SCIENTIFIC TERRESTRIAL SERVICES

Terrestrial Assessment

FOR THE PROPOSED PHASE 1F DEVELOPMENT OF THE RICHARD'S BAY INDUSTRIAL DEVELOPMENT ZONE (RBIDZ).

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EXECUTIVE SUMMARY

Scientific Terrestrial Services (Pty) Ltd (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) to obtain an Environmental Authorisation (EA) for the proposed 80 Kilo-Tonnes Per Annum (ktpa) titanium dioxide (TiO_2) Plant project the Richard's Bay Industrial Development Zone (RBIDZ), Richard's Bay, Kwazulu-Natal Province. The proposed footprint associated with the development will henceforth be referred to as the "study area"". Environmental authorisation (Ref: 14/12/16/3/3/2/665) was granted for Phase 1F of the proposed RBIDZ's development in September 2016. The Phase 1F development included the following infrastructure development:

- Water infrastructure;
- Sewer infrastructure;
- Stormwater infrastructure;
- Roads;
- Electrical services; and
- Infill of Wetlands (to enable the development of the site for industrial purposes)[1].

The next phase of the RBIDZ development, (i.e., the focus of the current report), which is located within the same areas as the Phase 1F development, involves the development of an 80 ktpa TiO_2 Plant. The proposed project consists of the following infrastructure development:

- A Solar Plant, Water Extraction, and Bottling Plant;
- An 80 000 tons per annum (tpa) Rutile Pigment Plant which will produce 80 000 tpa pigment of the TiO_2 nature;
- Storage Areas for dangerous goods;
- Waste Management Area;
- Water Reservoir;
- Service roads;
- Service areas, including a pump station and an air-to-water plant (for on-site generators).
- Storm water culverts; and
- Parking areas.

Species diversity and habitat integrity:

According to the updated 2018 Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a), the study area is located within the Maputaland Wooded Grassland (listed as endangered (EN) in both Mucina and Rutherford (2006) and in the 2018 Vegetation Map) and the Northern Coastal Forest vegetation types (listed as least concern (LC) in both Mucina and Rutherford (2006) and in the 2018 Vegetation Map). The Maputaland Wooded Grassland and the Northern Coastal Forest vegetation types thus form the reference states in which on-site vegetation characteristics are compared.

Overall, the habitat within the study area ranged from well-vegetated areas to transformed areas in which indigenous vegetation[2] was scarce. The biodiversity of the study area can thus be defined under five broad habitat units as described below. These habitat units were distinguished based on species composition, vegetation structure, ecological function, physical nature of the environment and habitat condition.

During the field assessment, five habitat units were identified within the study area, namely:

1) **Degraded Hygrophilous Grassland** - this habitat unit is the largest habitat unit within the study area (approx. 32.2 ha) and supported a moderately low to moderate species richness;
2) **Degraded Coastal Forest** - this habitat was the second smallest of all the habitat units within the study area (approx. 3.4 ha) and supported a moderately high species diversity;

[1] All wetlands within the study area, except for the large Depression Wetland in the west (refer to Section 3 below of the current report and the Freshwater Report: SAS 22-1058 (2022), will be infilled to allow for development as per the EA granted in 2016 (Ref 14/12/16/3/3/2/665). No development is proposed to take place within the large Depression Wetland in the west of the study area.

[2] **The NEMA definition of indigenous vegetation**: "Indigenous vegetation: refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding 10 years.

3) **Thicket Habitat** - this habitat was the third largest of the habitat units (comprising approx. 8.2 ha) and supported a moderately low species diversity;
4) **Freshwater Habitat** - the Freshwater Habitat was scattered throughout the study area (comprising approx. 20.8 ha) and comprised of three wetland types, namely a Depression Wetland, Wetland Flats, and Seep Wetlands. The Freshwater Habitat also comprised of an artificial Earth Canal that ran through the Seep Wetland). Species diversity varied between the wetland types with some supporting a higher diversity than others. All wetlands, except for the large Depression Wetland in the west of the study area (in which no development is proposed) will be infilled for development (EA already granted). Although several wetland types were identified during the field assessment (i.e., Seep Wetlands, Wetland Flats, and a Depression Wetland) and are discussed in the current report, EA (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382) has already been granted for the infill of the Seep Wetlands and Wetland flats. As such, although these wetlands have yet to be infilled, they are only included in the habitat writeups. Given that EA has been granted for their infill, no sensitivity will be assigned to these wetlands and associated impacts will thus not be discussed; and
5) **Transformed Habitat** - the Transformed Habitat is the smallest habitat unit within the study area (approximately 1.7 ha) and was associated with the complete transformation of areas for road and/or infrastructure development.

From a floral and faunal perspective, the sensitivity of the above habitats was as follows:

Habitat	Floral Sensitivity	Faunal Sensitivity
Degraded Hygrophilous Grassland	Moderately Low	Intermediate
Degraded Coastal Forest	Moderately High	Moderately High
Thicket Habitat	Moderately Low	Intermediate
Freshwater Habitat: Depression Wetland (west)	Moderately High	Moderately High
Transformed Habitat	Low	Low

Species of Conservation Concern (SCC):

The habitats within the study area provide suitable habitat to sustain viable populations of floral SCC. A Floral walkdown of the study area was conducted in 2015 and permits granted for the relocation of *Boophone disticha* and *Crinum macowanii* within the study area. These species were recently relocated (see STS 22-2019 (2022) for details). However, additional species were identified on site during 2022 that were not previously identified and as such no relocation of this species has occurred. Furthermore, habitat to support other SCC is available within the habitats. If the proposed development is authorised, it will be necessary to conduct a thorough walkdown of all the footprint areas and all floral SCC marked for possible relocation to suitable habitat outside the direct footprint (as far as is feasible). Permits from the necessary authorities will be required for the possible relocation, removal, or destruction of this species before vegetation clearing activities commence.

No faunal SCC were observed within the study area, however, the habitat available suggests that there is a medium to high possibility that 17 SCC may utilise the study area for foraging, or as breeding habitat in the case of the reptile and invertebrate SCC. SCC include: *Coracias garrulus* (European Roller), *Circus ranivorus* (Marsh Harrier), *Falco biarmicus* (Lanner Falcon), *Circaetus fasciolatus* (Southern Banded Snake Eagle), *Stephanoaetus coronatus* (Crowned Eagle), *Geokichla guttata* (Spotted-ground-thrush), *Pyxicephalus edulis* (African Bullfrog), *Python natalensis* (Southern African Python), *Bitis gabonica* (Gaboon Adder), *Hemisus guttatus* (Spotted Shovel nosed Frog), *Homoroselaps dorsalis* (Striped Harlequin Snake), *Agriocnemis ruberrima* (Orange Wisp), *Dendroaspis angusticeps* (Green Mamba), *Chamaesaura macrolepis* (Large-scaled Grass Lizard), *Lycophidion pygmaeum* (Pygmy Wolf Snake), *Hyperolius pickersgilli* (Pickersgill's Reed Frog), *Pomatonota dregii* (East Coast Katydid) and *Arytropteris basalis* (Flat-necked Shieldback). Herpetofaunal SCC face an increased mortality risk during construction due to their poor dispersal abilities. As such, prior to development, a search and rescue plan should be developed in the event of encountering these SCC during clearing activities for the proposed development.

Important Ecological Features within the study area:

The study area overlaps important conservation features, including CBA Irreplaceable areas and a nationally threatened Ecosystem, namely the CR Kwambonambi Hygrophilous Grasslands Ecosystem.

The presence of CBA Irreplaceable areas and Threatened Ecosystem habitat within the i) Degraded Hygrophilous Grassland, Thicket Habitat, and Transformed Habitat was not supported; given the level of anthropogenic influences experienced both within and around these habitats and thus the subsequent habitat degradation and fragmentation (and the subsequent influence this has on ecosystem processes (e.g., dispersal corridors), the presence of intact habitat of important conservation features was absent. However, such habitat was confirmed for the Freshwater Habitat (particularly the western Depression Wetland). Although the western Depression Wetland habitats have been impacted by anthropogenic influences (that have subsequently resulted in degradation within the habitat), this freshwater feature still provides suitable habitat to support an array of species as well as ecological processes (e.g., dispersal and connective corridors, nutrient cycling etc.). Despite the degradation and habitat fragmentation that the western Depression Wetland has experienced, it still provides important ecological features within the landscape, albeit modified. The presence of intact (albeit modified) CBA habitat was thus confirmed for this feature.

Impacts associated with the proposed development:

The authorised Phase 1F of the development includes infilling of the Wetland Flats and the Seep Wetlands within the study area (refer to Section 1.1 for further details). Thus, no impacts pertaining to these wetland types are presented in the impact assessment below. However, the Depression Wetland in the west of the study area is not within the proposed layout and will therefore not be infilled. As such, the impacts associated with the Depression Wetland (i.e., secondary impacts) are presented in the impact assessment below.

For the Pre-Construction & Planning phase, the habitats were assessed together. For the Construction Phase, the impacts were assessed separately for each habitat, namely Degraded Hygrophilous Grassland, Degraded Coastal Forest, Thicket Habitat, Depression Wetland (as explained above), and Transformed Habitat. For the Operational & Maintenance Phase, the impacts were assessed for all habitats (except for the Depression Wetland, i.e., Degraded Hygrophilous Grassland, Degraded Coastal Forest, Thicket Habitat, Transformed Habitat). During this phase, impacts associated with the Depression Wetland (in which no development is proposed), were assessed separately.

Following the biodiversity assessment within the study area, the impacts associated with the proposed development activities, from a floral habitat perspective, were determined and are presented below:

FLORAL			
Habitat	**Component**	**Pre-mitigation Impact**	**Post-mitigation Impact**
Pre-Construction & Planning Phase			
All Habitats (excluding infilled Wetlands that were not assessed)	Floral Habitat Diversity	High	Medium
	Floral SCC	High	Medium
Construction Phase			
Degraded Hygrophilous Grassland	Floral Habitat Diversity	High	Medium
	Floral SCC	Medium	Medium
Degraded Coastal Forest	Floral Habitat Diversity	High	High
	Floral SCC	High	Medium
Thicket Habitat	Floral Habitat Diversity	Medium	Medium
	Floral SCC	Medium	Low
Depression Wetland	Floral Habitat Diversity	High	Medium
	Floral SCC	High	Medium
Transformed Habitat	Floral Habitat Diversity	Low	Low
	Floral SCC	Very Low	Insignificant
Operational & Maintenance Phase			
All Habitats (excluding infilled Wetlands that were not assessed)	Floral Habitat Diversity	Medium	Low
	Floral SCC	Medium	Low
Depression Wetland	Floral Habitat Diversity	Medium	Low
	Floral SCC	Medium	Low

FAUNAL			
Habitat	**Component**	**Pre-mitigation Impact**	**Post-mitigation Impact**
Pre-Construction & Planning Phase			
All Habitats	Faunal Habitat Diversity	Very High	Medium
	Faunal SCC	Very High	Medium
Construction Phase			
Degraded Hygrophilous Grassland	Faunal Habitat Diversity	High	Very Low
	Faunal SCC	Medium	Insignificant
Degraded Coastal Forest	Faunal Habitat Diversity	Very High	Medium
	Faunal SCC	Very High	Medium
Thicket Habitat	Faunal Habitat Diversity	Medium	Very Low
	Faunal SCC	Medium	Very Low
Depression Wetland	Faunal Habitat Diversity	High	Medium
	Faunal SCC	High	Medium
Transformed Habitat	Faunal Habitat Diversity	Low	Insignificant
	Faunal SCC	Low	Insignificant
Operational & Maintenance Phase			
All Habitats (except for Depression Wetland)	Faunal Habitat Diversity	High	Very Low
	Faunal SCC	Low	Very Low
Depression Wetland	Faunal Habitat Diversity	High	Very Low
	Faunal SCC	High	Very Low

In particular, the proposed infrastructure area will impact on two habitat units of increased sensitivity, i.e., the Degraded Coastal Forest and the western Depression Wetland (within the Freshwater Habitat). The following recommendations are thus proposed:

- (Western) Depression Wetland: although no development is proposed within the Depression Wetland in the west of the study area, this wetland feature is still subject to edge effect impacts from the associated development activities. The indiscriminate placement of the proposed infrastructure within the Depression Wetland will result in broader-scale impacts on floral and faunal communities if flow regimes are altered, or if edge effect management such as AIP control is not effectively implemented. It is thus recommended that appropriate measures should be taken to minimise the impacts on the Wetland feature.
- Degraded Coastal Forest: The Degraded Coastal Forest Habitat meets the NFA definition of "natural forests". Although this habitat has experienced some degradation historically (e.g., firewood collection, AIP proliferation, etc.,), the habitat supports higher levels of biodiversity than the surrounding areas, contributing significantly toward woody species diversity. The Forest habitat also provides important ecological functions within the landscape (e.g., dispersal corridors). Thus, loss of the forest habitat may impact ecological connectivity within the greater landscape. Usually, impacts to such habitat could be minimised by means of effective infrastructure and development layout plans, i.e., development plans be designed to, as far as is feasible, avoid the associated habitat. As is often the recommendation from the forestry department within the DFFE, a 30 m exclusion buffer around forests should be implemented to shield against adverse impacts. However, avoidance of the Degraded Forest Habitat is unlikely a feasible option as there are no other alternate areas for infrastructure to be placed. In instances where avoidance of such areas is not possible, permits from the DFFE must be applied for (i.e., clearance of natural forests - clearing of trees in natural forests [Section 7(1) of the NFA]). In such instances, it is recommended that the proponent liaise with the relevant authorities and discuss the need for potential biodiversity offsets.

Concluding Remarks:

It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

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Part A: Background Information

Prepared for:	SRK Consulting Pty (Ltd).
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DOCUMENT GUIDE

The table below provides a guide to the reporting of biodiversity impacts as they relate to 1) Government Notice No. 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Biodiversity** as published in Government Gazette 43110 dated 20 March 2020, and 2) Government Notice No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Plant and Animal Species** as published in Government Gazette 43855 dated 30 October 2020.

Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
No.	**SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS**	**Section in report/Notes**
2	**Terrestrial Biodiversity Specialist Assessment**	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	**Part A – C:** Cover Page **Part A:** Appendix E
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	**Part A**: Section 1
2.3	**The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:**	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	**Part B**: Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	**Part B**: Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	**Part A:** Section 3 (desktop analysis) **Part B**: Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Area (FEPA) sub catchments;	**Part A:** Section 3 (desktop analysis) **Part B:** Section 3.2 – 3.4 (flora) **Part C:** Section 3.2 – 3.7 (fauna) **For descriptions on the presence of FEPAs, please refer to the Freshwater Assessment (SAS 22-1058, 2022)*
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	**Part A**: Section 3 (desktop analysis) **Part B**: Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Not Applicable.
2.3.7	**The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:**	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: *a) the reasons why an area has been identified as a CBA;*	**Part A**: Section 3 (desktop analysis)

	b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation; *c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);* *d) the impact on ecosystem threat status;* *e) the impact on explicit subtypes in the vegetation;* *f) the impact on overall species and ecosystem diversity of the site; and* g) *the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	**Part B**: Section 3.1, 3.3, 5.3.3 **Part C:** Section 3
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: *a) the impact on the ecological processes that operate within or across the site;* *b) the extent the proposed development will impact on the functionality of the ESA; and* c) *loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- *a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	**Part A**: Section 3 (desktop analysis)
2.3.7.4	Priority areas for protected area expansion, including- *a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;*	**Part A**: Section 3 (desktop analysis)
2.3.7.5	SWSAs including: *a) the impact(s) on the terrestrial habitat of a SWSA; and* b) *the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);*	Not Applicable. No SWWAs were associated with the study area.
2.3.7.6	FEPA sub catchments, including- *a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;*	**For descriptions on the presence of FEPAs, please refer to the Freshwater Biodiversity Assessment (SAS 22-1058, 2022)*
2.3.7.7	Indigenous forests, including: *a) impact on the ecological integrity of the forest; and* b) *percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.*	**Part B**: Section 5
2.4	**The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.**	
	Part B: Results of the **Floral Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities. **Part C:** Results of the **Faunal Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities.	
3	**Terrestrial Biodiversity Specialist Assessment Report**	
3.1	**The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:**	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	**Part A:** Appendix E
3.1.2	A signed statement of independence by the specialist;	**Part A:** Appendix E
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	**Part B:** Section 1.3 (flora) **Part C:** Section 1.3 (fauna)
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	**Part A**: Appendix C **Part B:** Section 2 (flora) **Part B:** Appendix A (flora) **Part C:** Section 2 (fauna)

		Part C: Appendix A (fauna)
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	**Part B:** Section 1.3 (flora) **Part C:** Section 1.3 (fauna)
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	**Part B:** Section 4 (flora) **Part C:** Section 4 (fauna)
	Impact Assessment Requirements 3.1.7 Additional environmental impacts expected from the proposed development; 3.1.8 Any direct, indirect and cumulative impacts of the proposed development; 3.1.9 The degree to which impacts and risks can be mitigated; 3.1.10 The degree to which the impacts and risks can be reversed; 3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources; 3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	**Part B:** Section 5 (flora) **Part C:** Section 5 (fauna)
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	**Not Applicable to this report**
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	**Part A:** Executive summary **Part B:** Section 6 (flora) **Part C:** Section 6 (fauna)
3.1.15	Any conditions to which this statement is subjected.	**Part B:** Section 5.4 (flora) **Part C:** Section 5.4 (fauna)
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	This report is submitted to the EAP and applicant and will be appended to the EIA / EMP by the EAP in due course as part of the application process
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	

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GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson *et al*. (2011), Hui and Richardson (2017) and Wilson *et al*. (2017), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), and the associated Alien and Invasive Plant (AIP) Species Regulations, 2020].

Alien species (syn. exotic species; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Baseline (IEM Series)	Conditions that currently exist. Also called "existing conditions".
Baseline information (IEM Series)	Information derived from data that: • records the existing elements and trends in the environment; and • records the characteristics of a given project proposal.
Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006)	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act.
Critical Biodiversity Area (CBA)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Critically Endangered (CR) (IUCN[3] Red List category)	**Applied to both species/taxa and ecosystems**: A species is CR when the best available evidence indicates that it meets at least one of the five IUCN criteria for CR, indicating that the species is facing an extremely high risk of extinction. CR ecosystem types are at an extremely high risk of collapse. Most of the ecosystem type has been severely or moderately modified from its natural state. The ecosystem type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost. CR species are those considered to be at extremely high risk of extinction.
Development footprint (as per the NEMA definition)	"in respect of land, means any evidence of its physical transformation as a result of the undertaking of any activity"
Degradation	The many human-caused processes that drive the decline or loss in biodiversity, ecosystem functions or ecosystem services in any terrestrial and associated aquatic ecosystems.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Driver (ecological)	A driver is any natural or human-induced factor that directly or indirectly causes a change in ecosystem. A direct driver clearly influences ecosystem processes, where indirect driver influences ecosystem processes through altering one or more direct drivers.
Ecological Condition	"ecological condition" means the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a reference condition of "natural". Various terminology can be used for precision of language:

[3] International Union for Conservation of Nature (IUCN)

	➢ Fair ecological condition: Areas that are moderately modified, semi-natural. An ecological condition class in which ecological function is maintained even though composition and structure have been compromised. Can apply to a site or an ecosystem. ➢ Good ecological condition: Areas that are natural or near-natural. An ecological condition class in which composition, structure and function are still intact or largely intact. Can apply to a site or an ecosystem. ➢ Poor ecological condition: Areas that are severely or irreversibly modified. An ecological condition class in which ecological function has been compromised in addition to structure and composition. Can apply to a site or an ecosystem.
Ecological processes	The functions and processes that operate to maintain and generate biodiversity. In order to include ecological processes in a biodiversity plan, their spatial components need to be identified and mapped.
Ecological Support Area (ESA)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Ecoregion	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region."
Endangered (EN) (IUCN Red List category)	**Applied to both species/taxa and ecosystems**: A species is EN when the best available evidence indicates that it meets at least one of the five IUCN criteria for EN, indicating that the species is facing a very high risk of extinction. EN ecosystem types are at a very high risk of collapse. EN species are those considered to be at very high risk of extinction.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range.
Fatal flaw **(IEM Series)**	Any problem, issue or conflict (real or perceived) that could result in proposals being rejected or stopped.
Faunal Class	In biological classification, class (Latin: classis) is a taxonomic rank, as well as a taxonomic unit. Class specifically refers to major groups, namely: mammals, avifauna (birds), reptiles and invertebrates.
Ground-truth	Ground truth is a term used in various fields to refer to information provided by direct observation (i.e., empirical evidence) as opposed to information provided by inference.
Habitat **(As per the definition in NEMBA)**	A place where a species or ecological community naturally occurs.
Habitat loss	Conversion of natural habitat in an ecosystem to a land use or land cover class that results in irreversible change in the composition, structure and functional characteristics of the ecosystem concerned.
Impact **(IEM Series, draft Offset policy, and NEMA)**	The positive or negative effects on human well-being and/or on the environment. Impact-related terminology: ➢ Cumulative impact: Past, current and reasonably foreseeable future impacts of an activity, considered together with the impact of the proposed activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities. ➢ Impact Significant/significance: Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e., intensity, duration, and likelihood). Impact significance is the value placed on the change by different affected parties (i.e., level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e., biophysical, social and economic). Such judgement

	reflects the political reality of impact assessment in which significance is translated into public acceptability of impacts. ➢ Residual negative impacts: Negative impacts that remain after the proponent has made all reasonable and practicable changes to the location, siting, scale, layout, technology and design of the proposed development, in consultation with the environmental assessment practitioner and specialists (including a biodiversity specialist), in order to avoid and minimise negative impacts, and/or rehabilitate and/or restore impacted areas within 30 years (*It is acknowledged that the time it takes for full restoration differs from ecosystem type to ecosystem type, as well as the local conditions. Given that there is no readily accessible information on the recovery times of the different ecosystem types in South Africa, a general timeframe had to be used. The 30-year general timeframe in the definition of "residual impact" reflects that the difficulty in restoring South African ecosystems once they have been disturbed. It is based on the risk-averse and cautious approach.*). ➢ Significant impact: An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds, or targets.
Indigenous vegetation (As per the definition in NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed invasive species	All alien species that are regulated in South Africa under the NEMBA, Alien and Invasive Species Regulations, 2020.
Least Threatened	Least threatened ecosystems are still largely intact.
Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g., species are still native if they increase their range as a result of watered gardens but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
Near Threatened (according to IUCN)	Close to being at high risk of extinction in the near future.
Red Data Listed (RDL) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Species of Conservation Concern (SCC)	The term SCC in the context of this report refers to all RDL and IUCN listed threatened species as well as provincially and nationally protected species of relevance to the project.
Threatened ecosystem	An ecosystem that has been classified as CR, EN or VU, based on an analysis of ecosystem threat status. A threatened ecosystem has lost or is losing vital aspects of its structure, function, or composition. The NEMBA allows the Minister of Environmental Affairs or a provincial MEC for Environmental Affairs to publish a list of threatened ecosystems. To date, threatened ecosystems have been listed only in the terrestrial environment. In cases where no list has yet been published by the Minister, such as for all aquatic ecosystems, the ecosystem threat status

	assessment in the National Biodiversity Assessment (NBA) can be used as an interim list in planning and decision making.
Threatened species	A species that has been classified as CR, EN or VU, based on a conservation assessment (Red List), using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.
Vulnerable (VU) (Red List category)	**Applied to both species/taxa and ecosystems**: A species is VU when the best available evidence indicates that it meets at least one of the five IUCN criteria for VU, indicating that the species is facing a high risk of extinction. An ecosystem type is VU when the best available evidence indicates that it meets any of the criteria A to E for VU and is then considered to be at a high risk of collapse.

LIST OF ACRONYMS

AIP	Alien and Invasive Plants
BGIS	Biodiversity Geographic Information Systems
BotSoc	Botanical Society of South Africa
CARA	Conservation of Agricultural Resources Act, 1983 [Act No. 43 of 1983]
CBA	Critical Biodiversity Area
CR	Critically Endangered
DFFE	Department of Forestry, Fisheries, and the Environment
E-GIS	Environmental Geographical Information Systems
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
EW	Extinct in the Wild
FEPA	Freshwater Ecosystem Priority Area
GIS	Geographic Information System
GN	Government Notice
Ha	Hectare
IBA	Important Bird and Biodiversity Areas
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
ktpa	Kilo-Tonnes Per Annum
KZNNCMAA	The KwaZulu-Natal Nature Conservation Management Amendment Act, 1999 (Act No. 5 of 1999)
KZNSCP	KwaZulu-Natal Systematic Conservation Plan
LC	Least Concern
masl	Meters Above Sea Level
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, 1998 [Act No. 107 of 1998]
NEMBA	National Environmental Management: Biodiversity Act, 2004 [Act No. 10 of 2004]
NEMPAA	The National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
NFA	National Forest Act, 1998 [Act No. 84 of 1998, as amended]
NPAES	National Protected Areas Expansion Strategy
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RBIDZ	Richards Bay Industrial Development Zone
SABAP 2	South African Bird Atlas Project 2
SACAD	South African Conservation Areas Database, Quarter 2
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SAPAD	South African Protected Areas Database, Quarter 2
STS	Scientific Terrestrial Services
SWSA	Strategic Water Source Area
TiO_2	Titanium Dioxide
tpa	Tons per Annum
VEGMAP	National Vegetation Map Project
VU	Vulnerable
WSAs	Water Source Areas

1 INTRODUCTION

Scientific Terrestrial Services (Pty) Ltd (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) to obtain an Environmental Authorisation (EA) for the proposed 80 Kilo-Tonnes Per Annum (ktpa) titanium dioxide (TiO_2) Plant project in the Richard's Bay Industrial Development Zone (RBIDZ), Richard's Bay, Kwazulu-Natal Province. The proposed footprint associated with the development will henceforth be referred to as the "study area". The location and extent associated with the study area is depicted in Figures 1 and 2. Refer to Section 1.1 for a more detailed project description.

The study area is located immediately west of Richard's Bay Central, which is located within the uMhlathuze Local Municipality, an administrative area of the King Cetshwayo District Municipality. The study area is situated three km north of the R34 John Ross Highway and 0.5 km southwest of the R619 regional road.

The purpose of this report (Part A) is to define the biodiversity associated with the proposed development from a desktop conservation database perspective. It is the objective of this desktop assessment to provide detailed information to guide the fieldwork components (discussed in Parts B and C) to ensure that all relevant ecological aspects are considered prior to performing the field assessments. This report is not a standalone report and should be considered in consolidation with the outcome of the biodiversity assessments (floral assessment in Part B and the faunal assessment in Part C).

1.1 Project Background

The purpose of the RBIDZ is to develop an industrial estate to attract local and foreign investors who will create production capacity to beneficiate South Africa's raw materials prior to export and will thus create employment and improve the associated skills base. The RBIDZ is thus an integral part of the national Government's macroeconomic policy to develop South Africa's manufacturing sector by encouraging investment in the manufacturing industries, centred on beneficiation of the country's natural resources (RBIDZ SOC Ltd, 2014). The RBIDZ also aims to attract foreign direct investment and develop linkages between domestic and zone-based industries (RBIDZ SOC (2014)). By attracting advanced foreign production and technology methods, experience in global manufacturing and production networks will also be gained.

EA (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382)) was granted for Phase 1F of the proposed RBIDZ's development in September 2016. The extent of Phase 1F is illustrated in Figure 3. The Phase 1F development included the following infrastructure development:

- Water infrastructure;
- Sewer infrastructure;
- Stormwater infrastructure;
- Roads;
- Electrical services;
- Extension of the Alton South railway line to the RBIDZ Phase 1F; and
- Infill of Wetlands (to enable the development of the site for industrial purposes). All wetlands within the study area, except for the large Depression Wetland in the west (refer to Part B of the current report and the Freshwater Report: SAS 22-1058 (2022), will be infilled to allow for development as per the EA granted in 2016 (Ref 14/12/16/3/3/2/665). No development is proposed to take place within the large Depression Wetland in the west of the study area.

The next phase of the RBIDZ development (i.e., the focus of the current report), which is located within the same areas as the Phase 1F development, involves the development of an 80 ktpa TiO_2 Plant. The proposed project consists of the following infrastructure development (Figure 3 & 4):

- A Solar Plant, Water Extraction, and Bottling Plant;
- An 80 000 tons per annum (tpa) Rutile Pigment Plant which will produce 80 000 tpa pigment of the TiO_2 nature;
- Storage Areas for dangerous goods;
- Waste Management Area;
- Water Reservoir;
- Service roads;
- Service areas, including a pump station and an air-to-water plant (for on-site generators);
- Storm water culverts; and
- Parking areas.

Figure 1: Digital satellite image depicting the study area in relation to the surrounding area.

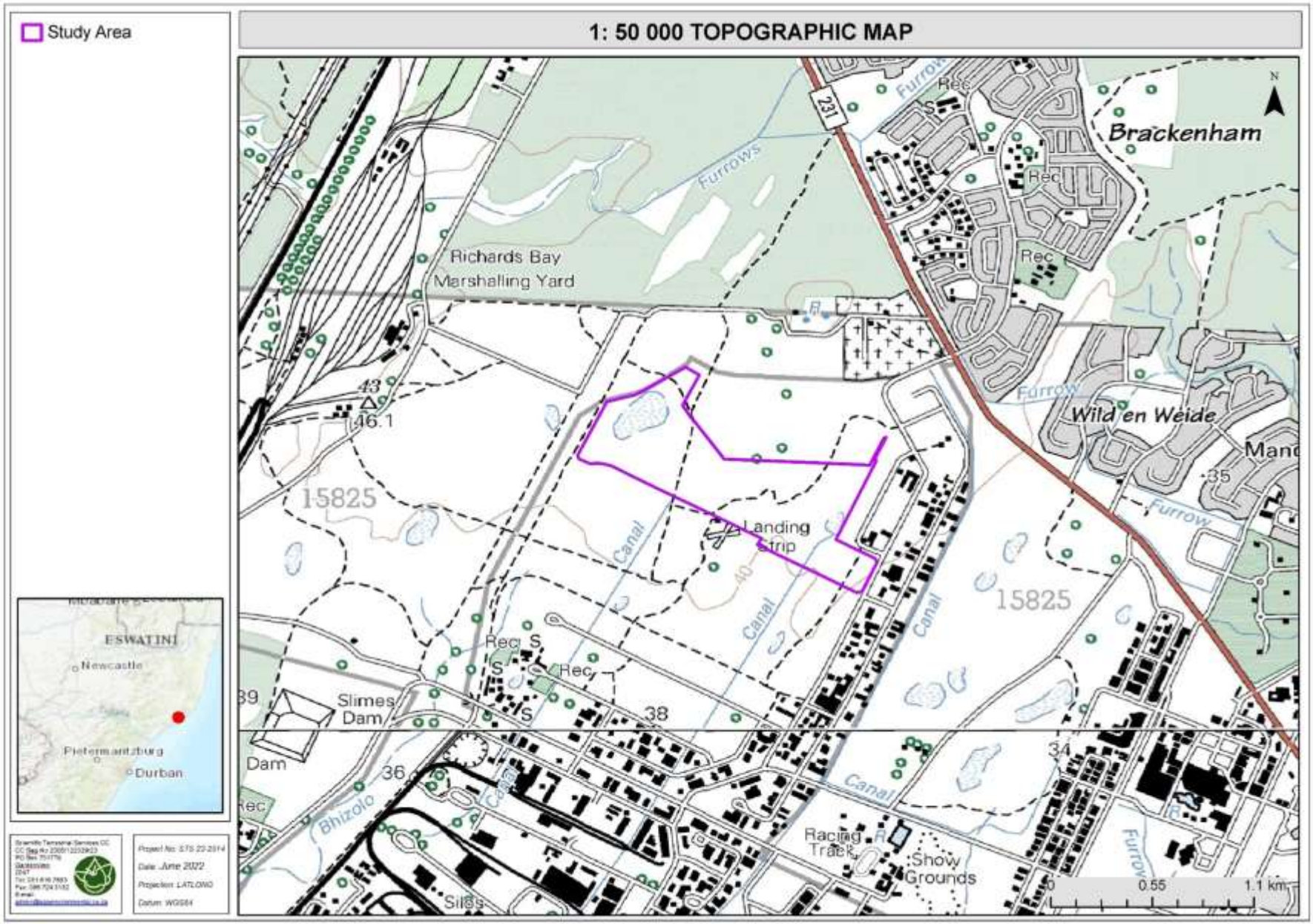

Figure 2: The study area depicted on a 1:50 000 topographical map in relation to the surrounding area.

Figure 3: The proposed development layout associated with the study area, as provided by the proponent. The approved Phase 1F development area is also illustrated.

Figure 4: Proposed conceptual development layout associated with the study area (layout provided by the proponent).

1.2 Scope of Work

Specific outcomes in terms of Part A of the report are as follows:

- To compile a desktop assessment with all relevant information as presented by South African National Biodiversity Institute's (SANBI's) Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org) and the Environmental Geographical Information Systems (E-GIS) website (https://egis.environment.gov.za/). The desktop assessment aims to gain background information on the physical habitat and potential floral and faunal ecology associated with the study area;
- To state the indemnity and terms of use of this report (Appendix A) as well as to provide the details of the specialists who prepared the reports (Appendix E);
- To outline the legislative requirements that were considered for the assessment (Appendix B of this report); and
- To provide the methodologies followed relating to the impact assessment and development of the mitigation measures (Appendix C) that were applied in the floral and faunal assessments (Part B and Part C).

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The biodiversity desktop assessment is confined to the study area and does not include detailed results of the surrounding areas or adjacent properties, although ecologically important or sensitive areas according to the desktop databases of the surrounding areas have been included on the relevant maps;
- It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the assessed area's actual site characteristics at the scale required to inform more intricate planning, e.g., at the scale needed for an EA. Nevertheless, this information is useful as background information to the study and is important in legislative contextualisation of risk and impact and was used as a guideline to inform the biodiversity assessment (refer also to Parts B and C), and to focus on areas and aspects of increased conservation importance. It must, however, be noted that site assessment of key areas may potentially contradict the information contained in the relevant databases, in which case the site verified, ground-truthed information must carry more weight in the decision-making process;
- The National Web-Based Environmental Screening Tool, hereafter referred to as the "Screening Tool", identified the potential presence of sensitive species within the study

area. As per the best practise guidelines as stipulated by the SANBI's protocol, the name of sensitive species may not appear in the public domain to protect the identity and potential location of such species; and

- The field assessment was undertaken during autumn (6 – 7 April 2022). The field assessment aimed to determine the ecological status of the habitat associated with the study area, and to "ground-truth" the results of the desktop assessment. Information from previous filed assessments associated with the study area (e.g., namely Nemai Consulting (2016) and Exigent Group (2019)) were also used as additional source material.

1.4 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996[4];
- The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
    - Government Notice (GN) number R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020 as it relates to the NEMBA;
    - GN number 1002: National List of Ecosystems that are Threatened and Need Protection dated 9 December 2011, as it relates to the NEMBA;
    - GN number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020;
- The National Forest Act, 1998 (Act No. 84 of 1998, amended) (NFA);
    - GN 1935: List of Protected Tree Species as published in the Government Gazette 46094 dated 25 March 2022, as it relates to the NFA;
- The National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEMPAA);
- Government Gazette 45421 dated 10 May 2019 as it relates to the Department of Forestry, Fisheries, and the Environment (DFFE)'s national environmental screening report required with an application for environmental authorisation as identified in regulation 16(1)(v) of EIA Regulations:

[4] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 1996". It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the Acts amending it are allocated act numbers.

- For the Terrestrial Biodiversity Theme: GN 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity as published in Government Gazette 43110 dated 20 March 2020; and
- For Animal and Plant Species Themes**:** GN 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant and Animal Species as published in Government Gazette 43855 dated 30 October 2020; and

➢ The KwaZulu-Natal Nature Conservation Management Amendment Act, 1999 (Act No. 5 of 1999) (KZNNCMAA).

The details of each of the above, as they pertain to this study, are provided in Appendix B of this report.

2 STRUCTURE OF THE BIODIVERSITY REPORT

Part A of this report served to introduce the study area, as well as the general approach to the study. Part A also presents the results of general desktop information reviewed as part of the study including the information generated by the relevant authorities as well as the context of the site in relation to the surrounding anthropogenic activities and ecological character.

Part B presents the results of the floral field assessment, data analyses and discussion of the results. Part B then presents the results of the impact assessment where the impacts on floral ecology and biodiversity are discussed.

Part C presents the results of the faunal field assessment, data analyses and discussion of the results. Part C then presents the results of the impact assessment where the impacts on faunal ecology and biodiversity are discussed.

3 ASSESSMENT APPROACH

Maps and digital satellite images were generated prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. The biodiversity desktop assessment is confined to the study area and does not include the neighbouring and adjacent properties, although the sensitivity of surrounding areas is included on the respective maps.

Relevant databases and documentation that were considered during the assessment of the study area include [5]:

- 2010 National Protected Area Expansion Strategy (NPAES) (Government of South Africa. 2010; DEA & SANBI, 2009), including the below listed vector datasets:
    - NPAES Focus Areas 2010: National Protected Areas Expansion Strategy: Focus areas for protected area expansion (South African National Parks (SanParks), 2010);
    - NPAES Formal: Polygons of formal protected national parks areas in South Africa (SANParks/SANBI, 2013); and
    - NPAES Protected Areas – Informal: Informal conservation areas in South Africa (SANParks/SANBI, 2012).
- The South African Conservation Areas Database, Quarter 4 (SACAD, 2021);
- The South African Protected Areas Database, Quarter 4 (SAPAD, 2021);
- The KwaZulu-Natal Systematic Conservation Plan (KZNSCP);
- The Kwazulu-Natal Critical Biodiversity Areas (CBAs) irreplaceable areas Database (2016);
- The National Vegetation Map Project (VEGMAP), with the below vector dataset used for information on Biomes, Bioregions and Vegetation Type(s):
    - 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a)
- The National List of Threatened Ecosystems 2011 (SANBI 2011; South Africa, 2011);
- From the National Biodiversity Assessment (NBA, 2018) Terrestrial Assessment project (Skowno et al, 2019):
    - 2018 Terrestrial ecosystem threat status and protection level - remaining extent (SANBI, 2018b); and
    - 2018 Terrestrial ecosystem threat status and protection level layer (SANBI, 2018c).
- The Important Bird and Biodiversity Areas (IBA) Programme and vector dataset (BirdLife South Africa, 2015; Marnewick et al, 2015a and 2015b), in conjunction with the South African Bird Atlas Project 2 (SABAP 2);
- The International Union for Conservation of Nature (IUCN);
- The Screening Tool (accessed 2022); and

[5] Datasets obtained from:

- SANBI BGIS (2019). The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: http://bgis.sanbi.org as retrieved in 2019; and
- Department of Environmental Affairs Environmental Geographical Information Systems (E-GIS) website. URL: https://egis.environment.gov.za/

- From the 2017 Strategic Water Source Areas (SWSA) project:
    - 2017 SWSA **Surface water** (Water Research Commission, 2017).

The field assessment took place during late autumn (6 - 7 April 2022) to “ground-truth” the results of the desktop assessment. Results of the field assessment are presented in Parts B and C.

4 RESULTS OF THE DESKTOP ANALYSIS

4.1 Conservation Characteristics of the study area based on National and Provincial Datasets

The following section contains data accessed as part of the desktop assessment and are presented as a “dashboard” report below (Table 1). The dashboard report aims to present concise summaries of the data on as few pages as possible to allow for improved assimilation of results by the reader to take place. Where required, further discussion and interpretation are provided.

Table 1: Summary of the biodiversity characteristics associated with the study area [Quarter Degree Squares (QDS) 2832CA.

Details of the area of interest in terms of Mucina & Rutherford (SANBI, 2018a)		
Bioregion (Figure 5)	Most of the study area is situated within the **Zonal & Intrazonal Forests Bioregion** and **Indian Ocean Coastal Belt Bioregion**.	
Biome (Figure 6)	A small section in the centre is in the **Forest Biome** and the **Indian Ocean Coastal Belt Biome**.	
Vegetation Type (Figure 7)	The study area is located within the **Maputaland Wooded Grassland** and the **Northern Coastal Forest** vegetation types.	
Description of the vegetation type associated with the study area (Mucina and Rutherford, 2006)		
Vegetation Type/s	**Maputaland Wooded Grassland**	**Northern Coastal Forest**
Climate	Weak rainfall seasonality near the coast tending toward summer rainfall towards the interior. Relatively high precipitation attaining annual values up to 1 200 mm in coastal localities, decreasing rapidly to the interior.	High water availability – including winter and summer rainfall areas with fairly constant temperatures.
Altitude (m)	20 – 120	10 - 150
MAP* (mm)	964	1044
MAT* (°C)	21	21
MFD* (Days)	0	-
MAPE* (mm)	1902	1853
MASMS* (%)	68	20
Distribution	KwaZulu-Natal Province and southern Mozambique	KwaZulu-Natal and (to a very small extent) Eastern Cape Province.
Conservation	**Endangered (EN).** Target 25%. About 17% statutorily conserved mainly in the Greater St Lucia Wetland Park. Some 46% transformed mostly for plantations and partly for cultivated land. The southern half of the area is not protected, and it is here that over 90% of the extent of the vegetation type has been transformed—mostly to pulpwood timber plantations, cane fields and informal settlements. Aliens include scattered populations of *Chromolaena odorata* and *Lantana camara*.	**Least threatened (LC)** in general, but still under threat on coastal dunes of KwaZulu-Natal (due to mining). Target 43%. About 68% statutorily conserved, mostly under Ezemvelo KZN Wildlife management. The original extent of these forests has been diminished by agriculture (mainly sugar cane and fruit gardens), timber plantations, urban sprawl, and tourism-oriented development on the KwaZulu-Natal coast. The current threats count (besides the ongoing coastal development pressures) also illegal clearing of the forest and turning it into lots for small-scale agriculture.
Geology and 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.	Well-developed sandy-loamy soils on sedimentary rocks of the Karoo Supergroup and Jurassic intrusive dolerites (in places) as well as on Holocene marine sediments. Forming stabilised sandy dune systems, mostly younger than 10 000 years and still in the process of sedimentation
Vegetation & landscape features (Appendix D).	Generally flat landscape of the Maputaland coastal plain supporting coastal sandy grasslands rich in geoxylic suffrutices[6], 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.	Species-rich, tall/medium height subtropical coastal forests occur on coastal (rolling) plains and stabilised coastal dunes.

[6] In South Africa, geoxylic suffrutices are considered 'underground trees' - i.e., a growth form that typically only attains a hundredth to a tenth the height of a normal tree.

Conservation details pertaining to the area of interest (various databases)	
NBA (2018) **- Figure 8**	Scattered sections throughout the study are located within the remaining extent of the **Maputaland Wooded Grassland** which is currently considered to be **Endangered (EN)** and is **Moderately Protected.** The study area is also located within the **Northern Coastal Forest (**which is of **LC** and **Weakly Protected)**, although according to the NBA 2018 database, the study area is not within the remaining extent thereof. The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa. Two headline indicators that are applied to both ecosystems and species are used in the NBA: **threat status** and **protection level**.: - **Ecosystem threat status** tells us about the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), based on the proportion of each ecosystem type that remains in good ecological condition relative to a series of thresholds. - **Ecosystem protection level** tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected, Poorly Protected, Moderately Protected or Well Protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the NEMPAA.
National Threatened Ecosystems (2011) - Figure 9	According to the National Threatened Ecosystem Database (2011), most of the study area is situated within a threatened ecosystem, namely the **Kwambonambi Hygrophilous[7] Grasslands Ecosystem (CR).** **Key biodiversity features include of the ecosystem include**: • one amphibian species, *Hyperolius pickersgilli*; • four millipede species including *Centrobolus fulgidus*, *Centrobolus richardi*, *Centrobolus rugulosus* and *Doratogonus zuluensis*; • one plant species, *Kniphofia leucocephala*; and • six vegetation types including KwaZulu-Natal Coastal Forest, KwaZulu-Natal Dune Forest, Mangrove Forest, Maputaland Wooded Grassland, Maputuland Coastal Belt and Swamp Forest. The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). **Note**: *The National List of Threatened Terrestrial Ecosystems published in terms of the NEMBA in 2011 remains in legal force. The data contained in NBA 2018 represents an update of the assessment of threat status for terrestrial ecosystems, but the National List of Threatened Terrestrial Ecosystems has not yet been revised.*

[7] Hygrophilous = growing in damp places.

SAPAD (2021, Q4)[8]; SACAD (2021, Q4) [9]; NPAES (2018) - Figure 10 & 11	According to the SAPAD (2021_Q4), the study area is located within a 10 km radius of two protected areas, namely: the **Enseleni Nature Reserve** (> 4 km) and the **Richards Bay Game Reserve** (> approx. 7 km). The NPAES (2018) database indicates that the study rea is located 10 km radius of two protected areas, namely: the **Enseleni Nature Reserve** (> 4 km) and the **Richards Bay Game Reserve** (> approx. 7 km). Although the two databases indicated the presence of the same reserves, the extent of the reserves differs slightly between the databases. However, no conservation areas, as identified by the SACAD (2021_Q4), were located within 10 km of the study area.
IBA (2015) - Figure 12	The study area is located within 10 km of an IBA (IBA, 2015), namely the Richards Bay Game Reserve IBA (> approx. 7 km). Regionally threatened species within the IBA include Pink-backed Pelican (*Pelecanus rufescens*), Caspian Tern (*Sterna caspia*), Mangrove Kingfisher (*Halcyon senegaloides*), Great White Pelican (*Pelecanus onocrotalus*) and Greater Flamingo (*Phoenicopterus roseus*).
Detail of the area of interest in terms of the KZNSCP: Terrestrial Systematic Conservation Plan – Figure 13	
CBA Irreplaceable	Sections of the study area are situated within an area which is classified as **CBA Irreplaceable.** CBA areas 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. CBA irreplaceable areas are identified as being Irreplaceable and often represent the only localities for which the conservation targets for one or more biodiversity features contained within can be achieved, i.e., there are no alternative sites available.
The Kwazulu-Natal Systematic Conservation Plan (KZNSCP) - Figure 14	
Vegetation Types	The KZNSCP database provides a localised indication of vegetation units identified on a provincial level (EKZNW, 2011). According to the KZNSCP database, the study area is located within the following vegetation types: 1) Freshwater Wetlands, namely Wetlands and Coastal Lakes and Pans, 2) KwaZulu-Natal Coastal Forests, namely Maputaland Moist Coastal Lowlands Forest, and 3) Maputaland Wooded Grassland. EKZNW (2011) classifies the Maputaland Wooded Grassland and the Maputaland Moist Coastal Lowland Forest as EN and the Subtropical Freshwater features as vulnerable (VU).
National Web-based Screening Tool (accessed 2022)	
The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. this assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below: ➢ **Very High:** Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km^2 are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under CR, EN, or VU criteria of the International Union for the Conservation of Nature (IUCN) or species listed as Critically/ Extremely Rare under South Africa's National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale. ➢ **High:** Recent occurrence records for all threatened (CR, EN, and VU) and/or rare endemic species are included in the high sensitivity level.	

[8] **SACAD (2021):** The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.

