Terrestrial Biodiversity Assessment

Proposed Kurland Bulk Water Infrastructure

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Compiled for: **SES Environmental Services**

Date of report: **05/05/2022**

Draft Report

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Revisions

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First Draft	2022/05/05	Jamie Pote
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1 Introduction & Background

1.1 Background

SES Environmental Services have been appointed to undertake a basic assessment application for Bulk Water Supply pipeline between Matjiesfontein Reservoir, near Keurboomstrand to augment the water supply at Kurland, within Bitou Local Municipality (Figure 1), comprising several components as outlined below. As part of this application, a terrestrial biodiversity assessment is required.

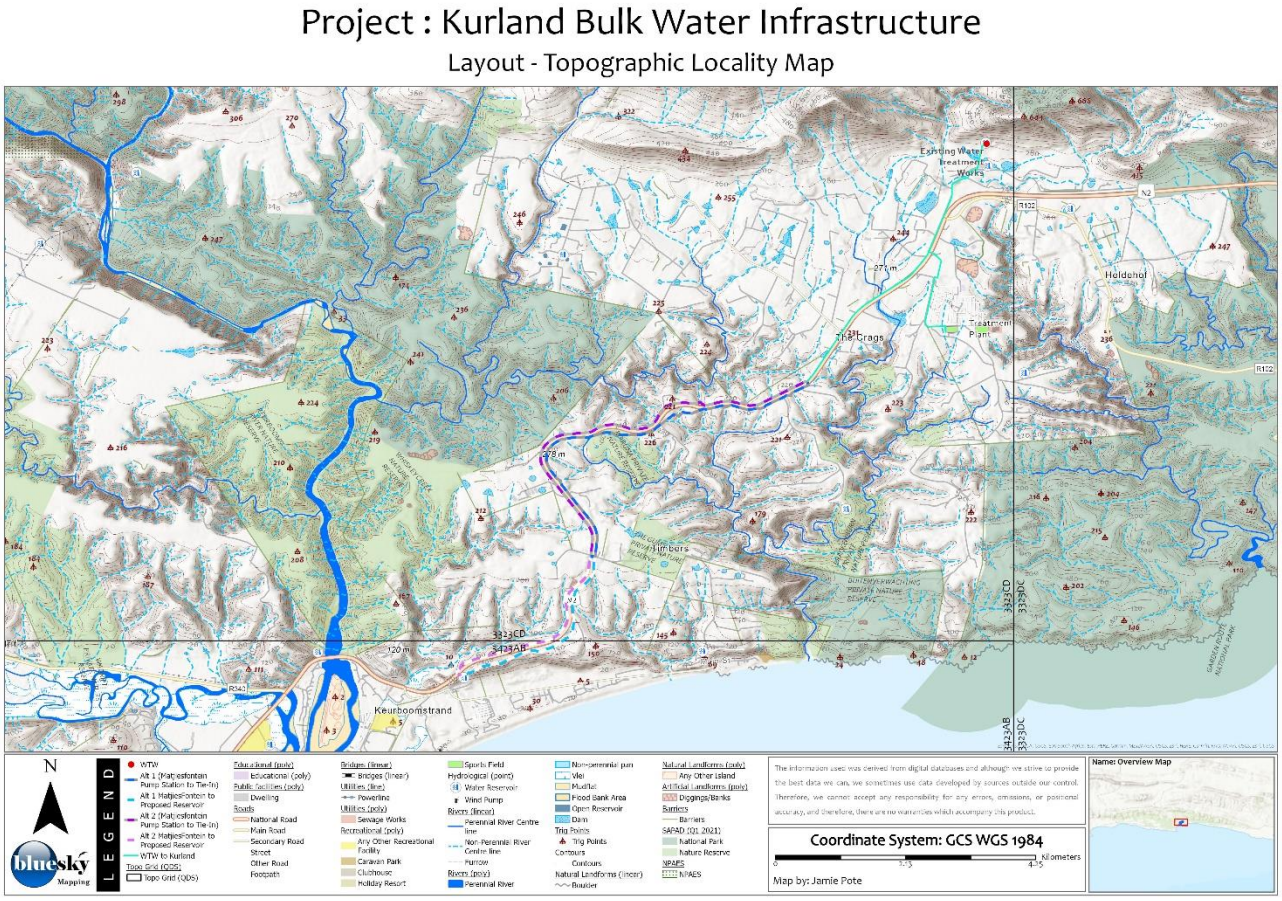

Figure 1: Locality Map.

1.2 Project Description

1.2.1 Activity Location and Description

The subject site is situated between Keurboomstrand in the south and Kurland in the north, within the Bitou Local Municipality, in a rural area with scattered dwellings and small farms (Refer to Figure 1). The bulk water infrastructure is comprised of the following proposed components:

- New Matjiesfontein Pump Station – At the existing reservoir near Keurboomstrand, to include construction of an additional pumpstation.
- New Upper Matjiesfontein Reservoir and Pump Station.
- Preferred 200 mm Bulk Pipeline (Alternative 1 situated on the south/east side of the N2 National Road) – includes two sections, Matjiesfontein to Upper Matjiesfontein and Upper Matjiesfontein to existing Kurland pipeline.
- Alternative 200 mm Bulk Pipeline (Alternative 2 situated on the north/west side of the N2 National Road) - includes two sections, Matjiesfontein to Upper Matjiesfontein and Upper Matjiesfontein to existing Kurland pipeline.

- Water Treatment Works (WTW) upgrade – construction of additional new reservoir and pumpstation at existing WTW near Kurland.
- 315 mm Pipeline to Kurland – from WTW adjacent to gravel access road to N2 intersection.
- 200 mm Pipeline to Kurland – from N2 intersection to Kurland, adjacent to existing roads.

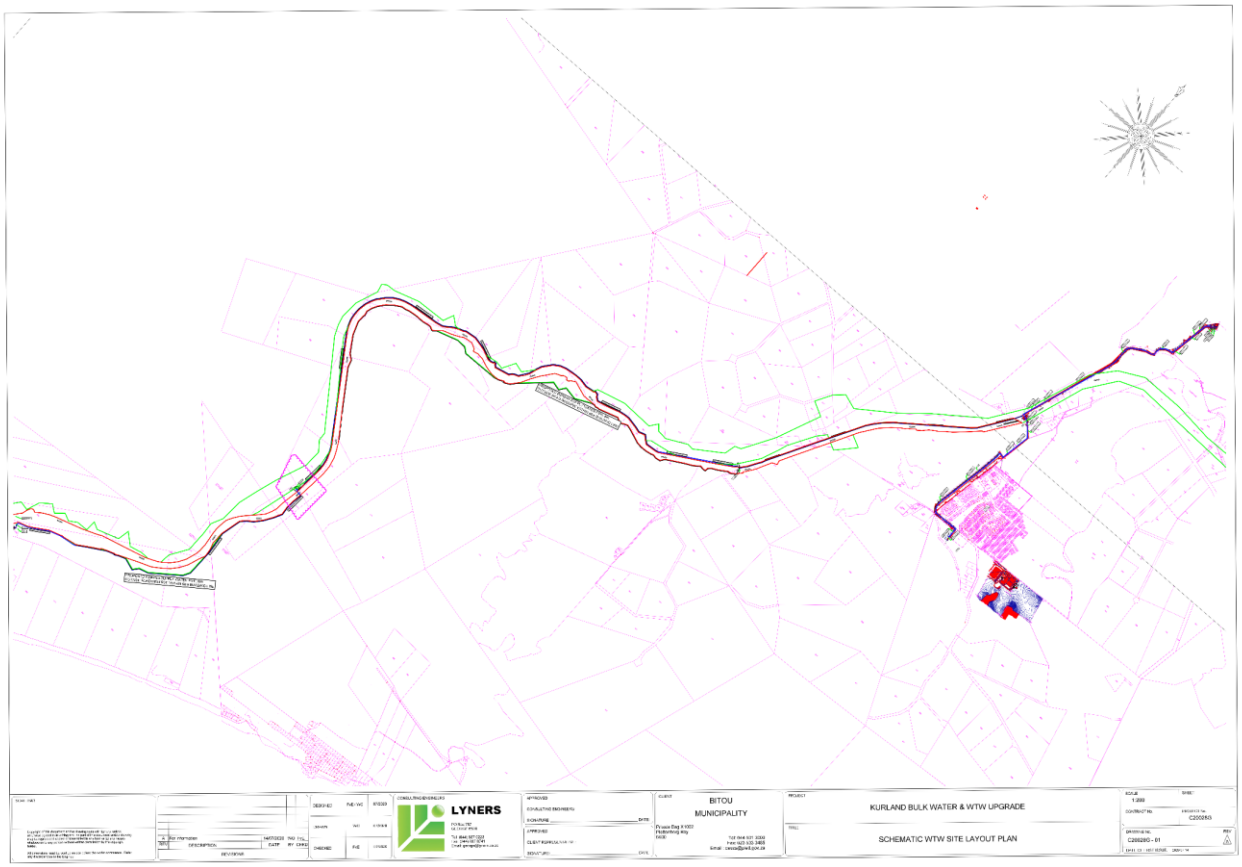

Figure 2: Pipeline layout plan.

The route is situated within a hilly area, incised by several unnamed non-perennial watercourses, with several being tributaries of the Matjies River along the central portion of the route. The proposed bulk water infrastructure is considered to be critical infrastructure to provide water to the Kurland community.

The portion of the new pipeline will be located 6 m within the 60 m building line of the private property adjacent to the N2 National Road, i.e. the bulk of the route, other than where it will physically traverse the N2, thus being outside of the road reserve.

1.2.2 Aspects of the project that could potentially have Biodiversity related Impacts

The key components of the project and their respective impacts upon terrestrial biodiversity and ecological processes include the following:

Component	Potential Biodiversity and Ecological Impacts
Pipeline	
The construction of the pipeline will require temporary clearing of the site along its length within the footprint.	The terrestrial environment will be temporarily impacted where vegetation clearing is required to construct the pipeline along its length and width. Several minor perennial watercourse crossing will be required. On completion of installation, overburden and topsoil will be replaced and the site will revegetate.
Pump stations and reservoirs	
The construction of the pipeline will require permanent	The terrestrial environment will be permanently impacted where vegetation clearing is required to construct pump stations and

Component	Potential Biodiversity and Ecological Impacts
clearing of the site along its length within the footprint.	reservoirs within the affected footprint. This loss of vegetation cover will be permanent but have a limited footprint.

1.3 Methodology and Approach

The proposed methodology and approach are outlined below:

- Conduct a comprehensive desktop study and identify potential risks relating to vegetation and flora of the site and surrounding area, for a Terrestrial Biodiversity Assessment Report. This will include the relevant Regional Planning and legislated frameworks, which will also be represented in a series of associated maps.
- Conduct a detailed site visit to assess the following:
  - Detailed field survey of vegetation, flora and habitats present.
  - Comprehensive species list, highlighting species that are of special concern, threatened, Red Data species and species requiring permits for destruction/relocation in terms of NEMBA and the Provincial Nature Conservation Ordinance No. 19 of 1974.
  - Detailed mapping of the various habitat units and assessment of habitat integrity, ecological sensitivity, levels of degradation and transformation, alien invasion and species of special concern, the outcome being a detailed sensitivity map ranked into high, medium or low classes.
- Reporting will be comprised of a preliminary summary, with identification of anticipated impacts and risks for any scoping phase report (where applicable), a draft detailed Assessment Report (for public review and comment) and a Final Assessment Report for submission. The draft and final detailed reports will include the following:
  - Indicate any assumptions made and gaps in available information. Assessment of all the vegetation types and habitat units within the relevant Regional Planning Frameworks.
  - A detailed species list highlighting the various species of special concern categories (endemic, threatened, Red Data species and other protected species requiring permits for destruction/relocation and invasive/exotic weeds).
  - Description and assessment of the habitat units and site sensitivities ranked into high, medium or low classes based on sensitivity and conservation importance. A standard methodology has been developed based on other projects in the specific area.
  - Assessment of Impacts and Mitigation Measure, as well as specific measure that may be required for alternative development plans.
  - A comprehensive EMPr for inclusion in the reports and EMP with specific management actions for construction and Operation.
  - A habitat sensitivity map will be compiled, indicting the sensitivities as described above.
  - A map indicating buffers (if required) to accommodate Regional Planning and any other requirements.

1.3.1 Site visit

Site visits were conducted on 10 September 2021 and 24 – 25 March 2022, during spring and late summer. The site falls within a predominantly winter rainfall area however significant rainfall had been received during the period in which it was assessed and for the purposes of this report, the site visit is deemed to be adequate.

1.4 Purpose of Report

1.4.1 Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes

This report has been compiled to fulfil the requirement for a **Terrestrial Biodiversity Assessment** as per the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of NEMA (GNR 320), **as gazetted on 20 March 2020.**

This report is undertaken as supporting information as part of a greater environmental application process and is compliant in terms of the requirements in the above regulations in terms of Terrestrial Biodiversity.

In terms of the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of sections 24(5)(a) and (h) and 44 of NEMA, gazetted **on 30 October 2020**, relating to requirements relating specifically to the **Terrestrial Plant species theme**, this report includes these flora species requirements. The terrestrial biodiversity assessment also gives consideration of fauna, as per protocol requirements for terrestrial biodiversity reporting.

The principles that guide this process include protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources which are fundamental to sustainable development. Since the ecology of a landscape is a function of the relationships between living organisms, including humans, and their physical environment, this terrestrial biodiversity or ecological assessment report will consider not only vegetation but also flora and fauna as well as the physical environment in which they occur, which will determine the ecological processes that are affected within the site and immediate surrounds (area of influence).

1.4.2 Data sources and references

A comprehensive list of references, including data sources is provided in Section 9.1. Data sources that have been were for this report include the following:

- National (DFFE) Web Based Environmental Screening Tool (referred to as NEST in this report) – to generate the sites potential environmental sensitivity.
- National Vegetation Map 2018 (NVM, 2018), Mucina & Rutherford (2006) and National Biodiversity Assessment (NBA, 2019) – description of vegetation types, species (including endemic) and vegetation unit conservation status.
- National and Regional Legislation including Provincial Nature Conservation Ordinances and NEM:BA Threatened or Protected Species (ToPS).
- Botanical Database of Southern Africa (BODATSA) and New Plants of Southern Africa (POSA) – lists of plant species and potential species of concern found in the general area (SANBI)
- International Union for Conservation of Nature (IUCN) – Red List of Threatened Species
- Animal Demography Unit Virtual Museum (VM) – potential faunal species
- Global Biodiversity Information Facility (GBIF) – potential faunal species
- Southern African Bird Atlas Project 2 (SABAP2) – for bird species records
- National Red Books and Lists – mammals, reptiles, frogs, dragonflies & butterflies
- National Freshwater Ecosystem Priority Areas assessment (NFEPA, 2011) – important catchments
- National Protected Areas Expansion Strategy (NPAES, 2018) and South Africa Protected Area database (2020) – protected area information
- Sub-Topical Ecosystem Planning (STEP, 2002) – bioregional plan
- Eastern Cape Biodiversity Conservation Plan (ECBCP, 2007) – critical biodiversity areas
- Eastern Cape Biodiversity Conservation Plan (ECBCP, 2019) – critical biodiversity areas
- SANBI BGIS – All other biodiversity GIS datasets
- Aerial Imagery – Google Earth, Esri, Chief Surveyor General (http://csg.dla.gov.za)
- Cadastral and other topographical country data – Chief Surveyor General (http://csg.dla.gov.za)
- Other sources include peer-reviewed journals, regional and local assessments and studies in the general location of the project and its area of influence, landscape prioritization schemes (Key Biodiversity Areas), systematic conservation planning assessments and plans (as above), and any pertinent masters and doctoral theses, among others.

A Glossary and list of Abbreviations is provided in Section 9.6 Annexure E: Abbreviations and Glossary.

1.4.3 Assumptions, Uncertainties and Gaps in Knowledge

The findings and recommendations of this report may be susceptible to the following uncertainties and limitation:

- No assessment has been made of aquatic processes relating to any wetlands, pans and rivers/seeps and/or estuaries outside of the scope of those having an influence on the terrestrial biodiversity.
- Any botanical surveys based upon a limited sampling time-period, may not reflect the actual species composition of the site due to seasonal variations in flowering times. Additionally, the composition of fire adapted vegetation may vary depending on level of maturity or time since last burn. As far as possible, site collected data has been supplemented with desktop and database-centred distribution data.

2 Policy

2.1 Company Policy

No company policy is applicable to this assessment.

2.2 Legislation Framework

In terms of NEMA EIA Regulations (07 April 2014, as amended), the following specific listing notices have bearing on this report[1]:

Listing Notice 1 (GNR):

27. The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—
(i) the undertaking of a linear activity; or
~~(ii) maintenance purposes undertaken in accordance with a maintenance management plan.~~

Being a linear activity, this listed activity will not be triggered, and the non-linear components will not exceed 1 Ha.

9. The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water—
~~(i) with an internal diameter of 0,36 metres or more; or~~
~~(ii) with a peak throughput of 120 litres per second or more;~~

excluding where—
(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or
~~(b) where such development will occur within an urban area.~~

The proposed pipelines are under the threshold, hence although exceeding the length and being outside of the road reserve, this listed activity will not be triggered.

12. The development of:
~~(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or~~
(ii) infrastructure or structures with a physical footprint of 100 square metres or more;

1 *The listed activities itemized are only those with Biodiversity relevance to this report and is not a complete list.*

where such development occurs—
(a) within a watercourse;
~~(b) in front of a development setback; or~~
(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —
excluding—
~~(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;~~
~~(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;~~
~~(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;~~
~~(dd) where such development occurs within an urban area;~~
(ee) where such development occurs within existing roads, road reserves or railway line reserves; or
~~(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.~~

This listed activity will likely be triggered, due to several watercourse crossings.

19. The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;
but excluding where such infilling, depositing, dredging, excavation, removal or moving—
~~(a) will occur behind a development setback;~~
~~(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;~~
~~(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.~~
~~(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or~~
~~(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.~~

This listed activity will likely be triggered, due to several watercourse crossings.

Listing Notice 2 (GNR):

None are applicable

Listing Notice 3 (GNR):

2. The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres.
i. Western Cape
i. A protected area identified in terms of NEMPAA, excluding conservancies;
ii. In areas containing indigenous vegetation; or
~~iii. Inside urban areas:~~
~~(aa) Areas zoned for use as public open space; or~~
~~(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, or zoned for a conservation purpose.~~

This listed activity may be triggered, due to areas containing indigenous vegetation.

12. The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.

(a) Western Cape
i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;
ii. Within critical biodiversity areas identified in bioregional plans;
~~iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas;~~
~~iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or~~
~~v. On land designated for protection or conservation purposes in an Environmental Management Framework adopted in the prescribed manner, or a Spatial Development Framework adopted by the MEC or Minister.~~

It is likely the activity will require clearing of more than 300 square metres, and the site is within designated critical biodiversity areas and ecosystem service areas.

14. The development of -
(i) ~~dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or~~
(ii) infrastructure or structures with a physical footprint of 10 square metres or more;
where such development occurs -
(a) within a watercourse;
~~(b) in front of a development setback; or~~
(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;
~~excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.~~
(a) Western Cape
i. Outside urban areas:
~~(aa) A protected area identified in terms of NEMPAA, excluding conservancies;~~
(bb) National Protected Area Expansion Strategy Focus areas;
~~(cc) World Heritage Sites;~~
~~(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;~~
(~~ee) Sites or areas identified in terms of an international convention;~~
(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;
~~(gg) Core areas in biosphere reserves;~~
~~(hh) Areas on the estuary side of the development setback line or in an estuarine functional zone where no such setback line has been determined.~~

It is likely the activity will require construction of structures with a physical footprint of more than 10 square meters within a watercourse or within 32 metres of a watercourse, and the site falls within designated critical biodiversity areas and ecosystem service areas.

