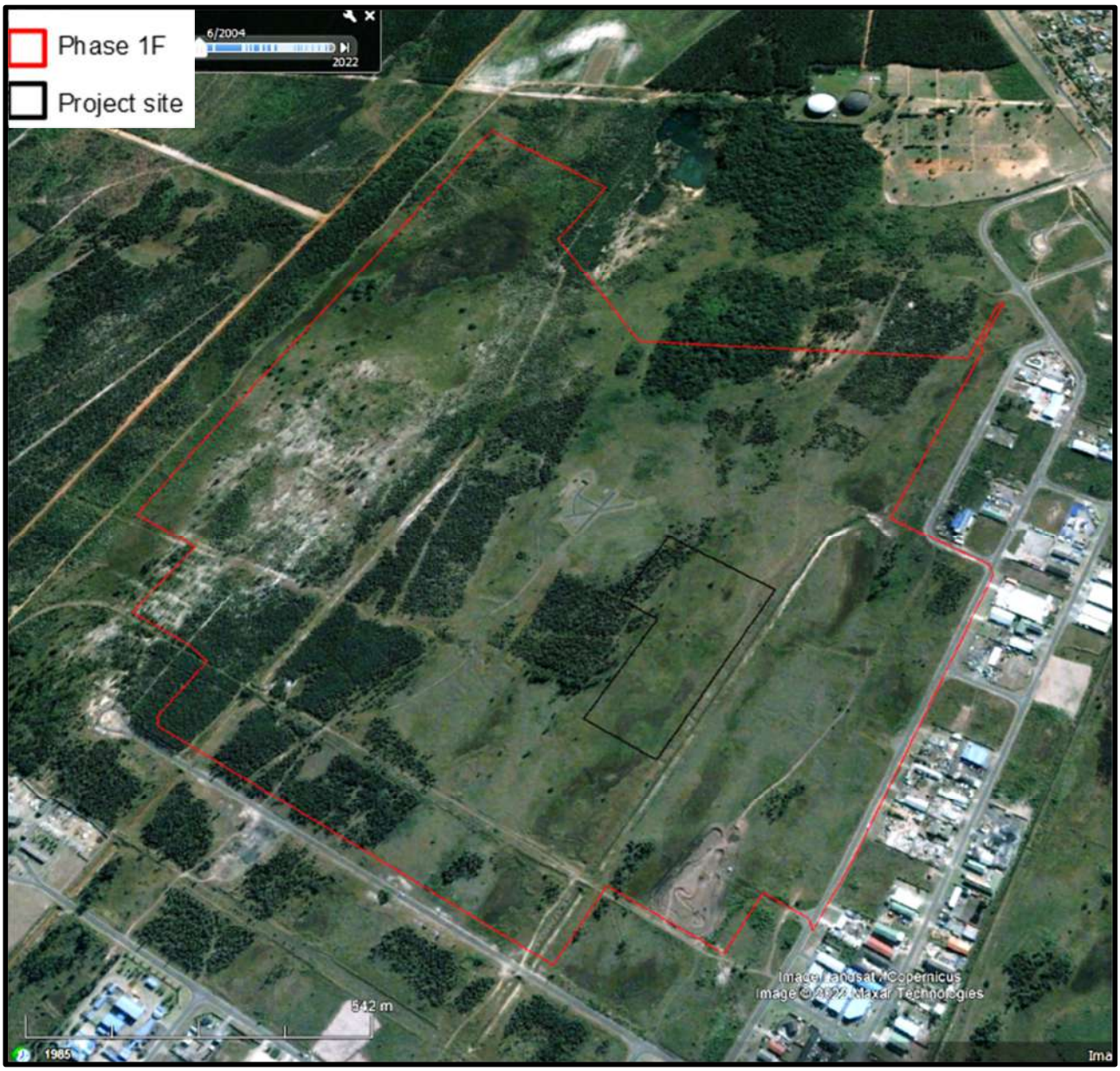


FIGURE 20: Google Earth view - 4/6/2004.

FIGURE 21: Google Earth view - 21/7/2007.

FIGURE 22: Google Earth view – 12/12/2018.

FIGURE 23: Google Earth view - 13/7/2020.

FIGURE 24: Site visit - 16/7/2020, after the infilling of the wetland on the project site.

4.2 Site Inspections

4.2.1 General Observations

The general vegetation structure of the project site can be described as open grassland with a few scattered clumps of thicket vegetation, interspersed with small and shallow seasonal wetlands. The area was largely degraded with signs of vehicle tracks and general soil disturbance evident.

Based on floristic composition, vegetation structure and level of degradation, four plant communities were identified, described, and mapped. However, due to the mosaic nature of the vegetation, specifically within the wetland, these boundaries were not precise but followed broad patterns. The meandering and transect routes are presented in Figure 25.

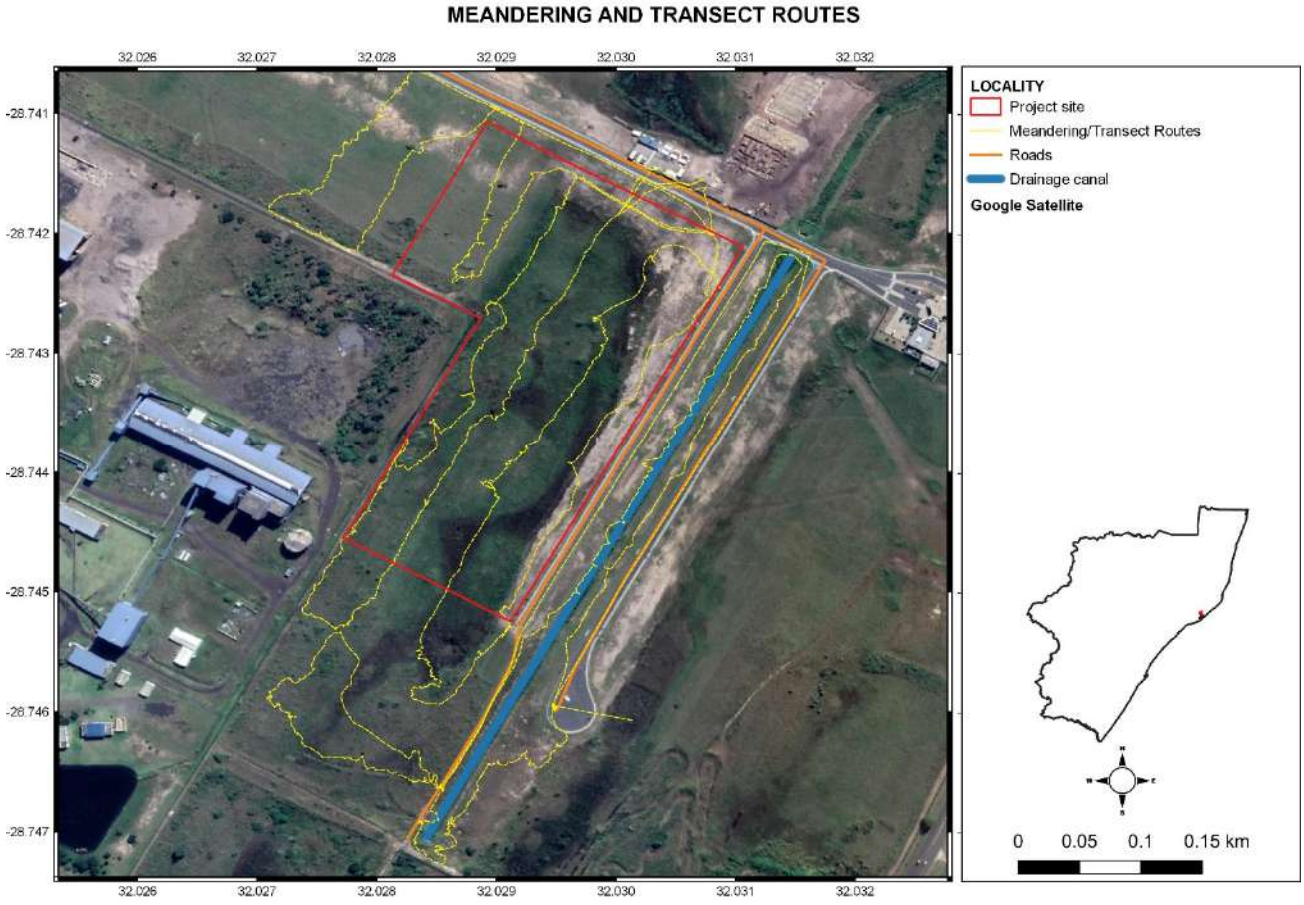


FIGURE 25: Transect routes on the project site.

4.2.2 Vegetation Communities

Four vegetation communities were identified and delineated and included *Digitaria natalensis – Parinari capensis* Grassland (Dn – Pc Grassland), *Ischaemum fasciculatum* Hygrophilous Grassland (If Hygrophilous Grassland), Degraded areas, and *Typha capensis – Phragmites australis* drainage canal (Figure 26). Flora species inventories for the vegetation communities are provided in Appendix 5.

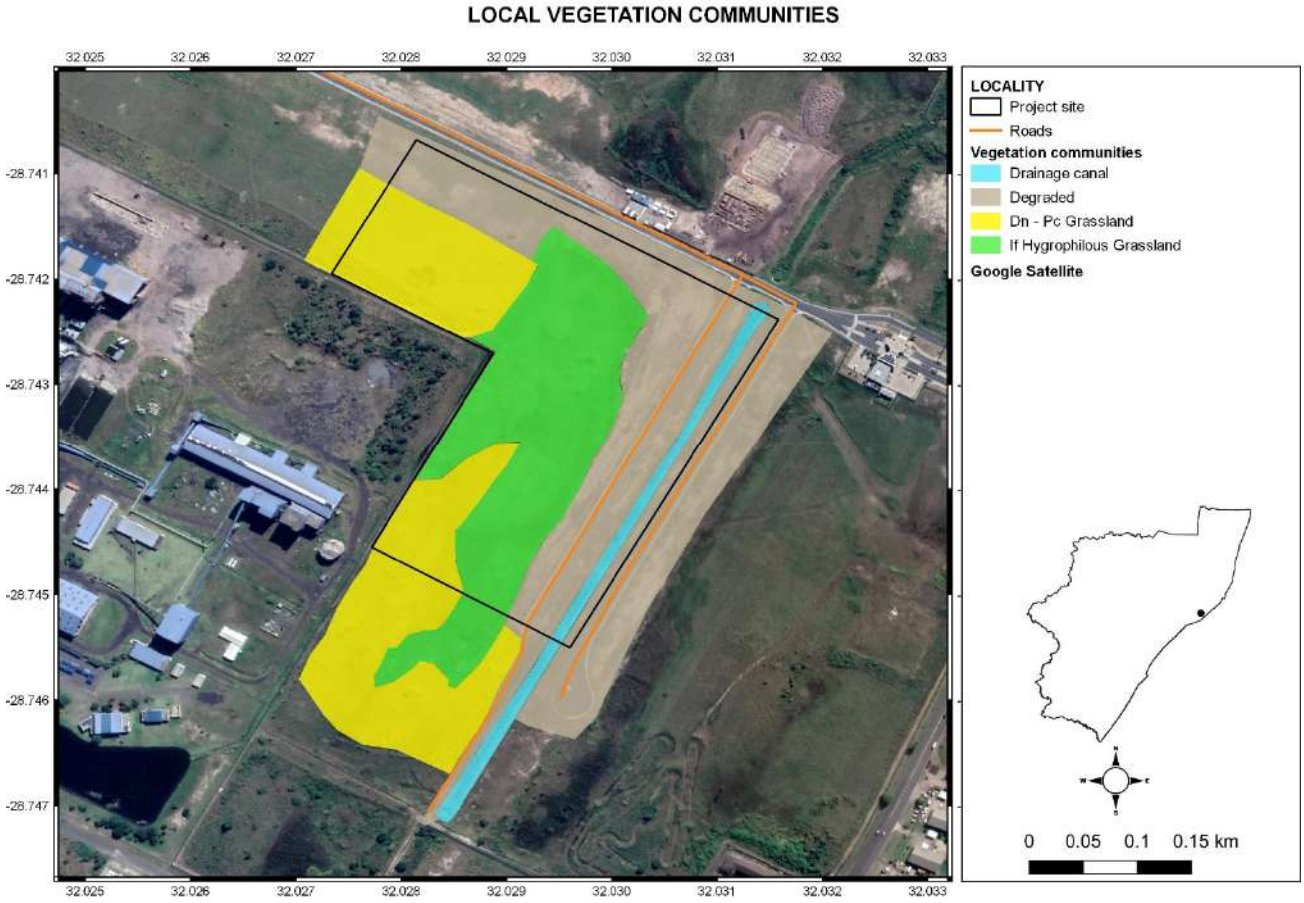


FIGURE 26: Local vegetation communities.

4.2.2.1 *Digitaria natalensis – Parinari capensis* Grassland

Present on the northern and southwestern side of the project site. Graminoids and forbs were the most dominant growth forms and suffrutices occurred frequently (Figure 27). Trees were rare and stunted and included *Syzygium cordata*, *Brachylaena discolor* and a single specimen of the species *Anonna senegalensis* on the north.

Common species included the graminoids *Digitaria natalensis* (dominant), *Aristida junciformis* and *Panicum dregeanum*, the geoxylic suffrutices *Parinari capensis*, and *Salacia krausii*, the forbs *Helichrysum kraussii*, *Lobelia anceps*, *Thunbergia atriplicifolia*, *Raphionacme palustris* (Endemic) and *Gomphocarpus physocarpus*.

Except for *Psidium guajava*, invasive species present such as *Lantana camara* and *Chromolaena odorata* occurred at low abundance. Saplings of *P. guajava* was common in this community.

FIGURE 27: *Digitaria natalensis-Parinari capensis* vegetation community.

4.2.2.2 *Ischaemum fasciculatum* Hygrophilous Grassland

The graminoids *Ischaemum fasciculatum*, *Brachiaria humidicola* and *Hemarthria altissima* dominated this community and formed a dense cover on most areas. Additional common species included the marsh fern *Cyclosorus interruptus*, and the herbaceous plant *Centella asciatica* (Figure 28).

A small area close to the southeastern border was dominated by the cyperoids/helophytes *Eleocharis limosa* and *Fuirena ciliaris* and is indicative of perennial marshy conditions. A small thicket dominated by *Dichrostachys cinerea*, and with the species *Phoenix reclinata, Psidium guajava, Osteospermum moniliferum, Searsia nebulosa, Syzygium cordatum* and *Diospyros lycioides* (low abundance) also present, was embedded within the hygrophilous grassland on a slightly elevated area and more representative of terrestrial vegetation than hygrophilous grassland vegetation.

The invasive species *Psidium guajava* was common on the vegetation communitie's western boundary and the invasives *Lantana camara* and *Chromolaena odorata* was scattered throughout the wetland but occurred at very low abundance.

FIGURE 28: *Ischaemum fasciculatum* Hygrophilous Grassland with the *D. cinerea* thicket in the centre of the collage.

4.2.2.3 Drainage Canal

Located to the east of the project site and dominated by the hydrophyte *Typha capensis* and the graminoid *Phragmites australis*. Other common species included the marsh fern *Cyclosorus interruptus*, the herbaceous plant *Centella asciatica*, and the hydrophyte *Persicaria madagascariensis* (Figure 29).

The invasive species *Tecoma stans* was present but occurred at low abundance.

FIGURE 29: Drainage canal.

4.2.2.4 Degraded Areas

Characterised by sparse basal cover interspersed with patches of bare ground. The cyperiod *Cyperus natalensis* and the graminoids *Digitaria natalensis, Panicum dregeanum* and *Dactyloctenium aegyptium* was common. Most of the herbaceous flora was composed of weedy species (Figure 30).

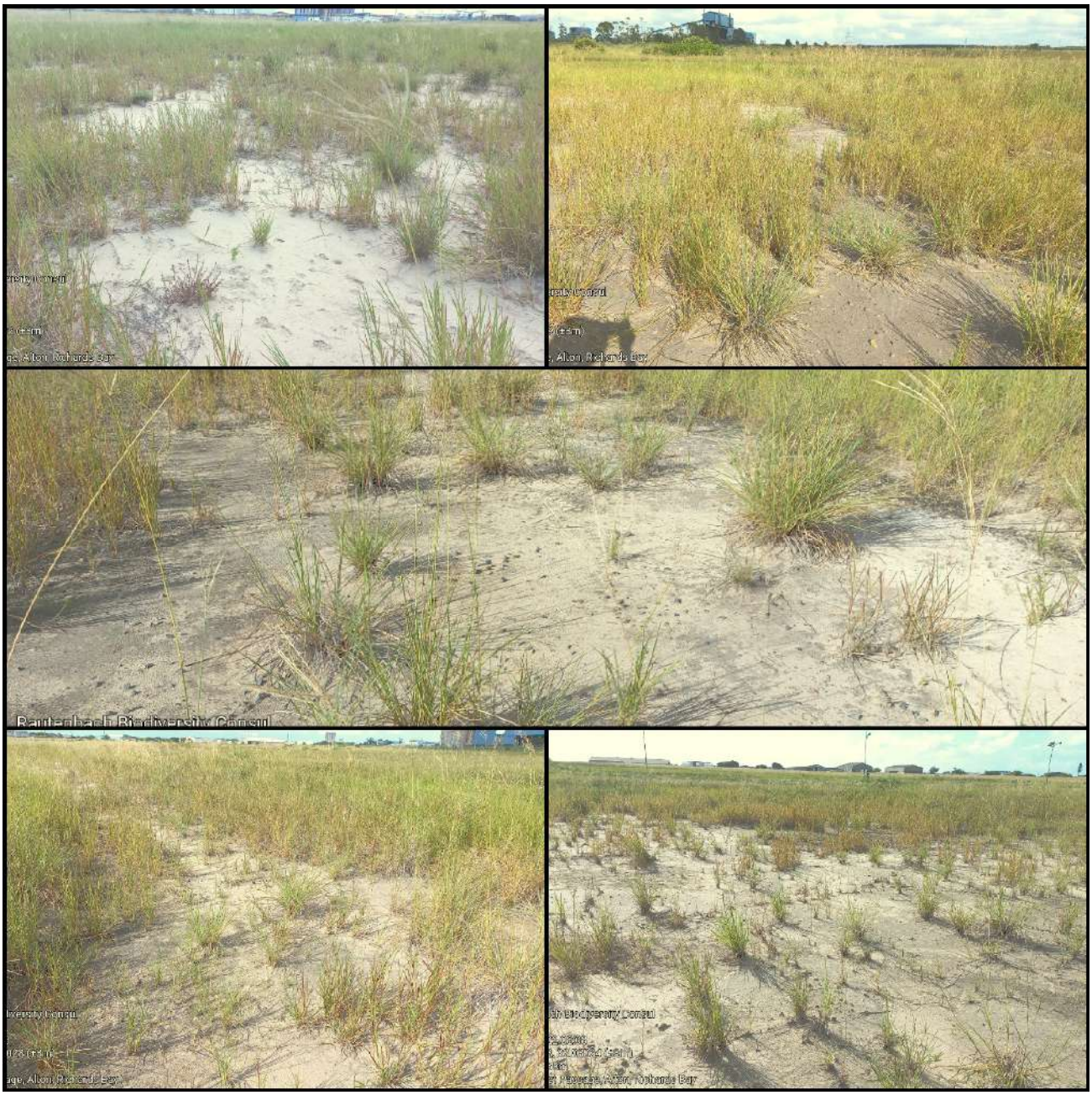


FIGURE 30: Degraded areas.

4.2.3 Flora Species

Of the 131 species recorded during the field surveys, 23% (Maputaland Wooded Grassland), and 19% (Subtropical Freshwater Wetlands) are regarded as important floristic elements of these vegetation types by Mucina & Rutherford (2006).

Noteworthy observations included four RSA endemics of which three species (*Raphionacme palustris, Helichrysum ruderale, Selago tarachodes*) were present in the *D. natalensis* - *P. capensis* Grassland, and one in the *I. fasciculatum* Hygrophilous Grassland (*Roella glomerata*).

R. palustris is a KwaZulu-Natal endemic and is scattered in the province, from the coast to approximately 1 000 masl. where it inhabits swamps or wet grasslands. *S. tarachodes* and *R. glomerata* is restricted to the KZN and

Eastern Cape provinces. *H. ruderale* is widespread in KZN and often found in dense stands on disturbed areas. All the endemics are listed as of Least Concern, with stable populations and no risk of extinction.

Seventeen percent of species recorded consisted of invasive and naturalized plants. Of these, 7 species are listed as Cat 1b or Cat 2 invasives.

The rest of the indigenous species documented are all widespread and common in South Africa, with a conservation status of Least Concern.

Red Listed and provincial protected species

One species listed as Declining and provincial protected, i.e., *Crinum* cf. *stuhlmanniii* was observed in the *Digitaria natalensis – Parinari capensis* Grassland vegetation community. At the time of the assessment no flowering material was present. Identification of this genus to species level is difficult without flowering material, but based on habitat and geographic range, it is likely to be *C. stuhlmanniii*. Nevertheless, all species from the Family AMARYLLIDACEAE are protected by the Provincial Conservation Ordinance and may not be damaged, destroyed or relocated without permit authorization from Ezemvelo KwaZulu-Natal Wildlife. Geographic localities of the individuals are provided below and the distribution on the project site displayed in Figure 31.

NUMBER OF INDIVIDUALS	LATITUDE	LONGITUDE
4	-28.741895°	32.028920°
2	-28.742085°	32.028850°
6	-28.742063°	32.029019°
1	-28.742057°	32.029010°
1	32.029010°	32.029058°

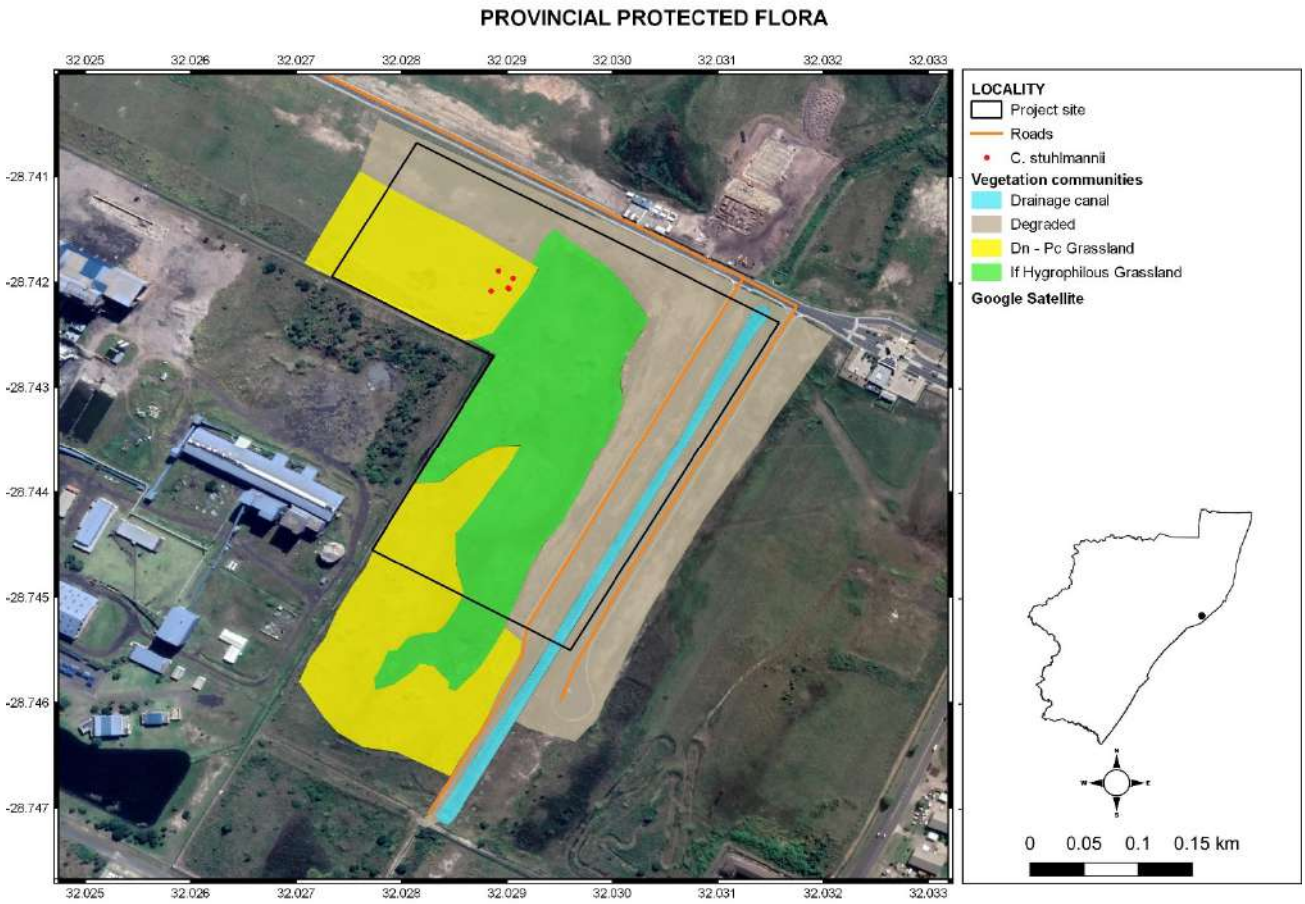


FIGURE 31: The distribution of *C.*cf. *stuhlmannii* on the project site.

Red listed flora identified during previous studies on Phase 1F included an additional RSA Endemic *Ledebouria ovatifolia* (Ecopulse 2016), and the Declining *Hypoxis hemerocallidea*, *Boophone disticha* and *Eulophia speciosa* (Nemai 2016). Although none of these species were observed on the project site, the possibility exist that the species could have been overlooked during the transect walks.

4.2.4 Fauna Species

A few fauna species were observed through direct observation and indirect evidence (call identification, feeding signs, scats, tracks; Table 14; Figure 32) and included four mammal, two frog, one reptile and 18 bird species. All the species are listed as of Least Concern with stable population numbers and no risk of extinction. No provincial protected species were recorded. *C. dilepis* was found dead on the electric fence surrounding Tata Steel.

Additional fauna species recorded during previous surveys on Phase 1F included the mammals *Mus musculus* (introduced) and *Rattus* sp. (introduced), the indigenous reptiles *Agama aculeata distanti*, *Lygodactylus capensis capensis* and *Acanthocercus atricollis atricollis*, the frog *Kassina senegalensis* and the birds *Bostrychia hagedash*, *Vanellus armatus*, *Streptopelia senegalensis*, *Corvus albus*, *Acridotheres tristis* (introduced), *Passer domesticus* (introduced), and *Ploceus velatus* (Ecopulse 2016; Nemai 2016). These species are all listed as of Least Concern and are common and abundant throughout their respective distributional ranges.