[9] **SAPAD (2021):** The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the "System of Protected Areas", which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

➢ **Medium:** Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. ➢ **Low:** Areas where no SCC are known or expected to occur.	
Terrestrial Biodiversity Theme	For the terrestrial biodiversity theme, the study area is considered to have a **Very High sensitivity**. The triggering features include: the presence of CBAs, National Forestry Inventory, Protected Area Expansion Strategy, and a threatened ecosystem, namely the Kwambonambi Hygrophilous Grasslands Ecosystem (CR).
Animal Species Theme	For the animal species theme, the study area is considered to have an overall **high sensitivity**. Species identified by the Screening Tool for the study area include: - **Aves:** *Circus ranivorous* (African marsh harrier (VU)), *Circaetus fasciolatus* (Southern banded snake eagle (NT)), *Geokichla guttata* (Spotted ground thrush (VU)), *Neppapus auratus* (African pygmy goose (LC)), *Tetrathopius ecaudatus* (Bateleur (EN)), and *Halcyon senegaloides* (Mangrove kingfisher (LC)); - **Reptilia**: *Pelusios rhodesianus* (Variable hinged terrapin (LC), *Dendroaspis angusticeps* (Green mamba (VU)); - **Amphibia**: *Hyperolius pickersgilli* (Pickersgill's Reed Frog (EN)); - **Invertebrate**: *Arytropteris basalis* (Flat-necked shieldback (VU)), *Pomatonota dregii* (East coast katydid (VU)), Forest invertebrate (unknown); - **Insect**: *Teriomima zuluana* (Zulu buff (LC)); and - **Sensitive Species:** Sensitive species 1[10], Sensitive species 2, & Sensitive species 9.
Plant Species Theme	For the Plant Species Theme, the study area is considered to have an overall **medium sensitivity**. Species identified by the Screening Tool for the study area include Sensitive species 89, Sensitive species 1252, Sensitive species 649, Sensitive species 191, *Thesium polygaloides* (VU), *Freesia laxa* subsp. *azura* (VU), *Fimbrisylis aphylla* (VU), *Emplectanthus cordatus* (VU), *Pachycarpus concolor* subsp. *arenicola* (VU), *Senecio ngoyanus* (VU), *Cassipourea gummiflua* var. *verticillate* (VU), *Oxygonum dregeanum* subsp. *streyi* (EN), and *Pavonia dregei* (VU).
Strategic Water Source Areas (SWSA) - Figure 15	
Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage.	
Name and Criteria	The study area is located within 10 km of a SWSA, namely the Zululand Coast SWSA.

NBA = National Biodiversity Assessment; SAPAD = South African Protected Areas Database; SACAD = South African Conservation Areas Database; NPAES = National Protected Areas Expansion Strategy; IBA = Important Bird Area; MAP = Mean annual precipitation; MAT = Mean annual temperature; MAPE = Mean annual potential evaporation; MFD = Mean Frost Days; MASMS = Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply); CBA = Critical Biodiversity Areas.

[10] As per the best practice guidelines as stipulated by the South African National Biodiversity Institute protocol (SANBI), the name of sensitive species may not appear in the public domain as a means to protect the identity and potential location of such species.

Figure 5: Bioregions associated with the study area (Mucina & Rutherford, 2006).

Figure 6: Biomes associated with the study area (Mucina & Rutherford, 2006).

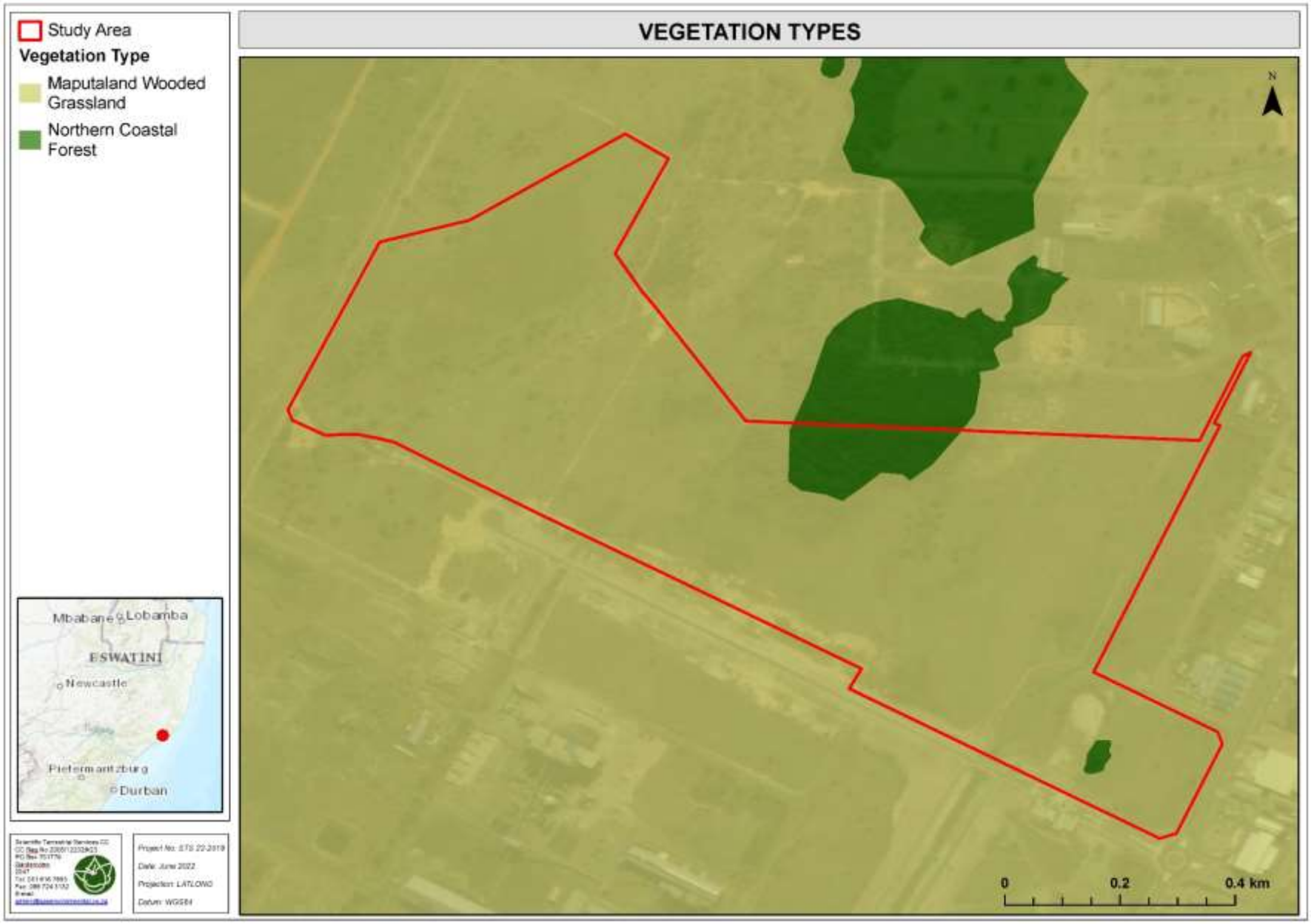

Figure 7: Vegetation types associated with the study area (Mucina & Rutherford, 2006).

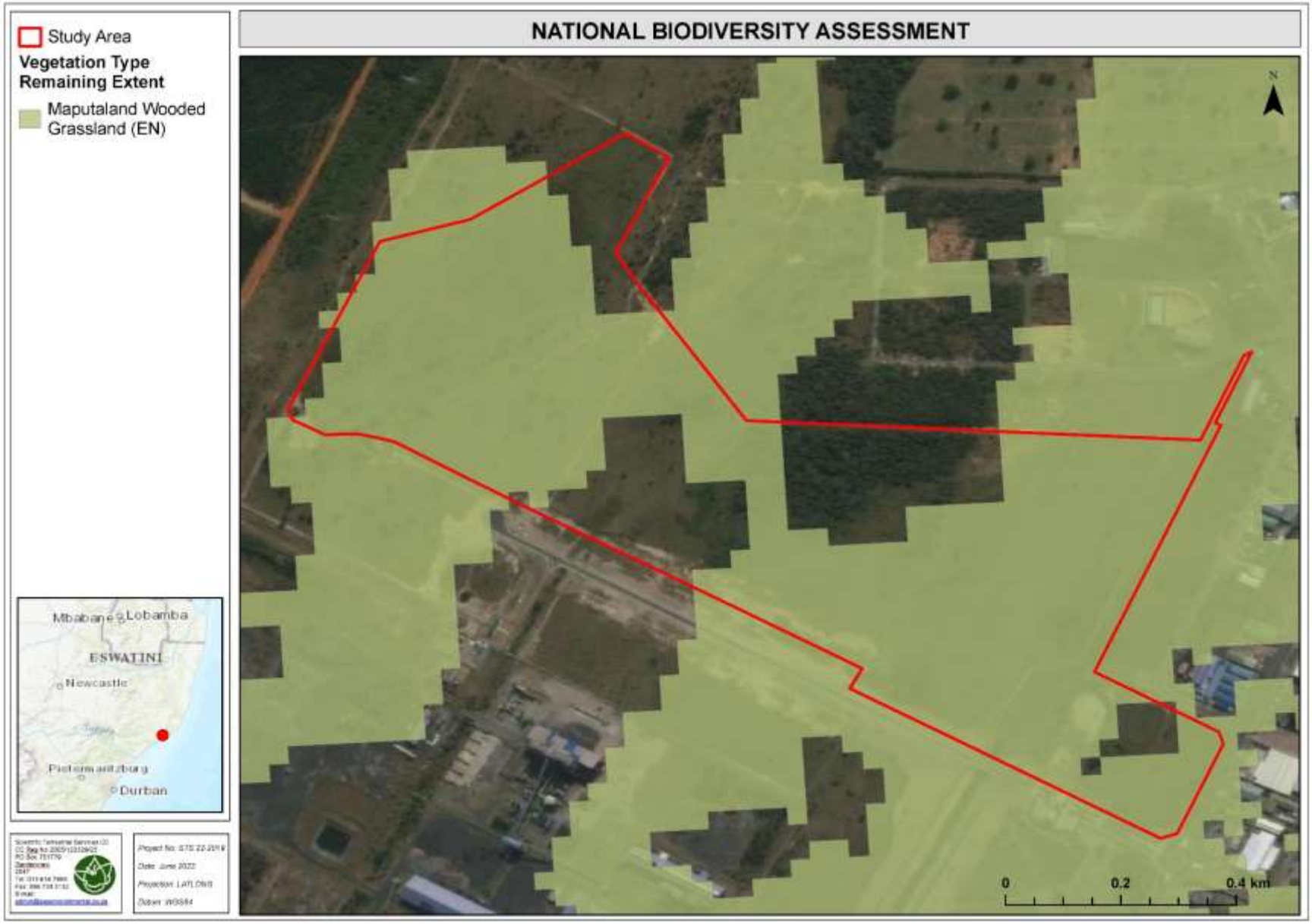

Figure 8: The remaining extent of the vegetation type associated with the study area according to the National Biodiversity Assessment (NBA, 2018).

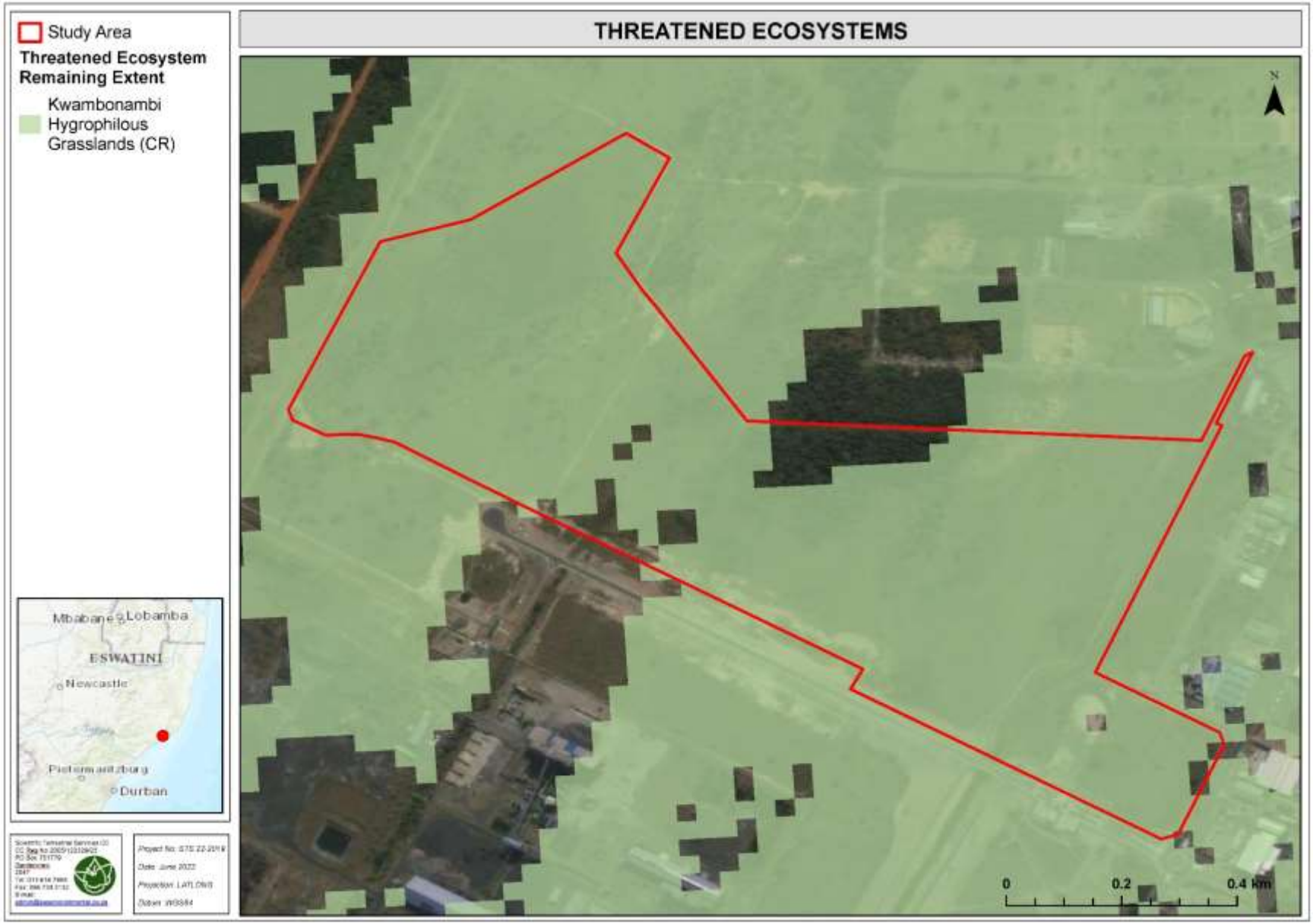

Figure 9: The remaining extent of the critically endangered threatened ecosystem database (2011) associated with the study area.

Figure 10: National protected and conservation areas as per SAPAD (Q3, 2021) associated with the study area.

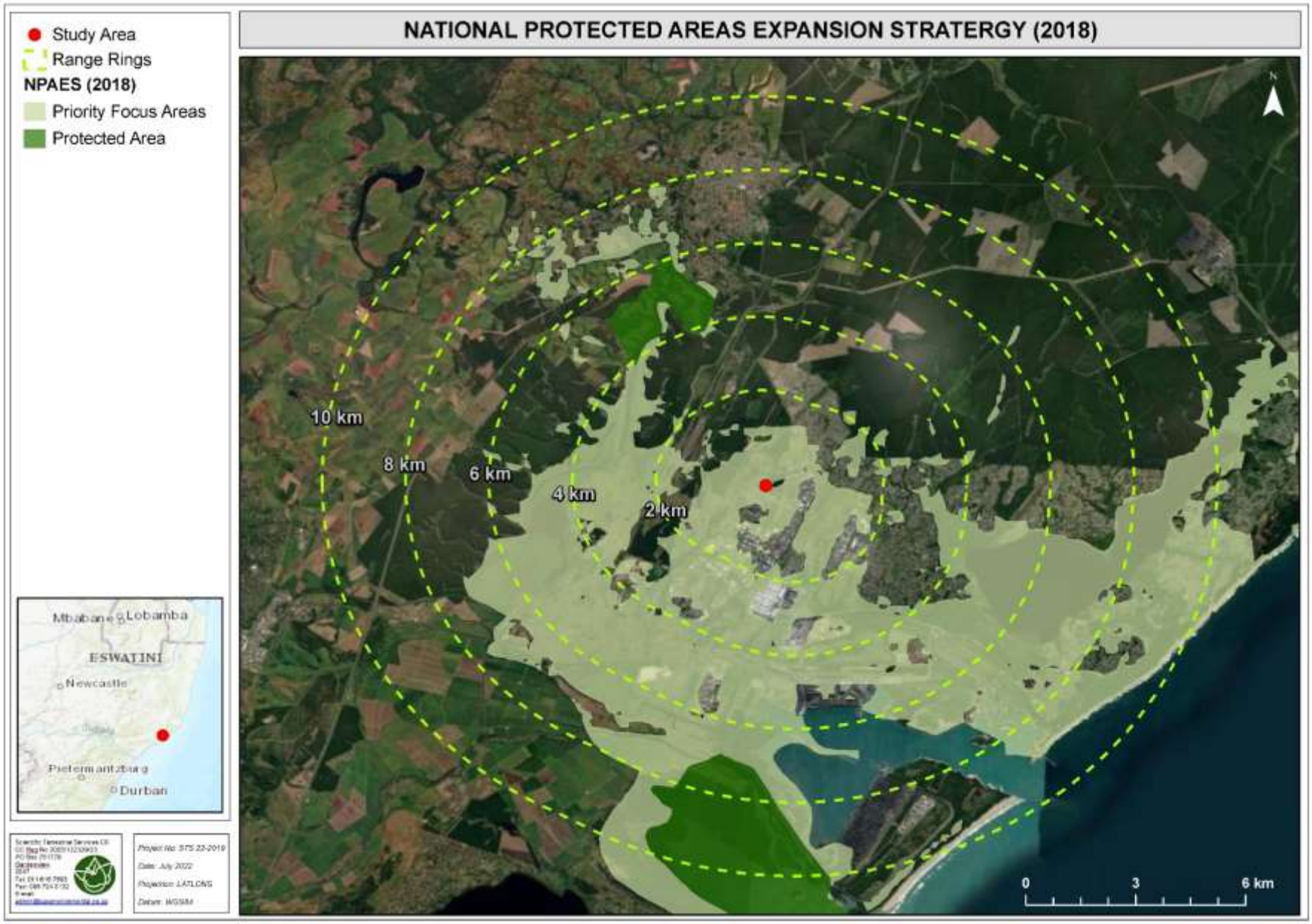

Figure 11: NPAES (2018): National Protected Areas and Expansion Strategy areas associated with the study area.

Figure 12: Important Bird & Biodiversity Areas (IBAs) associated with the study area.

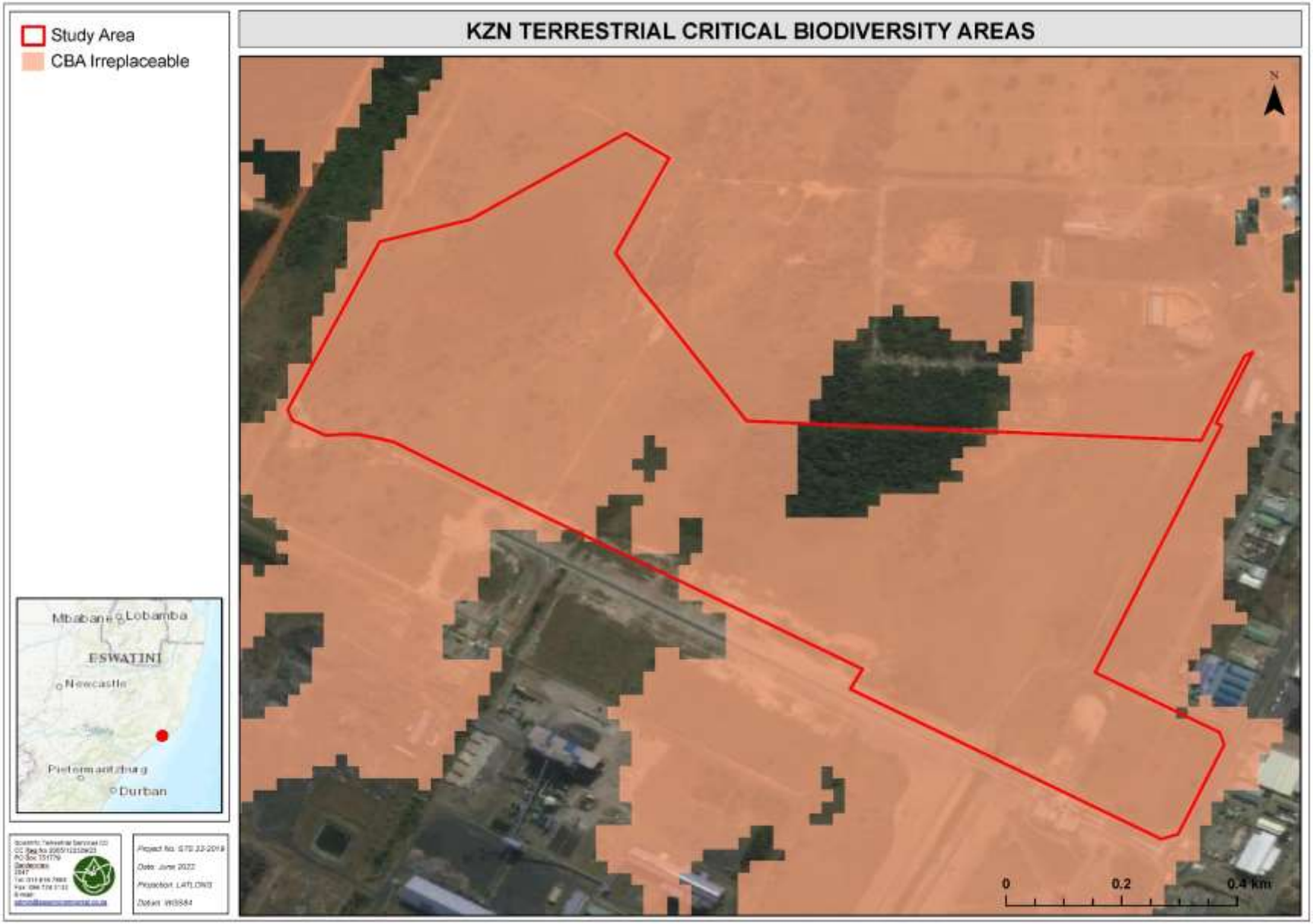

Figure 13: The study area in relation to the KwaZulu-Natal Terrestrial Critical Biodiversity Database.

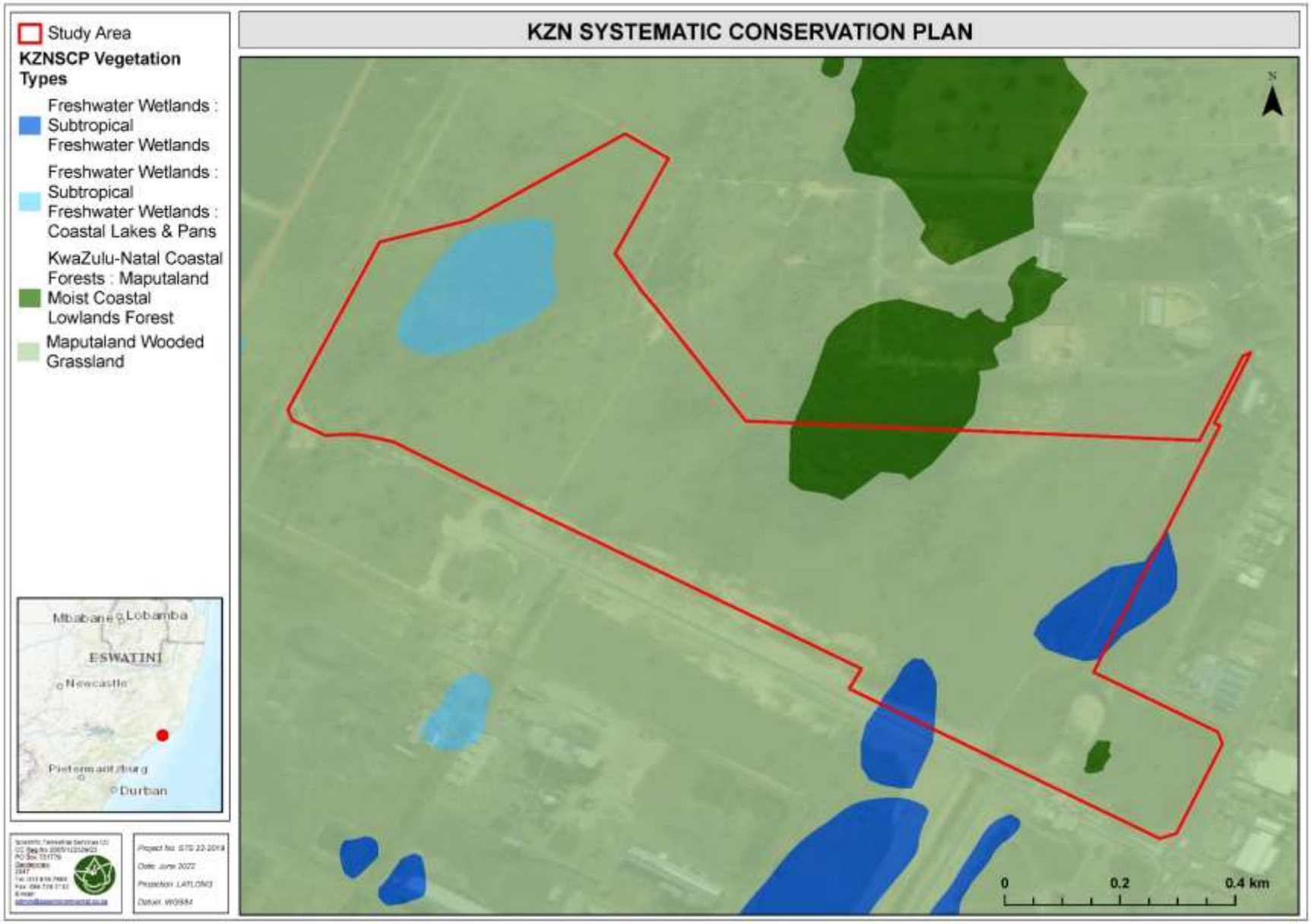

Figure 14: Vegetation types associated with the study area as per the KZN systematic conservation plan (KZNSCP).

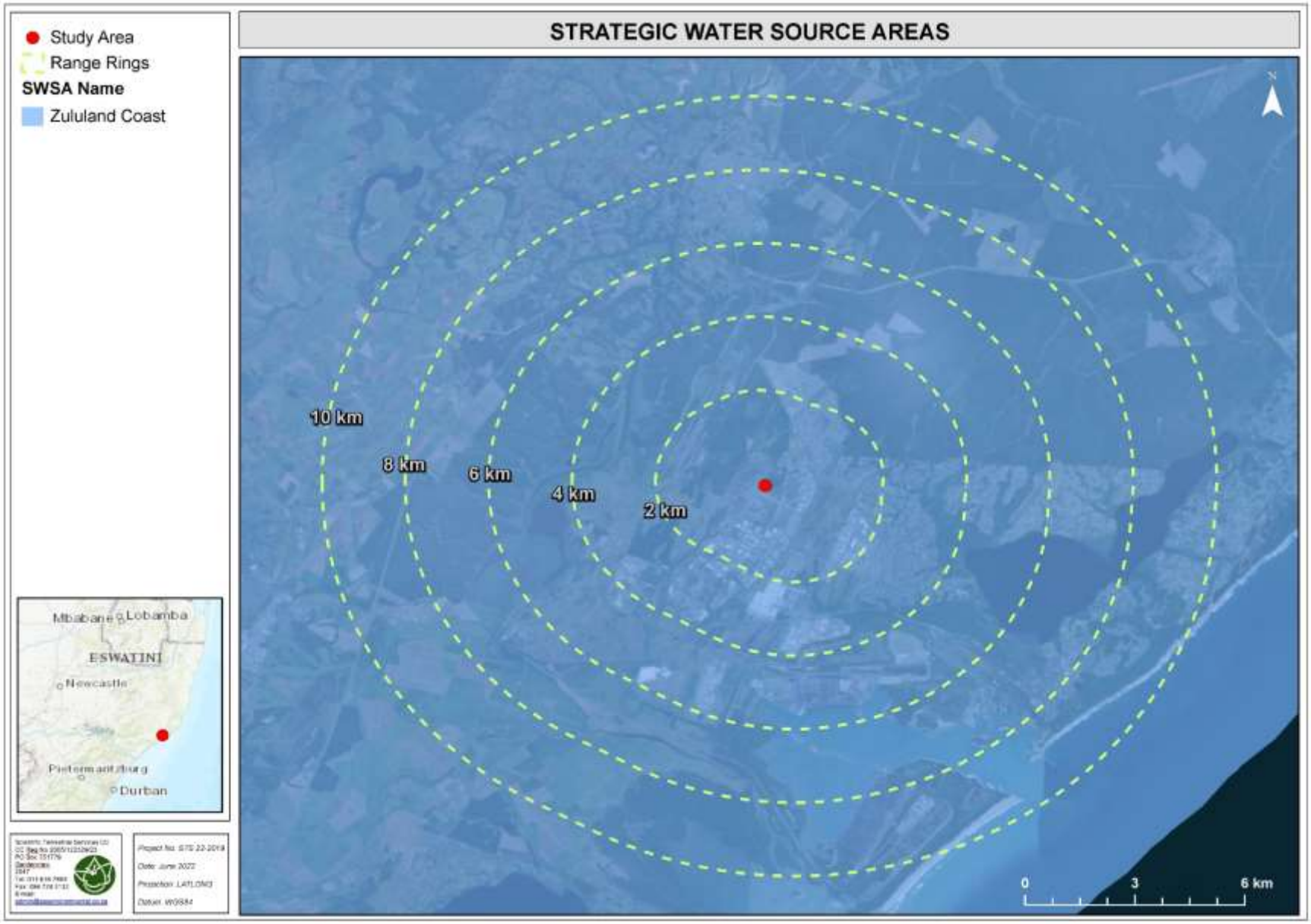

Figure 15: Strategic Water Source Areas associated with the study area.

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APPENDIX A: Indemnity and Terms of Use of this Report

The findings, results, observations, conclusions, and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and STS (Pty) Ltd and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if, and when, new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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APPENDIX B: Legislative Requirements

THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996

The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive realisation of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.

THE CONSERVATION OF AGRICULTURAL RESOURCES ACT, 1983 (ACT NO. 43 OF 1983) (CARA)

Removal of the alien and weed species encountered in the application area must take place to comply with existing legislation (amendments to the regulations under the CARA, 1983 and Section 28 of the NEMA, 1998). Removal of species should take place throughout the construction and operation, phases.

THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) (NEMA)

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations (GN R326 as amended in 2017 and well as listing notices 1, 2 and 3 (GN R327, R325 and R324 of 2017), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the Environmental Impact Assessment process depending on the nature of the activity and scale of the impact.

THE NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004) (NEMBA)

The objectives of this act are (within the framework of NEMA) to provide for:

- The management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity;
- The use of indigenous biological resources in a sustainable manner;
- The fair and equitable sharing among stakeholders of the benefits arising from bio prospecting involving indigenous biological resources;
- To give effect to ratify international agreements relating to biodiversity which are binding to the Republic;
- To provide for cooperative governance in biodiversity management and conservation; and
- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of the surrounding areas are not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of the benefits arising from indigenous biological resources.
Furthermore, a person may not carry out a restricted activity involving either:

a) A specimen of a listed threatened or protected species;
b) Specimens of an alien species; or
c) A specimen of a listed invasive species without a permit.

GOVERNMENT NOTICE NUMBER R. 1020: ALIEN AND INVASIVE SPECIES REGULATIONS, 2020 (IN GOVERNMENT GAZETTE 43735), INCLUDING GOVERNMENT NOTICE NUMBER 1003: ALIEN AND INVASIVE SPECIES LISTS, 2020 (IN GOVERNMENT GAZETTE 43726) AS IT RELATES TO THE NEMBA

NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of alien and invasive species. This act in terms of alien and invasive species aims to:

- Prevent the unauthorised introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur,
- Manage and control alien and invasive species, to prevent or minimise harm to the environment and biodiversity; and
- Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004) as:

(a) A species that is not an indigenous species; or
(b) An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

Categories according to NEMBA (Alien and Invasive Species Regulations, 2020):

- **Category 1a**: Invasive species that require compulsory control;
- **Category 1b**: Invasive species that require control by means of an invasive species management programme;
- **Category 2**: Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread; and
- **Category 3**: Ornamentally used plants that may no longer be planted.

NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT, 2003 (ACT NO. 57 OF 2003) AS AMENDED[11] (NEMPAA)

The objective of this act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological biodiversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; for the continued existence, governance and functions of South African National Parks; and for matters in connection thereof.

[11] Amendments to the NEMPAA:

- National Environmental Management: Protected Areas Amendment Act 31 of 2004 – Gazette No. 27274, No. 131. Commencement date: 1 November 2005 [Proc. No. R. 58, Gazette No, 28123]
- National Environment Laws Amendment Act 14 of 2009 – Gazette No.32267, No. 617. Commencement date: 18 September 2009 [Proc. 65, Gazette No. 32580]
- National Environmental Management: Protected Areas Amendment Act 15 of 2009 – Gazette No. 32660, No. 748. Commencement date: 23 October 2009 – except for sections 1 and 8 [Proc. No. 69, Gazette No. 32660]
- Schedule 2 amended by Government Notice R236 in Government Gazette 36295 dated 27 March 2013. Commencement date: 1 April 2013 of sections 1 and 8 (relating to Schedule 2) of the National Environmental Management Protected Areas Amendment Act, 15 of 2009 [Proc. No. 7, Gazette No. 36296]
- National Environmental Management: Protected Areas Amendment Act 21 of 2014 - Government Notice 445 in Government Gazette 37710 dated 2 September 2014. Commencement date: 2 September 2014.
- Schedule 2 amendment by General Notice 2 of 2016 in Government Gazette 39728 dated 25 February 2016. Commencement date: 25 February 2016.

THE NATIONAL FOREST ACT, 1998 (ACT NO. 10 OF 1998) (NFA)

According to the department of Department of Forestry, Fisheries, and the Environment (DFFE) (previously the Department of Agriculture, Forestry and Fisheries) ©2019 website (https://www.daff.gov.za/daffweb3/):
"In terms of the National Forests Act of 1998 certain tree species (types of trees) can be identified and declared as protected. The Department of Water Affairs and Forestry followed an objective, scientific and participative process to arrive at the new list of protected tree species, enacted in 2004. All trees occurring in natural forests are also protected in terms of the Act. Protective actions take place within the framework of the Act as well as national policy and guidelines. Trees are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilisation."

Applicable sections of the NFA pertaining to the proposed project include the below:
Section 12:
Declaration of trees as protected

1) The Minister may declare-
    a. particular tree,
    b. a particular group of trees,
    c. a particular woodland; or
    d. trees belonging to a particular species,
    to be a protected tree, group of trees, woodland, or species.
2) The Minister may make such a declaration only if he or she is of the opinion that the tree, group of trees, woodland or species is not already adequately protected in terms of other legislation.
3) In exercising a discretion in terms of this section, the Minister must consider the principles set out in section 3(3) of the NFA.

Section 15(1):
No person may cut, disturb, damage, or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence granted by the Minister or in terms of an exemption from the provisions of this subsection published by the Minister in the Gazette.

Contravention of this declaration is regarded as a first category offence that may result in a person who is found guilty of being sentenced to a fine or imprisonment for a period up to three years, or both a fine and imprisonment.

THE KWAZULU-NATAL NATURE CONSERVATION MANAGEMENT AMENDMENT ACT, 1997 (ACT NO. 9 OF 1997) (KZNNCMAA)

This act aims to:

- provide institutional structures for nature conservation is KwaZulu-Natal;
- establish control and monitoring bodies and mechanisms; and
- provide for matter incidental thereto.

The Act further provides a list of Specially Protected flora and fauna Species (Schedule 6) and Protected flora and fauna Species (Schedule 7) for the KwaZulu-Natal Province.

APPENDIX C: Impact Assessment Methodology

Impact Assessment as provided by SRK Consulting

The assessment of impacts was based on SRK's professional judgement, field observations and desk-top analysis and, where conducted, specialist studies. The significance of potential impacts that may result from the proposed project was determined to assist decision-makers (e.g., government authorities) but in some instances, the proponent). The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur.

The criteria used to determine impact consequence are presented in Table 1C:

Table C1: Criteria used to determine the Consequence of the Impact.

Rating	Definition of Rating	Score
A. Extent *– the area over which the impact will be experienced*		
Local	Confined to project or study area or part thereof (e.g., site)	1
Regional	The region, which may be defined in various ways, e.g., cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. Intensity *– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. Duration *– the timeframe over which the impact will be experienced and its reversibility*		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years	3

The combined score of these three criteria corresponds to a Consequence Rating in Table C2:

Table C2: Method used to determine the Consequence Score.

Combined Score (A+B+C)	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence is derived, the probability of the impact occurring is considered, using the probability classifications presented in Table C3:

Table C3: Probability Classification

Probability – the likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall significance of impacts is determined by considering consequence and probability using the rating system prescribed in Table C4:

Table C4: Impact significance ratings based on impact probability and consequence

		Consequence				
		Very High	**High**	**Medium**	**Low**	**Very Low**
Probability	**Definite**	Very High	High	Medium	Low	Very Low
	Probable	Very High	High	Medium	Low	Very Low
	Possible	High	Medium	Low	Very Low	Insignificant
	Improbable	High	Medium	Low	Very Low	Insignificant

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed in Table C5:

Table C5: Impact significance categories and definitions.

Impact significance	Definition
Very High	The proposed activity should only be approved under special circumstances.
High	The potential impact will affect the decision regarding the proposed activity/development.
Medium	The potential impact should influence the decision regarding the proposed activity/development.
Low	The potential impact may not have any meaningful influence on the decision regarding the proposed activity/development.
Very Low	The potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity/development.
Insignificant	The potential impact is negligible and will not have an influence on the decision regarding the proposed activity/development.

In the last step the impacts are considered in terms of their status (positive or negative impact). The prescribed system for considering impacts status is provided in Table C6:

Table C6: Status of Impact

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')

In the report, practical mitigation and optimisation measures are recommended and impacts were rated in the prescribed way both with and without the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- Essential: must be implemented and are non-negotiable.
- Optional: must be shown to have been considered and sound reasons provided by the proponent if not implemented.

Each potential impact is rated in terms of the following:

Reversibility: To assess the degree to which the potential impact can be managed and /or mitigated, each impact is assessed twice, as follows:

- Firstly, the potential impact is assessed and rated prior to implementing any mitigation and management measures.
- Secondly, the potential impact is assessed and rated after the proposed mitigation and management measures have been implemented.

The purpose of this dual rating of the impact is to enable comparison of the pre- and post- mitigation significance ratings and to calculate the percentage change, which indicates the degree to which the impact may be avoided, managed, mitigated and /or reversed.

Irreplaceable Loss: To assess the degree to which the potential impact could cause irreplaceable Loss of Resources (LoR), one of the following classes (%) is selected based on the specialist's informed decision:

5	100% - permanent loss
4	75% - 99% - significant loss
3	50% - 74% - moderate loss
2	25% - 49% - minor loss
1	0% - 24% - limited loss

The Loss of Resources aspect does not affect the overall significance rating of the impact.

The following format was provided for the impact assessment:

Impact:

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	#N/A	#N/A	#N/A	**#N/A** **#N/A**		**#N/A**		
Essential mitigation measures: . …. . …. . …. . …. . …. . ….								
With mitigation	#N/A	#N/A	#N/A	**#N/A** **#N/A**		**#N/A**		

Mitigation measure development

The following points presents the key concepts considered in the development of mitigation measures for the proposed construction:

- Mitigation and performance improvement measures and actions that address the risks and impacts[12] are identified and described in as much detail as possible. Mitigating measures are investigated according to the impact minimisation hierarchy as follows:
  - Avoidance or prevention of impact;
  - Minimisation of impact; and
  - Rehabilitation.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation, or compensation; and
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, wherever possible.

Recommendations

Recommendations were developed to address and mitigate impacts associated with the proposed projects. These recommendations also include general management measures which apply to the proposed projects as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the projects from planning, through to construction and operation.

[12] Mitigation measures should address both positive and negative impacts

APPENDIX D: Vegetation Type

Maputaland Wooded Grassland (CB 2)

Figure D1: Maputaland Wooded Grassland: Wooded grassland in Maputaland (northern KwaZulu-Natal) with prominent (silvery leaves) undescribed species of geoxylic suffrutex (*Ozoroa* sp. Nov.) as depicted in Mucina and Rutherford (2006) page 577. Photo taken my W.S. Mathews.

Table D1: Dominant & typical floristic species of the Maputaland Wooded Grassland (Mucina & Rutherford, 2006). Information taken from Mucina & Rutherford 2006, page 577.

WOODY LAYER	
Small Trees & Tall Shrubs	*Acridocarpus natalitius* var. *linearifolius*, *Dichrostachys cinerea* subsp. *nyassana*, *Diospyros lycioides* subsp. *sericea*, *Hyphaene coriacea*, *Terminalia sericea, Grewia microthyrsa*[S].
Low Shrubs	*Helichrysum kraussii* (d), *Agathisanthemum bojeri*, *Crotalaria monteiroi* var. *monteiroi*.
Geoxylic Suffrutices	*Parinari curatellifolia* (d), *Salacia kraussii* (d), *Ancylobotrys petersiana*, *Diospyros galpinii*, *Eugenia capensis*[#], *Syzygium cordatum*[#], *Eugenia albanensis*[C], *Gymnosporia markwardii*[M].
Woody Climbers	*Albertisia delagoensis*[S], *Cissampelos hirta*[S].
FORB LAYER	
Herbs	*Chamaecrista plumosa, Helichrysopsis* septentrionale[M], *Oxygonum robustum*[M], *Tricliceras mossambicense*[M].
Geophytic Herb	*Cyrtanthus galpinii*.
GRASS LAYER	
Graminoids	*Diheteropogon amplectens* (d), *Themeda triandra* (d), *Aristida stipitata* subsp. *raciliflora*, *Bewsia biflora*, *Cyperus obtusiflorus*, *C. tenax*, *Digitaria natalensis*, *Eustachya paspaloides*, *Setaria sphacelata*, *Sporobolus fimbriatus*, *S. subulatus*, *Urelytrum agropyroides, Abildgaardia hygrophila*[C], *Cyperus natalensis*[C].
Biogeographically Important Taxon (Bushmanland endemic)	
Geoxylic Suffrutices	*Ochna* sp. nov.,[#], *Syzygium cordatum*[#].
Succulent Herb	*Aloe* sp. nov.
Geophytic Herb	*Brachystelma vahrmeijeri*

*(d) = dominant, [#] = Suffrutex Form, [C] = Coastal Belt Element, [M] = Maputaland Endemic, [S] = Southern distribution limit.

Northern Coastal Forest (FZo7)

Figure D2: Northern Coastal Forest: Interior of a scrap forest with Strelitzia Nicolai in the Vernon Crookes Nature Reserve near Scottburgh (KwaZulu-Natal) as depicted in Mucina and Rutherford (2006) page 604. Photo taken my L. Mucina.

Table D2: Dominant & typical floristic species of the Northern Coastal Forest as described in Mucina & Rutherford (2006).

WOODY LAYER	
Tall Trees	*Albizia adianthifolia* (d), *Drypetes reticulata* (d), *Mimusops caffra* (d), *Psydrax obovata* subsp. *obovata* (d), *Sideroxylon inerme* (d), *Trichilia emetica*, *Vepris lanceolata*. Small Trees: *Brachylaena discolor* subsp. *discolor* (d), *Buxus natalensis* (d), *Cavacoa aurea* (d), *Englerophytum natalense* (d), *Erythroxylum emarginatum* (d), *Eugenia capensis* (d), *ymnosporia nemorosa* (d), *Kraussia floribunda* (d), *Peddiea africana* (d), *Rhus nebulosa* (d), *Strychnos henningsii* (d), *Acokanthera oblongifolia*, *Callichilia orientalis*, *Deinbollia oblongifolia*, *Dovyalis rhamnoides*, *Euclea natalensis*, *E. racemosa*, *Scutia myrtina*, *Strychnos decussata*, *Tapura fischeri*, *Teclea gerrardii*, *Turraea floribunda*, *Xylotheca kraussiana*.
Tall Shrubs	*Carissa bispinosa* subsp. *bispinosa*, *Hyperacanthus amoenus*, *Putterlickia verrucosa*.
Low Shrubs	*Chrysanthemoides monilifera* subsp. *rotundata, Isoglossa woodii* (d).
Woody Climbers	*Acacia kraussiana* (d), *Rhoicissus tomentosa* (d), *Dalbergia armata*, *Monanthotaxis caffra*, *Uvaria caffra*.
FORB LAYER	
Mega-herbs	*Dracaena aletriformis* (d), *Strelitzia nicolai* (d).
Herbs	*Achyranthes aspera* (d), *Asystasia gangetica* (d), *Laportea peduncularis* (d), M*icrosorum scolopendria* (d).
Herbaceous Climbers	*Gloriosa superba.*
GRASS LAYER	
Graminoids	*Cyperus albostriatus* (d), *Oplismenus hirtellus* (d).
Biogeographically Important Taxon (Bushmanland endemic)	
Trees	*Celtis gomphophylla*[S] (d), *Chrysophyllum viridifolium*[S] (d), *Diospyros inhacaensis*[S] (d), *Drypetes natalensis*[S] (d), *Cola natalensis*[S], *Inhambanella henriquesii*[S], *Manilkara concolor*[S], *Coffea racemosa*[S] (d), *Dovyalis longispina*[S] (d), *Artabotrys monteiroae*[S], *Encephalartos ferox*[M], *Erythrococca berberidea*[S], *Pancovia golungensis*[S]
Shrubs	*Haplocoelum foliolosum* subsp. *mombasense*[S], *Landolphia kirkii* [S].

(d) = dominant, [M] = Maputaland Endemic, [S] = Southern distribution limit.

APPENDIX E: Details, Expertise And Curriculum Vitae of Specialists

1. (a) (i) Details of the specialist who prepared the report

Samantha-Leigh Daniels	PhD Candidate Plant Science (University of Pretoria)
Daryl van der Merwe	MSc Conservation Biology (University of the Cape Town)
Christien Steyn	MSc Plant Science (University of Pretoria)
Christopher Hooton	BTech Nature Conservation (Tshwane University of Technology)
Nelanie Cloete	MSc Botany and Environmental Management (University of Johannesburg)
Stephan van Staden	MSc Environmental Management (University of Johannesburg)

1. (A). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Nelanie Cloete		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2047	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	Nelanie@sasenvgroup.co.za		
Qualifications	MSc Environmental Management (University of Johannesburg) MSc Botany (University of Johannesburg) BSc (Hons) Botany (University of Johannesburg) BSc (Botany and Zoology) (Rand Afrikaans University)		
Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP) Member of the South African Association of Botanists (SAAB) Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group Member of the Grassland Society of South Africa (GSSA)		

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	1401	Fax:	011 615 6240/ 086 724 3132
Telephone:	011 616 7893		
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Natural Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health Practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

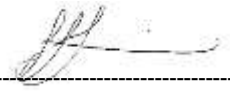
Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Christien Steyn		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	christien@sasenvgroup.co.za		
Qualifications	MSc Plant Science (University of Pretoria) BSc (Hons) Plant Science (University of Pretoria) BSc (Environmental Science) (University of Pretoria)		

Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP) Member of the South African Association of Botanists (SAAB) Member of the Botanical Society of South Africa (BotSoc)

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Samantha-Leigh Daniels, declare that -

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



Signature of the Specialist

I, Daryl van der Merwe, declare that -

- I act as the **independent specialist** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
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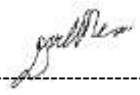
- All the particulars furnished by me in this form are true and correct.



Signature of the Specialist

I, Christien Steyn, declare that -

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

Signature of the Specialist

I, Christopher Hooton, declare that -

- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
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- All the particulars furnished by me in this form are true and correct.