Implications:

- The proposed activity is linear hence does not trigger LN1, activity 27.
- Critical Biodiversity Areas and watercourses are present, hence the respective Listing Notice 3 activities will be triggered as above, hence a Basic Assessment application is required.
- Relevance of additional listed activities will be further investigated in the report.

Other potentially relevant legislation, which will be evaluated as required, includes the following:

- NEMA: Environmental management principles set out in NEMA, and other Specific Environmental Management Acts (SEMA's) should guide decision making throughout the project life cycle to reflect the objective of sustainable development. One of the most important and relevant principles is that disturbance of ecosystems, loss of biodiversity, pollution and degradation of environment and sites that constitute the nation's cultural heritage should be avoided, minimised or as a last option remedied. This is supported by the Biodiversity Act as it relates to loss of biodiversity.
- Liability for any environmental damage, pollution, or ecological degradation: Arising from all -related activities occurring inside or outside the area to which the permission/right/permit relates is the responsibility of the rights holder. The National Water Act and NEMA both oblige any person to take all reasonable measures to prevent pollution or degradation from occurring, continuing or reoccurring (polluter pays principle). Where a person/company fails to take such measures, a relevant authority may direct specific measures to be taken and, failing that, may carry out such measures and recover costs from the person responsible.
- Public participation: Public consultation and participation processes prior to granting licences or authorisations can be an effective way of ensuring that the range of ways in which the activities impact on the environment, social and economic conditions are addressed, and taken into account when the administrative discretion to grant or refuse the licence is made. No specific public participation is undertaken as part of this assessment; however, it will be undertaken as part of the environmental application for which this report has been compiled. As part of that process, any comments raised in that process will be addressed as required. Where applicable, local persons, including landowners and residents, will be informally interviewed, where information pertaining to the terrestrial environment may provide value or information.
- Constitution of Republic of South Africa (1996): Section 24(a) of the Constitution states that everyone has the right '*to an environment that is not harmful to their health or well-being*'. Construction activities must comply with South African constitutional law by conducting their activities with due diligence and care for the rights of others.
- National Forests Act 84 of 1998 with Amendments: Lists Protected trees, requiring permits for removal Department of Agriculture, Forestry and Fisheries). Section (3)(a) of the National Forests Act stipulate that '*natural forests must not be destroyed save in exceptional circumstances where, in the opinion of the Minister, a proposed new land use is preferable in terms of its economic, social or environmental benefits*'.
- Provincial Nature and Environmental Conservation Ordinances: Lists Protected species, requiring permits for removal.
- The National Water Act (No. 36 of 1998): Requires that provision is made both in terms of water quantity and quality for 'the reserve', namely, to meet the ecological requirements of freshwater systems and basic human needs of downstream communities. It is essential in preparing an EMP that any impacts on water resources be they surface water or groundwater resources, and/ or impacts on water quality or flow, are carefully assessed and evaluated against both the reserve requirement and information on biodiversity priorities. This information will be required in applications for water use licenses or permits and/or in relation to waste disposal authorisations.
- Conservation of Agricultural Resources Act 43 of 1993: Lists Alien invasive species requiring removal.
- Sustainable Development Goals: Goal 15: Life on Land: Protect, restore, and *promote sustainable use of terrestrial ecosystems*, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. The approach, assessment methodology and recommendations contained within this report are in line with this sustainable development goal.

2.3 Systematic Planning Frameworks Summary

A screening of Systematic Planning Framework for the region was undertaken (summarised in Table 1), that included the following features:

- Critically Endangered and Endangered Ecosystems.

- Vulnerable Ecosystems.
- Critical Biodiversity Areas.
- Ecological Support Areas.
- River, Estuarine and Wetland Freshwater Ecosystem Priority Areas (FEPAs) and buffers.
- Protected Areas (and buffers) and Protected Area Expansion Strategy (PAES).
- Critical Habitat for endemic, protected and threatened species.

A summary of the key implications of the respective ecological receptors and indicators is provided in the sections below and further information is also provided in Section 9.4: Appendix D: Systematic Planning Frameworks.

Table 1: Summary of Regional Planning Biodiversity features.

FEATURE[2]	DESCRIPTION	IMPLICATIONS/COMMENT
National Environmental Screening Tool (Terrestrial Biodiversity)	Very High Terrestrial Biodiversity Medium Animal Species Medium & Low Plant Species Very High Aquatic Sensitivity	CBA 1 & 2, ESA 1 & 2, FEPA sub-catchment, Protected Areas & Vulnerable ecosystem. Animal & Plant species potentially present in proximity to site (refer to species assessment section). Several watercourses are traversed.
National Vegetation Map (NVM, 2018)	Garden Route Shale Fynbos Southern Afrotemperate Forest South Outeniqua Sandstone Fynbos Tsitsikamma Sandstone Fynbos	Vulnerable Least Concern Least Concern Least Concern
Regional Planning: Sub-Tropical Ecosystem Planning (STEP)	No thicket designated – several non-thicket, fynbos & forest communities identified, outside of thicket biome.	Afrotemperate Forest (Critically Endangered), Tsitsikamma Plateau Fynbos (Vulnerable), Keurbooms Grassy Fynbos & Tsitsikamma Mountain Fynbos Complex (Currently not Vulnerable)
GRBSP	Knysna Enon Fynbos, Keurbooms Thicket-Forest, Covie Coastal Proteoid Fynbos, Tsitsikamma Riverine Forest, Tsitsikamma Perennial Stream, Upland Grassy Fynbos, Tsitsikamma Forest Fynbos, Tsitsikamma Plateau Forest & Tsitsikamma Plateau Proteoid Fynbos	Portions of the route traverse areas designated CBA and ESA in terms of f the GRBSP.
WCBSP	Critical Biodiversity Areas Ecological Support Areas Protected Areas	Most of the route traverses areas designated either Other Natural Areas or Ecological Support Areas (1 & 2) associated with the transformed landscape, powerline corridors and/or the road reserve. A small section passes through designated CBA and a private nature reserve more or less centrally along

[2] Refer to Figure 7 to Figure 13 and Section 9.4: Appendix D: Systematic Planning Frameworks.

FEATURE[2]	DESCRIPTION	IMPLICATIONS/COMMENT
		the route just to the west of The Crags.
Critically Endangered and Endangered Ecosystems (NBA 2018)	None	N/A
Vulnerable Ecosystems (NBA)	Garden Route Shale Fynbos	Transformation levels have exceeded 40 % for the unit. The site and vegetation unit is within a rural farming area with elevated levels of transformation and directly adjacent to the N2 National Road with associated elevated disturbances. Alien vegetation impacts are also significant surrounding the N2 corridor. At risk, but not under imminent threat.
Protected Areas (SAPAD)	The proposed route does traverse protected areas.	Protected areas and ecological processes associated with them are in proximity to the proposed activity. Whiskey Creek Nature Reserve, & Garden Route National Park within 100 m of the alternative route. Kiaruna Private Nature Reserve is traversed by the preferred route.
NPAES	None directly affected nor in close proximity.	No NPAES or ecological processes within are likely affected.
Strategic Water Source Areas (SWSA)	The northern portion of the route falls within the Tsitsikamma & Upper Keurbooms SWSA.	Specific activity unlikely to have any significant impact to downstream water resources.
Freshwater Ecosystem Priority Areas (FEPA's)	Road traverses several non-perennial tributaries of the Matjies & Keurbooms Rivers (both Class AB: Largely Natural) as well as other minor unnamed non-perennial watercourses.	Specific activity will unlikely have any significant impact to nearby rivers and watercourses outside of localised crossing impacts but if constructed to standard specifications, no impacts of significance on terrestrial biodiversity related processes would be anticipated.
Important Bird Areas (IBA's)	Within 20 km of the Outeniqua Mountains IBA to the west & Tsitsikamma National Park IBA to the south-east and within 50 km of the Wilderness-Sedgefield-Lakes Complex to the south-west.	Birds associated with the Outeniqua Mountains IBA may be transient visitors I the areas surrounding the site, while the other two are associated with coastal habitat and specific bird associations are less likely.
Key Biodiversity Areas (KBA's)	None	N/A
Marine/Coastal areas	None	N/A
RAMSAR sites	None	N/A

FEATURE[2]	DESCRIPTION	IMPLICATIONS/COMMENT
Within 32 m of Watercourse	Both alternatives will traverse the upper reaches of several non-perennial drainage lines.	Terrestrial impact will be negligible associated with construction of the pipeline
Within 100 m of River	Both alternatives will traverse within 100 m of the upper reach of the perennial Matjies River.	Terrestrial impact will be negligible associated with construction of the pipeline
Within 500 m of Wetland	Several wetlands and dams are within 500 m of the proposed pipeline routes.	Terrestrial impact will be negligible associated with construction of the pipeline
Forest	Forest is present and will be directly affected by a portion of both the preferred and alternative pipeline routes.	Forest pockets and ecological processes associated with them are affected by the proposed pipeline I the vicinity of The Crags, near the Kiaruna Private Nature Reserve.
Surrounding Land Uses	Mostly rural farming with forestry, conservation and urban areas and the N2 National Road.	Large portions of the route are considered transformed, degraded or having secondary vegetation.
Regional Hotspots & Regions of Endemism	Site is within the Cape Floristic Region.	Several endemic species are known from the wider surrounding area, however the likelihood of any being significantly affected by the proposed activity is low due to the disturbed nature of the area surrounding the road servitude.
Critical Habitat for listed endemic/ protected species	The endemic and other protected species that are present are generally having widespread distributions and the activity is unlikely to pose any significant threat to any species or population. Several species are flagged and require site investigation, however since most of the proposed road footprint is within cultivated lands, old lands, and otherwise disturbed areas, the risk is low. Residual risk of a species within footprint investigated during site visit, as there is a low risk, although unlikely, that some species could occur in disturbed areas. (refer to Sections 3.1.8 & 3.1.10).	

Implications:

- Garden Route Shale Fynbos is of conservation concern (Vulnerable); however, it is not yet considered to be endangered or critically endangered.
- Critical Biodiversity and Ecological Support Areas are identified in the most recent conservation plan (WC BSP, 2017).
- Protected Areas are present in the vicinity of the site and the site will traverse a private nature reserve.
- Forest is present and will be affected by the proposed site.
- Several minor watercourse crossings will be required.

2.3.1 National Environmental Screening Tool

The DEA Screening Tool indicates the following:

- Terrestrial Biodiversity is Very High (Figure 3).

- Plant species sensitivity is Moderate/Low (Figure 4).
- Animal Species sensitivity is High/Moderate (Figure 5).
- Aquatic Sensitivity is Low/Very High (Figure 6).

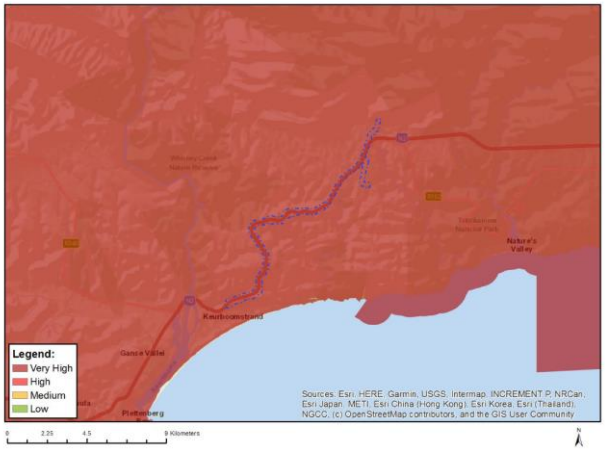

Figure 3: Terrestrial Biodiversity Sensitivity

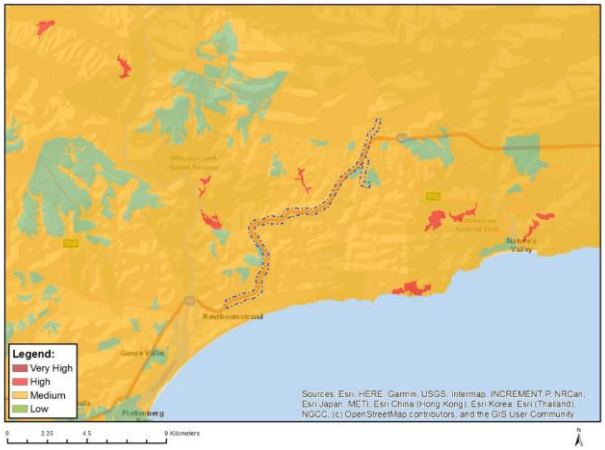

Figure 4: Plant Species Sensitivity

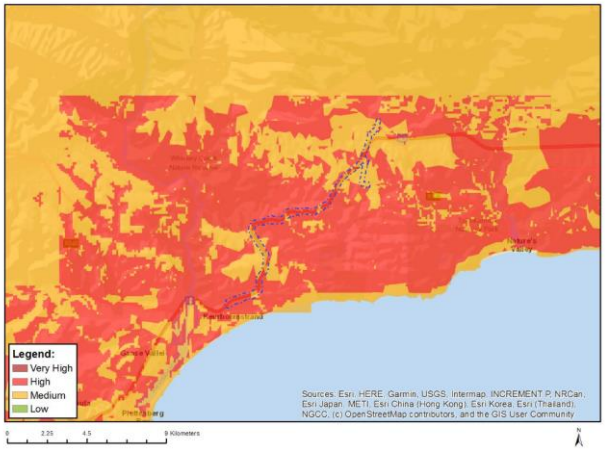

Figure 5: Animal Species Sensitivity

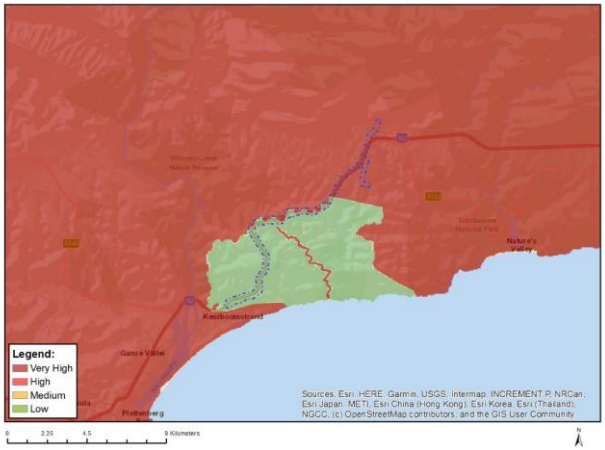

Figure 6: Aquatic Sensitivity

Terrestrial Sensitivity	Feature(s) in proximity
Very High	ESA 1 & 2; CBA 1 & 2; National Forest Inventory; FEPA sub-catchments; Protected Areas Expansion Strategy (PAES and Sanparks); SWSA & Vulnerable ecosystem; Whiskey Creek Nature Reserve, Kiaruna Private Nature Reserve & Garden Route National Park;
High	None
Medium	None

Plant Sensitivity	Feature(s) in proximity
Very High	None
High	None
Medium	*Faurea macnaughtonii, Ocotea bullata, Ruschia duthiae, Indigofera hispida, Aspalathus bowieana, Amauropelta knysnaensis, Leucospermum glabrum, Mimetes pauciflorus, Mimetes splendidus, Selago burchellii, Selago rotundifolia, Psydrax capensis, Erica onusta, Erica stylaris, Erica glandulosa subsp. fourcadei, Centella longifolia, Marsilea schelpeana, Pterygodium newdigateae, Felicia westae, Osteospermum pterigoideum, Psoralea trullata, Acmadenia alternifolia,*

Plant Sensitivity	Feature(s) in proximity
	Muraltia knysnaensis, Erica glumiflora, Acrolophia lunata, Pterygodium cleistogamum, Sensitive species 131, 419, 1038, 181, 448, 1171, 53, 654 &763.

Animal Sensitivity	Feature(s) in proximity
Very High	None
High	*Bradypterus sylvaticus, Circus maurus* & *Circus ranivorus* (birds).
Medium	*Chlorotalpa duthieae (mammal); Bradypterus sylvaticus, Neotis denhami, Circus ranivorus, Turnix hottentottus* & *Circus maurus* (birds); *Afrixalus knysnae* (amphibian); *Aneuryphymus montanus, Forest invertebrate* & *-Sarophorus punctatus (invertebrates); Aleoides thyra orientis, Tsitana dicksoni (insects); Sensitive species 7.*

Aquatic Sensitivity	Feature(s) in proximity
Very High	Aquatic CBAs; Rivers, Strategic water source area, Very High Wetlands and Estuaries; Very High Freshwater ecosystem priority area quinary catchments.
High	None

NOTE: as per point 1.5 of the Terrestrial Biodiversity Specialist Assessment and Minimum Report Content Requirements:

'If any part of the proposed development footprint falls within an area of 'very high' sensitivity, the assessment and reporting requirements prescribed for the 'very high' sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.'

Based on the above reporting protocol condition, the entire pipeline route will fall into the above category, which implies that for a temporary linear activity, such as a pipeline, the screening tool designated high sensitivity should be reduced to a low sensitivity and only a complicated statement would be required.

The site assessment will physically screen for the presence of these, and other possible species or sensitivities that are not identified in the screening tool. Not all features are directly affected, but being in proximity, the risks associated with the activity will be investigated further and addressed in the report.

2.3.2 Vegetation of Southern Africa

Several vegetation units (Table 1, Figure 7) are present along the route (Mucina & Rutherford, 2006). The site is located within Southern Afrotemperate Forest, South Outeniqua Sandstone Fynbos, Tsitsikamma Sandstone Fynbos (Least Concern) and Garden Route Shale Fynbos (Vulnerable). A general description of the vegetation unit is provided in Section 9.4: Appendix D: Systematic Planning Frameworks (as per Mucina & Rutherford, 2006) as a reference point for the baseline vegetation composition.

Undulating hills and moderately undulating plains on the coastal forelands. Comprising a mix of fynbos and forest vegetation units depending on the underlying geology (shale or sandstone), aspect (wetter south-facing or drier north-facing) and slope. Fynbos units are structurally a moderate to dense proteoid, restioid and ericoid shrubland with thicket and scrub forest elements in wetter or fire protected areas, with a grassier fynbos occasionally present. Forest is restricted to a band located centrally within the site.

Fire is generally an important factor in the fynbos units but is excluded or absent in the forest unit. The Garden Route Shale Fynbos is generally situated in a similar biophysical niche as the forest, however with fire a determining factor. It is probable that historical clearing of forest has played some part in the distribution of this unit. It is noted that belts of *Virgilia oroboides* (Keurboom) occur on the interface between fynbos and forest, which could be indicative of a natural successional inclination towards forest.