TABLE 14: Fauna species inventory

FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LIST STATUS	OBERVATION INDICATOR AND HABITAT
MAMMALS				
BOVIDAE	*Silvicapra grimmia*	Common Duiker	LC	Tracks – Degraded area
HERPESTIDAE	*Atilax paludinosus*	Marsh Mongoose	LC	Tracks and scats – Alongside drainage canal and in *I. fasciculatum* Hygrophilous Grassland.
LEPORIDAE	*Lepus saxatilis*	Scrub Hare	LC	Scats - *D. natalensis – P. capensis* Grassland.
MURIDAE	*Otomys* cf. *angoniensis*	Angoni Vlei Rat	LC	Scats & feeding signs – *D. natalensis – P. capensis* Grassland and *I. fasciculatum* Hygrophilous Grassland.
FROGS				
BUFONIDAE	*Sclerophrys gutteralis*	African Common Toad	LC	Call identification – *I. fasciculatum* Hygrophilous Grassland.
HYPEROLIIDAE	*Hyperolius marmoratus*	Marbled Reed Frog	LC	Direct observation – *I. fasciculatum* Hygrophilous Grassland.
REPTILES				
CHAMAELEONIDAE	*Chamaeleo dilepis*	Flap-necked Cameleon	LC	Direct observation – Electrocuted on fence (Tata Steel) alongside the western boundary of the project site.
BIRDS				
ACCIPITRIDAE	*Milvus aegyptius*	Yellow-billed Kite	LC	Direct observation – Foraging over the project site.
ANATIDAE	*Alopochen aegyptiaca*	Egyptian Goose	LC	Call identification – Flying over the project site.
ARDEIDAE	*Ardea melanocephala*	Black-headed Heron	LC	Direct observation – *I. fasciculatum* Hygrophilous Grassland; alongside drainage canal.
CAPRIMULGIDAE	*Caprimulgus pectoralis*	Fiery-necked Nightjar	LC	Direct observation – Flushed from *I. fasciculatum* Hygrophilous Grassland.
CENTROPODIDAE	*Centropus burchellii*	Burchells Coucal	LC	Call identification – Thicket vegetation west and northwest of the project site (outside of the project site).
CISTICOLIDAE	*Cisticola juncidis*	Zitting Cisticola	LC	Direct observation & call identification – *D. natalensis – P. capensis* Grassland & *I. fasciculatum* Hygrophilous Grassland.
	Cisticola natalensis	Croaking Cisticola	LC	Direct observation & call identification – *D. natalensis – P. capensis* Grassland & *I. fasciculatum* Hygrophilous Grassland.
COLUMBIDAE	*Streptopelia semitorquata*	Red-eyed Dove	LC	Call identification – Thicket vegetation west and northwest of the project site (outside the project site).
CUCULIDAE	*Chrysococcyx caprius*	Diderick Cuckoo	LC	Call identification – Thicket vegetation west and northwest of the project site (outside project site).
ESTRILDIDAE	*Estrilda astrild*	Common Waxbill	LC	Direct observation – Drainage canal and Grassland.
HIRUNDINIDAE	*Cecropis abyssinica*	Lesser-striped Swallow	LC	Direct observation & call identification – *I. fasciculatum* Hygrophilous Grassland.
LANIIDAE	*Lanius collaris*	Common Fiscal	LC	Direct observation – On fence west of the project site (Tata Steel).
MEROPIDAE	*Merops persicus*	Blue-cheeked Bee-eater	LC	Direct observation & Call identification – *I. fasciculatum* Hygrophilous Grassland.
MOTACILLIDAE	*Macronyx croceus*	Yellow-throated Longclaw	LC	Direct observation – *I. fasciculatum* Hygrophilous Grassland.
PLOCEIDAE	*Amblyospiza albifrons*	Thick-billed Weaver	LC	Indirect observation (nest site) – In *Phragmites* reeds in the drainage canal.
	Euplectes albonotatus	White-winged Widowbird	LC	Direct observation – *I. fasciculatum* Hygrophilous Grassland.
	Euplectes orix	Southern Red Bishop	LC	Direct observation – Drainage canal.

FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LIST STATUS	OBERVATION INDICATOR AND HABITAT
PYCNONOTIDAE	*Pycnonotus tricolor*	Dark-capped Bulbul	LC	Direct observation - Thicket vegetation west and northwest of the project site (outside the project site).

FIGURE 32: Indirect/direct evidence of fauna species on the project site.

4.2.5 Potential Occurrence of Red Listed Fauna and Flora

Based on current vegetation/habitat conditions, the geographic location of the area, habitat suitability and the general abundance of a species, an additional three Red Listed fauna species are expected to be present and included:

- One mammal species listed as **Near Threatened**, with a **Low** probability of occurrence.
- One frog species listed as **Near Threatened**, with a **Medium** probability of occurrence.
- One bird species listed as **Vulnerable**, with a **Low** probability of occurrence.

The precautionary approach is to assume that species listed as potential occurrences is present and more detailed studies may be required to confirm the presence or absence of the species. Details of the individual species is provided in Table 15. The rest of the species listed in Appendices 3 & 4 is unlikely to be present since the area

falls outside of a species' known distributional range; or the area does not offer suitable habitat and/or are too disturbed or were never recorded within 5 km of the project site.

TABLE 15: Potential occurrences – Red Listed Fauna

TAXONOMIC INFORMATION			CONSERVATION STATUS						
FAMILY	**SCIENTIFIC NAME**	**COMMON NAME**	**SA RED LIST STATUS**	**NEMBA 2015**	**PROVINCIAL**	**CITES**	**ENDEMISM**	**HABITAT**	**PROBABILITY OF OCCURRENCE**
MAMMALS									
MUSTELIDAE	*Poecilogale albinucha*	African Striped Weasel	NT	-	Sched 3	-	-	Savannah and grassland habitats, although it probably has a wide habitat tolerance and has been recorded from lowland rainforest, semi-desert grassland, fynbos with dense grass and pine.	**Low** – The project site falls within the distributional range of this species. Prey species available on the project site (i.e., *Otomys* sp.). Low probability on account of its rarity throughout its range.
FROGS									
HEMISOTIDAE	*Hemisus guttatus*	Spotted Burrowing Frog	NT	-	Sched 5	-	RSA Endemic	Grassland and Savanna. Southern Mpumalanga, and central and eastern KwaZulu-Natal, south to Durban on the coast. The northernmost coastal record is from Hluhluwe. It breeds in seasonal pans, swampy areas, and in pools near rivers. It nests in burrows in wet soil close to temporary water, and tadpoles move to water to develop.	**Medium** – A locally abundant species under suitable conditions. Habitat present within the hygrophilous grassland on the project site. Known to be present in uMhlathuze Municipality.
BIRDS									
FALCONIDAE	*Falco biarmicus*	Falcon, Lanner	VU	-	Sched 3	II	-	Favours open grassland or woodland near cliff or electricity pylon br sites.	**Low** - Recorded from the pentad 2845_3200 in 2021. No breeding or roosting habitat on project site. Prey source (i.e., rodents, birds) present on the site and the area may be used for foraging. Can be regarded as a transient.

4.3 Habitat Sensitivity Analyses

To evaluate the SEI (Site Ecological Importance) of the project site, results from the desktop assessment and the site inspections were combined and the maximum SEI per receptor (i.e., vegetation community, habitat, species) were selected.

The vegetation of the project site was found to be impacted by longstanding and significant anthropogenic disturbance and not representative of the environmental sensitivities identified during the desktop assessment. Based on floristic composition, vegetation structure and level of degradation, four vegetation communities were identified, described, and mapped and included *Digitaria natalensis – Parinari capensis* Grassland, *Ischaemum fasciculatum* Hygrophilous Grassland, Degraded areas, and *Typha capensis – Phragmites australis* drainage canal.

Most of the flora species present are widespread and abundant in South Africa, with no extinction risk. Noteworthy observations included one species listed as Declining (Red List of SA Plants) and provincial protected (i.e., *Crinum* cf. *stuhlmanniii*), present in the *D. natalensis - P. capensis* Grassland, and four RSA endemics of which three species (*Raphionacme palustris, Helichrysum ruderale, Selago tarachodes*) were present in the *D. natalensis - P. capensis* Grassland, and one in the *I. fasciculatum* Hygrophilous Grassland (*Roella glomerata*). All the endemics are listed as of Least Concern on the Red List of SA Plants (SANBI).

The undeveloped habitats directly adjacent to the project site and alongside the boundaries of Phase 1F on the northwest is degraded by longstanding anthropogenic disturbance. The vegetation on the project site and on the rest of Phase 1F is thus not connected to undisturbed natural vegetation.

The SEI for the *Dn – Pc* Grassland vegetation community was regarded as of Medium sensitivity owing to the presence of one species listed as Declining (*C.* cf. *stuhlmanniii*) and three RSA endemics. For the fauna species, SEI ranged from Low to Medium. The overall SEI for the project site was therefore regarded as of Medium sensitivity. A summary of the SEI evaluation is provided in Table 16 and results mapped in Figure 33.

TABLE 16: Evaluation of the Site Ecological Importance of vegetation communities and habitats on the project site.

RECEPTOR	CONSERVATION IMPORTANCE (CI)	FUNCTIONAL INTEGRITY (FI)	RECEPTOR RESILIENCE (RR)	SITE ECOLOGICAL IMPORTANCE
Digitaria natalensis – Parinari capensis grassland	**Low** • Located within the **CR** Kwambonambi Hygrophilous Grassland ecosystem and the **EN** Maputaland Wooded Grassland vegetation type, within national, provincial and district **CBA** areas & **NPAES** focus areas. • Extent of vegetation community on project site ~ 2,51 ha. • No confirmed occurrence or habitat for sensitive flora associated with the ecosystem as listed in Table 11. • No confirmed or highly likely populations of Red Listed flora listed in Appendix 3. • One flora species listed as Declining and provincial protected present (i.e., *Crinum* cf. *stuhlmannii*). • Confirmed presence of three RSA endemics (*R. palustris*, *H. ruderale*, *S. tarachodes*). • < 50% of receptor contains natural habitat with limited potential to support SCC flora.	**Low** • > 1 ha but < 5 ha. • Longstanding history of anthropogenic disturbance. • Vegetation of the immediate surroundings degraded and/or transformed.	**Very Low** • Very low rehabilitation potential. • Grassland will be colonized by plants from the immediate surroundings, which is already degraded. • The grassland will therefore be highly unlikely to have a species composition representative of its original natural state in future.	**Medium** BI = Low RR = Very Low
Ischaemum fasciculatum Hygrophilous Grassland	**Very Low** • Located within the **CR** Kwambonambi Hygrophilous Grassland and the **VU** Subtropical Freshwater vegetation type, within national, provincial and district **CBA** areas & **NPAES** focus areas. • Extent of vegetation community on project site ~ 3,95 ha. • No confirmed occurrence or habitat for sensitive flora associated with the ecosystem as listed in Table 11. • No confirmed or highly likely populations of Red Listed flora listed in Appendix 3. • Confirmed presence of one RSA Endemic listed as of Least Concern (*Roella glomerata*).	**Very Low** • > 1 ha but < 5 ha. • Wetland transformed due to infilling to prepare for development.	**Very Low** • Wetlands are not easily restored without significant intervention.	**Low** BI = Very Low RR = Very Low
Degraded areas	**Very Low**	**Very Low**	**Very Low**	**Low**

RECEPTOR	CONSERVATION IMPORTANCE (CI)	FUNCTIONAL INTEGRITY (FI)	RECEPTOR RESILIENCE (RR)	SITE ECOLOGICAL IMPORTANCE
	• Located within the **CR** Kwambonambi Hygrophilous Grassland and falls within the EN Maputaland Wooded Grassland, the **VU** Subtropical Freshwater vegetation types and within national, provincial and district **CBA** areas & **NPAES** focus areas. • Extent of area on project site ~ 4,1 ha. • No confirmed occurrence or habitat for sensitive flora associated with the ecosystem as listed in Table 11. • No confirmed or highly likely populations of Red Listed flora listed in Appendix 3. • Not representative of the environmentally sensitive areas identified during the desktop assessment.	• Longstanding history of anthropogenic disburbance such as vegetation clearance and infilling of the wetlands.	• Low rehabilitation potential for Grassland habitat. • Very low rehabilitation potential for wetland habitat. Wetlands are not easily restored without significant intervention.	BI = Very Low RR = Very Low
Drainage line	**Very Low** • Located within the **CR** Kwambonambi Hygrophilous Grassland and falls within the EN Maputaland Wooded Grassland, the **VU** Subtropical Freshwater vegetation types and within national, provincial and district **CBA** areas & **NPAES** focus areas. • Extent of area on project site - ~ 0,4 ha. • No confirmed occurrence or habitat for sensitive flora associated with the ecosystem as listed in Table 11. • No confirmed or highly likely populations of Red Listed flora listed in Appendix 3. • Not representative of the environmentally sensitive areas identified during the desktop assessment.	**Very Low** • Longstanding history of anthropogenic disburbance such as vegetation clearance and infilling of the wetlands.	**High** • Because the area is not natural, it was excavated and are managed, its ability to recover is good since it does not need to recover to a fully natural state.	**Very Low** BI = Very Low RR = High
Poecilogale albinucha	**Very Low** • Red List status – **Near Threatened**. • AOO ~ 7 138 km^2 • Number of mature individuals < 10 000	**Low** • Poor habitat connectivity but migrations may still be possible across some transformed/degraded habitat.	**Very Low** • Partial recovery of vegetation following decommissioning may provide suitable habitat to prey species (i.e., rodents)	**Low** BI = Very Low RR =Very Low

RECEPTOR	CONSERVATION IMPORTANCE (CI)	FUNCTIONAL INTEGRITY (FI)	RECEPTOR RESILIENCE (RR)	SITE ECOLOGICAL IMPORTANCE
			and provide sufficient prey items to *P. albinucha*. • The entire Phase 1F is earmarked for development, thereby removing habitat of preferred prey species (i.e., rodents).	
Hemisus guttatus	**Very Low** • Red List status – Near Threatened • EOO ~ 501 – 2 000 km • Number of mature individuals – Unknown. • Potential habitat within the Hygrophilous Grassland.	**Low** • Wetland habitat significantly disturbed by past anthropogenic disturbance, but migrations may still be possible across some degraded habitats. • Partial recovery of some areas in the wetland occurred, potentially providing habitat to *H. guttatus*.	**Very Low** • Habitat will be permanently transformed by the proposed development and the wetland habitat completely destroyed. • Species unlikely to return to the area once the impact has been removed.	**Low** BI = Very Low RR =Very Low
Falco biarmicus	**Medium** • Red List status – Vulnerable • < 10 000 mature individuals • Prey animals (small mammals; birds) present on the project site.	**Low** • Prey species present in the degraded grassland habitat. • Area likely to be used for foraging. • Tolerant to anthropogenic disturbance provided that suffient prey items are available.	**Very Low** • Species reliant on a sufficient prey base. • Development of the project site and Phase 1F will destroy habitat and consequently result in the absence of prey species. • *F. biarmicus* will move out of the area to more suitable habitats.	**Medium** BI = Low RR =Very Low

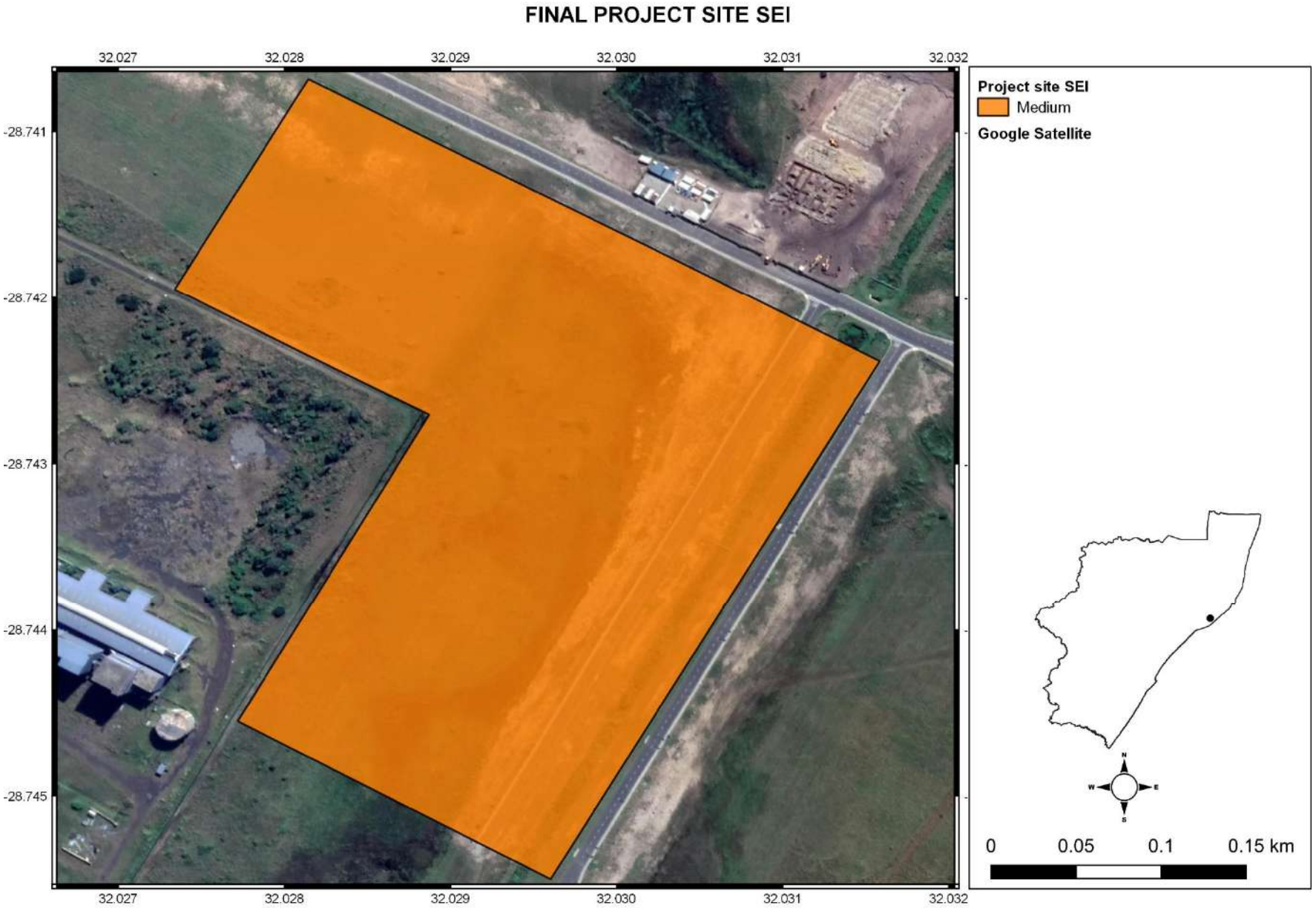


FIGURE 33: Final project site SEI.

4.4 Construction and Operational Phase Impacts

Direct, indirect, residual and cumulative impacts were considered for the construction and operational phases of the proposed project. No information was available on the anticipated lifespan of the proposed facility.

- **Direct impacts** occur as a direct result of an action at the same time and location as the action.
- **Indirect impacts** are reasonably foreseeable and occur as a result of an action but occur later in time or are removed from the action location.
- **Residual impacts** are defined as those impacts that remain following the implementation of mitigation measures.
- **Cumulative impacts** result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

Negative impacts were addressed through the implementation of the mitigation hierarchy which is a framework designed to limit environmental impacts through the following sequential steps:

Avoidance: This preventive step is intended to avoid impacts on the most sensitive features for example, through site selection, project design and/or scheduling. Avoidance is often the easiest and most cost-effective way of reducing potential negative impacts but requires that biodiversity be considered in the early stages of a project.

Minimisation: A preventative step with the aim of reducing negative impacts that cannot be avoided through physical, operational or abatement controls. Minimisation can reduce negative impacts such as noise and pollution, invasive species etc. The construction phase tends to be the key phase for minimization measures.

Rehabilitation/restoration: Measures taken to repair degradation or damage to biodiversity features following project impacts that cannot be completely avoided and/or minimized. It is the most important remediative component of the mitigation hierarchy. Restoration tries to return an area to the original ecosystem that was present before impacts, whereas rehabilitation only aims to restore basic ecological functions and/or ecosystem services – such as through planting trees to stabilise bare soil.

Offset: Offsets are designed to compensate for significant residual impacts that remain after the application of the appropriate, comprehensive, and targeted avoidance, minimization and restoration measures were applied.

4.4.1 Construction Phase Impacts and Mitigation

The expected duration of the construction phase will be approximately 36 – 48 months. A description of the proposed project and associated infrastructure is provided in Section 1.1 of this report.

To accommodate the proposed infrastructure the following construction activities likely to be undertaken may include (but may not be necesarrily limited to) the following:

- Vegetation clearance
- Topsoil stripping
- Access roads and tracks
- Fence construction
- Establishment of contractor’s camp, yard, and workshops
- Bulk earthworks
- Concrete batch plant
- Building and plant construction
- Stormwater drainage and effluent management
- Labour force

- Construction traffic

The main impacts these activities may have on the terrestrial biodiversity of the area may include the following:
- Permanent loss of habitat in sensitive environmental areas.
- Loss of SCC flora.
- Loss of SCC fauna.
- Loss/disturbance of local fauna populations.
- Spread of invasive plant species and weeds.
- Noise and artificial light disturbance.
- Soil erosion and sedimentation.
- Pollution of soils and habitat.

The impacts are discussed below, and mitigation measures are proposed to reduce the impacts on the receiving environment.

Impact 1: Permanent loss of habitat in sensitive environmental areas.

Impact description:
During the desktop assessment, it was determined that the project site falls within the following sensitive environmental areas:
- Kwambonambi Hygrophilous Grassland ecosystem listed as **Critically Endangered**.
- Maputaland Wooded Grassland vegetation type listed as **Endangered**.
- Subtropical Freshwater Wetlands listed as **Vulnerable**.
- NPAES focus area
- National, Provincial and District scale **CBA areas**

Phase 1F is zoned for the development of noxious industries. It is still largely undeveloped but has a longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services (i.e., water, sewer, stormwater, electricity, roads, artificial drainage canals, Figures 18-22), and the more recent infilling of the wetlands presented in Figure 13. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO^2 Pilot plant which covers approximately a third of Phase 1F. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds.

None of the sensitive environmental features associated with the CR ecosystem (i.e., *Hyperolius pickersgilli, Centrobolus fulgidus*, *Doratogonus zuluensis*, *Centrobolus richardi, C. rugulosus, Kniphofia leucocephala;* Table 11) was present since the project site does not offer suitable habitat. *H. pickersgilli* requires perennial wetlands with very dense reed beds; the millipede species are all forest specialists, and *K. leucocephala* is so rare it is only known from one locality south of Richards Bay.

Following the infilling of the wetlands, the vegetation composition of the area changed and resulted in a mosaic of terrestrial vegetation interspersed within hygrophilous grassland vegetation. Of the 131 species recorded during the field surveys, 23% (Maputaland Wooded Grassland), and 19% (Subtropical Freshwater Wetlands) are regarded as important floristic elements of these vegetation types by Mucina & Rutherford (2006). The project site is not representative its CBA status and none of the important biodiversity features associated with this CBA area were observed (Table 13).

During the construction phase, all the vegetation will be cleared from the project site to accommodate infrastructure, resulting in a permanent loss of habitat and species from the development footprint. Given the degraded/secondary/transformed nature of the vegetation on the project site, and the absence of important biodiversity features associated with this ecosystem/CBA areas, the area is regarded as of low ecological sensitivity and is unlikely to contribute significantly to ecosystem conservation targets. The area south of the project site, outside of the development footprint is still largely undeveloped although degraded, but still provide habitat to several local fauna species. Therefore, care should be taken to prevent construction personnel and machinery from operating outside of the development footprint to prevent disturbance of local flora populations and destruction of their habitat.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	All the vegetation will be removed to accommodate infrastructure and replaced with impermeable surfaces.	**Low Negative (33)**
Extent	Local (2)	The vegetation on the project site and on the rest of Phase 1F is degraded by past anthropogenic disturbance and not connected to undisturbed natural vegetation.	
Magnitude	Low (4)	Vegetation on the project site connected to degraded vegetation on undeveloped areas adjacent to the project site.	
Probability	Probable (3)	Surrounding natural areas within Phase 1F is degraded. Areas outside the boundaries of Phase 1F is transformed by urban expansion and plantations.	
Mitigation/Enhancement Measures			

Mitigation:

The probability, magnitude and extent of the impact cannot be practically mitigated since all the vegetation will be removed to accommodate the proposed infrastructure. However, the magnitude and extent of the disturbance can be minimized on adjacent habitats to limit disturbance of local fauna species and their habitat through the implementation of the following mitigation measures:

GENERAL

- Undeveloped areas beyond the development footprint should be regarded as no-go areas and be expressly off limits to construction personnel and construction vehicles and this should be communicated to them and monitored.
- Limit site camps and lay-down areas to the disturbed areas within the boundaries of the project site as identified during this assessment and displayed in Figure 26.
- No vegetation clearance, construction camps, access roads, firewood collecting, hunting, disturbance of fauna/flora must be allowed in the no-go areas.
- No stockpiling of topsoil on the no-go areas must be allowed.
- No open fires must be allowed on the construction site, or any of the no-go areas.
- Keep the camp and all its storage and laydown areas secure and neat at all times
- No vegetative matter may be removed from the no-go areas.
- No fires or open flames should be permitted close to the no-go areas, expecially in the dry season.
- Do not locate any site toilet, sanitary convenience, septic tank or French drain within a horizontal distance of 100 m the drainage line.
- Do not locate any reservoir, dam or depot for any substance which causes or is likely to cause pollution within a horizontal distance of 100 m of the drainage line.
- Do not dump waste of any nature, or any foreign material into the drainage line.
- Do not allow the use of the water in the drainage line for the cleaning of clothing, tools, or equipment.
- Prevent the discharge of water containing pollutants or visible suspended materials directly into the drainage line.
- Do not discharge any turbid water pumped from excavations into the drainage line.

ROADS AND ACCESS

- Make use of existing roads and tracks where feasible, rather than creating new routes.
- Ensure that adequate vehicle turning areas are allowed for.
- Always enforce speed limits, both on public roads and on-site roads.
- Ensure that only authorised roads and access routes are used.
- Vehicles may not leave the designated roads and tracks and turnaround points must be limited to specific sites.
- Maintain all access routes and roads to minimise erosion and undue surface damage. Repair rutting and potholing immediately and maintain stormwater control mechanisms.
- Runoff from roads must be managed to avoid erosion and pollution problems.
- Clear up any gravel or cement spillage on roads.
- No offroad driving is to be permitted.

TOPSOIL CONSERVATION AND STOCKPILING OF TOPSOIL

- Topsoil should be stockpiled separately from overburden (subsoil and rocky material).
- In the absence of a recognizable topsoil layer, strip the upper most 300 mm of soil.
- Co-ordinate works to limit unnecessarily prolonged exposure of stripped areas and stockpiles. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area.

- Strip and stockpile herbaceous vegetation, overlying grass, and other fine organic matter along with the topsoil.
- Do not strip topsoil when it is wet.
- Store stripped topsoil in an approved location and in an approved manner for later reuse in the rehabilitation process.
- Stockpile topsoil stripped from different sites separately, as reapplication during rehabilitation must be site specific. If necessary, keep a stockpile register.
- Do not mix topsoil obtained from different areas.
- Topsoil is to be handled twice only – once to strip and stockpile, and once to replace and level.
- Position topsoil stockpiles on demarcated areas only.
- Ensure that all topsoil is stored in such a way and in such a place that it will not cause erosion gullies or wash away.
- Do not stockpile topsoil in heaps exceeding 2 m in height.
- Protect topsoil stockpiles from erosion.
- Remove exotic / invasive plants and broad leaf weeds that emerge on topsoil stockpiles.
- If topsoil is to be stockpiled for extended periods, especially during the wet season, one of the following measures need to be implemented:
    - The re-vegetation of the stockpiles with indigenous grasses.
    - The covering of the stockpiles with a protective material such as hessian mats.
- Ensure that topsoil is at no time buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles or machinery. This will render the topsoil unsuitable for use during rehabilitation.