Specialist Signature

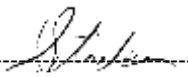
I, Nelanie Cloete, declare that -

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

Signature of the Specialist

I, Stephen van Staden, declare that -

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



Signature of the Specialist

SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF SAMANTHA-LEIGH DANIELS

PERSONAL DETAILS

Position in Company	Junior Floral Ecologist
Joined SAS Environmental Group of Companies	2020

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Association of Botanists (SAAB)
Member of the Botanical Society of South Africa (BotSoc)
Member of the Association for Tropical Biology and Conservation (ATBC)

EDUCATION

Qualifications

PhD (Plant Science) (University of Pretoria)	Present
MSc (Plant Science) (University of Pretoria)	2017
BSc (Hons) Zoology & Entomology (University of Pretoria)	2014
BSc Zoology & Entomology (University of Pretoria)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Free State

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Terrestrial Ecological and Biodiversity Scoping Assessments
- Terrestrial Ecological and Biodiversity Screening Assessments
- Floral Assessments
- Alien and Invasive Control Plan (AICP)
- Terrestrial Monitoring
- Desktop Studies, Mapping and Background Information Research

Training

- Plant species identification
- Herbarium usage and protocols

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Application for Environmental and Water Use Authorisations, Waste Management and Air Emission Licences for the proposed 80 000 tonne per annum (tpa) TiO_2 Plant in the Richard's Bay Industrial Development Zone, KwaZulu Natal

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	**SAS Environmental Group of Companies**			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	
Specialist name:	**CHRIS HOOTON (SAS)**			
Specialist Qualifications:	**BTech Nature Conservation (Tshwane University of Technology) National Diploma Nature Conservation (Tshwane University of Technology)**			
Professional affiliation/registration:				
Physical address:				
Postal address:	PO. Box 751779, Gardenview			
Postal code:	2047	Cell:	083 342 0639	
Telephone:	011 616 7893	Fax:	086 724 3132	
E-mail:	Chris@sasenvgroup.co.za			

2. DECLARATION BY THE SPECIALIST

I, CHRIS HOOTON , declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

SAS Environmental Group of Companies

Name of Company:

12 12 2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Chris Hooton, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

SAS Environmental Group of Companies

Name of Company

12-12-2022

Date

Signature of the Commissioner of Oaths

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE/C SHIFT
2022 -12- 12
BEDFORDVIEW
SOUTH AFRICAN POLICE SERVICE

2022/12/12

Date

KWAZULU-NATAL PROVINCE
ECONOMIC DEVELOPMENT, TOURISM AND ENVIRONMENTAL AFFAIRS
REPUBLIC OF SOUTH AFRICA

	(For official use only)
Provincial Reference Number:	
NEAS Reference Number:	KZN / EIA /
Waste Management Licence Number (if applicable):	
Date Received by Department:	

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

Submitted in terms of section 24(2) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) or for a waste management licence in terms of section 20(b) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).

KINDLY NOTE:

1. This form is current as of **May 2021**. It is the responsibility of the Applicant / Environmental Assessment Practitioner ("EAP") to ascertain whether subsequent versions of the form have been released by the Department.

PROJECT TITLE

Application for Environmental and Water Use Authorisations, Waste Management and Air Emission Licences for the proposed 80 000 tonne per annum (tpa) TiO2 Plant in the Richard's Bay Industrial Development Zone, KwaZulu Natal

DISTRICT MUNICIPALITY

king Cetswayo District municipality

1. SPECIALIST INFORMATION

Specialist name:	CHRIS HOOTON		
Contact person:	CHRIS HOOTON		
Postal address:			
Postal code:		Cell:	
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	Chris@sasenvgroup.co.za		
Professional affiliation(s) (if any)			

Project Consultant / EAP:	Ndomupei Masawi

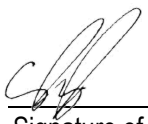
EAPASA Registered EAP number:	2020/401		
Contact person:	Ndomupei Masawi		
Postal address:	PostNet Suite #177, Private Bag X20009, Garsfontien		
Postal code:	0102	Cell:	
Telephone:	012 361 9821	Fax:	012 361 9912
E-mail:	nmasawi@srk.co.za		

2. DECLARATION BY THE SPECIALIST

I, CHRIS HOOTON are that --

General declaration:

- I act as the independent specialist in this application;
- do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist:

SAS Environmental Group of Companies

Name of company:

12 12 2022

Date:

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Application for Environmental and Water Use Authorisations, Waste Management and Air Emission Licences for the proposed 80 000 tonne per annum (tpa) TiO_2 Plant in the Richard's Bay Industrial Development Zone, KwaZulu Natal

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	**SAS Environmental Group of Companies**			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	
Specialist name:	**SAMANTHA-LEIGH DANIELS (SAS)**			
Specialist Qualifications:	**PhD Candidate Plant Science** **MSc (Plant Science)** **BSc (Hons) Zoology & Entomology** **BSc Zoology & Entomology**			
Professional affiliation/registration:	**Member of the South African Association of Botanists (SAAB)** **Member of the Botanical Society of South Africa (BotSoc)** **Member of the Association for Tropical Biology and Conservation (ATBC)**			
Physical address:	**29 Arterial Road West Oriel Bedfordview**			
Postal address:	**P.O. Box 751779 Gardenview**			
Postal code:	2047	Cell:	084 311 4878	
Telephone:	011 616 7893	Fax:	086 724 3132	
E-mail:	Samatha@sasenvgroup.co.za			

2. DECLARATION BY THE SPECIALIST

I, SAMANTHA-LEIGH DANIELS , declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

SAS Environmental Group of Companies
Name of Company:

12 12 2022
Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Samantha Daniels, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

SAS Environmental Group of Companies

Name of Company

2022/12/12

Date

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE/C SHIFT
2022 -12- 12
BEDFORDVIEW
SOUTH AFRICAN POLICE SERVICE

Signature of the Commissioner of Oaths

2022/12/12

Date

KWAZULU-NATAL PROVINCE
ECONOMIC DEVELOPMENT, TOURISM AND ENVIRONMENTAL AFFAIRS
REPUBLIC OF SOUTH AFRICA

	(For official use only)
Provincial Reference Number:	
NEAS Reference Number:	KZN / EIA /
Waste Management Licence Number (if applicable):	
Date Received by Department:	

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

Submitted in terms of section 24(2) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) or for a waste management licence in terms of section 20(b) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).

KINDLY NOTE:

1. This form is current as of **May 2021**. It is the responsibility of the Applicant / Environmental Assessment Practitioner ("EAP") to ascertain whether subsequent versions of the form have been released by the Department.

PROJECT TITLE

Application for Environmental and Water Use Authorisations, Waste Management and Air Emission Licences for the proposed 80 000 tonne per annum (tpa) TiO2 Plant in the Richard's Bay Industrial Development Zone, KwaZulu Natal

DISTRICT MUNICIPALITY

king Cetswayo District municipality

1. SPECIALIST INFORMATION

Specialist name:	SAMANTHA-LEIGH DANIELS		
Contact person:	SAMANTHA-LEIGH DANIELS		
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			
Professional affiliation(s) (if any)	Member of the South African Association of Botanists (SAAB) Member of the Botanical Society of South Africa (BotSoc) Member of the Association for Tropical Biology and Conservation (ATBC)		

Project Consultant / EAP:	Ndomupei Masawi

EAPASA Registered EAP number:	2020/401		
Contact person:	Ndomupei Masawi		
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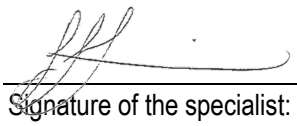
Postal code:	0102	Cell:	
Telephone:	012 619 821	Fax:	012 361 9912
E-mail:	nmasawi@srk.co.za		

2. DECLARATION BY THE SPECIALIST

I, SAMANTHA-LEIGH DANIELS are that --

General declaration:

- I act as the independent specialist in this application;
- do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist:

SAS Environmental Group of Companies

Name of company:

12 12 2022

Date:

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF DARYL VAN DER MERWE

PERSONAL DETAILS

Position in Company	Field Biologist
Joined SAS Environmental Group of Companies	2019

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Environmental Observation Network (SAEON)

EDUCATION

Qualifications

MSc (Conservation Biology) (University of Cape Town)	2019
BSc (Hons) Plant Science (Ecology) (University of Pretoria)	2014
BSc Environmental Science (University of Pretoria)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, Western Cape, Northern Cape

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Faunal assessments
- Invertebrate assessments
- Invertebrate monitoring
- Avifaunal Assessments
- Alien and Invasive Control Plan (AICP)
- Ecological Scans
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use License Applications/ General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of the EMPR and WUL conditions

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTIEN STEYN

PERSONAL DETAILS

Position in Company	Floral Ecologist
Joined SAS Environmental Group of Companies	2018

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 127823/21)
Member of the Botanical Society of South Africa (BotSoc)
Member of the Grassland Society of South Africa (GSSA)
Member of the Land Rehabilitation Society of Southern Africa (LARSSA)
Member of the South African Association of Botanists (SAAB)

EDUCATION

Qualifications

MSc Plant Science (University of Pretoria)	2017
BSc (Hons) Plant Science (Invasion Biology) (University of Pretoria)	2014
BSc Environmental Science (University of Pretoria)	2013

Short courses and Training

- BotSoc Branch: Environmental Impact Assessment (EIA) Course (2022).
- Advanced Grass Identification Course (2021).
- Practical Plant Identification, including Herbarium Usage and Protocols.
- Vegetation Classification and Mapping: Use of Geographic Information System for understanding vegetation pattern and biodiversity conservation.
- Introduction to Statistics for Biologists: Applications of plant ecology principles in plant conservation, i.e., species distribution modelling, alien plant invasions, conservation planning.
- International Plant Functional Trait Course: Hands-on, field-based exploration of plant functional traits, along with experience in the usage of plant traits data in climate-change research and ecosystem ecology. https://www.uib.no/en/rg/EECRG/97477/plant-functional-traits-course-2

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Free State

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Terrestrial Ecological and Biodiversity Scoping Assessments
- Terrestrial Ecological and Biodiversity Screening Assessments
- Floral Assessments
- Input into Terrestrial Rehabilitation Plan design with the focus on the re-establishment of vegetation
- Floral Rescue and Relocation Plans
- Alien and Invasive Plant Control and Management Plans (AIPCPs)
- Alien and Invasive Plant Identification and awareness training
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Desktop Studies, Mapping and Background Information Research

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTOPHER HOOTON

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Biodiversity Specialist
Joined SAS Environmental Group of Companies	2013

EDUCATION

Qualifications

BTech Nature Conservation (Tshwane University of Technology)	2013
National Diploma Nature Conservation (Tshwane University of Technology)	2008

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape, Free State
Africa - Zimbabwe, Sierra Leone

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Faunal Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF NELANIE CLOETE

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Botanical Science and Terrestrial Ecology
Joined SAS Environmental Group of Companies	2011

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 400503/14)
Member of the South African Association of Botanists (SAAB)
Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group
Member of the Grassland Society of South Africa (GSSA)
Member of the Botanical Society of South Africa (BotSoc)
Member of the Gauteng Wetland Forum (GWF)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2013
MSc Botany (University of Johannesburg)	2007
BSc (Hons) Botany (University of Johannesburg)	2005
BSc (Botany and Zoology) (Rand Afrikaans University)	2004

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Environmental and Legal Compliance Course	2021

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Eastern Cape, Free State
Africa - Democratic Republic of the Congo (DRC)

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Plant species and Landscape Plan

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource Discipline Lead, Managing Member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health Practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000

Short Courses

Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Tools for Wetland Assessment (Rhodes University)	2017
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2018
Wetland Management: Introduction and Delineation (WLID1502S) (University of the Free State)	2018
Hydropedology and Wetland Functioning (TerraSoil Science and Water Business Academy)	2018

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
Eastern Africa – Tanzania Mauritius
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
Central Africa – Democratic Republic of the Congo

DEVELOPMENT SECTORS OF EXPERIENCE

1. Mining: Coal, chrome, Platinum Group Metals (PGMs), mineral sands, gold, phosphate, river sand, clay, fluorspar
2. Linear developments (energy transmission, telecommunication, pipelines, roads)
3. Minerals beneficiation
4. Renewable energy (Hydro, wind and solar)
5. Commercial development
6. Residential development
7. Agriculture
8. Industrial/chemical

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Offset Plans
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Biodiversity Offset Plan

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Hydropedological Assessment

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments

SCIENTIFIC TERRESTRIAL SERVICES

Terrestrial Biodiversity Assessment

FOR THE PROPOSED 80ktpa TiO_2 PLANT PROJECT AT THE RICHARD'S BAY INDUSTRIAL DEVELOPMENT ZONE

Part B: Floral Assessment

Prepared for:	SRK Consulting Pty (Ltd).
Report authors:	S. L Daniels
Report reviewers:	C. Steyn (Pr.Sci.Nat) N. Cloete (Pr.Sci.Nat)
Report Reference:	STS 22-2014
Date:	August 2022

Part of the SAS Environmental Group of Companies

http://www.sasenvironmental.co.za

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LIST OF ACRONYMS

AIP	Alien and Invasive Plants
BGIS	Biodiversity Geographic Information Systems
BODATSA	Botanical Database of Southern Africa
CBA	Critical Biodiversity Area
CR	Critically Endangered
DFFE	Department of Forestry, Fisheries, and the Environment
E-GIS	Environmental Geographical Information Systems
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
EW	Extinct in the Wild
Ezemvelo Wildlife	Ezemvelo Kwa-Zulu Natal Wildlife (Provincial Authority)
GIS	Geographic Information System
GPS	Global Positioning System
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
ktpa	Kilo-Tonnes Per Annum
KZN	Kwazulu-Natal
KZNNCMAA	The KwaZulu-Natal Nature Conservation Management Amendment Act, 1999 (Act No. 5 of 1999)
KZNSCP	Kwazulu-Natal Systematic Conservation Plan
LC	Least Concern
NBA	National Biodiversity Assessment (2018)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004)
NFA	The National Forest Act, 1998 (Act No. 84 of 1998)
NL	Not Listed
NT	Near Threatened
P	Protected
PES	Present Ecological State
POC	Probability of Occurrence
POSA	Plants of southern Africa
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RBIDZ	Richard's Bay Industrial Development Zone
RDL	Red Data Listed
SAS	Scientific Aquatic Services (Pty) Ltd
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services (Pty) Ltd
TiO_2	Titanium Dioxide
TOPS	Threatened or Protected species (in terms of NEMBA)
tpa	Tons per Annum
VU	Vulnerable

GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson *et* al. (2011), Hui and Richardson (2017), Wilson *et* al. (2017) and Skowno et al. (2019), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), and the associated Alien and Invasive Species Regulations, 2020].

Alien species (syn. exotic species; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Baseline (IEM Series)	Conditions that currently exist. Also called "existing conditions".
Baseline information (IEM Series)	Information derived from data that: • records the existing elements and trends in the environment; and • records the characteristics of a given project proposal.
Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006)	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act.
Critical Biodiversity Area (CBA)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Critically Endangered (CR) (IUCN[1] Red List category)	**Applied to both species/taxa and ecosystems**: A species is CR when the best available evidence indicates that it meets at least one of the five IUCN criteria for CR, indicating that the species is facing an extremely high risk of extinction. CR ecosystem types are at an extremely high risk of collapse. Most of the ecosystem type has been severely or moderately modified from its natural state. The ecosystem type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost. CR species are those considered to be at extremely high risk of extinction.
Development footprint (as per the NEMA definition)	"in respect of land, means any evidence of its physical transformation as a result of the undertaking of any activity"
Degradation	The many human-caused processes that drive the decline or loss in biodiversity, ecosystem functions or ecosystem services in any terrestrial and associated aquatic ecosystems.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Driver (ecological)	A driver is any natural or human-induced factor that directly or indirectly causes a change in ecosystem. A direct driver clearly influences ecosystem processes, where indirect driver influences ecosystem processes through altering one or more direct drivers.
Ecological Condition	"ecological condition" means the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a reference condition of "natural".

[1] International Union for Conservation of Nature (IUCN)

	Various terminology can be used for precision of language: ➢ Fair ecological condition: Areas that are moderately modified, semi-natural. An ecological condition class in which ecological function is maintained even though composition and structure have been compromised. Can apply to a site or an ecosystem. ➢ Good ecological condition: Areas that are natural or near-natural. An ecological condition class in which composition, structure and function are still intact or largely intact. Can apply to a site or an ecosystem. ➢ Poor ecological condition: Areas that are severely or irreversibly modified. An ecological condition class in which ecological function has been compromised in addition to structure and composition. Can apply to a site or an ecosystem.
Ecological processes	The functions and processes that operate to maintain and generate biodiversity. In order to include ecological processes in a biodiversity plan, their spatial components need to be identified and mapped.
Ecological Support Area (ESA)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Ecoregion	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region."
Endangered (EN) (IUCN Red List category)	**Applied to both species/taxa and ecosystems**: A species is EN when the best available evidence indicates that it meets at least one of the five IUCN criteria for EN, indicating that the species is facing a very high risk of extinction. EN ecosystem types are at a very high risk of collapse. EN species are those considered to be at very high risk of extinction.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range.
Geoxylic suffrutices	So-called 'underground trees' or geoxylic suffrutices, comprise life forms with massive **underground** wooden structures. In southern African savannas, geoxylic suffrutices or 'underground trees' attain only a hundredth to a tenth the height of normal trees **above-ground**.
Ground-truth	Ground truth is a term used in various fields to refer to information provided by direct observation (i.e., empirical evidence) as opposed to information provided by inference.
Habitat **(As per the definition in NEMBA)**	A place where a species or ecological community naturally occurs.
Habitat loss	Conversion of natural habitat in an ecosystem to a land use or land cover class that results in irreversible change in the composition, structure and functional characteristics of the ecosystem concerned.
Impact **(IEM Series, draft Offset policy, and NEMA)**	The positive or negative effects on human well-being and/or on the environment. Impact-related terminology: ➢ Cumulative impact: Past, current and reasonably foreseeable future impacts of an activity, considered together with the impact of the proposed activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities. ➢ Impact Significant/significance: Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e., intensity, duration, and likelihood). Impact significance is the value placed on the change by different affected parties (i.e., level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e., biophysical, social and economic). Such judgement

	reflects the political reality of impact assessment in which significance is translated into public acceptability of impacts. ➢ Residual negative impacts: Negative impacts that remain after the proponent has made all reasonable and practicable changes to the location, siting, scale, layout, technology and design of the proposed development, in consultation with the environmental assessment practitioner and specialists (including a biodiversity specialist), in order to avoid and minimise negative impacts, and/or rehabilitate and/or restore impacted areas within 30 years (*It is acknowledged that the time it takes for full restoration differs from ecosystem type to ecosystem type, as well as the local conditions. Given that there is no readily accessible information on the recovery times of the different ecosystem types in South Africa, a general timeframe had to be used. The 30-year general timeframe in the definition of "residual impact" reflects that the difficulty in restoring South African ecosystems once they have been disturbed. It is based on the risk-averse and cautious approach.*). ➢ Significant impact: An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds, or targets.
Important Bird and Biodiversity Area (IBA)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Indigenous vegetation (As per the definition in NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed invasive species	All alien species that are regulated in South Africa under the NEMBA, Alien and Invasive Species Regulations, 2020.
Least Threatened	Least threatened ecosystems are still largely intact.
Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g., species are still native if they increase their range as a result of watered gardens but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
Near Threatened (according to IUCN)	Close to being at high risk of extinction in the near future.
Protected	Species of high conservation value or national importance that require protection, according to TOPS 2007 and NEMBA.
Red Data Listed (RDL) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Species of Conservation Concern (SCC)	The term SCC in the context of this report refers to all RDL and IUCN listed threatened species as well as provincially and nationally protected species of relevance to the project.
Threatened ecosystem	An ecosystem that has been classified as CR, EN or VU, based on an analysis of ecosystem threat status. A threatened ecosystem has lost or is losing vital aspects of its structure, function, or composition. The NEMBA allows the Minister of Environmental Affairs or a provincial MEC

	for Environmental Affairs to publish a list of threatened ecosystems. To date, threatened ecosystems have been listed only in the terrestrial environment. In cases where no list has yet been published by the Minister, such as for all aquatic ecosystems, the ecosystem threat status assessment in the National Biodiversity Assessment (NBA) can be used as an interim list in planning and decision making.
Threatened species	A species that has been classified as CR, EN or VU, based on a conservation assessment (Red List), using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.
Vulnerable (VU) (Red List category)	**Applied to both species/taxa and ecosystems**: A species is VU when the best available evidence indicates that it meets at least one of the five IUCN criteria for VU, indicating that the species is facing a high risk of extinction. An ecosystem type is VU when the best available evidence indicates that it meets any of the criteria A to E for VU and is then considered to be at a high risk of collapse.

1 INTRODUCTION

Scientific Terrestrial Services (Pty) Ltd (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) to obtain an Environmental Authorisation (EA) for the proposed 80 Kilo-Tonnes Per Annum (ktpa) titanium dioxide (TiO_2) Plant project the Richard's Bay Industrial Development Zone (RBIDZ), Richard's Bay, Kwazulu-Natal Province. The proposed footprint associated with the development will henceforth be referred to as the "study area" (Figure 1). Refer to Section 1.1 for a more detailed project description.

The study area is located immediately west of Richard's Bay Central, which is located within the uMhlathuze Local Municipality, an administrative area of the King Cetshwayo District Municipality. The study area is situated three km north of the R34 John Ross Highway and 0.5 km southwest of the R619 regional road.

The purpose of this report is to define the floral ecology of the study area, to identify areas of increased Ecological Importance and Sensitivity (EIS), as well as the mapping of such areas, and to describe the Present Ecological State (PES) of the study area. The primary objective of the floral assessment is not to compile an exhaustive species list but rather to ensure that sufficient data are collected to describe all the vegetation communities present in the area of interest, to optimise the detection of species of conservation concern (SCC) and to assess habitat suitability for other potentially occurring SCC (SANBI, 2020).

1.1 Project Background

The purpose of the RBIDZ is to develop an industrial estate to attract local and foreign investors who will create production capacity to beneficiate South Africa's raw materials prior to export and will thus create employment and improve the associated skills base. The RBIDZ is thus an integral part of the national Government's macroeconomic policy to develop South Africa's manufacturing sector by encouraging investment in the manufacturing industries, centred on beneficiation of the country's natural resources (RBIDZ SOC Ltd, 2014). The RBIDZ also aims to attract foreign direct investment and develop linkages between domestic and zone-based industries (RBIDZ SOC (2014)). By attracting advanced foreign production and technology methods, experience in global manufacturing and production networks will also be gained.

EA (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382) was granted for Phase 1F of the proposed RBIDZ's development in September 2016. The extent of the Phase 1F development

is illustrated in Figure 1. The Phase 1F development included the following infrastructure development:

- Water infrastructure;
- Sewer infrastructure;
- Stormwater infrastructure;
- Roads;
- Electrical services;
- Extension of the Alton South railway line to the RBIDZ Phase 1F; and
- Infill of Wetlands (to enable the development of the site for industrial purposes). All wetlands within the study area, except for the large Depression Wetland in the west (refer to Part B of the current report and the Freshwater Report: SAS 22-1058 (2022), will be infilled to allow for development as per the EA granted in 2016 (Ref 14/12/16/3/3/2/665). No development is proposed to take place within the large Depression Wetland in the west of the study area.

The next phase of the RBIDZ development, (i.e., the focus of the current report), which is located within the same areas as the Phase 1F development, involves the development of an 80 ktpa TiO_2 Plant. The proposed project consists of the following infrastructure development (Figure 1 & 2):

- A Solar Plant, Water Extraction, and Bottling Plant;
- An 80 000 tons per annum (tpa) Rutile Pigment Plant which will produce 80 000 tpa pigment of the TiO_2 nature;
- Storage Areas for dangerous goods;
- Waste Management Area;
- Water Reservoir;
- Service roads;
- Service areas, including a pump station and an air-to-water plant (for on-site generators).
- Storm water culverts; and
- Parking areas.

Figure 1: Proposed development layout associated with the study area. The approved Phase 1F development area is also illustrated.

Figure 2: Proposed conceptual development layout associated with the study area. Layout provided by the proponent.

1.2 Scope of Work

Specific outcomes in terms of the report are as follows:

- To determine and describe habitat types, communities and the ecological state of the study area and to rank each habitat type based on conservation importance and ecological sensitivity;
- To provide inventories of floral species as encountered within the study area;
- To identify and consider all sensitive landscapes such as indigenous forests, rocky ridges, wetlands and/ or any other special features such as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs);
- To conduct a Red Data Listed (RDL) floral species assessment as well as an assessment of other SCC, including the potential for such species to occur within the study area;
- To provide detailed information to guide the activities associated with the proposed development within the study area; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements, to allow regional and national biodiversity targets to be met, and the provision of ecological services in the local area is sustained.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The floral assessment was confined to the study area and does not include the neighbouring and adjacent properties. The study area and immediate surroundings were, however, included in the desktop analysis of which the results are presented in **Part A: Section 3**;
- The National Web-Based Environmental Screening Tool, hereafter referred to as the "Screening Tool", identified the potential presence of sensitive species within the study area. As per the best practise guidelines as stipulated by the South African National Biodiversity Institute's (SANBI's) protocol, the name of sensitive species may not appear in the public domain to protect the identity and potential location of such species;
- As EA (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382) was granted for Phase 1F of the project (including the infilling of the Seep Wetlands and the Wetland Flats (refer to Section 1.1 for further details)), no impacts pertaining to these wetland types are presented in this report. As the Depression Wetland in the west of the study area will not be infilled, this wetland will be subject to impacts (especially indirect impacts). As

such, only impacts pertaining to the Depression wetland are included in the current report (refer to Section 5); and

- The data presented in this report are based on one site visit, undertaken between 6 – 7 April 2022 (autumn). The KZN assessment guidelines require that assessments take place in summer (i.e., between early November and end of April). On-site data was augmented with all available desktop data and additional information (e.g., from previous assessments of the study area, namely Nemai Consulting (2016, assessment conducted in May 2013) and Exigent Group (2019, assessments conducted in July and September 2019)). Together with project experience in the area, the findings of this assessment are considered an accurate reflection of the floral ecological characteristics of the study area for the purposes of informed decision-making processes.

2 ASSESSMENT APPROACH

2.1 General Approach

The vegetation surveys are based on the subjective sampling method which is a technique where the specialist chooses specific sample sites within the area of interest, based on their professional experience in the area and background research done prior to the site visit. This allows representative recordings of floral communities and optimal detection of SCC (refer to the methodology description in **Appendix A**).

The below list includes the steps followed during the preparation for, and the conduction of, the field assessments:

- To guide the selection of appropriate sample sites, background data and digital satellite images were consulted before going to site, during which broad habitats, vegetation types and potentially sensitive sites were identified. The results of these analyses were then used to focus the fieldwork on specific areas of concern and to identify areas where targeted investigations were required (e.g., for SCC detection and within the study area);
- All relevant resources and datasets as presented by the SANBI's Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org) and the Environmental Geographical Information Systems (E-GIS) website (https://egis.environment.gov.za/), including the KZN Systematic Conservation Plan (KZNSCP), the KZN Spatial Planning database, and the Screening Tool, were consulted to gain background information on the physical habitat and potential floral diversity associated with the assessment areas;

- Based on the broad habitat units delineated before going to site and the pre-identified points of interest, which is updated based on on-site observations and access constraints, the selected sample areas were surveyed on foot, following subjective transects, to identify the occurrence of the dominant plant species and habitat diversities, but also to detect SCC which tend to be sparsely distributed; and
- Photographs were taken of each vegetation community that is representative of typical vegetation structure of that community, as well as photos of all detected SCC (except for sensitive species as identified by the Department of Forestry, Fisheries, and the Environment (DFFE)National Web-based Screening Tool).

Additional information on the method of assessment is provided in **Appendix A** of this report.

2.2 Definitions, descriptions, and taxon nomenclature

Scientific nomenclature for plant species in this report follows that of the SANBI's Red List of South African Plants Online, as it relates to the Botanical Database of Southern Africa (BODATSA). For alien species, the definitions of Richardson et al. (2011) are used. Vegetation structure is described as per Edwards (1983) (refer to Appendix A: Figure A1).

2.3 Sensitivity Mapping

All the ecological features of the assessment areas were considered, and sensitive areas were assessed and delineated using a Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto satellite imagery. The sensitivity map should assist the Environmental Assessment Practitioner (EAP) / proponent as to the suitability of the proposed development activities within the assessment area.

3 RESULTS OF FLORAL ASSESSMENT

3.1 Broad-scale vegetation characteristics

According to the updated 2018 Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a), the study area is located within the Maputaland Wooded Grassland (listed as endangered (EN) in both Mucina and Rutherford (2006) and in the 2018 Vegetation Map) and the Northern Coastal Forest vegetation types (listed as least concern (LC) in both Mucina and Rutherford (2006) and in the 2018 Vegetation Map). The Maputaland Wooded Grassland and the Northern Coastal Forest vegetation types thus form the reference states in which on-site vegetation characteristics are compared.

Mucina and Rutherford (2006) describe the Maputaland Wooded Grassland as follows: "generally flat landscape of the Maputaland coastal plain supporting coastal sandy grasslands rich in geoxylic suffrutices[2], 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."

Mucina and Rutherford (2006) describe the Northern Coastal Forest as "species-rich, tall/medium height subtropical coastal forests that occur on coastal (rolling) plains and stabilised coastal dunes. Herbaceous vines and woody climbers are important structural determinants in these forests".

The study area is also located within a threatened ecosystem, namely the critically endangered (CR) Kwambonambi Hygrophilous[3] Grasslands Ecosystem, as per to the National Threatened Ecosystem Database (2011).

The KZNSCP database provides a localised indication of vegetation units identified on a provincial level (EKZNW, 2011). According to the KZNSCP database, the study area is located within the following vegetation types: 1) Freshwater Wetlands, namely Wetlands and Coastal Lakes and Pans, 2) KZN Coastal Forests, namely Maputaland Moist Coastal Lowlands Forest, and 3) Maputaland Wooded Grassland. EKZNW (2011) classifies the Maputaland Wooded Grassland and the Maputaland Moist Coastal Lowland Forest as EN and the Subtropical Freshwater Wetlands as vulnerable (VU). Although these vegetation types have been identified on a provincial level, the vegetation types as identified by Mucina & Rutherford (2006) and the 2018 Vegetation Map will be used as reference vegetation types; whereas the provincial vegetation types were used to gain additional insight into the floral communities expected for these vegetation types. These provincial vegetation types compliment the national vegetation types, i.e., the freshwater systems correspond to the Maputaland Wooded Grassland (as per Mucina & Rutherford, 2006), the Maputaland Moist Coastal Lowlands Forest align with the Northern Coastal Forest (as per Mucina & Rutherford, 2006), and the Maputaland Wooded Grassland aligns with the Maputaland Wooded Grassland (as per Mucina & Rutherford, 2006).

[2] In South Africa, geoxylic suffrutices are considered 'underground trees' - i.e., a growth form that typically only attains a hundredth to a tenth the height of a normal tree.

[3] Hygrophilous = growing in damp places.

3.2 Ground-truthed vegetation characteristics

Overall, the habitat within the study area ranged from well-vegetated areas to transformed areas in which indigenous vegetation[4] was largely absent. The biodiversity of the study area can be defined under five broad habitat units as described below (Figure 3). These habitat units were distinguished based on species composition, vegetation structure, ecological function, physical nature of the environment, and habitat condition.

The five broad habitat units include:

1. **Degraded Hygrophilous Grassland**: This habitat unit is the largest habitat unit within the study area (approximately 32.2 ha) and supported a moderately low to moderate species richness;
2. **Degraded Coastal Forest**: This habitat was the second smallest of all the habitat units within the study area (approx. 3.4 ha) and supported a moderately high species richness;
3. **Thicket Habitat**: This habitat was the third largest of the habitat units (comprising approx. 8.2 ha) and supported a moderately low species richness;
4. **Freshwater Habitat**: The Freshwater Habitat was scattered throughout the study area (comprising of approx. 20.8 ha) and was associated with 1) natural watercourse[5] features (including a Depression Wetland[6] in the west, Wetland Flats[7] within the central areas, and Seep Wetlands[8] within the eastern sections of the study area), and 2) artificial freshwater features, including a man-made canal (hereafter earth canal) that runs through one of the Seep wetlands (SAS 22-1058, 2022). Species richness varied between the wetland types with some supporting a higher diversity than others**.** Although several wetland types were identified during the field assessment (i.e., Seep

[4] **The NEMA Listing Notice definition of indigenous vegetation**: "Indigenous vegetation: refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding 10 years.

[5] The National Water Act, 1998 (Act No. 36 of 1998) (NWA) define a watercourse as follows:

- A river or spring;
- A natural channel which water flows regularly or intermittently;
- A wetland, dam, or lake into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse;
- and a reference to a watercourse includes, where relevant, its bed and banks.

[6] A **Depression Wetland** is an inland aquatic ecosystem with closed or near closed elevation contours, which increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates. Dominant water sources are precipitation, groundwater discharge, interflow and (diffuse or concentrated) overflow (Ollis *et al*., 2013).

[7] **Wetlands flat** often appear as irregularly shaped wetland areas which are not linked to a stream. They are often level or near-level areas where waterlogging occurs and can be differentiated from depressions by their lack of defined margins (Ollis *et al*., 2013).

[8] **Seep Wetlands** are located on gently to steeply sloping land and dominated by the colluvial (gravity-driven), unidirectional movement of water and material down-slope. Water inputs are primarily via subsurface flows from an up-slope direction (Ollis *et al*. 2013).

Wetlands, Wetland Flats, and a Depression Wetland) and are discussed in the section below (Section 3.6), EA (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382) has already been granted for the infill of the Seep Wetlands and Wetland flats. As such, although these wetlands have yet to be infilled, they are only included in the habitat writeup. Given that EA has been granted for their infill, no sensitivity will be assigned to these wetlands and associated impacts will thus not be discussed (refer to Section 5); and

5. **Transformed Habitat**: The Transformed Habitat is the smallest habitat unit within the study area (approximately 1.7 ha) and was associated with the complete transformation of areas for road and/or infrastructure development. No habitat was available for plant species, and thus a lack of suitable habitat for SCC was also evident within this habitat (the area is mostly concreted and barren). The medium sensitivity for the plant species theme as assigned by the screening tool to the study area was not supported for the Transformed Habitat. Generally, vegetation communities were largely absent or represented by alien and invasive plant (AIP) species, although the abundance thereof was low. The Transformed Habitat did not provide any unique habitat or areas of important conservation significance. As such, the high sensitivity for the terrestrial biodiversity theme as assigned by the screening tool to the study area was not supported in areas in which the Transformed Habitat was located. Given the lack of importance of this habitat within the study area, this habitat unit will not be discussed in more detail within the habitat write-up below.

For a breakdown of the floral communities, habitat characteristics and conservation sensitivities associated with the above-mentioned habitat units, refer to Section 3.3 – 3.6 and Section 4. Figure 3 & 4 depicts the full extent and the zoomed extent of the study area and its associated Habitat Units.

It should be noted that although different extents (i.e., of the study area) were assessed in the previous assessments, similar vegetation habitats were identified by STS and Exigent Group (2019). Some variation, particularly pertaining to the Forest habitat, was noted between the STS and Exigent Group habitats and those identified by Nemai Consulting (2016).

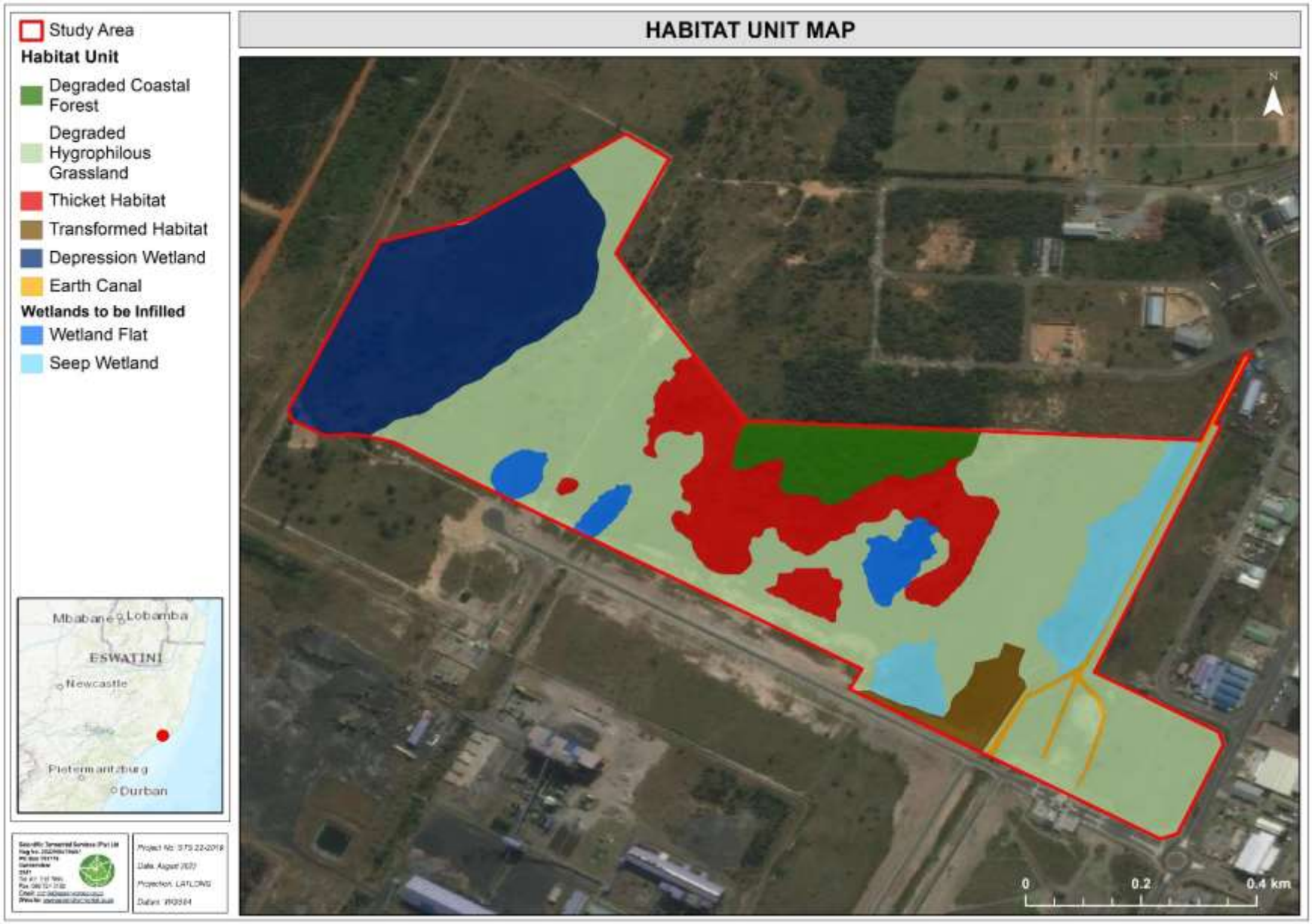


Figure 3: Conceptual illustration of the habitat units associated with the study area.

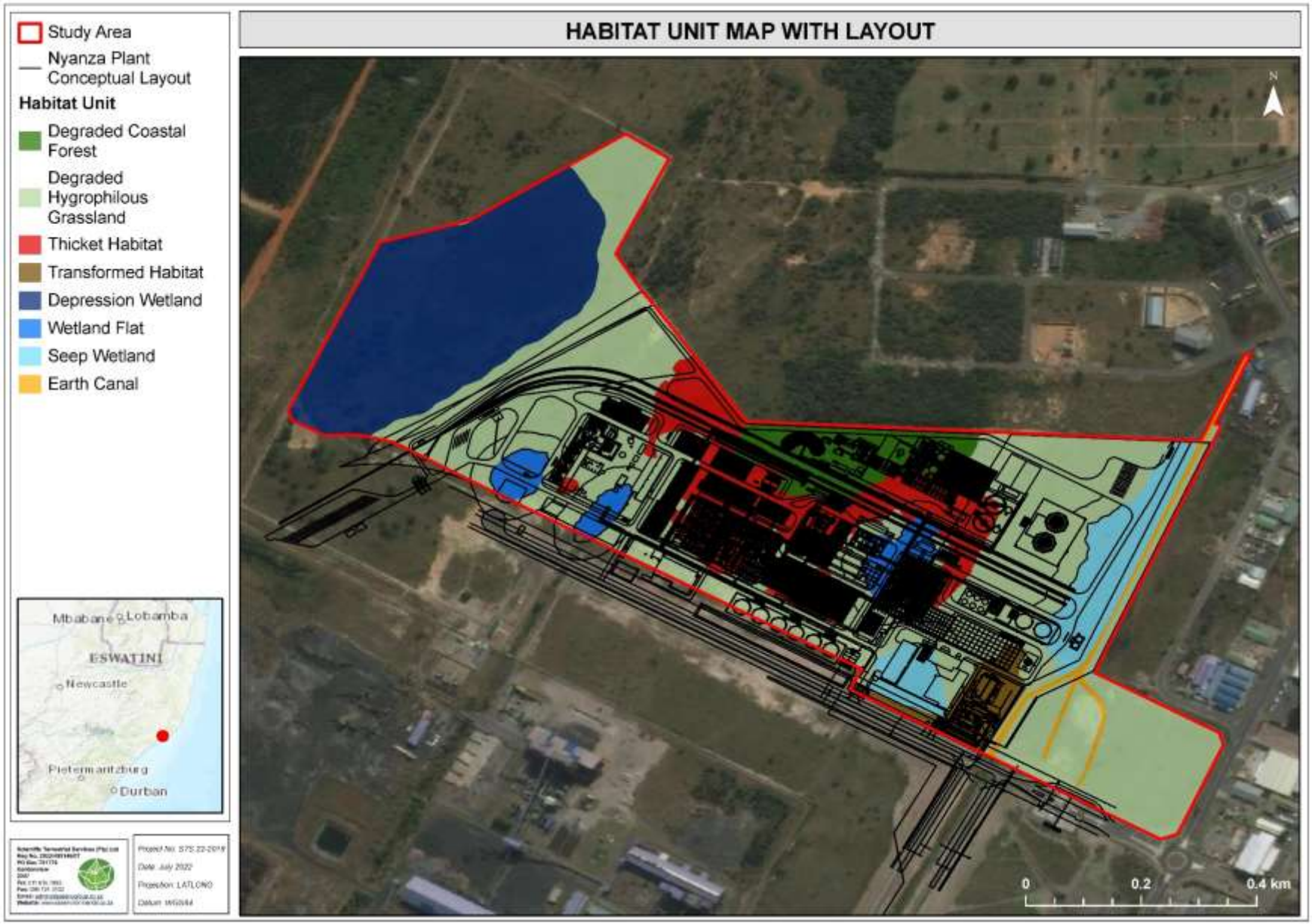
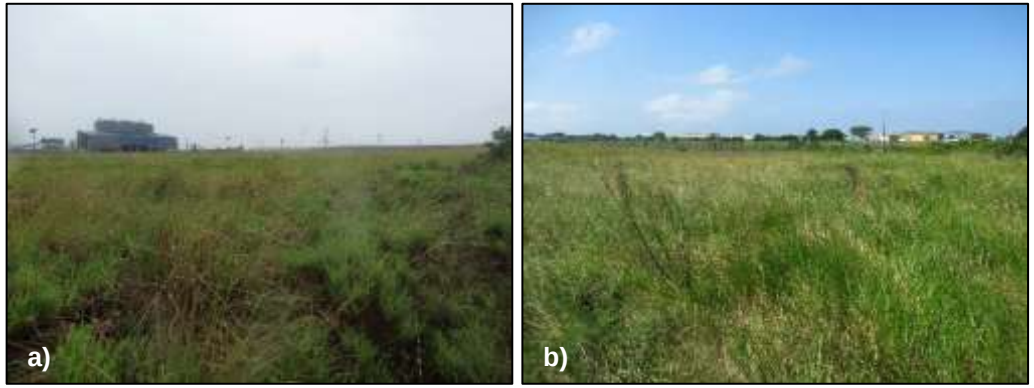


Figure 4: Conceptual illustration of the habitat units (with development layout) associated with the study area.

3.3 Degraded Hygrophilous Grassland Habitat

Reference Photo/s



Representative pictures illustrating the vegetation associated of the Degraded Hygrophilous Grassland Habitat Unit. a - b) typical vegetation structure associated with the habitat unit, i.e., homogenous, moist, medium to tall grassland.

Habitat Overview

This habitat unit is the largest habitat unit within the study area (approximately 32.2 ha) and supports a moderately low species richness. The habitat is generally characterised by a homogenous grassy layer in which scattered woody shrub species (e.g., *Helichrysum krausii* and *Osteospermum moniliferum* subsp. *rotundatum*) were recorded. The habitat unit was described as moist grassland as one of the dominant grass species recorded was *Imperata cylindrica* (a species that favours moist environments – in addition to disturbed places). The increased incidence of this grass species within the habitat is likely attributed to the location of the habitat between several wetlands and within an area of higher annual rainfall. The Maputaland Wooded Grassland vegetation type (i.e., the reference vegetation type) characteristically supports a high diversity of geoxylic suffrutices and a rich herbaceous layer (Siebert et al. 2011). Within the Degraded Hygrophilous Grassland habitat, suffrutices diversity and abundance were low; *Diospyros galpanii* and *Eugenia capensis* were the most commonly recorded species within the habitat. The herbaceous layer was poorly developed and represented by only a few, commonly occurring species.

Historically, the habitat unit has been subjected to anthropogenic influences as well as associated edge effect impacts (e.g., alien, and invasive plant (AIP) proliferation, dumping of rubble, suppression of fire and herbivory regimes, and habitat fragmentation). The habitat supported a moderately high density and diversity of AIP species (e.g., *Chromolaena odorata, Cuscuta campestris, Lantana camara, Psidium guajava,* and *Pteridium aquilinum*). As a result of the anthropogenic influences experienced within the grassland, the habitat is considered to be in an overall fair ecological condition. Given the level of degradation that has occurred throughout the habitat, the degree of change experienced in the fire and herbivory regimes, including the combined impact that these factors have on species composition through life-history strategies[9], it was established that the Degraded Hygrophilous Grassland habitat does not consist of primary grassland[10] vegetation (especially given the presence of AIP species and lack of a diverse herbaceous layer which are characteristic features of healthy coastal grasslands (SANBI,

[9] The ability of grassland species to respond to disturbance is determined by their life-history strategies. For example, whether a species re-sprouts, vegetatively reproduces or sexually reproduces (through seed) after a disturbance (e.g., fire) is important within grassland ecosystems. Changes in disturbances within grassland ecosystems can alter the ratios (and thus composition) of species of different life-history strategies (Simpson *et al.* 2021).

[10] Primary grasslands are those that have not been significantly modified from their original state; even though they may no longer have their full complement of naturally occurring species, they have not undergone significant or irreversible modification and still retain their essential ecological characteristics (SANBI, 2013).

<table>
<tr><td colspan="2">2013). This, considered together with the lack of characteristic vegetation components (e.g., high diversity of suffrutices and herbaceous species) of the reference vegetation, the Degraded Hygrophilous Grassland habitat is no longer considered to be representative of the reference vegetation type, i.e., the Maputaland Wooded Grassland.</td></tr>
<tr><th colspan="2">Species Overview</th></tr>
<tr><td colspan="2">Compositional characteristics of the habitat unit:
➢ Dominant grass species included Aristida stipitata, Cymbopogon validus, Digitaria eriantha, Imperata cylindrica, Ischaemum fasciculatum, Melinis repens, and Themeda triandra;
➢ The herbaceous layer was not diverse. Representative species included Chamaecrista mimosoides, Cyanotis speciosa, Lobelia flaccida, Smilax anceps, Tephrosia purpurea, and Thunbergia natalensis;
➢ The woody layer was represented by scattered individuals of Gomphocarpus physocarpus, Helichrysum krausii, Lantana rugosa, and Osteospermum moniliferum subsp. rotundatum; and
➢ AIPs were common and moderately dominant within the habitat unit. Species recorded included Amaranthus spinosus, Bidens pilosa, Chromolaena odorata, Cuscuta campestris, Lantana camara, Psidium guajava, Pteridium aquilinum, Richardia brasiliensis and Tagetes minuta. Refer also to section 3.7.