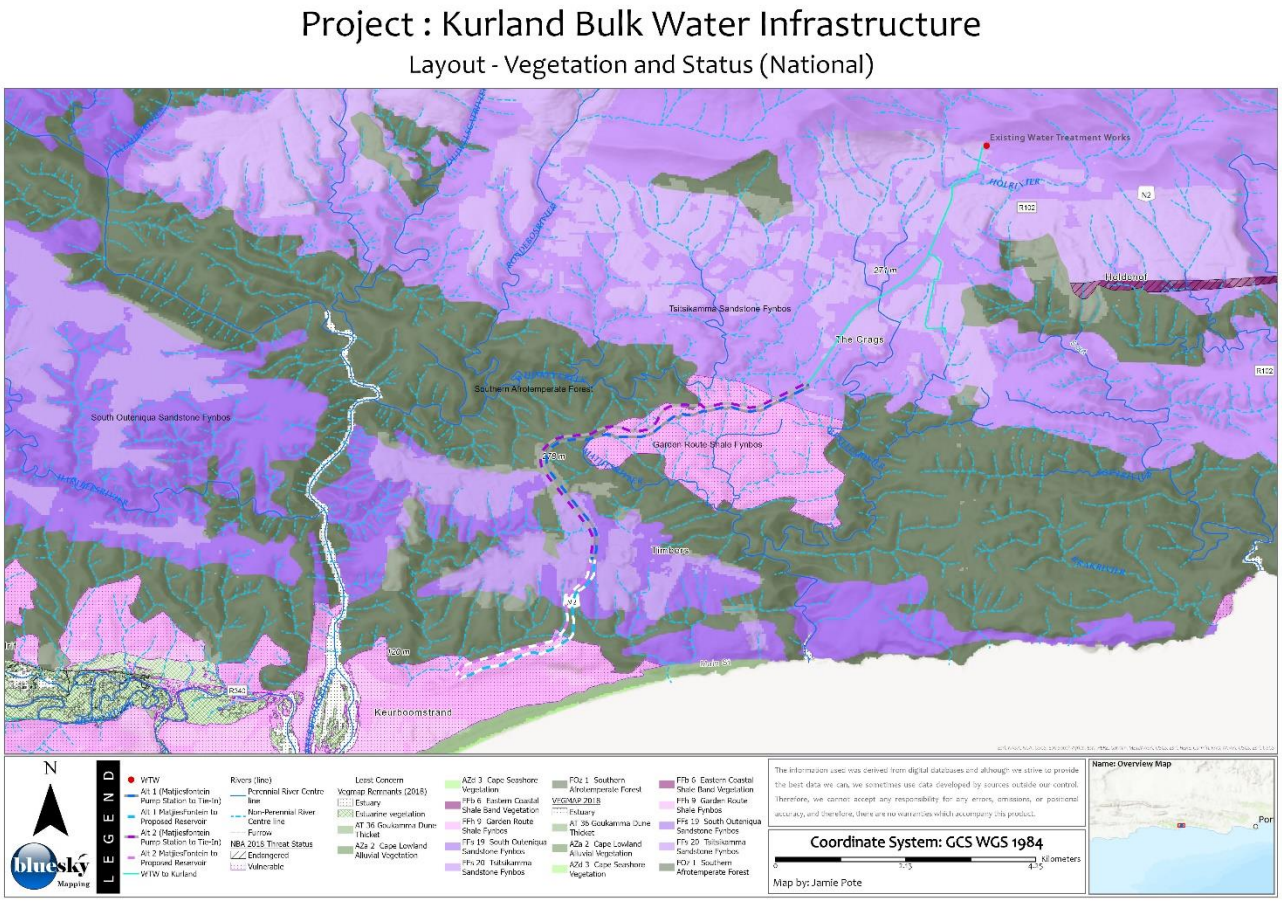

Figure 7: Vegetation of Southern Africa (National).

Implications:

- Garden Route Shale Fynbos is of conservation concern (Vulnerable); however, it is not yet considered to be endangered or critically endangered.
- The vegetation assessed on site is typical of the vegetation unit, refer to Section 3.1 for specific description.
- Several South Africa and Eastern Cape endemic species are recorded from the represented vegetation units, some having localised distributions and others are widespread. Refer to Sections 3.1.8 and 9.3.

2.3.3 National Biodiversity Assessment

The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa and informs policies, strategic objectives, and activities for managing and conserving biodiversity more effectively. The NBA is especially important for informing the National Biodiversity Strategy and Action Plan (NBSAP), the National Biodiversity Framework (NBF) and the National Protected Area Expansion Strategy (NPAES), and also informs other national strategies and frameworks across a range of sectors,

such as the National Spatial Development Framework, the National Water and Sanitation Master Plan and the National Biodiversity Economy Strategy. Ecosystem protection level is an indicator that tracks how well represented an ecosystem type is in the protected area network. It has been used as a headline indicator in national reporting in South Africa since 2005. It is computed by intersecting maps of ecosystem types and ecological condition with the map of protected areas. Ecosystem types are then categorised based on the proportion of the biodiversity target for each ecosystem type that is included in one or more protected areas. For terrestrial ecosystems, biodiversity targets are set for each ecosystem type using established species–area accumulation curves (ranging between 16 and 34%).

The outcome of the most recent National Biodiversity Assessment (2018) indicate that Garden Route Shale Fynbos has a *Vulnerable* conservation status (Table 1), which indicates that less than 60 % of the unit remains, and that although ecosystem functioning is not under imminent threat by loss of natural habitat, it is under threat. There is a moderate to high level of utilization of this unit leading to widespread degradation and transformation. The remaining units currently have a *Least Concern* status, which indicates that more than 60 % of the unts remain and ecosystem functioning as a result of loss of natural habitat is not under imminent threat.

Implications:

- One most at risk vegetation unit (Garden Route Shale Fynbos) is categorised as having a Vulnerable Conservation Status and is considered to be under threat (low), with less than 60 % considered to be intact. The conservation target is 23 % and it is currently poorly protected.
- The site traverses a populated rural area, generally surrounded by extensive areas of cultivated lands in the northern with undeveloped land in the south. The site is within identified ecological corridors. The specific activity is unlikely to significantly affect ecological processes at a broader level since it will be following an existing significant ecological barrier, the N2 national road.
- The activity is unlikely to significantly affect conservation targets of the vegetation unit, having a limited, largely linear, footprint.
- The social benefits to the community would likely exceed any terrestrial biodiversity risks or impacts, with implementation of recommended mitigation measures.

2.3.4 Garden Route Biodiversity Sector Plan (GRBSP, 2010)

The site is within the Garden Route Biodiversity Sector Plan (GRBSP) planning domain (Figure 8) and several vegetation units as well as Critical Biodiversity Areas and Ecological Support Areas are identified. The Garden Route Biodiversity Sector Plan (GRBSP, 2010) identified the vegetations as consisting of Knysna Enon Fynbos, Keurbooms Thicket-Forest, Covie Coastal Proteoid Fynbos, Tsitsikamma Riverine Forest, Tsitsikamma Perennial Stream, Upland Grassy Fynbos, Tsitsikamma Forest Fynbos, Tsitsikamma Plateau Forest, and Tsitsikamma Plateau Proteoid Fynbos. The Garden Route BSP further indicates portions of the site as being Critical Biodiversity Area and Ecological Support Areas.

The authors of the GRBSP recognize the occurrence of Grassland habitat types in the typically Fynbos and Thicket domain, while Mucina and Rutherford (2006) do not. This may be due to difference in scale of mapping as the local Grasslands are not very extensive, but it may also be due to a slight difference in opinion as they mapped some of the more extensive Grassland areas as Grassy Fynbos. In the opinion of the authors of the GRBSP, Grassland habitat types differ from Grassy Fynbos - or for that matter any Fynbos type, as they mapped some of the WCBSP delineated Grassland as Dune- and Shale Fynbos – in largely lacking Restionaceae and Proteaceae, also with only a few Ericaceae present. In its natural state the vegetation is dominated by Poaceae, but a rich assembly of herbs can be present – especially soon after a fire. In the past these Grasslands were probably largely retained by herbivores, with some interaction between herbivory and fires to maintain

the graminoid component as the dominant plants. In many cases this process has collapsed and the graminoid component became overgrown with ericoid shrubs, especially Passerina species. The latter degraded condition further creates the impression that the vegetation is a "grassy Fynbos type".

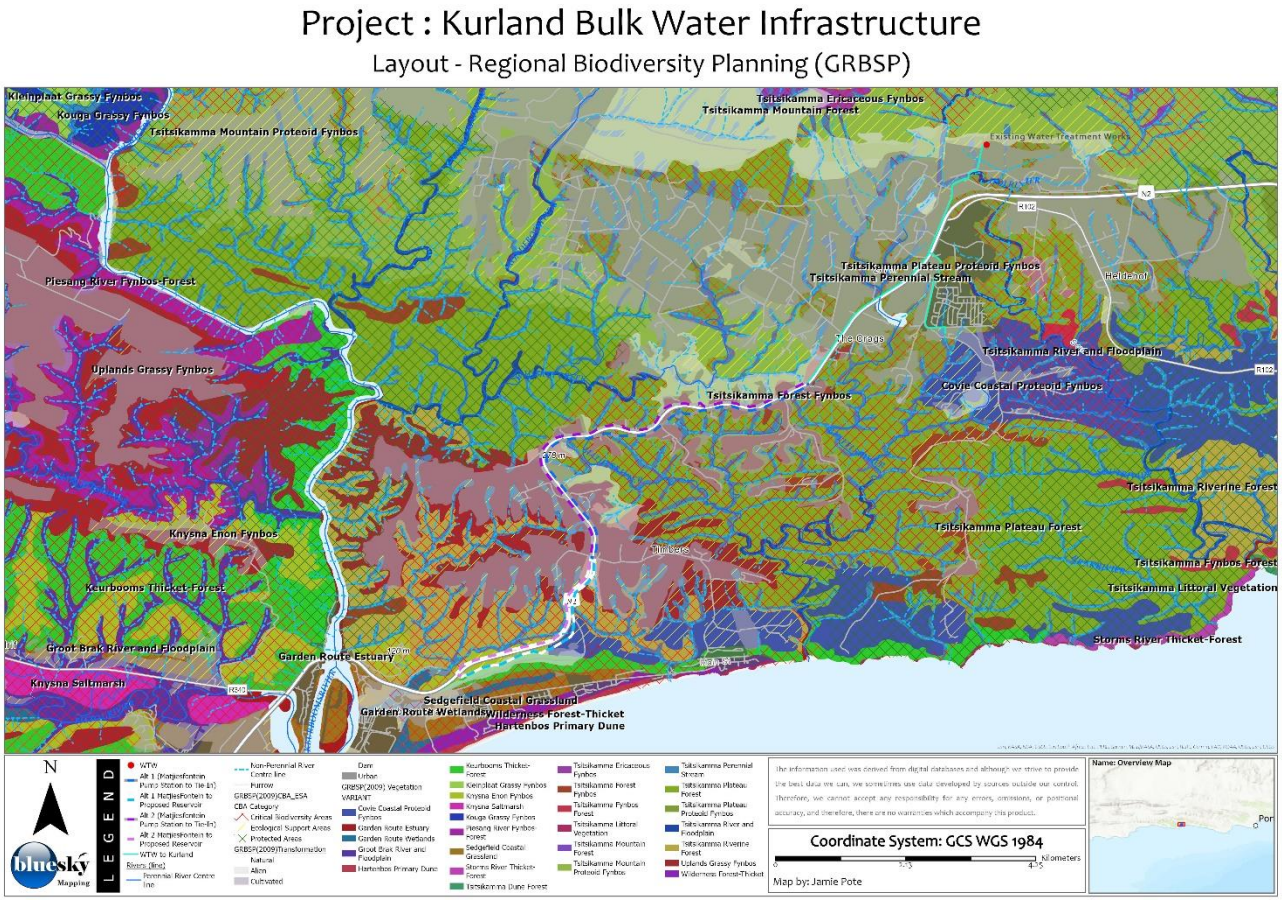

Figure 8: Garden Route Biodiversity Sector Plan (GRBSP) designated vegetation units, Critical Biodiversity Areas and Ecological Support Areas.

Implications:

- The vegetation classification of the site differs between the National Vegetation Map classification and the Garden Route Biodiversity Spatial Plan.
- This difference could be a result of differences in mapping scales; however, it is noted that the revised National Vegetation Map (2018) has not taken the GRBSP (2010) classification.
- The GRBSP is not a gazetted Bioregional Plan, hence its findings and recommendations are for guideline purposes. The Terrestrial Biodiversity Assessment will try and address this discrepancy.

2.3.5 Sub-Tropical Ecosystem Planning (STEP, 2006)

The site is within the Subtropical Ecosystem Planning (STEP) planning domain; however no distinct thicket units are identified within or in close proximity to the site footprint (Figure 9). Thicket elements are noted, which are likely elements represented from thicket that is present in the broader area (i.e. coastal Gouritz Dune Thicket), as well as there being some shared species between thicket and forest.

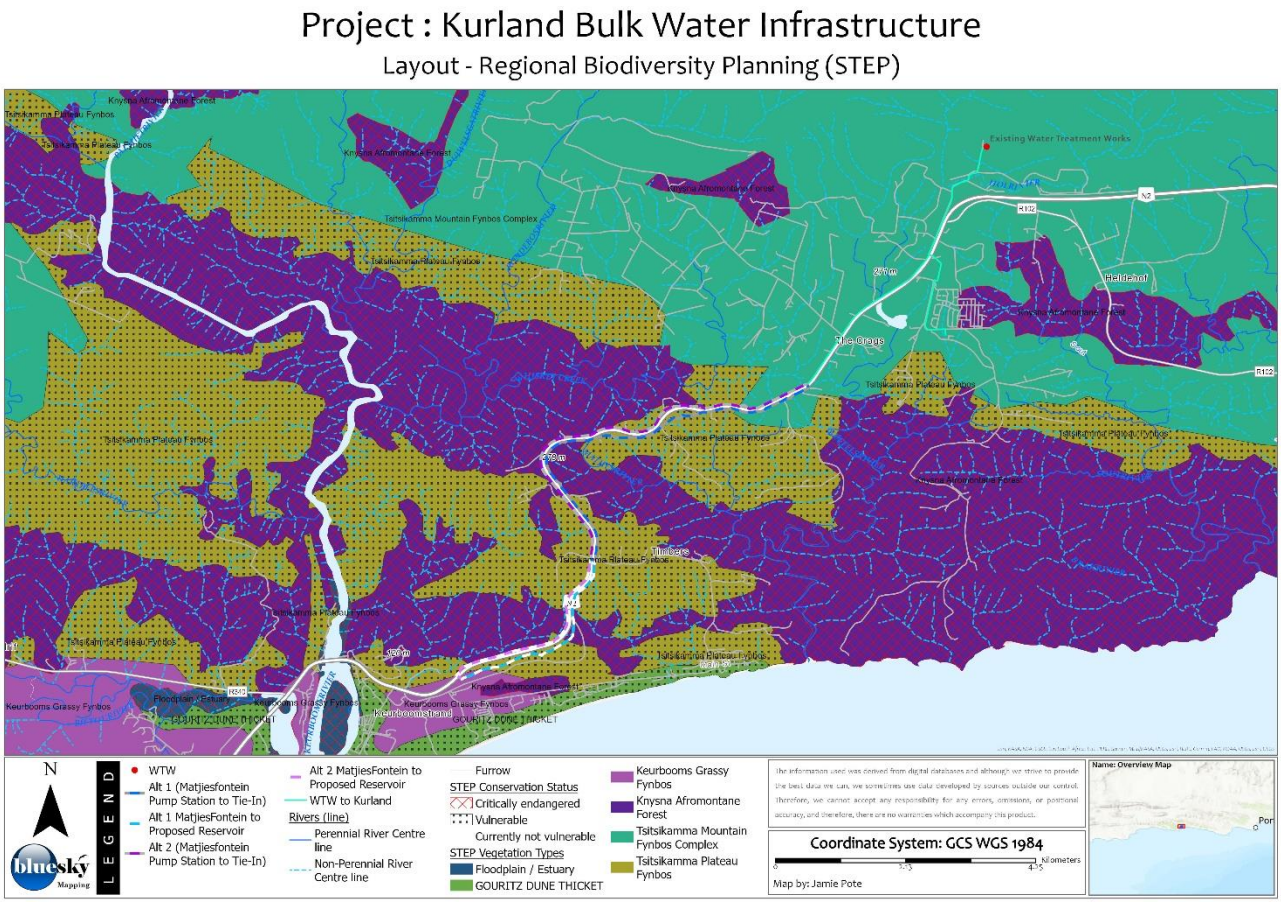

Figure 9: Sub Tropical Ecosystem Planning (STEP) designated vegetation units.

2.3.6 Western Cape Biodiversity Conservation Plan (WC BSP, 2017)

The Western Cape Biodiversity Sector Plan (WCBSP, 2010) was developed in line with the principles and methods gazetted in the National Environmental Management: Biodiversity Act No 291 of 2009, "*Guideline regarding the determination of Bioregions and the Preparation of and publication of Bioregional Plans*". The management objectives required to achieve the desired state, as described by the ECBCP (2019) are provided in *Table 11*, contained in Section 9.4: Appendix D: Systematic Planning Frameworks.

As indicated in Figure 10 below, portions of the proposed activity is situated within and/or in proximity to WC BSP (2017) designated CBA and ESA area; however, most of the route is outside of such designated CBA or ESA areas, including the proposed upper Matjiesfontein pump station and expansion of Kurland WTW infrastructure, which is to some extent due to it falling within degraded and/or transformed areas since it is situated directly adjacent to the road reserve, or in areas that are not designated such a status. The proposed Matjiesfontein pump station falls within designated ESA 2 and the route crosses along the edge of several designated CBA 1 patches or within designated ESA 1, including a portion of the proposed alternative existing Matjiesfontein reservoir to upper Matjiesfontein pipeline and the preferred and alternative proposed pipelines between the upper Matjiesfontein pumpstation and The Crags (in the vicinity of Kiaruna Private Nature Reserve). The proposed preferred pipeline route between the existing Matjiesfontein reservoir and the proposed upper Matjiesfontein pumpstation follows a band of designated ESA 1, which corresponds to an existing powerline servitude.

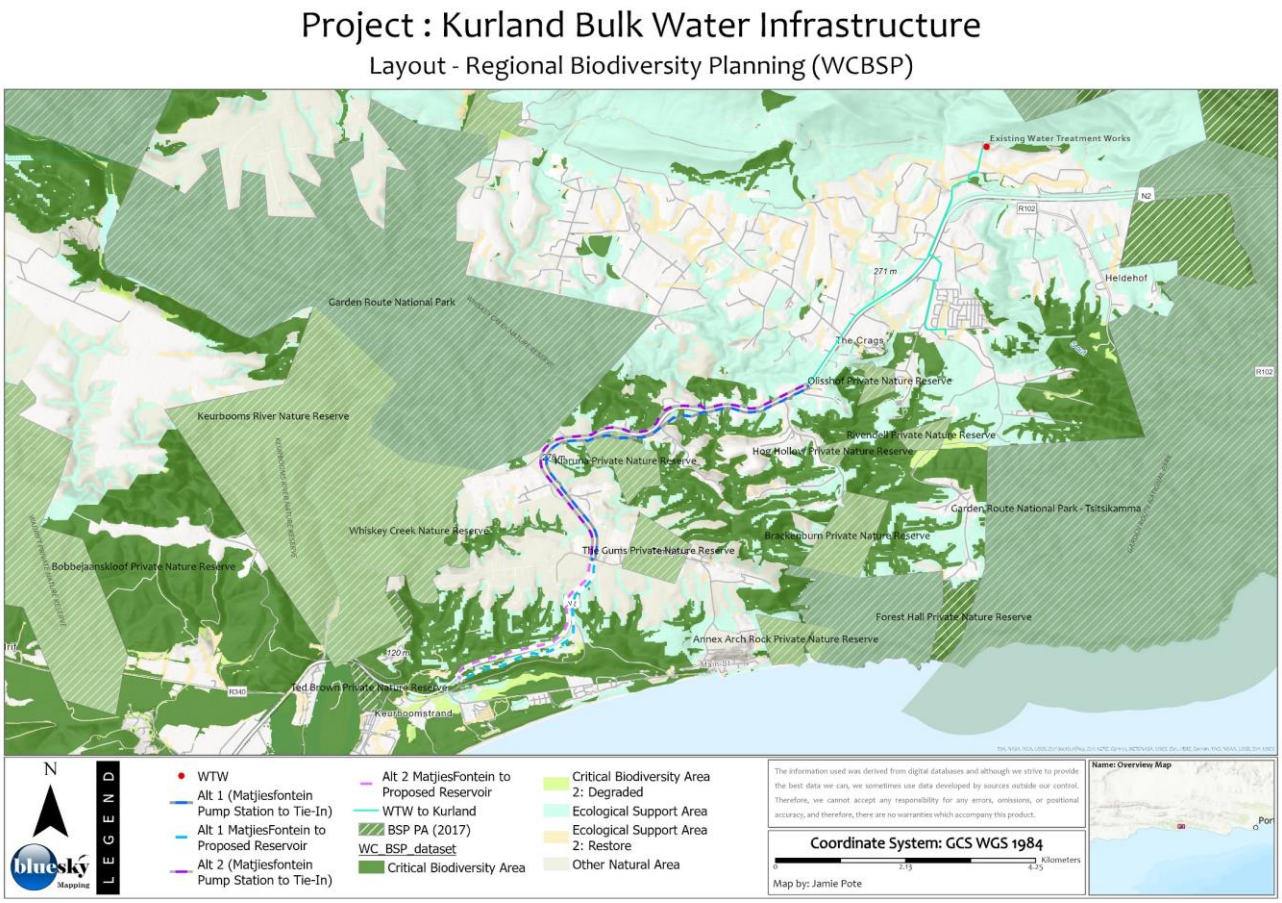

Figure 10: Critical Biodiversity and Protected Areas (WCBSP, 2017).