FIRE CONTROL

- Take adequate precautions to ensure that fires are not started because of works on the site.
- Do not permit any fires or open flames in the vicinity of no-go areas, especially during the dry season.
- Take immediate steps to extinguish any fire which may break out on the construction site.
- No open fires are permitted anywhere on site.
- Restrict contained fires for heating and cooking (i.e., in a fire drum) to designated areas on site. Prevent employees from creating fires randomly outside designated areas.
- Do not store gas and liquid fuel in the same storage area.
- Do not permit any smoking within 3 m of any fuel or chemical storage area, or refuelling area.

REHABILITATION PHASE

The rehabilitation phase refers to the period of the project after the completion of the construction works, the onset signalled by site cleanup, site rehabilitation, the withdrawal of the contractor from site, and coinciding with the maintenance period.

Removal of structures and infrastructure

- Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, fixtures, and any other temporary works.
- Materials that will not be used again must be sold if possible or rehabilitated to blend in with the surrounding landscape.
- Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and / or a state no worse than prior to construction.

Inert waste and rubble

- Clear the site of all inert waste and rubble, including surplus rock.
- Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal facility.

Hazardous waste and pollution control

- Remove from site all temporary fuel stores, hazardous substance stores, hazardous waste stores and pollution control sumps. Dispose of hazardous waste in the appropriate manner.
- Remove from site all pollution containment structures. Dispose of materials that will not be used again as hazardous waste.
- Remove from site all temporary sanitary infrastructure and wastewater disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the appropriate manner.

Final shaping

- Shape all disturbed areas to blend in with the surrounding landscape.
- Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfilling is smoothed over to blend in with the surrounding landscape.

Topsoil replacement and soil amelioration

- The principle of Progressive Reinstatement must be followed wherever possible. This includes the reinstatement of disturbed areas on an ongoing basis, immediately after the specified construction activities for that area are concluded.
- Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
- Execute topsoil placement concurrently with construction where possible, or as soon as construction in an area has ceased.
- Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas on the construction site, including temporary access routes and roads. Replace topsoil to the original depth (i.e., as much as was removed prior to construction).
- Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
- The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage.
- Do not use topsoil suspected to be contaminated with the seed of alien vegetation.
- Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner to blend in with the local surrounding area.
- After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.

Ripping and scarifying

- Rip and / or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers if necessary.
- Rip and / or scarify all disturbed areas on the construction site, including temporary access routes and roads, compacted during the execution of the works.
- Rip and / or scarify along the contour to prevent the creation of down-slope channels.
- Rip and / or scarify all areas at 300 mm intervals (but not more than 400 mm intervals), ensuring that the lines overlap.
- Do not rip and / or scarify areas under wet conditions, as the soil will not break up.

Revegetation

- Should revegetation be required, only indigenous specie must be used. **NO exotic species** must be used during landscaping.

Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	All vegetation will be permanent removed from the project site to accommodate infrastructure.	**Minor Negative (16)**
Extent	Site (1)	Disturbance will be limited to the development footprint.	
Magnitude	Minor (2)	Impacts will be limited to the development footprint.	
Probability	Improbable (2)	Adjacent habitats are degraded and not connected to undisturbed natural vegetation.	

Cumulative impacts:

Although the area has a longstanding history of anthropogenic disturbance, it will contribute cumulatively towards the loss of threatened ecosystem, threatened vegetation types, CBA and NPAES focus areas from developments on areas with the same sensitive biodiversity features.

Residual Risks:

Expected to be minor for the proposed project. The permanent removal of vegetation will however result in a permanent residual impact.

Impact 2: Loss of SCC flora

Impact description:

SCC flora identified on the project site included three RSA Endemics, all listed as of LC with widespread distributions, and one species listed as Declining and provincial protected (*Crinum* cf. *stuhlmannii*).

The RSA Endemics is not restricted to the project site and has widespread distributions in South African, with stable populations. These species were also not particularly common on the project site and it is highly unlikely that vegetation removal will impact local and regional populations.

C. cf. *stuhlmanniii* has a widespread distribution in South Africa but is heavily exploited by the medicinal plant trade. This species is however a suitable candidate for translocation and must be removed from the development footprint prior to construction site establishment and vegetation clearance to a suitable habitat, but may not be removed/translocated without permit authorisation from Ezemvelo KZN Wildlife.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	All the vegetation will be removed to accommodate infrastructure and replaced with impermeable surfaces.	**Moderate Negative (55)**
Extent	Local (2)	Development footprint and adjacent undeveloped areas.	
Magnitude	Low (4)	Decline of SCC flora populations. Low abundance on the project site.	
Probability	Definite (5)	The vegetation on the project site will be entirely removed.	
Mitigation/Enhancement Measures			

Mitigation:

The magnitude and extent of the disturbance can be minimized through the implementation of the following mitigation measures:

- The presence of the Declining species *C.* cf. *stuhlmanniii* was confirmed during the field assessment. Geographic localities are provided in Section 4.2.3 and displayed in Figure 31. In addition to the above, the following SCC flora was confirmed to be present on Phase 1F during previous assessments. The probability exist that these species could have been overlooked on the project site during the February 2022 field assessment.
  - *Ledebouria ovatifolia* (Provincial protected)
  - *Hypoxis hemerocallidea* (Declining)
  - *Boophone disticha* (Declining)
  - *Eulophia speciosa* (Declining)
- Prior to vegetation clearance, the development footprint and the 200 m of adjoining areas must be scanned for the presence of the above listed species by a suitably qualified Botanist/Ecologist. Any protected plants close to the site that will remain in place must be clearly marked and may not be defaced, disturbed, destroyed, or removed. The plants must be cordoned off with construction tape or similar barriers and marked as no-go areas.
- This scan should be conducted at a favourable time of the year when the probability of recognising these species is high (Aug – Oct).
- Any Red Listed or protected species that falls within the development footprint must be removed and translocated prior to vegetation clearance.
- The above species are all geophytes and thus suitable candidates for translocations.
- No Red Listed or provincial protected species may be removed/translocated without permit authorization from Ezemvelo KZN Wildlife.
- Since most of Phase 1F will be developed, receiver sites within Phase 1F are limited to the small conservation areas north and south of the project site (Figure 2). The suitability of these areas as receiver sites must be investigated prior to the removal of any affected species.

TRANSLOCATION PROTOCOL

Basic principles for the translocation of the affected species into suitable habitats are described below:

Principles of Plant Translocations

- *In situ* conservation is preferable to *ex situ* conservation. Removing a population from its natural habitat and placing it under artificial conditions results in the erosion of the inherent genetic diversity and characteristics of that species.
- To ensure the persistence of a population, it is imperative that the ecological processes maintaining that population persist.
- Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed from.
- Re-planting into the wild must cause as little disturbance and harm as possible to existing natural ecosystems.
- Rescue must be limited to only those areas where plants will be destroyed by the development. No plants should be removed from areas that will otherwise not be disturbed.
- Rescue should not be undertaken from any site where there is a significant risk that well-established invasive alien plants or other pests will be spread by the relocated plants.
- Translocation of Red Data species is an unacceptable conservation measure since the translocated species may have undesirable ecological effects. For example, alterations to habitat by translocated species may be harmful to other species and translocations may lead to transmission of pathogens or parasites (Hodder & Bullock, 1997). Translocation

may result in rapid changes in the species itself (Conant, 1988). Translocations are expensive and rarely successful (Griffith *et al.*, 1989). Success entails not only survival of the translocated individuals but also establishment of a self-sustaining, viable population able to reproduce and adapt to changing environmental conditions (Milton *et al.*, 1999).

- Suitable habitat adjacent to known populations of Red List plant species has a high probability of being colonized.

Plant Rescue Plan

Below are details on the actions that are required to rescue Red Listed/Protected plant species from the path of development and what steps are to be taken to house them temporarily before placing it into suitable habitats.

Prior to vegetation clearance, the following actions must be taken:

ACTION	RESPONSIBLE PERSON
• A walk-through survey to identify and mark the locations of *C.* cf. *stuhlmanniii* (localities provided in Section 4.2.3 of this report) and a scan of the entire project site for the potential presence of the SCC flora identified during previous studies (listed above) on Phase 1F. • Identification of suitable receiver sites.	Botanist / Ecologist / ECO
Search and rescue operation of all protected species within the development footprint: • For each individual plant that is rescued, the plant must be photographed before removal, tagged with a unique number or code and a latitude longitude position recorded using a hand-held GPS device. • The plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into a suitable/natural habitat. • If planted into suitable/natural habitat, the position must be marked to aid in future monitoring of that plant.	Botanist / Ecologist / ECO
• Rescued plants housed in a temporary nursery may be used in one of two ways: ▪ transplanted into suitable natural habitats near to where they were rescued, or ▪ used for replanting in rehabilitation areas. • Receiver sites must be matched as closely as possible with the origin of the plants and, where possible, be placed as near as possible to where they originated.	Botanist / Ecologist / ECO
• Any listed plants close to the development servitude that will remain in place must be marked clearly and may not be defaced, disturbed, destroyed, or removed. • They should be cordoned off with construction tape or similar barrier and marked as no-go areas.	ECO
ECO to give permission to clear vegetation only once all search and rescue operations have been completed.	ECO
The ECO should monitor construction activities in sensitive habitats to ensure that impacts within these areas are kept to a minimum.	ECO
The collecting of plants by unauthorized persons should be prevented and signs stating so should be placed at the entrance to the site.	Client / ECO

Monitoring requirements

The following monitoring activities are recommended as part of the plant rescue plan:

- The submission of a report that provides an indication of the number of individuals of each listed species that are likely to be impacted by the proposed development.
- Post-relocation monitoring of plants relocated during search and rescue to evaluate whether the intervention was successful or not.
- This should be undertaken on a three-monthly basis for two years after transplanting to evaluate the success thereof. Provision of detailed records, including photographs, indicating the success of the plant rescue operation.

ADDITIONAL MITIGATION MEASURES

- Undeveloped areas beyond the development footprint should be regarded as no-go areas and be expressly off limits to construction personnel and construction vehicles and this should be communicated to them.
- During construction, the ECO must monitor vegetation clearing at the site. Any deviations from the approved plans which will result in the removal of vegetation from additional areas should first be checked for Red Listed/protected species by the ECO. Any Red List/protected species present which can survive translocation should be translocated to a safe site provided that the required permits are in place.
- No plant species are permitted to be collected or removed by the contractor without prior approval from the ECO.
- The timing between clearing of an area and subsequent development must be minimised.

• No harvesting of plants for firewood, medicinal or any other purposes must be permitted.			
Post Mitigation/Enhancement Measures			
Duration	Short duration (1)	Potential impacts during the search and rescue and translocation phase.	**Minor Negative (4)**
Extent	Site (1)	Provincial protected and Declining flora will be translocated.	
Magnitude	Small (0)	SCC will be removed and translocated.	
Probability	Improbable (2)	Slight possibility that some specimens may be overlooked.	
Cumulative impacts: Cumulative contribution to loss of SCC expected.			
Residual Risks: Expected to be minor on the project site provided that the mitigation measures are implemented.			

Impact 3: Loss of SCC fauna

Impact description:
No threatened fauna was observed during the February 2022 field assessment and previous assessments done in the past on Phase 1F (Ecopulse 2016; Nemai 2016). Nevertheless, based on current site conditions, one mammal (*Poecilogale albinucha*), one frog (*Hemisus guttatus*), both listed as Near Threatened, and one bird species (*Falco biarmicus*) listed as Vulnerable may potentially be present.

Scats, tracks, and runways from the small mammal species *Otomys* cf. *angoniensis* was abundant on the project site and is indicative of a healthy population. The project site therefore offers sufficient prey items to the specialist small mammal predator *Poecologale albinucha* as well as for the raptor *Falco biarmicus* which feeds predominantly on birds and small mammals. Removal of vegetation will result in a direct impact on the prey species by causing a decline of the local population and may indirectly affect the abundance and distribution of *P. albinucha* and *F. biarmicus* in the area.

The infilling of the wetland resulted in the destruction of habitat suitable for the frog species *Hemisus guttatus*. This area was however partially restored through natural processes and currently provide habitat for this species. Unassisted recolonisation of the site was therefore likely but would have depended on the abundance of this species on adjoining areas. This species is known to be present in the Richards Bay area but due to its cryptic and fossorial nature it is rarely encountered. The mechanical removal of topsoil and excavations may unearth *H. guttatus* and individuals are likely to get killed during this process.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	The loss of Red Listed fauna is permanent.	**Low Negative (39)**
Extent	National (4)	Potential impacts on population abundance and national threat status.	
Magnitude	Low (4)	All species have a Low probability of occurrence on the project site and are not particularly abundant in the larger geographic area.	
Probability	Probable (3)	All species are known to be present in the Richards Bay area although the probability of the affected species being on the project site is regarded as low.	
Mitigation/Enhancement Measures			

Mitigation:
The probability, magnitude and extent of the impact cannot be practically mitigated since all the vegetation will be removed to accommodate the proposed infrastructure and destroy the habitat of the small mammal prey species.

Measures to reduce the inadvertent killing of *H. guttatus* include the following:

- During vegetation clearance, methods should be employed to minimise potential harm to this species. Clearing must take place in a phased and slow manner, commencing from the interior of the project area progressing outwards towards the boundary.

• Should a specimen be unearthed, all construction work on the area should be immediately stopped and the unearthed specimen should be carefully catured and relocated outside of the project area by an Ecologist/Zoologist in a suitable habitat.			
Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	The loss of Red Listed fauna is permanent.	**Low Negative (33)**
Extent	National (4)	May impact on national threat status.	
Magnitude	Minor (2)	The species have a low probability of occurrence on the project site.	
Probability	Probable (3)	All species are known to be present in the Richards Bay area although the probability of the affected species being on the project site is regarded as low.	
Cumulative impacts: Cumulative contribution to loss of species on national and provincial scales.			
Residual Risks: Expected to be low but may cumulatively contribute to the loss of species on national and provincial scales.			

Impact 4: Loss/disturbance of local fauna populations

Impact description:
The project site provide habitat to several fauna species. Although it is assumed that the majority of fauna species will move to different areas as a result of disturbance, many fauna species have very specific habitat requirements. For example, frogs are reliant on aquatic habitats for breeding. Although the wetland on the project site was already infilled, partial but natural recovery of vegetation on the infill areas were observed during the site visits in February 2022 and provided habitat to local frog populations.

The smaller non-volant mammals such as rodents, mongooses and duikers are tolerant to disturbance and would simply move away to more suitable habitats during the construction phase, if provided the opportunity. However, the clearing of vegetation to accommodate infrastructure will reduce available habitat for fauna species on Phase 1F. Local fauna species such as Duikers are already prevented from natural dispersal by the boundary fence of Phase 1F and may contribute to ever-reducing population sizes in future. The duikers will also be vulnerable to poaching for food.

Slower moving species such as reptiles and the more terrestrial frog species would either seek shelter or not be able to move away from construction machinery and would be killed by vehicles and earth-moving machinery. These slower moving species would also be vulnerable to poaching for food, trade, or fatality.

Construction phase activities are likely to cause disturbance and displacement of local bird populations, especially shy and/or ground nesting species such as pipits and night jars. The construction phase of a project can be highly disturbing to birds breeding in the vicinity of the construction activities. Many birds are highly susceptible to disturbance, and should this disturbance take place during a critical time in the breeding cycle, for example, when the eggs have not hatched or just prior to the chick fledging, it could lead to temporary or permanent abandonment of the nest or premature fledging. In both instances, the consequences are almost invariably fatal for the eggs or the fledgling. Such a sequence of events can have far reaching implications for certain large, rare species that only breed once a year or once every two years.

Adverse environmental impacts of the project on fauna populations can however be minimised through several mitigation measures.

	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Permanent (5)	Disturbance events will be limited to the duration of the construction phase, but local loss of habitat will be permanent.	**Moderate Negative (55)**
Extent	Local (2)	The impact will be limited to Phase 1F. Noise, disturbance will disturb species on adjacent habitats.	
Magnitude	Low (4)	Many of the species will be able to move to different areas.	
Probability	Definite (5)	Local fauna populations will be disturbed by construction activities. Fauna habitat will be destroyed to accommodate infrastructure.	

Mitigation/Enhancement Measures

Mitigation

This is a difficult impact to mitigate due to the nature of the work. The magnitude of the impact can however be reduced by implementing the following avoidance and minimization measures to reduce impacts on local fauna populations.

- Vegetation clearance should, ideally, start during the non-breeding season of fauna populations (i.e., winter).
- Where possible, work should be restricted to one area at a time. This will give the smaller birds, mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.
- During vegetation clearance, methods should be employed to minimise potential harm to fauna species. Clearing must take place in a phased and slow manner, commencing from the interior of the project site progressing outwards towards the boundary to maximise potential for mobile species to move to adjacent areas.
- Prior and during vegetation clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery.
- Fauna species such as frogs and reptiles that have not moved away should be carefully and safely removed to a suitable location beyond the extent of the development footprint by an Ecologist/Zoologist trained in the handling and relocation of animals.
- Areas beyond the development footprint should be expressly off limits to construction personnel and construction vehicles and this should be communicated to them.
- It is recommended that, while trenches are open during the construction phase, an appropriately sloping section of the sidewall is made available for the escape of any trapped animals.
- All stormwater structures should be designed to block amphibian and reptile access to the road surface.
- All contractors and subcontractor personnel working on the project must participate in an environmental awareness program. The program must include appropriate wildlife avoidance methodologies, such as impact minimisation procedures and methods for protecting nesting birds. Information about the importance and purpose of protecting wildlife must be described in the program.
- No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted in the project site or surrounding areas.

Mitigation measures for mammals and herpetofauna

- Prior to construction and vegetation clearance a suitably qualified Zoologist should closely examine the project site for the presence of local fauna species and relocate any affected non-Red Listed/Protected animals to appropriate habitat away from the project site.

Post Mitigation/Enhancement Measures

Duration	Permanent (5)	Disturbance events will be limited to the duration of the construction phase, but local loss of habitat will be permanent.	**Moderate Negative (50)**
Extent	Local (2)	Impacts will be limited to Phase 1F. Noise, movement will disturb species in adjacent habitats.	
Magnitude	Minor (2)	Many of the species will be able to move away from disturbance.	
Probability	Definite (5)	Local fauna populations will be affected by construction activities regardless of any mitigation measures.	

Cumulative impacts:

Cumulative contribution to loss of local fauna populations on provincial scale.

Residual Risks:

Expected to be Moderate.

Impact 5: Noise and artificial light disturbance

Impact description:

Fauna generally respond to disturbances caused by human activities according to the magnitude, timing, and duration of the particular disturbance. Human activities can affect an animal's ability to feed, rest, and breed if it is unable to habituate to the disturbance caused. Disturbance created by general visual and noise pollution associated with workers and construction activities can therefore affect wildlife utilising nearby habitats.

Noise from human activities (in particular from infrastructure and construction sites) has a strong impact on the physiology and behavior of birds. This impact concerns the masking of signals used (1) for communication and mating and (2) for

hunting. As a result of this masking, there is a decrease in bird density with an increase in noise level. Furthermore, if alternative silent habitats do not exist, the noise impact could negatively affect wild bird conservation (Bottalico *et al.,* 2015).

Unfortunately it is very difficult to mitigate this impact. This impact is, however, likely to be short-lived during the construction phase and will probably mainly affect local bird species that can easily migrate to other areas.

The ecologic effects of artificial light have been well documented. Light pollution has been shown to affect both flora and fauna. For instance, prolonged exposure to artificial light prevents many trees from adjusting to seasonal variations. This, in turn, has implications for the wildlife that depend on trees for their natural habitat. Research on insects, turtles, birds, fish, reptiles, and other wildlife species shows that light pollution can alter behaviors, foraging areas, and breeding cycles, and not just in urban centers but in rural areas as well.

For example, bright electric lights can disrupt the behavior of birds especially during inclement weather with low cloud cover, they routinely are confused during passage by brightly lit buildings, communication towers, and other structures, increasing the risk of collission with these man-made structures. Frogs have been found to inhibit their mating calls when they are exposed to excessive light at night, reducing their reproductive capacity, and the feeding behavior of bats is altered by artificial light (Chepesiuk, 2009).

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Short-term (2)	Duration of the construction phase.	**Low Negative (30)**
Extent	Local (2)	It may impact on local fauna populations.	
Magnitude	Moderate (6)	Can alter foraging, breeding cycles, communication, and mating.	
Probability	Probable (3)	Several fauna species are present on Phase 1F. Consequently, the probability exist the species could be affected.	

Mitigation/Enhancement Measures

Mitigation

Measures to minimize the impacts of noise and artificial lighting is listed below.

- All outside lighting should be directed into the proposed development as opposed to away from the development, and also not in the direction of sensitive areas, including sensitive areas on neighboring properties.
- Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible.
- To reduce low intensity noise levels, work areas need to be effectively screened to reduce or deflect noise. Engineering controls such as modifications to equipment or work areas to make it quieter, the acquisition of equipment designed to emit low noise and vibration, creation of noise barriers, proper maintenance of tools and equipment must be considered.
- Noise from vehicles and powered machinery and equipment on-site should not exceed the manufacturer's specifications, based on the installation of a silencer.
- Equipment should be regularly serviced.
- Attention should also be given to muffler maintenance and enclosure of noisy equipment.

Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	Duration of the construction phase.	**Low Negative (21)**
Extent	Local (2)	Likely to be limited to Phase 1F	
Magnitude	Low (4)	A difficult impact to mitigate but may be reduced with the implementation of the mitigation measures.	
Probability	Probable (3)	Local fauna likely to be impacted regardless of any mitigation measures.	

Cumulative impacts:

None expected during the construction phase. Will be a short duration impact and limited to the construction phase.

Residual Risks:

Expected to be low negative but of short duration.

Impact 6: Spread of invasive plant species and weeds

Impact description:
During the construction phase, large areas of vegetation will be cleared to accommodate infrastructure. This will create ideal opportunities and optimal conditions for weeds and alien & invasive plant species to invade disturbed areas and become established. IAPs and indigenous weeds can out-compete and replace indigenous flora, which will in turn impact on natural biodiversity. However, the alien invasive plant issue is one that can be successfully mitigated by means of ongoing alien invasive plant management on and around the proposed development.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Long-term (4)	Initiated during the construction phase but will result in a longstanding impact should no control be implemented.	**Moderate Negative (48)**
Extent	Local (2)	Phase 1F	
Magnitude	Moderate (6)	Spread of IAPs to adjacent undeveloped areas. Replacement of indigenous flora. Adjacent habitats already degraded.	
Probability	Highly Probable (4)	Vegetation clearance will create optimal opportunities for the establishment of invasive species.	

Mitigation/Enhancement Measures

Mitigation:
Implementation of an ongoing Alien & Invasive plant species eradication and control programme. Guidelines are provided below:

INVASIVE PLANT SPECIES MANAGEMENT AND MONITORING PLAN

These guidelines provide an outline of the overall approach that should be adopted on the site to minimize the probability of invasive alien plants becoming established and ensuring that any outbreaks are managed quickly to ensure that they do not become a long-term problem. The establishment of any dense infestations will be expensive to eradicate and will require more complex control measures than would be necessary for low density invasions.

Prevention

A prevention strategy should be considered and established, that must include regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural habitats. Prevention could also include measures such as washing the working parts and wheels of earth-moving equipment prior to it being brought onto site, visual walk-through surveys every three months.

Early identification and eradication

Monitoring plans should be developed which are designed to contain Invasive Alien Plant Species shortly after they arrive on the project site. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When new Invasive Alien Plant Species are spotted an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also ensure that natural systems are impacted to the smallest degree possible.

CONTROL METHODS

Control methods for the removal of IAPs is provided below:

Chemical control – the use of herbicides

- Chemical control should only be used as a last resort since it is hazardous for natural vegetation. It should not be necessary if regular monitoring is undertaken, which should be effective for controlling invasive alien plants and weeds.
- Chemical control involves the use of registered herbicides to kill the target weed. Managers and herbicide operators must understand how herbicides function. The use of inappropriate herbicides is wasteful and expensive and often do

more harm than good, especially when working close to aquatic habitat. Some herbicides can quickly contaminate fresh water and/or be transported downstream where they may remain active in the ecosystem.

- Herbicides are either classified as selective or non-selective. Selective herbicides are usually specific to a group of plants, e.g., those specified for use on broad leaf plants, but should not kill narrow-leaf plants such as grasses. **Non-selective herbicides can kill any plant that they come into contact with and are therefore not suitable for use in areas where indigenous vegetation is present.**
- Chemical application techniques include foliar (leaf) application, stem applications (basal stem, total frill, stem injections) and stump applications (cut stump, total stump, scrape, and paint).

Herbicide use tips and precautions

- Only use herbicides that are registered for use on the specific species to be treated.
- Spray plants during the active growing period. When leaf colour starts to turn for winter, it is too late to apply herbicides.
- Spray plants before the seeds are produced, namely, between flowering and fruit set. Avoid using herbicides on drought-stressed or diseased plants or in extremely hot or cold conditions.
- Do not spray plants that are over 1 m in height.
- Herbicides should not be applied during wet conditions, before or after rain. If it rains after application, it is important to monitor the effect as one may need to re-apply.
- Herbicides should always be applied immediately after the selected mechanical control method (e.g., after frilling, ringbarking, cut stumping or strip- barking). Once the stem has dried it will not absorb the herbicide. However, if for some reason this is not done, and one needs to apply the herbicide a few days or a week or two later, it is imperative to remove any callous tissue that has formed. Once the living cells are exposed, the herbicide should be applied.
- **Chemical control of alien plants is not recommended in aquatic systems due to the risk of pollution.**
- Remember to keep herbicide in the shade while at the work site to keep it cool.
- To avoid spills, keep herbicide containers on a waterproof tarpaulin, or inside a big plastic bucket. When mixing herbicides, ensure that you use a funnel to avoid spilling. Should you spill the herbicide, it can be poured back into the container from the plastic bucket.
- Containers containing mixed herbicide should be clearly marked (e.g., 'glyphosate mix'). Likewise, containers filled with water to be used for mixing herbicide should also be clearly marked to ensure that people do not drink from them.
- Always use a measuring jug to measure the correct quantity required.
- To mix herbicides, half fill the appropriate size container with water, and then add the herbicide using the measuring jug. Secondly, close the container and shake, and then fill the rest of the container with water.
- Keep the herbicide away from food.
- Carefully read and understand the instructions on the label prior to initiating chemical control. Most selective herbicides will lose selectivity at a high enough dose, highlighting the importance of adhering to instructions on the label.
- Always store herbicides in the original container and in secure storage areas.
- All persons must wear the required personal protective equipment when working with herbicides. These include overalls, rubber gloves and a face mask.
- Avoid skin contact with herbicides and avoid breathing in the vapour.

Manual methods

- Always start at the highest point and work downwards, i.e., downhill when using manual control methods.
- Start towards the edge of the infestation and work towards the centre.

Hand pulling

- Hand pulling is most effective with small (30 cm), immature or shallow rooted plants.
- Shake the excess sandy material from the plant, this makes the plant easier to stockpile and lighter to transport.

Chopping/cutting/slashing

- These menthods entails damaging or removing the plant by physical action. This method is most effective for plants in the immature stage, or for plants that have relatively woody stems/trunks. This control option is feasible in sparse infestations or on small scale, and for controlling species that do not coppice after cutting. For species that coppice after cutting, chemical treatment of the cut stumps will be required.
  - Cut/slash the stem of the plant as near as possible to ground level.
  - Paint resprouting plants (i.e., black wattle, lantana) with an appropriate herbicide immediately after they have been cut.
  - Stockpile removed material into piles as prescribed.