Refer to Appendix C for a list of species recorded within this habitat unit.</td></tr>
<tr><th colspan="2">Vegetation Structure</th></tr>
<tr><td colspan="2">The vegetation structure can be described as moist, homogenous, medium to tall grassland (as per Diagram A1 in Appendix A) in which occasional woody species, particularly Osteospermum moniliferum subsp. rotundatum and Psidium guajava, were recorded.</td></tr>
<tr><th colspan="2">Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc)</th></tr>
<tr><td>Presence of Unique Landscapes</td><td>Sections of the Degraded Hygrophilous Grassland habitat are located within the following biodiversity features:
• A nationally threatened ecosystem, namely the Kwambonambi Hygrophilous Grasslands Ecosystem (CR) – the Maputaland Wooded Grassland vegetation type is a key feature of the ecosystem and as this habitat unit is not representative of the reference vegetation type, the presence of the threatened ecosystem is discounted;
• CBA Irreplaceable[11] – CBA habitat is triggered by the presence of the threatened ecosystem. The lack of threatened ecosystem habitat thus indicates the lack of CBA habitat. This is further supported by the degradation that this habitat has received resulting in decreased function within the ecosystem;
• The habitat does not meet the NFA definition of “natural forests”, i.e., “a group of indigenous trees- (a) whose crowns are largely contiguous; or (b) which have been declared by the Minister to be a natural forest under section 7(2)”; and
• Protected Area Expansion Strategy – Several conservation and protected areas are within 10 km of the study area; however, the priority focus areas within the study area align with the provincial mapping of the CBA Important Areas. As no CBA habitat was confirmed on site, the study area is not a suitable target for protected areas expansion.

The Screening Tool identified the Terrestrial Biodiversity Theme for the study area as having a very high sensitivity. Triggering feature included the presence of CBAs, National Forestry Inventory, Protected Area Expansion Strategy, and a threatened ecosystem. Intact CBAs, national forest inventory, and threatened ecosystem habitat were not identified within this habitat unit. Thus, the very high sensitivity as assigned to the study area for the Terrestrial Biodiversity Theme was not supported in areas where the Degraded Hygrophilous Grassland habitat was situated.</td></tr>
</table>

[11] CBA irreplaceable areas are identified as being Irreplaceable and often represent the only localities for which the conservation targets for one or more biodiversity features contained within can be achieved, i.e., there are no alternative sites available.

Species of Conservation Concern	No threatened floral SCC were recorded on site during the April 2022 field assessment. In terms of Section 56 of the National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) (NEMBA), threatened species are Red Data Listed (RDL) species falling into the CR, EN, VU or Protected (P) categories of ecological status. The Screening Tool indicated that the study area is in an area of **medium sensitivity** from a Plant Species Theme perspective. However, no RDL species were recorded within the Degraded Hygrophilous Grassland habitat. Furthermore, suitable habitat to support RDL species was not identified within this habitat unit. Thus, the medium sensitivity for the Plant Species Theme as assigned by the screening tool was not confirmed for this habitat unit. The KZN Nature Conservation Management Amendment Act, 1999 (Act No. 5 of 1999) (KZNNCMAA) provides a list of Specially Protected Species (Schedule 6) and Protected Species (Schedule 7) for the KZN Province. These species were also considered as part of the SCC assessment for the study area because they are considered important provincially. Provincially protected species/genera/families recorded, and the Probability of Occurrence (POC) calculations for KZNNCMAA protected species/genera/families, are presented below for the habitat unit: - **Orchidaceae Family (e.g., *Disa woodii,* POC = Confirmed, Status = LC);** - **Amaryllidaceae Family (*Crinum macowanii*., POC = Confirmed, Status = LC);** - **Amaryllidaceae Family (*Boophone disticha*, POC = Previously Confirmed, Status = LC)[12]; and** - Orchidaceae Family (e.g., *Eulophia cucullata, Eulophia speciosa, Microcoelia exilis* POC = High, Status = LC). Additionally, several protected tree species, as per the National Forest Act, 1998 (Act No. 84 of 1998) (NFA), were included in the SCC assessment. However, no NFA protected species were recorded, and none were expected within this habitat unit. The Threatened or Protected Species (TOPS) List as per the 2007 Regulations provides a list of protected species for the KZN Province. No suitable habitat to support TOPS species was identified within the Degraded Hygrophilous Grassland habitat unit. Permits from Ezemvelo KZN Wildlife (Provincial Authority) and authorisation from the DFFE should be obtained to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place. Refer to **Appendix B** for the complete floral SCC assessment results.

[12] This species was recorded in previous assessments of the study area (Nemai (2016)) but was not recorded during the field assessments undertaken by STS.

Reference photos of selected flora within this habitat unit



Left to right*: Osteospermum moniliferum* subsp. *rotundatum* (in flower; a commonly recorded species within the habitat)*; Dipcadi marlothii* (in flower; an herbaceous species infrequently recorded within the habitat)*; Gomphocarpus physocarpus* (in flower; a common shrub species occasionally recorded within the habitat. This species is commonly found in seasonally moist soils and degraded places – both characteristics of the Degraded Hygrophilous Grassland habitat).

Concluding Remarks

The Degraded Hygrophilous Grassland habitat unit is of a moderately low importance form a floral ecological perspective.

Key considerations:

- The reference vegetation type, as per Mucina & Rutherford (2006), included the Maputaland Wooded Grassland**.** Given the overall degraded nature of the habitat, the lack of primary grassland habitat, as well as the degree of alteration of natural fire and grazing regimes, the Degraded Hygrophilous Grassland habitat is no longer considered representative of the reference vegetation type.

- The Degraded Hygrophilous Grassland habitat unit provides suitable habitat to sustain viable populations of floral SCC, namely protected orchid species (as per the KNNCMA), *Disa woodii,* and protected species within the Amaryllidaceae Family (as per the KNNCMA). However, no other SCC (barring those marked for relocation (i.e., *Boophone disticha* and *Crinum macowanii*) were recorded within the habitat unit and such species are not anticipated to be found within the Degraded Hygrophilous Grassland habitat due to a lack of suitable habitat. A Floral walkdown of the study area was conducted in 2015 and permits granted for the relocation of *Boophone disticha* and *Crinum macowanii* species within the study area. These species were recently relocated (see STS 22-2019 (2022) for details). However, the orchid species (i.e., *Disa woodii)* identified on site during 2022 was not previously identified as a species requiring rescue and relocation and as such no relocation of this species has occurred. If the proposed development is authorised, it will be necessary to conduct a thorough walkdown of all the footprint areas and all floral SCC marked for possible relocation to suitable habitat outside the direct footprint (as far as is feasible). Permits from the necessary authorities will be required for the possible relocation, removal, or destruction of this species before vegetation clearing activities commence.

- In terms of the Screening Tool outcome, the Degraded Hygrophilous Grassland habitat unit does not match the medium sensitivity assigned to the Plant Species Theme, as no suitable habitat to support RDL species was identified. Given that important biodiversity features such as CBAs, ESAs, and threatened ecosystems were not confirmed for the habitat, the very high sensitivity assigned to the Terrestrial Biodiversity Theme was not supported.

- Due to the area already being exposed to disturbances and edge effect impacts from surrounding industrialisation, this habitat unit is susceptible to AIP proliferation. Care must be taken to limit edge effects on the surrounding natural areas. Furthermore, it is recommended that an AIP species management plan be developed to manage both the proliferation of AIPs within the habitat unit as a whole.

3.4 Degraded Coastal Forest

Reference Photo/s


Representative pictures illustrating the typical habitat associated with the Degraded Coastal Forest habitat unit.

Habitat Overview

The Degraded Coastal Forest habitat[13] unit comprised the second smallest extent of the study area (approximately 3.4 ha) and was located mainly within the northern, central regions of the study area. This tree-dominated habitat was characterised by the presence of overlapping tree canopies and a poorly developed grass layer. Following the definition by Mucina *et al.* (2021), this habitat was classified as Forest Habitat[14]. The Degraded Coastal Forest habitat unit supported a moderately high species richness, particularly within the interior regions. Floral diversity was notably lower along the margins, where AIP proliferation was also noted. The Degraded Forest Habitat has experienced anthropogenic influences – historic use of the area by vagrants is evident within the habitat. Evidence of dumping and potential firewood collection is also evident. Within the interior region, some AIP proliferation was recorded, albeit in lower densities. The edges of this habitat transition into dense, encroached thickets (see Thicket habitat discussions in Section 3.5 below).

Typical tree species characteristic of the Northern Coastal Forest vegetation type (i.e., the reference vegetation type) was recorded within the habitat and included species such as *Brachylaena discolor* subsp. *discolor, Dracaena aletriformis, Phoenix reclinata, Psydrax obovata* subsp. *obovata, Strelitzia Nicolai, Trema orientalis*, and *Ziziphus mucronata*. An important determinant of

[13] Exigent Group (2019) also identified the Forest habitat. Habitat findings are similar across these studies.

[14] "Forest is a vegetation-physiognomic and ecosystem-functional tree-dominated formation often containing several sub-canopy shrub layers, with the tree canopy having crowns overlapping or touching, covering at least 40% of projected cover, and lacking continuous grassy undergrowth."

Northern Coastal Forests is the presence of i) distinguishable layers, namely tree, shrub, and herb layers, and ii) the presence and dominance of several herbaceous vines and woody climbers throughout (Mucina & Rutherford, 2006). Although distinct understory vegetation was occasionally present within the habitat, such layers were not always especially evident – likely attributed to altered species composition (and thus structure) because of edge effect impacts. Secondly, herbaceous vines and woody creepers were recorded within the habitat (e.g., *Dalbergia armata* and *Rhoicissus tomentosa*) but were not dominant within the habitat. As such, the Degraded Coastal Forest is considered to share an affinity with Northern Coastal Forests, although it is not considered fully representative of the reference vegetation type (in terms of overall species composition and vegetation structure). However, the habitat is considered to be a modified remnant of the reference vegetation type.

Species Overview

Compositional characteristics of the habitat unit:

- The woody layer, including trees and shrubs, was dominant and well represented. Common woody species recorded within this habitat included *Brachylaena discolor* subsp. *discolor, Dalbergia armata, Dracaena aletriformis, Englerophytum natalense, Euclea natalensis, Phoenix reclinata, Strelitzia nicolai, Trema orientalis*, *Trichilia dregeana* and *Ziziphus mucronata;*
- Tyical forb and herb species included *Asystasia gangetica, Gloriosa superba, Laportea peduncularis,* and *Microsorum scolopendria;*
- The graminoid layer was largely lacking, although occasional individuals of species such as *Cyperus albostriatus, Melinis repens* and *Oplismenus cf. hirtellus* were recorded*;* and
- AIPs were mainly recorded along the margins of the habitat unit, and rarely within the interior regions. Species recorded included *Lantana camara, Passiflora edulis, Passiflora suberosa*, and *Solanum mauritianum.* Refer also to section 3.7.

Refer to **Appendix C** for a list of species recorded within this Habitat Subunit.

Vegetation Structure

The vegetation structure can be described as **tall to high forest** (as per Diagram A1 in Appendix A) in which woody species dominated and the grassy layer was poorly developed and not well represented. Distinguishable tree, shrub, and herb layers were occasionally evident, although not always.

Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc)

Presence of Unique Landscapes	Sections of the Degraded Coastal Forest habitat are located within the following biodiversity features: • **Protected Area Expansion Strategy** – Several conservation and protected areas are within 10 km of the study area; the priority focus areas within the study area align with the provincial mapping of the CBA Important Areas. As CBA habitat was confirmed on site, the habitat unit is considered a suitable target for protected areas expansion; and • The Degraded Coastal Forest habitat meets the **NFA definition of "natural forests"**, i.e., "a group of indigenous trees- (a) whose crowns are largely contiguous; or (b) which have been declared by the Minister to be a natural forest under section 7(2)". Although degraded in nature, the Degraded Coastal Forest habitat supports higher levels of biodiversity than the surrounding areas, contributing significantly towards woody species diversity. They also provide important ecological functions within the landscape (e.g., dispersal corridors). The Screening Tool identified the Terrestrial Biodiversity Theme for the study area as having a **very high sensitivity**. Triggering features included the presence of CBAs, National Forestry Inventory, Protected Area Expansion Strategy, and a threatened ecosystem. Natural forest habitat was identified within this habitat unit. Thus, the very high sensitivity as assigned to the study area for the Terrestrial Biodiversity Theme was supported in areas where the Degraded Coastal Forest habitat was situated.
Species of Conservation Concern	No RDL floral SCC were recorded on site during the April 2022 field assessment. The Screening Tool indicated that the study area is in an area of **medium sensitivity** from a Plant Species Theme perspective. Although no RDL species were directly recorded within the Degraded Coastal Forest habitat, suitable habitat to support the following species is available within the habitat unit:

- Sensitive species 1252[15] (POC = High, Status = VU); and
- *Cassipourea gummiflua* var. *verticillata* (POC = Medium, Status = VU).

Given that suitable habitat to support RDL species was recorded within the Degraded Coastal Forest, the medium sensitivity as assigned by the screening tool is supported for this habitat.

Provincially protected species as per the KZNNCMAA were also considered as part of the SCC assessment for the habitat unit. Provincially protected species/genera/families recorded and the POC calculations for KZNNCMAA protected species/genera/families are presented below for the habitat unit:

- *Sideroxylon inerme* (POC = high, Status = LC (also protected under the NFA)); and
- Orchidaceae Family (POC = high, Status = LC).

No NFA protected species were recorded within the habitat, however suitable habitat to support NFA species was identified:

- *Sideroxylon inerme* (POC = high, Status = LC (also protected under the KZNNCMAA));
- *Pittosporum viridiflorum* (POC = high, Status = LC); and
- *Catha edulis* (POC = medium, Status = LC).

No suitable habitat to support TOPS species was identified within the Degraded Coastal Forest habitat unit.

Permits from Ezemvelo KZN Wildlife and authorisation from the DFFE should be obtained to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place.

Reference photos of flora within this habitat subunit



From left to right: *Asystasia gangetica* (in flower; a dominant herbaceous species recorded within the habitat unit), *Albizia adianthifolia* (a common tree species recorded within the habitat), and *Dracaena aletriformis* (a small woody species recorded within the interior of the habitat unit).

Concluding Remarks

[15] As per the best practice guidelines as stipulated by the South African National Biodiversity Institute protocol (SANBI), the name of sensitive species may not appear in the public domain as a means to protect the identity and potential location of such species.

This habitat unit is important from a floral ecological importance and resource management perspective.

Key considerations:

- This habitat unit is unique within the study area and within the greater surrounding areas. The habitat unit has been subjected to anthropogenic influences and subsequent edge effects, including firewood collection, AIP proliferation (particularly at the margins) and dumping of rubble. Despite these impacts, the Degraded Coastal Forest is in a moderate ecological condition and supports an array of woody species that have an affinity for shaded, moist forest habitats. The Degraded Coastal Forest habitat has the potential to support a RDL species (*Cassipourea gummiflua* var. *verticillata*) and is likely to support other RDL species (e.g., Sensitive species 1252). Suitable habitat is available to support several protected species (as per the NFA and KZNNCMAA), namely *Sideroxylon inerme, Pittosporum viridiflorum, Catha edulis,* and species within the Orchidaceae Family.

- Given the increased propensity for protected species with the Degraded Coastal Forest habitat, if the proposed development is authorised, it will be necessary to conduct a thorough walkdown of all the footprint areas and all floral SCC marked for possible relocation to suitable habitat outside the direct footprint (as far as is feasible). The protected species walkdown must be conducted during the flowering season of the species to ensure adequate detection and identification of the species – early November to late April March will be ideal for this area. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation.

- In terms of the Screening Tool outcome, the Degraded Coastal Forest habitat matches the medium sensitivity assigned to the Plant Species Theme, as suitable habitat to support RDL species was identified. Given that important biodiversity features such as forest habitat were confirmed for the habitat, the very high sensitivity assigned to the Terrestrial Biodiversity Theme was supported.

- As is often the recommendation from the forestry department within the DFFE, a 30 m exclusion buffer around forests should be implemented to shield against adverse impacts. If avoidance of such areas is not possible, permits from the DFFE must be applied for (i.e., clearance of natural forests - clearing of trees in natural forests [Section 7(1) of the NFA]). In such instances, it is recommended that the proponent liaises with the relevant authorities regarding the need for potential offset activities.

- Due to the area already being exposed to disturbances and edge effect impacts from expanding infrastructure, this habitat unit is susceptible to AIP proliferation and bush encroachment (particularly from the neighbouring Thicket Habitat – see Section 3.5 below). It is recommended that an AIP species management plan and bush encroachment control plan be developed to manage AIP proliferation and bush encroachment within the habitat unit and the surrounding areas.

3.5 Thicket Habitat

Reference Photo/s

Representative pictures illustrating the typical habitat associated with the Thicket habitat unit.

Habitat Overview

The Thicket habitat unit comprised the third largest extent of the study area (approximately 8.2 ha) and was located mainly within the northern, central regions of the study area, where it surrounded the Degraded Coastal Forest habitat. This habitat consisted of a dense tree and shrub layer and was similar to the Degraded Coastal Forest Habitat in that it was tree-dominated. However, typical forest characteristics were largely lacking from this habitat unit – i.e., lack of overlapping tree canopies, a lack of forest tree species, a complete lack of distinct tree, shrub, and herb layers and the presence of a prominent and well-developed grass layer. Significant bush encroachment by *Dichrostachys cinerea* and AIP proliferation was particularly evident within the habitat. Bush encroachment within the area is likely due to the suppression of fire and the lack of herbivory within the study area – these features have been suppressed given that i) the area is located next to industry and plantations so fire is suppressed for safety and economic reasons, and ii) the area is fenced off thus herbivores (including natural and domestic) cannot access the area.

Floral diversity was notably lower than the neighbouring Degraded Coastal Forest Habitat but higher than the surrounding Degraded Hygrophilous Grassland Habitat. The Thicket habitat has been subject to anthropogenic influences and is largely degraded in nature – AIP proliferation is particularly evident within the habitat. The Thicket habitat is not representative of either of the reference vegetation types – it is neither grassland or forest, but the result of anthropogenic influences (e.g., altered fire and herbivory regimes).

Species Overview

Compositional characteristics of the habitat unit:

- The woody layer, including trees and shrubs, was dominant and well represented. Common woody species recorded within this habitat included *Dichrostachys cinerea, Dombeya rotundifolia, Osteospermum moniliferum* subsp. *rotundatum, Strychnos spinosa,* and *Syzygium cordatum;*
- Representative forb and herb species included *Gloriosa superba, Leonotis leonurus, Sida cordifolia,* and *Xysmalobium cf. undulatum;*
- The graminoid layer was well developed and included species such as *Digitaria eriatha, Hyparrhenia hirta, Melinis repens,* and *Setaria sphacelata* var. *sphacelata;*
- The succulent layer was represented by the following species: *Aloe umfoloziensis* and *Aloe marlothii*; and
- AIPs were somewhat prolific within this habitat. Species recorded included *Eucalyptus camaldulensis, Ipomoea purpurea, Lantana camara, Psidium guajava,* and *Pteridium aquilinum.* Refer also to section 3.7.

Refer to **Appendix C** for a list of species recorded within this habitat unit.

Vegetation Structure

The vegetation structure can be described **medium, closed thicket (i.e., woodland)** (as per Diagram A1 in Appendix A). Compositionally, the vegetation is not representative of any specific vegetation type (i.e., neither the Maputaland Wooded Grassland or the Northern Coastal Forests vegetation types); instead, the habitat has resulted from anthropogenic influences (e.g., a lack of fire and herbivory) which has allowed bush encroachment to proliferate, resulting in an increased incidence of woody thicket in places.

Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc)

Presence of Unique Landscapes	Sections of the Degraded Coastal Forest habitat are located within the following biodiversity features: • **CBA irreplaceable & Threatened Ecosystem**– the Maputaland Wooded Grassland vegetation type is a key feature of the ecosystem and as this habitat unit is not representative of the reference vegetation type, the presence of the threatened ecosystem is discounted. Thus, the presence of intact CBA irreplaceable habitat and the presence of intact threatened ecosystem habitat (i.e., the CR Hygrophilous Grasslands Ecosystem) within the Thicket habitat was not confirmed; • **Protected Area Expansion Strategy** – Several conservation and protected areas are within 10 km of the study area; the priority focus areas within the study area align with the provincial mapping of the CBA Important Areas. However, as CBA habitat was confirmed on site, the habitat unit is not considered a suitable target for protected areas expansion; and • The Thicket habitat does **not** meet the **NFA definition of "natural forests"**. The Screening Tool identified the Terrestrial Biodiversity Theme for the study area as having a **very high sensitivity**. Triggering feature included the presence of CBAs, National Forestry Inventory, Protected Area Expansion Strategy, and a threatened ecosystem. Intact CBA habitat and threatened ecosystem habitat were not identified within this habitat unit. Furthermore, the habitat unit is not considered to be forest habitat as per the NFA definition. Thus, the very high sensitivity as assigned to the study area for the Terrestrial Biodiversity Theme was not supported in areas where the Thicket habitat was situated.
Species of Conservation Concern	No RDL floral SCC were recorded on site during the April 2022 field assessment. The Screening Tool indicated that the study area is in an area of **medium sensitivity** from a Plant Species Theme perspective. However, no RDL species were recorded within the Thicket habitat and suitable habitat to support such species was not recorded within the habitat. Thus, the medium sensitivity as assigned to the Plant Species Theme was not supported for this habitat unit. Provincially protected species/genera/families recorded and the POC calculations for these species/genera/families are presented below for the habitat unit: - **Amaryllidaceae Family (*Crinum macowanii*., POC = Confirmed, Status = LC); and** - *Sideroxylon inerme* (POC = Medium, Status = LC (also protected under the NFA)). One NFA protected species was recorded within the habitat, and suitable habitat to support other NFA species was identified: - ***Sclerocarya birrea* subsp*. caffra* (POC = Confirmed, Status = LC);** - *Balanites maughamii* (POC = medium, Status = LC); - *Catha edulis* (POC = medium, Status = LC); and - *Sideroxylon inerme* (POC = Medium, Status = LC (also protected under the KZNNCMAA)). No suitable habitat to support TOPS species was identified within Thicket habitat unit.

	Permits from Ezemvelo KZN Wildlife and authorisation from the DFFE should be obtained to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place.

Reference photos of flora within this habitat subunit



From left to right: *Psidium guajava* (in fruit; guava, a dominant AIP species recorded within the habitat unit), *Smilax anceps* (in flower; a common scrambling vine recorded within the habitat), and *Dichrostachys cinerea* (with unripe fruit; a woody, bush encroaching species that was dominant within the habitat unit).

Concluding Remarks

This habitat unit is not important from a floral ecological importance and resource management perspective.

Key considerations:

- The reference vegetation type, as per Mucina & Rutherford (2006), included the Maputaland Wooded Grassland and the Northern Coastal Forest. The Thicket habitat unit is not representative of either of the reference vegetation types. This habitat has been subjected to various anthropogenic influences (as is evident by the degree of bush encroachment and AIP proliferation which has resulted in habitat degradation).

- The Thicket habitat unit provides suitable habitat to sustain viable populations of floral SCC, namely species as per the KZNNCMAA and the NFA. However, no RDL SCC were recorded within the Thicket habitat unit and such species are not anticipated to be found within the unit due to a lack of suitable habitat. A Floral walkdown of the study area was conducted in 2015 and permits granted for the relocation of *Crinum macowanii* within the study area. These species were recently relocated (see STS 22-2019 (2022) for details). However, other SCC species as identified above may be present within the site given suitable habitat availability. If the proposed development is authorised, it will be necessary to conduct a thorough walkdown of all the footprint areas and all floral SCC marked for possible relocation to suitable habitat outside the direct footprint (as far as is feasible). It is recommended that the walkdown be conducted between the beginning of November and the end of April. Permits from the necessary authorities will be required for the possible relocation, removal, or destruction of this species before vegetation clearing activities commence.

- In terms of the Screening Tool outcome, the Thicket habitat unit does not match the medium sensitivity assigned to the Plant Species Theme, as no suitable habitat to support RDL species was identified. Given that no important biodiversity features such as CBAs, threatened ecosystems, or forest habitat was confirmed for the habitat, the very high sensitivity assigned to the Terrestrial Biodiversity Theme was not supported for the Thicket habitat.

- Due to the area already being exposed to disturbances and edge effect impacts from expanding infrastructure, this habitat unit is susceptible to AIP proliferation and bush encroachment. It is recommended that an AIP species management plan and bush encroachment control plan be developed to manage AIP proliferation and bush encroachment within the habitat unit and the surrounding areas.

3.6 Freshwater Habitat Unit

Reference Photos

Representative pictures illustrating the habitat and typical vegetation structure associated with Freshwater Habitat unit: a – b) indicate typical wetland conditions on site, and c) indicates the typical habitat associated with the earth canal (i.e., man-made feature) within the wetland habitat. Photo a) above is representative of the Depression wetland and b) is representative of the Wetland flats.

Habitat Overview

The Freshwater Habitat comprised the second largest habitat (approx. 20.8 ha) within the study area and was associated with 1) natural watercourse features (including a Depression Wetland in the west (in which no development is proposed), Wetland Flats within the central areas, and Seep Wetlands within the eastern sections of the study area), and 2) artificial freshwater features, including an earth canal that runs through one of the Seep wetlands (SAS 22-1058, 2022).

Although different wetlands were identified on site, all of them shared a common subset species including *Cynodon dactylon, Cyperus latifolious, Eleocharis acutangular, Isolepis cernua, Imperata cylindrica,* and *Ischaemum fasciculatum,* among others. Despite the shared subset of species, the Depression Wetland in the west of the study area, which was inundated with water at the time of assessment and is likely to be so for extended periods of the year, additionally supported obligate wetland species (e.g., *Nymphaea nouchali*). Overall, floral diversity was considered to moderate within the Depression Wetland and ranged from moderate to moderately low within the Wetland Flats and Seep Wetlands. The Earth canal, in which water is channelled supported a moderate to moderately low floral diversity and was typically dominated by *Typha capensis* and *Phragmites australis*. Where water ponded within the channel, *Nymphaea nouchali* was recorded.

Overall, the Freshwater habitat has been impacted by anthropogenic influences (e.g., impacts because of surrounding industrial development, including AIP proliferation and vegetation clearing). Anthropogenic impacts, particularly AIP establishment throughout the habitat, have thus resulted in habitat degradation. Despite this degradation, the Freshwater habitat unit is considered a unique feature as it provides important ecological functions within the landscape (e.g., flood attenuation, streamflow regulation and toxic substrate removal).

Species Overview	
Species reported are the dominant species recorded across the Freshwater habitat, including the different wetland types. Habitats in which particular species were associated are indicated in brackets behind the species name. Compositional characteristics of the Freshwater habitat included: ➢ The woody layer was largely absent within this habitat although woody species (e.g., *Syzigium cordatum*) were infrequently recorded on the outer skirts of the wetland areas; ➢ Herbaceous species were occasionally recorded. Typical species included *Disa woodii, Nymphaea nouchali* (Depression Wetland & Erath Canal), *Persicaria cf. decipiens,* and *Rhynchospora corymbosa;* ➢ Graminoid species were well represented and were the dominant growth form. Species identified included the following: *Cynodon dactylon, Cyperus denudatus, Cyperus fastigatus, Cyperus latifolious, Eleocharis acutangular, Isolepis cernua, Imperata cylindrica, Ischaemum fasciculatum, Phragmites australis* (Depression Wetland & Erath Canal), *Typha capensis* (Depression Wetland & Erath Canal); and ➢ AIPs were recorded within the habitat unit. Examples of species recorded within the Freshwater habitat included *Bidens pilosa, Ipomoea purpurea, Pteridium aquilinum, Tagetes minuta,* and *Xanthium strumarium*. Refer also to section 3.7. Refer to **Appendix C** for a list of species recorded within this Habitat.	
Vegetation Structure	
The vegetation structure can be described as **medium to tall, moist grasslands** (as per Diagram A1 in Appendix A) that supported a moderate to moderately low species richness.	
Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc.)	
Presence of Unique Landscapes	Sections of the Freshwater habitat are located within the following biodiversity features: • **Threatened Ecosystem** –the Maputaland Wooded Grassland vegetation type (in which scattered wetland features are characteristic) is a key feature of the ecosystem. Thus, the presence of presence of threatened ecosystem habitat (i.e., the CR Hygrophilous Grasslands Ecosystem) within the habitat was confirmed; • **CBA Irreplaceable** – the presence of CBA habitat was confirmed for the habitat, especially as threatened ecosystem habitat was identified within the habitat; • **Protected Area Expansion Strategy** – Several conservation and protected areas are within 10 km of the study area; the priority focus areas within the study area align with the provincial mapping of the CBA Important Areas. As CBA habitat was confirmed on site, the habitat unit is considered a suitable target for protected areas expansion; and • The Wetlands identified on site are considered watercourses as per the NWA. The Screening Tool identified the Terrestrial Biodiversity Theme for the study area as having a **very high sensitivity**. Triggering features included the presence of CBAs, National Forestry Inventory, Protected Area Expansion Strategy, and a threatened ecosystem. Intact CBA habitat was identified within this habitat unit. Furthermore, the Freshwater Habitat (particularly the Wetlands) provide important ecological features within the greater landscape. Thus, the very high sensitivity as assigned to the study area for the Terrestrial Biodiversity Theme was supported in areas where the Freshwater Habitat (particularly the Wetlands) is situated.
Species of Conservation Concern	No RDL floral SCC were directly recorded on site during the April 2022 field assessment. However, suitable habitat to support RDLs was identified within the habitat. The Screening Tool indicated that the study area is in an area of **medium sensitivity** from a Plant Species Theme perspective. Although no RDL species were recorded within the Freshwater habitat, available habitat to support species identified by the screening tool was recorded: - *Fimbrisylis aphylla* (POC = Medium, Status = VU); and - *Thesium polygaloides* (POC = Medium, Status = VU). As such, the medium sensitivity assigned by the screening tool was supported for the Freshwater Habitat.

	Provincially protected species/genera/families recorded and the POC calculations thereof are presented below for the habitat unit: - **Orchidaceae Family (*Disa woodii,* POC = Confirmed, Status = LC).** No NFA protected or TOPS species were recorded within the habitat and no suitable habitat to support such species was identified. Permits from Ezemvelo KZN Wildlife and authorisation from the DFFE should be obtained to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place.

Some reference photos of flora within this habitat unit

From left to right: *Nymphaea nouchali* (in flower; recorded within the Depression Wetland & Erath Canal), *Imperata cylindrica* (in flower; a common species recorded throughout the Freshwater habitat), and *Cyperus sphaerospermus* (a common species recorded throughout the Freshwater Habitat).

Concluding Remarks

This habitat unit is considered important (e.g., Depression Wetland) to moderately important (remaining wetlands and associated earth canal) from a floral ecological and resource management perspective.

- This Freshwater Habitat is unique within the study area and within the greater surrounding areas. Edge effects, including vegetation clearance, dumping of rubble and AIP proliferation, have occurred within the habitat unit. Despite this, the Freshwater habitat is in an overall moderate ecological condition. The habitat unit is unlikely to support RDL species or SCC as per the NFA or the TOPS List. However, suitable habitat is available to support a provincially protected species, namely *Disa woodii*, which was recorded during the field assessment.

- A Floral walkdown of the study area was conducted in 2015 and permits granted for the relocation of Crinum macowanii within the study area. These species were recently relocated (see STS 22-2014, 2022 for details). However, other SCC species as identified within the Degraded Hygrophilous Grassland as above (e.g., Disa woodii) were present within the site. As infill of the Seep Wetlands and the Wetland Flats has been authorised (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382) except for the Depression Wetland in the far west of the study area), it will be necessary to conduct an additional walkdown of all the footprint areas (preferably during the flowering season of identified SCC, i.e., September to December), and all floral SCC marked for possible relocation (as far as is feasible) to suitable habitat outside the direct footprint, i.e., within the Depression Wetland in the west of the study area in which no development will occur. Permits from the necessary authorities will be required for the possible relocation, removal, or destruction of this species before vegetation clearing activities commence.

- In terms of the Screening Tool outcome, the Freshwater habitat unit matches the medium Sensitivity assigned to the Plant Species Theme, given that the suitable habitat for species as identified by the screening tool is available. Furthermore, given the importance of the Freshwater habitat within the study area and greater landscape, the very high sensitivity as assigned to the study area for the Terrestrial Biodiversity Theme was supported in areas where the Freshwater habitat (particularly the natural Wetlands) is situated.

- Recommendations as per the Freshwater assessment (SAS 22-1058, 2022) must be strictly adhered to and recommendation effectively incorporated so to minimise the impacts of the proposed development within the study area and to mitigate the negative effects thereof at a larger scale. Recommendations are as follows: i) development activities should stay within the approved footprint (and avoid encroaching the nearby freshwater systems and associated buffers), and ii) it is critical to manage potential seepage from the infrastructure (e.g., hazardous waste) which would have a detrimental impact on the water quality due to parameters such as sulphates and electrical conductivity which could be elevated due to seepage from the associated infrastructure.

- Due to the area already being exposed to disturbances and edge effect impacts from the nearby industrial development, the Freshwater habitat unit is susceptible to AIP proliferation. Care must be taken to limit edge effects on these features and the surrounding natural areas. Furthermore, it is recommended that an AIP species management plan be developed to manage AIP proliferation within the Freshwater Habitat Unit. Appropriate implementation of a stormwater management plan is required to address erosion control measures.

3.7 Alien and Invasive Plant (AIP) Species

South Africa is home to an estimated 759 naturalised or invasive terrestrial plant species (Richardson et al., 2020), with 327 plant species, most of which are invasive, listed in national legislation[16]. Many introduced species are beneficial, e.g., almost all agriculture and forestry production are based on alien species, with alien species also widely used in industries such as horticulture. However, some of these species manage to "escape" from their original locations, spread and become invasive. Although only a small proportion of introduced species become invasive (~0.1–10%), those that do proceed to impact negatively on biodiversity and the services that South Africa's diverse natural ecosystems provide (from ecotourism to harvesting food, cut flowers, and medicinal products) (van Wilgen and Wilson, 2018).

3.7.1 Legal Context

South Africa has released several articles of legislation that are applicable to the control of alien species. Currently, invasive species are controlled by the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) – Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020. AIPs defined in terms of NEMBA are assigned a category and listed within the NEMBA List of Alien and Invasive Species (2020) in accordance with Section 70(1)(a) of the NEMBA:

- **Category 1a** species are those targeted for urgent national eradication;
- **Category 1b** species must be controlled as part of a national management programme, and cannot be traded or otherwise allowed to spread;
- **Category 2** species are the same as category 1b species, except that permits can be issued for their usage (e.g., invasive tree species can still be used in commercial forestry, providing a permit is issued that specifies where they may be grown and that permit holders "*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, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3*"); and

[16] Government Notice number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020, as it relates to the National Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004).

- **Category 3** are listed invasive species that can be kept without permits, although they may not be traded or further propagated, and must be considered a Category 1b species if they occur in riparian zones.

Duty of care related to listed invasive species are referred to in NEMBA Section 73[17]. The motivation for this duty of care is both environmentally and economically driven. Management of alien species in South Africa is estimated to cost at least ZAR 2 billion (US$142 million) each year - this being the amount currently spent by the national government's DFFE - i.e., the Working for Water programme (van Wilgen & Wannenburgh (2016)). Managing AIPs early on will reduce clearing costs in the long run.

3.7.2 Site Results

A total of 23 species were recorded within the study area. Of the 23 AIPs recorded during the field assessment, 11 species are listed under NEMBA Category 1b, two are listed under NEMBA Category 2, one was listed under NEMBA Category 3, and the remaining eight species are not listed under NEMBA. However, these species are considered problem plants[18] and are deemed to have a negative impact on indigenous floral communities within the study area. Refer to Table 1 below for more information on the AIPs recorded on site.

The abundance of AIPs with the study area varied from low to moderate. Given the propensity of such species to spread, especially in areas of disturbance and degradation, it is highly recommended that a proposed Alien and Invasive Species Control Plan (AIPCP) be developed and implemented to ensure the further loss of indigenous floral communities do not occur.

[17] Section 73(2): A person who is the owner of land on which a listed invasive species occurs must-
a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
c) take all the required steps to prevent or minimise harm to biodiversity.

[18] A problem plant is any plant, shrub or tree which has a negative environmental impact in a particular locality and result in the subsequent loss of biodiversity, and (potential) excessive water consumption. These species, which can be native, have not been listed or classified as alien or invasive plants by the current South African. *The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).*

Table 1: Dominant alien floral species identified during the field assessment with their invasive status as per NEMBA: Alien and Invasive Species Lists, GN R1003 of 2020. NL = Not listed.

Scientific Name	Common Name	NEMBA Status	Degraded Hygrophilous Grasslands	Degraded Coastal Forest	Thicket habitat	Freshwater Habitat
Woody Species						
Eucalyptus camaldulensis	River red gum	1b	x	x	x	x
Lantana camara	Lantana	1b	x	x	x	x
Melia azadarach	Syringa	1b	x		x	x
Psidium guajava	Guava	3	x		x	
Solanum mauritianum	Bug weed	1b	x	x	x	
Herbaceous Species						
Amaranthus spinosus	Spiny amaranth	NL	x			
Bidens pilosa	Blackjack	NL	x	x	x	x
Chromolaena odorata	Triffid weed	1b	x			
Conyza bonariensis	Hairy flea bean	NL	x		x	
Datura stramonium	Common thorn apple	1b	x		x	x
Hibiscus trionum	Flower-of-an-hour	NL	x			
Ipomoea purpurea	Purple morning glory	1b	x	x	x	x
Pteridium aquilinum	Bracken fern	NL	x	x	x	x
Richardia brasiliensis	Tropical Mexican clover	NL	x			
Ricinus communis	Castor-oil plant	2	x			
Tagetes minuta	Khaki Bos	NL	x			x
Taraxacum officinale	Common dandelion	NL	x			
Verbena bonariensis	Tall verbena	1b	x			
Xanthium strumarium	Large cocklebur	1b	x			x
Climbing Speices						
Cuscuta campestris	Common dodder	1b	x		x	
Passiflora edulis	Passion fruit	2		x	x	
Passiflora suberosa	Devil's pumpkin	1b		x	x	
Graminoid Speices						
Arundo donax	Spanish reed	1b				x

4 SENSITIVITY MAPPING

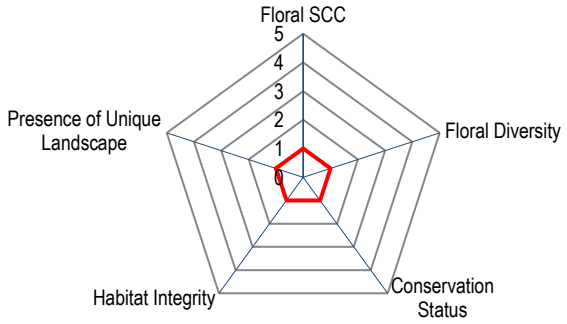
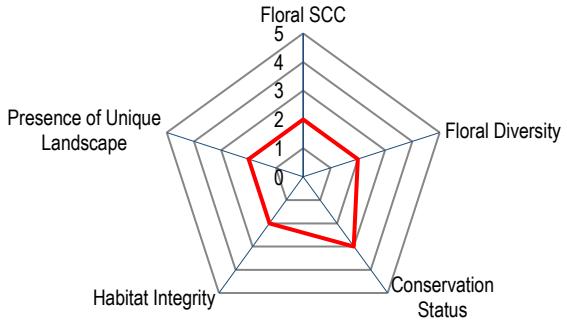
The National Web-Based Online Screening Tool identified the study area to be in a **medium sensitivity** area for the Plant Species Theme. The Terrestrial Biodiversity Theme was identified as having a **very high sensitivity**. Based on the ground-truthed results of the site visit, the following was established for the habitat units:

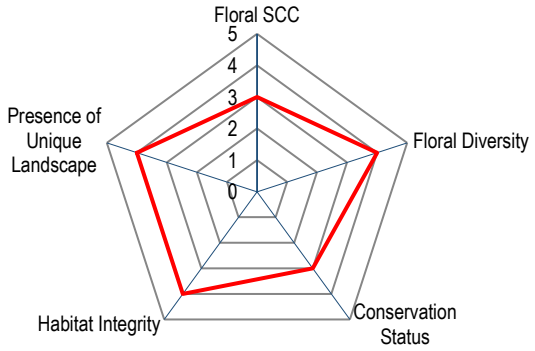
- Degraded Hygrophilous Grassland: neither the very high sensitivity for the Terrestrial Biodiversity Theme nor the medium sensitivity for the Plant Species Theme as assigned by the screening tool was supported for this habitat unit;
- Degraded Coastal Forest: both the very high sensitivity for the Terrestrial Biodiversity Theme and the medium sensitivity for the Plant Species Theme as assigned by the screening tool was supported for this habitat unit;
- Thicket Habitat: neither the very high sensitivity for the Terrestrial Biodiversity Theme nor the medium sensitivity for the Plant Species Theme as assigned by the screening tool was supported for this habitat unit;
- Freshwater Habitat (i.e., the Depression Wetland): both the very high sensitivity for the Terrestrial Biodiversity Theme and the medium sensitivity for the Plant Species Theme as assigned by the screening tool was supported for this habitat unit; and
- Transformed Habitat: neither the very high sensitivity for the Terrestrial Biodiversity Theme nor the medium sensitivity for the Plant Species Theme as assigned by the screening tool was supported for this habitat unit.

Table 2 below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development. It should be noted that no sensitivity is provided for the Seep Wetlands or the Wetland Flats as EA has already been granted for their infill (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382).

Figures 5 - 7 conceptually illustrates the areas considered to be of varying ecological sensitivity and how they will be impacted by the proposed infrastructure development. The areas are depicted according to their sensitivity in terms of the presence or potential for floral SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity (compared to a reference type).

Table 2: A summary of the sensitivity of each habitat unit and implications for development.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Low 	Optimise development potential.	**Transformed Habitat Unit**	- Indigenous vegetation absent. - Habitat entirely transformed because of anthropogenic activities (e.g., buildings, road development etc.). - Indigenous floral diversity was low. - AIP infestation is prominent. - No habitat for floral SCC present and the potential for the habitat to support viable populations of SCC is deemed very low. - No significant biodiversity features present.
Moderately low 	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	**Degraded Hygrophilous Grassland** **&** **Thicket Habitat**	- No primary grassland recorded. - Habitat has been degraded due to historic anthropogenic disturbances (e.g., firewood collection, altered fire & herbivory regimes, AIP proliferation etc). - The floral communities have shifted away from the reference vegetation type/s and are degraded and encroached (e.g., in Thicket habitat). - Although degraded, floral SCC were recorded within these habitats. Suitable habitat to support viable populations of other SCC is available, although the capacity thereof is deemed to be moderately low. - No significant biodiversity features present.

Moderately high 	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance	**Degraded Coastal Forest** **&** **Freshwater Habitat (including the Depression Wetland)**	- Habitat in moderate ecological condition and supports a diversity of indigenous floral species. - Provides unique habitat for an array of species that have an affinity for i) forest habitats, and 2) wet environments. - Meets the definitions provided by 1) the NFA (in terms of the Forest habitat), and 2) the NWA (in terms of the freshwater habitat). - Provide important ecological features within the study area and greater surrounding areas, for example, the forests provide dispersal corridors, and the Freshwater habitat provides flood attenuation processes. - Floral SCC were recorded within these habitats. Suitable habitat to support viable populations of other SCC is available, and the capacity thereof is deemed to be moderate. - Significant biodiversity features present (e.g., CBA).

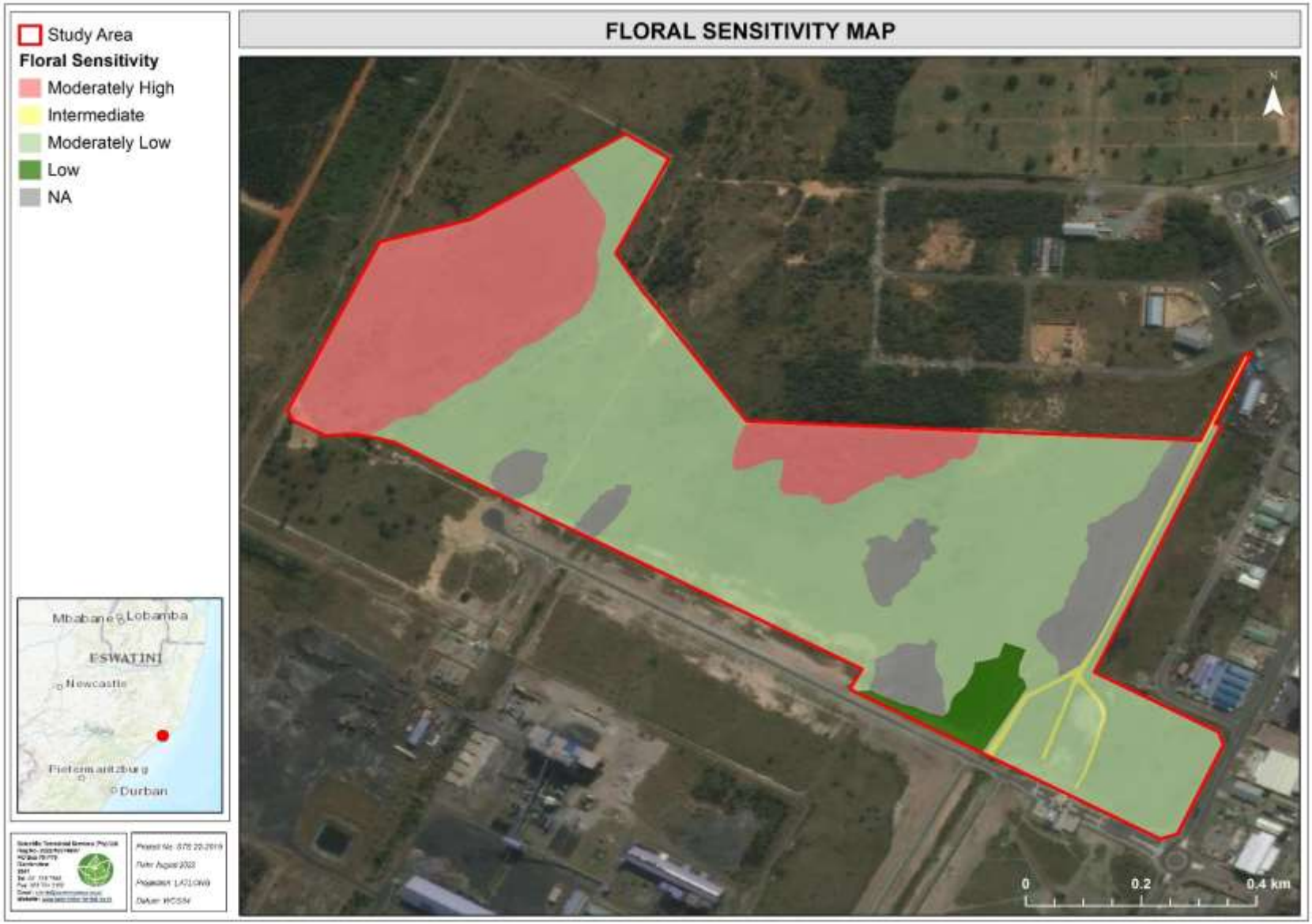


Figure 5: Conceptual illustration of the habitat sensitivity associated with study area as identified during the field assessment. Wetlands (including the Seep Wetlands and Wetland Flats) that will be infilled do not have an assigned sensitivity. They have been mapped in grey and assigned a NA (Not Applicable).