Figure 11 below indicates closeups for two notable areas along the route, namely the far southern end of the route and a central portion between the proposed upper Matjiesfontein. It should be noted that the designated ESA 1 and 2 patches surrounded by CBA along the route correspond to degraded or transformed areas surrounding the N2 National Road.

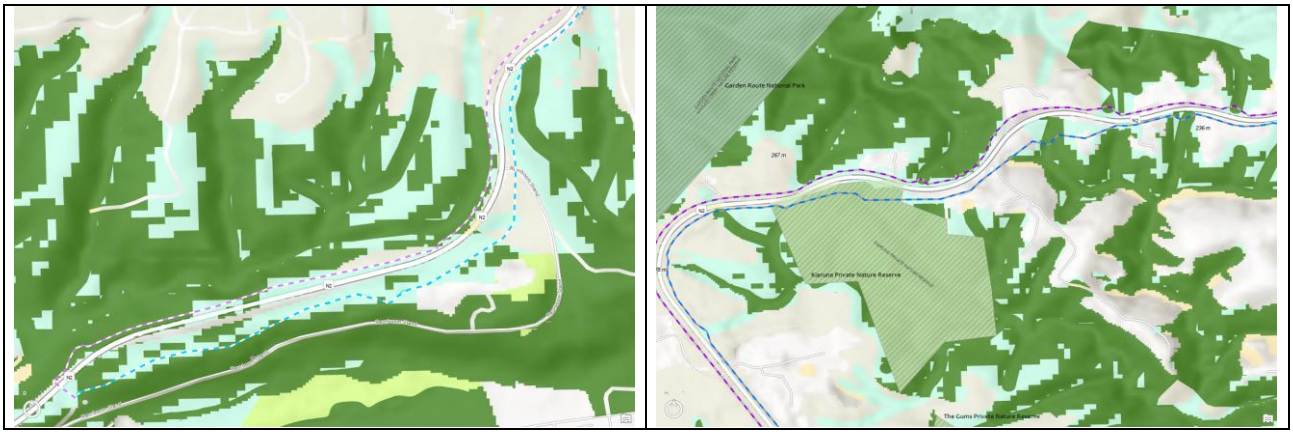

Figure 11: Ecological Corridors extracted from WCBSP map showing southern portion (left) and central portion (right) of the site.

As is evident the closeups reflect the levels of disturbance and transformation associated with the linear N2 national road, where this corridor reflects a lower CBA or ESA status in comparison to areas more distant from the road. Since both the preferred and alternative routes are in proximity to the road, they fall within this corridor. Notable the proposed preferred route as well as the proposed alternative route (to a lesser degree) will traverse several CBA patches, associated with remnant pockets of forest and/or natural vegetation associated with drainage lines as well as passing through the Kiaruna Private Nature Reserve. Bearing in mind that the CBA mapping scale is course, on-site observations correlate with this

elevated disturbance or transforma mation and reduced CBA/ESA categorisation. From the CBA/ESA map, it is clearly evident that fragmentation is already present along the proposed route, where intact areas are designated CBA 1, while degraded and transformed areas tend to have a lower status (i.e. ESA, Other Natural Area or No Natural Area Remaining).

Specific aspects will be further analysed and discussed in the vegetation assessment component of this report. The following can be generally concluded:

- The route abuts and follows the N2 national road corridor, which already serves to fragment the landscape to a significant extent, with associated elevated levels of disturbance and transformation in the area directly adjacent to this N2 corridor.

With reference to Table 4, the guidelines recommend the following for ESA areas:

- Designated CBA areas are essential for meeting biodiversity conservation targets, and loss thereof should be minimised
- Designated ESA areas are not essential for meeting biodiversity conservation targets, but that play an important role in supporting the functioning of PA's or CBAs and maintain ecological connectivity. Note that broad level ecological processes are already impacted by the existing road corridor.
- Land-use guidelines for CBA areas recommend no further loss of habitat.
- Land-use guidelines for ESA areas recommend maintaining in a functional, near-natural state, however, some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
- The background levels of disturbance are high due to the N2 national road and further fragmentation and/or disturbance to the CBA and ESA as a result of the development will be limited to the footprint on a site, in close proximity to an already disturbed corridor (i.e. the N2 national road).

The pipeline footprint will be minimal as most areas will rehabilitate to pre-disturbance levels within a few years after construction is complete within the fynbos vegetated areas, however this is unlikely within forested areas. The other infrastructure including pump stations and reservoirs will be permanent but will however have minimal footprints and are largely outside of designated CBA areas. As per point 1.5 of the Terrestrial Biodiversity Specialist Assessment and Minimum Report Content Requirements, '*If any part of the proposed development footprint falls within an area of 'very high' sensitivity, the assessment and reporting requirements prescribed for the 'very high' sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.*' Based on the above reporting protocol condition, the entire pipeline route will fall into this category. This implies that since the pipeline is a linear activity and will rehabilitate to pre-construction conditions within 2 years (for fynbos vegetation and not forest), the impact is deemed to acceptable. Forest vegetation will not rehabilitate to pre-construction conditions; hence the above condition will not apply.

Implications:

- The route is largely outside of designated CBA & ESA areas, which reflect the disturbed nature of the N2 national road corridor and other transformation, such as agriculture.
- The route will traverse a few patches of designated CBA and/or ESA, which will be discussed in further detail in the assessment section of this report.

2.3.7 Other Biodiversity Sector Plans

The site is outside of the planning domain of any other Biodiversity Sector Plans.

2.3.8 Protected areas

The South Africa Protected Areas Database (SAPAD) database, a comprehensive database of various protected area categories, is updated on a quarterly basis, and provides a comprehensive source of all national and private nature reserves, world heritage sites and other formal legally protected conservation areas situated within South Africa (Figure 12).

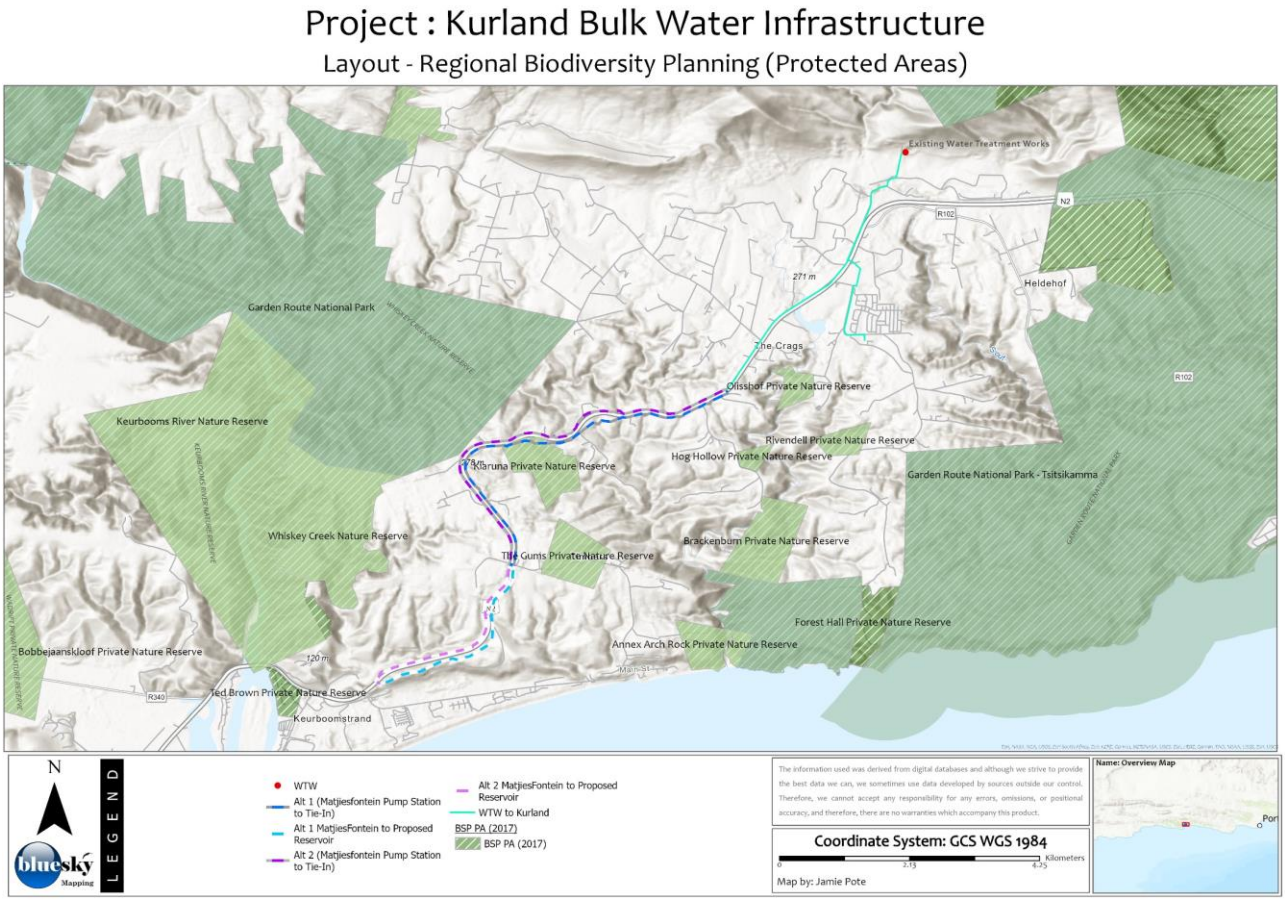

Figure 12: Protected Areas and NPAES in vicinity.

The Kiaruna Private Nature Reserve is the only protected environment that will potentially be directly affected by the proposed activity, as the preferred option will traverse this reserve. Other protected areas in the broader vicinity, which are unlikely to have any direct or indirect impacts of significance include Whiskey Creek Nature Reserve, Keurbooms River Nature Reserve, The Gums Private Nature Reserve, Garden Route National Park, Annex Arch Rock Private Nature Reserve, Forest Arch Nature Reserve, Brackenburn Private Nature Reserve, Hog Hollow Private Nature Reserve, Ollishof Private Nature

Reserve, Rivendell Private nature Reserve, Ted Brown Private Nature Reserve & Buitenverwachting Private Nature Reserve.

When projects are located in legally protected and internationally recognized areas, clients should ensure that project activities are consistent with any national land use, resource use, and management criteria (including Protected Area Management Plans, National Biodiversity Strategy and Action Plans (NBSAP's), or similar documents).

Excluding the Kiaruna Private Nature Reserve, no other protected areas, nor any ecological processes associated with them are likely to be affected in any significant manner by the proposed project.

Implications:

- The activity will have no direct, indirect or cumulative impact on any protected environment other than the Kiaruna Private Nature Reserve (preferred alternative only).

2.3.9 Strategic Water Source Areas

Strategic water source areas (Figure 13) are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy. Strategic water source areas are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy.

The northern portion of the site is situated within a Strategic Water Source Area, the specific activity (pipeline & associated infrastructure) is unlikely to have an impact on any Strategic Water Source area, as it will not alter water flows.

Implications:

- There is unlikely to be any significant impacts to any critical water supply to downstream economies and urban centres as a result of development of this site, which is small in size and will not significantly affect water flow or catchment runoff.

2.3.10 Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project responds to the high levels of threat prevalent in river, wetland and estuary ecosystems of South Africa. It provides strategic spatial priorities for conserving the country's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or '*FEPAs*'.

Concerning terrestrial fauna and flora components associated with Freshwater Ecosystem Priority Areas, the proposed pipeline will cross several non-perennial watercourses. It is unlikely to be affected significantly as a result of the development of the site, with respect to terrestrial biodiversity processes.

No RAMSAR sites are affected or situated within the Local municipal area and no Marine Protected Areas are directly affected.

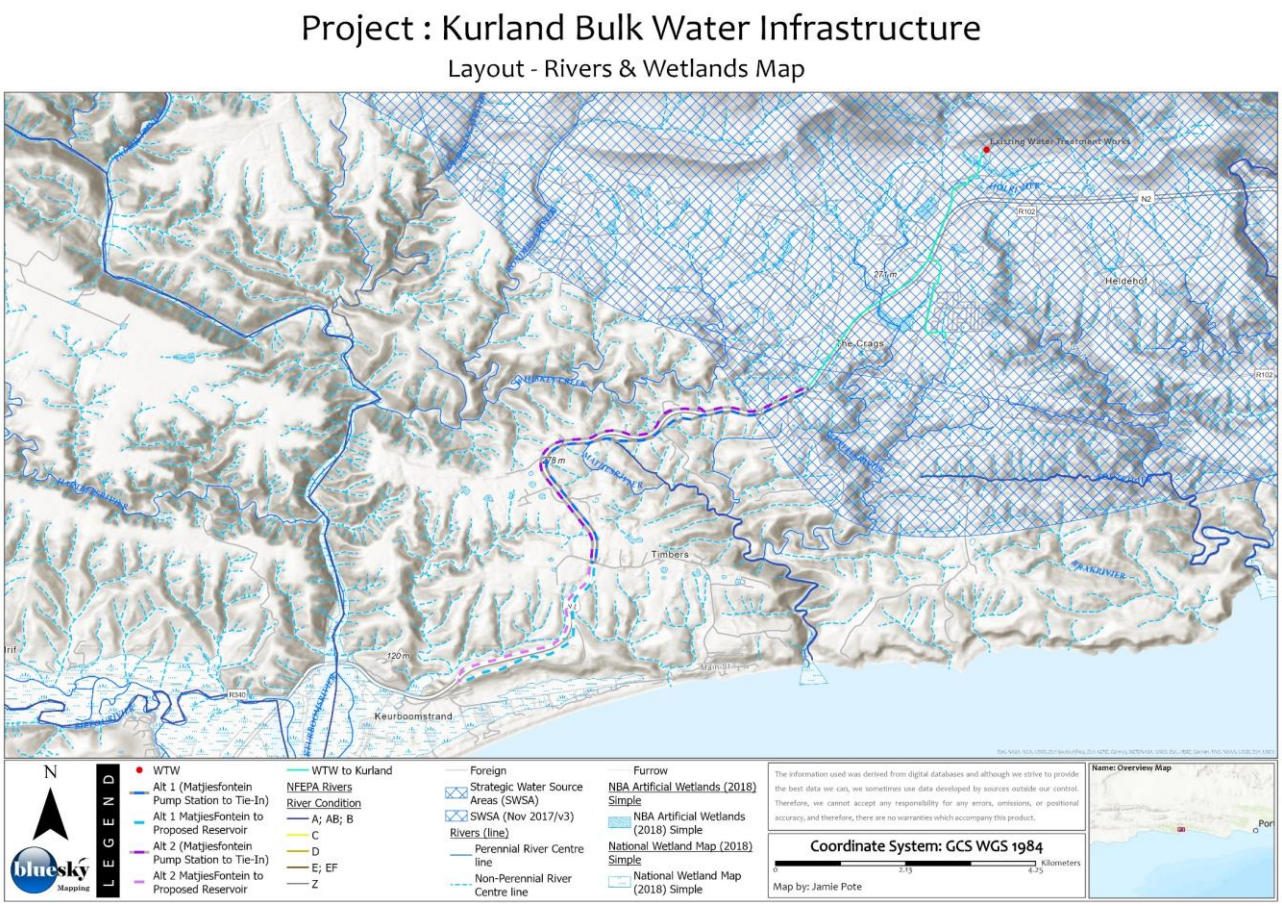

Figure 13: Rivers and Wetlands.

Implications:

- The pipeline will traverse several non-perennial watercourses, however there is likely to be minimal direct impact of a terrestrial nature (i.e., riparian), with implementation of adequate mitigation measures.

2.3.11 Regional Hotspots and Centres of Endemism

The site is situated within the Maputaland-Pondoland region and is located inland of the Pondoland Centre of Endemism. The Pondoland centre is associated with the Msikaba Formation Sandstone found in a coastal band between Port St Johns and Port Shepstone.

The location of the proposed activity is within the Cape Floral Kingdom region of Endemism suggests that the screening for possible endemic species should be undertaken. Additional screening of endemic species has thus been undertaken and is provided in Section 3.1.8.

Implications:

- Several endemic species could possibly occur within the wider area and will be assessed in further detail in the respective report sections.

2.3.12 Key Biodiversity Areas

Important Bird Areas

Important Bird and Biodiversity Areas (IBA's) are sites of international significance for the conservation of the world's birds and other biodiversity. They also provide essential benefits to people, such as food, materials, water, climate regulation and flood attenuation, as well as opportunities for recreation and spiritual fulfilment.

Implications:

- The proposed activity is situated outside of any *designated IBA's* and while the site may have occasional visits from transient bird or other faunal species known from the adjacent IBA area, no direct or indirect impact is anticipated as the disturbance will not be significantly above current baseline levels.

2.4 Vegetation and Ecological Processes and Corridors

2.4.1 Critical Biodiversity Areas

Given that the objective of CBAs is to identify biodiversity priority areas which should be maintained in a natural to near natural state, development within these areas is not encouraged. The following issues need to be considered when considering development within a CBA:

- Are there alternative areas within the site but outside of the CBA that could be developed?
- Does the project undermine the overall ecological functioning of the broad CBA area?
- Can mitigation measures reduce the impact of the development on ecological processes?

Implications:

- Portions of the site are within designated CBA areas.

2.4.2 Ecological Support Areas

These include supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may be an ecological process area that connects and therefore sustains Critical Biodiversity Areas or a terrestrial feature. The ESA'S are not well defined in the ECBCP (refer to Section 2.3.7). ESAs are generally extensions to the CBA area incorporating small areas that are perhaps no longer natural, or are comprised of secondary vegetation, generally following the drainage line ecological corridors within the wider surrounding landscape that will improve connectivity.

Implications:

- Portions of the site are within any designated ESA areas.

2.4.3 Ecosystem Processes

Distinct ecological processes are generally associated with surface geology and soils, climate, topography, drainage systems, and the make-up of the remaining native vegetation. These features could

be missed or only partly incorporated into land use plans unless they are specifically identified and targeted. Ideally, areas maintaining adaptive diversification (e.g., environmental gradients) or containing historically isolated populations should be identified and protected. The spatial aspect of ecological processes also needs to be determined and such insights incorporated in conservation planning. Finally, connectivity within these areas should be ensured to maintain species migration and gene flow. However, the spatial components of processes have rarely been considered in conservation planning – an approach that is also especially useful for development planning in biodiversity hotspots. Three types of ecological processes are discussed below.

Implications:

- Portions of the site are within any designated ESA areas.

2.4.4 Ecosystem Services

"*Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fibre; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services, recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling*". (Millennium Ecosystem Assessment (MEA), 2005) Terrestrial (or land) ecosystems provide valuable ecosystem services that contribute to human well-being.

Within the site, the most important ecosystem services are the provision of habitat for faunal species (foraging), cultural use and livestock grazing, as well as crop/pasture production. There is already a change to ecosystem services from predevelopment conditions because of the adjacent N2 National Road and other associated developments along this route, including dwellings, etc.