Basal bark

For plants with thin bark or stems up to 25 cm in diameter.

- Application of suitable herbicide in water can be carried out to the bottom 250 mm of the stem. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.
- If the plant is multi stemmed, then individual stems need to be treated.

Ring barking

This method is not used for stands but for large individual trees.

- Remove the bark and cambium around the trunk of the tree in a continuous band around the tree at least 25 cm wide, starting as low as possible.
- Where clean de-barking is not possible due to crevices in the stem or where roots are exposed, a combination of bark removal and basal stem treatments should be carried out.
- For aggressively coppicing species pull off the bark below the cut to ground level (bark stripping), to avoid the use of herbicide.

Bark stripping

- All the bark should be stripped from the trunk between the ground level and 1 m above ground level.
- Application of suitable herbicide can also be used with this method.
- Herbecide applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.

Frilling

- Using an axe or bush knife, make a series of overlapping cuts around the trunk of the tree, through the bark into the softwood (approximately 500 mm from ground level). The thickness of the blade should force the bark open slightly, ensuring access to the cambium layer.
- Ensure to affect the cuts around the entire stem.
- Apply a suitable herbicide immediately to the cuts by spraying into the frill. The frill needs to be deep enough to retain the herbicide.

Mechanical methods

Felling

- De-branch cut trees and where possible remove all material.
- Where possible large trees are to be felled so that they fall uphill.
- Cut the plant down as low as possible to the ground.
- Apply a suitable herbicide immediately (no later than 30 minutes) to the cambium layer.
- Ensure all the cuts in the cambium layer are treated.

Injection

- Drill or punch downward slanting holes into the tree around the entire circumference of the stem.
- Inject the chemical directly into the plant.

Foliar spray

- Use a solid cone nozzle that ensures an even coverage on all leaves and stems to the point of runoff.
- Do not spray just before rain (a rainfall-free period of 6 hours is recommended) or before dew falls.
- Avoid spraying in windy weather as the spray may come into contact with non target plants.
- Spraying dormant or drought stressed plants is not effective as they do not absorb enough of the herbicide.

Cut stump application

This is a highly effective and appropriate control method for larger woody vegetation that has already been cut off close to the ground.

- The appropriate herbicide should be applied to the stump using a paintbrush within 30 minutes of being cut.
- Stems should be cut as low as possible. Herbicides are applied in water as recommended for the herbicide.

Construction phase activities

The following management actions are required to minimize soil and vegetation disturbance during the construction phase, to reduce the probability of invasive alien plants becoming established:

ACTION	FREQUENCY

The Environmental Control Officer (ECO) is to provide permission before any natural vegetation is to be cleared for development.	Daily/when required
Clearing of vegetation must be undertaken as the work front progresses. Mass clearing is not to be permitted.	Weekly/when required
On areas where revegetation is required but cannot be done immediately after clearance, the cleared area must be protected with packed brush or appropriately battered with fascine work (fixing horizontal branches along the ground using vertical pegs to create resistance to down-slope flow of water/materials). Alternatively, jute (Soil Saver) may be pegged over the soil to stabilize it.	Weekly
Organic matter used to encourage regrowth of vegetation on cleared areas should not be brought onto site from foreign areas. Brush from cleared areas (except for invasive plants) should be used as much as possible. The use of manure or other soil amendments should not be used as this would encourage invasion.	Weekly
Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
ECO to survey site once a month to detect aliens and have them removed.	Monthly
Alien vegetation regrowth must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best practice for the species concerned. Such information can be obtained from the Working for Water website as well as herbicide guidelines.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into adjacent no-go areas. No-go areas should be clearly demarcated prior to construction.	Daily

Disposal of removed plant material

- When removing material, take care to remove all debris, including shoots and seeds.
- Disposal of the cut IAP material needs to be carefully considered, for example, **the burning of some species of IAPs stimulates seed release or rapid seed germination.**

Post-removal follow-up and rehabilitation

- Re-establishment of indigenous vegetation needs to be undertaken where required to reduce the probability of re-emergence of invasive alien plants and to reduce the risk of soil erosion where the soil surface is poorly vegetated. Rehabilitation should follow these steps:
  - All areas of exposed soil should be immediately protected by placing packed brush or creating erosion control barriers using branches, sticks or logs. On slopes, these should be placed horizontally across the slope at 1 m intervals (the steeper the slope the closer the barriers should be placed to one another). If topsoil has been lost, rehabilitation of indigenous vegetation will be a difficult and expensive process.
  - Monitor these areas on a regular basis (monthly during construction and three-monthly during operation) for emergent seedlings of invasive alien species and remove these (hand pulling or chemical control).

Construction phase monitoring

To monitor the impact of clearing activities and rehabilitation efforts (where required), monitoring must be undertaken. This section provides a description of a monitoring programme to assess of the magnitude of IAPs on site and of the management actions.

In general, the following principles apply to monitoring:

- Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
- Simple records must be kept of daily operations, e.g., area/location cleared, labour units and, if ever used, the amount of herbicide used.
- It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action

The following monitoring is required during the construction phase of the projects:

MONITORING ACTION	INDICATOR	TIMEFRAME

Document alien species present on site	Alien species list	Pre-construction and monthly thereafter
Alien plant distribution	Distribution maps, GPS coordinates	Monthly
Document and record alien control measures implemented	Record of clearing activities	6-monthly
Review alien control success rate	Decline in abundance of alien plant species over time	Annually

Post Mitigation/Enhancement Measures			
Duration	Short-term (1)	Monthly monitoring and then the immediate removal of IAPs.	**Minor Negative (2)**
Extent	Site (1)	Suitable control and eradication methods will prevent the spread.	
Magnitude	Small (0)	Suitable control methods will ensure that IAPs are immediately removed.	
Probability	Improbable (1)	Unlikely to spread to adjacent areas provided that a management and monitoring programme are implemented.	

Cumulative impacts:
None expected provided that the mitigation measures are implemented.

Residual Risks:
Expected to be minor and localized provided that the mitigation measures are implemented.

Impact 7: Soil erosion and sedimentation

Impact description:

Construction activities will temporarily expose the soils to the erosive elements. This could be exacerbated by water flowing down trenches and access roads, as well as from trench de-watering activities. Soil erosion can result in the loss of valuable topsoil and formation of erosion gullies. This can cause localised habitat loss / alteration due to increased sediment deposition or erosion of areas. Rapid and effective rehabilitation of these areas will be important in reducing erosion risk.

Although impacts would be localised, erosion is likely to persist or worsen over time if not addressed. If managed properly, the probability and extent of this impact can be reduced quite significantly.

	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Permanent (5)	A gradual process with permanent effects.	**Moderate Negative (52)**
Extent	Local (2)	Project site and adjacent habitats.	
Magnitude	Moderate (6)	Soil degradation on adjacent habitats.	
Probability	Highly Probable (4)	High erosion potential of soils on the project site.	

Mitigation/Enhancement Measures

Mitigation:
Mitigation measures to minimize soil erosion is outlined below:

EROSION CONTROL
Surface water control

- Monitor water consumption and ensure that all possible use is accounted for, and areas of waste are identified (i.e., water used for surface wetting, for batching, for potable supply etc.).
- Repair identified leaks and address issues of water wastage as soon as these are identified.
- Avoid over-wetting, saturation, and unnecessary runoff during dust control activities.
- Do not allow surface water or storm water to be concentrated, or to flow without erosion protection measures being in place.
- Ensure that overland discharge occurs over areas that have a minimum cover of 90% grass cover at a minimum height of 150 mm.

Erosion protection

- Program construction activities so that the area of exposed soil is minimised during times of the year when the potential for erosion is high, for example during summer when intense rainstorms are common.
- Site-specific plans for site erosion and sediment control should be developed and implemented. This should include a determination of site erosion potential and the identification of water bodies at risk.
- Site drainage such as those generated by the dewatering of excavated trenches must be diverted away from cleared, graded, or excavated areas.
- Sediment barriers or sediment traps such as silt fences, sandbags, and hay bales for example must be established to curb erosion and sedimentation where necessary.
- Sediment barriers should be regularly maintained and cleaned to ensure effective drainage.
- These temporary barriers may only be removed once construction has been completed and there is no further risk of sedimentation.
- Stockpiles are not to be used as stormwater control features.
- Erosion, sediment control measures such as silt fences, concrete blocks and/or sandbags must be placed around stockpiles (i.e., soil and materials) to limit runoff.
- Stockpiling of any materials on slopes is to be avoided unless appropriate erosion control and management measures are implemented.
- Protect all areas from erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas.
- Retain natural shrubbery and grass species wherever possible.
- Do not permit vehicular or pedestrian access into undeveloped areas beyond the demarcated boundary of the work areas.

Post Mitigation/Enhancement Measures			
Duration	Short-term (1)	Erosion protection measures will be in place.	**Minor Negative (2)**
Extent	Site (1)	Limited to the site	
Magnitude	Small (0)	Erosion protection measures will be in place.	
Probability	Improbable (1)	Unlikely to happen if mitigation measures are implemented.	

Cumulative impacts:
None expected provided that the mitigation measures are implemented.

Residual Risks:
Minor: Expected to be minor and localized provided that the mitigation measures are implemented.

Impact 8: Pollution of soils and habitat

Impact description:
Waste products and pollutants generated during the construction phase may include fuels and oils from construction vehicles as well as solid waste in the form of building material and litter from labourers. These can potentially enter undevelopment areas adjacent to the project site either directly through disposal/mismanagement of waste products, or indirectly through surface water runoff during periods of rainfall.

Chemicals can enter the air, water, and soil when they are produced, used, or disposed. Their impact on the environment is determined by the amount of the chemical that is released, the type and concentration of the chemical, and where it is found. Some chemicals can be harmful if released to the environment even when there is not an immediate, visible impact. Some chemicals are of concern as they can work their way into the food chain and accumulate and/or persist in the environment for many years. Harmful effects of such chemical and biological agents as toxicants from pollutants, insecticides, pesticides, and fertilizers can affect an organism and its community by reducing its species diversity and abundance. Such changes in population dynamics affect the ecosystem by reducing its productivity and stability.

	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Permanent (5)	Many chemicals can persist in the environment for many years and permanently alter biological processes.	**Moderate negative (56)**
Extent	Regional (3)	Chemicals can enter air and water causing a regional impact. Windblown litter can enter adjacent habitats and the drainage canal. Pollution of downstream habitats.	
Magnitude	Moderate (6)	Reduction of species diversity and abundance. Contamination of ecosystems.	

Probability	Highly probable (4)	Hazardous chemicals will be used during the construction phase. Solid, liquid, and hazardous waste will be generated during the construction phase.	

Mitigation/Enhancement Measures

Mitigation:

SOLID WASTE

- Collect all domestic waste in adequate numbers of litter bins located as required on the work sites and within the Contractors camp.
- Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out.
- Ensure that personnel make use of the litter bins provided. Keep all work sites and the Contractors camp tidy and litter free at all times.
- Empty litter bins weekly (or as required before they reach capacity).
- Where necessary, dedicate a storage area on site for the collection of construction waste.
- Ensure that solid waste is transported properly, avoiding waste spills en-route.
- No solid waste may be burned on site.

LIQUID WASTE

- Ensure that adequate numbers of conveniently located site toilets are available on all work sites at all times in quantities related to the number of users (1 toilet per 30 users is the norm).
- Maintain and clean site toilets regularly as is required to keep them in good, functional working order and in an acceptable state of hygiene.
- Combine drinking water facilities with hand washing facilities near site toilets.

HAZARDOUS WASTE

- Ensure compliance with all national, regional, and local legislation with regards to the storage and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.
- Collect any hazardous waste in receptacles located on a drip tray on site pending disposal.
- Regularly dispose of all hazardous waste not earmarked for reuse, recycling, or resale (such as oil contaminated with chlorinated hydrocarbons, electrical cleaning solvent, certain chemicals) at a registered hazardous waste disposal site.
- Contain chemical spills, and arrange for cleanup / control by the supplier, or by professional pollution control personnel.

POLLUTION CONTROL

- Do not dump waste of any nature, or any foreign material into the drainage canal.
- Do not allow the use of the water in the drainage canal for the cleaning of clothing, tools, or equipment.
- Deflect any unpolluted water / runoff away from any dirty area (including plants, maintenance areas, and contractors' yard).
- Otherwise, clean, but silt laden water may be discharged overland, provided no erosion is resultant from this discharge.
- Take special care during rainy periods to prevent the contents of sumps and drip trays from overflowing.
- Do not hose oil or fuel spills into the surrounding natural environment.
- Clean small oil or fuel spills with an approved absorbent material, such as 'Drizit' or 'Spill-sorb'.
- Contain oil or fuel spills in water using an approved oil absorbent fibre.
- Treat soil contaminated by oil or fuel using one of the following methods:
  - Remove the soil to the depth of the contamination and dispose of at a registered Hazardous Waste Disposal Site.
  - Remove the soil to the depth of the contamination, and regenerate using approved bio-remediation methods.
- Report major oil or fuel spills to the provincial Department of Water Affairs and Forestry, as well as to the relevant Local Authority.
- Carefully control all on-site operations that involve the use of cement and concrete.
- Limit cement and concrete mixing to single sites where possible.
- Use plastic trays or liners when mixing cement and concrete: Do not mix cement and concrete directly on the ground.
- Dispose of all visible remains of excess cement and concrete after the completion of tasks. Dispose of in the approved manner (solid waste concrete may be treated as inert construction rubble, but wet cement and liquid slurry, as well as cement powder must be treated as hazardous waste).
- Contain water and slurry from cement and concrete mixing operations. Direct such wastewater into a settlement pond or for later disposal as hazardous waste.
- Do not allow the washing of trucks delivering concrete anywhere but within designated wash bays equipped with runoff containment. Direct such wastewater into a settlement pond for later disposal.
- Minimise fuels and chemicals stored on site.

• Install bunds on storage areas and take other precautions to reduce the risk of spills. • Implement a contingency plan to handle spills, so that environmental damage is avoided. • No refueling, servicing of plant/equipment or chemical substance storage allowed outside of designated areas. • Drip trays should be used during al fuel/chemical dispensing. • Drip trays to be placed beneath standing machinery/plant. • In the case of petrochemical spillages, the spill should be collected immediately and stored in a designated area until it can be disposed of in accordance with the Hazardous Chemical Substances Regulations, 1995 (Regulation 15).			
Post Mitigation/Enhancement Measures			
Duration	Short-term (2)	Duration of the construction phase.	**Minor Negative (10)**
Extent	Site (1)	Limited to the site.	
Magnitude	Minor (2)	Minor and will probably not happen provided that the mitigation measures are implemented.	
Probability	Improbable (2)	Due to the nature of the operations, some possibility exist that the impact will occur, but with a low likelihood provided that the mitigation measures are implemented.	
Cumulative impacts: None expected provided that the mitigation measures are implemented.			
Residual Risks: Expected to be minor and localized provided that the mitigation measures are implemented.			

4.4.2 Operational Phase Impacts and Mitigation

No information on the anticipated lifespan of the proposed development was provided. Ecological impacts likely to be associated with the operational phase may include the following:

- Invasion and spread of IAPs and weeds
- Disturbance of local fauna communities and accidental fauna mortalities
- Artificial noise and light disturbance
- Pollution of soils and habitat

The above impacts are discussed below, and mitigation measures are proposed to reduce the impacts on the receiving environment.

Impact 1: Invasion and spread of IAPs and weeds

Impact description:
The clearance of vegetation and disturbance initiated during the construction phase may create edge habitat immediately adjacent to the facility. This creates ideal opportunities and optimal conditions for weeds and alien & invasive plant species to invade these edge habitats. IAPs and indigenous weeds can out-compete and replace the remaining indigenous flora in the general area surrounding the facility, which will in turn impact on natural biodiversity.
The alien invasive plant issue is one that can be successfully mitigated, by means of ongoing alien invasive plant management on and around the proposed development.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Low Negative (39)**
Extent	Local (2)	Areas directly adjacent to the facility may be affected as well as remaining natural habitat within Phase 1F.	
Magnitude	Moderate (6)	Invasive species may replace indigenous species over time. The vegetation of Phase 1F is disturbed by past anthropogenic activities.	

Probability	Probable (3)	Invasive species are already present on the project site and on adjacent habitats. Spread of invasives thus likely (i.e., wind-dispersed seeds; birds as seed dispersers)	

Mitigation/Enhancement Measures

Mitigation:

Implementation of an ongoing Alien & Invasive plant species eradication and control programme. Guidelines are provided under the mitigation measures for Impact 6 in the construction phase impact descriptions.

The following management actions are aimed at maintaining non-invaded areas clear of invasive alien species as well as reducing the abundance of any aliens during the operational phase:

ACTION	FREQUENCY
Surveys for alien species should be conducted regularly. All aliens identified should be cleared immediately following detection. Refer to	Every 3 months for 2 years and biannually thereafter.
Re-vegetation with indigenous, locally occurring species should take place in areas where natural vegetation is slow to recover or where repeated invasion has taken place where applicable.	Biannually, but re-vegetation should take place at the beginning of the rainy season.
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected.	When necessary
No alien species should be cultivated on site. If vegetation is required for aesthetic or other purposes, then non-invasive locally occurring indigenous species should be used.	When necessary

The following monitoring is required during the operational phase of the project:

MONITORING ACTION	INDICATOR	TIMEFRAME
Document alien species distribution and abundance on site	Alien species distribution maps	Every 3 months
Document alien plant control measures implemented, and success rate achieved	Records of control measures and their success rate	Every 3 months
Document rehabilitation measures implemented, and success achieved in problem areas	Decline in vulnerable bare areas over time	Every 3 months

Post Mitigation/Enhancement Measures

Duration	Short-term (1)	Regular surveys will be conducted to identify and remove invasives.	**Minor Negative (2)**
Extent	Site (1)	Monitoring will prevent the spread to adjacent undeveloped areas.	
Magnitude	Small (0)	Invasives will be immediately removed	
Probability	Very Improbable (1)	With regular maintenance and monitoring it is unlikely that invasives will spread to adjacent undeveloped areas.	

Cumulative impacts:

None expected if mitigation measures are implemented.

Residual Risks:

Expected to be Minor and localized if mitigation measures are implemented.

Impact 2: Disturbance/loss of local fauna species and accidental fauna mortalities

Impact description:

Except for a few generalist bird species such as House Sparrows and Crows, it is unlikely that local fauna populations will utilise the project site. The facility will be fenced which will prevent larger animals such as Duikers and Mongooses from entering the area. However, smaller reptile species such as such as *Agama aculeata distanti*, *Lygodactylus capensis*

capensis, Acanthocercus atricollis atricollis, and in particular *Chamaeleo dilepis* are prone to electrocution on electric fencing.

Phase 1F provides habitat to several fauna species. The construction of the proposed facility will reduce the available habitat for these species, and result in increased fragmentation of available habitat within Phase 1F, increase the risk of poaching and may result in accidental mortalities because of increased traffic in the area. Local fauna species such as Duikers are already prevented from natural dispersal by the boundary fence of Phase 1F which may contribute to ever-reducing population sizes in future. The duikers will also be vulnerable to poaching for food and increased human presence and traffic from staff accessing the facility will increase the risk of wildlife mortalities on the roads.

The above impacts described will be an ongoing threat during the entire operational phase of the project.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Moderate Negative (52)**
Extent	Local (2)	Local fauna population on Phase 1F	
Magnitude	Moderate (6)	Reduced availability of habitat on Phase 1F. Increased presence of people and vehicles on Phase 1F.	
Probability	Highly probably (4)	Local fauna populations will be affected.	
Mitigation/Enhancement Measures			
Mitigation: Minimization methods to reduce electrocutions on electric fencing: • Should the facility be fenced with electrified fencing, then no electrified strands should be placed within 30 cm of the ground. • Keep foliage trimmed well away from the electric fence. • Regularly patrol the perimeter of the fenceline to remove any overgrowing vegetation. General minimization measures: • Access to undeveloped areas should be restricted and controlled. This should be clearly communicated to all employees. • No hunting, snaring, killing, or disturbing any fauna species to be allowed on Phase 1F. • No collecting or flora species must be permitted anywhere on Phase 1F. • The handling and removal of any venomous fauna species such as snakes must be prohibited. Should any such species be encountered, a qualified and experienced professional with experience in snake handling and removal must be contacted immediately. • The vehicle operating speed of employees entering Phase 1F should be reduced to avoid collisions with local fauna species.			
Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Low Negative (33)**
Extent	Local (2)	Phase 1F	
Magnitude	Low (4)	No habitat on the facility. Only generalist bird species may utilise the area occasionally. Electrocution of reptiles cannot be entirely prevented.	
Probability	Probable (3)	It is likely that impacts will occur regardless of mitigation measures.	
Cumulative impacts: Cumulative contribution of habitat loss resulting in a decline in local fauna populations.			
Residual Risks: Residual impacts are expected with regards to a loss of local habitat, habitat connectivity and loss of local fauna species.			

Impact 3: Noise and artificial light disturbance

Impact description:

Potential negative ecological consequences of noise and artificial light disturbance have been discussed under the Construction phase impacts. Since those impacts are also applicable during the Operational phase, it will not be discussed further.

	Rating	Motivation	Significance
Prior to Mitigation			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Low Negative (33)**
Extent	Local (2)	Phase 1F	
Magnitude	Low (4)	Likely to affect local fauna populations.	
Probability	Probable (3)	Likely to affect local fauna populations.	

Mitigation/Enhancement Measures

Mitigation:

- Outside lighting should be designed to minimise impacts on fauna.
- All outside lighting should be directed into the facility as opposed to away from the facility, and not in the direction of undeveloped areas, including undeveloped areas adjacent to the proposed development.
- Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible.
- To reduce low intensity noise levels, work areas need to be effectively screened to reduce or deflect noise. Engineering controls such as modifications to equipment or work areas to make it quieter, the acquisition of equipment designed to emit low noise and vibration, creation of noise barriers, proper maintenance of tools and equipment must be considered.
- Noise from vehicles and powered machinery and equipment used during operations should not exceed the manufacturer's specifications, based on the installation of a silencer. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.

Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	The duration of the operational phase is unknown. The worst-case scenario was therefore considered.	**Low Negative (24)**
Extent	Local (2)	Phase 1F	
Magnitude	Minor (2)	Likely to affect local fauna communities	
Probability	Probable (3)	Likely to affect local fauna communities	

Cumulative impacts:

This impact is not particularly significant with regards to noise pollution but may contribute cumulatively to light pollution in the larger area.

Residual Risks:

Low negative but with a cumulative contribution towards light pollution of the larger geographic area.

Impact 4: Pollution of soils and habitat

Impact description:

Improper waste management practices and the improper storage of hazardous chemical substances could result in significant environmental damage on the project site and adjacent properties. Hazardous substances may enter the soil as water trickles from contaminated sites leaching chemicals, resulting in soil and groundwater contamination. Contaminated soil can damage flora and fauna directly and indirectly by releasing toxic components into the food chain. Ingesting, inhaling, or touching contaminated soil may have a serious adverse impact on humans and fauna. The project site also falls within an area with a shallow water table which increases the potential for groundwater contamination significantly.

Improper waste management practices may result in soil contamination and loss of biodiversity on undeveloped areas adjacent to the project site (i.e., windblown litter).

Understanding the legal responsibilities with respect to waste management can be a daunting task. Compliance requirements pertaining to waste is contained in a wide array of legislation, across all tiers of government and administered by numerous government departments. Poor waste management practises can lead to high clean-up and rehabilitation costs in terms of Section 28 of the National Environmental Management Act (Act 73 of 1998) and Section 19 of the National Water Act (Act 36 of 1998).

	Rating	Motivation	Significance

Prior to Mitigation			
Duration	Permanent (5)	Groundwater contamination is permanent and irreversible.	**Moderate Negative (48)**
Extent	Region (3)	Contaminated groundwater can spread over large areas.	
Magnitude	High (8)	Can result in significant environmental damage and health impacts.	
Probability	Probable (3)	Due to the size of the operation, it is expected that large volumes of hazardous chemicals will be stored on the premises.	

Mitigation/Enhancement Measures

Mitigation:

To comply with the chemical regulations in South Africa, it is required that a comprehensive Hazardous Materials Management Plan and Emergency Spill Response Procedures be developed by taking into consideration all the relevant National, Provincial and Munical laws and regulations, as well as the relevant SANS/SABS codes Specific attention should be paid to the following:

- Record keeping – Detailed, up to date records of all chemicals stored on site, including the volumes of the chemicals and the areas where the chemicals are stored
- Safety data sheets for all chemical
- Correct labelling of chemicals
- Criteria for temperature control should it be required
- Health and environmental hazard identification
- Precautions for safe handing
- Conditions for safe storage, including any incompatabilities
- Exposure controls/personal protection
- Ecological information
- Disposal considerations
- Relevant South African regulations and statutory provisions

Detailed spill response procedures must as a minimum include the following:

- Materials inventory
- Facilities map
- Spill kit inventory and labelling
- Spill log
- Responsibilities
- Emergency contact numbers
- Emergency evacuation procedures
- Spill response and cleanup for small, medium, and large spills
- Detailed clean-up procedures
- Reporting of spills

It is recommended that an Integrated Waste Management Plan for general and hazardous waste, structured around the steps in the waste management hierarchy (avoid, reduce, recycle, eliminate), the National Waste Management Strategy 2020, the NEMA: Waste Act, 2004, and all the applicable environmental laws, regulations, and best practice standards be developed.

Integrated Waste Management (IWM) is a comprehensive waste prevention, recycling, composting, and disposal program. An effective IWM system considers how to prevent, recycle, and manage solid and hazardous waste in ways that most effectively protect human health and the environment. IWM involves evaluating organisational needs and conditions, and then selecting and combining the most appropriate waste management activities for those conditions. The major IWM activities are waste prevention, recycling and composting, and combustion and disposal in properly designed, constructed, and managed landfills. Each of these activities requires careful planning, financing, collection, and transport.

An integrated waste management plan is a practical document that can help guide the Plant's waste management efforts. It can help to:

<table>
<tr><td colspan="4">
• Define and understand current waste management practices and the system in place.
• Identify problems and deficiencies with the current system.
• Identify opportunities for improvement in the current system.
• Set priorities for action to address problems and affect improvement.
• Measure progress toward implementing actions.
• Identify the resources needed and develop budgets and schedules.
• Revisit and modify priorities as the plan develop.
</td></tr>
<tr><td colspan="4">Post Mitigation/Enhancement Measures</td></tr>
<tr><td>Duration</td><td>Permanent (5)</td><td>The duration of the operational phase is unknown. The worst-case scenario was therefore considered.</td><td rowspan="4">Minor Negative (16)</td></tr>
<tr><td>Extent</td><td>Site (1)</td><td>Limited to site operations.</td></tr>
<tr><td>Magnitude</td><td>Minor (2)</td><td>Expected to be minor provided that the mitigation measures are implemented.</td></tr>
<tr><td>Probability</td><td>Improbable (2)</td><td>Unlikely to occur but cannot be entirely eliminated. With the implementation of the mitigation measures, accidental spillages can be contained and prevented from entering into the environment.</td></tr>
<tr><td colspan="4">Cumulative impacts:
None expected provided that the mitigation measures are implemented.</td></tr>
<tr><td colspan="4">Residual Risks:
Expected to be minor and localized provided that the mitigation measures are implemented.</td></tr>
</table>

4.5 Cumulative Impacts

4.5.1 Definition and Main Principles of Cumulative Impacts

The cumulative impacts from several projects is the change in the environment which results from the incremental impact of the project under review, added to the incremental impacts of other past, present, and future projects. Cumulative impacts can result from individually minor but collectively significant project related impacts taking place over time.