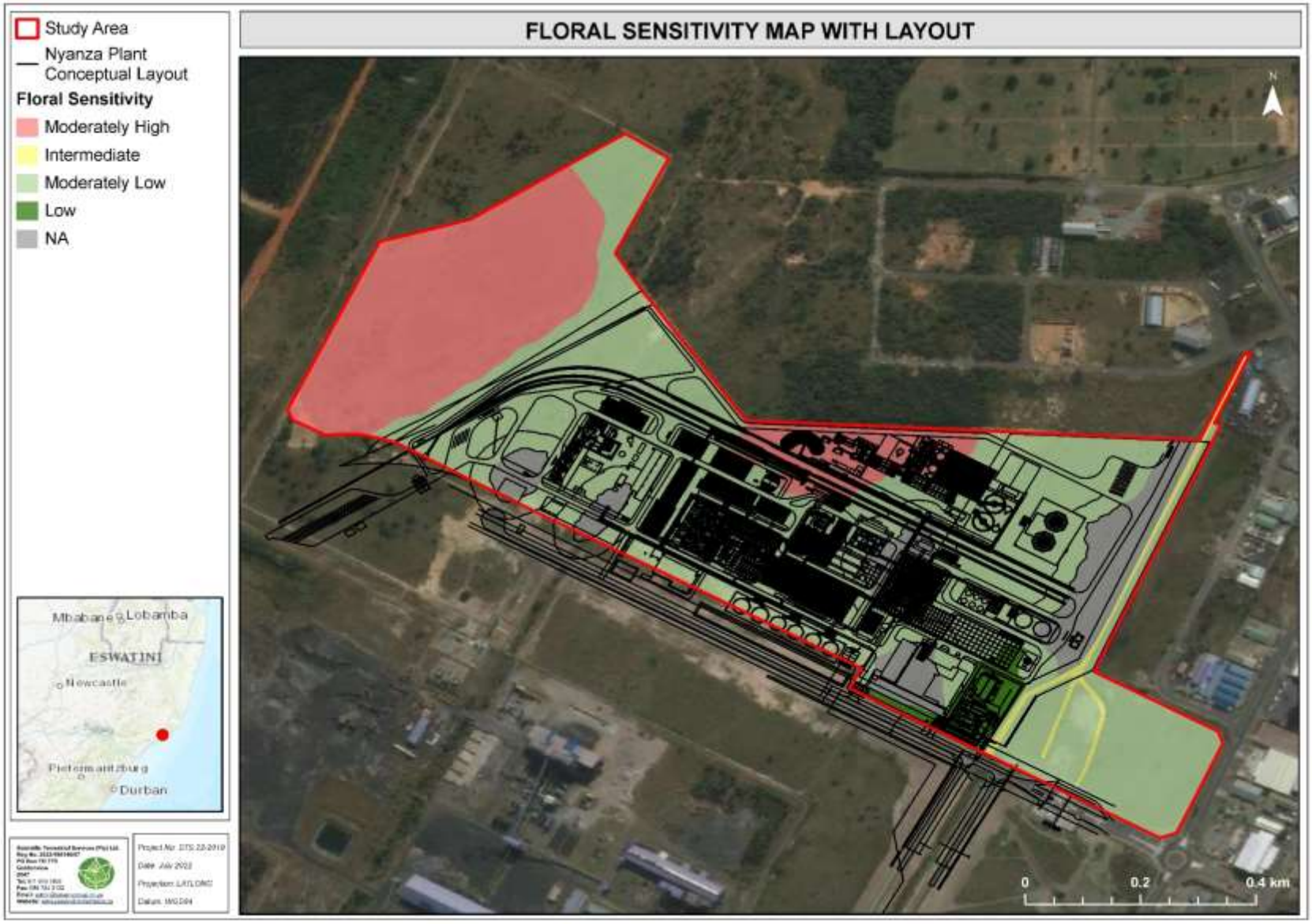


Figure 6: Conceptual illustration of the habitat sensitivity associated with study area and proposed development layout as identified during the field assessment. Wetlands (including the Seep Wetlands and Wetland Flats) that will be infilled do not have an assigned sensitivity. They have been mapped in grey and assigned a NA (Not Applicable).

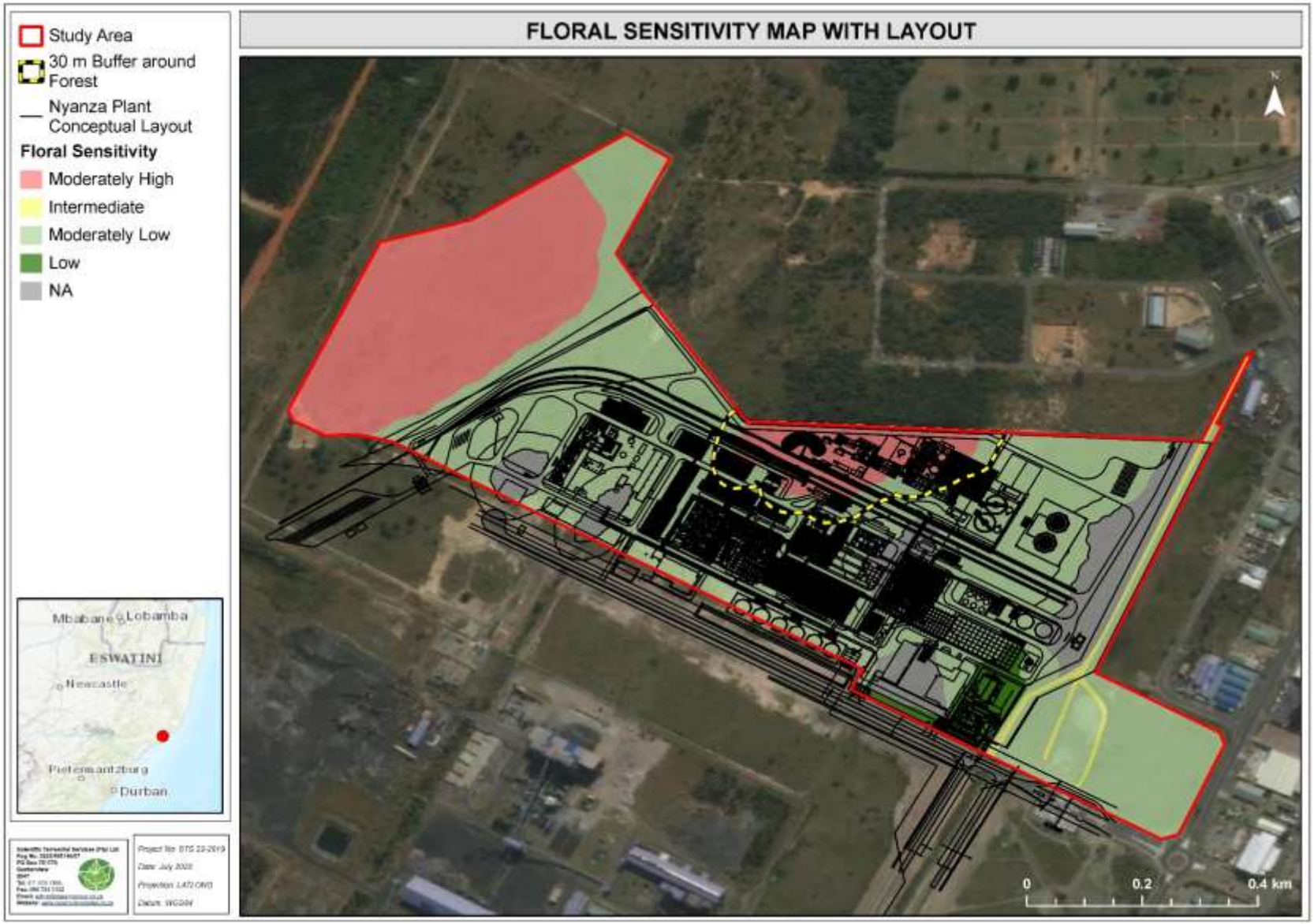


Figure 7: Conceptual illustration of the habitat sensitivity associated with the study area and proposed development layout and proposed 30 m forest exclusion buffer. Wetlands (including the Seep Wetlands and Wetland Flats) that will be infilled do not have an assigned sensitivity. They have been mapped in grey and assigned a NA (Not Applicable).

5 IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed development for the study area. An impact discussion and assessment (using the methodology as provided by the proponent – see Appendix C of Part A) of all potential i) Pre-construction & Planning Phase, ii) Construction Phase, and ii) Operational & Maintenance Phase impacts for the 1) floral habitat and diversity, and 2) SCC habitat and diversity associated with the study area are provided in Section 5.1 and 5.2. All mitigatory measures required to minimise the perceived impacts are presented in Section 5.1.

The authorised Phase 1F of the development includes infilling of the Wetland Flats and the Seep Wetlands within the study area (refer to Section 1.1 for further details). Thus, no impacts pertaining to these wetland types are presented in the impact assessment below. However, the Depression Wetland in the west of the study area is not within the proposed layout and will therefore not be infilled. As such, the impacts associated with the Depression Wetland (i.e., secondary impacts) are presented in the impact assessment below.

For the Pre-Construction & Planning phase, all habitat units were assessed collectively. For the Construction Phase, the impacts for each habitat unit, namely Degraded Hygrophilous Grassland, Degraded Coastal Forest, Thicket Habitat, Depression Wetland (as explained above), and Transformed Habitat, were assessed independently. For the Operational & Maintenance Phase, the impacts were assessed collectively for habitats that are 1) entirely Transformed already, or 2) that will be entirely transformed due to the proposed development (e.g., Thicket habitat and Transformed Habitat). The remaining habitats (i.e., the Degraded Hygrophilous Grassland, Degraded Coastal Forest and, the Depression Wetland), were assessed independently for the Operational & Maintenance Phase.

5.1 Floral Impact Assessment Results

The below table indicates the perceived risks to the floral ecology associated with all phases of the proposed development. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Table 3: Impact on the (1) floral habitat and diversity, and (2) SCC (across all habitat units*) associated with the proposed development activities for the Pre-construction & Planning Phase. *Excluding the Wetland types that EA has been granted for infill.

(1) IMPACT on Floral Habitat & Diversity across the habitats: Degradation and modification of the receiving environment, loss of floral habitat and species diversity resulting from: - Inconsiderate planning, infrastructure design and placement leading to unnecessary edge effects impacts, e.g., failure to compile an AIP control and management plan, and/or erosion or stormwater control plan or poor infrastructure design leading to increased risk of hazardous chemical leakage into surrounding areas.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Probable	**HIGH**	– ve	High
Essential mitigation measures: ➢ Minimise loss of natural vegetation where possible through effective planning and limiting the development footprint to what is essential. The designs must further adhere to all legislation and all reasonable precautions must be taken to prevent potential spills and /or leaks; ➢ Ensure development layouts are designed to ensure that hazardous chemical leakage and/or spills do not occur. Layouts should include infrastructure to house spill kits etc.; ➢ It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, are not placed outside of the authorised footprint, especially within the freshwater habitat (i.e., the Depression Wetland that is to be left as open space); ➢ The area in which construction activities is to take place has been fenced off and clearly demarcated. The fence should be checked regularly to ensure no holes have been created etc.; ➢ An AIP Management/Control Plan should be compiled by a qualified professional and implemented prior to the start of construction activities. No chemical control of AIPs to occur without a suitably trained professional and no chemical control to be permitted near the Depression Wetland. Also, only the use of certified chemicals should be allowed; ➢ As is often the recommendation from the forestry department within the DFFE, a 30 m exclusion buffer around forests should be implemented to shield against adverse impacts. If avoidance of such areas is not possible, permits from the DFFE must be applied for (i.e., clearance of natural forests - clearing of trees in natural forests [Section 7(1) of the NFA]). In such instances, it is recommended that the proponent liaises with the relevant authorities regarding the need for potential offset activities; and ➢ Appropriate Rehabilitation measures, Erosion Control, stormwater management, and Bush Encroachment Control Plans should be implemented to ensure control thereof.								
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Probable	**MEDIUM**	– ve	High
(2) IMPACT on SCC across the habitats: loss of floral SCC and/or habitat because of: - Failure to conduct an additional site walkdown for additional SCC observed during the 2022 field assessment; and - Failure to obtain the necessary permits for nationally and provincially protected species and failure to relocate floral SCC to suitable habitat outside of the surface infrastructure footprint.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	High 3	Long-term 3	**high** **7**	Definite	**HIGH**	– ve	High
Essential mitigation measures: ➢ A walkdown of the footprint area should take place prior to vegetation clearing and should be conducted by a suitably qualified specialist. A walkdown (and associated rescue and relocation) has occurred within the Degraded Hygrophilous Grassland habitat and thicket habitat. However, a walk-through of the remaining areas within the study area, particularly the Degraded Coastal Forest Habitat is recommended; ➢ Permits from Ezemvelo KZN Wildlife and authorisation from the DFFE should be obtained to remove, cut, or destroy any provincially and/or nationally protected species before any vegetation clearing may take place; ➢ The identification and marking of floral SCC must take place prior to the commencement of the construction phase where vegetation clearing will occur. Rescue and relocation activities of the identified SCC should occur during the construction phase, before the commencement of vegetation clearing (refer to tables below); and ➢ It is recommended that for species that cannot be relocated, seedlings and /or seeds of these species are harvested form the development footprint area before clearing activities commence and grown under nursery conditions with the purpose to use these species for rehabilitation at a later stage.								
With mitigation	Regional 2	Medium 2	Medium-term 2	**Medium** **6**	Definite	**MEDIUM**	– ve	High

Table 4: Impact on the (1) floral habitat and diversity, and (2) floral SCC associated with the Degraded Hygrophilous Grassland for the proposed development activities for the Construction Phase.

(1) IMPACT on Habitat and Diversity within the Degraded Hygrophilous Grassland: Construction-related activities, including vegetation clearing activities, will result in:

- Direct loss of Degraded Hygrophilous Grasslands within the approved footprints due to site clearing;
- A decrease in floral habitat and diversity, reduced habitat integrity, and fragmentation of the habitat from surrounding areas;
- Construction-related disturbances (soil disturbance, increased movement of workers etc.) likely to promote AIP spread which will result in the replacement of native flora outside of the planned footprint;
- Construction-related disturbances (uncontrolled dust generation and potential increased fire frequency) impacting on natural habitat outside of the planned footprints; and
- Increased movement of vehicles and construction teams, including lack of rehabilitation of bare areas outside of the approved footprints, resulting in compaction and degradation of soils and a higher probability of erosion.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Definite	**HIGH**	– ve	High

Essential mitigation measures:

- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint – manage footprint creep to surrounding areas;
- The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat outside of the authorised footprint. This can be achieved by:
  - Ensuring continued demarcation of all footprint areas during construction activities;
  - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal or garden refuse sites;
  - A rehabilitation plan must be prepared and implemented, and all rehabilitation actions must be adhered to in order to mitigate edge effects on the receiving (and surrounding) environment;
  - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management should be implemented to ensure that no unnatural preferential flow paths are created and to prevent erosion and siltation;
  - All soils compacted because of construction activities should be ripped and profiled and reseeded with indigenous seed mixes; and
  - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made of Category 1b species identified within the study area (refer to Section 3.7 of this report).
- If any spills/leaks/storage failures occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder re-establishment of vegetation down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and
- No illicit fires must be allowed during the construction of the proposed development.

With mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High

(2) IMPACT on SCC within the Degraded Hygrophilous Grassland: Vegetation clearing leads to: - the spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High
Essential mitigation measures: ➢ Limit impact footprint to what is absolutely necessary; ➢ Construction should take place in a phased manner, commencing only in areas where SCC have already been rescued and relocated (i.e., during the Pre-construction phase). All necessary permits and authorisations will need to be obtained from authorities before the commencement of relocation/ destruction activities occur; and ➢ Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed disturbance footprint area.								
With mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High

Table 5: Impact on (1) floral habitat and diversity, and (2) floral SCC associated with the Degraded Coastal Forest for the proposed development activities for the Construction Phase.

(1) IMPACT on Habitat and Diversity within the Degraded Coastal Forest: Construction-related activities, including vegetation clearing activities, will result in:

- Direct loss of Degraded Coastal Forest within the approved footprints due to site clearing;
- A decrease in floral habitat and diversity, reduced habitat integrity, and fragmentation of the habitat from surrounding areas, as well as loss of significant and specialised habitat conditions;
- Construction-related disturbances (soil disturbance, increased movement of workers etc.) likely to promote AIP spread which will result in the replacement of native flora outside of the planned footprint;
- Construction related activities within the forest and the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachment
- Construction-related disturbances (uncontrolled dust generation and potential increased fire frequency) impacting on natural habitat outside of the planned footprints; and
- Increased movement of vehicles and construction teams, including lack of rehabilitation of bare areas outside of the approved footprints, resulting in compaction and degradation of soils and a higher probability of erosion.
- Compaction and degradation of soils which have a higher probability of erosion.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	High 3	Long-term 3	**High** **7**	Definite	**HIGH**	– ve	High

Essential mitigation measures:

- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint – manage footprint creep to surrounding areas;
- Restrict construction of new infrastructure to outside of the 30 m forest exclusion buffer where possible and feasible. If unfeasible, the proponent should liaise with the relevant authorities to investigate alternative mitigation measures;
- The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat outside of the authorised footprint. This can be achieved by:
  - Ensuring continued demarcation of all footprint areas during construction activities;
  - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal site;
  - A rehabilitation plan must be prepared and implemented, and all rehabilitation actions must be adhered to in order to mitigate edge effects on the receiving environment. The proponent should also rehabilitate he remaining areas of the forest, even if they are not located directly on the property in question;
  - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management;
  - All soils compacted because of construction activities should be ripped and profiled and reseeded with indigenous seed mixes; and
  - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made of Category 1b species identified within the study area (refer to Section 3.7 of this report).
- Access roads should be kept to existing roads so to reduce fragmentation of remaining Degraded Coastal Forest. Vehicles to be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities;
- If any spills/leaks/storage failures occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder re-establishment of vegetation down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and
- No illicit fires must be allowed during the construction of the proposed development.

With mitigation	Local 1	High 3	Long-term 3	**High** **7**	Definite	**HIGH**	– ve	High

(2) IMPACT on SCC within the Degraded Coastal Forest: Vegetation clearing leads to: - the spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Definite	**HIGH**	– ve	High
Essential mitigation measures: ➢ Limit impact footprint to what is absolutely necessary; ➢ Construction should take place in a phased manner, commencing only in areas where SCC have already been rescued and relocated (i.e., during the Pre-construction phase). All necessary permits and authorisations will need to be obtained from authorities before the commencement of relocation/ destruction activities; and ➢ Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed disturbance footprint area.								
With mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High

Table 6: Impact on (1) floral habitat and diversity, and (2) floral SCC associated with the Thicket Habitat for the proposed development activities for the Construction Phase.

(1) IMPACT on Habitat and Diversity within the Thicket habitat: Construction-related activities, including vegetation clearing activities, will result in:

- Direct loss of Thicket habitat within the approved footprints due to site clearing;
- A decrease in floral habitat and diversity, reduced habitat integrity, and fragmentation of the habitat from surrounding areas;
- Construction-related disturbances (soil disturbance, increased movement of workers etc.) likely to promote AIP spread which will result in the replacement of native flora outside of the planned footprint;
- Construction-related disturbances (uncontrolled dust generation and potential increased fire frequency) impacting on natural habitat outside of the planned footprints; and
- Increased movement of vehicles and construction teams, including lack of rehabilitation of bare areas outside of the approved footprints, resulting in compaction and degradation of soils and a higher probability of erosion.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High

Essential mitigation measures:

- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint – manage footprint creep to surrounding areas;
- The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat outside of the authorised footprint. This can be achieved by:
  - Ensuring continued demarcation of all footprint areas during construction activities;
  - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal site;
  - A rehabilitation plan must be prepared and implemented, and all rehabilitation actions must be adhered to in order to mitigate edge effects on the receiving environment;
  - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management;
  - All soils compacted because of construction activities should be ripped and profiled and reseeded with indigenous seed mixes; and
  - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made of Category 1b species identified within the study area (refer to Section 3.7 of this report).
- Access roads should be kept to existing roads so to reduce fragmentation of remaining Thicket habitat. Vehicles to be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities;
- If any spills/leaks/storage failures occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder re-establishment of vegetation down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and
- No illicit fires must be allowed during the construction of the proposed development.

With mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High

(1) IMPACT on SCC within the Thicket Habitat: Vegetation clearing leads to: - The spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High
Essential mitigation measures: ➢ Limit impact footprint to what is absolutely necessary; ➢ Construction should take place in a phased manner, commencing only in areas where SCC have already been rescued and relocated (i.e., during the Pre-construction phase). All necessary permits and authorisations will need to be obtained from authorities before the commencement of relocation/ destruction activities occur; and ➢ Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed disturbance footprint area.								
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Definite	**LOW**	– ve	High

Table 7: Impact on (1) floral habitat and diversity, and (2) floral SCC associated with the Depression Wetland (i.e., undeveloped Freshwater Habitat) for the proposed development activities for the Construction Phase.

(1) IMPACT on Habitat Diversity within the Freshwater Habitat: Secondary impacts because of construction-related activities, e.g., vegetation clearing activities in neighbouring habitats will result in: - Edge effects e.g., dumping of cleared vegetation or construction rubble and/or the AIP spread which will result in the replacement of native flora, the reduction in floral habitat and diversity, reduced habitat integrity, and habitat fragmentation of the habitat with surrounding areas, as well as loss of significant and specialised habitat conditions; and - Compaction and degradation of soils which have a higher probability of erosion.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Definite	**HIGH**	– ve	High
Essential mitigation measures: ➢ Removal of vegetation must remain within the approved development footprint (i.e., outside of the Depression wetland) – manage footprint creep to surrounding areas. As this wetland is not proposed to be developed, strict mitigation measures should be implemented to ensure no construction of any sort or associated activities (e.g., dumping of cleared vegetation or construction rubble) occurs within the habitat ; ➢ Appropriate edge effect management must be implemented. Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat, including the Depression Wetland. This can be achieved by: - Ensuring continued demarcation of all footprint areas during construction activities; - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal site; - A rehabilitation plan must be prepared and implemented, and all rehabilitation actions must be adhered to in order to mitigate edge effects on the receiving environment; - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management; - All soils compacted because of construction activities should be ripped and profiled and reseeded with indigenous seed mixes; and - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made of Category 1b species identified within the study area (refer to Section 3.7 of this report). ➢ Access roads should be kept to existing roads so to reduce fragmentation. No new roads should be developed within the Depression Wetland or within its associated buffers (refer to the Freshwater assessment (SAS 22-1058 (2022)). Vehicles to be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities; ➢ If any spills/leaks/storage failures occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder re-establishment of vegetation or ecological function down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and ➢ No illicit fires must be allowed during the construction of the proposed development.								
With mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Probable	**MEDIUM**	– ve	High

(2) IMPACT on SCC within the Freshwater Habitat: Secondary impacts because of construction-related activities, e.g., vegetation clearing activities in neighbouring habitats will result in: - The loss of floral SCC and SCC habitat (e.g., in the case of vegetation cutting and/or rubble from construction activities that are dumped in the Wetland and/or associated buffer); and - The spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Probable	**HIGH**	– ve	High
Essential mitigation measures: ➢ Ensure footprint creep into the Wetland does not occur. Furthermore, dumping of vegetation cuttings and/or rubble should not be allowed within the extent (or associated buffers) of the depression wetland; ➢ Ensure no collection of floral SCC occurs by personnel; and ➢ Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed disturbance footprint area.								
With mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Probable	**MEDIUM**	– ve	High

Table 8: Impact on (1) floral habitat and diversity, and (2) floral SCC associated with the Transformed Habitat for the proposed development activities for the Construction Phase.

(1) Habitat Diversity within the Transformed Habitat: A lack of vegetation means that vegetation clearing activities are unlikely to be of concern. However, issues of concern include: - Construction-related disturbances (soil disturbance, increased movement of workers etc.) likely to promote AIP spread which will result in the replacement of native flora outside of the planned footprint; - Construction-related disturbances (uncontrolled dust generation and potential increased fire frequency) impacting on natural habitat outside of the planned footprints; and - Increased movement of vehicles and construction teams, including lack of rehabilitation of bare areas outside of the approved footprints, resulting in compaction and degradation of soils and a higher probability of erosion.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Definite	**LOW**	– ve	High
Essential mitigation measures: ➢ The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat outside of the authorised footprint. This can be achieved by: - Ensuring continued demarcation of all footprint areas during construction activities; - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal site; - A rehabilitation plan must be prepared and implemented, and all rehabilitation actions must be adhered to in order to mitigate edge effects on the receiving environment; - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management; - All soils compacted because of construction activities should be ripped and profiled and reseeded with indigenous seed mixes; and - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made of Category 1b species identified within the study area (refer to Section 3.7 of this report). ➢ Access roads should be kept to existing roads so to reduce fragmentation. Vehicles to be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities; ➢ If any spills/leaks/storage failures occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder re-establishment of vegetation or ecological function down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and ➢ No illicit fires must be allowed during the construction of the proposed development.								
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Definite	**LOW**	– ve	High
(2) IMPACT on SCC within the Transformed Habitat: A lack of vegetation means that vegetation clearing activities are unlikely to be of concern. However, issues of concern include: - The spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Low 1	Medium-term 2	**Very Low** **4**	Definite	**VERY LOW**	– ve	High
Essential mitigation measures: ➢ Ensure footprint creep into the Wetland does not occur. Furthermore, dumping of vegetation cuttings and/or rubble should not be allowed within the extent (or associated buffers) of the depression wetland; and ➢ Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed disturbance footprint area.								
With mitigation	Local 1	Low 1	Short-term 1	**Very low** **3**	Possible	**INSIGNIFICANT**	– ve	High

Table 9: Impact on the (1) floral habitat and diversity, and (2) SCC for <u>all habitats</u> (especially within the surrounding areas) except for the Depression Wetland associated with the proposed development activities for the Operational & Maintenance Phase.

(1) IMPACT on Floral Habitat & Diversity across the habitats: loss of floral habitat and diversity because of: - Ineffective or malfunctioning of storage facilities that store hazardous chemicals, resulting in chemical leaks and/or spills that contaminate the receiving environment; - Ineffective rehabilitation of exposed and impacted areas, increasing erosion risk and AIP proliferation within the surrounding areas; - An increased risk of fire frequency impacting on floral communities and SCC outside of the development footprint; and - Ineffective edge effect management (e.g., AIP control) which leads to the continued spread of AIP species within the surrounding natural areas.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Probable	**MEDIUM**	– ve	High
Essential mitigation measures: ➢ No dumping of litter or refuse must be allowed on-site. Appropriate disposal of such material should be at a separate waste facility; ➢ Edge effects arising from the proposed development, such as erosion and AIP species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020) (refer to Section 3.7 of this report); ➢ Ongoing AIP monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas; ➢ If any spills/leaks/storage failures occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder re-establishment of vegetation or ecological function down the line. Spill kits should be kept on-site within workshops. In the event of infrastructure failure (i.e., chemical storage facilities) or a breakdown, maintenance of infrastructure and vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; ➢ Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which complies with legal standards; and ➢ If any fires break out, they should be extinguished immediately. Fire extinguishers and hoses should be easily accessible through the proposed infrastructure development to allow for quick use in the case of fire. This is of particular importance given that the study area (in which hazardous chemicals are stored, thus resulting in an increase fire risk) is surrounded by grassland and forest habitat (which may catch a light easily).							
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Probable	**LOW**	– ve	High

(2) IMPACT on SCC across the habitats: Loss of SCC individuals and suitable habitat because of:

- Failure to monitor the success of relocated floral SCC;
- The increased introduction and proliferation of AIP species due to a lack of maintenance activities, or poorly implemented and monitored AIP Management programme, leading to ongoing displacement of natural vegetation outside of the footprint area;
- Loss of SCC may occur because of the increased human presence in the area once operational, potentially leading to Illegal harvesting/ collection of SCC; and
- An increased risk of fire frequency impacting on floral communities and SCC outside of the development footprint.

	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Probable	**MEDIUM**	– ve	High
Essential mitigation measures: ➢ Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations. No harvesting of SCCs by operational and maintenance teams must be allowed; ➢ Edge effects arising from the proposed development, such as erosion and AIP species proliferation, which may affect adjacent SCC habitat, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020) (refer to Section 3.7 of this report); and ➢ Ongoing AIP plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas.							
With mitigation	Local 1	Low 1	Long-term 3	**Low** **4**	Probable	**LOW**	– ve	High

Table 10: Impact on the (1) floral habitat and diversity, and (2) SCC for the Depression Wetland (associated with the Freshwater Habitat) associated with the proposed development activities for the Operational & Maintenance Phase.

(1) IMPACT on Floral Habitat & Diversity the Depression Wetland: loss of floral habitat and diversity because of: - Ineffective or malfunctioning of storage facilities that store hazardous chemical, resulting in chemical leaks and/or spills that contaminate the receiving environment, including the Depression Wetland; - Ineffective rehabilitation of exposed and impacted areas, increasing erosion risk and AIP proliferation within the surrounding areas; - An increased risk of fire frequency impacting on floral communities within the Depression Wetland and outside of the development footprint; and - Ineffective edge effect management (e.g., AIP control) which leads to the continued spread of AIP species within the surrounding natural areas as well as the continued fragmentation and degradation of remaining forest patches in the surrounding areas.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Probable	**MEDIUM**	– ve	High
Essential mitigation measures: ➢ No dumping of litter or refuse must be allowed on-site. Appropriate disposal of such material should be at a separate waste facility; ➢ Edge effects arising from the proposed development, such as erosion and AIP species proliferation, which may affect and further fragment remaining (surrounding) forest patches, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020) (refer to Section 3.7 of this report); ➢ Ongoing AIP monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas; ➢ If any spills/leaks/storage failures occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder re-establishment of vegetation or ecological function down the line. Spill kits should be kept on-site within workshops. In the event of infrastructure failure (i.e., chemical storage facilities) or a breakdown, maintenance of infrastructure and vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; ➢ Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which complies with legal standards; and ➢ If any fires break out, they should be extinguished immediately. Fire extinguishers and hoses should be easily accessible through the proposed infrastructure development to allow for quick use in the case of fire. This is of particular importance given that the study area (in which hazardous chemicals are stored, thus resulting in an increase fire risk) is surrounded by grassland and forest habitat (which may catch a light easily).							
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Probable	**LOW**	– ve	High
(2) IMPACT on Floral SCC for the Depression Wetland: Ineffective edge effect management leading to: - Failure to monitor the success of relocated floral SCC (where applicable); - AIP control and erosion that can lead to the loss of SCC habitat and availability.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Probable	**MEDIUM**	– ve	High
Essential mitigation measures:								

➢ Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations. No harvesting of SCCs by operational and maintenance teams must be allowed; ➢ Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020) (refer to Section 37 of this report); and ➢ Ongoing AIP plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas. No chemical control of AIPs to occur without a certified professional and no chemical control to be permitted in Freshwater habitat.								
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Probable	**LOW**	– ve	High

5.2 Impact Discussion

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed development activities.

Prior to mitigation measures the i) Pre-construction & Planning Phase, ii) Construction Phase and iii) Operational & Maintenance Phase scored an impact significance as follows:

Table 11: Impacts associated with the proposed development.

Habitat	Component	Pre-mitigation Impact	Post-mitigation Impact
Pre-Construction & Planning Phase			
All Habitats (excluding infilled Wetlands that were not assessed)	Floral Habitat Diversity	High	Medium
	Floral SCC	High	Medium
Construction Phase			
Degraded Hygrophilous Grassland	Floral Habitat Diversity	High	Medium
	Floral SCC	Medium	Medium
Degraded Coastal Forest	Floral Habitat Diversity	High	High
	Floral SCC	High	Medium
Thicket Habitat	Floral Habitat Diversity	Medium	Medium
	Floral SCC	Medium	Low
Depression Wetland	Floral Habitat Diversity	High	Medium
	Floral SCC	High	Medium
Transformed Habitat	Floral Habitat Diversity	Low	Low
	Floral SCC	Very Low	Insignificant
Operational & Maintenance Phase			
All Habitats (excluding Freshwater Habitat)	Floral Habitat Diversity	Medium	Low
	Floral SCC	Medium	Low
Depression Wetland	Floral Habitat Diversity	Medium	Low
	Floral SCC	Medium	Low

5.2.1 Impact on Floral Habitat and Diversity

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed development activities. The proposed development activities will result in the clearance of vegetation (> 30 ha), which will lead to a loss of floral habitat and diversity within the study area.

The proposed development activities within the Degraded Hygrophilous Grassland (of moderately low floral sensitivity) will result in the extensive loss of the associated floral habitat. However, this habitat is largely degraded in nature and did not support a floral community representative of the reference vegetation type. As such, a significant loss of the associated degraded floral communities is not anticipated (impact restricted to local scale). Despite the extensive loss of floral species in the Degraded Hygrophilous Grassland, it is unlikely to impact floral communities at a larger local and regional (provincial) level.

The proposed development activities will result in negative impacts on a sensitive habitat unit, namely the Degraded Coastal Forest Habitat (of moderately high floral sensitivity). This habitat unit provides unique habitat both within the study area and within the greater surrounding

areas. Development within the Forest Habitat and the the associated destruction thereof will greatly impact on the species diversity and the associated habitat provided within such habitat. Usually, impacts to such habitat could be minimised by means of effective infrastructure and development layout plans, i.e., development plans be designed to, as far as is feasible, avoid the associated habitat. As is often the recommendation from the forestry department within the DFFE, a 30 m exclusion buffer around forests should be implemented to shield against adverse impacts. However, avoidance of the Degraded Forest Habitat is unlikely a feasible option as there are no other alternate areas for infrastructure to be placed. In instances where avoidance of such areas is not possible, permits from the DFFE must be applied for (i.e., clearance of natural forests - clearing of trees in natural forests [Section 7(1) of the NFA]). In such instances, it is recommended that the proponent liaise with the relevant authorities and discuss the need for potential biodiversity offsets. If mitigation measures are not effectively implemented, then a significant loss of floral communities associated with the Degraded Coastal Forest is anticipated for the proposed development and further, the proposed development is likely to impact floral communities at a larger local and regional (provincial) level.

The proposed development activities within the Thicket Habitat (of moderately low floral sensitivity) will result in the extensive loss of the associated floral habitat. However, this habitat is largely encroached and degraded in nature and did not support a floral community representative of the reference vegetation type. As such, a significant loss of the associated degraded floral communities is not anticipated (impact restricted to local scale). Despite the extensive loss of floral species in the Thicket Habitat, it is unlikely to impact floral communities at a larger local and regional (provincial) level.

Although no development is proposed within the Depression Wetland (of moderately high floral sensitivity) in the west of the study area, this wetland feature is still subject to edge effect impacts from the associated development activities. This wetland feature provides unique habitat within the study area and serves as dispersal and connective corridors within the surrounding areas. The indiscriminate placement of the proposed infrastructure within the Depression Wetland will result in broader-scale impacts on floral communities if flow pattern of these systems is altered, or if edge effect management such as AIP control is not effectively implemented. It is thus recommended that appropriate measures should be taken to minimise the impacts on the Wetland feature. If mitigation measures are not implemented, then a significant loss of floral communities associated with the Depression Wetland (i.e., within the Freshwater Habitat) is anticipated. Given the connective properties of the Depression Wetland within the greater landscape, the proposed development may impact floral communities at a larger local level.

The proposed development within the Transformed Habitat Unit (of low sensitivity) is not deemed likely to impact on the floral habitat and diversity that is located within this habitat unit, nor is it likely to impact floral communities at a larger local and regional (provincial) level.

Negative impacts likely to be associated with the floral ecology within study area includes, but are not limited to, the following:

- Development footprint creep and placement of infrastructure within natural habitat outside of the authorised footprint, i.e., within the Depression Wetland in the west;
- Destruction of floral habitat during construction activities;
- AIP proliferation, bush encroachment, and erosion in disturbed areas as well as fragmentation of surrounding habitats; and
- Increased human movement, leading to greater pressure on natural floral habitat and increasing the potential for harvesting of protected floral species.

5.2.2 Impacts on Floral SCC

The study area does provide habitat to support SCC. The loss of SCC within areas where vegetation clearance will occur is deemed definite – particularly if Degraded Coastal Forest and the western Depression Wetland will be affected). Impacts on SCC from the proposed development activities can be reduced if vegetation clearing is kept only to areas where development activities and associated surface infrastructure will be erected and vegetation in between these structures be retained.

The habitats within the study area provide suitable habitat to sustain viable populations of floral SCC, namely protected orchid species (as per the KNNCMAA), *Disa woodii,* and protected species within the Amaryllidaceae Family (as per the KNNCMAA). A Floral walkdown of the study area was conducted in 2015 and permits granted for the relocation of *Boophone disticha* and *Crinum macowanii* within the study area. These species were recently relocated (see STS 22-2019 (2022) for details). However, the orchid species (*Disa woodii*) identified on site during 2022 was not previously identified and as such no relocation of this species has occurred. If the proposed development is authorised, it will be necessary to conduct a thorough walkdown of all the footprint areas and all floral SCC marked for possible relocation to suitable habitat outside the direct footprint (as far as is feasible). Permits from the necessary authorities will be required for the possible relocation, removal, or destruction of this species before vegetation clearing activities commence.

Activities which are likely to negatively affect the flora of conservation concern within and around the study area include, but are not limited to, the following:

- Placement of infrastructure within sensitive floral habitat (particularly within the Degraded Coastal Habitat or the western Depression Wetland) or habitat favoured by the recorded protected floral species;
- Irreversible destruction of favourable floral habitat for SCC during construction activities;
- Poorly managed habitat where SCC have been relocated; and
- Poorly managed AIP proliferation with subsequent displacement of floral SCC outside of authorised footprints.

5.2.3 Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas

The study area overlaps important conservation features including CBA Irreplaceable areas and a nationally threatened Ecosystem, namely the CR Kwambonambi Hygrophilous Grasslands Ecosystem. The presence of CBA Irreplaceable areas and Threatened Ecosystem habitat within the i) Degraded Hygrophilous Grassland, Thicket Habitat, and Transformed Habitat was not supported; given the level of anthropogenic influences experienced both within and around these habitats and thus the subsequent habitat degradation and fragmentation (and the subsequent influence this has on ecosystem processes (e.g., dispersal corridors), the presence of intact habitat of important conservation features was absent. However, such habitat was confirmed for the Freshwater Habitat (particularly the western Depression Wetland). Although the western Depression Wetland habitats have been impacted by anthropogenic influences (that have subsequently resulted in degradation within the habitat), this freshwater feature still provide suitable habitat to support an array of species as well as ecological processes (e.g., dispersal and connective corridors, nutrient cycling etc.). Despite the degradation and habitat fragmentation that the western Depression Wetland have experienced, it still provides important ecological features within the landscape, albeit modified. The presence of intact (albeit modified) CBA habitat was thus confirmed for this feature.

5.2.4 Impact on Indigenous Forests

The Degraded Coastal Forest Habitat meets the NFA definition of “natural forests”. Although this habitat has experienced some degradation historically (e.g., firewood collection, AIP proliferation, etc.,), the habitat supports higher levels of biodiversity than the surrounding areas, contributing significantly towards woody species diversity. The Forest habitat also provide important ecological functions within the landscape (e.g., dispersal corridors). Thus, loss of the forest habitat may impact ecological connectivity within the greater landscape.

Where possible, it is advised that the development plans be designed to avoid the Degraded Coastal Forest Habitat. As is often the recommendation from the forestry department within the DFFE, a 30 m exclusion buffer around forests should be implemented to shield against adverse impacts. If avoidance of such areas is not possible, permits from the DFFE must be applied for (i.e., clearance of natural forests - clearing of trees in natural forests [Section 7(1) of the NFA]). In such instances, it is recommended that the proponent liaise with the necessary authorities.

5.2.5 Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key residual impacts that have been identified:

- Permanent loss of and altered floral diversity of sensitive habitat (i.e., Degraded Coastal Forest Habitat);
- Permanent loss of and altered floral species diversity;
- Edge effects such as further habitat fragmentation and AIP proliferation, especially within the Depression Wetland;
- Loss of connective Freshwater Habitat and thus the fragmentation of dispersal and connective corridors within the greater surrounding areas;
- Permanent loss of protected floral species and suitable habitat for such species;
- Disturbed areas are not rehabilitated to an ecologically functioning state with resulting significant loss of floral habitat, species diversity and SCC/protected floral species likely to be permanent; and
- Ongoing AIP proliferation and bush encroachment in the adjacent natural vegetation communities.

5.2.6 Cumulative Impacts

Within the surrounding areas, the current greatest threat to the floral ecology that is likely to contribute to cumulative impacts include i) the continued expansion of the surrounding infrastructure that could impact on the remaining extent of the vegetation type and further fragment landscapes, and ii) the continued proliferation of AIP species and/or bush encroachment, resulting in the overall loss of native floral communities within the local area.

6 CONCLUSION

STS was appointed to conduct a Biodiversity Assessment as part of the EIA to obtain an EA for the proposed 80 ktpa TiO_2 Plant project the RBIDZ, Richard's Bay, KZN Province. The proposed footprint associated with the development will henceforth be referred to as the "study area".

During the field assessment, five broad habitat units were identified within the study area, namely Degraded Hygrophilous Grassland, Degraded Coastal Forest, Thicket Habitat, Freshwater Habitat, and Transformed Habitat. The sensitivities, from a floral perspective, of each of the habitat units was as follows: i) the Transformed Habitat was of **low sensitivity**, the Degraded Hygrophilous Grassland and the Thicket Habitat were of a **moderately low sensitivity**, the Freshwater Habitat, ranged from **intermediate** to **moderately high sensitivity** and the Degraded Coastal Forest was of **moderately high sensitivity**.

The habitats within the study area provide suitable habitat to sustain viable populations of floral SCC. A Floral walkdown of the study area was conducted in 2015 and permits granted for the relocation of *Boophone disticha* and *Crinum macowanii* species within the study area. These species were recently relocated (see STS 22-2019 (2022) for details). However, additional species were identified on site during 2022 that were not previously identified and as such no relocation of this species has occurred. Furthermore, habitat to support other SCC is available within the habitats. If the proposed development is authorised, it will be necessary to conduct a thorough walkdown of all the footprint areas and all floral SCC marked for possible relocation to suitable habitat outside the direct footprint (as far as is feasible). Permits from the necessary authorities will be required for the possible relocation, removal, or destruction of this species before vegetation clearing activities commence.

The proposed infrastructure area will impact on two habitat units of increased sensitivity, i.e., the Degraded Coastal Forest (directly) and the western Depression Wetland (indirectly). The following recommendations are thus proposed:

- Western Depression Wetland: although no development is proposed within the Depression Wetland in the west of the study area, this wetland feature is still subject to edge effect impacts from the associated development activities. The indiscriminate placement of the proposed infrastructure either within or close to the Depression Wetland will result in broader-scale impacts on floral communities if recharge patterns etc. of these systems is altered, or if edge effect management such as AIP control is not effectively implemented. Appropriate measures must be taken to mitigate the impacts on the Wetland feature; and

- Degraded Coastal Forest: Usually, impacts to such habitat could be minimised by means of effective infrastructure and development layout plans, i.e., development plans be designed to, as far as is feasible, avoid the associated habitat. As is often the recommendation from the forestry department within the DFFE, a 30 m exclusion buffer around forests should be implemented to shield against adverse impacts. However, avoidance of the Degraded Forest Habitat is unlikely a feasible option as there are no other alternate areas for infrastructure to be placed. In instances where avoidance of such areas is not possible, permits from the DFFE must be applied for (i.e., clearance of natural forests - clearing of trees in natural forests [Section 7(1) of the NFA]). In such instances, it is recommended that the proponent liaise with the relevant authorities and discuss the need for potential biodiversity offsets.

Following the biodiversity assessment within the study area, the impacts associated with the proposed development activities were determined. Provided that strict mitigation measures are implemented, the impacts associated with the proposed development can be reduced.

It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

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APPENDIX A: Floral Method of Assessment

Floral Species of Conservational Concern Assessment

Prior to the site visit, a record of floral SCC and their habitat requirements was developed for the study area, which includes consulting the National Web-based Environmental Screening Tool. Because not all SCC have been included in the Screening Tool layers (e.g., NT and DD taxa), it remains important for the specialist to be on the lookout for additional SCC. For this study, two primary sources were consulted and are described below.

The National Web-Based Environmental Screening Tool

The Screening Tool was accessed to obtain a list of potentially occurring species of conservation concern for the study area. Each of the themes in the Screening Tool consists of theme-specific spatial datasets which have been assigned a sensitivity level namely, "*low*", "*medium*", "*high*" and "*very high*" sensitivity. The four levels of sensitivity are derived and identified in different ways, e.g., for **confirmed** areas of occupied habitat for SCC a Very High and High Sensitivity is assigned and for areas of suitable habitat where SCC may occur based on spatial models only, a Medium Sensitivity is assigned. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below[19]:

- **Very High**: Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km^2 are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) D criteria of the IUCN or species listed as Critically/ Extremely Rare under South Africa's National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale.
- **High**: Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2000) that have a spatial confidence level of less than 250 m with segments of remaining natural habitat.
- **Medium**: Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level.
- **Low**: Areas where no SCC are known or expected to occur.

BRAHMS Online Website

The Botanical Database of Southern Africa (BODATSA) is accessed to obtain plant names and floristic details (http://posa.sanbi.org/) for species of conservation concern within a selected boundary;

[19] More details on the use of the Screening Tool for Species of Conservation Concern can be found in the below resources:
- South African National Biodiversity Institute (SANBI). 2020. Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.0.
- The National Web based Environmental Screening Tool website: https://screening.environment.gov.za/screeningtool/#/pages/welcome

- This website provides access to South African plant names (taxa), specimens (herbarium sheets) and observations of plants made in the field (botanical records). Data is obtained from the BODATSA, which contains records from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KZN Herbarium in Durban (NH).
- Information on habitat requirements etc. is obtained from the SANBI Red List of South African Plants website (http://redlist.sanbi.org/).
- Typically, data is extracted for the Quarter Degree Square (QDS) in which the study area is situated but where it is deemed appropriate, a larger area can be included.

NEMBA TOPS Species

The 2007 Threatened or Protected Species (TOPS) Regulations under Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA), were taken into consideration for the Limpopo Province.

NFA Species

Protected tree species, as per the National Forest Act, 1998 (Act No. 84 of 1998) (NFA), were taken into consideration for the Limpopo Province.

Specially Protected and Protected Species

The KZN Nature Conservation Management Amendment Act, 1997 (Act No. 9 of 1997) (KZNNCMAA) provides a list of Specially Protected Species (Schedule 6) and Protected Species (Schedule 7) for the KZN Province. Species relating to these were taken into consideration for the Limpopo Province.

Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species.

The Probability of Occurrence (POC) for each floral SCC is described:

- "**Confirmed'**: if observed during the survey;
- "**High**": if within the species' known distribution range and suitable habitat is available;
- "**Medium**": if either within the known distribution range of the species or if suitable habitat is present; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

Low POC	Medium POC	High POC	Confirmed

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Floral Habitat Sensitivity

The floral habitat sensitivity of each habitat unit was determined by calculating the mean of five different parameters which influence floral communities and provide an indication of the overall floristic ecological integrity, importance and sensitivity of the habitat unit. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Floral SCC:** The confirmed presence or potential for floral SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Unique Landscapes:** The presence of unique landscapes or the presence of an ecologically intact habitat unit in a transformed region;
- **Conservation Status:** The conservation status of the ecosystem or vegetation type in which the habitat unit is situated based on local, regional and national databases. Whether the habitat is representative of a Critical Biodiversity Area or forms part of an Ecological Support Area is also taken into consideration;

- **Floral Diversity:** The recorded floral diversity compared to a suitable reference condition such as surrounding natural areas or available floristic databases; and
- **Habitat Integrity:** The degree to which the habitat unit is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the floral habitat sensitivity class in which each habitat unit falls. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the habitat unit in question. In order to present the results use is made of spider diagrams to depict the significance of each aspect of floral ecology for each vegetation type. The different classes and land-use objectives are presented in the table below:

Table A1: Floral habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimizing development potential.
≥3.5<4.5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
≥4.5 ≤5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

Vegetation Surveys

When planning the timing of a floristic survey, it is important to remember that the primary objective is not an exhaustive species list but rather to ensure that sufficient data are collected to describe all the vegetation communities present in the area of interest, to optimise the detection of SCC and to assess habitat suitability for other potentially occurring SCC (SANBI, 2020).

The vegetation survey incorporates the subjective (or stratified) sampling method. Subjective sampling is a sampling technique in which the specialist relies on his or her own professional experience when choosing sample sites within the study area. This allows representative recordings of floral communities and optimal detection of SCC. Subjective sampling is used to consider different areas (or habitat units) which are identified within the main body of a habitat/study area.