Implications:

- The contribution of the site to any ecosystem services of an ecological or biodiversity nature is low to moderate.
- The proposed activity will not significantly affect ecosystem services as described above, as the linear activity impact will be minimal and temporary for most of its length.

2.4.5 Critical/Important Terrestrial Habitats

Special Habitats include areas that are rare within a region, or which support important species, ecosystems or ecological processes. A description of these habitats is provided in Section 9.5.5: Critical/Important Terrestrial Habitats. The site has been screened for such habitat (Table 2).

Table 2: Critical or Important Habitats.

Critical Habitat	Comment/Presence
Rocky Outcrops	Not Present
Wetland habitat	Present in surrounding landscape
Priority Estuaries	Not Present
Forest	Present in patches along route and surrounding area
Fynbos	Present in patches along route and surrounding area
Threatened or Protected Species	Several species are confirmed in the nearby vicinity

Implications:

- Potential critical or important terrestrial habitats that would be affected directly by the proposed activity are present, the extent to which they are likely to be affected will be described in more detail and assessed in the sections below.

3 Biodiversity Risk Identification and Assessment

3.1 Baseline Biodiversity Description

3.1.1 Site Locality

The subject site is situated between Keurboomstrand in the south and Kurland in the north, within the Bitou Local Municipality, in a rural area with scattered dwellings and small farms (Refer to Figure 15).

3.1.2 Topography and Drainage

The site falls within a gently undulating landscape, incised by a network of perennial and non-perennial rivers that generally drain towards the south and south-east.

3.1.3 Landcover

Landcover (Figure 14) along the route is comprised of natural vegetation (fynbos, dense bush and indigenous forest) with plantations, cultivated fields, urban areas and other dwellings. Notable, the area in the vicinity of the proposed upper Matjiesfontein pump station is surrounded by plantations (gum and pine) and dense alien infestation is also evident surrounding these plantation areas. The northern portion, between The Crags and Kurland, is generally cultivated and or having secondary or disturbed vegetation with Kurland being an urbanised area having dense dwellings.

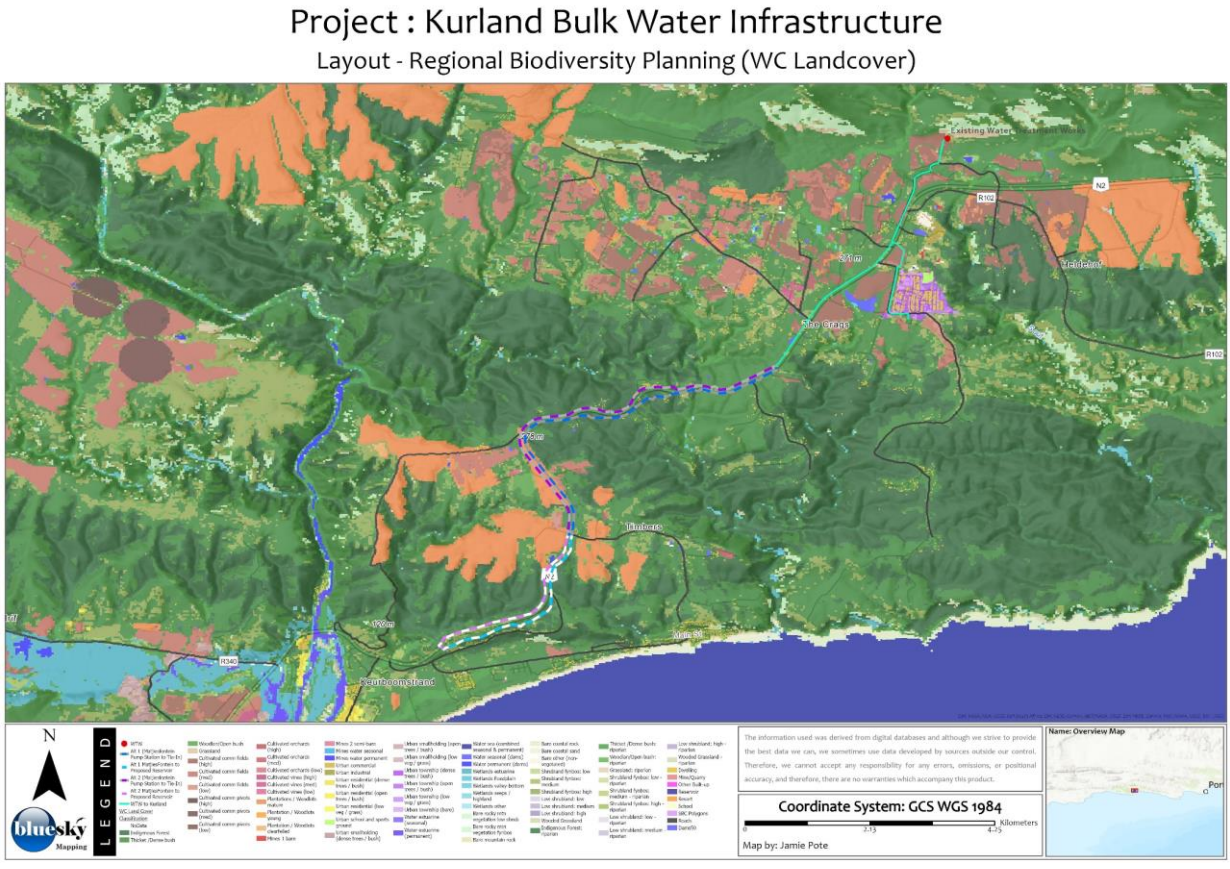

Figure 14: Landcover of the site and surrounding area.

3.1.4 Terrestrial Landscape Features (Habitat)

Overview

The project area is generally characterised by undulating hills and plains, vegetated with a mozaic of fynbos communities with bands and pockets of natural forest, incised by occasional perennial and non-perennial rivers, generally draining to the south. The general area has notably moderate to high levels of transformation, degradation and utilization, in the corridor along the N2 between Keurboomstrand, The Crags and Kurland. Plantations of gum and pine trees are prevalent surrounding the site as well as numerous small farm dwellings, accommodation facilities such as guesthouses and other tourism related infrastructure. Extensive cultivated areas (pastures) are present between The Crags and Kurland, used primarily for horses and other livestock. Alien invasion (Blackwood, Black Wattle, Rooikrantz, Eucalyptus and Pine) is prevalent and significant, with extensive stands of dense alien vegetation. Even intact or semi-intact vegetation pockets tend to have alien trees present to a greater or lesser extent.

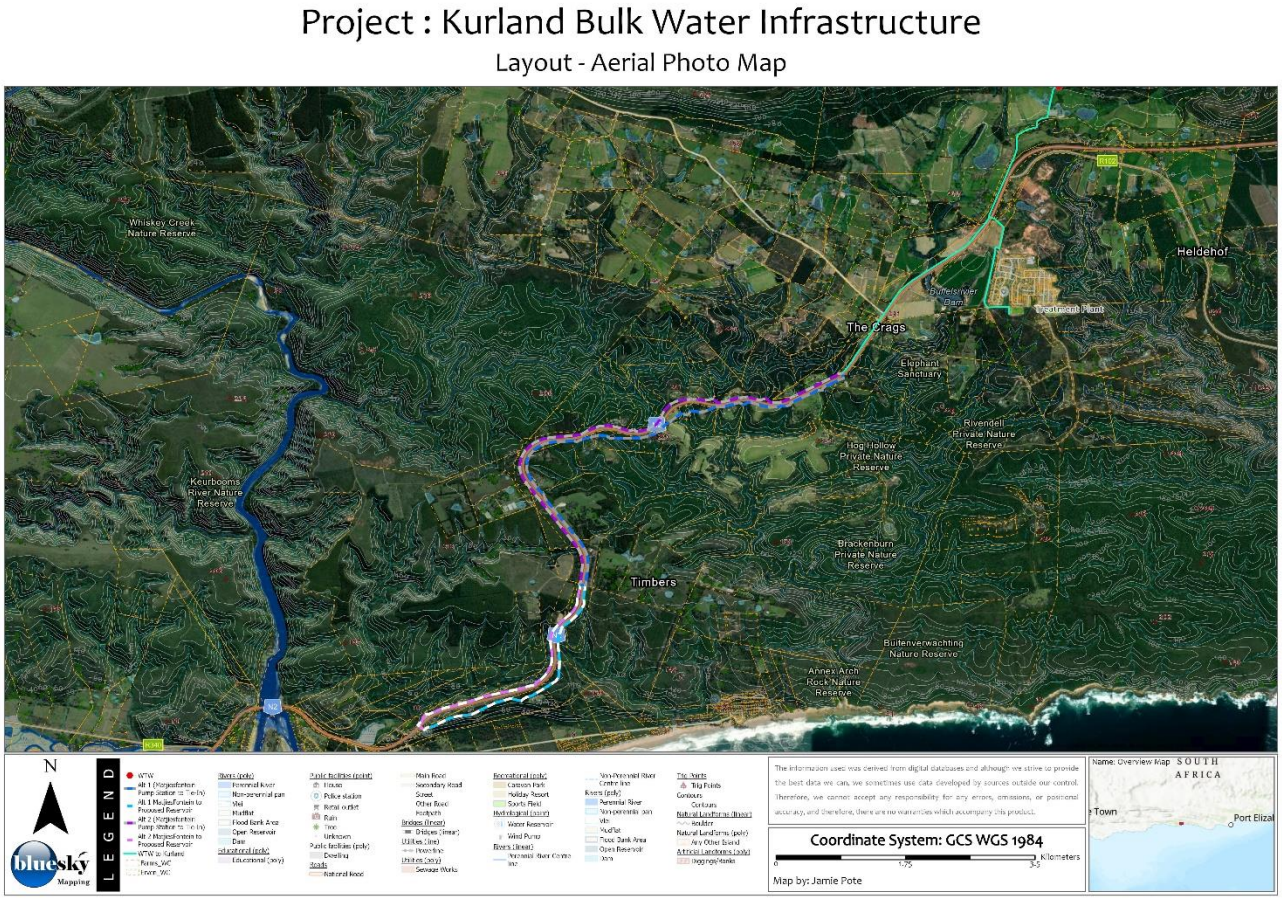

Figure 15: Aerial Photograph of the site and surrounding area.

Two key ecological corridors are noted (Figure 10 & Figure 11), one being at the southern end surrounding the existing Matjiesfontein reservoir and the second towards The Crags, in the vicinity of the Kiaruna Private Nature Reserve. These two corridors effective encompass Southern Afrotemperate Forest - Garden Route Shale Fynbos bands that run in a north-west to south-east direction. While the National Vegetation Map (Figure 7) shows these units as being contiguous units, on the ground the situation is somewhat more complex, with a patchwork of forest and fynbos rather being evident, with some plantations. It would appear from on-site observations, that the Fynbos (Garden Route Shale Fynbos), in the absence of fire develops a more pronounced tree component, comprising typical thicket or forest pioneer species. Since it is well known that extensive areas of forest were cleared from this area historically, it could be that the Garden Route Shale Band Fynbos is a secondary fynbos unit, and in the absence of fire successional processes come into play which perhaps promote the development of a

secondary forest. It is also evident that the N2 National Road and other surrounding infrastructure already provides a significant disruption to the broader ecological processes and the overall impact of the proposed pipeline infrastructure will be negligible in comparison to the baseline disturbances already at play.

This offers habitat for a limited suite of animal species, although animals have largely been displaced by people. In the surrounding area, lack of topological complexity, including slope and aspect, limit the availability of microhabitats for a diverse range of different species.

Figure 16:. Fynbos along powerline corridor near existing Matjiesfontein reservoir.

Figure 17: Fynbos along powerline corridor near existing Matjiesfontein reservoir.

Figure 18: Natural/Near Natural Fynbos.

Figure 19: Natural/Near Natural Fynbos.

Figure 20: Dense alien / plantation (at proposed Upper Matjiesfontein reservoir site).

Figure 21: Moribund fynbos with pioneer forest / thicket elements.

Figure 22: Natural Forest near Kiaruna Private Nature Reserve (south side of N2).

Figure 23: Natural Forest near Kiaruna Private Nature Reserve (north side of N2).

Figure 24: Remnant/Secondary Fynbos patches near Kurland.

Figure 25: Cultivated pastures near Kurland.

The vegetation present on site can be broadly categorised as follows (Figure 16 to Figure 25):

- Intact or Secondary Fynbos (including low to moderate density invaded: Intact, semi-intact and secondary fynbos patches with light alien infestation. Most of these areas are disturbed to some extent, being in proximity to the N2 national road and also along the pipeline north of the Matjiesfontein reservoir along a powerline servitude. Most of the southern portion of the pipeline route from Matjiesfontein reservoir to just south of the proposed Upper Matjiesfontein pump station as well as scattered patches in other areas. All such areas would be considered to have a **moderate** ecological sensitivity.
- Fynbos with forest or forest-thicket elements: Intact, semi-intact and secondary fynbos patches with a developed tree component, possibly forest elements or due to lack of fire. Scattered patches along the route as well as a portion of the preferred alternative in the vicinity of the Keurboomstrand turnoff as well as around the existing Matjiesfontein reservoir and Kurland WTW. All such areas would be considered to have a **moderate** ecological sensitivity.
- Natural Forest: Intact Forest pockets comprising large, dense trees, often with a heavily invaded pioneer forest – climax fynbos around the edges. These forest pockets would be protected in terms of the National Forests Act, and an opinion will be required from the respective forestry authority to clarify if they will allow the activity (i.e. will permits top remove such forest be possible). Mostly confirmed to a ± 4 km section in the vicinity of the Kiaruna Private Nature Reserve, comprising several fragmented forest patches including the upper reaches of some non-perennial some watercourses. All such areas would be considered to have a **high to very high** ecological sensitivity.
- Disturbed areas (including plantations and densely invaded fynbos): Primarily dense alien infested areas and plantations with the occasional indigenous element present. Scattered patches along the pipeline but includes a continues stretch from just south of the proposed upper Matjiesfontein pump station towards the forested areas near the Kiaruna Private Nature Reserve as well an area between the Kuerboomstrand turnoff and the existing Matjiesfontein reservoir. Includes the proposed Upper Matjiesfontein pump station. All such areas would be considered to have a **low** ecological sensitivity.
- Transformed areas: this includes all hardened surfaces such surfaced and unsurfaced roads, cultivated lands and pastures. In all these areas there has been a complete transformation and natural vegetation has been replaced by either hardened surfaces or crops including pastures grasses. All such areas would be considered to have a **very low** ecological sensitivity. Most of the Kurland portion from the tie-in to the WTW and to Kurland, excluding a few remnant patches of secondary fynbos vegetation and some significantly degraded watercourses, are transformed.

The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the localised impact associated with the site footprint would in general be of low to very low significance with implementation of recommended mitigation measures.

Vegetation composition

Predominant species within the fynbos vegetation along the proposed route include *Metalasia muricata, Passerina rigida, Passerina falcifolia, Phylica purpurea, Anthospermum aethiopicum, Erica canaliculata*, all being common and abundant. Other common by less abundant species include *Erica discolor, Erica versicolor & Erica densifolia. Hypodiscus striatus, Gnidia galpinii, Leucadendron salignum, Erica gibbosa, Erica sparsa, Erica formosa, Erica uberiflora & Protea mundii* are occasionally present.

Erica glandulosa subsp. *fourcadei* (Vulnerable) can be locally common including in previously disturbed areas or where secondary vegetation occurs. The species has a widespread distribution and is unlikely to be significantly affected by the minimal footprint associated with temporary construction of the pipeline.

Numerous typically non-fynbos species are also noted to be present within fynbos, disturbed areas and also in ecotone areas (such as on the edge of forest or forest-thicket type vegetation, including *Romulea rosea, Pelargonium alchemilloides, Monopsis unidentata, Monopsis simplex, Helichrysum foetidum, Rumohra adiantiformis, Senecio angulatus, Haemanthus albiflos, Chasmanthe aethiopica, Carpobrotus edulis, Carpobrotus deliciosus, Cheilanthes viridis, Blechnum capense, Hypoxis villosa, Asparagus aethiopicus, Salvia africana, Pelargonium alchemilloides, Aristea pusilla, Helichrysum felinum, Eriocephalus africanus, Indigofera erecta, Crassula rubricaulis, Podalyria burchellii, Gerbera cordata, Lobelia tomentosa, Crassula orbicularis, Chironia baccifera, Polygala fruticosa, Polygala myrtifolia, Gazania rigens, Euryops virgineus, Stachys aethiopica, Agathosma ovata, Dietes iridioides & Streptocarpus rexii.*

In disturbed areas grasses such as *Aristida junciformis, Brachiaria serrata, Cymbopogon marginatus, Heteropogon contortus & Ehrharta calycina* are common as well as species such as *Trifolium repens* (White Clover) and *Plantago lanceolata* and several common weedy species.

Occasional, less common other species include *Agathosma pulchella, Berzelia intermedia, Commelina africana, Elegia juncea, Elytropappus rhinocerotis, Eragrostis capensis, Halleria lucida, Helichrysum cymosum, Helichrysum teretifolium, Olea capensis, Searsia (Rhus) lucida & Watsonia fourcadei*

A notable woody tree component is also present, sometimes scattered within fynbos vegetation but notable denser in areas perhaps where fire has been excluded for an extended period. Some of these species are typical of thicket or forest pre-cursors and include *Virgilia divaricata, Olea capensis, Burchellia bubalina, Buddleja saligna, Commelina africana, Mystroxylon aethiopicum, Gymnosporia nemorosa, Cynanchum ellipticum, Lauridia tetragona, Searsia (Rhus) chirindensis, Colpoon compressum, Diospyros dichrophylla, Grewia occidentalis & Pterocelastrus tricuspidatus, Brachylaena neriifolia, Clematis brachiata, Canthium inerme, Cassine peragua,*

Natural intact forest pockets care comprised of *Rapanea melanophloeos, Zanthoxylum capense, Apodytes dimidiata, Allophylus decipiens, Dovyalis rhamnoides, Podocarpus latifolius.* Other species typical of the vegetation unit are also present including trees such as *Cunonia capensis, Curtisia dentata, Nuxia floribunda, Olinia ventosa, Podocarpus latifolius, Pterocelastrus tricuspidatus, Olea capensis, Canthium inerme, Cassine peragua, Diospyros whyteana, Cyathea capensis, Burchellia bubalina, Trichocladus crinitus, and herbs and shrubs such as Sparrmannia africana, Blechnum capense, Rumohra adiantiformis* as well as the grass *Oplismenus hirtellus*. The tree *Ilex mitis* is occasionally present in the wider area, often near watercourses.

The water lilly *Nymphaea* sp. is present in standing water, including a small dam in the vicinity of the Kiaruna Private Nature Reserve and a small wetland/dam near the Kurland WTW.

Kniphofia uvaria occasionally occurs in damp (seep) areas, such as where road stormwater may accumulate.

3.1.5 Present Ecological State

Table 3 provides a comprehensive description and assessment of biodiversity and ecological indicators for the site.

Table 3: Summary of Key Biodiversity and Ecological Indicators.