The assessment of the significance of cumulative impacts is rather similar to the assessment of impacts conducted during the Scoping and EIA phases, except that during the cumulative impact assessment (CIA) a more extensive and broader review of possible impacts are assessed.

The main principles for describing and assessing cumulative impacts are listed below (after DEAT, 2004):

- Cumulative impacts are caused by the aggregate of past, present, and reasonably foreseeable future actions.
- Cumulative impacts are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who has taken the action.
- It is not practical to analyse the cumulative impacts of an action on every environmental receptor, the list of environmental impacts must focus on those that are truly meaningful.
- Cumulative impacts on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
- Cumulative impact analyses on natural systems must use natural ecological boundaries.
- Cumulative impacts may result from the accumulation of similar effects or the synergistic interaction of different effects.
- Cumulative impacts may last for years beyond the life of the action that caused the impacts.
- Each affected resource, ecosystem, and human community must be analysed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.

Basic concepts of importance in a CIA

The basic concepts of importance in a CIA, apart from the cumulative impacts are the valued ecosystem components (VECs), area of influence, and limits of acceptable change. All these constitute the main issues in defining the study area, the cumulative impacts, and their significance.

4.5.2 Methodology and Results

Valued Ecosystem Components (VECs) of the project site

VECs are defined as elements of the environment that has scientific, ecological, economic, social, or cultural significance.

VECs of ecological significance were identified during the desktop assessment on the project site and is listed in Table 17. The VECs included areas that must be protected and conserved in terms of national, provincial, district and municipal legislation and biodiversity plans, and fauna and flora species listed as Threatened.

TABLE 17: VECs identified to inform the cumulative impact assessment.

VEC	DESCRIPTION AND MANAGEMENT OBJECTIVES
Threatened Terrestrial Ecosystems	Kwambonambi Hygrophilous Grassland listed as CR with a high irreplaceability value. Remnants falls within national and district scale CBA:Irreplaceable areas.
Threatened vegetation types	• Provincial conservation targets for the Maputaland Woodland Grassland vegetation type have been set at 25%, and for the Subtropical Freshwater Wetlands at 24%. Both vegetation types are currently under-protected. • Only 17% of the original extent of the Maputaland Wooded Grassland and 15% of the Subtropical Freshwater Wetlands protected (Jewitt 2018). • Further loss of these vegetation types could potentially affect the ability to meet provincial conservation targets.
CBAs	• Areas that are irreplaceable for meeting biodiversity targets. There are no other options for conserving the ecosystems, species, or ecological processes in these areas. • Maintain in natural or near natural ecological condition. • Compatible land uses include open space and low impact ecotourism or recreation.
City of uMhlathuze priority zones for conservation and Corridors/linkages	• Conservation zones are areas of biodiversity/environmental significance, which are not viable for proclamation as nature reserves, but that require some form of legal protection. Included are unique or regionally important natural habitats; wetland and forest areas that are protected in terms of national legislation; and all areas that fall within the 1:100-year flood line. No transformation of the natural assets or the development of land for purposes other than conservation should be permitted in this zone. Sustainable use of renewable resources is permitted. • Corridors/linkages are areas that provide a natural buffer for Protected areas and Conservation zones, areas that provide a natural link between Protected areas and Conservation zones; areas that supply, or ensure the supply of, significant environmental services. Transformation of natural assets and the development of land in these zones should only be permitted under controlled conditions.
NPAES focus areas	• Priority areas for protected areas expansion. The aim of NPAES focus areas is to improve the representativity and efficiency of the protected areas network in South Africa. • South Africa's current protected area network still falls far short of sustaining biodiversity and ecological processes. • Targets can only be met by secured intact habitat.
Red Listed flora & fauna	• There is a wide range of activities specified in the NEMBA Act (2004) relating to endangered, vulnerable and protected species which include: hunting, catching, searching, pursuing, lying in wait, gathering, collecting or plucking, picking parts of or cutting, uprooting, damaging or destroying, importing, exporting, having in possession or exercising physical control over, growing, breeding or in any other way propagating, conveying, translocating, selling or otherwise trading in, buying, donating or accepting as a gift, or in any way acquiring or disposing of any specimen. • Restricted activities include importing, having in possession or exercising physical control over, growing, breeding or in any other way propagating, conveying, translocating, selling

	or otherwise trading, buying, giving, donating, or accepting as a gift, or in any way acquiring or disposing of any specimen.

Area of influence

The determination of spatial boundaries was informed by the distribution of VECs within the landscape relative to known current and future development pressure affecting the same VECs.

Limits of acceptable change

Limits of acceptable change were expressed in terms of goals/management objectives for the identified VECs as listed in Table 17.

Identification of activities/projects affecting the same VECs

The approach to assessing cumulative impacts affecting the same VECs is to screen potential interactions with other projects based on:

- Past ecological impacts.
- Present ecological impacts.
- Future ecological impacts/development pressure.

Past and present ecological impacts

uMhlathuze Municipality

A simplified version of the most recent land cover dataset for South Africa (SANLC 2020) was overlayed with municipal infrastructure datalayers to visualise the extent of natural areas relative to transformed areas in uMhlathuze Municipality (Figure 34). Since all the VECs on the project site represents areas/species of national, provincial, district and/or municipal conservation importance required to meet biodiversity conservation targets, the resultant map provided a useful overview of how much natural habitat is still present in the Municipal area.

uMhlathuze Municipality has a longstanding history of anthropogenic disturbance. The once continuous ecosystems and vegetation types in the municipality was significantly transformed and fragmented over time by urban and rural expansions, agriculture, and multiple linear infrastructure developments, with remaining natural habitat in many instances small and highly fragmented. The extent of transformation and habitat fragmentation is clearly visible on Figure 34.

Phase 1F

Phase 1F is zoned for the development of noxious industries. It is still largely undeveloped but has a longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services infrastructure (i.e., water, sewer, stormwater, electricity, roads, artificial drainage canals, Figures 20-24), and the more recent infilling of the wetlands as was delineated by Nemai Consulting (2016) in Figure 15. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO^2 Pilot plant which covers approximately a third of Phase 1F. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds (Figure 35).

The project site on Phase 1F has experienced past environmental disturbances that were judged to have had a negative influence on its biodiversity and ecology and included the following:

- Land clearance on the project site resulted in the direct loss of indigenous vegetation.
- The wetlands on the proposed development site were fragmented by the construction of a drainage line and roads.
- The wetlands on the project site were infilled to prepare the area for future development.

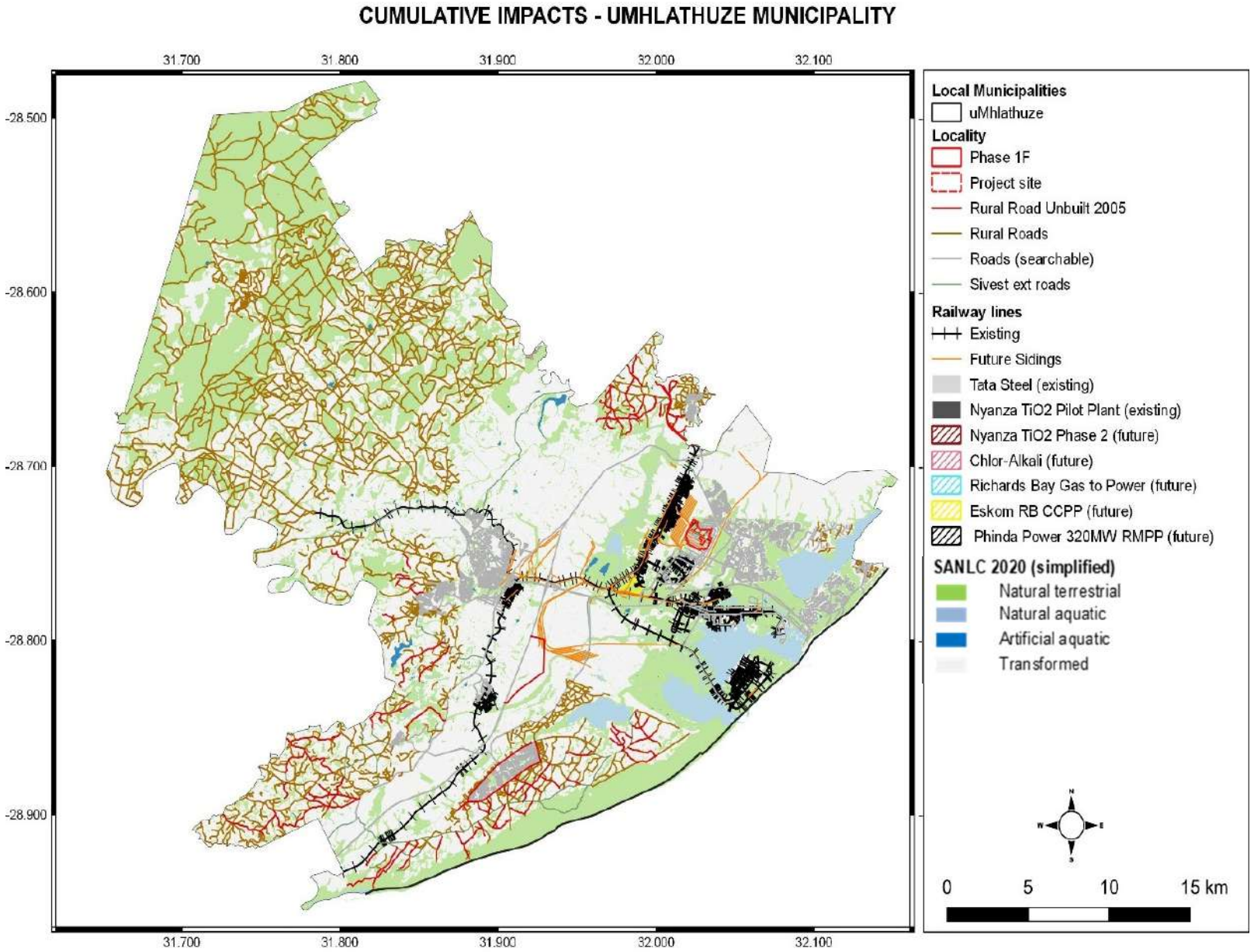


FIGURE 34: Cumulative impacts in uMhlathuze Municipality.

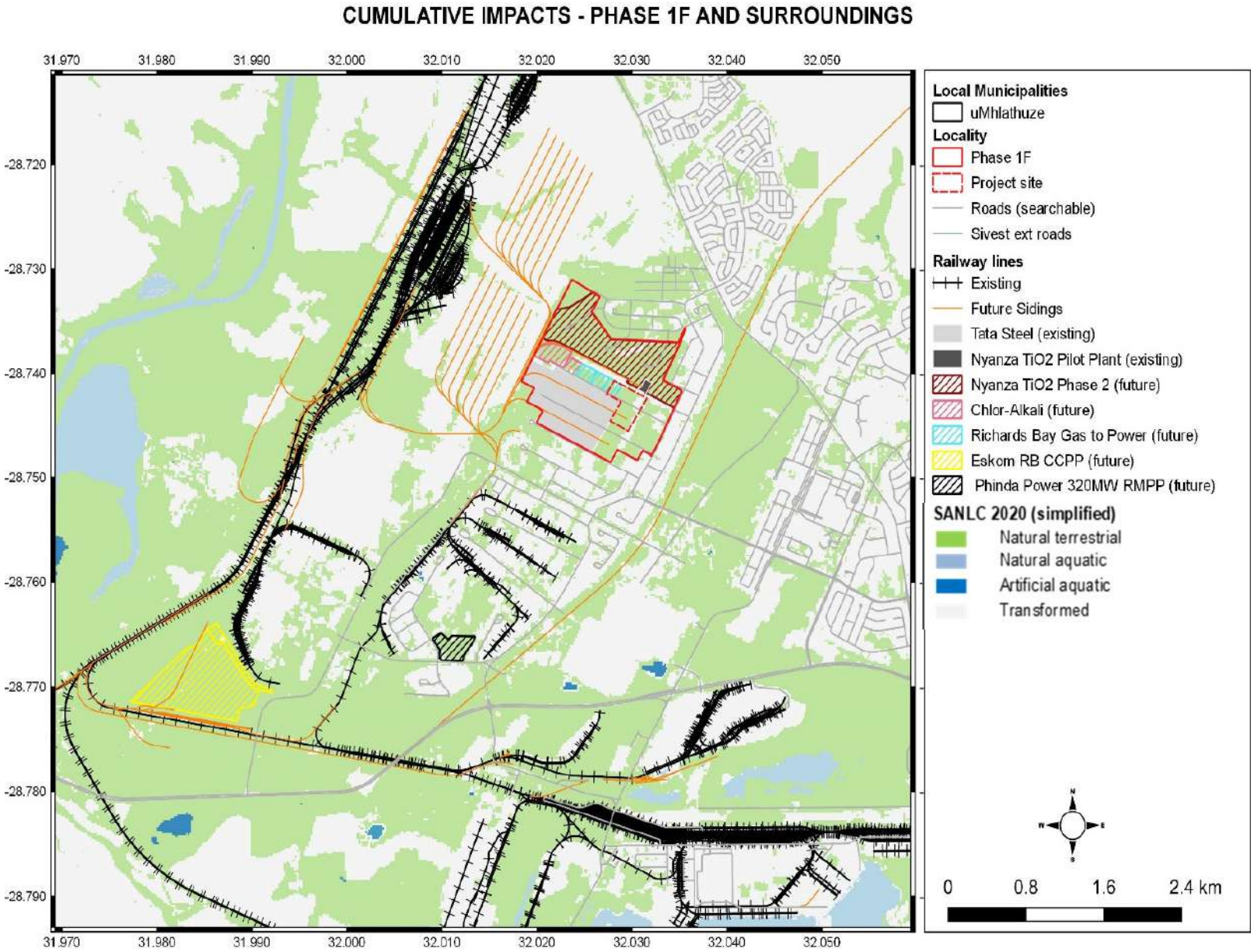


FIGURE 35: Cumulative impacts phase 1F and surroundings.

Future development pressure

The information available to inform the CIA was limited to projects located within the same VECs close to the project site and is summarized in Table 18.

This is however an underestimation of VEC loss since the uMhlathuze Municipality, in their Spatial Development framework listed several future planned developments within the area. Since no detailed information was available for these developments, the CIA was limited to the projects listed in Table 18.

TABLE 18: Existing and known future projects considered for the cumulative impact assessment. The extent of VECs on each project site is indicated for each project.

						CBA PROVINCIAL (ha)				DRAFT ESMP (ha)			
DEVELOPMENT	**DEVELOPMENT FOOTPRINT (ha)**	**KWAMBONAMBI HYGROPHILOUS GRASSLAND (ha)**	**MAPUTALAND WOODED GRASSLAND (ha)**	**SUBTROPICAL FRESHWATER WETLANDS (ha)**	**CBA NATIONAL (ha)**	**CBA3: OPTIMAL (ha)**	**BIODIVERSITY AREAS (ha)**	**CBA: IRREPLACEABLE DISTRICT (ha)**	**NPAES (ha)**	**CONSERVATION (ha)**	**CORRIDOR/LINKAGES (ha)**	**SCC FLORA (HABITAT LOSS - ha)**	**SCC FAUNA (HABITAT LOSS – ha)**
Tata Steel (existing)	54	54	52,2	1,8	33,8	7,29	46,1	33,8	30	1,6	7,34	54	54
Nyanza Pilot (existing) and Commercial plant (future/proposed)	67	67	64,6	2,32	62,4	41,46	20,29	62,4	64,3	19,87	14,2	67	67
Pakwe (future/proposed)	11,8	11,8	6,51	5,29	11,5	1,38	10,42	11,5	11,8	6,65	2,28	11,8	11,8
Chlor-Alkali (future/authorised)	8,44	8,44	8,44	-	6,49	5,77	2,67	6,49	8,44	-	-	8,44	8,44
Richards Bay Gas to Power (future/authorised)	7,16	7,16	7,16	-	3,4	0,42	6,74	3,4	7,16	-	-	7,16	7,16
Phinda Power Plant (future/authorised)	8,3	8,3	8,3	-	4		8,3	4	8,3	-	-	8,3	8,3
Eskom Richards Bay CCPP (future/authorised)	71	71	67,53	3,47	68,35	50,45	20,55	68,35	71	2,42	2,3	71	71
Roads and Railway (Future sidings – future/proposed)	Unknown	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present	Unknown	Unknown

4.5.3 Cumulative Impact Assessment Significance

Cumulative impact 1: Permanent loss of habitat in sensitive environmental areas

Nature:
To evaluate the cumulative contribution of habitat loss in sensitive environmental areas, the extent of the VECs on the respective project sites were measured using QGIS 3.14 software. For each project it was assumed that vegetation clearance will result in the absolute loss of biodiversity within the impact footprint. The cumulative loss of habitat within the respective VECs is summarised below.

VEC	CUMULATIVE LOSS (ha)
Kwambonambi Hygrophilous Grassland Ecosystem	227,7
Maputaland Wooded Grassland	214,74
Subtropical Freshwater Wetlands	12,88
CBAs National (Very High Sensitivity)	189,94
CBAs Provincial	
• CBA3: Optimal	106,77
• Biodiversity areas	115,07
CBA: Irreplaceable (District scale)	189,94
NPAES focus areas importance for terrestrial biodiversity	201
ESMP Draft	
• Conservation	30,54
• Corridors/linkages	26,12

The cumulative contribution of railway sidings was excluded from this evaluation since the width of the servitudes is unknown. The loss of habitat within the respective VECs is thus an underestimation of habitat loss within the VECs for the projects listed above.

Kwambonambi Hygrophilous Grassland Ecosystem
Historically this ecosystem measured 34 000 ha and lies inland but adjacent to the Kwambonambi Dune Forest ecosystem, extending from Richards Bay to St Lucia Estuary (National List of Threatened ecosystems in South Africa, 2011). The Biodiversity Summary for uMhlathuze Municipality (https://bgis.sanbi.org/LUDS/Home/Municipality/117) reported that 12 205,1 ha is present in the Municipality. The cumulative loss of habitat within this ecosystem based on the data provided in Table 18 will therefore represent a 1,86% loss of the ecosystem extent within the Municipal area. Important to note is that the ecosystems data presented in the Biodiversity Summaries project was done prior to the enlargement of the Municipal area in 2016 and is therefore outdated.

THREATENED VEGETATION TYPES
Maputaland Wooded Grassland
The Draft Baseline Environmental Management Framework Report compiled by Coastal and Environmental Services in 2018 reported that historically this vegetation type covered 31 192 ha in King Cetshwayo District, with the remaining extent in 2018 estimated at 3 316 ha. The cumulative loss of vegetation from the developments listed in Table 18 will therefore represent a loss of 6.47 % of this Endangered vegetation type within King Cetshwayo District. National and Provincial conservation targets was set at 25% for this vegetation type, with a protection level of Moderately Protected, indicating that the vegetation type is under-protected (South African National Biodiversity Institute 2006- 2018; Jewitt 2018). Thus, additional loss of vegetation within this vegetation type could potentially affect the ability to meet provincial conservation targets.

Subtropical Freshwater Wetlands
The Draft Baseline Environmental Management Framework Report compiled by Coastal and Environmental Services in 2018 reported that historically this vegetation type covered 9 454 ha in King Cetshwayo District, with the remaining extent in 2018 estimated at 5 060 ha. The cumulative loss of vegetation from the developments listed in Table 18 will therefore represent a loss of 0,25%. This vegetation type was listed by Jewitt (2018) as Vulnerable and Moderately Protected, indicating that the vegetation type is under-protected. Additional loss of vegetation within this vegetation type could potentially affect the ability to meet provincial conservation targets**.**

CBA areas

CBA areas are considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. The cumulative loss of CBA areas could potentially affect the ability to meet national and provincial conservation targets.

NPAES focus areas
NPAES focus areas are areas identified as priority areas for protected areas expansion. The aim of NPAES focus areas is to improve the representativity and efficiency of the protected areas network in South Africa. South Africa's current protected area network still falls far short of sustaining biodiversity and ecological processes. The cumulative loss of habitat within NPAES focus areas could therefore potentially affect the ability to reach national conservation targets.

ESMP areas
Areas identified as conservation zones and corridor/linkage zones were identified on four of the projects evaluated (Table 18). Within the ESMP, conservation zones are defined as areas of biodiversity/environmental significance, which are not viable for proclamation as nature reserves, but that require some form of legal protection. Included are unique or regionally important natural habitats; wetland and forest areas that are protected in terms of national legislation; and all areas that fall within the 1:100-year flood line. No transformation of the natural assets or the development of land for purposes other than conservation should be permitted in this zone. Sustainable use of renewable resources is permitted.

Corridors/linkages are defined as areas that provide a natural buffer for Protected areas and Conservation zones, areas that provide a natural link between Protected areas and Conservation zones; areas that supply, or ensure the supply of, significant environmental services. Transformation of natural assets and the development of land in these zones should only be permitted under controlled conditions.

The cumulative contribution of the developments will result in a loss of 30,54 ha in conservation areas, and 26,12 ha in corridors/linkages. This will reduce the availability of habitat for local fauna populations, limits fauna dispersal which can lead to a loss of genetic diversity. This reduces the long-term health of populations, making it more vulnerable to disease at at greater risk of extinction.

The Spatial Development Framework has identified several development opportunities for the Richards Bay area associated with urban and industrial development (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021). The limited space to accommodate the growth demand in the area will increase the conflict between conservation and development. Within the context of this assessment, it is evident that the current and future developments reviewed (Table 18) conflicts with National, Provincial, District and Municipal scale conservation planning initiatives and management objectives. The situation highlights the need for closer collaboration and coordinated planning between environmental stakeholders and prospective developers.

	Overall impact of the proposed project considered in isolation (post-mitigation)	**Cumulative impact of the project and other projects in the area**
Duration	Permanent (5)	Permanent (5)
Extent	Site (1)	National (4)
Magnitude	Minor (2)	Very High (10)
Probability	Improbable (2)	Probable (3)
Significance	**Minor Negative (4)**	**High (76)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Yes	To an extent
Confidence in findings:	Low – insufficient information	

Cumulative impact 2: Loss of SCC flora & and associated habitats

Nature:
To evaluate this impact, it was assumed that each development will result in the absolute loss of biodiversity value within the respective project footprints. The clearing of 227,7 ha of habitat could invariably lead to the destruction of Red Listed flora and their associated habitat. At least 28 Red Listed flora species typically found in grassland and wetland habitats are known to be present within the Richards Bay area.

The greater uMhlathuze municipal area falls within the Maputaland-Pondoland Biodiversity hotspot which is recognized as the second richest floristic region in Africa. This area containings approximately 80 % of the of South Africa's remaining forests, rich birdlife and many other significant flora and fauna species. The greater uMhlathuze Municipal area supports more than 170 Red Data species, which has been reported as amongst the highest in the country for an area of its size.

Nevertheless, the most recent land-use cover dataset (SANLC 2020) indicated that the once continuous ecosystems and vegetation types within the municipal area was significantly transformed and fragmented over time by urban and rural expansions, agriculture, and multiple linear infrastructure developments. The remaining undeveloped areas with indigenous land cover within the Richards Bay area is for the most part considered as irreplaceable by Ezemvelo KZN, mainly because of the large concentration of Red Data species present in the municipality.

The Spatial Development Framework has identified several development opportunities for the Richards Bay area associated with urban and industrial development (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021). This will reduce the availability of habitat for Red Listed flora, limits dispersal which can lead to a loss of genetic diversity. This reduces the long-term health of populations, making it more vulnerable to disease and at greater risk of extinction. In general, plant diversity and population size decrease with decreasing size of habitats and habitat connectivity.

	Overall impact of the proposed project considered in isolation (post-mitigation)	**Cumulative impact of the project and other projects in the area**
Duration	Short duration (1)	Permanent (5)
Extent	Site (1)	National (4)
Magnitude	Small (0)	Moderate (6)
Probability	Improbable (2)	Highly probable (4)
Significance	**Minor (4)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Yes	To an extent
Confidence in findings:	Low – insufficient information	

Cumulative impact 3: Loss of Red Listed fauna & associated habitats

Nature:
To evaluate this impact, it was assumed that each development will result in the absolute loss of biodiversity value within the respective project footprints. The clearing of 227,7 ha of habitat could invariably lead to the destruction of Red Listed fauna species and their associated habitat. At least 16 Red Listed fauna species found in grassland and wetland habitats are known to be present within the Richards Bay area.

This area containings approximately 80 % of the of South Africa's remaining forests, rich birdlife and many other significant flora and fauna species. The greater uMhlathuze Municipal area supports more than 170 Red Data species, which has been reported as amongst the highest in the country for an area of its size.

Nevertheless, the most recent land-use cover dataset (SANLC 2020) indicated that the once continuous ecosystems and vegetation types within the municipal area was significantly transformed and fragmented over time by urban and rural expansions, agriculture, and multiple linear infrastructure developments. The remaining undeveloped areas with indigenous land cover within the Richards Bay area is for the most part considered as irreplaceable by Ezemvelo KZN, mainly because of the large concentration of Red Data species present in the municipality.

The Spatial Development Framework has identified several development opportunities for the Richards Bay area associated with urban and industrial development (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021). This will reduce the availability of habitat for Red Listed fauna, limits dispersal which can lead to a loss of genetic diversity. This reduces the long-term health of populations, making it more vulnerable to disease and at greater risk of extinction.

	Overall impact of the proposed project considered in isolation (post-mitigation)	**Cumulative impact of the project and other projects in the area**
Duration	Permanent (5)	Permanent (5)

Extent	National (4)	National (4)
Magnitude	Minor (2)	Moderate (6)
Probability	Probable (3)	Highly probable (4)
Significance	**Low (33)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	To an extent	To an extent
Confidence in findings:	Low – insufficient information	

Loss/disturbance of local fauna populations

Nature:
To evaluate this impact, it was assumed that each development will result in the absolute loss of biodiversity value within the respective project footprints. The clearing of 227,7 ha of habitat will invariably lead to the destruction of fauna and their associated habitat.

The Spatial Development Framework has identified several development opportunities for the Richards Bay area associated with urban and industrial development (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021). This will reduce the availability of habitat for local fauna populations, limits dispersal which can lead to a loss of genetic diversity. This reduces the long-term health of populations, making it more vulnerable to disease and at greater risk of extinction.the long-term health of populations, making it more vulnerable to disease and at greater risk of extinction.

	Overall impact of the proposed project considered in isolation (post-mitigation)	**Cumulative impact of the project and other projects in the area**
Duration	Permanent (5)	Permanent (5)
Extent	Local (2)	Region (3)
Magnitude	Minor (2)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**Moderate (50)**	**High (70)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Replaceable
Can impacts be mitigated?	To an extent	To an extent
Confidence in findings:	Low – insufficient information	

Cumulative impact 5: Artificial light disturbance

Nature:
Impacts from artificial light disturbance are associated with the changes to the night-time visual landscape. All the proposed developments considered in the cumulative impact assessment will introduce light into the landscape. These projects will substantially increase overall artificial light levels and lead to an increase in the overall levels of sky glow in the area. Sky glow impacts may extend into areas some distance from the facilities themselves.