One of the problems with random sampling, another popular sampling method, is that random samples may not cover all areas of a study area equally and thus increase the potential to miss floral SCC. Random sampling methods also tend to require more time in the field to locate the amount of SCC that can be detected using subjective sampling methods - In the context of an EIA where time constraints are often restrictive, priority needs to be given to collecting data in the shortest time possible without compromising the efficiency of locating SCC (SANBI, 2020).

Vegetation structure has been described following the guideline in Edwards (1983). Refer to Figure A1 below:

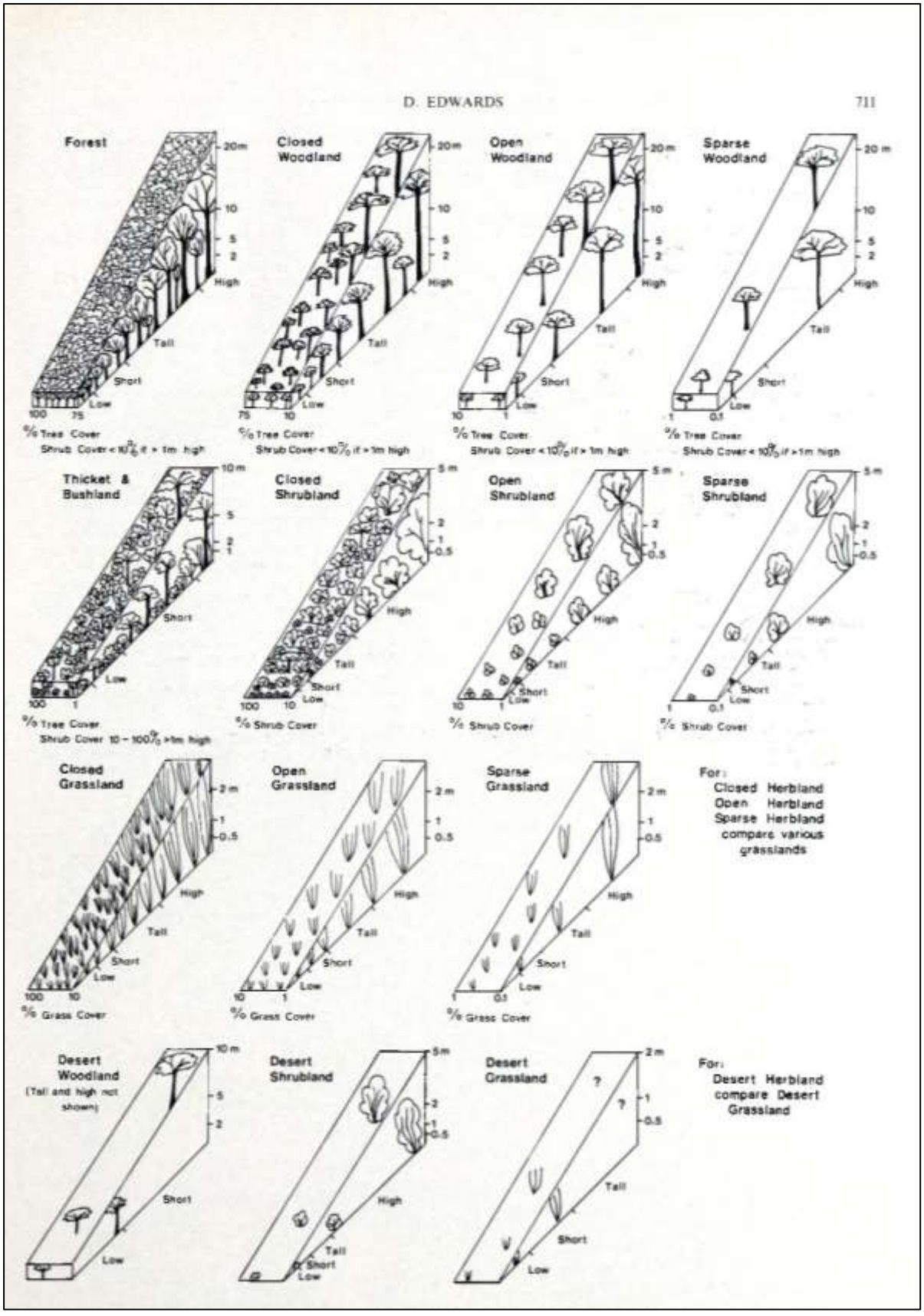

Figure A1: Diagrammatic representation of structural groups and formation classes. Only dominant growth forms are shown.

APPENDIX B: Floral SCC

South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. This scientific system is designed to measure species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action. For the POC assessment, a list of Red Data Listed (RDL) species previously recorded within the 10 km of the study area was pulled from the Botanical Database of Southern Africa (BODATSA) (http://posa.sanbi.org/). This list was further cross-checked with the NEMA TOPS flora) to identify provincially protected species previously recorded for the area.

Definitions of the national Red List categories

Categories marked with ^{N} are non-IUCN, national Red List categories for species not in danger of extinction but considered of conservation concern. The IUCN equivalent of these categories is Least Concern (LC).

- **Extinct (EX)** A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
- **Extinct in the Wild (EW)** A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
- **Regionally Extinct (RE)** A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
- **Critically Endangered, Possibly Extinct (CR PE)** Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
- **Critically Endangered (CR)** A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **Endangered (EN)** A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
- **Vulnerable (VU)** A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
- **Near Threatened (NT)** A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable and is therefore likely to become at risk of extinction in the near future.
- ^{N}**Critically Rare** A species is Critically Rare when it is known to occur at a single site but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
- ^{N}**Rare** A species is Rare when it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows:
  - Restricted range: Extent of Occurrence (EOO) <500 km^2, OR
  - Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km^2, OR
  - Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR
  - Small global population: Less than 10 000 mature individuals.
- **Least Concern** A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
- **Data Deficient - Insufficient Information (DDD)** A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined.

Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.

- **Data Deficient - Taxonomically Problematic (DDT)** A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
- **Not Evaluated (NE)** A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in **Plants of southern Africa: an online checklist** are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

The below tables present the results of the POC assessment.

NATIONALLY PROTECTED SPECIES

Table B1: RDL species (as obtained from POSA) & species identified by the Screening Tool that have the potential to be located within the study area. The POC for each species is provided below. Habitat descriptions have been excluded for the Sensitive species identified by the Screening tool to protect their identity.

Species	Threat status	Habitat	POC
Cassipourea gummiflua var. *verticillata*	VU	Evergreen forest, riverine and swamp forest. Moist scarp forest and coastal lowland forest. Generally, within Sand Forest, Northern Coastal Forest, Scarp Forest, Southern Mistbelt Forest, Swamp Forest, Lowveld Riverine Forest **Suitable Habitat: Degraded Coastal Forest**	**Medium**
Emplectanthus cordatus	VU	Scarp forest. Within Northern Coastal Forest, Scarp Forest	**Low**
Fimbrisylis aphylla	VU	Permanently wet vleis, open places and swamps, often in water. Usually near the sea. **Suitable Habitat: Freshwater Habitat** (Particularly within the wetlands that experienced less seasonal water inundation (i.e., those that were often inundated with water).)	**Medium**
Freesia laxa subsp. *azura*	VU	Grassy dunes or light shade along margins of coastal forests. Maputaland north of Richard's Bay and extending to central Mozambique.	**Low**
Oxygonum dregeanum subsp. *streyi*	EN	Coastal grasslands and palm veld, sandy soils.	**Low**
Pachycarpus concolor subsp. *arenicola*	VU	Grassy vegetation on stabilized dunes within 20 km of the coast. Northern Maputaland coastal plain and southern Mozambique.	**Low**
Pavonia dregei	VU	Coastal grasslands along forest margins, sometimes in disturbed places.	**Low**
Senecio ngoyanus	VU	Coastal grassland, marshy depressions, sometimes on granite domes.	**Low**
Sensitive species 1252[20]	VU	NA	**High**

[20] As per the best practise guidelines as stipulated by the South African National Biodiversity Institute protocol (SANBI), the name of sensitive species may not appear in the public domain as a means to protect the identity and potential location of such species.

Species	Threat status	Habitat	POC
		Suitable Habitat: Degraded Coastal Forest	
Sensitive species 649	VU	NA	**Low**
Sensitive species 191	VU	NA	**Low**
Sensitive species 89	VU	NA	**Low**
Thesium polygaloides	VU	Swamps on coastal flats. Maputaland coastal plain to Durban. **Suitable Habitat: Freshwater Habitat**	**Medium**

NEMBA TOPS List for South Africa[21]

Table B2: TOPS list for the KZN Province – plant species.

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	**Common Name**	**POC**	**Provincial Distribution**	**Conservation Status**
Diaphananthe millarii	Tree Orchid	**Low**	**Provincial distribution**: Eastern Cape, KZN **Range**: East London and Durban.	**VU**
Encephalartos aemulans	Ngotshe Cycad	**Low**	**Provincial distribution**: KZN	**CR**
Encephalartos altensteinii	Bread Palm	**Low**	**Provincial distribution**: Eastern Cape, KZN	**VU; P**
Encephalartos caffer	Breadfruit Tree	**Low**	**Provincial distribution**: Eastern Cape, KZN	**NT; P**
Encephalartos cerinus	Waxen Cycad	**Low**	**Provincial distribution**: KZN	**CR**
Encephalartos friderici-guilielmi	No common name	**Low**	**Provincial distribution**: Eastern Cape, KZN	**NT; P**
Encephalartos ghellinckii	No common name	**Low**	**Provincial distribution**: Eastern Cape, KZN	**VU; P**
Encephalartos laevifolius	Kaapsehoop Cycad	**Low**	**Provincial distribution**: Eastern Cape, KZN, Limpopo, Mpumalanga	**CR**
Encephalartos lebomboensis	Lebombo Cycad	**Low**	**Provincial distribution**: KZN, Mpumalanga	**EN**
Encephalartos msinganus	Msinga, Cycad	**Low**	**Provincial distribution**: KZN	**CR**
Encephalartos natalensis	Natal Giant Cycad	**Low**	**Provincial distribution**: Eastern Cape, KZN	**NT; P**
Encephalartos ngoyanus	Ngoye Dwarf Cycad	**Low**	**Provincial distribution**: KZN	**VU**
Encephalartos senticosus	No common name	**Low**	**Provincial distribution**: KZN	**VU; P**
Encephalartos woodii	Wood's Cycad	**Low**	**Provincial distribution**: KZN	**EW**

[21] National Environmental Management: Biodiversity Act 10 of 2004 - Threatened or Protected Species Regulations, 2007. Government Notice R152 in Government Gazette 29657 dated 23 February 2007. Commencement date: 1 September 2007 [GN R150, Gazette no. 29657], as amended.

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	**Common Name**	**POC**	**Provincial Distribution**	**Conservation Status**
Merwilla plumbea	Blue Squill	**Low**	Provincial distribution: KZN, Mpumalanga Major habitats: Grassland. Description: Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m.	**NT**
Newtonia hildebrandtii* var. *hildebrandtii	Lebombo Wattle	**Low**	**Provincial distribution**: KZN	**Now LC**
Siphonochilus aethiopicus	Wild Ginger	**Low**	**Provincial distribution**: KZN, Limpopo, Mpumalanga **Range**: Sporadically from the Letaba catchment in the Limpopo Lowveld to Swaziland. Extinct in KZN. Widespread elsewhere in Africa. **Description**: Tall open or closed woodland, wooded grassland or bushveld.	**CR**
Stangeria eriopus	No common name	**Low**	**Provincial distribution**: Eastern Cape, KZN	**VU; P**
Warburgia salutaris	Pepper-bark Tree	**Low**	**Provincial distribution**: KZN, Limpopo, Mpumalanga **Range**: North-eastern KZN, Mpumalanga and Limpopo Province. Also occurs in Swaziland, Mozambique and Zimbabwe and Malawi.	**EN**

CR = Critically Endangered**, EN** = Endangered**, EW** = Extinct in the Wild**, NT** = Near Threatened**, VU** = Vulnerable**, P** = Protected, **POC** = Probability of Occurrence.

NFA Tree species

Table B3: NFA plant list for species with a known distribution range falling within the study area[22].

SCIENTIFIC NAME (COMMON NAME)	HABITAT & DISTRIBUTION[23] [24]	NATIONAL RED LIST STATUS	POC
Afrocarpus falcatus (Bastard yellowwood)	Found in mist belt forest, scrap forest, Afromontane forest, and coastal forest.	LC P	Low
Balanites maughamii (Green thorn)	Open woodland, dry forest, thorn thicket and coastal forest.	LC P	Medium
Barringtonia racemose (Powder-puff tree)	Streamside's, freshwater swamps and less saline areas of coastal mangrove swamps.	LC P	Low
Boscia albitrunca (White-stem shepard's tree)	Found id dry, open woodland and bushveld, mostly in hot, semi-desert areas. Often on termitaria and in rocky areas.	LC P	Low

[22] https://www.thetreeapp.co.za/team/
[23] http://pza.sanbi.org/
[24] http://redlist.sanbi.org/index.php

SCIENTIFIC NAME (COMMON NAME)	HABITAT & DISTRIBUTION[23] [24]	NATIONAL RED LIST STATUS	POC
Bruguiera gymnorrhiza (Black Mangrove)	Evergreen woodlands and thickets along the intertidal mud-flats of sheltered shores, estuaries and inlets, mainly towards the seaward side of mangrove formation.	LC P	Low
Cassipourea swaziensis (Swazi onionwood)	Found on exposed quartzite rock outcrops in grassland.	LC P	Low
Catha edulis (African tea)	Found in bushveld and along margins of and in medium-to high- altitude evergreen and riverine forest. Often in rocky places.	LC P	Medium
Ceriop tagal (Indian Mangrove)	Evergreen woodlands and thickets along the intertidal mud-flats of sheltered shores, estuaries and inlets. The most inland of the rhizophoraceous mangroves.	LC P	Low
Cleistanthus schlechteri (False Tamboti)	It occurs in sand forest and woodland on sandy flats, rocky outcrops or riparian bush.	LC P	Low
Ficus trichopoda (Swamp fig)	Found in swamp forest and coastal forest, often in groves above water or marshy ground with many prop-(pillar)-roots.	LC P	Low
Mimusops caffra (Coastal Red Milkwood)	Dune forest and thicket. Found in coastal dune forest where it is commonly found growing up to the high-tide mark. Also grows in sand forest.	LC P	Low
Ocotea bullata (African acorn)	High, cool, evergreen Afromontane forests.	LC P	Low
Pittosporum viridiflorum (Cheesewood)	*Pittosporum viridiflorum* is widely distributed in the eastern half of South Africa, occurring from the Western Cape up into tropical Africa and beyond to Arabia and India. It grows over a wide range of altitudes and varies in form from one location to another. *Pittosporum viridiflorum* grows in tall forest and in scrub on the forest margin, kloofs and on-stream banks.	LC P	High
Podocarpus latifolius (Broad-leaved Yellowwood)	The real yellowwood grows naturally in mountainous areas and forests in the southern, eastern, and northern parts of South Africa, extending into Zimbabwe and further north. It is also found on rocky hillsides and mountain slopes but does not get as tall where it is exposed as it does in the forests.	LC P	Low
Rhizophora mucronata (Red Mangrove)	Evergreen woodlands and thickets along the intertidal mud-flats of sheltered shores, estuaries and inlets, mainly in the seaward side of the mangrove formation.	LC P	Low
Sclerocarya birrea* subsp. *caffra (Marula)	Found in open bushveld and woodland.	LC P	Confirmed
Sideroxylon inerme (Milkwood)	Found in dry bushvled, coastal dune thicket and forest, riverine vegetation and on termitaria.	LC P	High

CR= Critically Endangered**, LC = Least Concern; NT =** Near Threatened**, P=** Protected, POC = Probability of Occurrence; **R =** Rare

Provincially Protected Flora

Table B4: Protected plant species for the KZN Province, as per Schedule 6 and 7 of the KZN Nature Conservation Management Act, 1999 (Act No 5 of 1999). Information on species ecology and distribution obtained from the Red List of South African Plants (http://redlist.sanbi.org/index.php).

SCIENTIFIC NAME	COMMON NAME	ECOLOGY & DISTRIBUTION / RANGE	IUCN	POC
SIXTH (6th) SCHEDULE: SPECIALLY PROTECTED INDIGENOUS PLANTS				
Encephalartos cerinus	Cerinus Cycad	**Range:** Central KZN.	CR	**Low**
Ocotea bullata	Black Stinkwood	**Habitat description:** High, cool, evergreen Afromontane forests. **Range:** Widespread in South Africa from the Cape Peninsula to the Wolkberg Mountains in Limpopo.	EN	**Low**
Warburgia salutaris	Pepperbark Tree	**Range:** North-eastern KZN, Mpumalanga and Limpopo Province. Also occurs in Swaziland, Mozambique and Zimbabwe and Malawi.	EN	**Low**
SEVENTH (7th) SCHEDULE: PROTECTED INDIGENOUS PLANTS				
Alberta magna	Natal Flame Bush	**Habitat description:** Evergreen bush and forest margins, and wooded ravines, usually near streams or on moist soils in drainage lines, from the coast up to 1300 m (Forest). **Range:** Lusikisiki to Nkandla and Ngome	NT	**Low**
Albizia suluensis	Zulu False-Thorn	**Habitat description:** Scarp Forest, riverine thicket and open woodland, often along streams, usually along the upper altitudinal perimeter and on steep slopes. **Range:** Hlabisa to Hluhluwe	EN	**Low**
Aloe saundersiae	Grass Aloe	**Habitat description:** Mistbelt grassland, on cool, shady, south-facing slopes of granite outcrops, often in crevices and pockets of soil with moss. **Range:** Nkandla	CR	**Low**
Aloe cooperi	Grass Aloe	**Habitat description:** Occupies a wide variety of habitats in grasslands, from marshy areas to dry and well-drained, often wedges in shallow pockets among rocks, but also on hillsides in open grasslands. **Range:** Widespread across KZN, Mpumalanga Highveld to Wolkberg Mountains in Limpopo Province. Also in Swaziland.	LC	High
Aristaloe aristata (Aloe aristata)	Grass Aloe	**Habitat description:** Variable. In the Karoo found in hot, dry sandy areas, but elsewhere in the range it also occurs in deep shade in riverine forest, as well as open montane grasslands in Lesotho and adjacent areas. **Range:** Widespread in South Africa and Lesotho, from the eastern Karoo eastwards through the interior of the Eastern Cape, across Lesotho and adjacent areas in KZN and the Free State.	LC	Low
Aloe minima (Aloe parviflora)	Grass Aloe	**Habitat description:** Open montane grasslands. Occurs on fairly heavy soils with loose stones. **Range:** Widespread across KZN and high-lying areas of eastern Mpumalanga as far north as the Blyde River Canyon. It also occurs in Swaziland.	LC	Low
Aloe modesta	Grass Aloe	**Habitat description:** Montane grassland, 1600-2000m. **Range:** Dullstroom and Wakkerstroom districts in Mpumalanga and also possibly occurs near Vryheid in KZN.	VU	Low
Aloe inconspicua	Grass Aloe	**Habitat description:** Transition between grassland and valley bushveld, mostly in short	EN	Low

SCIENTIFIC NAME	COMMON NAME	ECOLOGY & DISTRIBUTION / RANGE	IUCN	POC
		grassland, generally on gently sloping ground beside large hills and in hilly thornveld. **Range:** Bushman's River Valley, near Estcourt.		
Aloe kniphofioides	Grass Aloe	**Habitat description:** Montane grassland. **Range:** High altitude grasslands of Mpumalanga, KZN and north-eastern Eastern Cape.	VU	Low
Aloe myriacantha	Grass Aloe	**Habitat description:** Grows among rocks in short grassland, occurs from near sea level up to 1600 m. **Range:** In South Africa formerly known only from the Eastern Cape between Grahamstown and the Kei River mouth and the Maputaland area in far northern KZN (Reynolds 1969). However, this rather inconspicuous grass aloe may have been overlooked, as more recent collections in the Mkambati Nature Reserve (Glen and Hardy 2000), the Maclear district (Bester, S.P. 458, 19-3-1993, NH) and Little Noodsberg (Hilliard, O.M. and Burtt, B.L. 15485 12-2-1982, PRE) indicate that the distribution is probably continuous along the Eastern Cape and KZN coast between Kei Mouth and Richards Bay, and that it also occurs much further inland to the foothills of the Drakensberg.	LC	Low
Aloe thraskii	Dune Aloe	**Habitat description:** Dense coastal bush on dunes from the beach margin to a few hundred metres inland, but no further than the top of the first sea-facing slope. **Range:** aMatikulu to Port St Johns	NT	Low
Atalaya natalensis	Natal Krantz Ash	**Habitat description:** Scarp forest. Occurs in rocky areas on steep slopes or groves where there is less competition for light from taller overstorey trees. **Range:** Eastern Cape coast from The Haven to Umtamvuna, and Ngoye, Nkandla and Ngome forests in KZN. **Suitable habitat within the study area:** Scarp Forest.	NT	Low
Avicennia marina	White Mangrove	**Habitat description:** Intertidal zone mudflats and sandy shores, and estuaries and tidal riverbanks with brackish water. It is a common and often dominant constituent of mangrove swamps (usually the inland fringes of mangrove associations) and is also a pioneer of new mud banks. (Forest). **Range:** Widespread in estuaries along the east coast of South Africa from Chalumna to Kosi Bay.	LC	Low
Barringtonia racemosa	Brackwater Mangrove	**Habitat description:** Streamsides, freshwater swamps and less saline areas of coastal mangrove swamps. **Range:** Coastal areas of eastern Africa, extending as far south as Pondoland, on the border between KZN and the Eastern Cape. It extends to India, Thailand, northern Australia and islands of the south Pacific.	LC	Low
Bowkeria citrina	Yellow Shell-flower Bush	**Habitat description:** Forest margins and cliff edges on cool slopes, 1400-1800 m. **Range:** Southern Mpumalanga and northern KZN between Groenvlei, Wakkerstroom and Luneburg	Rare	Low

SCIENTIFIC NAME	COMMON NAME	ECOLOGY & DISTRIBUTION / RANGE	IUCN	POC
Breonadia salicina	Matumi	**Habitat description:** Terrestrial **Range:** KZN, Limpopo, Mpumalanga	LC	Low
Bruguiera gymnorrhiza	Black Mangrove	**Habitat description:** Evergreen woodlands and thickets along the intertidal mud-flats of sheltered shores, estuaries and inlets, mainly towards the seaward side of mangrove formation. **Range:** Widespread along the east coast of South Africa from the Nahoon to Kosi Bay.	LC	Low
Curtisia dentata	Assegaaiboom	**Habitat description:** Evergreen forest from coast to 1800 m. **Range:** Cape Peninsula to the Zimbabwe-Mozambique highlands.	NT	Low
Euphorbia bupleurifolia	Cycad Spurge	**Habitat description:** Open grassland, usually in shallow soils with a thin cover of grass (Grassland, Savanna). **Range:** Grahamstown to Pietermaritzburg.	LC	Low
Euphorbia flanaganii	Vingerpol	**Habitat description:** Coastal grasslands and low dune bush, mainly on sandstones, 40-800 m. **Range:** KZN south coast to Port Alfred.	VU	Low
Euphorbia gerstneriana	N/A	**Habitat description:** Savanna and coastal grassland, 100-800 m (KZN Hinterland Thornveld) **Range:** Port Shepstone to Mahlabatin	VU	Low
Ficus bizanae	Pondo Fig	**Habitat description:** Terrestrial. Coastal forests, often along rivers. **Range:** Eastern Cape, KZN.	LC	Low
Ficus trichopoda	Swamp Fig	**Habitat description:** As the common name swamp fig suggests, the natural habitat is in swamps and swamp forests, not usually away from permanent water. It grows naturally from the northern coast of KZN into Mozambique extending northwards. It is also found in northern Zambia where it extends northwards into Zaïre and Tanzania. Although this tree has attractive features, it can become a bit untidy. It would suit the warmer parts of the country where there is little frost and where there is good water availability. **Range:** KZN	LC	Low
Gerbera aurantiaca	Hilton daisy	**Habitat description:** Mistbelt grassland, well-drained doleritic areas **Range:** KZN Midlands, Carolina and Badplaas	EN	Low
Hibiscus tiliaceus	Lagoon Hibiscus	**Habitat description:** Terrestrial **Range:** Eastern Cape, KZN	LC	Low
Hydrostachys polymorpha	Waterfall Flower	**Habitat description:** Grows on submerged rocks in clear, fast-flowing perennial streams, rapids and waterfalls (Grassland). **Range:** Several rivers in the KZN Midlands.	VU	Low
Impatiens flanaganiae	Giant Wild Balsam	**Habitat description:** Scarp forest, in leaf litter among large boulders near the base of waterfalls in deep, moist, shaded sandstone gorges. (Scarp Forest, KZN Hinterland Thornveld). **Range:** Pondoland and southern KZN.	VU	Low
Lumnitzera racemosa	Tonga Mangrove	**Habitat description:** Mangrove swamps, usually on the landward side. **Range:** Occurs only in Kosi Bay. A globally widespread species also occurring from Kenya to South Africa, Madagascar, tropical Asia, Northern Australia and Polynesia.	EN	Low

SCIENTIFIC NAME	COMMON NAME	ECOLOGY & DISTRIBUTION / RANGE	IUCN	POC
Mimusops caffra	Coastal Red Milkwood	**Habitat description:** Terrestrial. Its natural habitat is dune forest from the high tide mark in KZN and the former Transkei region. It is also found in Mozambique. This tree is common from Port Alfred and Bathurst in Eastern Cape to Maputo in Mozambique. It forms up to 75% of the coastal and dune forest and flourishes even within reach of the salty sea sprays. It is found in abundance in Durban as it grows along coastal roads to the north and south. **Range:** Eastern Cape, KZN**.**	LC	Low
Philenoptera sutherlandii	Giant Umzimbeet	**Habitat description:** Terrestrial **Range:** Eastern Cape, KZN**.**	LC	Low
Millettia grandis	Umzimbeet	**Habitat description:** Terrestrial. Trees are common below an altitude of 600m – especially in Pondoland (south of Port Edward and before Port St Johns in the Eastern Cape). They occur in forests and forest margins. In forest margins, they can be pioneer plants. **Range:** Eastern Cape, KZN**.**	LC	Low
Newtonia hildebrandii	Lebombo Wattle	**Habitat description:** Sand Forest. **Range:** In South Africa restricted to Maputaland, northern KZN, but is widespread in southern Africa.	LC	Low
Oxyanthus pyriformis	Natal Loquat	**Habitat description:** Terrestrial **Range:** KZN	LC	Low
Prionium serratum	Palmiet	**Habitat description:** An aquatic or semi-aquatic plant growing in marshy coastal areas, and along rivers **Range:** Western and Eastern Cape as far as Grahamstown and from Port St Johns to southern KZN.	LC	Low
Prunus africana	Red Stinkwood	**Habitat description:** Evergreen forests near the coast, inland mistbelt forests and afromontane forests up to 2100 m. **Range:** Widespread in Africa from the southern Cape, through KZN, Swaziland and northwards in to Zimbabwe and central Africa and the islands of Madagascar and Comoros.	VU	Low
Pseudosalacia streyi	Rock Lemon	**Habitat description:** Scarp forest on sandstone along rocky stream banks in river gorges, sometimes extending to forest margins, 50-200 m. **Range:** Pondoland, Izotsha River to Mtentu River	EN	Low
Raphia australis	Raphia Palm	**Habitat description:** Swamp forest, on seasonally inundated coastal dunes. **Range:** Kosi Bay and Mozambique.	VU	Low
Brunia trigyna ***(Raspalia trigyna)***	Raspalia	**Habitat description:** Pondoland, grassland on sandstone, seasonally moist areas in open grassland along stream banks, generally in sites protected from fire, 350-450 m. **Range:** Formerly from Murchison district to Magwa Gorge, now only Umtamvuna Nature Reserve and Mkambati.	CR	Low
Rhizophora mucronata	Red Mangrove	**Habitat description:** Evergreen woodlands and thickets along the intertidal mud-flats of sheltered shores, estuaries and inlets, mainly in the seaward side of the mangrove formation.	LC	Low

SCIENTIFIC NAME	COMMON NAME	ECOLOGY & DISTRIBUTION / RANGE	IUCN	POC
		Range: In South Africa this species occurs from Nahoon to Kosi Bay. It is globally widespread, also occurring along the western shores of the Pacific Ocean, Ryukyu Island, Micronesia, Melanesia, northern coast of Australia, Polynesia and the Indian Ocean; along the East African shores from near Massawa in the Red Sea to South Africa.		
Rhynchocalyx lawsonioides	Natal Privet	**Habitat description:** Pondoland scarp forest, in upper margins of forests above deep river gorges and along the margins of kloof forests (Forest). **Range:** Oribi Gorge to Port St Johns.	NT	Low
Sandersonia aurantiaca	Christmas Bells	**Habitat description:** Cool, moist slopes with minimal herbivory and fire, 200-1800 m. (Grassland). **Range:** Northern KZN to East London, also in Swaziland.	LC	Low
Sideroxylon inerme	White Milkwood	**Habitat description:** Terrestrial. This species is commonly found in dune forests, almost always in coastal woodlands and also in littoral forests (forests along the seashore). **Range:** Eastern Cape, KZN, Limpopo, Mpumalanga, Western Cape	LC	High
Siphonochilus aethiopicus	Wild Ginger	**Habitat description:** Tall open or closed woodland, wooded grassland or bushveld. **Range:** Sporadically from the Letaba catchment in the Limpopo Lowveld to Swaziland. **Extinct in KZN**. Widespread elsewhere in Africa.	CR	Low
Stangeria eriopus	Stangeria	**Habitat description:** Scarp and coastal forest, Ngongoni and coastal grassland. **Range:** Bathurst to southern Mozambique.	VU	Low
Syzygium pondoense	Pondo Waterwood	**Habitat description:** Pondoland scarp forest. Rocky islands and sandbanks in streams, restricted to Msikaba Formation Sandstone, 20-200 m (Forest). **Range:** From Umtamvuna to Mlambomkulu Rivers.	Rare	Low
Syzygium legatii	Mountain Waterberry	**Habitat description:** Terrestrial **Range:** KZN	LC	Low

CR= Critically Endangered**, EN=** Endangered**, NT =** Near Threatened**, VU=** Vulnerable**, P=** Least Concern, **POC** = Probability of Occurrence.

Table B5: Protected plant genera and families for the KZN Province, as per Schedule 6 and 7 of the KZN Nature Conservation Management Act, 1999 (Act No 5 of 1999).

Protected Genus		POC
Bersama spp.	White Ash Trees	Low
Brachystelma spp.	Brachystelmas	Low
Cassipourea spp.	Onionwood Trees	Medium
Ceropegia spp.	Ceropegias	Low
Catha spp.		Low
Cyathea spp.	Tree ferns	Low
Drosera spp.	Sundews	Low
Encephalartos spp.	Cycads	Low
Erica spp.	Ericas	Low
Eugenia spp.	Myrtles	Low

Protected Genus		POC
Gasteria spp.	Gasterias	Low
Gladiolus spp.	Gladiolii	Low
Haworthia spp.	Haworthias	Low
Huernia spp.	Succulent Asclepiads	Low
Kniphofia spp	Red Hot Pokers	Medium
Microsporium spp	Climbing Ferns	Low
Podocarpus spp.	Yellowwood Trees	Low
Selicornia spp	Salt Marsh and Mangrove Herbs	Low
Sarcoconia spp	Salt Marsh and Mangrove species	Low
Scaevola spp.		Low
Scilla spp.	Blue Squills	Low
Stapelia spp.	Succulent Asclepiads	Low
Amaryllidaceae	All members	Confirmed
Hyacinthaceae	All species	Low
Lauraceae	All species not in the Wild quince and stinkwood trees (except *Ocotea bullata* – listed in sixth schedule)	Low
Orchidaceae	All Species	Confirmed
Proteaceae	Proteas, Faureas, Leucospermums and Leucodendrons	Low

APPENDIX C: Floral Species List

Table C1: Dominant woody floral species encountered during the field assessment. Alien species identified during the field assessment are indicated with an asterisk (*).

Scientific Name	Degraded Hygrophilous Grasslands	Degraded Coastal Forest	Thicket habitat	Freshwater Habitat
Woody Species				
**Eucalyptus camaldulensis*	x	x	x	x
**Lantana camara*	x	x	x	x
**Melia azadarach*	x		x	x
**Psidium guajava*	x		x	
**Solanum mauritianum*	x	x	x	
Albizia adianthifolia		x		
Annona senegalensis		x	x	
Asparagus cf. setaceus		x	x	
Bauhinia galapanii		x	x	
Brachylaena discolor subsp. *discolor*		x	x	
Bridelia cf. cathartica		x		
Celtis africana		x		
Combretum molle			x	
Cussonia zuluensis		x		
Dalbergia armata		x	x	
Dalechampia capensis		x	x	
Dichrostachys cinerea			x	
Diospyros galpanii	x			
Dombeya rotundifolia			x	
Dracaena aletriformis		x		
Elephantorrhiza elephantina	x			
Englerophytum natalense		x		
Erythrina lysistemon		x	x	
Euclea natalensis		x	x	
Eugenia capensis	x			
Gomphocarpus physocarpus	x			
Gymnosporia senegalensis			x	
Harpephyllum caffrum		x		
Helichrysum krausii	x			
Hippobromus pauciflorus		x	x	
Hyphaene coriacea		x	x	
Lantana rugosa	x			
Osteospermum moniliferum subsp. *rotundatum*	x		x	
Phoenix reclinata		x		
Psydrax obovata subsp. *obovata*		x	x	
Rhoicissus tomentosa		x	x	
Sclerocarya birrea subsp. *caffra*			x	
Scutia myrtina		x	x	
Searsia chirendensis		x	x	
Searsia lancea			x	x
Strelitzia Nicolai		x	x	
Strychnos spinosa			x	
Syzygium cordatum			x	x
Trema orientalis		x		
Trichilia emetica		x		
Trimeria cf. grandiflora		x		

Scientific Name	Degraded Hygrophilous Grasslands	Degraded Coastal Forest	Thicket habitat	Freshwater Habitat
Vabguaria infausta			x	
Vachellia karoo			x	
Vachellia zanthoploea			x	
Ziziphus mucronata		x	x	
Herbaceous Species				
Asystasia gangetica		x		
Chamaecrista mimosoides	x		x	
Crinum cf. macowanii	x		x	
Cyanotis speciosa	x			
Dipcadi marlothii	x			
Disa woodii	x			x
Drimiopsis maculata		x	x	
Freesia laxa		x		
Gerbera spp.			x	
Gloriosa superba		x	x	
Hypoxis rigidula	x		x	
Imperata cylindrica	x			
Justica betonica	x			x
Laportea peduncularis		x		
Lasiosiphon capitatus	x		x	
Ledebouria spp.	X		x	
Leonotis leonurus			x	
Lobelia flaccida,	x		x	
Microsorum scolopendria		x		
Nymphaea nouchali				x
Persicaria cf. decipiens				x
Rhynchospora corymbosa				x
Sida cordifolia	x		x	
Smilax anceps	x		x	
Stachys natalensis		x		
Stenochlaena tenuifolia		x		
Tephrosia purpurea	x			
Thunbergia natalensis	x			
Vernonia spp.	x		x	
Xysmalobium cf. undulatum			x	
Succulent Species				
Aloe marlothii	x		x	
Aloe umfoloziensis			x	
Graminoid Species				
Aristida stipitata	x			
Cymbopogon validus	x		x	
Cynodon dactylon	x			x
Cyperus albostriatus		x		
Cyperus denudatus				x
Cyperus fastigatus				x
Cyperus latifolious				x
Cyperus latifolious				x
Digitaria eriantha	x		x	
Eleocharis acutangular				x
Hyparrhenia hirta	x		x	
Imperata cylindrica	x			x
Ischaemum fasciculatum	x			x
Ischaemum fasciculatum				x
Isolepis cernua				x
Melinis repens	x	x	x	

Scientific Name	Degraded Hygrophilous Grasslands	Degraded Coastal Forest	Thicket habitat	Freshwater Habitat
Oplismenus cf. hirtellus		x		
Phragmites australis				x
Setaria sphacelata var. *sphacelata*			x	
Themeda triandra	x			
Typha capensis				x

SCIENTIFIC TERRESTRIAL SERVICES

Terrestrial Assessment

FOR THE PROPOSED PHASE 1F DEVELOPMENT OF THE RICHARD'S BAY INDUSTRIAL DEVELOPMENT ZONE (RBIDZ).

Part A: Faunal Assessment

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ACRONYMS

ADU	The Animal Demography Unit online database: http://vmus.adu.org.za/.
AIP/AIPs	Alien Invasive Plant/Alien Invasive Plants
CR	Critically Endangered
DFFE	Department of Forestry, Fisheries, and the Environment
EAP	Environmental Assessment Practitioner
EIA	Ecological Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EN	Endangered
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectares
IEM	Integrated Environmental Management
IUCN	International Union for Conservation of Nature and Natural Resources
Km	Kilometres
KZNNCMA	The KwaZulu-Natal Nature Conservation Management Act, 1999 (Act No. 5 of 1999)
KZNSCP	KwaZulu-Natal Systematic Conservation Plan
LC	Least Concern
NA	Not Applicable
NBA	National Biodiversity Assessment, as it related to the NEMBA
NE	Not Evaluated
NEMBA	National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004)
NT	Near Threatened
NYBA	Not yet been assessed
P	Protected, according to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004): Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List. December 2007
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Square
R	Rare
RBIDZ	Richards Bay Industrial Development Zone
RDL	Red Data Listed
SABAP2	Southern African Bird Atlas Project 2
SANBI	South Africa National Biodiversity Institute
SCC	Species of Conservation Concern
SP	Specially Protected
STS	Scientific Terrestrial Services
TOPS	Threatened Or Protected Species (list of 2007) according to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
TSF	Tailings Storage Facility
VU	Vulnerable

GLOSSARY OF TERMS

Alien and Invasive species	A species that is not an indigenous species; or an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
Carrying Capacity	The maximum population size of a biological species that can be sustained by that specific environment, given the food, habitat, water, and other resources available.
CBA (Critical Biodiversity Area)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation and ridges.
Corridor (ecological)	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Diversity	Abundance and species richness of faunal classes
Ecosystem	A community of living organisms in conjunction with the non-living components of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycles and energy flows.
Endangered (according to IUCN)	Organisms at very high risk of extinction in the wild
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
ESA (Ecological Support Area)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Faunal Class	In biological classification, class (Latin: classis) is a taxonomic rank, as well as a taxonomic unit. Class specifically refers to major groups, namely: mammals, avifauna (birds), reptiles and invertebrates.
Habitat Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Least Concern	Unlikely to become extinct in the near future. A least-concern species is a species that has been categorized by the International Union for Conservation of Nature (IUCN) as evaluated as not being a focus of species conservation. They do not qualify as threatened, near threatened, or (before 2001) conservation dependent.
Least Threatened	Least threatened ecosystems are still largely intact.
Near Threatened (according to IUCN)	Close to being at high risk of extinction in the near future.
Protected	Species of high conservation value or national importance that require protection, according to NEMBA: TOPS 2007 species list
Refugia (ecological)	Refugium (plural: refugia) is a location which supports an isolated or relict population of a once more widespread species. This isolation can be caused by climatic changes, geography, or human activities such as deforestation and overhunting.
Resource (ecological)	In biology and ecology, a resource is a substance or object in the environment required by an organism for normal growth, maintenance, and reproduction.
RDL (Red Data listed) species	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
SCC (Species of Conservation Concern)	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.
Termitaria	Colonies of termites, typically within a tall mound of cemented earth.
Vulnerable (according to IUCN)	Species meets one of the 5 red list criteria and thus considered to be at high risk of unnatural (human-caused) extinction without further human intervention.

1. INTRODUCTION

1.1 Project description:

Scientific Terrestrial Services Pty (Ltd) (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) to obtain an Environmental Authorisation (EA) for the proposed 80 Kilo-Tonnes Per Annum (ktpa) titanium dioxide (TiO_2) Plant project the Richard's Bay Industrial Development Zone (RBIDZ), Richard's Bay, Kwazulu-Natal Province. The proposed footprint associated with the development will henceforth be referred to as the "study area". The location and extent associated with the study area is depicted in Figure 1. Refer to Part A, Section 1.1 for a more detailed project description.

The study area is located immediately west of Richard's Bay Central, which is located within the uMhlathuze Local Municipality, an administrative area of the King Cetshwayo District Municipality. The study area is situated three km north of the R34 John Ross Highway and 0.5 km southwest of the R619 regional road.

The purpose of this report (Part A) is to define the biodiversity associated with the proposed development from a desktop conservation database perspective. It is the objective of this desktop assessment to provide detailed information to guide the fieldwork components (discussed in Parts B and C) to ensure that all relevant ecological aspects are considered prior to performing the field assessments. This report is not a standalone report and should be considered in consolidation with the outcome of the biodiversity assessments (floral assessment in Part B and the faunal assessment in Part C).

1.2 Background

The purpose of the RBIDZ is to develop an industrial estate to attract local and foreign investors who will create production capacity to beneficiate South Africa's raw materials prior to export and will thus create employment and improve the associated skills base. The RBIDZ is thus an integral part of the national Government's macroeconomic policy to develop South Africa's manufacturing sector by encouraging investment in the manufacturing industries, centred on beneficiation of the country's natural resources (RBIDZ SOC Ltd, 2014). The RBIDZ also aims to attract foreign direct investment and develop linkages between domestic and zone-based industries. By attracting advanced foreign production and technology methods, experience in global manufacturing and production networks will also be gained.

Environmental authorisation (Ref: 14/12/16/3/3/2/665) was granted for Phase 1F of the proposed RBIDZ's development in September 2016. The extent of the Phase 1F development

is illustrated in Figure 1. The Phase 1F development included the following infrastructure development:

- Water infrastructure;
- Sewer infrastructure;
- Stormwater infrastructure;
- Roads;
- Electrical services; and
- Infill of Wetlands (to enable the development of the site for industrial purposes). All wetlands within the study area, except for the large Depression Wetland in the west (refer to Part B of the current report and the Freshwater Report: SAS 22-1058 (2022), will be infilled to allow for development as per the EA granted in 2016 (Ref 14/12/16/3/3/2/665). No development is proposed to take place within the large Depression Wetland in the west of the study area.

The next phase of the RBIDZ development, for which is the focus of the current report, involves the development of an 80 ktpa TiO_2 Plant. The proposed project consists of the following infrastructure development (Figure 2):

- A Solar Plant, Water Extraction, and Bottling Plant;
- An 80 000 tons per annum (tpa) Rutile Pigment Plant which will produce 80 000 tpa pigment of the TiO_2 nature;
- Storage Areas for dangerous goods;
- Waste Management Area;
- Water Reservoir;
- Service roads;
- Service areas, including a pump station and an air-to-water plant (for on-site generators);
- Storm water culverts; and
- Parking areas.

The purpose of this report is to define the faunal ecology of the study area as well as mapping and defining areas of increased Ecological Importance and Sensitivity (EIS) and to define the Present Ecological State (PES) of the study area. The objective of this study is:

- To provide inventories of faunal species as encountered within the study area;
- To determine and describe habitat types, communities and the ecological state of the study area and to rank each habitat type based on conservation importance and ecological sensitivity;

- To identify and consider all sensitive landscapes including rocky ridges, wetlands and/ or any other special features;
- To conduct a Red Data Listed (RDL) species assessment as well as an assessment of other Species of Conservation Concern (SCC), including potential for such species to occur within the study area;
- To provide detailed information to guide the activities associated with the proposed development activities associated within the study area; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements and the provision of ecological services in the local area.

1.2. Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and considered and the information provided is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management;
- The National Web-Based Environmental Screening Tool, hereafter referred to as the "Screening Tool", identified the potential presence of sensitive species within the study area. As per the best practise guidelines as stipulated by the South African National Biodiversity Institute's (SANBI's) protocol, the name of sensitive species may not appear in the public domain to protect the identity and potential location of such species;
- As EA (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382) was granted for Phase 1F of the project (including the infilling of the Seep Wetlands and the Wetland Flats (refer to Section 1.1 for further details)), no impacts pertaining to these wetland types are presented. As the Depression Wetland in the west of the study area will not be infilled, this wetland will be subject to impacts (especially indirect impacts). As such, only impacts pertaining to the Depression wetland are included in the current report (refer to Section 5);
- Due to the nature and habits of most faunal taxa, the high level of surrounding anthropogenic activities, it is unlikely that all species would have been observed during a field assessment of limited duration. Therefore, site observations were compared with literature studies where necessary;

- The faunal assessment was limited to the study area only and did not assess in detail the surrounding properties. The surrounding properties were noted on an adhoc basis whilst moving to and from the study area, with data extrapolated to these areas through the use of satellite imagery;
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the study area may therefore have been missed during the assessment; and
- The data presented in this report are based on one site visit, undertaken between 6 – 7 April 2022. A more comprehensive assessment would require that assessments take place in all seasons of the year. However, on-site data was augmented with all available desktop data and additional information (e.g., from previous assessments of the study area, namely Nemai Consulting 2016). Together with project experience in the area, the findings of this assessment are considered an accurate reflection of the faunal ecological characteristics of the study area for the purposes of informed decision-making processes.

Figure 1: Proposed development layout associated with the study area. The approved Phase 1F development area is also illustrated.

Figure 2: Proposed conceptual development layout associated with the study area. Layout provided by the proponent.

2. ASSESSMENT APPROACH

The field assessment was undertaken on the 6th to the 7th of April 2022 (late summer season), to determine the faunal ecological status of the study area. A reconnaissance 'walkabout' was initially undertaken to determine the general habitat types found throughout the study area, following this, specific study sites were selected that were considered to be representative of the habitats found within the study area, with special emphasis being placed on areas that may potentially support faunal SCC. Sites were investigated on foot to identify the occurrence of fauna within the study area. Camera traps were used to increase the likelihood of capturing more elusive mammal species.

A detailed explanation of the method of assessment is provided in Appendix A of this report. The faunal categories covered in this assessment are mammals, reptiles, amphibians, general invertebrates and arachnids. For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of Part A of the study.

2.1 General approach

To accurately determine the PES of the study area and capture comprehensive data with respect to faunal taxa, the following methodology were applied:

- Maps and digital satellite images were consulted prior to the field assessment in order to determine broad habitats, vegetation types and potentially sensitive sites. An initial visual on-site assessment of the study area was made in order to confirm the assumptions made during consultation of the digital satellite imagery;
- A literature review with respect to habitats, vegetation types and species distribution was conducted. For a detailed description of the vegetation types and habitats associated with the study area, please refer to Part B report;
- Relevant databases considered during the assessment of the study area included the Important Bird and Biodiversity Areas (IBA, 2015), South African Bird Atlas Project 2 (SABAP2), International Union for Conservation of Nature (IUCN), Kwazulu-Natal Systematic Conservation Plan (KZNSCP)and the National Biodiversity Assessment (NBA, 2018);
- Specific methodologies for the assessment, in terms of field work and data analysis of faunal ecological assemblages are presented in Appendix A of this report; and
- For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of Part A.

2.2 Sensitivity Mapping

All the ecological features associated with the study area were considered, and sensitive areas were assessed. In addition, identified locations of protected species were marked by means of Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto satellite imagery and/or topographic maps. The sensitivity map should guide the final design and layout of the proposed development activities. Please refer to Section 4 of this report for further details.

2.3 Faunal Species of Conservational Concern Assessment

During field assessments, it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. As such, and to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) estimation is used, considering several factors to determine the probability of faunal SCC occurrence within the study area. Species listed in Appendix B whose known distribution ranges and habitat preferences include the proposed infrastructure development sites were taken into consideration. Faunal species likely to occur within the study area are indicated and briefly discussed within each of the relevant dashboards, along with their POC.