ASPECT	DESCRIPTION
LANDSCAPE AND COMMUNITY DESCRIPTION	
Aspect, Slope, Topography	Undulating hills in the south, becoming a flat plain in the north.
Substrate	Soils typically poor to moderate, typical of areas where fynbos occurs.
Vegetation units	Fynbos & Forest
Total Ground Cover (%)	> 80 %
Tree Height (m) – Median (alien species)	> 10 m in Forest or plantations and alien invasive trees. Occasional scattered small indigenous trees withi fynbos areas are rarely over 5 m.
Tree Cover (%) Aerial	Indigenous < 20 %, Alien invasives > 20 %.
Shrub Cover (%)	> 50 %
Herbaceous Cover (%)	
Grass Cover (%)	< 10 % (in natural areas), up to 100 % in cultivated areas and pastures.
Bare soil/rock (%) and disturbed	< 10 %
TERRESTRIAL LANDSCAPE FEATURES	
Forest	Forest is present.
Thicket	No thicket is present, although thicket elements (i.e. species typical of thicket) are present, likely associated with the sporadic coastal thicket in the area.
Grassland	No natural grassland is present, grassland elements are present, most likely indicative of secondary vegetation and in pastures and/or cultivated areas.
Fynbos/Grassy Fynbos	Fynbos elements is present, being the dominant vegetation unit.
Riparian	Riparian vegetation is occasionally present along the watercourse comprising clumps of sedges. Where forest occurs over riparian areas, do distinct riparian vegetation is present.
Wetland	No wetlands are present on site, some in adjacent landscape.
Estuaries	No estuaries are present.
Dunes/Coastal	No coastal/dune habitat is present.
Rocky Outcrop Habitat	No rocky outcrop habitat of significance was recorded; however, some typical outcrop elements are present in the drier fynbos habitats.
Fauna Nesting Sites	None observed.
Fauna Feeding Grounds	No notable faunal feeding grounds are present, other than for livestock grazing in the pastures.
Ecotones *(Transitional zone between two structurally different plant communities which retains characteristics of each and often contains species not found in the adjacent communities)*	Ecotones are naturally present in intact areas between Forest and Fynbos; however, within the site disturbance levels are high, due to various sources including alien invasion, clearing of vegetation for services (roads, pipelines, powerlines, etc.), which tends to create an artificial ecotone. The ecotones tend to be heavily invaded with alien species which fundamentally reduces their ecotone value.
Ecological Corridors	The N2 national road, which has fences on either side, will create a significant disruption to ecological corridors.
Evolutionary Processes	None of significance within the terrestrial environment.
Transformed	The site is significantly locally transformed by several features including the N2 national road, urbanisation (Kuyga) and rural development including dwellings, cultivated areas and other infrastructure (powerlines, smaller roads and pipelines, etc.). The edges of the N2 national road corridor are significantly transformed and or degraded along its length, with extensive areas having secondary vegetation with occasional patches of intact or natural, but often with moderate to dense alien invasion. Remnant forest pockets tend to be less degraded
Degraded (modified)	Extensive areas are degraded or having secondary vegetation, including the road reserve.
Secondary vegetation	
DISTURBANCES, CURRENT LAND USES AND SOURCES OF DEGRADATION	
Human disturbances	Human disturbance and alien invasion is substantial within and surrounding the site.

ASPECT	DESCRIPTION
Habitat fragmentation	The N2 National Road as well as other linear infrastructure, including secondary roads, powerline corridors and other human development do fragment the landscape to significant levels in proximity to the site. More extensive, less fragmented habitat of the same vegetation units represented on the site are present in the surrounding area.
Invasive Alien Plants	Present and abundant in disturbed areas, as well as in intact vegetation, often to a lesser extent. Intact forest pockets tend to not have significant invasion within, but the edges are often densely invaded. Several plantation areas having gum and pine trees are present in the broader area.
Other degradation	Rubble and other rubbish is prevalent, especially along the N2 national road corridor.
Remaining intact habitat:	Intact habitat is present and widespread in the surrounding landscape; none are differentiable within the site other than some remnant forest pockets, which also tend to be fragmented to some extent.
Grazing (livestock)	Surrounding area is likely to be used for grazing (pastures).
Hunting	Likely present in surrounding rural landscape.
Conservation (passive)	Specific site does not contribute significantly to passive conservation being ion close proximity to the multiple-lane surfaced N2 National Road.
Recreational (sport)	None
Other	None
PATTERNS OF BIODIVERSITY	
Flora	Flora diversity is moderate to high in the surrounding area, with lower diversity in disturbed areas, which are prevalent along the route.
Fauna	Fauna diversity is moderate to low.
Species of Special Concern	A few species are potentially found in the region and vegetation units, including known populations in the vicinity of the site, however none of significance were recorded within the site at the time of the site survey(s).
ECOLOGICAL PROCESSES	
Gene dispersal barriers	Roads, powerlines, pipelines, residential areas and dwellings, cultivated fields.
Gene dispersal corridors	The N2 National Road is likely to serve as a significant barrier to some species (mammals and reptiles), but less of a barrier to other (birds).
Aeolian (dune) processes	None
Climatic gradients	No climatic gradients are present.
Rivers and Drainage Lines (Riparian Vegetation)	Several minor non-perennial drainage lines are present in proximity to the site, and several will be traversed by the proposed pipeline.
Refuges (outcrops/islands)	Rocky and other refuges are <u>not present</u> within the site. Small patches of natural vegetation including forest pockets may serve as refuges where suitable habitat is not accessible.
Fire	Fire is present, and present in fynbos.
Ecotones/Tension zones	Ecotones are present; however, they tend to be invaded or degraded.
Erosion	Erosion is low within the site.
ECOLOGICAL SERVICES	
Carbon storage	Fynbos is considered a low carbon accumulator, forest a high carbon accumulator.
Provisioning Services	<u>Livestock grazing:</u> Grazing is prevalent in the cultivated pastures, natural vegetation (fynbos) is generally not suited to livestock grazing. <u>Timber (Building materials):</u> Forest and Plantations are sources of timber. <u>Fuelwood:</u> Several Wattle species are likely utilised for fuelwood. <u>Food:</u> None known <u>Fibre:</u> None known <u>Medicinal plants:</u> None were recorded within the site. Various species in the surrounding area have medicinal properties and are most likely harvested informally.
Other (ornamentals)	Several species of both fynbos and forest are known to have ornamental use.
CONSERVATION IMPORTANCE	
Current Distribution (extent)	Garden Route Shale Fynbos has a more localised distribution with higher levels of transformation than the other vegetation units that are represented

ASPECT	DESCRIPTION
	within the site. The site footprint comprises a small percentage of the remining habitat for all vegetation units.
Red Listed Species and other Species of Special Concern	Several species are known from the surrounding area and vegetation units.
Habitat for SSC	Several species of special concern are known from the general area, as well as the vegetation unit that is present. High levels of degradation and alien invasion are likely to reduce the availability and suitability of the area surrounding the N2 national road, and specifically the proposed pipeline routes.
Relative Conservation importance	Site has low importance regionally due to limited footprint of the proposed activity. The vegetation unit has been identified regionally as being vulnerable, however intact vegetation within the site is limited.
OTHER SENSITIVITIES	
Conservation importance	Low, limited footprint area with pipeline likely to be temporary as natural vegetation will revegetate the servitude once construction is completed.
Topography	Undulating hills in the south, becoming a flat plain in the north.
Wetlands	None directly affected.
Rehabilitation potential	Rehabilitation potential is moderate to high for fynbos and low to very low for forest.
Community structure	Community structure is moderate in fynbos, generally comprised of a groundcover and/or shrub strata becoming more complex in natural forest.

In summary, the following general observations can be noted regarding the site:

- The fynbos vegetation on site is moderately degraded, mostly because of alien invasion, to completely transformed, in areas cleared for other uses (such as cultivated areas, urbanisation or around dwellings with the occasional near pristine pocket, including secondary patches. Intact Forest pockets are generally pristine or near pristine, but edges are often highly degraded with high levels of alien invasion.
- Extensive pockets or patches of the vegetation units are generally present in the broader area, including natural forest. The N2 national road does create a significant disruption already to ecological connectivity, hence the additional impact posed by the pipeline adjacent to this or other roads, which will largely result in a temporary impact during construction in fynbos, but more permanent in forest, is unlikely to increase the overall localised ecological disruptions more than current baseline levels.
- Alien invasion is variable but tends to be high to very high over large areas of the pipeline route.
- Erosion and erosion risk is generally low across the site.

3.1.6 Flora

Several endemic and range restricted species are known from the surrounding area. None are likely to be present. Note, there is a residual very-low possibility that these species could be present, and cannot be discounted without extensive seasonal sampling, which is generally outside the scope of such an assessment, unless a specific risk is identified. Due to the localised nature of the impact, as well as the level of degradation of the site, the risk of a species suffering any significant loss is low.

3.1.7 Fauna

The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint would be of low significance if mitigation measures are adhered to. The site is unlikely to provide significant or important faunal habitat due to proximity to the N2 National Road and other disturbance including alien invasion and other human disturbances.

Mammals

Larger mammal species may include transient species such as bushbuck and duiker. Should they be present, they are likely to be mobile species that would move away from disturbance and with intact habitat available in the immediate surrounds would unlikely be negatively affected by the development.

Small mammals within the habitat are generally mobile and likely to be transient to the area. They will most likely vacate the area once construction commences. As with all construction sites there is a latent risk that there will be some accidental mortalities. Generally, these small mammals are mobile and will vacate the area once construction commences. This risk is unlikely to exceed current baseline risks due to the nearby N2 National Road.

The risk of species of special concern being impacted significantly is low, and it is unlikely that there will be any impact to populations of such species because of the activity. A faunal search and rescue is recommended as a precaution before commencement.

Avifauna and Bats

The proposed activity is unlikely to pose any significant risk to birds or bats, which are unlikely to be affected by the temporary nature of the activity, as well as proximity to the N2 National Road which has significant traffic that would pose a far greater baseline risk to such species than the proposed activity.

Reptiles

Reptiles such as lizards are less mobile compared to mammals, and some mortalities could arise. It is recommended that a faunal search and rescue be conducted before commencement. Should any reptiles be found during constructions, a retile handler should be on called. Since the N2 national road is adjacent to the proposed site, it is unlikely that overall impacts or risk will exceed current baseline levels.

Amphibians

Since most of the pipeline covers terrestrial habitat withi limited sources of aquatic habitat, amphibians are not anticipated to be found to occur in abundance. Several watercourse crossings are present as well as the occasional pool of standing water, which could provide habitat for several commonly occurring species. Forest and densely vegetated areas are known to provide habitat for several terrestrial amphibian species such as Knysna Leaf-folding Frog, although due to the temporary and limited footprint, this is not anticipated to be of significance in non-forest habitat.

Invertebrates

Several Invertebrate and insect species noted to have an elevated conservation status are known from the broader area, although due to the temporary and limited footprint, this is not anticipated to be of significance in non-forest habitat.

3.1.8 Species of Special Concern occurring in the region

Several endemic and range restricted species are known from the general surrounding area and there is a residual likelihood that they could be present, but cannot be discounted without comprehensive seasonal sampling, which is generally outside the scope of such an assessment, unless a specific risk is identified. Due to the localised nature of the impact, with vegetation clearing only required for site development, as well as the level of degradation, the risk of a species suffering any significant population loss is low. There is always a residual risk to species for any activity.

Red Listed, Endemic and Protected Flora

As per Table 5, the site falls within the general distribution range of a few flora species several Vulnerable, Endangered or Critically Endangered flora species. Due to the temporary nature of the construction of the pipeline, which will likely rehabilitate to pre-construction conditions on completion, these species are unlikely to be significantly affected by the proposed activity, in particular within the fynbos and disturbed areas. Furthermore, due to the degraded and invaded state of much of the proposed pipeline route, as well as the proximity to the N2 National Road, it was further noted during the site visit, that suitable habitat is limited, in particular within the remnant fynbos pockets as well as the densely invaded areas.

Since the project footprint is surrounded by extensive outlying areas of natural habitat, any temporary disturbance as a direct result of the activity during the construction phase is unlikely to pose a significant negative impact to flora species.

Table 4: Flora Species of Special Concern.

SCIENTIFIC NAME	FAMILY	STATUS[3]	COMMENT/PRESENCE
Acmadenia alternifolia	Rutaceae	VU [B1ab(ii,iii,iv)+2ab(ii,iii,iv)], NEST (M), End	GRSF. Not Recorded
Acmadenia tetragona	Rutaceae	NT [B1ab(iii)+2ab(iii)], End	GRSF, SOSF
Acrolophia cochlearis	Orchidaceae	PNCO	
Acrolophia lunata	Orchidaceae	NEST (M), En [B1ab(ii,iii,v); D], PNCO	
Afrocarpus (Podocarpus) falcatus	Podocarpaceae	NFA	SAF
Amauropelta knysnaensis	Thelypteridaceae	NEST (M), VU [D2]	SAF
Angraecum pusillum	Orchidaceae	PNCO	SAF
Angraecum sacciferum	Orchidaceae	PNCO	
Aptenia cordifolia	Aizoaceae	PNCO	
Aspalathus bowieana	Fabaceae	NEST (M), EN [B1ab(i,ii,iii, iv, v)]	SOSF
Brabejum stellatifolium	Proteaceae	PNCO	SAF
Centella longifolia	Apiaceae	NEST (M), Rare	
Cliffortia ruscifolia	Rosaceae	DDT, End	GRSF
Clivia mirabilis	Amaryllidaceae	PNCO	SAF
Crassula roggeveldii	Crassulaceae	Rare, End	GRSF
Delosperma brevipetalum	Aizoaceae	PNCO	
Delosperma litorale	Aizoaceae	PNCO	
Delosperma sp.	Aizoaceae	PNCO	
Dietes iridioides	Iridaceae	PNCO	SAF
Disa bracteata	Orchidaceae	PNCO	
Disa cornuta	Orchidaceae	PNCO	
Disa hallackii	Orchidaceae	PNCO	
Drosanthemum sp.	Aizoaceae	PNCO	
Erica aneimena	Ericaceae	PNCO	SOSF
Erica chloroloma	Ericaceae	NEST (M), VU [B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v)], PNCO	Not Recorded
Erica cordata	Ericaceae	PNCO	SOSF
Erica deflexa	Ericaceae	PNCO	SOSF
Erica densifolia	Ericaceae	PNCO	SOSF
Erica diaphana	Ericaceae	LC, PNCO, End	TSF
Erica discolor	Ericaceae	LC, PNCO, End	TSF, SOSF
Erica formosa	Ericaceae	PNCO	SOSF
Erica fuscescens	Ericaceae	PNCO	SOSF

[3] **PNCO** - Provincial Nature Conservation Ordinance (1974); **ToPS** – Threatened or Protected Species; **RD** – Recent Discovery; **NEST** - National environmental Screening Tool; **GRSF** - Garden Route Shale Fynbos, **SOSF** - South Outeniqua Sandstone Fynbos, **TSF** - Tsitsikamma Sandstone Fynbos, **SAF** - Southern Afrotemperate Forest; **LC** – Least Concern, **VU** – Vulnerable, **EN** – Endangered, **CR** – Critically Endangered.

SCIENTIFIC NAME	FAMILY	STATUS[3]	COMMENT/PRESENCE
Erica gillii	Ericaceae	PNCO	SOSF
Erica glandulosa	Ericaceae	LC, PNCO, End	TSF
Erica glandulosa subsp. fourcadei	Ericaceae	VU [B1ab(ii,iii,iv,v)], PNCO, BIT, End, NEST (M)	Present, occasional individuals noted, often on disturbed or secondary vegetation and within road reserve.
Erica glumiflora	Ericaceae	NEST (M), VU [B1ab(i,ii,iii,iv,v)], PNCO	Present, occasional individuals noted, often on disturbed or secondary vegetation and within road reserve.
Erica gracilis	Ericaceae	PNCO	SOSF
Erica hispidula	Ericaceae	LC, PNCO, End	GRSF, SOSF
Erica inconstans	Ericaceae	PNCO	SOSF
Erica juniperina	Ericaceae	PNCO	SOSF
Erica lanata	Ericaceae	PNCO	SOSF
Erica lehmannii	Ericaceae	PNCO	SOSF
Erica nabea	Ericaceae	PNCO	SOSF
Erica newdigateae	Ericaceae	LC, PNCO, BIT, End	
Erica onusta	Ericaceae	NEST (M), CR [B1ab(iii,v)]	
Erica outeniquae	Ericaceae	PNCO	SOSF
Erica priorii	Ericaceae	PNCO	SOSF
Erica rosacea subsp. rosacea	Ericaceae	LC, PNCO, End	TSF
Erica similis	Ericaceae	PNCO	SOSF
Erica simulans	Ericaceae	PNCO	SOSF
Erica sparsa	Ericaceae	LC, PNCO, End	TSF, SOSF
Erica sparsa var. sparsa	Ericaceae	LC, PNCO, BIT, End	
Erica stylaris	Ericaceae	PNCO, NEST (M), VU [B1ab(iii)+2ab(iii)]	
Erica trachysantha	Ericaceae	LC, PNCO, End	TSF
Erica triceps	Ericaceae	PNCO	SOSF
Erica uberiflora	Ericaceae	LC, PNCO, End	TSF, SOSF
Erica unicolor	Ericaceae	PNCO	SOSF
Erica velatiflora	Ericaceae	PNCO	SOSF
Erica versicolor	Ericaceae	PNCO	SOSF
Erica zitzikammensis	Ericaceae	DDT, PNCO, End	TSF
Eriospermum vermiforme	Eriospermaceae	EN [B1ab(ii,iii,v)+2ab(ii,iii,v)], End	GRSF
Faurea macnaughtonii	Proteaceae	NEST (M), Rare, PNCO	Not Recorded
Felicia tsitsikamae	Asteraceae	VU, End	TSF
Felicia westae	Asteraceae	NEST (M), EN [B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)]	
Freesia sparrmannii	Iridaceae	PNCO	SAF
Geissorhiza bracteata	Iridaceae	PNCO	SOSF
Geissorhiza fourcadei	Iridaceae	LC, PNCO, End	TSF, SOSF
Geissorhiza inconspicua	Iridaceae	LC, PNCO, End	TSF, SOSF
Geissorhiza outeniquensis	Iridaceae	PNCO	SOSF
Gladiolus gueinzii	Iridaceae	LC, PNCO, BIT, End	
Gladiolus roseovenosus	Iridaceae	CR [C2a(i)], PNCO, End	GRSF
Helichrysum outeniquense	Asteraceae	CR [D], End	TSF
Hermannia lavandulifolia	Malvaceae	VU [A2c]	Not Recorded
Holothrix parviflora	Orchidaceae	LC, PNCO, BIT, End	
Indigofera hispida	Fabaceae	NEST (M), VU [B1ab(iii)]	
Lachenalia youngii	Hyacinthaceae	LC, PNCO, BIT, End	
Lampranthus pauciflorus	Aizoaceae	EN [B1ab(ii,iii,iv,v)], PNCO	Not Recorded
Lebeckia gracilis	Fabaceae	EN [A2bc; B1ab(ii,iii,iv,v)]	Not Recorded
Leucadendron comosum subsp. comosum	Proteaceae	PNCO	SOSF
Leucadendron conicum	Proteaceae	NT [A4c], PNCO, End	TSF, SOSF
Leucadendron ericifolium	Proteaceae	PNCO	SOSF
Leucadendron eucalyptifolium	Proteaceae	LC, PNCO, End	GRSF, SOSF, TSF
Leucadendron olens	Proteaceae	PNCO	SOSF