Potential negative ecological consequences of artificial light disturbance have been discussed under the Construction phase impacts and will therefore not be repeated. Mitigation measures for cumulative impacts of artificial light disturbance are however limited to mitigating impacts directly with each development.

	Overall impact of the proposed project considered in isolation (post-mitigation)	**Cumulative impact of the project and other projects in the area**
Duration	Permanent (5)	Permanent (5)
Extent	Local (2)	Region (3)
Magnitude	Minor (2)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	**Low (24)**	**High (70)**
Status (positive or negative)	Negative	Negative

Reversibility	Reversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Replaceable
Can impacts be mitigated?	To an extent	To an extent
Confidence in findings:	Low – insufficient information	

4.5.4 Discussion and Management Recommendations

The evaluation of cumulative impacts that is addressed through project-based EIA is limited in scope and unable to effectively address and manage cumulative environmental change within regional environments. EIA approaches to cumulative impact assessments typically emphasize stressor-based cumulative impact prediction and considers the incremental impacts of the project under review in combination with impacts from previous, existing, and known future/proposed project-based activities. However, these assessments do not adequately deal with regional, cumulative effects and operates in too limited time and space to adequately assess cumulative impacts.

Within the context of this report, the approach to assessing cumulative impacts associated with the Pakwe project involved the identification of VECs on the project site and the identification of past, present and future actions/projects that may affect the same VECs.

The VECs identified represented areas/species of national, provincial, district and municipal scale environmental importance considered important in terms of habitats, species, ecosystems, and ecosystem services conservation required to meet national and provincial conservation targets.

uMhlathuze Municipality has a longstanding history of anthropogenic disturbance. The once continuous ecosystems and vegetation types in the municipality was significantly transformed and fragmented over time by urban and rural expansions, agriculture, and multiple linear infrastructure developments, with remaining natural areas in many instances small and highly fragmented by linear infrastructure.

The projects evaluated (Table 18) contributes only a small fraction of the total land use change given the large-scale developments planned for uMhlathuze Municipality. The most recent SDF (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021) has identified several development opportunities for the Richards Bay area associated with urban and industrial expansion. The limited space to accommodate the growth demand in the area will increase the conflict between conservation and development.

To meet national, provincial and district conservation targets, conservation of a substantial portion of the remaining natural areas in the Municipality is required. It is therefore recommended that a Strategic level approach (SEA) to cumulative impacts will be more suitable to identify and minimize potential cumulative impacts on the VECs in the municipal area. Municipal/district/provincial authorities responsible for strategic planning are in a better position to quantify and evaluate the cumulative impacts of the gradual environmental degradation over time and future development pressure within the context of the remaining natural habitat currently present in the municipality.

The World Bank (1999) defines SEA as: *an instrument that examines the environmental issues and impacts associates with a strategy, policy, plan for program for a particular region; including the evaluation and comparison of impacts against those of alternative options and recommendation of measures to strengthen environmental management in the region*.

The main objectives from a municipal perspective should as a minimum include the following:

- develop a broader understanding of the current state of the environment *vis a vis* cumulative change processes.
- identify as far as possible the extent to which cumulative effects in the past have conditioned the existing environment; and consider priorities for future environmental management with respect to general policy objectives and potential development options.

- Authorisation of new projects should consider the cumulative contribution of impacts on VECs as identified during the SEA cumulative impacts assessment.
- The identification of potential opportunities for municipal level mitigation (i.e., biodiversity offsets), and the monitoring of key biological components and processes.

4.6 Environmental Management Program (EMPr)

An Environmental Management Program (EMPr) for the proposed development is required in terms of Section 2 and Section 28 of the National Environmental Management Act (1998). The EMPr tends to become a legally binding document on the applicant as a condition of approval of the Project by the Department of Environment Affairs, in addition to other conditions that may be stipulated in the Environmental Authorisation.

The aim of an EMPr is to facilitate appropriate environmental controls during all phases of the project to minimise environmental damage arising from implementation of the project during the construction and operation phases. To achieve this, the EMPr must make recommendations for the planning and design (pre-construction/design phase), specify the limitations the contractor must abide by during construction, detail the issues that should be taken cognisance of and indicate specific actions that must be undertaken so as to ensure that the environment is not unnecessarily damaged. The EMPr therefore specifies the framework within which the contractor must carry out operations. Management and monitoring measures for the operation phase are also included to provide environmental guidance for the lifetime of the Development.

In addition, the EMPr provides a clear indication of the responsibilities for environmental management requirements by each of the role players involved in the construction and operation phases of the Development. Guidance for the implementation of the EMPr is provided, including the compilation of method statements which are required to be implemented to achieve compliance with the Environmental Specifications. Corrective actions in the event of non-compliance with the EMPr are also defined.

Specialist ecological impact mitigation for the project phases and for inclusion in the EMPr is presented in Sections 4.2.7.1 & 4.2.7.2. Note that only impacts requiring monitoring are summarised in the EMPr tables provided below to prevent unnecessary duplication.

OBJECTIVE: Protection of SCC flora

PROJECT COMPONENT/S	Vegetation clearance to prepare the project site for construction
POTENTIAL IMPACTS	• Loss of Red Listed and protected flora.
ACTIVITY/RISK SOURCE	• Vegetation clearance • Site access: moving vehicles; machinery • Use and storage of plant machinery
MITIGATION: TARGET/OBJECTIVE	Protected of sensitive flora species.

MITIGATION: ACTION/CONTROL	RESPONSIBILITY	TIMEFRAME
The identification of SCC flora species on the site during a final walkthrough.	Ecologist/Botanist/ECO	Pre-construction
The identification of suitable receiver sites for translocation	Ecologist/Botanist	Pre-construction
Acquire permit authorsation from Ezemvelo KZN Wildlife the removal of protected flora.	Project proponent/Principal Contractor	Pre-construction
Removal and transplant of affected flora onto suitable receiver sites.	Ecologist/Botanist	Pre-construction
	ECO, Contractor	Construction & operation phases
Laydown and storage areas to be located away from no-go areas as far as possible.	Contractor	Pre-construction & Construction phase

Development of a stormwater management plan for the site.	Contractor	Pre-construction phase
The provision of adequate sanitation and ablution facilities for all employees.	Contractor	Pre- construction & construction phases
Implementation of an IAPs and weeds eradication/control plan (Guidelines provided in Appendix 8).	Contractor, Environmental Manager, ECO	Pre-construction, construction, operational phases
Monitoring of the implementation of the recommended mitigation measures as set out in the EIA report.	ECO, Environmental Manager	Pre-construction & construction phases

PERFORMANCE INDICATOR	Provision of detailed records, including photographs, indicating the success of the plant rescue operation.
MONITORING	Monitoring be undertaken on a three-monthly basis for two years after transplanting to evaluate the success thereof.

OBJECTIVE: Protection of local fauna and associated habitat

PROJECT COMPONENT/S	Infrastructure development
POTENTIAL IMPACTS	• Fauna mortalities • Disturbance of the local fauna populations • Loss of habitat
ACTIVITY/RISK SOURCE	• Vegetation clearance • Site access: Moving vehicles, machinery. • Human disturbance caused by construction activities • Poaching • Inadvertent killing of fauna species by moving machinery
MITIGATION: TARGET/OBJECTIVE	Protection of local fauna and associated habitat

MITIGATION: ACTION/CONTROL	RESPONSIBILITY	TIMEFRAME
Access to undeveloped areas should be strictly prohibited.	Principle Contractor/ECO	Duration of the contract
Open excavations to be inspected for the presence of fauna species and relocated to suitable locations when required.	Principle Contractor/ECO	Construction phase

PERFORMANCE INDICATOR	• Minimise disturbance of local fauna species. • Prevent habitat loss of local fauna populations.
MONITORING	• Daily monitoring of remaining undeveloped areas. • Daily monitoring of open excavations to check for fauna species.

OBJECTIVE: Prevention of accidental mortalities of Red Listed fauna and local fauna

PROJECT COMPONENT/S	• Vegetation clearance • Excavations • Electric fencing
POTENTIAL IMPACTS	• Loss of Red Listed species • Loss of local fauna species
ACTIVITY/RISK SOURCE	• Vegetation clearance • Excavations • Electric fencing
MITIGATION: TARGET/OBJECTIVE	• Protection of *H. guttatus* from accidental mortalities. • Protection of slow-moving local fauna species from accidental mortalities. • Mitimize electrocutions of local fauna species

MITIGATION: ACTION/CONTROL	RESPONSIBILITY	TIMEFRAME
• Vegetation clearance must take place in a phased and slow manner, commencing from the interior of the project area progressing outwards towards the boundary. Areas to be monitored continously for the presence of fauna species. • Should a specimen be unearthed, all construction work on the area should be immediately stopped and the unearthed specimen should be carefully catured and relocated outside of the project area by an Ecologist/Zoologist in a suitable habitat.	Principle Contractor/ECO	Construction phase
• Regular patrols of the perimeter fenceline to remove overgrowing vegetation.	Project Proponent	Operational phase

PERFORMANCE INDICATOR	• No loss of Red Listed fauna and local fauna species
MONITORING	Construction phase: • Continuous monitoring during vegetation clearance and excavation activities.
	Operational phase: • Monthly patrols of the perimeter fenceline to remove overgrowing vegetation.

OBJECTIVE: Prevent the spread and establishment of IAPs & weeds

PROJECT COMPONENT/S	Vegetation clearance
POTENTIAL IMPACTS	• Degradation of habitat
ACTIVITY/RISK SOURCE	• Vegetation clearance
MITIGATION: TARGET/OBJECTIVE	• Prevent the establishment and spread of IAPs and weeds

MITIGATION: ACTION/CONTROL	RESPONSIBILITY	TIMEFRAME
• Implementation of an ongoing Alien & Invasive plant species eradication and control programme.	Principle Contractor/ECO	Duration of the construction phase
• Implementation of an ongoing Alien & Invasive plant species eradication and control programme.	Project Proponent	Duration of the operational phase

PERFORMANCE INDICATOR	• Photographic and simple records. • Decline in abundance of alien plant species over time.
MONITORING	• Construction phase monitoring – Once a month. • Operational phase monitoring – Every three months.

OBJECTIVE: Erosion control

PROJECT COMPONENT/S	• Vegetation clearance • De-watering activities • Dust control measures
POTENTIAL IMPACTS	• Erosion and sedimentation • Habitat degradation

	• Habitat loss
ACTIVITY/RISK SOURCE	• Vegetation clearance • De-watering activities during construction • Dust control measures during construction.
MITIGATION: TARGET/OBJECTIVE	• Prevent soil erosion and sedimentation

MITIGATION: ACTION/CONTROL	RESPONSIBILITY	TIMEFRAME
• Monitor water consumption and ensure that all possible use is accounted for, and areas of waste are identified (i.e., water used for surface wetting, for batching, for potable supply etc.). • Repair identified leaks and address issues of water wastage as soon as these are identified.	Principle Contractor/ECO	Duration of the construction phase
• Erection of sediment barriers	Principle Contractor/ECO	Duration of the construction phase

PERFORMANCE INDICATOR	• No erosion and sedimentation.
MONITORING	• Weekly inspection of sediment barriers and directly after inclement weather.

5. CONCLUSIONS

The project site is located within Phase 1F of the Richards Bay Industrial Development zone. Phase 1F is approximately 191 ha in extent and was zoned for the development of noxious industries. Phase 1F has a longstanding longstanding history of anthropogenic disturbance which included the historic planting of *Pinus* and *Eucalyptus* plantations, vegetation clearance to accommodate the installation of various services (i.e., water, sewer, stormwater, electricity, roads, installation of artificial drainage canals, and the infilling of wetland habitat to prepare the Phase for future development. Currently Phase 1F is occupied by Tata Steel and the Nyanza TiO^2 Pilot plant which covers approximately a third of the Phase. Phase 1F is located amidst mixed-use industrial developments, residential areas, exotic plantations, and a few open spaces degraded by invasive plant species/weeds.

A two-phased approach was used to determine the conservation significance of the project site and surrounding landscape and included a comprehensive desktop review followed by site inspections. Desktop environmental sensitivities identified during the desktop review included:

- The location of the site within the Kwambonambi Hygrophilous Grassland ecosystem listed as **Critically Endangered**.
- The location of the project site within the Maputaland Wooded Grassland vegetation type listed as **Endangered**.
- The location of the project site within Subtropical Freshwater Wetlands listed as **Vulnerable**.
- The location of the project site within a NPAES focus area.
- The location of the project site within National, Provincial and District scale **CBA areas**
- The location of the project site on areas zoned for conservation and corridors/linkages regarded as important areas for biodiversity conservation on municipal scale.

The above areas listed are all areas of national, provincial, district and municipal environmental importance considered important in terms of habitats, species, ecosystems, and ecosystem services conservation required to meet national, provincial and district conservation targets.

Site inspections was conducted from 21 – 23 February 2022 and observations on current impacts, fauna and flora species composition, general habitat condition, and habitat connectivity were documented during meandering and transect walks. Major impacts specific to the project site included land clearance to accommodate services infrastructure, infilling, and fragmentation (drainage canal construction; roads) of the wetlands which historically covered ~ 44 % of the site.

Based on floristic composition, vegetation structure and level of degradation, four plant communities were identified, and included *Digitaria natalensis – Parinari capensis* Grassland, *Ischaemum fasciculatum* Hygrophilous Grassland, Degraded areas, and *Typha capensis – Phragmites australis* dominated drainage canal.

Following the infilling of the wetlands, partial natural regeneration of the vegetation occurred on the infill area but resulted in a mosaic of terrestrial vegetation interspersed within hygrophilous grassland vegetation. Due to the mosaic nature of the vegetation, the vegetation community boundaries delineated were not precise but followed broad patterns.

Of the 131 flora species recorded during the field surveys, 23% (Maputaland Wooded Grassland), and 19% (Subtropical Freshwater Wetlands) are regarded as important floristic elements of these vegetation types by Mucina & Rutherford (2006).

Noteworthy observations included one species listed as Declining and provincial protected, i.e., *Crinum* cf. *stuhlmanniii* present in the *Digitaria natalensis – Parinari capensis* Grassland vegetation community, and four RSA endemics of which three species (*Raphionacme palustris, Helichrysum ruderale, Selago tarachodes*) were present in the *D. natalensis - P. capensis* Grassland, one in the *I. fasciculatum* Hygrophilous Grassland (*Roella glomerata*). All the endemics are listed as of Least Concern, with stable populations and no risk of extinction.

C. cf. *stuhlmannnii* is a suitable candidate for translocation and must be removed from the development footprint prior to construction site establishment and vegetation clearance to a suitable habitat but may not be removed/translocated without permit authorisation from Ezemvelo KZN Wildlife.

Seventeen percent of flora species recorded consisted of invasive and naturalized plants. Of these, 7 species are listed as Cat 1b or Cat 2 invasives. The rest of the indigenous species documented are all widespread and common in South Africa, with a conservation status of Least Concern.

None of the sensitive environmental features associated with the CR ecosystem (i.e., *Hyperolius pickersgilli, Centrobolus fulgidus*, *Doratogonus zuluensis*, *Centrobolus richardi, C. rugulosus, Kniphofia leucocephala;* Table 11) was present since the project site does not offer suitable habitat. The project site is also not representative its CBA status and none of the important biodiversity features associated with this CBA area were observed.

Few fauna species were observed and included four mammal, two frog, one reptile and 18 bird species. All the species are listed as of Least Concern with stable population numbers and no risk of extinction. No provincial protected species were recorded.

Red Listed fauna potentially present included two species listed as NT (i.e., *Poecilogale albinucha* & *Hemisus guttatus*) and one species listed as VU (*Falco biarmicus*). Following infilling of the wetland, partial natural regeneration of the vegetation on the infill areas occurred and currently this area is occupied by the rodent species *Otomys* cf. *angoniensis*. The project site therefore offers sufficient prey items to the specialist small mammal predator *P. albinucha* as well as for the raptor *F. biarmicus* which feeds predominantly on birds and small mammals. Removal of vegetation will result in a direct impact on the prey species by causing a decline of the local population and may indirectly affect the abundance and distribution of *P. albinucha* and *F. biarmicus* in the area.

Unassisted recolonisation by *H. guttatus* may have occurred on the project site on the infilled areas following partial natural regeneration. This species is known to be present in the Richards Bay area but due to its cryptic

and fossorial nature it is rarely encountered. The mechanical removal of topsoil and excavations may unearth *H. guttatus* and individuals are likely to get killed during this process.

Based on the confirmed presence of the Declining and provincial protected flora species, the potential occurrence of Red Listed flora species recorded during previous surveys within Phase 1F, and the potential occurrence of three fauna species of conservation significance it was concluded that the project site is of Medium ecological sensitivity.

Many of the anticipated project-specific impacts during the construction and operational phases can be successfully mitigated to moderate, low, and minor levels of significance. Nevertheless, within the context of cumulative impacts, even minor project-specific impacts may contribute to significant cumulative impacts over time. The project under consideration is located within areas recognized as of national, provincial, district or municipal conservation significance (VECs) considered important in terms of habitats, species, ecosystems, and ecosystem services conservation that are required to meet national, provincial, district and municipal conservation targets. Despite the presence of VECs within Phase 1F, this area was incorporated into the Industrial Development Zone and received authorization for industrial development in 2016.

Considering uMhlathuze Municipalitie's longstanding history of anthropogenic disturbance, which significantly transformed and fragmented once continuous landscapes and ecosystems, coupled with the anticipated large-scale developments planned for the area (uMhlathuze Municipality Spatial Development Framework Fourth Review, May 2021), the limited space to accommodate the growth demand in the area will increase the conflict between conservation and development.

Going forward, it is therefore recommended that a strategic level approach be considered to identify and minimize potential cumulative impaces on the VECs that are required to meet and contribute to national, provincial and district biodiversity conservation targets, and to implement a municipal scale cumulative impact management strategy.

Such an assessment and management strategy are not the responsibility of the project proponent but must be conducted by the municipal/district/provincial authorities together with relevant stakeholders such as eZemvelo KZN Wildlife.

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APPENDIX 1: Impact Assessment Methodology.

Construction and operational phase impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase were assessed in terms of the following criteria:

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

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

$$S=(E+D+M)\,P$$

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

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

APPENDIX 2: Regional and provincial vegetation type summaries.

MAPUTALAND WOODED GRASSLAND (Mucina & Rutherford, 2006 vegetation description	
Historical distribution	KwaZulu-Natal Province and southern Mozambique: In South Africa from the Mozambique border near KwaNgwanase southwards to Sileza, Sibaya, Mseleni, Mbazwana, Sodwana Bay, Ozabeni, eastern and western shores of Lake St Lucia, KwaMbonambi and as far south as near Richards Bay. Altitude varies from about 20–120 m.
Vegetation & landscape features	Generally flat landscape of the Maputaland coastal plain supporting coastal sandy grasslands rich in geoxylic suffrutices, dwarf shrubs, small trees and very rich herbaceous flora. Excluded from this unit are the many interdune depression wetlands and hygrophilous grasslands neighbouring the wooded grasslands.
Geology & soils	Quaternary redistributed sand supporting yellowish redistributed sands of the Berea Formation (Maputaland Group). These are dystric regosols building dune crests, slopes, and relatively high-lying level plains. Water table found at depth 1.6–2.0 m below surface (and slightly deeper) in average rainfall years.
Important Taxa	
Geoxylic suffrutices (# suffrutex form)	*Parinari curatellifolia*, *Salacia kraussii*, *Ancylobotrys petersiana*, *Diospyros galpinii*, *Eugenia capensis#, Syzygium cordatum#.*
Graminoids	*Diheteropogon amplectens*, *Themeda triandra*, *Aristida stipitata* subsp. *graciliflora*, *Bewsia biflora*, *Cyperus obtusiflorus*, *C. tenax*, *Digitaria natalensis*, *Eustachya paspaloides*, *Setaria sphacelata*, *Sporobolus fimbriatus*, *S. subulatus*, *Urelytrum agropyroides*.
Herbs	*Chamaecrista plumosa*
Geophytic herbs	*Cyrtanthus galpinii*
Low shrubs	*Helichrysum kraussii*, *Agathisanthemum bojeri*, *Crotalaria monteiroi* var. *monteiroi*.
Small trees and tall shrubs	*Acridocarpus natalitius* var. *linearifolius*, *Dichrostachys cinerea* subsp. *nyassana*, *Diospyros lycioides* subsp. *sericea*, *Hyphaene coriacea*, *Terminalia sericea*.
Biogeographically Important Taxa ([C]Coastal belt element, [M]Maputaland endemic, [S]Southern distribution limit)	
Geoxylic suffrutices	*Eugenia albanensis*[C], *Gymnosporia markwardii*[M]
Graminoids	*Abildgaardia hygrophila*[C], *Cyperus natalensis*[C]
Herbs	*Helichrysopsis septentrionale*[M]; *Oxygonum robustum*[M], *Tricliceras mossambicense*[M]
Tall shrubs	*Grewia microthyrsa*[S]
Woody climbers	*Albertisia delagoensis*[S], *Cissampelos hirta*[S]
Endemic Taxa (# Suffrutex form)	
Geoxylic suffrutices	*Ochna* sp. nov., *Syzygium cordatum#*
Succulent herb	*Aloe* sp. nov. (*Strey 5100 PRE*)
Geophytic herb	*Brachystelma vahrmeijeri*
Conservation Status	
Conservation status (SANBI 2006 – 2018; Jewitt, 2018)	**ENDANGERED**
Conservation target (SANBI 2006 – 2018; Jewitt, 2018)	25%
Level of protection (SANBI 2006 – 2018; Jewittt, 2018)	Moderately protected (MP)
SUBTROPICAL FRESHWATER WETLANDS (Mucina & Rutherford, 2006 vegetation description)	
Historical distribution	KwaZulu-Natal, Mpumalanga, Gauteng, North-West, Limpopo and Eastern Cape Provinces as well as in Swaziland: Wetlands embedded within the Albany Thicket Biome, the Coastal Belt from

	Transkei as far as Maputaland as well as those of Lowveld and the Central Bushveld regions. Altitude ranging from 0–1 400 m.
Vegetation and landscape features	Flat topography supporting low beds dominated by reeds, sedges and rushes, waterlogged meadows dominated by grasses. Found typically along edges of often seasonal pools in aeolian depressions as well as fringing alluvial backwater pans or artificial dams.
Geology, soil and hydrology	Waterlogged, clayey soils of Champagne and Arcadia forms, containing certain levels of decaying organic matter, especially in very productive reed beds. These wetlands are underlain mostly by Cenozoic alluvium, less so by Karoo Supergroup volcanic rocks and sediments, as well as by the Cretaceous (and younger coastal) sediments of the Zululand and Maputaland Groups. Waterlogged habitats with water regularly forming columns of variable depth. The highest water levels are found in summer, during periods of maximum seasonal rainfall.
Important Taxa	
Marshes	
Small trees	*Hyphaene coriacea* (d), *Phoenix reclinata* (d)
Graminoids	*Chloris virgata*, *Cynodon dactylon*, *Cyperus articulatus*, *Dactyloctenium aegyptium*, *Diplachne fusca*, *Echinochloa pyramidalis*, *Fimbristylis obtusifolia*, *Hemarthria altissima*, *Imperata cylindrica*, *Ischaemum arcuatum*, *Leersia hexandra*, *Pycreus mundii*, *Sporobolus nitens*, *S. smutsii*, *Urochloa stolonifera*, *Bolboschoenus glaucus, Courtoisia cyperoides*, *Cyperus alopecuroides*, *C. pectinatus*, *Digitaria natalensis*, *Echinochloa stagnina*, *Eragrostis chapelieri, E. lappula, Eriochloa meyeriana*, *Fimbristylis bisumbellata*, *Fuirena ecklonii*, *Oxycaryum cubense*, *Paspalidium obtusifolium*, *Paspalum commersonii*, *Pycreus pelophilus*, *P. polystachyos*, *Scleria poiformis*, *Sporobolus consimilis*.
Herbs	*Pentodon pentandrus*, *Persicaria senegalensis*, *Burmannia madagascariensis, Centella coriacea*, *Commelina diffusa, Convolvulus mauritanicus*, *Desmodium dregeanum*, *Eclipta prostrata, Epaltes gariepina*, *Eriocaulon abyssinicum*, *Ethulia conyzoides*, *Glinus lotoides*, *Hydrocotyle ranunculoides, Ludwigia adscendens* subsp. *diffusa*, *L. leptocarpa*, *L. octovalvis*, *L. palustris*, *Neptunia oleracea*, *Persicaria attenuata* subsp. *africana, P. hystricula*, *Rorippa madagascariensis*, *Sium repandum*, *Vahlia capensis*.
Geophytic herbs	*Eulophia angolensis*, *Zeuxine africana*
Succulent herbs	*Salicornia pachystachya*.
Semiparasitic herb	*Buchnera longespicata*
Aquatic herbs	*Bergia salaria*, *Lagarosiphon crispus*.
Lakes and Ponds	
Graminoids	*Eleocharis dulcis* (forming rafts)
Aquatic herbs	*Azolla pinnata* var. *africana*, *Ceratophyllum demersum*, *Lemna minor*, *Nymphaea nouchali* var. *caerulea*, *Pistia stratiotes*, *Wolffia arrhiza*, *Aponogeton desertorum, A. natalensis, A. rehmannii, Ceratophyllum muricatum*, *Marsilea macrocarpa*, *Najas marina* subsp. *delilei*, *N. pectinata*, *Nymphoides indica* subsp. *occidentalis*, *N. rautanenii*, *Ottelia exserta*, *Potamogeton crispus*, *P. pectinatus*, *P. schweinfurthii*, *Spirodela polyrhiza*, *S. punctata, Trapa natans* var. *bispinosa*.
Carnivorous herbs	*Utricularia gibba* subsp. *exoleta*, *U. inflexa*, *U. subulata*
Geophytic herbs	*Crinum paludosum*
Reed & Sedge Beds	
Megagraminoids	*Cladium mariscus* subsp. *jamaicense*, *Cyperus papyrus*, *Phragmites australis*, *P. mauritianus*, *Schoenoplectus corymbosus*, *S. scirpoideus*, *Typha capensis*. Graminoids: *Cyperus fastigiatus*, *C. difformis*, *C. digitatus, C. latifolius*, *C. sexangularis*, *Fuirena ciliaris*.
Biogeographically Important Taxa (All Southernmost Distribution Limit)	
Streambanks	
Herbs	*Floscopa glomerata, Ipomoea aquatica*
Geophytic herbs	*Bolbitis heudelotii*.
Lakes and Ponds	
Aquatic herbs	*Brasenia schreberi*, *Ceratopteris cornuta, Wolffia globosa, Wolffiella welwitschii*.
Herbs	*Hygrophila schulli, Limnophyton obtusifolius, Marsilea apposita, M. coromandelina, M. minuta*, *M. villifolia*

Reed and Sedge Beds	
Graminoids	*Cyperus dives, C. procerus, C. prolifer.*
Endemic Taxa	
Marshes	
Graminoids	*Cyperus sensilis* (embedded within Indian Ocean Coastal Belt of KwaZulu-Natal).
Lakes and ponds	
Geophytic herbs	*Crinum campanulatum* (Albany region).
Aquatic herbs	*Isoetes wormaldii* (Albany region), *Wolffiella denticulata* (Maputaland).
Conservation Status	
Conservation status (Jewittt, 2018)	**VULNERABLE**
Conservation target (Jewitt, 2018)	24%
Level of protection (SANBI 2006 – 2018; Jewitt, 2018)	Moderately protected (MP)

APPENDIX 3: Red Listed flora species present/expected to be present in King Cetshwayo District.