3. FAUNAL ASSESSMENT RESULTS

3.1 Faunal Habitat

Five broad habitat units are associated with the study area. These habitat units are discussed briefly in terms of faunal utilisation and importance below. For a more detailed description and discussion of these habitat units please refer to the Part B: Floral Report. Figure 3 provides a visual representation of the various habitats within the study area. The five broad habitat units include (Figure 3 and 4):

1. **Degraded Hygrophilous Grassland**: This habitat unit comprises of a moderately low floral species richness with reduced forage diversity for herbivorous faunal species. The habitat is generally characterised by a moist homogenous grassy layer in which scattered woody shrub species occurred, providing limited structural diversity within this unit for fauna. The habitat unit is moist and provides suitable habitat for amphibians and other species to forage within. Reduced floral heterogeneity did reduce faunal forage abundance and diversity, nonetheless the unit still provided habitat for an intermediate diversity of fauna. The reduced abundance of valuable niche habitat reduces the sensitivity from a faunal perspective, however, this habitat remains an important supporting unit;
2. **Degraded Coastal Forest**: The Degraded Coastal Forest habitat unit was located mainly within the northern-central regions of the study area. This tree-dominated habitat was characterised by the presence of overlapping tree canopies, and a poorly developed grassy layer. This unit was favoured by fauna, particularly arboreal species, where higher floral diversity and variable habitat structure provide valuable forage and shelter for fauna. This unit has experienced anthropogenic influences – historic use of the area by vagrants is evident within the habitat which may have impacted on faunal abundances through direct persecution. However, the unique characters of the unit provide niche habitat for several potential SCC. Some AIP proliferation has occurred around the borders of this unit which has degraded the habitat slightly for fauna. The edges of this habitat transition into dense, encroached thickets with lower forage abundances for fauna;
3. **Thicket Habitat**: The Thicket habitat unit was located mainly within the central regions of the study area in close association with the Degraded Coastal Forest habitat. This habitat consisted of a dense tree, shrub layer and graminoid layer which provides valuable shelter for most fauna, however, the homogeneity of the floral community does limit the abundance of forage within the unit for herbivorous. Smaller avifauna

which show preference to dense thickets may find valuable habitat herein whilst other small faunal species are likely to utilise these dense areas for refuge. Bush encroachment within the area is likely due to the suppression of fire and the lack of herbivory;

4. **Freshwater Habitat**: The Freshwater Habitat was associated with 1) natural watercourse[1] features (including a Depression Wetland[2], Wetland Flats[3] and Seep Wetlands[4]), and 2) artificial freshwater features, including a man-made canal (hereafter earth canal) that runs through one of the Seep wetlands (SAS 22-1058 (2022)). The natural watercourse features provided valuable niche habitat for fauna, including potential SCC and will be particularly favoured by amphibians, avifauna and invertebrates. The Depression Wetland unit will also function as a corridor and connectivity within the landscape should be retained as far as possible. The earth canals, although of reduced quality, do still provide habitat for fauna and were utilised as movement corridors within the study area, particularly by avifaunal and herpetofaunal species. Although several wetland types were identified during the field assessment (i.e., Seep Wetlands, Wetland Flats, and a Depression Wetland) and are discussed in the sections below, EA (Ref: 14/12/16/3/3/2/665 and 14/12/16/3/3/1/1382) has already been granted for the infill of the Seep Wetlands and Wetland flats. As such, although these wetlands have yet to be infilled, they are only included in the habitat writeup. Given that EA has been granted for their infill, no sensitivity will be assigned to these wetlands and associated impacts will thus not be discussed (refer to Section 5); and
5. **Transformed Habitat**: The Transformed Habitat was associated with the complete transformation of areas for road and/or infrastructure development. Given that faunal habitat suitability was severely reduced within this habitat (the area is mostly concreted and barren), this habitat unit is not considered important or valuable for faunal species.

[1] The National Water Act, 1998 (Act No. 36 of 1998) (NWA) define a watercourse as follows:

- A river or spring;
- A natural channel which water flows regularly or intermittently;
- A wetland, dam, or lake into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse;
- and a reference to a watercourse includes, where relevant, its bed and banks.

[2] A **Depression Wetland** is an inland aquatic ecosystem with closed or near closed elevation contours, which increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates. Dominant water sources are precipitation, groundwater discharge, interflow and (diffuse or concentrated) overflow (Ollis *et al*., 2013).

[3] **Wetlands flat** often appear as irregularly shaped wetland areas which are not linked to a stream. They are often level or near-level areas where waterlogging occurs and can be differentiated from depressions by their lack of defined margins (Ollis *et al*., 2013).

[4] **Seep Wetlands** are located on gently to steeply sloping land and dominated by the colluvial (gravity-driven), unidirectional movement of water and material down-slope. Water inputs are primarily via subsurface flows from an up-slope direction (Ollis *et al*. 2013).

Figure 3 below provides a visual representation of the above-mentioned habitat units while Sections 3.2 - 3.5 provide a dashboard report of the findings of each faunal class.

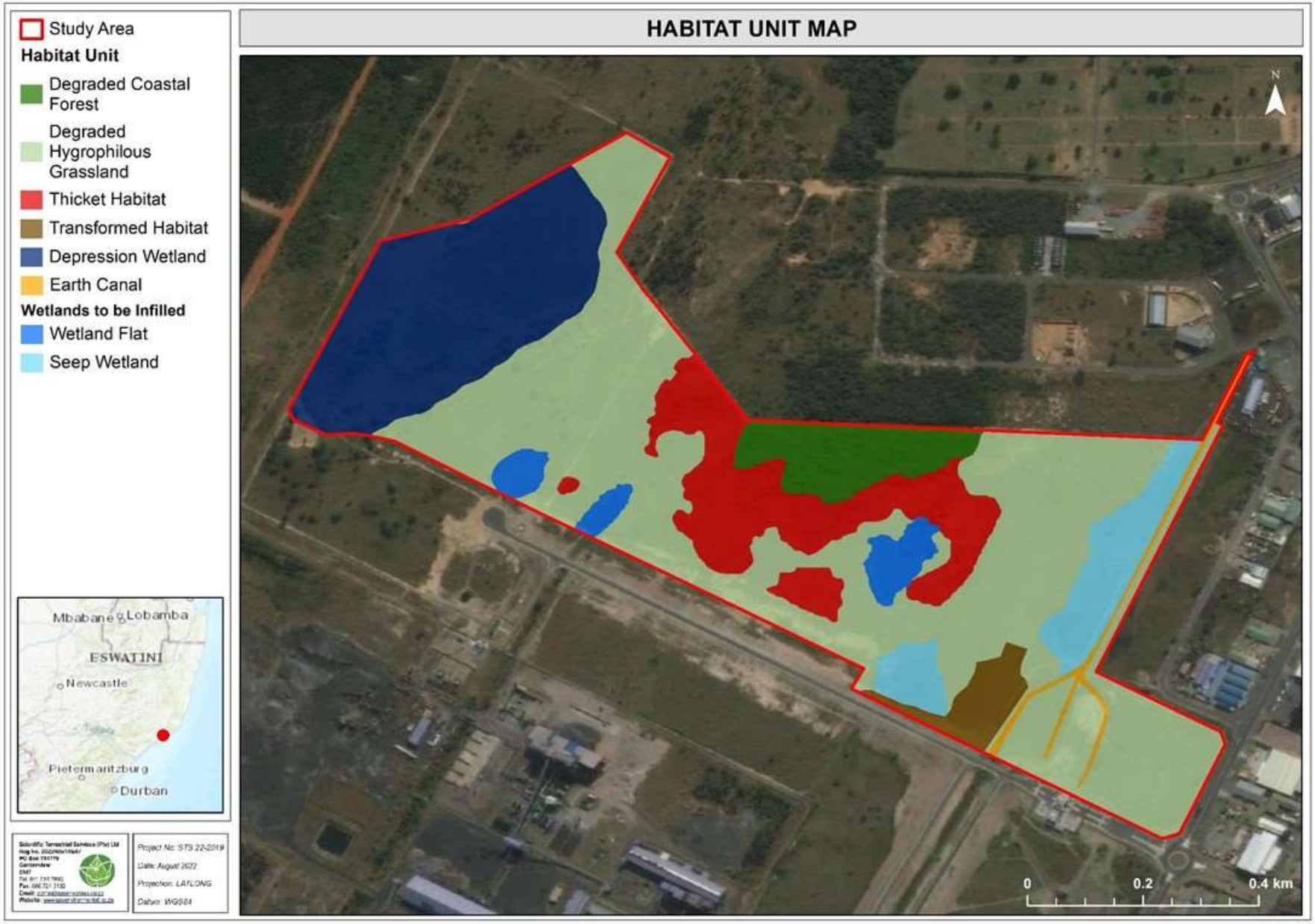


Figure 3: Overview of the habitat units associated with the study area, identified during the 2022 assessment.

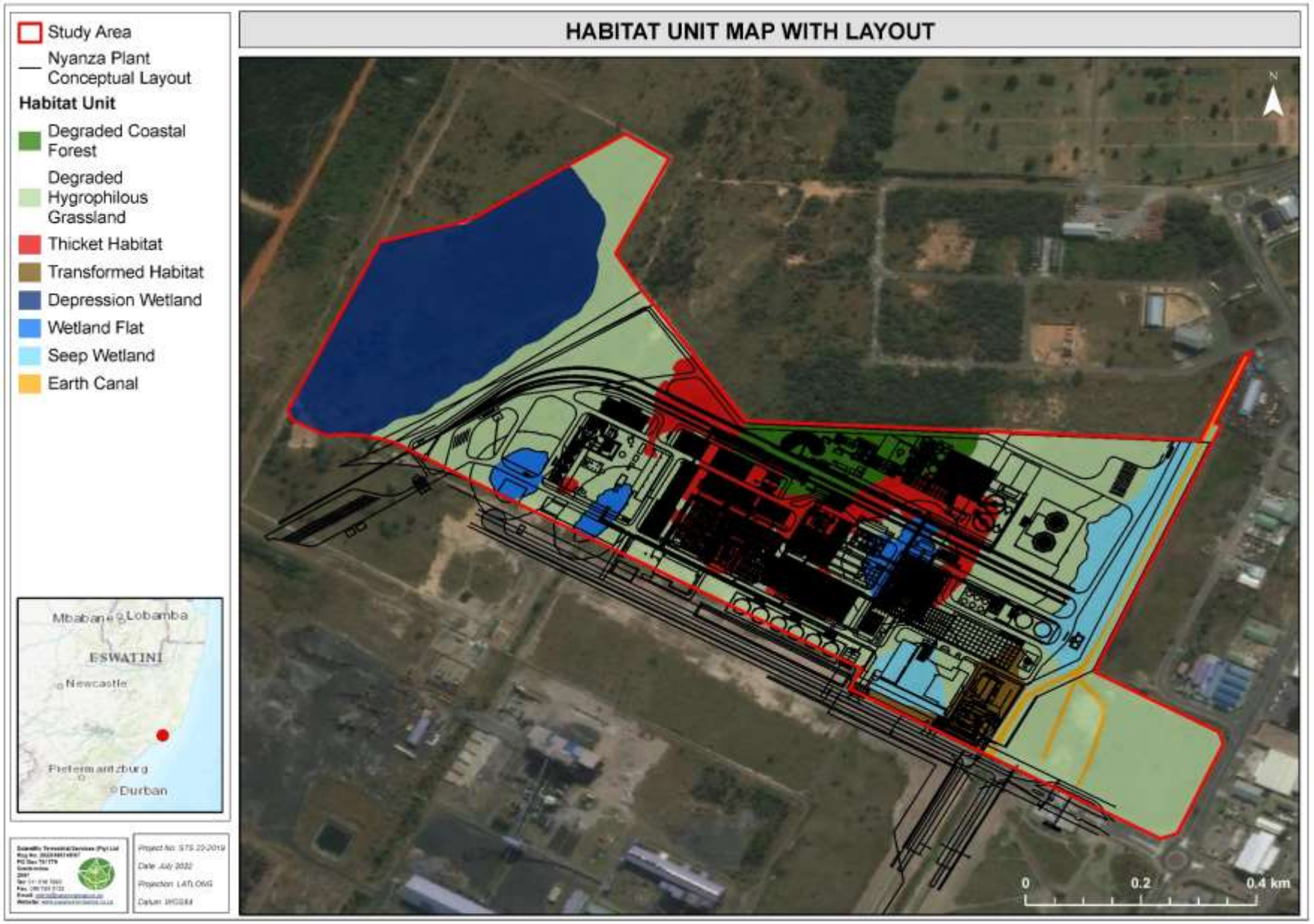


Figure 4: Conceptual illustration of the habitat units (with development layout) associated with the study area.

3.2 Mammals

Table 1: Field assessment results pertaining to mammal species within the study area.

SPECIES AND HABITAT RECORDED IN THE STUDY AREA

Left to Right: A large impermeable electrified fence restricts immigration and emigration for most faunal species (even larger invertebrates). View of the study area indicating Freshwater and Degraded Hygrophilous Grassland Habitat in the foreground and Degraded Coastal Forest and Thicket habitat in the background. Likely spoor of a *Tragelaphus scriptus* (Bushbuck) or potentially a *Cephalophus natalensis* (Natal Red Duiker). Hole excavated by *Hystrix africaeaustralis* (Porcupine) foraging on roots within the Thicket Habitat.

MAMMAL HABITAT AND DIVERSITY OVERVIEW

The study area is completely encircled by a tall, electrified fence which is an impermeable barrier to all but the smallest of mammals. The study area is largely undeveloped in terms of infrastructure with only a small section of Transformed Habitat within the south eastern portion. The remaining habitat remains natural, although degraded in some portions, largely through Alien and Invasive Plant (AIP) proliferation. Fragmentation from surrounding habitat and the high degree of industrialization to the south of the study area and settlements to the east have diminished the local mammal diversity drastically, and now mostly common and widespread species persist within the environment. The study area is further located adjacent a large commercial forestry operation to the west. Some corridors through Freshwater habitat do exist within this landscape matrix which will be suitable for mammal movement, though, the perimeter fencing of the study area is a notable hindrance for mammal movement. The study area comprises a mosaic of habitats which to a large degree provide valuable habitat for mammals, however, fragmentation in the larger landscape has reduced the species diversity. The vegetation, notably the Degraded Coastal Forest, Thicket and Freshwater Habitat contain adequate vegetative cover, food and water resources to sustain the low diversity of mammals observed. The homogenous nature of the Degraded Hygrophilous Grassland reduces forage availability and limits opportunities for more habitat specific species. One SCC, Sensitive species 7 may occur within the study area, however, this is unlikely due to the electric boundary fence which restricts movement. No other faunal SCC are anticipated to utilise the study area for foraging or as breeding habitat. The above-mentioned SCC and where it will likely occur in the study area are described in finer detail below. The Degraded Coastal Forest, Freshwater and Thicket habitat are of higher sensitivity from a mammalian perspective as they have increased forage availability and provide suitable areas for shelter and breeding. The proposed development will transform the local habitat which will lead to a decline in faunal species abundance and diversity. The loss of the Degraded Coastal Forest habitat and Freshwater habitat will lead to significant impacts as a result of the sensitive and valuable characteristics they provide mammals within.

MAMMAL SCC

Species	Habitat and Resources in the STUDY AREA	RSA Status	POC
Sensitive species 7	This species inhabits a wide range of forested habitats. It is known to survive in degraded thicket and Degraded Coastal Forest habitat along the urban fringe. Although habitat does exist within the study area the electrified fence surrounding the location restricts the potential occurrence of this species within the study area.	VU	Low

CONCLUDING REMARKS
Overall, the study area is not considered to be of increased importance from a mammal perspective as a result of the low mammal diversity noted during the field assessment and the fragmentation resulting from an electrified fence being installed around the study area. The construction and operation of the proposed facility and associated infrastructure will result in reduced habitat favourability for mammals, although many of the smaller species will be able to recolonize locations following construction. Of concern is the threat of constructing within Freshwater habitat and the Degraded Coastal Forest habitat, although these units were not inhabited by a diverse and abundant mammal assemblage, they remain important in terms of their ecoservice provisioning, sheltering locations and as a movement and dispersal corridors for fauna. It is recommended that infrastructure remain beyond the applicable regulated zones within these units. Edge effects and impacts associated with the proposed development, as stipulated in section 5.1 below should be prevented from encroaching into these sensitive areas. Please see section 5.1 for a detailed list of mitigatory measures to minimise impacts to mammals and general fauna. The online screening tool indicates that Sensitive species 7 may occur within the study area. Although habitat is suitable for this species within the Degraded Coastal Forest and Thicket Habitat the lack of movement corridors has likely resulted in the absence of the species from the study area. Although no signs of this taxon were observed suitable habitat remains available.

3.3. Avifauna

Table 2: Field assessment results pertaining to bird species within the study area.

SPECIES AND HABITAT RECORDED IN THE STUDY AREA

Left to Right: A flock of *Ciconia apiscopus* (Woolly-necked Stork) observed flying over the study area. *Pleceus capensis* (Cape Weaver) noted within the Thicket Habitat unit. *Anthus cinnamomeus* (African Pipit) observed within Transformed Habitat. *Spermestes cucullata* (Bronze Mannikin) utilising the Hygrophilous Grassland. *Dendrocygna viduata* (White-faced Whistling Duck) and *Merops persicus* (Blue-cheeked Bee-eater) observed within the Freshwater Habitat.
AVIFAUNAL HABITAT AND DIVERSITY OVERVIEW
For avifauna vegetation structure, as opposed to actual plant species richness, is widely acknowledged as the primary determinant of bird communities (Skowno & Bond 2003; Wichmann *et al.* 2009; Burgess *et al*. 2011; Smith *et al*. 2017). The mosaic of habitats provided suitable structure to support a diverse assemblage of avifauna. Avifaunal diversity varied within the various habitats associated with the study area. Diversity was highest in the Degraded Coastal Forest, Thicket and Freshwater Habitats while intermediate within the Hygrophilous Grassland and low within the Transformed Habitat. Diversity within the Hygrophilous Grassland was likely reduced due to the homogenous structure of the natural grassland and the reduced heterogeneity yet will provide valuable habitat for specialist grassland species. The AIP proliferation within the Thicket Habitat did increase cover but likely impacts on food sustainability over longer temporal scales as AIPs outcompete indigenous flora. No large raptors were observed which may be an indication of the high degree of human activity within the study area. During the investigation mostly small passerines were observed while waterbirds occurred in higher abundances within the Freshwater Habitats. The integrity of the study area with regard to avifaunal species is considered intermediate as a result of the high degree of transformation encompassing the study area and the degree of human movement within the study area. Grassland areas comprising of herbaceous plant species will be favoured by grassland species while, the Degraded Coastal Forest and Thicket habitat consists of varying densities of woody species that will be utilised by a diverse community of avifauna. The Degraded Coastal Forest habitat only contributes a small area to the site yet may have the highest species richness on site. Together with the Thicket unit, these, provide suitable shelter and habitat for the greatest abundance and diversity of birds. Food resources are high within the study area for avifaunal species. Within the Hygrophilous Grassland and Thicket habitat grass seeds and a large abundance of invertebrates will form the staple food resources for granivorous and insectivorous species, which are likely the most abundant group. The heterogenous vegetation composition will likely enhance the year-round provisioning of food for these species, though, understandable reductions in insect abundance may occur in winter when many birds will migrate altitudinally or to other regions. Portions of the survey area are overlayed with invasive tree species which create homogenous floral communities and reduce the food availability for a range of avifaunal species. During the summer months the overall food resource production of the herbaceous and woody layer will likely increase, and as such a higher abundance of avifauna can be supported. The summer months additionally see an increase in insect abundance which provides an energy rich source of food for avifaunal species. This increase is likely mimicked by small mammals as well as lizards, skinks and amphibians which are an important food resource for raptors and some smaller bird species. During the field assessment no avifuanal SCC were observed. It is considered likely that the following avifaunal SCC, as defined by Taylor *et al*. (2015), may transverse the area: Sensitive species 2, *Circus ranivorus* (Marsh Harrier), *Circaetus fasciolatus* (Southern Banded Snake Eagle), *Geokichla guttata* (Spotted-ground-thrush), *Mycteria ibis* (Yellow-billed Stork), *Coracias garrulus* (European Roller, NT), *Falco biarmicus* (Lanner Falcon), *Stephanoaetus coronatus* (Crowned Eagle) and *Rostratula benghalensis* (Greater Painted-snipe). Species observed on site other than those indicated in the photos above include *Dendrocygna viduata* (White-faced Whistling Duck), *Colius striatus* (Speckled Mousebird), *Apalis flavida* (Yellow-breasted Apalis), *Merops persicus* (Blue-cheeked Bee-eater), *Laniarius ferrugineus* (Southern Boubou), *Vidua macroura* (Pin-tailed Whydah) amongst others. For a full list of avifaunal species observed please refer to Appendix C.

AVIFAUNAL SCC							
Species	**Habitat and Resources in the STUDY AREA**	**RSA Status**	**POC**	**Species**	**Habitat and Resources in the STUDY AREA**	**RSA Status**	**POC**
Sensitive species 2	This species prefers a mix of grassland and freshwater habitat. The species forages on wetland verges and in grassland habitat. Foraging in agricultural fields also occurs. Roosts at night in utility infrastructure or trees.	EN	Low	*Coracias garrulus* (European Roller, NT)	A non-breeding migrant that prefers savanna and shrubland habitat but occurs in a variety of vegetation types which include forest, grassland and artificial/human modified units.	NT	Medium
Circus ranivorus (Marsh Harrier)	The species relies upon permanent wetlands for breeding, foraging and roosting. It hunts over drier adjacent floodplains, grasslands and croplands for birds, reptiles, frogs and insects.	EN	Medium	*Falco biarmicus* (Lanner Falcon)	Species favours open grassland, cleared woodlands and agricultural area where suitable perches for hunting are available. Within the study area the Hygrophilous Grassland is considered favourable.	VU	Medium
Circaetus fasciolatus (Southern Banded Snake Eagle)	This species occurs within coastal lowland thicket and forest habitat interspersed with grassland habitat. Within the study area it will utilise the Degraded Coastal Forest, Thicket and Grassland Habitat.	CR	Medium	*Stephanoaetus coronatus* (Crowned Eagle)	This species utilises forests (gallery and riverine), but also occurs in woodlands and forested gorges in savannah and woodland habitat and exotic plantations. Primary prey is mammals. Within the study area suitable habitat for the species is located within the Degraded Coastal Forest habitat but the extent is unlikely to support breeding.	VU	Medium
Geokichla guttata (Spotted-ground-thrush)	The species is found in dappled and open forest understory. They tend to avoid dense thicket habitats. Within the study area the Degraded Coastal Forest and portions of the Thicket habitat provide suitable habitat for the species.	EN	Medium	*Rostratula benghalensis* (Greater Painted-snipe)	These birds prefer freshwater habitat. The prefer secluded locations with muddy areas adjacent concealing vegetation	NT	Low
Mycteria ibis (Yellow-billed Stork)	This species utilises a diversity of permanent and seasonal wetlands. It generally utilises habitats that are free of surface vegetation. Within the study area most Freshwater habitat was covered with vegetation reducing habitat suitability.					EN	Low
CONCLUDING REMARKS							
Overall, the avifaunal sensitivity associated with the study area is considered intermediate as the potential for SCC was reduced and the observed assemblage was mostly associated with common, widely distributed species. Understandably, abundance and diversity will vary within the study area in accordance with available food resources, rainfall and seasonal changes, with some avifaunal species undertaking local migrations during the winter months. The proposed activities and associated infrastructure will result in a reduction in habitat and food resources and will likely impact on the diversity of the locality while abundance levels will decrease. Impacts to avifaunal species within the study area will result in the localised reduction in habitat, whilst edge effects such as noise and general human activities will impact on avifaunal species within the study area. Additionally, the increased movement of vehicles traveling to and from the study area as well as increased conflict with humans will likely increase the risk of persecution on avifaunal species. Please see section 5.1 below for a detailed list of mitigatory measures pertaining to avifauna.							

3.4. Herpetofauna

Table 3: Field assessment results pertaining to reptile and amphibian species within the study area.

SPECIES AND HABITAT RECORDED IN THE STUDY AREA

Left to right: ***Philothamnus natalensis natalensis*** (Eastern Natal Green Snake) which had been electrocuted by the electric fence. ***Kinixys zombensis*** (Eastern Hinged-back Tortoise) observed within the Degraded Coastal Forest Habitat. ***Hyperolius marmoratus*** (Painted Reed Frog) observed within the Thicket Habitat. ***Hyperolius argus*** (Argus Reed Frog) noted within the Freshwater Habitat unit.

Left to right: ***Lygodactylus capensis*** (Common Dwarf Gecko) observed within the Degraded Hygrophilous Grassland habitat. Likely a ***Pelusios castanoides*** (Yellow-bellied Hinged Terrapin) which had been electrocuted by the electric fence (a common site observed along the boundary fence). In the image to the far right, the red arrow indicates the live wire responsible for the terrapin and tortoise motilities within the study area. A solution is indicated by the green arrow where a dead trip wire (wire without any current) is placed Infront of the live wire to act as a barrier between the faunal species and the wire with the current. Alternatively, a small boundary fence can also be installed to impede movement to the base of the main fence and the associated live wires.
HERPETOFAUNA HABITAT AND DIVERSITY OVERVIEW
Reptile and amphibian species are notoriously hard to detect, owing to their secretive nature, nonetheless several herpetofaunal specimens were observed during the field assessment. During the sites assessment it was abundantly evident that the electric fence surrounding the property has been responsible for the electrocution of numerous herpetofauna. As such, suitable mitigation measures must be taken to avoid this

situation. The Freshwater, Degraded Coastal Forest and Thicket habitat provide valuable opportunities for reptiles and amphibian. The open to sparsely treed Degraded Hygrophilous Grassland habitat does not provide valuable habitat and is likely to host mostly common and hardy reptile and amphibian species adapted to grassy habitat. This is still considered suitable supporting habitat for the community represented within the study area as foraging can be undertaken here. The Transformed habitat is not considered valuable for herpetofauna. The Freshwater Habitat, Degraded Coastal Forest and Thicket will provide suitable breeding locations for a variety of amphibians and reptiles due to the unique moist characters and reduced exposure provided. Habitat integrity for herpetofauna is diminished as a result of fragmentation, particularly as a result of the electrified fence which has resulted in high mortality of terrapins and snakes. Herpetofaunal sensitivity in the footprint is therefore deemed to be moderately high overall, with several herpetofaunal species being observed during the field assessment. Although no SCC were observed within the study area the habitat provides suitable habitat for several species which include; *Pyxicephalus edulis* (African Bullfrog), *Bitis gabonica* (Gaboon Adder), *Homoroselaps dorsalis* (Striped Harlequin Snake), Sensitive species 1, *Lycophidion pygmaeum* (Pygmy Wolf Snake), *Python natalensis* (Southern African Python), *Hemisus guttatus* (Spotted Shovel nosed Frog), *Dendroaspis angusticeps* (Green Mamba), *Chamaesaura macrolepis* (Large-scaled Grass Lizard) and *Hyperolius pickersgilli* (Pickersgill's Reed Frog). The above-mentioned SCC and where they will likely occur in the footprint are described in finer detail below. All habitat units are suitable habitat for herpetofauna to forage within as a result of their adaptable nature and feeding habits which often draw them into human dwellings.

HERPETOFAUNA SCC

Species	Habitat and Resources in the MRA	RSA Status	POC	Species	Habitat and Resources in the MRA	RSA Status	POC
Pyxicephalus edulis (African Bullfrog)	Occurs in a variety of habitats from dry savannas to open grassy woodlands and riverine woodlands where it breeds in shallow well vegetated pans. When not breeding, it can travel up to 4 km from water, foraging for insects at night. Adults may be buried beneath the soil in the dry season.	TOPS NT	Medium	*Python natalensis* (Southern African Python)	This species is found in a variety of habitats, often associated with large animal burrows. The study area does provide suitable habitat for the species, but reduced prey abundance may be a limiting factor.	LC	Medium
Bitis gabonica (Gaboon Adder)	This species occupies moist coastal forest and the surrounding moist grassland. These characters were present within the study area.	NT	Medium	*Hemisus guttatus* (Spotted Shovel nosed Frog)	Inhabits pans and marshy ground in coastal bush and grassland habitats. Forages over extensive range of habitats.	VU	Medium
Homoroselaps dorsalis (Striped Harlequin Snake)	This species is partially fossorial and known to inhabit termitaria in grassland habitats. The Hygrophilous Grassland habitat will be most favourable for this species.	NT	Medium	*Dendroaspis angusticeps* (Green Mamba)	This species occupies low altitude forest. These characters were present within the Degraded Coastal Forest Habitat.	NT	Medium
Sensitive species 1	Prefers rivers, lakes, dams and freshwater swamps with suitable prey resources. The absence of open water and suitable prey resources reduces the suitability of the study area for this species.	TOPS	Low	*Chamaesaura macrolepis* (Large-scaled Grass Lizard)	Occurs in Savanna, Grassland habitat and within the Indian Ocean Coastal Belt. Within the study area portions of the Degraded Hygrophilous Habitat are suitable for the species.	NT	Medium
Lycophidion pygmaeum (Pygmy Wolf Snake)	This species inhabits lowland forest, grassland and mesic savanna habitats. It has also been recorded in pine plantations. Within the study area the species will utilise areas outside of the Freshwater Habitat.	NT	Medium	*Hyperolius pickersgilli* (Pickersgill's Reed Frog)	This species prefers densely vegetated marshy habitats in coastal bushveld and grassland.	EN	Medium

CONCLUDING REMARKS

Overall, the study area has portions of habitat which are considered sensitive from a herpetofaunal perspective, with a high diversity of herpetofaunal species observed during the field assessment. As such the proposed developments will impact on herpetofaunal species as a result of widespread vegetation clearing that will lead to the direct habitat loss, and may disturb habitats that are located immediately outside of the footprint area, particularley within the Freshwater Habitat. As a result, herpetofauna may become displaced as they are forced to migrate out of the areas of disturbance. The movement of herpetofauna out of the disturbance footprint areas will result in higher levels of competition for food resources and habitat, which can lead to a decrease in herpetofaunal abundance levels, including that of the potential occurring SCC. Additionally, the increased movement of vehicles traveling to and from the study area as well as increased conflict with humans will likely increase the risk of persecution for herpetofauna species. Please see section 5.1 below for a detailed list of mitigatory measures pertaining to herpetofauna. It is considered imperative that the existing electrified fence be installed with a tripwire and culverts or a wire mesh with culverts to prevent the current extent of terrapins and tortoise mortality resulting from electrocutions.

3.5 Invertebrates

Table 4: Field assessment results pertaining to invertebrate species within the study area.

SPECIES AND HABITAT RECORDED IN THE STUDY AREA
 **Left to right: *Brachycerus* sp. (Weevil) observed in the Transformed Habitat unit. *Zonocerus elegans* (Elegant Grasshopper) observed within the Degraded Hygrophilous Grassland. *Cynthia cardui* (Painted Lady) were mostly observed within the Degraded Hygrophilous Grassland. *Chalcostephia flavifrons* (Inspector) observed in the Degraded Hygrophilous Grassland Habitat. Large Mantodea ootheca and a Mantispid (Mantispidae) captured within the Freshwater habitat in the western portion of the study area.**
INVERTEBRATE HABITAT AND DIVERSITY OVERVIEW
During the field investigation cooler temperatures were experienced which did reduce the invertebrate activity. Sampling earlier in the summer season would have yielded more accurate and robust results for invertebrate abundances and diversities. The largely untransformed habitat provides both open grassland characters as well as well wooded forested areas interspersed with valuable Freshwater Habitat. Diversity appeared to be the highest in the Thicket unit, however, it is anticipated that the Degraded Coastal Forest and Freshwater units will support the highest diversity of invertebrates within the study area. The Degraded Coastal Forest, Thicket and Freshwater habitat has remained undeveloped/transformed and have maintained a relatively diverse floral composition and therefore suitable invertebrate habitat and forage is available herein. Water dependant insects were largely restricted to the Freshwater habitat. Insects are generally the most abundant macro-organisms within landscapes and often perform services vitally important for ecosystem functioning. Therefore, high insect abundance can indicate a healthy landscape. Insects serve as pollinators, remove detritus material, bury dung and associated parasites below the surface helping to cycle nutrients back into the soil while decreasing the parasitic load within an environment, reducing the risk of disease. Additionally, insects serve as a food resource for fauna within the survey area, and as such a low insect diversity and abundance may reduce forage sustainability for other faunal species from various classes. From an arachnid perspective, these species are notoriously hard to detect over a relatively short period of time, which can often lead to the under estimation of diversity and abundance. Taking this into consideration, habitat conditions for arachnids as well as available resources were analysed, whilst additional information on arachnid occurrences and species diversity for the QDS was collected from databases such as iNaturalist and the Animal Demography Unit (ADU). A number of arachnids were observed during the site assessment, most of which inhabit the graminoid layer. No Baboon Spider burrows were observed. Online databases also indicated that an intermediate assemblage of arachnids occur within the QDS 2832CA. The information available on databases, supplemented with the observations recorded on the site and the general habitat provide sufficient information and evidence to suggest that the diversity within the locality is intermediate. The ADU website has records of two (2) baboon spider species within the QDS's, namely: *Idiothele nigrofulva* and *Brachionopus robustus* and a single scorpion, *Uroplectes formosus* (Fair Lesser Thicktail). Species within the genera *Hadogenes, Opisthacanthus, Opistophthalmus, Ceratogyrus*, *Harpactira* and *Pterinochilus* are protected under TOPS and should they be discovered, suitable mitigation strategies will need to be undertaken under the guidance of a suitably qualified specialist with input from the relevant authorities. Insect species utilise all habitat types except for arctic tundra and ice dominated landscapes and will readily inhabit transformed and altered habitats. The survey area is comprised of various habitat units, which provided various niche habitat and suitable structure and resources for a diverse assemblage of species to occur. Invertebrate abundance was considered to be intermediate, however, temperatures were not

satisfactorily for high invertebrate activity which was taken into consideration for the scoring. Nonetheless it appeared that the Degraded Coastal Forest and Freshwater habitat were most suitable for invertebrates. Most insects observed belonged to the orders Orthoptera, Hemiptera and Coleoptera. The increased habitat heterogeneity provided habitat for a high diversity of invertebrates with variable habitat structure, fallen and dead trees and aquatic environments which numerous insects can inhabit and seek refuge.

INVERTEBRATE SCC

Species	Habitat and Resources in the STUDY AREA	RSA Status	POC	Species	Habitat and Resources in the STUDY AREA	RSA Status	POC
Pomatonota dregii (East Coast Katydid)	This species resides only within Indian Ocean Coastal Belt forests, a habitat type which is experiencing severe pressure by logging and cultivation with sugarcane and timber production.	VU	Medium	*Arytropteris basalis* (Flat-necked Shieldback)	This species occurs within coastal forest and thicket mosaics in KwaZulu-Natal Province. The Degraded Coastal Forest and Thicket Habitat will be suitable for this species within the study area.	VU	Medium

CONCLUDING REMARKS

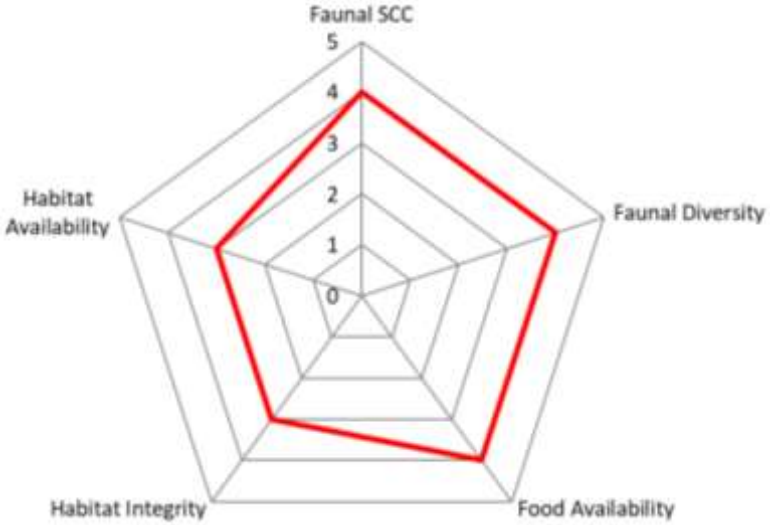
The proposed development will lead to loss of habitat and food resources and will likely lead to a reduction in the diversity of insects and arachnids observed within the study area. In general, species observed were commonly occurring that may persist in the surrounding landscape but will be faced with increased competition and potential lack of resources, putting strain on invertebrate populations. Development impacts will likely be highest within the Freshwater and Degraded Coastal Forest habitat as these units offer unique characteristics within the landscape. The insect SCC *Pomatonota dregii* (East Coast Katydid) and *Arytropteris basalis* (Flat-necked Shieldback) have a medium POC of occurring within the study area and development within the Degraded Coastal Forest may pose a high risk to these species. The loss of insect abundance and diversity will have a negative cascading effect on other faunal species in the study area. Please refer to section 5.1. below for a detailed list of recommended mitigatory measures.

4. SENSITIVITY MAPPING

Figure 5 conceptually illustrates the faunal ecological sensitivity for the various areas. The areas are depicted according to their sensitivity in terms of the presence or potential for faunal SCC, habitat integrity, levels of disturbance and overall levels of diversity. Table 5 below presents the sensitivity of each habitat along with an associated conservation objective and implications for the proposed activities.

Table 5: A summary of the sensitivity of each habitat unit and implications for the proposed activities.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Low 	Optimise development potential.	**Transformed Habitat Unit**	- This unit is entirely transformed because of anthropogenic activities (e.g., buildings, road development etc.) and thus offers limited habitat for fauna. - Faunal diversity was low. - AIP infestation is prominent. - No habitat for faunal SCC is present and the potential for the habitat to support viable populations of SCC is deemed very low.
Intermediate 	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	**Degraded Hygrophilous Grassland and Thicket Habitat**	- Habitat has been degraded due to historic anthropogenic disturbances (e.g., firewood collection, altered fire & herbivory regimes, AIP proliferation etc) and bush encroachment. - The floral communities (faunal habitat) have shifted away from the reference vegetation type/s and are degraded and encroached (e.g., in Thicket habitat). - Faunal SCC may utilise these units for foraging. Breeding within these units is considered unlikely.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Moderately high 	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance	**Degraded Coastal Forest & Freshwater Habitat (Depression Wetland)**	- Habitat in good ecological condition and high supports a diversity of faunal species. - Provides unique habitat for an array of species that have an affinity for 1) forest habitats, and 2) wet saturated environments. - Provide important ecological features within the study area and greater surrounding areas, for example, dispersal corridors and important hydrological function and processes. - Potential habitat for several faunal SCC.

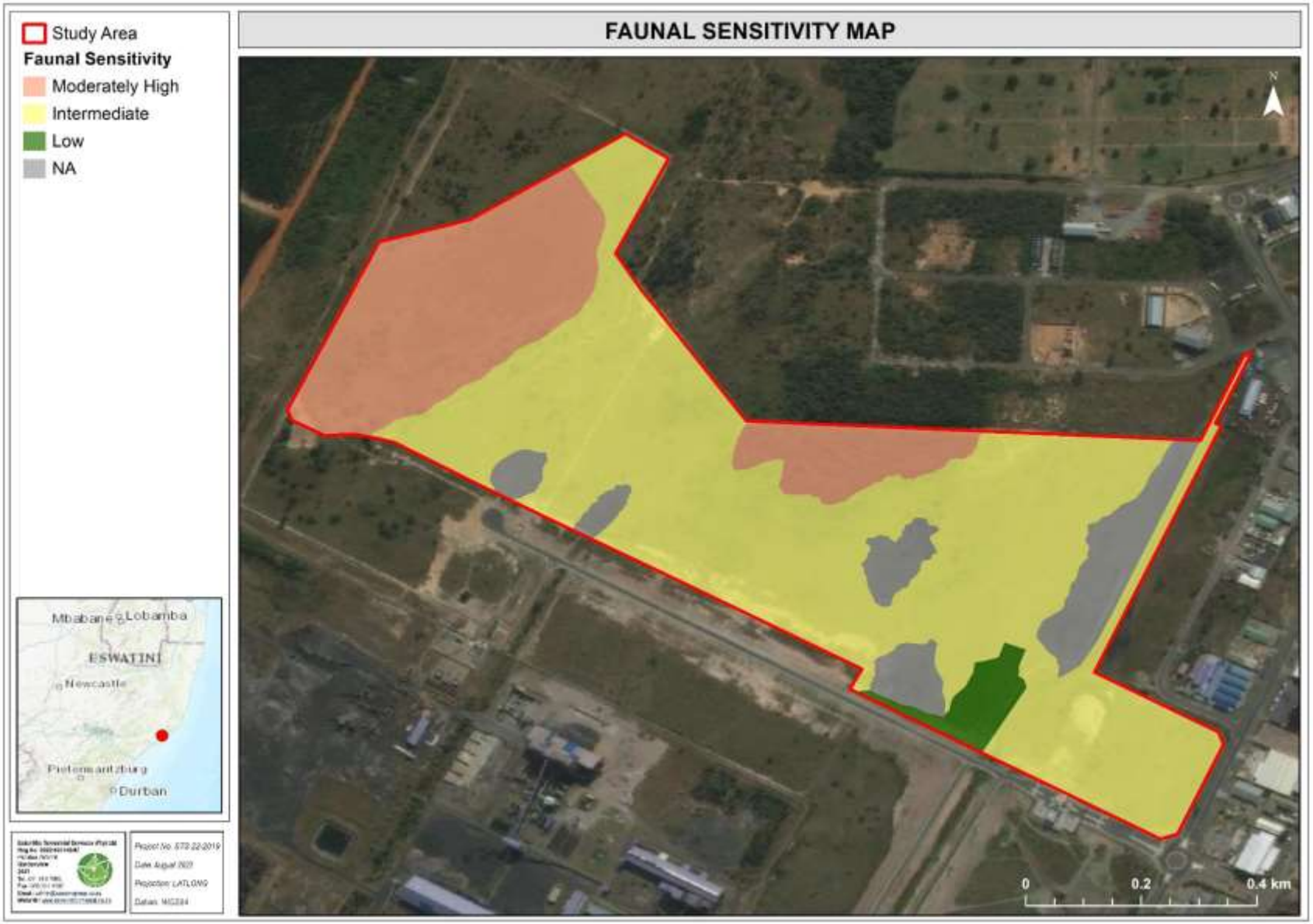


Figure 5: Conceptual illustration of the habitat sensitivity associated with study area identified during the field assessment. Wetlands (including the Seep Wetlands and Wetland Flats) that will be infilled do not have an assigned sensitivity. They have been mapped in grey and assigned a NA (Not Applicable).

5. IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed development for the study area. An impact discussion and assessment of all potential i) Pre-construction & Planning Phase, ii) Construction Phase, and ii) Operational & Maintenance Phase impacts for the 1) faunal habitat and diversity, and 2) SCC habitat and diversity associated with the study area are provided in Section 5.1 and 5.2. All mitigatory measures required to minimise the perceived impacts are presented in Section 5.1.

The authorised Phase 1F of the development includes infilling of the Wetland Flats and the Seep Wetlands within the study area (refer to Section 1.1 for further details). Thus, no impacts pertaining to these wetland types are presented in the impact assessment below. However, the Depression Wetland in the west of the study area is not within the proposed layout and will therefore not be infilled. As such, the impacts associated with the Depression Wetland (i.e., secondary impacts) are presented in the impact assessment below.

For the Pre-Construction & Planning phase, the habitats were assessed together. For the Construction Phase, the impacts were assessed separately for each habitat, namely Degraded Hygrophilous Grassland, Degraded Coastal Forest, Thicket Habitat, Infilled Wetlands, Depression Wetland (as explained above), and Transformed Habitat. For the Operational & Maintenance Phase, the impacts were assessed for all habitats (except for the Depression Wetland, i.e., Degraded Hygrophilous Grassland, Degraded Coastal Forest, Thicket Habitat, Infilled Wetlands, Transformed Habitat). During this phase, impacts associated with the Depression Wetland, were assessed separately.

5.1 Faunal Impact Assessment Results

The following tables indicate the perceived risks to the faunal ecology associated with all phases of the proposed infrastructure development. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that ALL mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Table 6: Impact on the (1) faunal habitat and diversity, and (2) SCC (<u>across all habitat units</u>) associated with the proposed development activities for the Pre-construction & Planning Phase.

IMPACT on Faunal Habitat & Diversity across the habitats: loss of faunal habitat and diversity because of inconsiderate planning, infrastructure design and placement leading to unnecessary edge effects impacts, e.g., failure to compile an AIP control and management plan, and/or erosion control plan.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	High 3	Long-term 3	**High** **8**	Definite	**VERY HIGH**	– ve	High
Essential mitigation measures: ➢ Minimise loss of natural vegetation where possible through effective planning and limiting the development footprint to what is essential. The designs must further adhere to all legislation and all reasonable precautions must be taken to prevent potential spills and /or leaks; ➢ A walkdown, conducted by a faunal specialist, of the footprint area should take place prior to vegetation clearing to rescue and relocate all small and slow moving fauna, particularly amphibians and reptiles. These individuals should be relocated within the study area where no development is proposed; ➢ It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, are not placed outside of the authorised footprint, especially within the freshwater habitat that has been designated as open space. Furthermore, infrastructure should be densified within the footprint to avoid destruction of Degraded Coastal Forest Habitat and any impacts to the large western portion of Freshwater Habitat; ➢ A stormwater management plan should be designed and implemented for all phases of the development, this in order to minimise potential erosion and sedimentation of the remaining freshwater habitats that will not be infilled and developed; ➢ An AIP Management/Control Plan should be compiled by a qualified professional and implemented prior to the start of construction activities. No chemical control of AIPs to occur without a certified professional and no chemical control to be permitted in Freshwater habitat; and ➢ Appropriate rehabilitation measures and a bush encroachment control plan should be implemented to ensure control thereof.								
With mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High
IMPACT on SCC across the habitats: Failure to obtain the necessary permits for nationally and provincially protected species and failure to relocate faunal SCC to suitable habitat outside of the surface infrastructure footprint.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	High 3	Long-term 3	**Very high** **8**	Definite	**VERY HIGH**	– ve	High
Essential mitigation measures: ➢ A walkdown of the location should be undertaken and all SCC invertebrate or vertebrate nests or burrows should be marked. Should any protected faunal species be noted within the development footprint which cannot be moved off the site without potential harm, a permit will have to be obtained from the relevant provincial or national authority for their translocation; ➢ Permits from Ezemvelo KZN Wildlife and authorisation from the DFFE should be obtained to remove or convey any provincially or nationally protected species before any vegetation clearing (destruction of faunal habitat) may take place; and ➢ The relocation of faunal SCC must take place prior to the commencement of the construction phase where vegetation clearing will occur. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation.								
With mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High

Table 7: Impact on the (1) faunal habitat and diversity, and (2) faunal SCC associated with the Degraded Hygrophilous Grassland for the proposed development activities for the Construction Phase.