SCIENTIFIC NAME	FAMILY	STATUS[3]	COMMENT/PRESENCE
Leucadendron salignum	Proteaceae	LC, PNCO, End	TSF, SOSF, GRSF
Leucadendron spissifolium subsp. fragrans	Proteaceae	PNCO	SOSF
Leucadendron spissifolium subsp. phillipsii	Proteaceae	LC, PNCO, End	TSF
Leucadendron uliginosum subsp. glabratum	Proteaceae	NT [B1ab(iii)+2ab(iii)], PNCO, End	TSF
Leucadendron uliginosum subsp. uliginosum	Proteaceae	PNCO	SOSF
Leucospermum cuneiforme	Proteaceae	LC, PNCO, End	TSF, SOSF
Leucospermum formosum	Proteaceae	EN [A3c+4c; B1ab(ii,iii,v)c(iv)+2ab(ii,iii,v)c(iv)] , PNCO, End	GRSF
Leucospermum glabrum	Proteaceae	EN [B1ab(iii,v)c(iv)+2ab(iii,v)c(iv); C2a(i)], PNCO, End, NEST (M)	TSF, SOSF
Leucospermum hamatum	Proteaceae	PNCO	SOSF
Leucospermum wittebergense	Proteaceae	PNCO	SOSF
Limonium scabrum var. scabrum	Plumbaginaceae	DDT, End	
Liparis capensis	Orchidaceae	PNCO	SAF
Marsilea schelpeana	Marsileaceae	NEST (M), VU [B1ab(ii,iii)+2ab(ii,iii)]	Associated with wetlands
Metalasia pulcherrima forma pallescens	Asteraceae	DDT, End	TSF
Mimetes cucullatus	Proteaceae	PNCO	SOSF
Mimetes pauciflorus	Proteaceae	VU [A2c+3c+4c], PNCO, End, NEST (M)	TSF, SOSF
Mimetes splendidus	Proteaceae	NEST (M), EN [B1ab(i,ii)c(iv)+2ab(i,ii)c(iv); C2a(i)b], PNCO	
Muraltia knysnaensis	Polygalaceae	NEST (M), EN [B1ab(ii,iii,iv,v)], End	Not Recorded
Mystacidium capense	Orchidaceae	PNCO	SAF
Ocotea bullata	Lauraceae	NEST (M), EN [A2bd], NFA	SAF
Osteospermum pterigoideum	Asteraceae	NEST (M), EN [B1ab(ii,iii,v)+2ab(ii,iii,v)]	
Otholobium carneum	Fabaceae	Rare, End	TSF, SOSF
Otholobium fruticans	Fabaceae	Rare, End	
Phalaris arundinacea	Poaceae	DDT, End	
Podocarpus elongatus	Podocarpaceae	NFA	SAF
Podocarpus latifolius	Podocarpaceae	NFA	SAF
Polypogon viridis	Poaceae	DDT, End	
Protea aurea subsp. aurea	Proteaceae	LC, PNCO, End	GRSF
Protea coronata	Proteaceae	NT [A2c+3c+4c], PNCO, End	GRSF
Protea cynaroides	Proteaceae	LC, PNCO, End	TSF, SOSF
Protea eximia	Proteaceae	LC, PNCO, End	TSF
Protea lorifolia	Proteaceae	PNCO	SOSF
Protea mundii	Proteaceae	LC, PNCO, End	TSF, SOSF
Protea neriifolia	Proteaceae	LC, PNCO, End	TSF, SOSF, GRSF
Protea repens	Proteaceae	PNCO	SOSF
Psoralea trullata	Fabaceae	NEST (M), Rare	
Psydrax capensis	Rubiaceae	NEST (M)	
Pterygodium cleistogamum	Orchidaceae	NEST (M), VU [B1ab(ii,iii)], PNCO	
Pterygodium newdigateae	Orchidaceae	NEST (M), CR PE, PNCO	
Romulea fibrosa	Iridaceae	PNCO	SOSF
Romulea pratensis	Iridaceae	LC, PNCO, End	TSF
Ruschia duthiae	Aizoaceae	NEST (M), VU [B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v)], PNCO	
Satyrium acuminatum	Orchidaceae	PNCO	
Satyrium longicolle	Orchidaceae	PNCO	

SCIENTIFIC NAME	FAMILY	STATUS[3]	COMMENT/PRESENCE
Selago burchellii	Scrophulariaceae	NEST (M), VU [B1ab(ii,iii,iv,v)], End	Not Recorded
Sensitive species 1038	Asphodelaceae	NEST (M), Rare	
Sensitive species 1171	Iridaceae	NEST (M), Rare, PNCO	
Sensitive species 131	Fabaceae	NEST (M), CR PE	
Sensitive species 181	Orchidaceae	NEST (M), CR PE, PNCO, End	
Sensitive species 419	Dioscoreaceae	NEST (M), VU [B1ab(iii,v)+2ab(iii,v)]	
Sensitive species 448	Iridaceae	NEST (M), VU [B1ab(i,ii,iii,iv,v)], PNCO	
Sensitive species 53	Orchidaceae	NEST (M), VU [B2ab(ii,iii,iv,v)], PNCO	
Sensitive species 654	Orchidaceae	NEST (M), VU [C2a(i)], PNCO	
Sensitive species 763	Orchidaceae	NEST (M), VU [A2c], End, PNCO	Not Recorded
Tetragonia decumbens	Aizoaceae	LC, PNCO, End, PNCO	
Tetragonia fruticosa	Aizoaceae	LC, PNCO, End, PNCO	
Tetragonia sp.	Aizoaceae	LC, PNCO, End, PNCO	
Tritoniopsis caffra	Iridaceae	PNCO	SOSF
Ursinia coronopifolia	Asteraceae	Rare, End	SOSF
Watsonia fourcadei	Iridaceae	PNCO	SOSF

Listed species (Table 4) were flagged from various database sources, including the National environmental Screening Tool, as occurring in the region and having an elevated status. All were cross-checked for distribution overlay and were actively screened for presence/absence on site. Other species may be endemic, but distribution range has been checked and are generally widespread. Sensitive species names have not been included.

Some of these species are also only from a single or a few populations. As per Table 4, no Endangered or Critically Endangered flora species were confirmed to be present nor are known to be present in the affected area. *Erica glandulosa* subsp. *fourcadei* and *Erica glumiflora*, both currently having a *Vulnerable* status and having somewhat widespread distributions were found to occur, often is disturbed areas such as the road reserve. This indicates that the species are likely to not be affected by the temporary nature of the pipeline construction. The site is relatively disturbed, being adjacent to the N2 national road as well as various other man-made features, and the area is generally well used by people.

A flora search and rescue procedure is recommended before commencement.

Red Listed and Protected Fauna

As per Table 5, site falls within the general distribution range of a few Vulnerable, Endangered or Critically Endangered fauna species. Due to the temporary nature of the construction of the pipeline, which will likely rehabilitate to pre-construction conditions on completion, these species are unlikely to be significantly affected by the proposed activity, in particular within the fynbos and disturbed areas. Furthermore, due to the degraded and invaded state of much of the proposed pipeline route, as well as the proximity to the N2 National Road, it was further noted during the site visit, that suitable habitat is limited, in particular within the remnant fynbos pockets as well as the densely invaded areas.

Since the project footprint is surrounded by extensive outlying areas of natural habitat, any disturbance or displacement associated with increased activity or habitat destruction as a direct result of the activity during the construction phase is unlikely to pose a significant negative impact to faunal species.

Table 5: Fauna Species of Special Concern

SCIENTIFIC NAME[4]	COMMON NAME	STATUS[5]	COMMENT/PRESENCE
MAMMALS			
Aonyx capensis	African Clawless Otter	NT	May be transient, unlikely to be affected.
Chlorotalpa duthieae	Duthie's Golden Mole	NEST (M), VU	May be transient, unlikely to be affected by the proposed activity due to the largely temporary nature of the pipeline construction phase.
Leptailurus serval	Serval	NT	May be transient, unlikely to be affected.
Loxodonta africana	African Bush Elephant	VU	Not Present
Panthera pardus	Leopard	VU	May be transient, unlikely to be affected.
Sensitive species 7		NEST (M), LC	May be transient, unlikely to be affected by the proposed activity due to the largely temporary nature of the pipeline construction phase.
AVIFAUNA (BIRDS)			
Bradypterus sylvaticus	Knysna Warbler	NEST (H, M), VU (SA), VU (Intl)	May be transient, unlikely to be affected due to the temporary nature of the activity.
Campethera notata	Knysna Woodpecker	NT (SA), VU (Intl)	May be transient, unlikely to be affected due to the temporary nature of the activity.
Circus maurus	Black Harrier	NEST (H, M), EN (SA), EN (Intl)	May be transient, unlikely to be affected due to the temporary nature of the activity.
Circus ranivorus	African Marsh Harrier	NEST (H, M), EN (SA), LC (Intl)	May be transient, unlikely to be affected due to the temporary nature of the activity.
Neotis denhami	Denham's Bustard	NEST (M), VU (SA), NT (Intl)	May be transient, unlikely to be affected due to the temporary nature of the activity.
Turnix hottentottus	Fynbos Buttonquail	NEST (M), EN (SA), EN (Intl)	May be transient, unlikely to be affected due to the temporary nature of the activity.
REPTILES			
Tetradactylus fitzsimonsi	FitzSimons' Long-tailed Seps	VU [B1ab(i,iii)]	Unlikely to be present, outside of known range.
AMPHIBIANS			
Afrixalus knysnae	*Knysna Leaf-folding Frog*	NEST (M), EN [B1ab(i,ii,iii,v)+2ab(i,ii,iii,v)]	May be present, in natural forest and pioneer forest/thicket areas unlikely to be affected due to the temporary nature of the activity, depending on the extent to which trees require removal within the forest.
INVERTEBRATES			
Aloeides thyra orientis	Red Copper	NEST (M)	May be transient, unlikely to be affected.
Aneuryphymus montanus	Yellow-winged Agile Grasshopper	NEST (M), VU [B2ab(iii,v)]	May be transient, unlikely to be affected.
Forest invertebrate	*Forest invertebrate*	NEST (M)	Associated with forest and may be present in intact forest pockets.
Sarophorus punctatus	Forest Dung Beetle	NEST (M), EN	Present within a limited range around between Plettenberg Bay & Natures Valley and inland. Associated with forest. May be present in forest, unlikely to be affected due to the temporary nature of the activity.
Tsitana dicksoni	Dickson's sylph	NEST (M), LC	Patchy populations between Cape Town and Humansdorp. Site does not overlap any known ore previously recorded locality.

[4] Species indicated in green are listed in the DEA screening tool, those in brown are from various other database and literature sources that are known from the general area.

[5] **PNCO** - Provincial Nature Conservation Ordinance (1974); **ToPS** – Threatened or Protected Species; **RD** – Recent Discovery; **NEST** - National environmental Screening Tool; **LC** – Least Concern, **VU** – Vulnerable, **EN** – Endangered, **CR** – Critically Endangered.

Some of these species are also only from a single or a few populations. As per Table 4, no Endangered or Critically Endangered fauna species were confirmed to be present nor are known to be present in the affected area. Listed species (Table 4) were flagged from various database sources, including the National environmental Screening Tool, as occurring in the region and having an elevated status. All were cross-checked for distribution overlay and were actively screened for presence/absence on site. Other species may be endemic, but distribution range has been checked and are generally widespread. Sensitive species names have not been included. No flagged species were found to be present during the site visit. The site is relatively disturbed, being adjacent to the N2 national road as well as various other man-made features, which are generally well used by people.

A fauna species relocation is recommended before commencement.

Alien Invasive Species

On 18 September 2020, the Minister of Environmental Affairs published the Alien and Invasive Species Regulations ("the Regulations") which came into effect on the 18 October 2020 in a bid to curb the negative effects of IAPs. The Regulations call on landowners and sellers of land alike to assist the Department of Environmental Affairs to conserve our indigenous fauna and flora and to foster sustainable use of our land. Non-adherence to the Regulations by a landowner or a seller of land can result in a criminal offence punishable by a fine of up to R 5 million (R 10 million in case of a second offence) and/or a period of imprisonment of up to 10 years.

Category 1a and 1b listed invasive species must be controlled and eradicated. Category 2 plants may only be grown if a permit is obtained, and the property owner ensures that the invasive species do not spread beyond his or her property. The growing of Category 3 species is subject to various exemptions and prohibitions. Some invasive plants are categorised differently in different provinces. For example: the Spanish Broom plant is categorised as a category 1b (harmful) invasive plant in Eastern Cape and Western Cape, but it is a category 3 (less harmful) invasive plant in the other seven provinces.

Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties. Alien Invasive Plants require removal according to the Conservation of Agricultural Resources Act 43 of 1983 (CARA) and the National Environmental Management: Biodiversity Act (10 of 2004; NEMBA): Alien and Invasive Species Lists (GN R598 and GN R599 of 2014). Alien control programs are long-term management projects and a clearing plan, which includes follow up actions for rehabilitation of the cleared area, is essential. This will save time, money and significant effort. Collective management and planning with neighbours allow for more cost-effective clearing and maintenance considering aliens seeds as easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing. A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas and prioritize sensitive areas such as riverbanks and wetlands. Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms but are often the most difficult to detect and control.

Several exotic invasive and other weed species were noted within the site, ranging from a few scattered individuals to dense infestations, in particular *Black Wattle, Blackwood & Port Jackson Willow* trees are common and abundant. The dense localised infestations of these tree species have a noticeable and definite impact to the habitat present and are a significant source of degradation. A weed management programme, as part of the construction contract including an after-care period will be required, until such time as natural vegetation has become adequately re-established. A two year after-care period is

recommended. A list of species is included in Table 6. Some species listed are not within the site but may be introduced during construction from the adjacent area.

Table 6: Alien (exotic) invasive and other weed species and status.

SCIENTIFIC NAME	COMMON NAME	FAMILY	STATUS[6]	COMMENT/PRESENCE
Acacia cyclops	Rooikrantz	Fabaceae	1b	Present, scattered
Acacia mearnsii	Black Wattle	Fabaceae	1b	Present, common
Acacia melanoxylon	Blackwood	Fabaceae	1b	Present, common
Acacia saligna	Port Jackson Willow	Fabaceae	1b	Present, common
Eucalyptus sp.	Gum tree	Myrtaceae	1b	Present, common
Hakea sericea	Silky hakea	Proteaceae	1b	Present, scattered
Pinus sp.	Pine tree	Pinaceae	1b	Present, common
Solanum mauritianum	Bugweed	Solanaceae	1b	Present, scattered

Eradication protocol

The act required the removal of these species, being the responsibility of the landowner, as described in Section 9.5.6: Alien Invasive Species. It is likely that the disturbed areas will be prone to alien infestation after construction is completed and follow up maintenance period will be required.

Specific eradication and management procedures must be stipulated in the EMP as to the methods to be implemented to remove and control the various alien invasive species as they tend to require species specific techniques. A management plan should be incorporated into the EMP, and a detailed action plan compiled and implemented by the ECO. All removed trees must either be removed from site or disposed of at a registered waste disposal facility. Alternatively, the plant material can be mulched using a woodchipper on site. And seed-bearing material is to be disposed of at a registered landfill.

3.1.9 Terrestrial Vegetation Sensitivity Assessment

An overall Biodiversity Sensitivity assessment, incorporating key vegetation and ecological indicators (summarised in Table 3) was undertaken and includes the following key criteria:

- relative levels of *intactness* i.t.o. overall loss of indigenous vegetation cover.
- presence, diversity and abundance of *species of special concern* (weighted in favour of local endemic species).
- extent of *invasion* (severity and overall ecological impact), as well as the degree to which successful rehabilitation could take place.
- overall degradation incorporating above factors.
- relative importance of the vegetation communities relative to regional conservation status – indicated as vulnerability of the area because of loss.

Intactness

Three basic classes are differentiated as follows:

- **Low**: > 75 % of original vegetation has been removed or lost; and/or no species of special concern present that are critically endangered, endangered or endemic with highly localised distribution.
- **Moderate**: 25 – 75 % of original vegetation has been removed/lost; and or presence of species of special concern but not having high conservation status or high levels of endemicity or highly localised distributions.
- **High**: < 25 % of original vegetation has been removed or lost; and or presence of species with a highly endemicity and or high conservation status (endangered or critically endangered).

[6] CARA - Conservation of Agricultural Resources Act (1993); National List of Invasive Species in Terms Sections 70(1), 71(3) and 71A (2016). Refer to Section 2.2 & Table 12 for detailed procedures and requirements.

Intactness for the site is variable but overall Low to Moderate, with some natural intact patches.

Alien Invasion

Three classes are differentiated as follows:

- **Low**: no or few scattered individuals.
- **Moderate**: individual clumps of invasives present but cover less than 50% or original area.
- **High**: dense, impenetrable stands of invasives present, or cover > 50 % of area with substantial loss functioning. Rehabilitation will most likely require specialised techniques over an extended period (> 5 years).

Alien invasion for the site is variable but overall Moderate to Very High.

Degradation

Overall Degradation is determined from the above alien invasion and intactness scores, according to the following matrix:

INTACTNESS	INVASION		
	LOW	MODERATE	HIGH
High	Pristine	Near Pristine	Moderately Degraded
Moderate	Near Pristine	Moderately Degraded	Severely Degraded
Low	Moderately Degraded	Severely Degraded	Transformed

Degradation for the site is variable, with some intact areas but overall Moderate to High.

Overall Sensitivity score

Overall Biodiversity Sensitivity of the vegetation within the site is calculated according to the following matrix which combines degradation and overall conservation status of the vegetation units of the site.

DEGRADATION	CONSERVATION STATUS			
	LEAST THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED
Severely degraded/ Transformed	Very Low	Low	Moderate	Moderate – High
Moderately degraded	Low	Moderate	High	High
Ecologically Pristine or near Pristine	Moderate	Moderate – High	High	Very High (No-Go area)

Refer to Figure 26 For overall sensitivity map and close-ups of the sections in Figure 27 to Figure 29.

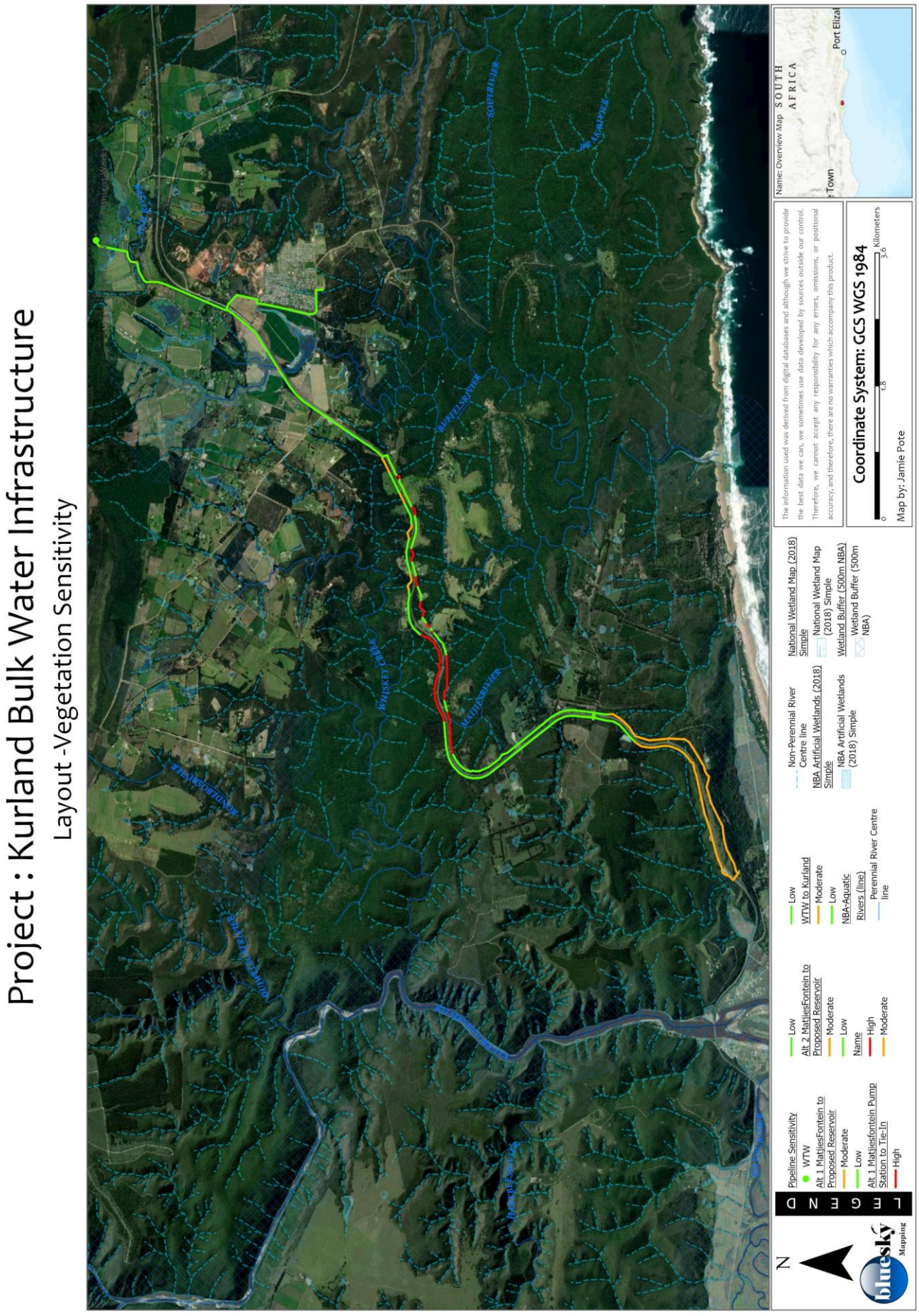

Figure 26: Overall Sensitivity.