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY		
FAMILY	**SCIENTIFIC NAME**	**SA RED LIST STATUS**	**NEMBA (2015)**	**PROVINCIAL**	**ENDEMISM**	**GROWTH FORM**	**PREFERRED HABITAT**	**FLOWERING TIME**
APOCYNACEAE	*Asclepias gordon-grayae*	EN	-	Sched 7	RSA Endemic	Herb	Tall, unburnt coastal grassland, in black peat soils in marshy areas, 10-100 m.	Sep - Apr
	Brachystelma petraeum	VU	-	Sched 12	RSA Endemic	Succulent/ geophyte	Moist grassland, in humus pockets in crevices of large, flat rock surfaces and flat, damp basal gravel. Midlands Mistbelt Grassland, Mooi River Highland Grassland, Drakensberg Foothill Moist Grassland.	Spring
	*** Sensitive Species 649*	VU	-	Sched 12/Sched 7	RSA Endemic	Succulent/ herb	Coastal grassland, 10-200 m. KwaZulu-Natal Sandstone Sourveld, KwaZulu-Natal Hinterland Thornveld, Pondoland-Ugu Sandstone Coastal Sourveld, KwaZulu-Natal Coastal Belt Grassland, Maputaland Wooded Grassland, Maputaland Coastal Belt.	Spring
	** *Emplectanthus cordatus*	VU	-	-	RSA Endemic	Climber	Northern Coastal Forest, Scarp Forest.	No information
	** *Pachycarpus concolor* subsp. *arenicola*	VU	-	-	-	Succulent/ herb	Northern Maputaland coastal plain and southern Mozambique. Grassy vegetation on stabilized dunes within 20 km of the coast.	Summer
ASPHODELACEAE	*Aloe saundersiae*	EN	-	Sched 7	RSA Endemic	Succulent/ herb	It occurs in crevices and small pockets on cool, semi-shaded rocky slopes in mistbelt and moist grassland. KwaZulu-Natal Sandstone Sourveld, Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland	Feb-Mar
	Aloe umfoloziensis	LC (restricted distribution)	-		KZN Endemic	Succulent/ herb	It occurs in river valleys with savanna and wooded grassland. Maputaland Coastal Belt, KwaZulu-Natal Coastal Belt Grassland, Tembe Sandy Bushveld, Western Maputaland Clay Bushveld, Zululand Coastal Thornveld, Eastern Valley Bushveld, Southern Lebombo Bushveld, Northern Zululand Sourveld, Zululand Lowveld	Jul-Aug
	* *Kniphofia leucocephala*	CR	-	Sched 7	RSA Endemic	Herb	Known only from vleis or wetlands in low-lying coastal grassland in the Richards Bay area of KwaZulu-Natal.	Feb-Mar

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY		
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME
ASTERACEAE	*Gerbera aurantiaca*	EN		Sched 12	RSA Endemic	Herb	Mistbelt grassland, well-drained doleritic areas. Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland, Dry Coast Hinterland Grassland, Northern Zululand Mistbelt Grassland, KaNgwane Montane Grassland, Paulpietersburg Moist Grassland, Wakkerstroom Montane Grassland	Aug-Oct
	*** Senecio ngoyanus*	VU	-	Sched 7	-	Herb	Formerly widespread along the coast of KwaZulu-Natal from Stanger northwards, now only occurring around St. Lucia and Ngoye Forest. It also occurs in southern Mozambique.	Unknown
	Cineraria atriplicifolia	VU	-	Sched 7	RSA Endemic	Herb	Grassland, open dry thornveld, or sometimes at the edges of thicket or forest or below steep cliffs in river valleys, 30-800 m.	Mar-Jul
	*** Nidorella tongensis*	EN	-	-	RSA Endemic	Herb	Kosi Bay to Mtunzini. Damp places among dunes overlooking the sea.	
BEGONIACEAE	*Begonia dregei*	EN	EN	Sched 7	RSA Endemic	Succulent/ herb	Rocky cliffs, steep earth banks and among rocks in forest below 600 m. Northern Coastal Forest, Scarp Forest, Southern Mistbelt Forest	Dec-Aug
CELASTRACEAE	*Elaeodendron croceum*	DECLINING	-	Sched 8	-	Tree	Margins of coastal and montane forests.	Oct-May
CURTISIACEAE	*Curtisia dentata*	NT	-	Sched 8	-	Shrub/tree	Evergreen forest from coast to 1800 m.	Oct-Mar
CYPERACEAE	*** Fimbristylis aphylla*	VU	-	-	-	Cyperoid	Permanently wet vleis, open places and swamps, often in water. Usually near the sea. KwaZulu-Natal Coastal Belt Grassland, Maputaland Wooded Grassland, Maputaland Coastal Belt.	May-Nov
DIOSCOREACEAE	*Sensitive species 1252*	VU	VU (Medicinal)	Sched 12	-	Geophyte	Wooded and relatively mesic places, such as the moister bushveld areas, coastal bush and wooded mountain kloofs.	Nov-Apr
EUPHORBIACEAE	*Acalypha entumenica*	EN	-	Sched 7	RSA Endemic	Herb	Mistbelt and Ngongoni Grassland on dolerite, 850-1 600 m. Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland.	Unknown
FABACEAE	*Philenoptera sutherlandii*	LC (Protected tree list)	-	-	RSA Endemic	Tree	Scarp forest	Nov-Mar

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY		
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME
GESNERIACEAE	*Streptocarpus wendlandii*	RARE	-	Sched 8	Rare/KZN Endemic	Epiphyte/herb	A range-restricted species (EOO <50 km²), but not threatened. Scarp forest 300-500 m, grows on steep earth banks but is occasionally epiphytic.	Dec-Mar
HYACINTHACEAE	*Merwilla plumbea*	NT	PROT	Sched 8	-	Geophyte	Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m. Grassland biome.	Sept-Dec
IRIDACEAE	*** Freesia laxa* subsp. *azurea*	VU	-	-	-	Geophyte	Grassy dunes or light shade along margins of coastal forests. Maputaland north of Richard's Bay and extending to central Mozambique.	Jun-Sept
LAURACEAE	*** Sensitive species 89*	VU	VU	Sched 7	RSA Endemic	Tree	Evergreen, mistbelt and scarp forests, on steep slopes and valley bottoms, close to waterfalls and streams. Northern Coastal Forest, Scarp Forest, Southern Mistbelt Forest	Oct-Feb
	Cryptocarya wyliei	NT	-	Sched 8	RSA Endemic	Shrub/tree	Scarp forest. Occurs on forest margins, in fringes of riverine forest, thicket and coastal bush.	Dec-Jan
	Ocotea bullata	EN	-	Sched 6	RSA Endemic	Tree	High, cool, evergreen Afromontane forests. Northern Coastal Forest, Southern Coastal Forest, Scarp Forest, Northern Mistbelt Forest, Southern Mistbelt Forest, Northern Afrotemperate Forest, Southern Afrotemperate Forest.	Nov-May
MALVACEAE	*** Pavonia dregei*	VU	-	-	RSA Endemic	Dwarf shrub	Coastal grasslands along forest margins, sometimes in disturbed places. Tembe Sandy Bushveld, Sand Forest, Northern Coastal Forest, KwaZulu-Natal Coastal Belt Grassland, Maputaland Coastal Belt.	Aug-Jun
ORCHIDACEAE	*Disa zuluensis*	EN	-	Sched 12/Sched 7	RSA Endemic	Geophyte/herb	Swampy areas, vleis in grassland, 1500-2000 m. Income Sandy Grassland, KwaZulu-Natal Highland Thornveld, Steenkampsberg Montane Grassland, Wolkberg Dolomite Grassland, Sekhukhune Montane Grassland	Dec-Jan
	Mystacidium aliceae	VU	-	Sched 12/Sched 7	RSA Endemic	Epiphyte	Occurs in thick scrub in hilly regions as a low-level epiphyte in shady conditions. Northern Coastal Forest, Southern Coastal Forest, Scarp Forest	Spring/summer
	Schizochilus gerrardii	EN	-	Sched 12/Sched 7	RSA Endemic	Geophyte/herb	Mistbelt grassland, around margins of rock outcrops in shallow soil, frequently in slight	Dec-Jan

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY		
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME
							seepages, 1200 m. Northern Zululand Mistbelt Grassland	
	Bonatea lamprophylla	VU	VU	Sched 12/Sched 7	-	Geophyte/ herb	Deeply shaded areas in coastal dune forest.	Sept-Oct
	Disperis johnstonii	NT	-	Sched 12/Sched 8	-	Geophyte/ herb	*Brachystegia* woodland, forest patches, usually in shelter of rocks, 1050-1350 m.	Mar-Jun
PASSIFLORACEAE	*Adenia gummifera* var. *gummifera*	DECLINING	-	Sched 12/Sched 8	-	Succulent/ climber	Forested ravines, forest patches and forest margins, forest scrub, miombo woodland, savanna, dune forest, on stony slopes, termitaria and littoral bush, 0-1 800 m.	Oct-Apr
POLYGANACEAE	** *Oxygonum dregeanum* subsp. *streyi*	EN	-	-	-	Herb	Southern Mozambique and the KwaZulu-Natal coast as far south as Port Edward. Coastal grasslands and palm veld, sandy soils. Historical records indicate that it formerly occurred all along the KwaZulu-Natal coast, but it now persists predominantly in a network of protected areas on the Maputaland coastal plain, with a few isolated occurrences on the KwaZulu-Natal South Coast.	Aug-Apr
RESTIONACEAE	*Restio zuluensis*	VU	-	Sched 7	-	Restioid/dwarf shrub	Grows on the margins of wetlands in short coastal grassland. Northern KwaZulu-Natal (from Kwambonambi) and southern Mozambique.	Insufficient information
RHIZOPHORACEAE	** *Cassipourea gummiflua* var. *verticillata*	VU	-	Sched 7	-	Tree	Evergreen forest, riverine and swamp forest. Moist scarp forest and coastal lowland forest. Northern Coastal Forest, Scarp Forest, Southern Mistbelt Forest, Swamp Forest, Lowveld Riverine Forest.	Dec-Apr
SANTALACEAE	** *Thesium polygaloides*	VU	-	-	RSA Endemic	Herb	Maputaland coastal plain to Durban. Swamps on coastal flats.	Unknown
ZAMIACEAE	** *Sensitive species 191*	VU	VU	Sched 12/Sched 7	-	Geophyte/ herb	Scarp and coastal forest, Ngongoni and coastal grassland. KwaZulu-Natal Coastal Belt Grassland, Pondoland-Ugu Sandstone Coastal Sourveld, Scarp Forest, Moist Coast Hinterland Grassland, Transkei Coastal Belt, KwaZulu-Natal Coastal Belt Thornveld, Northern Coastal Forest, Northern Zululand Sourveld, KwaZulu-Natal Sandstone Sourveld, Eastern Valley Bushveld, Bhisho	-

TAXONOMIC INFORMATION		CONSERVATION STATUS				HABITAT AND ECOLOGY		
FAMILY	SCIENTIFIC NAME	SA RED LIST STATUS	NEMBA (2015)	PROVINCIAL	ENDEMISM	GROWTH FORM	PREFERRED HABITAT	FLOWERING TIME
							Thornveld, Southern Lebombo Bushveld, Maputaland Coastal Belt, Lebombo Summit Sourveld, KwaZulu-Natal Hinterland Thornveld, Dry Coast Hinterland Grassland	
	Encephalartos natalensis	NT	PROT	Sched 7	KZN Endemic	Shrub/tree	Cliffs and either hot, dry slopes or cool, south-facing, often forested slopes. Forest, Grassland, Indian Ocean Coastal Belt, Savanna	-
	Encephalartos ngoyanus	VU	VU	Sched 7	-	Geophyte/ dwarf shrub/shrub	Open grassland and forest margins, often among boulders. Southern Lebombo Bushveld, Scarp Forest, KwaZulu-Natal Coastal Belt Grassland	-

APPENDIX 4: Red Listed fauna species present/expected to be present in King Cetshwayo District.

TAXONOMIC INFORMATION			CONSERVATION STATUS					
FAMILY	**SCIENTIFIC NAME**	**COMMON NAME**	**SA RED LIST STATUS**	**NEMBA 2015**	**PROVINCIAL**	**CITES**	**SA ENDEMISM**	**HABITAT**
MAMMALS								
BOVIDAE	*Cephalophus natalensis*	Natal Red Duiker	NT	-	Sched 2/Sched 4	-	-	Indigenous forests, dense thickets, including coastal, riverine, swamp and montane slope forests and forest clumps, as well as wooded ravines.
	*** Sensitive species 7*	Blue duiker	VU	VU	Sched 2/Sched 4	II	-	Forested and wooded habitats, including primary and secondary forests, gallery forests, dry forest patches, coastal scrub farmland and regenerating forest.
	Ourebia Ourebi	Oribi	EN	-	Sched 2/Sched 4	-	Near Endemic	Savannah woodlands, floodplains, and other open grasslands, from around sea level to about 2,200 masl. (Mpumalanga Province).
CANIDAE	*** Lycaon pictus*	African Wild Dog	EN	EN	Sched 3/Sched 4	-	-	Found mostly in protected areas but free-roaming pacts are occasionally present in northern KZN.
FELIDAE	*Leptailurus serval*	Serval	NT	PROT	Sched 4	II	-	In and around marshland, well-watered savannah, and long-grass environments, and are particularly associated with reed-beds and other riparian vegetation types.
HIPPOSIDERIDAE	*Cloeotis percivali*	Short-eared Trident Bat	EN	-	Sched 3	-	-	Savannah and woodland areas with sufficient cover in the form of caves and mine tunnels for day roosting.
MINIOPTERIDAE	*Miniopterus inflatus*	Greater long-fingered bat	NT	-	Sched 3	-	-	Associated with moist savannah habitats, depending on the availability of roosting sites (primarily caves).
MURIDAE	*Otomys auratus*	Vlei Rat (Grassland type)	NT	-	-	-	-	Mesic grasslands and wetlands within alpine, montane, and sub-montane regions in dense vegetation in close proximity to water.
	Otomys laminatus	Laminate Vlei Rat	NT	-	-	-	RSA Endemic	Mesic sub-montane grasslands along the Drakensberg foothills and has also been recorded from coastal forests as well as Restio-dominated coastal and mountain fynbos.
MUSTELIDAE	*Aonyx capensis*	Cape Clawless Otter	NT	-	Sched 3	II	-	Predominantly aquatic and seldom found far from permanent water. Fresh water is an essential habitat requirement.
	Hydrictis maculicollis	Spotted-necked Otter	VU	-	Sched 3	II	-	Freshwater habitats where water is not silt-laden, and is unpolluted, and rich in small fishes.
	Poecilogale albinucha	African Striped Weasel	NT	-	Sched 3	-	-	Savannah and grassland habitats, although it probably has a wide habitat tolerance and has been recorded from

TAXONOMIC INFORMATION			CONSERVATION STATUS					
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LIST STATUS	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT
								lowland rainforest, semi-desert grassland, fynbos with dense grass and pine.
NYCTERIDAE	*Nycteris woodi*	Wood's Slit-faced Bat	NT	-	-	-	End of range	Semi-arid and moist woodland savannahs (including miombo and mopane woodlands) where suitable day-roosts such as hollow trees, caves, rock fissures, maine adits and buildings are available.
RHINOLOPHIDAE	*Rhinolophus blasii*	Peak-saddle Horseshoe Bat	NT	-	Sched 3	-	End of range	Savannah woodlands and are dependent on the availability of daylight roosting sites such as caves, mine adits or boulder piles.
SORICIDAE	*Myosorex sclateri*	Sclater's Forest Shrew	VU	-	Sched 3	-	Endemic	Near water in subtropical swamps and coastal forests. Present in grassland, wetland and reedbed habitats.
VESPERTILIONIDAE	*Kerivoula argentata*	Damara Woolly Bat	NT	-	Sched 3	-	End of range	Evergreen forests, riverine forests and both mesic and dry woodland savannahs (including bushveld and miombo), mostly occurring in riverine associations such as riparian corridors.
	Laephotis wintoni	De Winton's Long-eared Bat	VU	-	-	-	End of range	Appears to prefer highland, mountainous grassland regions and has also been recorded from mountainous areas within mosaics of evergreen bushland, secondary wooded grasslands and farmlands, and forests.
REPTILES								
CORDYLIDAE	*Chamaesaura macrolepis*	Large-scaled grass lizard	NT	-	-	-	Near endemic to KZN	Occurs in the Savanna, Indian Ocean Coastal Belt and Grassland biomes in dry grassland, especially rocky, grassy hillsides.
CROCODYLIDAE	*** Sensitive species 2*	Nile crocodile	VU	VU	Sched 7/Sched 3	II	-	Rivers
ELAPIDAE	*Dendroaspis anguticeps*	Green mamba	VU	VU	Sched 3	-	-	In South Africa it is restricted to small patches of low altitude forests along the KwaZulu-Natal coastline, extending as far south as the extreme northeastern parts of the Eastern Cape.
PELOMEDUSIDAE	*** Pelusios rhodesianus*	Mashona Hinged Terrapin	VU	-	Sched 4	III	-	Temporary pans and semi-permanent, well-vegetated water bodies in sandy coastal regions.
FROGS								
HEMISOTIDAE	*Hemisus guttatus*	Spotted Burrowing Frog	NT	-	Sched 5	-	RSA Endemic	Grassland and savanna. Southern Mpumalanga, and central and eastern KwaZulu-Natal, south to Durban on the coast. The northernmost coastal record is from Hluhluwe. It breeds in seasonal pans, swampy areas, and in pools near

TAXONOMIC INFORMATION			CONSERVATION STATUS					
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LIST STATUS	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT
								rivers. It nests in burrows in wet soil close to temporary water, and tadpoles move to water to develop.
HYPEROLIIDAE	*/ ** *Hyperolius pickersgillii*	Pickersgill's Reed Frog	EN	-	Sched 4	-	KZN Endemic	Endemic to the coast of KwaZulu-Natal Province, South Africa, and is found within 15 km of the coast up to 380 m asl. Perennial wetlands comprised of very dense reed beds at low altitudes. Associated with deeper areas of water within wetland systems (20-80 cm).
BIRDS								
ACCIPITRIDAE	*Aquila rapax*	Eagle, Tawny	EN	EN	Sched 3	II	-	Favours open savanna woodland. Able to colonize treeless areas where pylons can support nest structures.
	** *Circaetus fasciolatus*	Snake-eagle, Southern Banded	CR	-	Sched 3	II	-	Lowland evergreen forest, sand forest and plantation margins; in SE Zimbabwe in mixed miombo woodland and evergreen forest.
	** *Circus ranivorus*	African Marsh Harrier	EN	-		II	-	Sparsely distributed across wetlands throughout central and east Africa. Require a minimum of 100 ha of wetland as a breeding territory. Dependent on permanent wetlands for breeding and feeding.
	Polemaetus bellicosus	Eagle, Martial	EN	EN	Sched 3	II	-	Mostly open savanna and woodland on plains, also semi-arid shrublands; rare in mountainous areas.
	Stephanoaetus coronatus	Eagle, African Crowned	VU	-	Sched 3	II	-	Favours tall, closed canopy forest, also found in riparian forest, dense woodland, and forested gorges in grassland. Inhabits gum and pine plantations.
ACCIPITRICAE	** *Terathopius ecaudatus*	Bateleur	EN	EN	Sched 4	II	-	Savannah and open to moderately dense woodland, including Kalahari thornveld, *Vachellia* (Acacia) savannah and Mopane *Colophospermum mopane* woodlands as well as semi-desert shrubland.
ALCEDINIDAE	** *Halcyon senegaloides*	Kingfisher, Mangrove	EN	-	Sched 3	-	-	Occupies two different habitats. The non-br season (Mar-Sept) is spent in mangroves. During Oct-Mar, the KwaZulu-Natal population migrates to the Transkei estuarine forests, and the Mozambique birds move to adjacent lowland forest to breed.
ANATIDAE	** *Nettapus auritus*	Pygmy-Goose, African	VU	-	Sched 3	-	-	Prefers permanent waters with waterlilies.
CAPRIMULGIDAE	*Caprimulgus natalensis*	Nightjar Swamp	VU		Sched 3			Grassland adjoining swamps, lagoons, and rivers, along KZN coast to Eastern Cape.
CICONIIDAE	*Ephippiorhynchus senegalensis*	Stork, Saddle-billed	EN	-	Sched 3	-	-	Along large river systems, lake margins and wetlands.

TAXONOMIC INFORMATION			CONSERVATION STATUS					
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LIST STATUS	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT
	Mycteria ibis	Stork, Yellow-billed	EN	-	Sched 9/Sched 3	-	-	Shoreline of most inland freshwater bodies, also occasionally in estuaries.
FALCONIDAE	*Falco biarmicus*	Falcon, Lanner	VU	-	Sched 3	II	-	Favours open grassland or woodland near cliff or electricity pylon br sites.
HELIORNITHIDAE	*Podica senegalensis*	Finfoot, African	VU	-	Sched 3	-	-	Favours slow flowing streams with overhanging branches.
JACANIDAE	*Microparra capensis*	Jacana, Lesser	VU	-	Sched 3	-	-	Permanent and seasonal shallow freshwaters with floating vegetation, especially water lilies.
LARIDAE	*Sterna caspia*	Tern, Caspian	VU	-	Sched 3	-	-	A marine or estuarine species; also occurs inland.
OTIDIDAE	*Neotis denhami*	Bustard Denham's	VU	VU	Sched 9/Sched 3	II	-	It inhabits grasslands, grassy Acacia-studded dunes, dense shrubland, light woodland, farmland, crops, dried marsh and arid scrub plains, also grass-covered ironstone pans and burnt savanna woodland in Sierra Leone and high rainfall sour grassveld, planted pastures and cereal croplands in fynbos in South Africa
PELECANIDAE	*Pelecanus onocrotalus*	Pelican, Great White	VU	-	Sched 3	-	-	Shallow lakes, estuaries, large pans, and dams. Food Mainly fish, also shrimps, and occasionally scavenges offal.
	Pelecanus rufescens	Pelican, Pink-backed	VU	-	Sched 9/Sched 3	-	-	Wetlands and estuaries.
PHALACROCORACIDAE	*Phalacrocorax capensis*	Cormorant, Cape	EN	-	-	-	-	Inshore marine habitats, also estuaries and lagoons.
PHOENICOPTERIDAE	*Phoenicopterus minor*	Flamingo, Lesser	NT	-	Sched 9/Sched 3	II	-	Primarily eutrophic shallow wetlands, especially saltpans.
	Phoenicopterus ruber	Flamingo, Greater	NT	-	Sched 9/Sched 3	II	-	Favours saline or brackish shallow water bodies such as saltpans, large dams, and coastal mudflats.
SCOLOPACIDAE	*Calidris canutus*	Knot Red	LC (NT)	-	-	-	-	Confined to the coastline, sheltered lagoons, estuaries, and occasionally open coast. Breeds in high Arctic tundra, circumpolar, mostly north of 70ºN.
	Calidris ferruginea	Sandpiper Curlew	LC (NT)	-	-	-	-	Common non-breeding Palaearctic migrant. Occurs in coastal lagoons, estuaries, sheltered coastlines and inland wetlands with muddy fringes.
	Limosa lapponica	Godwit Bar-tailed	LC (NT)	-	-	-	-	Uncommon to locally common non-breeding Palaearctic migrant. Occurs at coastal estuaries and lagoons, inland records are usually passage birds.

TAXONOMIC INFORMATION			CONSERVATION STATUS					
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LIST STATUS	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT
	Numenius arquata	Curlew, Eurasian	NT	-	-	-	-	Primarily sandy coastal wetlands but with more frequent inland records than Whimbrel.
SULIDAE	*Morus capensis*	Gannet, Cape	VU	VU	-	-	-	Coastal (to continental shelf).
TURDIDAE	** *Zoothera guttata*	Ground-thrush, Spotted	EN	-	Sched 3	-	-	Coastal and coastal-scarp forests.
INVERTEBRATES								
LYCAENIDAE	*** *Teriomima zuluana*	Zoeloe Geelvlerkie	VU	-	-	-	-	Found in KwaZulu-Natal Province in South Africa and in Mozambique, from Mtunzini in the south to Praia do Bilene in the north, as well as inland to the Makhathini Flats and the Usutu Gorge in Zululand. coastal lowland forest, on the edges, or in the understory, of forest/thicket in the Indian Ocean Coastal Belt.
PACHYBOLIDAE	* / *** *Centrobolus fulgidus*	Shining Red Millipede	EN	-	-	-	KZN Endemic	Largely restricted to forest habitats, including those along the coast, from Mtumvuma in the south to Cape Vidal in the north, and inland to the Ngoye, Nkhandla, Karkloof and Kranskop Forests.
	* / *** *Centrobolus richardi*	Richard's Bay Red Millipede	VU	-	-	-	KZN Endemic	Mainly along the coast, from Mtunzini in the south to Kosi Bay in the north. Appears to be mostly a coastal forest species.
	* / *** *Centrobolus rugulosus*	Wrinkled Red Millipede	LC	-	-	-	KZN Endemic	Forest and Woodland habitat in northern KZN.
SPIROSTREPTIDAE	* / *** *Doratogonus zuluensis*	Zululand Black Millipede	EN	-	-	-	KZN Endemic	Appears to be confined to dune forest.
	*** *Orthoporoides laccatus*	Milky Black Millipede	NE	-	-	-	KZN Endemic	Terrestrial
STREPTAXIDAE	*** *Gulella zuluensis*		NE	-	-	-	KZN Endemic	Restricted dune forest, dune scrub or coastal forest.
	*** *Gulella aliciae*		NE	-	-	-	KZN Endemic	Terrestrial
TETTIGONIIDAE	** *Arytropteris basalis*	Flat-necked Shieldback	VU	-	-	-	KZN Endemic	Coastal forest and thicket mosaics of KwaZulu-Natal Province.
	** *Pomatonota dregii*	East Coast Katydid	VU	-	-	-	KZN Endemic	Indian Ocean Coastal Belt forests

TAXONOMIC INFORMATION			CONSERVATION STATUS					
FAMILY	SCIENTIFIC NAME	COMMON NAME	SA RED LIST STATUS	NEMBA 2015	PROVINCIAL	CITES	SA ENDEMISM	HABITAT

*** Element of Kwambonambi Hygrophilous Grassland ecosystem**
**** DEA Screening Tool**
***** KZNSCP 2012**

APPENDIX 5: Flora Species Inventory.