IMPACT on Habitat Diversity within the Degraded Hygrophilous Grassland: Vegetation clearing activities will result in a decrease in faunal habitat and diversity, reduced habitat integrity, and habitat fragmentation of the habitat with surrounding areas. AIP spread which will result in the replacement of native flora; Construction activities will lead to the compaction and degradation of soils which have a higher probability of erosion and sedimentation of Freshwater Habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Definite	**HIGH**	– ve	High
Essential mitigation measures: - Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint – manage footprint creep into surrounding areas; - The construction footprint must be kept as small as possible to minimise impact on the Degraded Coastal Forest and Freshwater habitats that are not located within the proposed footprints (edge effect management). Care should be taken during the construction phase of the proposed development to limit edge effects outside of the authorised footprint; - Ensuring continued demarcation of all footprint areas during construction activities; - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmentally responsible manner, e.g., taken to a registered waste disposal site; - If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder faunal rehabilitation later down the line. Spill kits should be kept on site within workshops. in the event of a breakdown, maintenance of vehicles must take place with care and spillage preventative measures implemented; - No hunting/trapping or collecting of faunal species is allowed; - No informal fires by construction personnel are allowed; - Smaller species of invertebrates and reptiles are likely to be less mobile during the colder period, as such should any be observed in the study site during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own; - When rehabilitating a disturbed area, it is imperative that as far as possible the habitat that was present prior to disturbances is recreated, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area; - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management; and - All soils compacted because of construction activities outside of the final footprints should be ripped and profiled and reseeded with indigenous seed mixes to restore faunal habitat.								
With mitigation	Local 1	Low 1	Medium-term 2	**Very low** **4**	Definite	**VERY LOW**	– ve	High
IMPACT on SCC within the Degraded Hygrophilous Grassland: Vegetation clearing leads to the loss of faunal SCC and SCC habitat. Furthermore, the spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
	Regional	Medium	Medium-term	**Medium**	Probable	**MEDIUM**	– ve	High

Without mitigation	2	2	2	**6**				
Essential mitigation measures: - Limit impact footprint to what is absolutely necessary; - Stormwater runoff has potential to cause harm to the sensitive SCC which inhabit this unit, as such it is vital that this is managed, taking into account the hydrological and hydropedological regime of the study area; - No hunting/trapping or collecting of faunal SCC is allowed; - A walkdown of the footprint area is required before construction activities can commence, where all faunal SCC are searched for and relocated under the provision that the necessary permits have been obtained prior to this; and - Edge effect control needs to be implemented to prevent further degradation and potential loss of faunal SCC outside of the proposed disturbance footprint area.								
With mitigation	Local 1	Low 1	Short-term 1	**Very low** **3**	Possible	**INSIGNIFICANT**	– ve	High

Table 8: Impact on (1) faunal habitat and diversity, and (2) faunal SCC associated with the Degraded Coastal Forest for the proposed development activities for the Construction Phase.

IMPACT on Habitat Diversity within the Degraded Coastal Forest: Vegetation clearing activities will result in a decrease in faunal habitat and diversity, reduced habitat integrity, and habitat fragmentation of the habitat with surrounding areas, as well as loss of unique habitat conditions. AIP spread which will result in the replacement of native flora; Construction activities will lead to the compaction and degradation of soils which have a higher probability of erosion.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	High 3	Long-term 3	**Very high** **8**	Definite	**VERY HIGH**	– ve	High
Essential mitigation measures: - Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint – manage footprint creep to surrounding areas; - The construction footprint must be kept as small as possible and infrastructure should be densified to ensure forest is not impacted. Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat outside of the authorised footprint. - Ensure continued demarcation of all footprint areas during construction activities; - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal site; - If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder faunal rehabilitation later down the line. Spill kits should be kept on site within workshops. in the event of a breakdown, maintenance of vehicles must take place with care and spillage preventative measures implemented; - No hunting/trapping or collecting of faunal species is allowed; - No informal fires by construction personnel are allowed; - Smaller species of invertebrates and reptiles are likely to be less mobile during the colder period, as such should any be observed in the study site during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Operational personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own; - When rehabilitating a footprint site, it is imperative that as far as possible the habitat that was present prior to disturbances is recreated, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area; - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management; and - All soils compacted because of construction activities outside of the approved footprint should be ripped and profiled and reseeded with indigenous seed mixes.								
With mitigation	Regional 2	Medium 2	Medium-term 2	**Medium** **6**	Definite	**MEDIUM**	– ve	High
IMPACT on SCC within the Degraded Coastal Forest: Vegetation clearing leads to the loss of faunal SCC and SCC habitat. Furthermore, the spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	High 3	Long-term 3	**Very high** **8**	Probable	**VERY HIGH**	– ve	High

Essential mitigation measures:

- Limit impact footprint to what is absolutely necessary;
- Stormwater runoff within the Depression Wetland has potential to cause harm to the sensitive SCC which inhabit this unit and it is vital that hydropedological regimes are not altered, if they are it is unlikely that any potential SCC will re-establish populations where stream flow is altered;
- No hunting/trapping or collecting of faunal SCC is allowed;
- A walkdown of the footprint area is required before construction activities can commence, where all anticipated faunal SCC are searched and marked for relocation and/or destruction so that all necessary permits and authorisations can be obtained from authorities; and
- Edge effect control needs to be implemented to prevent further degradation and potential loss of faunal SCC outside of the proposed disturbance footprint area.

With mitigation	Local 2	Medium 2	Medium-term 2	**Medium** **6**	Probable	**MEDIUM**	– ve	High

Table 9: Impact on (1) faunal habitat and diversity, and (2) faunal SCC associated with the Thicket Habitat for the proposed development activities for the Construction Phase.

IMPACT on Habitat Diversity within the Thicket Habitat: Vegetation clearing activities will result in a decrease in faunal habitat and diversity, reduced habitat integrity. AIP spread which will result in the replacement of native flora; Construction activities will lead to the compaction and degradation of soils which have a higher probability of erosion.

	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High

Essential mitigation measures:

- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint – manage footprint creep to surrounding areas;
- The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat outside of the authorised footprint.
- Ensuring continued demarcation of all footprint areas during construction activities;
- If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder faunal rehabilitation later down the line. Spill kits should be kept on site within workshops. in the event of a breakdown, maintenance of vehicles must take place with care and spillage preventative measures implemented;
- No hunting/trapping or collecting of faunal species is allowed;
- No informal fires by construction personnel are allowed;
- Smaller species of invertebrates and reptiles are likely to be less mobile during the colder period, as such should any be observed in the study site during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Operational personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own;
- When rehabilitating a footprint site, it is imperative that as far as possible the habitat that was present prior to disturbances is recreated, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area;
- Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal site;
- Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management; and
- All soils outside of the approved footprint that have been compacted as a result of construction activities should be ripped and profiled and reseeded with indigenous seed mixes.

With mitigation	Local 1	Low 1	Medium-term 2	**Very low** **4**	Definite	**VERY LOW**	– ve	High
IMPACT on SCC within the Thicket Habitat: Vegetation clearing leads to the loss of faunal SCC and SCC habitat. Furthermore, the spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	High
Essential mitigation measures: - Limit impact footprint to what is absolutely necessary; - Stormwater runoff within the Depression Wetland has potential to cause harm to the sensitive SCC which inhabit this unit and it is vital that hydropedological regimes are not altered, if they are it is unlikely that any potential SCC will re-establish populations where stream flow is altered; - No hunting/trapping or collecting of faunal SCC is allowed; - A walkdown of the footprint area is required before construction activities can commence, where all anticipated faunal SCC are searched and marked for relocation and/or destruction so that all necessary permits and authorisations can be obtained from authorities; and - Edge effect control needs to be implemented to prevent further degradation and potential loss of faunal SCC outside of the proposed disturbance footprint area.								
With mitigation	Local 1	Low 1	Medium-term 1	**Very low** **4**	Probable	**VERY LOW**	– ve	High

Table 10: Impact on (1) faunal habitat and diversity, and (2) faunal SCC associated with the Depression Wetland (i.e., undeveloped Freshwater Habitat) for the proposed development activities for the Construction Phase.

IMPACT on Habitat Diversity within the Freshwater Habitat: Vegetation clearing activities will result in a decrease in faunal habitat and diversity, reduced habitat integrity, and habitat fragmentation of the habitat with surrounding areas, as well as loss of significant and specialised habitat conditions. AIP spread which will result in the replacement of native flora; Construction activities will lead to the compaction and degradation of soils which have a higher probability of erosion.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	High 2	Long-term 3	**High** **7**	Probable	**HIGH**	– ve	High
Essential mitigation measures: - Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint – manage footprint creep to surrounding areas. Portions of this wetland will be developed according to the proposed development layout. This unit is extremely sensitive to fauna and potentially provides habitat to several SCC while maintaining important hydrological regimes, strict mitigation measures should be implemented to ensure no construction of any sort or associated activities (e.g., dumping) occurs within the habitat or its buffer zone; - The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat outside of the authorised footprint; - Ensuring continued demarcation of all footprint areas during construction activities; - If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder faunal rehabilitation later down the line. Spill kits should be kept on site within workshops. in the event of a breakdown, maintenance of vehicles must take place with care and spillage preventative measures implemented; - No hunting/trapping or collecting of faunal species is allowed; - No informal fires by construction personnel are allowed; - Smaller species of invertebrates and reptiles are likely to be less mobile during the colder period, as such should any be observed in the study site during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Operational personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own; - When rehabilitating a footprint site, it is imperative that as far as possible the habitat that was present prior to disturbances is recreated, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area; - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal site; - A rehabilitation plan must be prepared and implemented, and all rehabilitation actions must be adhered to in order to mitigate edge effects on the receiving environment; - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management; and - All soils compacted because of construction activities should be ripped and profiled and reseeded with indigenous seed mixes.								
With mitigation	Regional 2	Medium 2	Medium-term 2	**Medium** **6**	Probable	**MEDIUM**	– ve	High
IMPACT on SCC within the Freshwater Habitat: Vegetation clearing leads to the loss of faunal SCC and SCC habitat. Furthermore, the spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	High 2	Long-term 3	**High** **7**	Definite	**HIGH**	– ve	High

Essential mitigation measures: - Limit impact footprint to what is absolutely necessary; - A walkdown of the footprint area is required before construction activities can commence, where all anticipated faunal SCC are identified. Several reptiles, avian and amphibian SCC likely utilise this unit for breeding or foraging purposes. Regular monitoring of these species should occur to ensure their continued persistence and establishment within the habitat; ➢ Stormwater runoff within the Freshwater Habitat has potential to cause harm to the sensitive SCC which inhabit this unit and it is vital that hydropedological regimes are not altered, if they are it is unlikely that any potential SCC will re-establish populations where stream flow is altered; - No hunting/trapping or collecting of faunal SCC is allowed; - Ensure no collection of faunal SCC occurs by personnel; and - Edge effect control needs to be implemented to prevent further degradation and potential loss of faunal SCC outside of the proposed disturbance footprint area.								
With mitigation	Regional 2	Medium 2	Medium-term 2	**Medium** **6**	Probable	**MEDIUM**	– ve	High

Table 11: Impact on (1) faunal habitat and diversity, and (2) faunal SCC associated with the Transformed Habitat for the proposed development activities for the Construction Phase.

Habitat Diversity within the Transformed Habitat: A lack of vegetation means that vegetation clearing activities are unlikely to of concern. However, AIP spread which will result in the replacement of native flora. Construction activities will lead to the compaction and degradation of soils which have a higher probability of erosion.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Probable	**LOW**	– ve	High
Essential mitigation measures: - The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). Care should be taken during the construction phase of the proposed development to limit edge effects to surrounding habitat outside of the authorised footprint. This can be achieved by: - Ensuring continued demarcation of all footprint areas during construction activities; - Construction rubble or cleared AIPs are to be disposed of in a sustainable and environmental responsible manner, e.g., taken to a registered waste disposal site; - Ensure that no unnatural preferential flow paths are created during construction, i.e., implement appropriate stormwater management; and - All soils compacted because of construction activities should be ripped and profiled and reseeded with indigenous seed mixes.								
With mitigation	Local 1	Low 1	Medium-term 2	**Very low** **4**	Possible	**INSIGNIFICANT**	– ve	High
IMPACT on SCC within the Transformed Habitat: Vegetation clearing leads to the loss of faunal SCC and SCC habitat. Furthermore, the spread of AIPs within the disturbed areas can lead to the additional loss of SCC diversity from surrounding natural habitat.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Probable	**LOW**	– ve	High
Essential mitigation measures: - Limit impact footprint to what is absolutely necessary; and								

- Edge effect control needs to be implemented to prevent further degradation and potential loss of faunal SCC outside of this habitat as a result if potential edge effects and footprint creep.								
With mitigation	Local 1	Low 1	Medium-term 2	**Very low** **4**	Possible	**INSIGNIFICANT**	– ve	High

Table 12: Impact on the (1) faunal habitat and diversity, and (2) SCC (<u>across all habitat units, excluding the Depression Wetland</u>) associated with the proposed development activities for the Operational & Maintenance Phase.

IMPACT on Faunal Habitat & Diversity across the habitats: Loss of faunal habitat and diversity because of i) ineffective rehabilitation of exposed and impacted areas, increasing erosion risk and AIP proliferation within the surrounding areas, and / or ii) ineffective edge effect management (e.g., AIP control) which leads to the continued spread of AIP species within the surrounding natural areas.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Probable	**HIGH**	– ve	High
Essential mitigation measures: - No dumping of waste must be allowed on-site. All waste from the site must be collected and disposed of at a separate waste facility; - Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020); - Maintain quality of existing Degraded Coastal Forest habitat; - No collection of firewood is allowed by personnel; and - Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas.								
With mitigation	Local 1	Low 1	Medium-term 2	**Very low** **4**	Probable	**VERY LOW**	– ve	High
IMPACT on SCC across the habitats: Loss of SCC individuals and suitable habitat because of failure to monitor the success of relocated faunal SCC as well as the increased introduction and proliferation of AIP species due to a lack of maintenance activities, or poorly implemented and monitored AIP Management program, leading to ongoing displacement of natural vegetation outside of the footprint area. Further loss of SCC may occur because of the increased human presence in the area once operational, potentially leading to Illegal harvesting/ collection, the persecution of fauna in the adjacent natural habitat, or an increased risk of fire frequency impacting on fauna and faunal communities outside of the development footprint.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Medium 2	Medium-term 2	**Low** **5**	Probable	**LOW**	– ve	High
Essential mitigation measures: ➢ Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations; ➢ No collection of faunal SCC is allowed by personnel; ➢ Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020); and ➢ Ongoing AIP plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas.								
With mitigation	Local 1	Low 1	Medium-term 2	**Very low** **4**	Probable	**VERY LOW**	– ve	High

Table 13: Impact on the (1) faunal habitat and diversity, and (2) SCC for the Depression Wetland (associated with the Freshwater Habitat) associated with the proposed development activities for the Operational & Maintenance Phase.

IMPACT on Faunal Habitat & Diversity the Depression Wetland: Loss of faunal habitat and diversity because of i) ineffective rehabilitation of exposed and impacted areas in the surrounding areas, increasing erosion and sedimentation risk and AIP proliferation within the surrounding areas, and / or ii) ineffective edge effect management (e.g., AIP control) which leads to the continued spread of AIP species within the surrounding natural areas.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Definite	**HIGH**	– ve	High
Essential mitigation measures: ➢ No dumping of waste must be allowed on-site. All waste from the site must be collected and disposed of at a separate waste facility; ➢ No impacts to the Depression Wetland or its buffer should be undertaken; ➢ Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas; and ➢ Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which complies with legal standards.								
With mitigation	Local 1	Low 1	Medium-term 2	**Very low** **4**	Definite	**VERY LOW**	– ve	High
IMPACT on Faunal SCC for the Depression Wetland: Ineffective edge effect management (e.g., AIP control and erosion plans) that can lead to the loss of SCC habitat and availability.								
	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** **7**	Probable	**HIGH**	– ve	High
Essential mitigation measures: ➢ Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020); ➢ No collection of faunal SCC is allowed by personnel; and ➢ Ongoing AIP plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas. No chemical control of AIPs to occur without a certified professional and no chemical control to be permitted in Freshwater habitat.								
With mitigation	Local 1	Low 1	Medium-term 2	**Very low** **4**	Probable	**VERY LOW**	– ve	High

5.2 Impact Discussion

The impact assessment was undertaken on all aspects of faunal ecology deemed likely to be affected by the proposed development activities.

Prior to mitigation measures the i) Pre-construction & Planning Phase, ii) Mining Phase and iii) Decommissioning & Closure Phase scored an impact significance as follows:

Habitat	Component	Pre-mitigation Impact	Post-mitigation Impact
Pre-Construction & Planning Phase			
All Habitats (excluding infilled Wetlands that were not assessed)	Faunal Habitat Diversity	Very High	Medium
	Faunal SCC	Very High	Medium
Construction Phase			
Degraded Hygrophilous Grassland	Faunal Habitat Diversity	High	Very Low
	Faunal SCC	Medium	Insignificant
Degraded Coastal Forest	Faunal Habitat Diversity	Very High	Medium
	Faunal SCC	Very High	Medium
Thicket Habitat	Faunal Habitat Diversity	Medium	Very Low
	Faunal SCC	Medium	Very Low
Depression Wetland	Faunal Habitat Diversity	High	Medium
	Faunal SCC	High	Medium
Transformed Habitat	Faunal Habitat Diversity	Low	Insignificant
	Faunal SCC	Low	Insignificant
Operational & Maintenance Phase			
All Habitats (except for Depression Wetland)	Faunal Habitat Diversity	High	Very Low
	Faunal SCC	Low	Very Low
Depression Wetland	Faunal Habitat Diversity	High	Very Low
	Faunal SCC	High	Very Low

5.2.1 Impact on Faunal Habitat and Diversity

The impact assessment was undertaken on all aspects of faunal ecology deemed likely to be affected by the proposed development activities. The proposed development activities will result in the extensive clearance of vegetation, which will lead to a loss of faunal habitat and diversity within the study area.

The proposed development activities within the Degraded Hygrophilous Grassland (of intermediate sensitivity) will result in the extensive loss of important supporting habitat. Although the habitat is degraded from a floral perspective this habitat remains the most extensive unit within the study area and likely plays an important role as a foraging areas for fauna. Although not sensitive from a faunal diversity perspective, impacts are anticipated to increase competition for resources within the adjacent unit. As such, impacts associated with the faunal communities is not anticipated to be high provided that mitigation measures are undertaken.

The proposed development activities will result in negative impacts on a sensitive habitat unit, namely the Degraded Coastal Forest Habitat and the Depression Wetland (of moderately high faunal sensitivity). These habitat units provide unique habitat both within the study area and

within the greater surrounding areas. Furthermore, important ecosystem functions are maintained by the Depression Wetland. Development within the Degraded Coastal Forest and adjacent the Depression Wetland Habitat will greatly impact on the species diversity and the associated ecosystem functions provided within these units and the broader area. However, impacts to the Degraded Coastal Forest can be greatly minimised by densifying the infrastructure within the footprint to avoid these habitats. As such, it is recommended that all zones of regulation associated with these to habitats are considered and development within these habitats, and their zones of regulation, avoided. If mitigation measures are not effectively implemented, High impacts are likely to result from the destruction of these units.

The proposed development activities within the Thicket Habitat (intermediate sensitivity) will result in the loss of forage and sheltering areas for several fauna. Although this unit is encroached and degraded in nature it does provide habitat of valuable structure for invertebrates, reptiles and avifauna. The loss of this unit is however not anticipated to lead to high impacts on faunal diversity at a regional (provincial) level.

The Transformed unit is already considered developed and thus impact are anticipated to be low.

Negative impacts likely to be associated with the faunal ecology within study area includes, but are not limited to, the following:

- Development footprint creep and placement of infrastructure within natural habitat outside of the authorised footprint, i.e., within the Depression Wetland in the west;
- Reduction in faunal movement corridors;
- AIP proliferation, bush encroachment, and erosion in disturbed areas degrading the remaining faunal habitat; and
- Increased human movement, leading to greater pressure on faunal communities and increasing the potential for human wildlife conflict.

Freshwater habitats function as important migratory corridors and provide valuable freshwater resources which cannot be replaced in the surrounding landscape. Impeding movement corridors will inevitably lead to increased population fragmentation and reduce the ability of fauna to locate suitable forage resources and habitat, impacting on diversity.

All edge effects are to be monitored to ensure that the surrounding natural habitat is not impacted upon, thereby ensuring no further impacts to faunal species diversity and habitat occurs. Impacts anticipated to occur to faunal habitat and diversity within the study area range from high to medium prior to mitigation implementation. With mitigation measures full implemented the impacts can be reduced to medium, very low and insignificant impacts all cases.

If left unmanaged, these edge effects may potentially impact areas outside of the study area, and as a result may alter more suitable faunal habitat on an increased spatial scale, jeopardizing conservation potential of landscapes surrounding the study area. However, mitigation measures will notably aid in the reduction of the significance of impacts due to decreased spatial scale and duration. Through implementing mitigation measures not only will the overall impact significance decrease, the effort, time and financial input costs for rehabilitation and AIP control over the long term will be reduced.

5.2.2 Impacts on Faunal SCC

Portions of the study area contain unique and sensitive faunal habitat and as such it is anticipated that several SCC may occur within the study area. The fragmented nature of the study area does reduce the potential for several of these species to occur, however, habitat remains suitable. Best construction and operation practices must be employed alongside the recommended mitigation measures to ensure no further habitat degradation occurs. This is important to assist in future rehabilitation activities, increasing the potential that SCC may in the future be able to recolonise suitable locations within the study area.

Due to distribution overlap, food resources and habitat availability within or in the vicinity of the study area, there is a reasonable possibility that twenty-one SCC may utilise the study area. These SCC are: Sensitive species 7, Sensitive species 2, *Coracias garrulus* (European Roller, NT), *Circus ranivorus* (Marsh Harrier), *Falco biarmicus* (Lanner Falcon), *Circaetus fasciolatus* (Southern Banded Snake Eagle), *Stephanoaetus coronatus* (Crowned Eagle), *Geokichla guttata* (Spotted-ground-thrush), *Rostratula benghalensis* (Greater Painted-snipe), *Mycteria ibis* (Yellow-billed Stork), *Pyxicephalus edulis* (African Bullfrog), *Python natalensis* (Southern African Python), *Bitis gabonica* (Gaboon Adder), *Hemisus guttatus* (Spotted Shovel nosed Frog), *Homoroselaps dorsalis* (Striped Harlequin Snake), *Dendroaspis angusticeps* (Green Mamba), *Chamaesaura macrolepis* (Large-scaled Grass Lizard), *Lycophidion pygmaeum* (Pygmy Wolf Snake), *Hyperolius pickersgilli* (Pickersgill's Reed Frog), *Pomatonota dregii* (East Coast Katydid), *Arytropteris basalis* (Flat-necked Shieldback). Habitat for larger species has been degraded through fragmentation and current anthropogenic activities and impacts. Smaller species of herpetofauna and invertebrates may breed within the site and as such impacts to Degraded Coastal Forest and the Depression Wetland may lead to high impacts to these species. It is strongly advised that a search, rescue and relocation plan be designed and implemented prior to the proposed development for the herpetofauna which likely occur within the study area. Even with mitigatory measures implemented, it is inevitable that development and increased human presence in the study area will reduce suitable breeding and foraging habitat for the abovementioned SCC, resulting in a potential decline of

SCC in the study area. However, should mitigation measures be followed it is unlikely that impacts to most SCC that may occur in the study area will be significant in the region.

5.2.3 Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are likely. The following points highlight the key residual impacts that have been identified:

- Continued degradation of natural habitat adjacent to the proposed sites as a result of edge effects;
- Altered faunal species diversity;
- Potential changes in the local hydrology of the area through wetland infilling and encroachment;
- Potential continued loss of faunal SCC;
- Potential loss of faunal abundance in the local area;
- Edge effects such as further habitat fragmentation and AIP proliferation; and
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and loss of faunal habitat and species diversity will most likely be long term (life of proposed solar development and due to increased human presence).

5.2.4 Cumulative Impacts

The study area has avoided extensive transforming impacts and as such has retained natural characters, however, fragmentation through extensive fencing and edge effects have occurred within and surrounding the study area due to its close proximity to human settlements and industry. These activities have degraded the habitat for mammals, however, the remaining classes are all anticipated to occur within the study area in intermediate abundances. The development will lead to common faunal species being displaced from the proposed footprint areas into adjacent habitats. This will lead to increased competition for space and food resources within the study are and adjacent unts. Edge effects and AIP proliferation are more concerning over the long-term. AIP proliferation will ultimately lead to loss of viable habitat, on a potentially increased scale, in the surrounding areas, displacing faunal species further as indigenous floral species (faunal habitat and food resources) are displaced and lost. An additional cumulative impact that could increase substantially over the life of the development, if not mitigated, is littering and dumping of other waste material in sensitive areas or outside designated areas, which may negatively impact faunal habitat on an increased scale over time.

6. CONCLUSION

Scientific Terrestrial Services Pty (Ltd) (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) to obtain an Environmental Authorisation (EA) for the proposed 80 Kilo-Tonnes Per Annum (ktpa) titanium dioxide (TiO_2) Plant project the Richard's Bay Industrial Development Zone (RBIDZ), Richard's Bay, Kwazulu-Natal Province.

Following the field assessment, four broad habitat units were identified within the study area, namely Degraded Coastal Forest Habitat, Degraded Hygrophilous Grassland, Freshwater Habitat, Thicket Habitat, and Transformed Habitat. These habitat units have been fenced off and thus are fragmented from other natural areas. Furthermore, the habitat units have all been subjected to varying degrees of anthropogenic impacts and as a result supported a reduced diversity of larger faunal species. Smaller fauna, such as invertebrates, reptiles, amphibians and avifauna are provided with sufficient space and habitat to be supported in the long term. The Freshwater habitat is considered the most important habitat unit, as it functions as an important ecological system and a movement corridor for fauna. The Degraded Coastal Forest Habitat also remains an important habitat providing unique features for arboreal species and forest specialist SCC. These units are both important to fauna and impacts to these units will result in high impacts. Due to existing and past disturbance, the Degraded Hygrophilous Grassland and the Thicket habitat, contains limited ecological value from a faunal perspective, although, there is potential for increased shelter within the Thicket for a diversity of common, resilient and small bodied insectivorous and herbivorous fauna. The Transformed Habitat has the lowest ecological value from a faunal perspective, as hard surfaces and buildings significantly degraded faunal resources in these localities. The sensitivities, from a faunal perspective, are Low for the Transformed Habitat while the Degraded Hygrophilous Grassland and Thicket Habitat are of intermediate sensitivity. The Degraded Coastal Forest and the Depression Wetland are considered of moderately high sensitivity from a faunal perspective.

No faunal SCC were directly observed during the field investigation. However, there is a reasonable possibility that twenty one SCC may utilise the study area to forage or potentially breed within it. Faunal SCC with a medium or low POC on site, are: Sensitive species 7, Sensitive species 2, *Coracias garrulus* (European Roller, NT), *Circus ranivorus* (Marsh Harrier), *Falco biarmicus* (Lanner Falcon), *Circaetus fasciolatus* (Southern Banded Snake Eagle), *Stephanoaetus coronatus* (Crowned Eagle), *Geokichla guttata* (Spotted-ground-thrush), *Rostratula benghalensis* (Greater Painted-snipe), *Mycteria ibis* (Yellow-billed Stork), *Pyxicephalus edulis* (African Bullfrog), *Python natalensis* (Southern African Python), *Bitis gabonica* (Gaboon Adder), *Hemisus guttatus* (Spotted Shovel nosed Frog), *Homoroselaps*

dorsalis (Striped Harlequin Snake), *Dendroaspis angusticeps* (Green Mamba), *Chamaesaura macrolepis* (Large-scaled Grass Lizard), *Lycophidion pygmaeum* (Pygmy Wolf Snake), *Hyperolius pickersgilli* (Pickersgill's Reed Frog), *Pomatonota dregii* (East Coast Katydid), *Arytropteris basalis* (Flat-necked Shieldback). Mammal, avifaunal, herpetofaunal and invertebrate SCC will face an increased mortality risk during construction as habitat is transformed. As such, a search and rescue plan in the event of encountering these SCC should be developed and implemented prior to commencement of construction activities.

The perceived impact significance of the proposed infrastructure development (prior to mitigation) on faunal habitat, diversity and SCC ranges from Very High to Low, and following mitigation, is anticipated to range from medium to insignificant. The highest impacts are anticipated to occur throughout the construction of the proposed development. Furthermore, unmanaged AIP and erosion proliferation have potential to result in impacts to faunal habitat, especially within the Freshwater Habitat, as a result of the long-term persistence of the proposed activities within the landscape and the high potential for stormwater run-off. Should all mitigatory measures stipulated in section 5.1 be sufficiently implemented, significance of development risks and impacts can be considerably reduced.

The objective of this study was to provide sufficient information on the faunal ecology of the area, together with other studies on the physical and socio-cultural environment, in order for the Environmental Assessment Practitioner (EAP) and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. It is the opinion of the ecologist that this study provides the relevant information required in order to implement IEM and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

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APPENDIX A: Faunal Method of Assessment

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of anthropogenic activities adjacent to the sites will have an impact on faunal behaviour and in turn the rate of observations.

Mammals

Mammal species were recorded during the field assessment with the use of visual identification, spoor, calls, dung and other notable field signs. Due to the short duration, limited size and disturbed nature of the environment, camera traps were not employed. Sherman traps were utilised to improve sampling of small mammals. Specific attention was paid to mammal SCC as listed by the International Union for the Conservation of Nature (IUCN), the Limpopo province and NEMBA.

Avifauna

The Southern African Bird Atlas Project 2 database (http://sabap2.adu.org.za/) was compared with the recent field survey of avifaunal species identified in the study area. Field surveys were undertaken utilising direct observation and bird call identification techniques in order to accurately identify avifaunal species. Specific attention was given to avifaunal SCC listed on a regional and national level, as well as those identified by the IUCN.

Reptiles

Reptiles were identified during the field survey. Suitable applicable habitat areas (rocky outcrops and fallen dead trees) were inspected, and all reptiles encountered were identified. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which reptile species are likely to occur on the study area. Specific attention was given to reptile SCC listed on a regional and national level, as well as those identified by the IUCN.

Amphibians

Identifying amphibian species is done by the use of direct visual identification along with call identification technique. Amphibian species flourish in and around wetland, riparian and moist grassland areas. It is unlikely that all amphibian species will have been recorded during the site assessment, due to their cryptic nature and habits, varied stages of life cycles and seasonal and temporal fluctuations within the environment. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which amphibian species are likely to occur within the study area as well as the surrounding area. Specific attention was given to amphibian SCC listed on a regional and national level, as well as those identified by the IUCN.

Invertebrates

Whilst conducting transects through the study area, all insect species visually observed were identified, and where possible photographs taken. It must be noted, however that due to the cryptic nature and habits of insects, varied stages of life cycles and seasonal and temporal fluctuations within the environment, it is unlikely that all insect species will have been recorded during the site assessment period. Nevertheless, the data gathered during the assessment along with the habitat analysis provided an accurate indication of which species are likely to occur in the study area at the time of the survey. Specific attention was given to insect SCC listed on a regional and national level, as well as those identified by the IUCN.

Arachnids

Suitable applicable habitat areas (rocky outcrops, sandy areas and fallen dead trees) where spiders and scorpions are likely to reside were searched. Rocks were overturned and inspected for signs of these species. Specific attention was paid to searching for Mygalomorphae arachnids (Trapdoor and Baboon spiders) as well as potential SCC scorpions.

Faunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC is described:

- "**Confirmed'**: if observed during the survey;
- "**High**": if within the species' known distribution range and suitable habitat is available;
- "**Medium**": if either within the known distribution range of the species or if suitable habitat is present; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Faunal Habitat Sensitivity

The sensitivity of the study area for each faunal class (i.e. mammals, birds, reptiles, amphibians and invertebrates) was determined by calculating the mean of five different parameters which influence each faunal class and provide an indication of the overall faunal ecological integrity, importance and sensitivity of the study area for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Faunal SCC:** The confirmed presence or potential for faunal SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Habitat Availability:** The presence of suitable habitat for each class;
- **Food Availability:** The availability of food within the study area for each faunal class;
- **Faunal Diversity:** The recorded faunal diversity compared to a suitable reference condition such as surrounding natural areas or available faunal databases; and
- **Habitat Integrity:** The degree to which the habitat is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the suitability and sensitivity of the study area for each faunal class. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the study area in relation to each faunal class. The different classes and land-use objectives are presented in the table below:

Table A1: Faunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1.0 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.
≥3.5<4.5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
≥4.5 ≤ 5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX B: Faunal SCC

Faunal Species of Conservation Concern

Appendix B1: Specially protected indigenous animals as listed in Schedule 4 and protected indigenous animals as listed in Schedule 5 of the KwaZulu-Natal Nature Conservation Management, 1999 (Act No. 5 of 1999).

SCIENTIFIC NAME	COMMON NAME	POC
Schedule 4 - Specially Protected Indigenous Animals		
Mammals		
Amblysomus marleyi	Marley's golden mole	Low
Chrysospalax villosus	Rough-haired golden mole	Low
Cloeotis percivali	Short-eared trident bat	Low
Scotoecus albofuscus	Thomas's house bat	Low
Otomops martiensseni	Large-eared free-tailed bat	Low
Chaerephon ansorgei	Ansorge's free-tailed bat	Low
Proteles cristatus	Aardwolf	Low
Lycaon pictus	Wild dog	Low
Mellivore capensis	Ratel	Low
Poecilogale albinucha	Striped weasel	Low
Aonyx capensis	Clawless otter	Low
Lutra maculicollis	Spotted-necked otter	Low
Felis serval	Serval	Low
Felis lybica	African wild cat	Low
Diceros bicornis	Black rhinoceros	Low
Oryceteropus afer	Antbear	Low
Ourebia ourebia	Oribi	Low
Neotragus moschatus	Suni	Low
Manis temminchii	Pangolin	Low
Birds		
All *Pelecanus* species	All pelicans	Low
Botaurus stellaris	Bittern	Low
Ciconiidae: all species	All storks	Low / High
Geronticus calvus	Bald ibis	Low
Polemaetus bellicosus	Martial eagle	Low
Terathopius ecaduatus	Bateleur	Low
Trigonoceps occipitalis	Lappet faced vulture	Low
Gyps coprotheres	White headed vulture	Low
Gyps africanus	Bearded vulture	Low
Gyophierax angloensis	Palmnut vulture	Low
Necrosyrtes monachus	Hooded vulture	Low
Sarothrura ayresi	White winged fulfftail	Low
Gruidae: all species	All cranes	Low
Neotis denhami	Stanley's bustard	Low
Columba delegorguei	Delegorgue's pigeon	Low
Poicephalus robustus	Cape parrot	Low
Scotopelia peli	Pel's fishing owl	Low
Bucorvus leadbeateri	Ground hornbill	Low

SCIENTIFIC NAME	COMMON NAME	POC
Stactolaema olivacea	Green barbet	Low
Mirafra ruddi	Rudd's lark	Low
Hirundo atrocaerulea	Blue swallow	Low
Zoothera guttata	Spotted thrush	Medium
Buphagidae: all species	All oxpeckers	Low
Spermestes fringilloides	Pied mannikin	Low
Reptiles		
Dermochelys coriacea	Letherback turtle	Low
Pelusios rhodesianus	Black-bellied terrapin	Low
Pelusios castanoides	Yellow-bellied terrapin	Low
Python sebae	African rock python	Low
Bitis gabonica	Gaboon viper	Medium
Scelotes guentheri	Gunther's burrowing skink	Low
Cryptoblepharus boutonii	Bouton's coral rag skink	Low
Tetradactylus breyeri	Breyer's long tailed seps	Low
Cordylus giganteus	Giant sungazer	Low
Pseudocordylus spinosus	Spiny crag lizard	Low
Pseudocordylus langi	Lang's crag lizard	Low
All *Bradypodion* speices	All dwarf chameleons	L/M
Amphibians		
Hyperolius pickersgilli	Pickergill's reed frog	Medium
Leptopelis xenodactylus	Long-toed tree-frog	Low
Arthroleptella ngongoniensis	Mist belt chirping frog	Low
Cacosternum poyntoni	Poynton's caco	Low
Butterflies and moths		
Stygionympha wichgrafi grisea	Greyish Wichgraf's brown	Low
Ornipholidotos peucetia penningtoni	Pennington's white mimic	Low
Durbania amakosa albescens	Amakosa rocksitter	Low
Lepidochrysops ketsi leucomacula	White-spotted sapphire	Low
Orachrysops ariadne	White-blotched ketsi blue	Low
Chrysoritis orientalis	Karkloof blue	Low
Callioratis millari	Milar's tiger moth	Low
Dragonflies		
Pseudagrion umsingaziense	Umsingazi sprite	Medium
Syncordulia gracilis	Yellow syncordulia	Low
Urothemis luciana	St Lucia basker	Low
Fruit chafers		
Ichnestoma nastula	NA	NA
Lamellothrea descarpentriesi	NA	Medium
Elaphinis pumila	NA	Low
Acrothyrea rufofemorata	NA	Low
Eudicella trimeni	NA	Low
Molluscs		
Laevicaulis haroldi		Low
Onycophorans		
Opisthopatus roseus		Low

Table B2. TOPS 2007 animal list for South Africa.

Scientific Name	Common Name	Threat Status	POC
Bunolagus monticularis	Riverine Rabbit	CR	Low
Cryptochloris wintoni	De Winton's Golden Mole	CR	Low
Damaliscus lunatus	Tsessebe	EN	Low
Diceros bicornis bicornis	Black Rhinoceros	EN	Low
Lycaon pictus	Africa Wild Dog	EN	Low
Ourebia ourebi	Oribi	EN	Low
Acinonyx jubatus	Cheetah	VU	Low
Cercopithecus mitis labiatus	Samango Monkey	VU	Low
Diceros bicornis minor	Black Rhinoceros	VU	Low
Equus zebra hartmannae	Hartmann's Mountain Zebra	VU	Low
Equus zebra zebra	Cape Mountain Zebra	VU	Low
Manistemminckii	Pangolin	VU	Low
Panthera leo	Lion	VU	Low
Philantomba monticola	Blue Duiker	VU	Low
Canis adustrus	Side-striped Jackal	P	Low
Ceratotherium simum	White Rhinoceros	P	Low
Crocuta crocuta	Spotted Hyaena	P	Low
Felis nigripes	Black-footed Cat	P	Low
Hyaena brunnea	Brown Hyaena	P	Low
Leptailurus serval	Serval	P	Low
Loxodonto africana	African Elephant	P	Low
Neotragus moschatus	Suni	P	Low
Orycteropus afer	Aardvark	P	Low
Otocyon megalotis	Bat-eared Fox	P	Low
Panthera pardus	Leopard	P	Low
Raphicerus melanotis	Cape Grysbok	P	Low
Vulpes chama	Cape Fox	P	Low
Alcelaphus buselaphus	Red Hartebeest	P	Low
Alcelaphus buselaphus lichtensteinii	Lichtenstein's Hartebeest	P	Low
Cephalophus natalensis	Natal Red Duiker	P	Low
Connochaetes gnou	Black Wildebeest	P	Low
Connochaetes taurinus	Blue Wildebeest	P	Low
Damaliscus pygargus phillipsi	Blesbok	P	Low
Damaliscus pygargus pygargus	Bontebok	P	Low
Giraffa camelopardalis	Giraffe	P	Low
Hippotragus equinus	Roan Antelope	P	Low
Hippotragus niger	Sable Antelope	P	Low
Oreotragus oreotragus	Klipspringer	P	Low
Oryx gazella	Gemsbok	P	Low
Pelea capreolus	Grey Rhebok	P	Low
Raphicerus sharpei	Sharpe's Grysbok	P	Low
Redunca arundinum	Southern Reedbuck	P	Low
Syncerus Caffer	Cape Buffalo	P	Low
Tregelaphus scriptus	Bushbuck	P	Low

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, P = Peripheral. NYBA = Not yet been assessed by the IUCN.

Table B6. Faunal SCC that may occur in the study area, according to the DFFE screening tool

Scientific name	Common Name	Status	POC
Sensitive species 2	NA	LC but CITES II	Low
Sensitive species 1	NA	EN	Low
Sensitive species 7	NA	VU	Low
Dendroaspis angusticeps	Green Mamba	VU	Medium
Circus ranivorous	African marsh harrier	VU	Medium
Circaetus fasciolatus	Southern banded snake eagle	NT	Medium
Geokichla guttata	Spotted ground thrush	VU	Medium
Neppapus auratus	African pygmy goose	LC	Low
Tetrathopius ecaudatus	Bateleur	EN	Low
Halcyon senegaloides	Mangrove kingfisher	LC	Low
Pelusios rhodesianus	Variable hinged terrapin	LC	Low
Hyperolius pickersgilli	Pickersgill's Reed Frog	EN	Medium
Arytropteris basalis	Flat-necked shieldback	VU	Medium
Pomatonota dregii	East coast katydid	VU	Medium
Forest invertebrate	NA	NA	NA
Teriomima zuluana	Zulu buff	LC	Low

R = Rare; NYBA = Not Yet Been Assessed by the IUCN

APPENDIX C: Faunal Species List

Table C1: Mammal species recorded, through tacks and signs, during the field assessment.

Scientific Name	Common Name	Threat Status
Lepus capensis	Scrub hare	LC
Sylvicapra grimmia	Common Duiker	LC
Tragelaphus scriptus	Bushbuck	LC
Cephalophus natalensis	Natal Red Duiker	LC
Hystrix africaeaustralis	Cape Porcupine	LC
Genetta genetta	Small-spotted Genet	LC

LC = Least Concern, VU = Vulnerable, NT = Near Threatened

Table C2: Avifaunal species recorded during the field assessment.

Scientific name	English name	Threat Status
Upupa africana	African Hoopoe	LC
Tchagra australis	Brown-crowned Tchagra	LC
Ciconia apiscopus	Woolly-necked Stork	LC
Anthus cinnamomeus	African Pipit	LC
Spermestes cucullata	Bronze Mannikin	LC
Dendrocygna viduata	White-faced Whistling Duck	LC
Merops persicus	Blue-cheeked Bee-eater	LC
Western Cattle Egret	Bubulcus ibis	LC
Andropadus importunus	Sombre Greenbul	LC
Ploceus intermedius	Lesser Masked-weaver	LC
Ploceus subaureus	Yellow Weaver	LC
Zosterops virens	Cape White-eye	LC
Cypsiurus parvus	African Palm Swift	LC
Apalis flavida	Yellow-breasted Apalis	LC
Merops persicus	Blue-cheeked Bee-eater	LC
Estrilda astrild	Common Waxbill	LC
Colius striatus	Speckled Mousebird	LC
Cinnyris talatala	White-bellied Sunbird	LC
Laniarius ferrugineus	Southern Boubou	LC
Pycnonotus tricolor	Dark-capped Bulbul	LC
Motacilla capensis	Cape Wagtail	LC
Vidua macroura	Pin-tailed Whydah	LC
Acridotheres tristis	Common Myna	LC
Camaroptera brachyura	Green-backed Camaroptera	LC
Saxicola torquatus	African Stonechat	LC
Passer domesticus	House Sparrow	LC
Cisticola chiniana	Rattling Cisticola	LC
Microcarbo africanus	Reed Cormorant	LC
Streptopelia semitorquata	Red-eyed Dove	LC
Cossypha caffra	Cape Robin-Chat	LC
Prinia subflava	Tawny-flanked Prinia	LC
Macronyx croceus	Yellow-throated Longclaw	LC
Vanellus coronatus	Crowned Lapwing	LC

Scientific name	English name	Threat Status
Dendrocygna viduata	White-faced Whistling Duck	LC
Lagonosticta rubricata	African Firefinch	LC
Lagonosticta senegala	Red-billed Firefinch	LC
Ardea melanocephala	Black-headed Heron	LC
Lanius collaris	Common Fiscal	LC
Pycnonotus tricolor	Dark-capped Bulbul	LC
Bostrychia hagedash	Hadeda Ibis	LC
Numida meleagris	Helmeted Guineafowl	LC
Passer domesticus	House Sparrow	LC
Streptopelia senegalensis	Laughing Dove	LC
Zosterops capensis	Cape White-eye	LC
Lybius torquantus	Black-collared Barbet	LC
Batis molitor	Chinspot Batis	LC
Chrysococcyx caprius	Diederik Cuckoo	LC
Dicrurus adsimilis	Fork-tailed Drongo	LC
Tockus nasutus	African Grey Hornbill	LC
Corythaixoides concolor	Grey Go-away-bird	LC
Pternistis natalensis	Natal Spurfowl	LC

LC = Least Concern, NT = Near Threatened, NYBA = Not Yet Been Assessed

Table C3: Amphibian species previously observed within the 2328DD and 2428BB QDS's (not observed during the site visit of the study area but has potential to utilise study area).

Scientific name	Common Name	Threat Status
Arthroleptis wahlbergi	Bush Squeaker	Least Concern
Leptopelis mossambicus	Brownbacked Tree Frog	Least Concern
Leptopelis natalensis	Forest Tree Frog	Least Concern
Schismaderma carens	Red Toad	Least Concern
Sclerophrys garmani	Olive Toad	Least Concern (IUCN, 2016)
Sclerophrys gutturalis	Guttural Toad	Least Concern (IUCN, 2016)
Hemisus guttatus	Spotted Shovel-nosed Frog	Vulnerable
Afrixalus delicatus	Delicate Leaf-folding Frog	Least Concern (2013)
Afrixalus fornasinii	Greater Leaf-folding Frog	Least Concern (2013)
Afrixalus spinifrons	Natal Leaf-folding Frog	Least Concern (2016)
Hylambates maculatus	Redlegged Kassina	Least Concern ver 3.1 (2013)
Hyperolius marmoratus	Painted Reed Frog	Least Concern (IUCN ver 3.1, 2013)
Hyperolius marmoratus taeniatus	Painted Reed Frog (subsp. taeniatus)	Least Concern (IUCN ver 3.1, 2013)
Hyperolius microps	Sharp-headed Long Reed Frog	Least Concern
Hyperolius pusillus	Water Lily Frog	Least Concern
Hyperolius tuberilinguis	Tinker Reed Frog	Least Concern
Kassina senegalensis	Bubbling Kassina	Least Concern
Phrynomantis bifasciatus	Banded Rubber Frog	Least Concern
Phrynobatrachus mababiensis	Dwarf Puddle Frog	Least Concern (IUCN, 2014)
Phrynobatrachus natalensis	Snoring Puddle Frog	Least Concern (IUCN, 2013)
Xenopus laevis	Common Platanna	Least Concern
Ptychadena anchietae	Plain Grass Frog	Least Concern
Ptychadena mascareniensis	Mascarene Grass Frog	Least Concern
Ptychadena oxyrhynchus	Sharpnosed Grass Frog	Least Concern
Ptychadena porosissima	Striped Grass Frog	Least Concern
Ptychadena taenioscelis	Dwarf Grass Frog	Least Concern

Scientific name	Common Name	Threat Status
Amietia delalandii	Delalande's River Frog	Least Concern (2017)
Cacosternum boettgeri	Common Caco	Least Concern (2013)
Cacosternum striatum	Stiped Caco	Least Concern (2013)
Tomopterna natalensis	Natal Sand Frog	Least Concern
Chiromantis xerampelina	Southern Foam Nest Frog	Least Concern (2013)

LC = Least Concern, NYBA = Not Yet Been Assessed

Table C4: Reptile species recorded during the field assessment.

Scientific name	Common Name	Threat Status
Philothamnus natalensis natalensis	Eastern Natal Green Snake	LC
Kinixys zombensis	Eastern Hinged-back Tortoise	LC
Lygodactylus capensis	Common Dwarf Gecko	LC
Pelusios castanoides	Yellow-bellied Hinged Terrapin	LC

LC = Least Concern, VU = Vulnerable, NYBA = Not Yet Been Assessed

Table C5: General invertebrate recorded during the field assessment.

Scientific Name	Common Name	Threat Status
Brachycerus sp.	Weevil	NA
Zonocerus elegans	Elegant Grasshopper	NYBA
Cynthia cardui	Painted Lady	NYBA
Chalcostephia flavifrons	Inspector	LC
Mantispidae	Mantispid	NA
Macrotermes sp.	Carton Nest Termites	NA
Psychidae	Bagworm	NA
Tefflus meyerlei	Ground beetle	NYBA
Trithemis furva	Dark Dropwing	LC
Orthoctha dasycnemis	Vlei Grasshopper	NYBA
Musca domestica	House Fly	NYBA
Creoleon sp.	Large Grassland Antlion	NA
Lycus sp.	Net-winged Beetle	NA
Danaus chrysippus	African Monarch	LC
Alcimus sp.	Robber Fly	NA

LC = Least Concern, NYBA = Not yet been assessed by the IUCN

Table C6: Arachnid species recorded during the site assessment.

Scientific Name	Common Name	Threat Status
Gasteracantha milvoides	Longhorn Kitespider	NYBA
Leucauge sp.	Orchard Spider	NA
Mexcala elegans	Ant-mimicking Spider	NA

LC = Least Concern, NYBA = Not Yet Been Assessed