TAXONOMIC INFORMATION			GROWTH FORM	* STATUS	** OCCURRENCE			
FAMILY	**SCIENTIFIC NAME**	**COMMON NAME**			*** **GRASSLAND**	**** H. GRASSLAND**	**CANAL**	**DEGRADED**
ACANTHACEAE	*Asystasia gangetica*		Herb	LC - Indigenous	Occational	-	-	-
	Thunbergia atriplicifolia	Natal Primrose	Herb	LC - Indigenous	Frequent	-	-	
AMARANTHACEAE	*Gomphrena celosioides*	Batchelor's Button	Herb	NE - Naturalised - Weed	Occational	-	-	Occational
AMARYLLIDACEAE	*Crinum* cf. *delagoensis*	Cape Coast Lily	Geophyte	LC - Indigenous	Rare	-	-	-
ANACARDIACEAE	*Searsia nebulosa*	Coastal Currant	Shrub	LC - Indigenous	Rare	Rare	-	-
ANNONACEAE	*Annona senegalensis*	Custard-apple	Tree	LC - Indigenous	Rare	-	-	-
APIACEAE	*Centella asiatica*	Pennywort	Herb	LC - Indigenous	Very abundant	Very abundant	Very abundant	Occational
APOCYNACEAE	*Gomphocarpus physocarpus*	Balloon Cottonbush	Herb	LC - Indigenous	Frequent	Frequent	Occational	Rare
	Raphionacme cf. *galpinii*		Geophyte	LC - Indigenous	Rare	-	-	-
	Raphionacme palustris	Long-pod raphionacme	Herb	RSA Endemic	Occational	-	-	-
ARECACEAE	*Phoenix reclinata*	Cape Date Palm	Tree	SFW Element - LC - Indigenous	Rare	Rare	-	-
ASTERACEAE	*Ageratum conyzoides*	Billygoat Weed	Herb	Cat 1b Invasive	Frequent	Frequent	-	-
	Berkheya speciosa		Herb	LC - Indigenous	Occational	-	-	-
	Bidens pilosa	Blackjack	Herb	NE - Naturalised - Weed	-	-	-	Frequent
	Brachylaena discolor	Coastal silver-oak	Tree	LC - Indigenous	Rare	-	-	-
	Chromolaena odorata	Triffid Weed	Shrub	Cat 1b Invasive	Occational	Occational	-	-
	Osteospermum moniliferum	Bushtick Berry	Shrub	LC - Indigenous	Occational	Occational	-	-
	Conyza canadensis	Canadian Horseweed	Herb	NE - Naturalised - Invasive (not listed)	Frequent	Frequent	-	Frequent
	Ethulia conyzoides	Blue Weed	Herb	SFW Element - LC - Indigenous	Frequent	Frequent	Frequent	Occational
	Helichrysum asperum		Shrub	LC - Indigenous	Rare	-	-	-
	Helichrysum aureonitens	Golden Everlasting	Herb	LC - Indigenous	Abundant	Abundant	-	-
	Helichrysum decorum		Herb	LC - Indigenous	Occational	-	-	-
	Helichrysum kraussii	Straw Everlasting	Shrub	MPW Element - LC - Indigenous	Abundant	-	-	-
	Helichrysum ruderale		Herb	RSA Endemic	Occational	-	-	-

TAXONOMIC INFORMATION			GROWTH FORM	* STATUS	** OCCURRENCE			
FAMILY	SCIENTIFIC NAME	COMMON NAME			*** GRASSLAND	**** H. GRASSLAND	CANAL	DEGRADED
	Lactuca indica	Indian Lettuce	Herb	NE - Naturalised - invasive (not listed)	Occational	-	-	Occational
	Mikania natalensis	Mikania	Climber	LC - Indigenous	Rare	-	-	-
	Nidorella anomala		Herb	LC - Indigenous	Occational	-	-	Occational
	Nidorella auriculata		Herb	LC - Indigenous	Occational	-	-	-
	Senecio erubescens		Herb	LC - Indigenous	Rare	-	-	-
	Senecio pterophorus		Herb	LC - Indigenous	Rare	-	-	-
	Taraxacum officinale	Common Dandelion	Herb	NE-Naturalised-Weed	Frequent	-	-	Frequent
	Tridax procumbens	Tridax Daisy	Herb	NE-Naturalised-Weed	Occational	-	-	Occational
BIGNONIACEAE	*Tecoma stans*	Yellow Bells	Tree	LC - Indigenous	-	-	Rare	-
BRASSICACEAE	*Lepidium virginicum*	Pepperweed	Herb	NE -Naturalised - Weed	Frequent	-	-	-
CAMPANULACEAE	*Roella glomerata*		Dwarf shrub	RSA Endemic	-	Rare	-	-
	Wahlenbergia krebsii	Fairy Bell-flower	Herb	LC - Indigenous	Frequent	Frequent	-	-
CANNABACEAE	*Trema orientalis*	Pigeonwood	Tree	LC - Indigenous	Rare	-	-	-
CELASTRACEAE	*Salacia kraussii*		Suffrutex	MPW Element	Frequent	-	-	-
CHRYSOBALANACEAE	*Parinari capensis*	Mobola-plum	Suffrutex	LC - Indigenous	Abundant	-	-	-
COMMELINACEAE	*Commelina africana*	Yellow Commelina	Herb	LC - Indigenous	Frequent	Frequent	-	-
	Commelina benghalensis	Wandering Jew	Herb	LC - Indigenous	Occational	-	-	Occational
	Commelina erecta		Herb	LC - Indigenous	Frequent	Frequent	-	-
CONVOLVULACEAE	*Cuscuta campestris*	Dodder	Parasite	LC - Indigenous	Abundant	Abundant	-	Frequent
CUCURBITACEAE	*Cucumis zeyheri*	Wild Cucumber	Herb	LC - Indigenous	Rare	-	-	-
CYPERACEAE	*Cyperus articulatus*	Jointed Flatsedge	Cyperoid	SFW Element - LC - indigenous	Frequent	-	-	-
	Cyperus natalensis in grassland		Cyperoid	MPW Element - LC - indigenous	Frequent	Frequent	-	Occational
	Cyperus obtusiflorus	White-flowered Sedge	Cyperoid	MPW Element - LC - indigenous	-	-	-	Rare
	Cyperus prolifer	Dwarf Papyrus	Cyperoid	SFW element - LC - Indigenous	-	Occational	-	-
	Cyperus sphaerospermus		Cyperoid	LC - Indigenous	-	Frequent	-	-
	Eleocharis acutangula		Cyperoid	LC - Indigenous	-	Rare	-	-
	Eleocharis limosa	Finger Rush	Cyperoid	LC - Indigenous	Rare	Abundant	-	-

TAXONOMIC INFORMATION			GROWTH FORM	* STATUS	** OCCURRENCE			
FAMILY	SCIENTIFIC NAME	COMMON NAME			*** GRASSLAND	**** H. GRASSLAND	CANAL	DEGRADED
	Fimbristylis dichotoma		Cyperoid	LC - Indigenous	-	Occational	-	-
	Fuirena ciliaris		Cyperoid	SFW Element - LC - Indigenous	-	Frequent	-	-
	Isolepis cernua		Cyperoid	LC - Indigenous	-	Occational	-	-
	Pycreus polystachyos		Cyperoid	SFW Element - LC - Indigenous	Frequent	Frequent	-	-
	Rhynchospora holoschoenoides		Cyperoid	LC - Indigenous	Occatioal	Frequent	-	-
EBENACEAE	*Diospyros galpinii*	Dwarf Hairy star-apple	Suffrutex	MPW Element – LC – Indigenous	Rare	-	-	-
	Diospyros lycioides	Bluebush star-apple	Suffrutex	LC - Indigenous	Rare	-	-	-
EUPHORBIACEAE	*Euphorbia hirta*		Herb	NE-Naturalised-Weed	Rare	Rare	-	Frequent
FABACEAE	*Acacia mearnsii*	Black Wattle	Tree	Cat 2 Invasive	Rare	-	-	-
	Chamaecrista comosa		Herb	LC - Indigenous	Frequent	Frequent	-	Rare
	Crotalaria lanceolata		Herb	LC - Indigenous	Rare	-	-	-
	Desmodium dregeanum		Dwarf shrub	SFW Element - LC - Indigenous	Abundant	Occational	-	Rare
	Desmodium incanum	Creeping Beggerweed	Herb	NE - Naturalised-Weed	Rare	-	-	-
	Dichrostachys cinerea	Sickle-bush	Shrub/tree	LC - Indigenous		Rare	-	-
	Eriosema cordatum	Heartleaf Eriosema	Herb	LC - Indigenous	Frequent	-	-	-
	Eriosema psoraleoides	Canary Pea	Dwarf shrub	LC - Indigenous	Rare	-	-	-
	Eriosema squarrosum		Herb	LC - Indigenous	Rare	-	-	-
	Indigofera spicata		Shrub	LC - Indigenous	Frequent	Rare	-	-
	Melilotus albus		Herb	NE -Naturalised-Invasive (not listed)	Frequent	Rare	-	Rare
	Rhynchosia sp.		Creeper	LC - Indigenous	Rare	-	-	-
	Sesbania sesban		Shrub	LC - Indigenous	Rare	-	-	-
	Vigna vexillata	Wild Sweetpea	Creeper	LC - Indigenous	Occational	-	-	-
	Zornia capensis	Caterpillar Bean	Herb	LC - Indigenous	-	-	Rare	-
HYPERICACEAE	*Hypericum lalandii*	Spindly Hypericum	Herb	LC - Indigenous	Rare	-	-	-
HYPOXIDACEAE	*Hypoxis angustifolia*	Yellow Star	Geophyte	LC - Indigenous	Rare	-	-	-
JUNCACEAE	*Juncus lomatophyllus*		Hydrophyte	LC - Indigenous	-	Abundant	-	-
LAMIACEAE	*Pycnostachys reticulata*	Blue Soldier	Herb	LC - Indigenous	-	Rare	-	-
LOBELIACEAE	*Lobelia anceps*		Herb	LC - Indigenous	Frequent	Occational	-	Rare

TAXONOMIC INFORMATION			GROWTH FORM	* STATUS	** OCCURRENCE			
FAMILY	SCIENTIFIC NAME	COMMON NAME			*** GRASSLAND	**** H. GRASSLAND	CANAL	DEGRADED
	Lobelia coronopifolia	Wild Lobelia	Herb	LC - Indigenous	Rare	-	-	-
	Lobelia flaccida		Herb	LC - Indigenous	Rare	Rare	-	-
	Monopsis stellarioides		Herb	LC - Indigenous	Rare	Frequent	-	-
LYCOPODIACEAE	*Lycopodiella cernua*	Nodding Clubmoss - obligate	Geophyte	LC - Indigenous	Rare	Abundant	Abundant	-
MALVACEAE	*Malvastrum coromandelianum*		Dwarf shrub	Cat 1b Invasive	Rare	-	-	-
	Triumfetta pilosa		Shrub	LC - Indigenous	Rare	-	-	-
MELASTOMATACEAE	*Dissotis canescens*	Pink Wild Tibouchina	Herb	LC - Indigenous	-	-	Abundant	-
	Dissotis phaeotricha			LC - Indigenous	Frequent	Frequent	-	-
MYRICACEAE	*Morella serrata*	Lance-leaved Waxberry	Shrub	LC - Indigenous	-	Rare	-	-
MYRTACEAE	*Eucalyptus* sp.	Bluegum	Tree	Cat 1b Invasive	Rare	-	-	-
	Psidium guajava	Guava	Tree	Cat 2 Invasive	Frequent	Frequent	-	-
	Syzygium cordatum	Waterberry	Tree	MPW Element – LC - Indigenous	Frequent	Frequent	Rare	-
NYMPHAEACEAE	*Nymphaea nouchali*	Blue Waterlily	Hydrophyte	LC - Indigenous	-	-	Rare	-
ONAGRACEAE	*Ludwigia octovalvis*		Herb	SFW element - LC - Indigenous	Frequent	Frequent	Frequent	-
	Oenothera indecora		Herb	NE -Naturalised	Rare	-	-	-
OROBANCHACEAE	*Alectra sessiliflora*		Herb	LC - Indigenous	Rare	-	-	-
PERACEAE	*Clutia monticola*		Shrub	LC - Indigenous	Frequent	-	-	-
POACEAE	*Andropogon huillensis*	Large Silver Andropogon	Graminoid	LC - Indigenous	Frequent	Frequent	-	-
	Aristida junciformis	Ngongoni Grass	Graminoid	LC - Indigenous	Abundant	Frequent	-	-
	Brachiaria humidicola	Creeping Signal Grass	Graminoid	LC - Indigenous	-	Very abundant	-	-
	Cymbopogon nardus	Giant Turpentine Grass	Graminoid	LC - Indigenous	Frequent	Occational	-	-
	Cynodon dactylon	Common Couch Grass	Graminoid	SFW Element - LC - Indigenous	Abundant	Abundant	-	Frequent
	Dactyloctenium aegyptium	Common Crowfoot	Graminoid	SFW Element - LC - Indigenous	Frequent	Frequent	-	Frequent
	Dactyloctenium australe	Natal Crowfoot	Graminoid	LC - Indigenous	Frequent	Frequent	-	Occational
	Digitaria natalensis	Common Finger Grass	Graminoid	MPW/SFW Elements - LC – Indigenous	Abundant	Abundant	-	Occational

TAXONOMIC INFORMATION			GROWTH FORM	* STATUS	** OCCURRENCE			
FAMILY	SCIENTIFIC NAME	COMMON NAME			*** GRASSLAND	**** H. GRASSLAND	CANAL	DEGRADED
	Eragrostis capensis	Small Heart Seed Grass	Graminoid	LC - Indigenous	Frequent	Rare	Frequent	-
	Eragrostis inamoena		Graminoid	LC - Indigenous	Frequent	Frequent	-	-
	Hemarthria altissima	Swamp Couch	Graminoid	SFW Element - LC - Indigenous	-	Very abundant	-	-
	Imperata cylindrica	Cotton-wool Grass	Graminoid	SFW Element - LC - Indigenous	Frequent	Frequent	Frequent	Rare
	Ischaemum fasciculatum	Border Grass	Graminoid	SFW Element - LC - Indigenous	-	Very abundant	-	-
	Melinis repens	Natal Red Top	Graminoid	LC - Indigenous	Frequent	Occational	-	Occational
	Panicum dregeanum		Graminoid	LC - Indigenous	Frequent	Frequent	-	-
	Paspalum dilatatum		Graminoid	NE - Naturalised-Invasive (not listed)	Occational	Occational	-	-
	Phragmites australis	Common Reed	Graminoid	SFW Element - LC - Indigenous	Occational	Occational	Abundant	-
	Setaria sphacelata	Common Bristle Grass	Graminoid	MPW Element - LC - Indigenous	Occational	Occational	-	-
	Sporobolus africanus	Dropseed	Graminoid	LC - Indigenous	Frequent	Occational	-	-
	Sporobolus pyramidalis	Cat's Tail Dropseed	Graminoid	LC - Indigenous	Frequent	Occational		
	Themeda triandra	Red Grass	Graminoid	MPW Element - LC - Indigenous	Occational	-	-	-
POLYGONACEAE	*Persicaria* cf. *madagascariensis*			NE - Naturalised	Occational	Frequent	Abundant	-
PTERIDACEAE	*Cheilanthes viridis*	Cliff Brake	Geophyte	LC - Indigenous	Occational	-	-	Rare
RUBIACEAE	*Agathisanthemum bojeri*		Herb	MPW Element - LC - Indigenous	Frequent	Occational	-	Rare
	Richardia brasiliensis		Herb	NE - Naturalised - Weed	Frequent	Occational	-	Frequent
	Vangueria infausta	Velvet Wild-medlar	Tree	LC - Indigenous	Rare	-	-	-
SCROPHULARIACEAE	*Selago tarachodes*		Herb	RSA Endemic	Occational	-	-	-
SMILACACEAE	*Smilax anceps*	Leg-ripper	Climber	LC - Indigenous	Frequent	Rare	-	-
SOLANACEAE	*Solanum nigrum*		Herb	NE-Naturalised	Rare	-	-	Rare
THELYPTERIDACEAE	*Cyclosorus interruptus*		Hydrophyte	LC - Indigenous	-	Very abundant	Very abundant	-
TYPHACEAE	*Typha capensis*	Common Bulrush	Hydrophyte	SFW Element - LC - Indigenous	-	Frequent	Frequent	-
VERBENACEAE	*Lantana camara*	Lantana	Shrub	Cat 1b Invasive	Occational	Occational	-	-
	Lippia javanica	Fever Tree	Shrub	LC - Indigenous	Rare	-	-	Rare

TAXONOMIC INFORMATION			GROWTH FORM	* STATUS	** OCCURRENCE			
FAMILY	SCIENTIFIC NAME	COMMON NAME			*** GRASSLAND	**** H. GRASSLAND	CANAL	DEGRADED
	Stachytarpheta urticifolia	Nettle-leaf Velvetberry	Herb	NE - Naturalised	-	Rare	-	-
XYRIDACEAE	*Xyris capensis*	Common Xyris	Hydrophyte	LC - Indigenous	Occational	Frequent	-	-

*** Status: NE – Not Evaluated; RSA Endemic – Endemic to South Africa; MPW Element – Floristic element of Maputaland Wooded Grassland; SFW element – Floristic element of Subtropical Freshwater Wetlands.**

**** Occurrence: Rare - <5; Occasional – 5–10; Frequent – 11–3; Abundant – 31-60; Very Abundant - >60**

***** *Digitaria natalensis – Parinari capensis* Grassland**

****** *Ischaemum fasciculatum* Hygrophilous Grassland**

APPENDIX 6: Declaration of independence

I, Anita Rautenbach (ID: 7103180154085) declare that I:

- Am committed to biodiversity conservation, but concomitantly recognise the need for economic development.
- Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them.
- Am subcontracted as a specialist consultant by Savannah Environmental (Pty) Ltd to undertake a terrestrial biodiversity assessment for the development of a 1060 MW simple cycle gas to power plant in Richards Bay, KwaZulu Natal province.
- Do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work performed.
- Have not and will not engage in conflicting interests in the undertaking of the activity.
- Undertake to disclose to the client and the competent authority any material information that have or may have the potential to influence the decision of the competent authority.
- The intellectual property in this report will only be transferred to the client (the party/company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, I recognize that written consent of the client will be required for me to release any part of this report to third parties.
- In addition, remuneration for services provided by us is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

A. Rautenbach (Pr. Sci. Nat)

APPENDIX 7: Details of specialist consultant

Name	Anita Rautenbach
Profession	Zoological/Ecological Consultant
Name of Firm	Rautenbach Biodiversity Consulting
Present Appointment	Zoologist/Ecologist
Date of Birth	18 March 1971
Nationality	South African
ID No.	710318 0154 085

OVERVIEW

I graduated with a Master's degree in Biological Science from the School of Life Sciences, University of KwaZulu-Natal Durban. My Master's dissertation investigated patterns and processes of rodent and shrew assemblages in the Savanna Biome of KwaZulu-Natal.

My main interest involves fauna taxonomy, distribution patterns and ecology. I have been involved in various research projects and ecological assessments in southern Africa. I have more than 12 years of experience in the environmental field and is currently registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP).

EDUCATION

- 2007: BSc. Zoology & Geography – University of South Africa
- 2010 – BSc. Honours (Biological Science – University of KwaZulu-Natal
- 2013 – MSc (Biological Science) – University of KwaZulu-Natal

PROFESSIONAL QUALIFICATIONS

- MSc (Biological Science)

MEMBERSHIP TO PROFESSIONAL SOCIETIES

- SACNASP – Professional Natural Scientist – (400725/15) – Zoological sciences
- Zoological Society of Southern Africa

PUBLICATIONS

- Solano, E., Taylor, P, J., Rautenbach, A., Ropiquet, A., Castiglia, R. 2014. Cryptic speciation and chromosomal repatterning in the African climbing mice *Dendromus* (Rodentia, Nesomyidae). PloS One (DOI: 10.1371/journal.phone.0088799).
- Rautenbach, A., Dickerson, T., Schoeman, M.C. 2013. Diversity of rodents and shrew assemblages in different vegetation types of the savannah biome in South Africa: no support for nested subset or competition hypotheses. African Journal of Ecology 5(1) pp. 30-40.
- Taylor, P.J., Rautenbach, A., Schoeman, M.C., Combrink, X. 2007. A winter survey of the smaller mammals of the uMkhuze section of the iSimangaliso Wetland Park, KwaZulu-Natal Province, South Africa. (https://www.researchgate.net/228787004)

EMPLOYMENT RECORD

• March 2015 – current	Rautenbach Biodiversity Consulting – (Full time Fauna/flora/vegetation/biodiversity/ecological assessments)
• March 2012 – March 2015	Rautenbach Biodiversity Consulting – Part time – Fauna assessments
• March 2012 – Feb 2013	GVK Siya Zama Building and Renovations – HSE officer
• March 2013 – March 2015	GVK Siya Zama Building and Renovations – Regional HSE Manager
• April 2007 – August 2011	Durban Natural Science Museum – Mammal technician
• 1997 – 2007	Dr D Storm – Receptionist
• 1992 – 1997	Drs Smith, Snyman & Partners (Medical typist)
• 1990 – 1991	Drs Brits & Griesel Pathologists (Medical typist)

LANGUAGE PROFICIENCY

LANGUAGE	SPEAK	READ	WRITE
• English	Fluent	Fluent	Fluent
• Afrikaans	Fluent	Fluent	Fluent

YEARS OF WORKING EXPERIENCE

12+ Years

COUNTRIES OF WORK EXPERIENCE

- South Africa
- Swaziland
- Mozambique
- Kenya
- Madagascar

FIELDS OF SPECIALISATION

- Terrestrial Biodiversity/ecological assessments
- Fauna assessments
- Flora & vegetation assessments – (KZN & Mpumalanga vegetation types)
- Threatened species assessments.

PROJECT EXPERIENCE (selected projects)

Ecological assessments (inclusive of fauna)

- Section 24G contravention – Retrospective ecological assessment related to the unlawful construction of an irrigation dam on the Farm Neederland 202 HT, Mpumalanga. Commissioned by Enprocon (Pty) Ltd. 2019.
- Proposed development of the Pavua dam hydropower facility, Mozambique. Commissioned by The Biodiversity Company. 2017.
- Proposed housing development in Amaoti, KwaZulu-Natal. Commissioned by The Biodiversity Company.
- Proposed Thukela-Goedertrou pipeline development, KwaZulu-Natal. Commissioned by The Biodiversity Company. 2017.
- Proposed development of the Shixini 3 Macadamia Orchards, Eastern Cape. Commissioned by Afzelia Environmental Consultants. 2005.
- Proposed Kingsburg housing development, Durban, KwaZulu-Natal. Commissioned by Afzelia Environmental Consultants.
- Proposed Ingogo dams' development, KwaZulu-Natal. Commissioned by Enprocon (Pty) Ltd.
- Proposed upgrade of Queen Nandi, Kwamashu and Inanda interchanges, KwaZulu-Natal. SANRAL

- Proposed development of a new dig-out port in Durban, KwaZulu-Natal Projects. Transnet capital projects.

Small mammal (rodents, shrews, bats) assessments

- Proposed development of a new mine in Kenya. Base Titanium.
- Small mammal (rodents & shrews) assessments, Phinda, KwaZulu-Natal. Phinda Game Reserve.
- Small mammal assessment (rodents, shrews) Albert Falls Dam, KwaZulu-Natal. Durban Natural Science Museum.
- Small mammal assessment as part of the Ecorat project, Swaziland. Durban Natural Science Museum. 2005.
- Small mammal assessment (rodents, bats, shrews) as part of the Operation Wallacea Bioblitz. Durban Natural Science Museum.
- Small mammal assessment in Madagascar – University of KwaZulu-Natal. 2005.

Ecological assessments (inclusive of fauna, flora and vegetation)

- Biodiversity Assessments – Hulamin Aluminium - Ongoing
- Section 24G contravention – Retrospective ecological assessment related to the unlawful enlargement of an irrigation dam on the Farm Witklip 4/207 HT, Mpumalanga. Commissioned by Enprocon (Pty) Ltd
- Proposed housing development on Erf 2082, Shelley Beach, KwaZulu-Natal. Commissioned by The Biodiversity Company.
- Proposed development of an opencast pit and underground decline shaft, ZAC Colliery, KwaZulu-Natal. Commissioned by The Biodiversity Company.
- Proposed development of the Richards Bay Combined Cycle Gas Turbine Power Plant, Richards Bay, KwaZulu-Natal. Commissioned by Savannah Environmental. 2018.
- Proposed development of a new abattoir in the Inkosi Langibalele municipal area. Commissioned by The Biodiversity Company.
- Section 24 G contravention – Retrospective assessment for the unlawful construction of a dam on Portion 5 of the Farm Tweefontein 3344, Newcastle, KwaZulu-Natal.
- Proposed housing development in Craigside, Newcastle. Commissioned by Enprocon (Pty) Ltd. 2017.
- Proposed Mdzonyana open-cast mining development, Limpopo province. Commissoned by Afzelia Environmental Consultants.
- Section 24G contravention – Retrospective ecological assessment related to the unlawful construction of a dam on the Farm Stefco 4/428, KwaZulu-Natal. Commissioned by Enprocon (Pty) Ltd. 2017.
- Retrospective terrestrial ecological assessment relating to the non-compliance of the provisions of Section 24F and Section 1 of NEMA on the Farm Doornkloof 376 HT.
- Proposed Umzimkhulu housing development, KwaZulu-Natal. Commissioned by The Biodiversity Company. 2017.
- Proposed development of pecan nut orchards and irrigation dams on Mtebeni Ranches, Pongola, KwaZulu-Natal. Commissioned by Enprocon (Pty) Ltd. 2020.
- Proposed Wilmar vegetable oil processing facility, Richards Bay, KwaZulu-Natal. Commissioned by Savannah Environmental. 2019.
- Proposed Wilmar vegetable oil pipeline development, Richards Bay, KwaZulu-Natal. Commissioned by Savannah. 2019.
- Proposed 1800 gas to power plant development, Richards Bay, KwaZulu-Natal. Commissioned by Savannah Environmental.

Threatened species assessments

- Specialist input to the wetland offset plan for the proposed Richards Bay Combined Cycle Gas Turbine Power Plant, Richards Bay, KwaZulu-Natal Province (*Hemisus guttatus* & *Crocidura mariquensis* assessment). Commissioned by Savannah Environmental. 2019.
- Proposed development of a housing estate, Coral Lagoon (Pty) Ltd, Durban, KwaZulu-Natal. *Bradypodion melanocephalum* assessment – Commissioned by Coral Lagoon (Pty) Ltd. 2017.

Flora and vegetation assessments

- Proposed business park development on Erf 947, Port Edwards, KwaZulu-Natal. Commissioned by The Biodiversity Company. 2019.
- Proposed mining development on the farm The Corner RE/11328, Umzumbe, KwaZulu-Natal. Commissioned by The Biodiversity Company. 2019
- Proposed development of a hospital in Newcastle, KwaZulu-Natal. Commissioned by Enprocon (Pty) Ltd. 2018.
- Proposed development of the Maphumulo Integrated Energy Centre, Glendale, KwaZulu-Natal. Commissioned by The Biodiversity Company.
- Proposed development of Portion 1 of Erf 286, Forest Hills, KwaZulu-Natal. Commissioned by The Biodiversity Company. 2017

COMPUTER LITERACY

- Microsoft Windows platforms
- Microsoft Office Suites including Office 365
- Google Earth
- QGIS 3.2 (GIS Software)
- Statistica
- BINMATNEST
- Ecosim
- Primer
- Distance

COURSES / CONFERENCES / WORKSHOPS

- 2007 Introduction to Bats – Bat Interest Group KZN
- 2009 ArcGIS Desktop – University of KwaZulu-Natal
- 2018 Conference – 'Bringing IAIA Back' - IAIAsa
- 2021 Guide to snake identification – African Snakebite institute (certificate)
- 2020 Verreauxs Eagle and Wind Farms – Birdlife South Africa (certificate)
- 2020 Cape Vulture Guidelines – Birdlife South Africa (certificate)
- 2021 Guidelines for pre-construction monitoring of bats at wind energy facilities – Inkululeko Wilflife Services (certificate)

REFERENCES

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