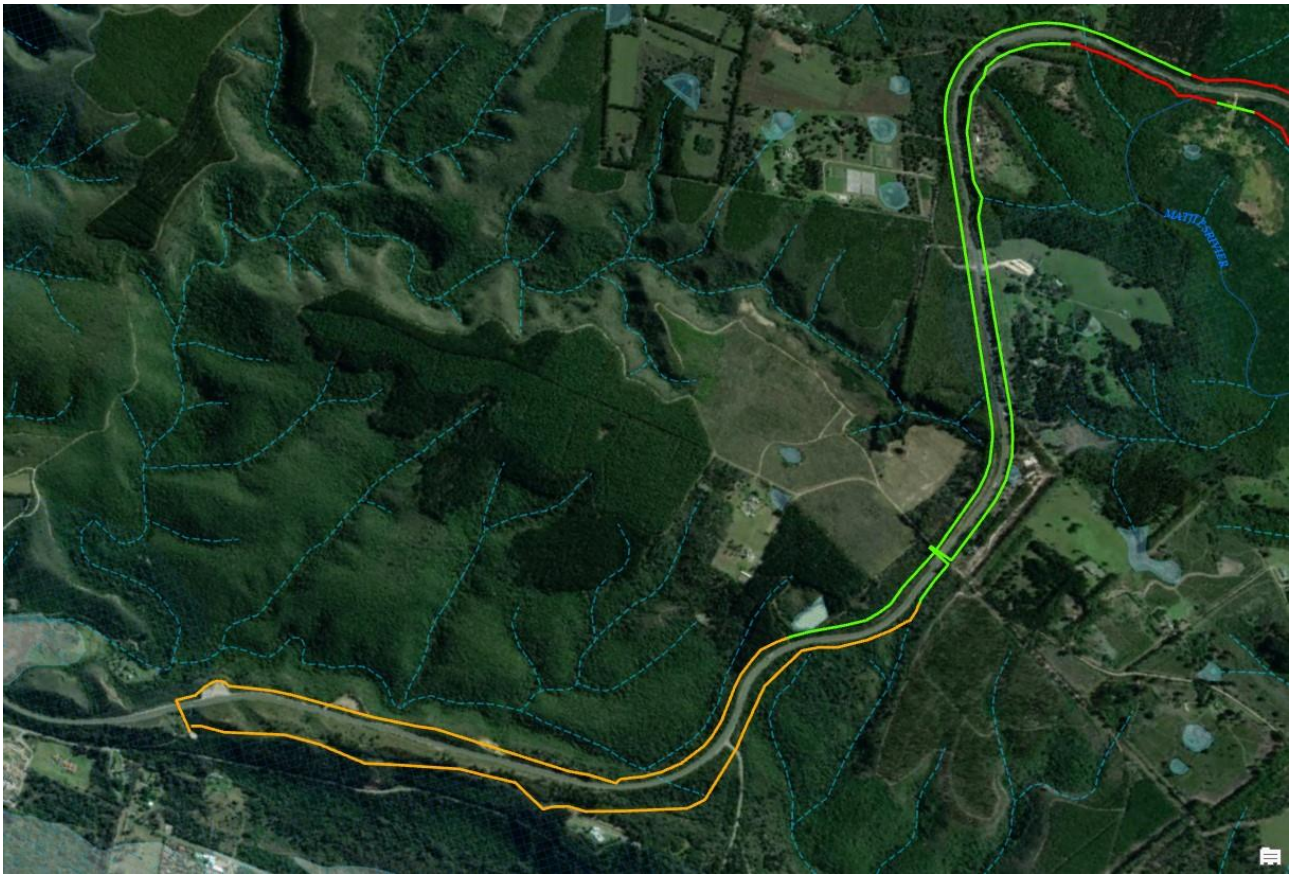

Figure 27: Sensitivity: Matjiesfontein to proposed new Upper Matjiesfontein pump station.

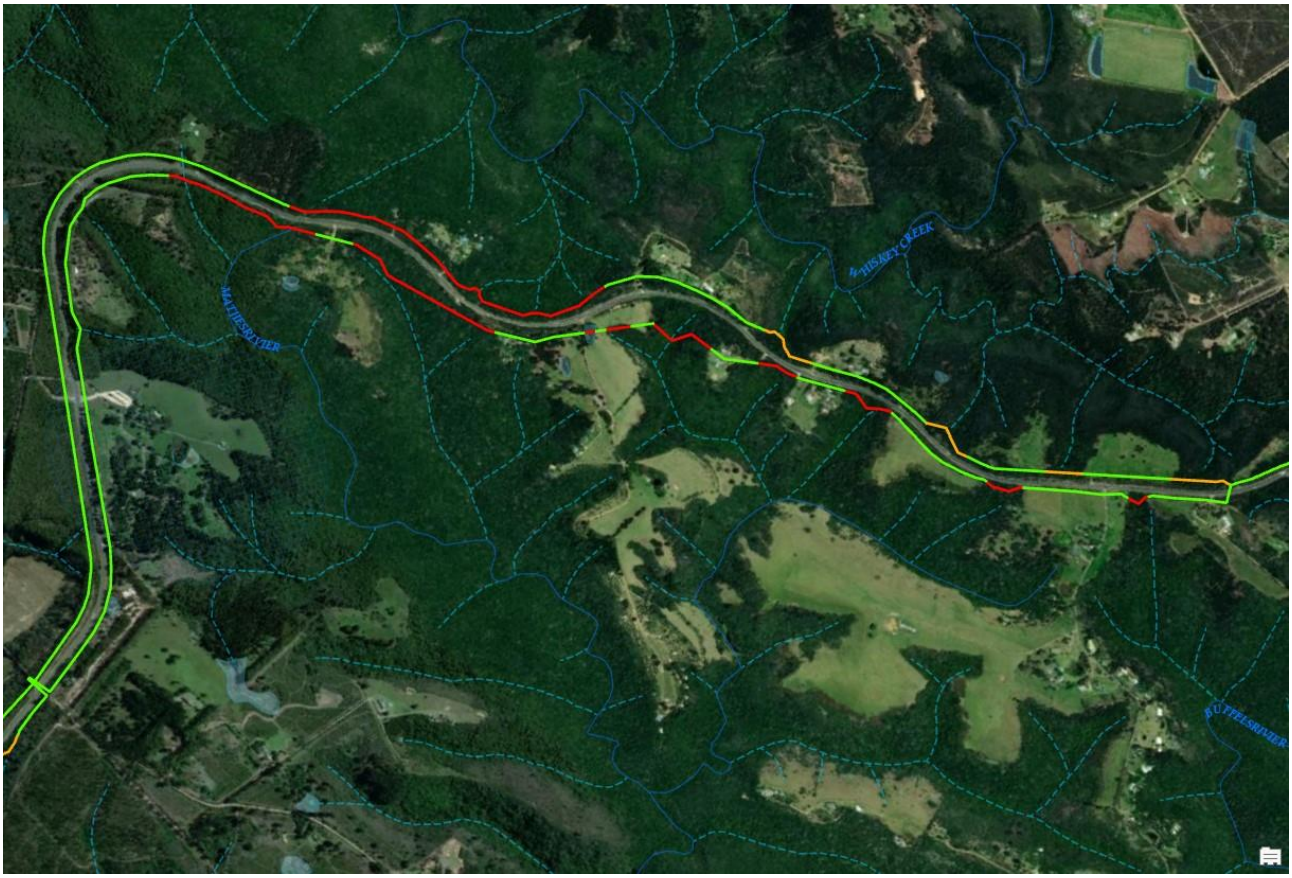

Figure 28: Sensitivity: Proposed new Upper Matjiesfontein pump station to Kurland tie-in.

Figure 29: Sensitivity: Kurland Water Treatment Works (WTW) to Kurland & tie-in.

The site sensitivity can be summarised as follows:

- Areas scoring an overall LOW sensitivity include the portions of the site that are completely transformed or severely degraded, that have a low conservation status, or where there is very dense alien infestation. Loss of these areas will not significantly compromise the current conservation status of the vegetation unit at a regional level, nor is its loss likely to compromise the ecological functioning of surrounding areas. Low sensitivity areas include all portions of site that pass through the settlements, cultivated fields, plantations and other significantly disturbed areas where ecological functioning is substantially compromised.
- Areas scoring an overall MODERATE sensitivity include the portions of natural vegetation that is mostly intact, but not having specific biodiversity related issues of significance or where proposed activity will have limited overall impact and recovery will be good with minimal intervention. Moderate sensitivity areas include intact fynbos vegetation in less disturbed areas, as well as marginal forest vegetation.
- Areas scoring an overall HIGH sensitivity include those areas having intact vegetation and deemed to have a sensitivity, including being within intact Critical Biodiversity Areas and connectivity corridors, or are deemed critical habitat for fauna and/or flora species that are considered to be vulnerable and/or have confirmed presence of species of conservation concern. High sensitivity terrestrial areas on site include intact forest pockets as well as around watercourses.
- Areas scoring an overall VERY HIGH sensitivity (No-Go Areas) include areas having a Critically Endangered or Endangered conservation status, or that are irreplaceable in terms of Critical Biodiversity Areas or are critical habitat (refer to Section 3.1.10) for any faunal species that is endangered or critically endangered. For the purposes of this assessment no specific Very High sensitivity terrestrial areas have been identified.

3.1.10 Aquatic Habitat

Aquatic systems do not function in isolation and in terms of ecological processes, the aquatic systems are very closely linked to the terrestrial system. Perennial, non-perennial watercourses and wetlands/dams are present in the wider area and the pipeline route does traverse several watercourses, most being within forested areas or some that are significantly disturbed. A small dam in the vicinity of the Kiaruna Private Nature Reserve and a small wetland/dam having reeds and sedges near the Kurland WTW were noted during the site visit.

The separate aquatic assessment will assess the impacts to the aquatic systems separately, however for the purposes of this report, any crossings must limit loss off vegetation as far as possible in order to limit risks to terrestrial processes and habitat in riparian vegetation.

3.1.11 Critical Habitat

The following Critical Habitat features have been identified within the site:

1. Criterion 1: Habitat for Critically Endangered (CR) and/or Endangered (EN) species
    - No Endangered or Critically Endangered Flora species were recorded. Several species known from general area were screened to confirm that most likely localities do not overlap with the site.
    - No other Endangered Mammals, Reptiles, Amphibians, or Invertebrates are known to be present on the site or will be affected (other than temporary displacement during construction).
2. Criterion 2: Habitat for Endemic or restricted-range species
    - Several range restricted flora species are potentially present in the surrounding area and vegetation types, none of which were confirmed to be present.
3. Criterion 3: Habitat for Migratory or congregatory species
    - No such terrestrial habitat will be directly or indirectly affected.
4. Criterion 4: Habitat for Highly threatened and/or unique ecosystems
    - No such terrestrial habitat will be directly or indirectly affected.
5. Criterion 5: Habitat for Key evolutionary processes
    - No such terrestrial habitat will be directly or indirectly affected.

3.1.12 No-Go Areas

No such areas are identified; however, construction of the road should be undertaken with care in vicinity of the watercourse and measures to be implemented to address stormwater and erosion adequately.

3.1.13 Potential Development Footprints

The site is considered to be developable, however it is recommended that intact forest should not be cleared. Where not possible to avoid, alternative construction options should be considered such as minimal hand clearing and trenching.

3.2 Risks and Potential Impacts to Biodiversity

3.2.1 Summary of actions, activities, or processes that require mitigation

The main impacts likely to result from the proposed activity include the following:

1. Permanent or temporary loss of indigenous vegetation cover because of site clearing. Site clearing before construction will result in the blanket clearing of vegetation within the affected footprint.

2. Loss of flora species of special concern during pre-construction site clearing activities. Numerous species of special concern are potentially present within the affected area, which could be destroyed during site preparation.
3. Susceptibility of some areas to erosion because of construction related disturbances. Removal of vegetation cover and soil disturbance may result in some areas being susceptible to soil erosion after completion of the activity.
4. Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species and removal of exotic and alien invasive species during construction. Post construction disturbed areas having no vegetation cover are often susceptible to invasion by weedy and alien species, which can not only become invasive but also prevent natural flora from becoming established.
5. Disturbances to ecological processes. Activity may result in disturbances to ecological processes.
6. Aquatic and Riparian processes. Diversion and increased velocity of surface water flows – Changes to the hydrological regime and increased potential for erosion. Impact of changes to water quality. Loss of riparian vegetation / aquatic habitat. Loss of species of special concern.
7. Loss of Faunal Habitat: Activity will result in the loss of habitat for faunal species.
8. Loss of faunal SSC due to construction activities: Activities associated with bush clearing and ploughing, killing of perceived dangerous fauna, may lead to increased mortalities among faunal species.

3.2.2 Potential Terrestrial Biodiversity Impacts (Direct)

Table 7: Potential Impacts to Terrestrial Biodiversity

IMPACT	Nature of Impact
Vegetation	Permanent or temporary loss of indigenous vegetation cover because of site clearing. Site clearing before construction will result in the blanket clearing of vegetation within the affected footprint.
Flora Species	Loss of flora species of special concern during pre-construction site clearing activities. Several special of concern are known from surrounding areas, which could be destroyed during site preparation, none of which were confirmed to be present.
Alien Invasive Species	Susceptibility of post construction disturbed areas to invasion by exotic and alien invasive species and removal of exotic and alien invasive species during construction. Post construction disturbed areas having no vegetation cover are often susceptible to invasion by weedy and alien species, which can not only become invasive but also prevent natural flora from becoming established.
Erosion	Susceptibility of some areas to erosion because of construction related disturbances. Removal of vegetation cover and soil disturbance may result in some areas being susceptible to soil erosion after completion of the activity.
Ecological Processes	Disturbances to ecological processes: Activity may result in disturbances to ecological processes.
Aquatic and Riparian processes	Aquatic and Riparian processes: None present/affected
Faunal Habitat	Loss of Faunal Habitat: Activity may result in the loss of habitat for faunal species, which could result in disturbance and displacement of faunal species.
Faunal Processes	Impacts to faunal processes because of the activity
Faunal Species	Loss of faunal SSC due to construction activities: Activities associated with bush clearing, killing of perceived dangerous fauna, may lead to increased mortalities among faunal species.

3.2.3 Potential Terrestrial Biodiversity Impacts (Indirect)

No significant additional ancillary linear infrastructure, such as roads, conveyors, power lines, pipelines and railways, which can impact on biodiversity and ecosystem services are expected.

3.2.4 Potential Terrestrial Biodiversity Impacts (Cumulative)

No cumulative impacts are expected because of the development of the site providing recommendation and mitigation measures are adhered to, due to the limited disturbance area.

3.3 Assessment of Risks and Impacts to Biodiversity

3.3.1 Criteria of assigning significance to potential impacts

The following methodology is to be applied in the specialist studies for the assessment of potential impacts.

CRITERIA	EXPLANATION
Nature of impact	Review the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"
Extent	Indicate whether the impact will be: • *(S) local* and limited to the immediate area of development (the site). • (L) limited to within 5 km of the development: or • (R) whether the impact may be realized regionally, nationally or even internationally.
Duration	Review the lifetime of the impact, as being: • (V) very short term (0 – 1 years), • *(S) short term* (1 – 5 years), • (M) medium (5 – 15 years), • *(L) long term* (>15 years but where the impacts will cease after the operation of the site), or • (P) permanent.
Intensity	Establish whether the impact is destructive or innocuous and should be described as either: • *(L) low* (where no environmental functions and processes are affected) • *(M) medium* (where the environment continues to function but in a modified manner) or • *(H) high* (where environmental functions and processes are altered such that they temporarily or permanently cease), including loss of critical endangered ecosystem and or critically endangered species (population).
Probability	Consider the likelihood of the impact occurring and should be described as: • *(I) improbable* (low likelihood) • *(P) probable* (distinct possibility) • (H) highly probable (most likely) or • *(D) definite* (impact will occur regardless of prevention measures).
Status of the impact	Description as to whether the impact will be positive (a benefit), negative (a cost), or neutral.
Degree of confidence	The degree of confidence in the predictions, based on the availability of information and specialist knowledge. This should be assessed as high, medium or low.
Significance	• (VL) *Very Low:* Considered to be negligible • *(L) Low:* Where the impact will not have an influence on the decision or require to be significantly accommodated in the project design • *(M) Medium*: Where it could have an influence on the environment which will require modification of the project design or alternative mitigation.

CRITERIA	EXPLANATION
	• *(H) High*: Where it could have a 'no-go' implication for the project unless mitigation or re-design is practically achievable. • *(VH) Very High*: Confirmed No-Go area, no mitigation feasible, redesign and avoidance are required, where activity will have a significant permanent and irreversible impact on a critically endangered ecosystem or species population.

3.3.2 Significance Rating

INTENSITY		DURATION: PERMANENT	LONG TERM	MEDIUM TERM	SHORT TERM	VERY SHORT TERM
HIGH INTENSITY						
EXTENT	National	Very High	Very High	High	High	Medium
	Regional	Very High[7]	High	High	High	Medium
	Local	High	High	Medium	Medium	Medium
	Site specific	Medium	Medium	Medium	Medium	Medium
MEDIUM INTENSITY						
EXTENT	National	High	High	High	Medium	Medium
	Regional	High	High	High	Medium	Medium
	Local	Medium	Medium	Medium	Medium	Medium
	Site specific	Medium	Medium	Medium	Medium	Low
LOW INTENSITY						
EXTENT	National	Medium	Medium	Medium	Medium	Medium
	Regional	Medium	Medium	Medium	Medium	Low
	Local	Medium	Medium	Medium	Low	Very Low
	Site specific	Low	Low	Low	Very Low	Very Low

Furthermore, the following must be considered:

1. Impacts should be described both before and after the proposed mitigation and management measures have been implemented.
2. All impacts should be evaluated for both the construction, operation and decommissioning phases of the project, where relevant.
3. The impact evaluation should take into consideration the cumulative effects associated with this and other facilities which are either developed or in the process of being developed in the region, if relevant.
4. Management actions: Where negative impacts are identified, specialists must specify practical mitigation objectives (i.e., ways of avoiding or reducing negative impacts). Where no mitigation is feasible, this should be stated, and the reasons given. Where positive impacts are identified, management actions to enhance the benefit must also be recommended.

3.3.3 Assessment of Terrestrial Biodiversity Impacts

Construction and operations can result in a range of negative impacts on terrestrial, marine and other aquatic ecosystems if not effectively managed. Table 7 describes impacts that may potentially occur in the site (as per DEA&DP guidelines) as well indicating the relevant EMP section. The predicted significance of these during the construction phase are summarised in Table 8 and during the operational phase are summarised in Table 9.

Table 8 : Construction Phase Assessment (Refer to Sections 3.3.1 & 3.3.2 for methodology).

[7] Considered a regional impact if activity will result in significant permanent and irreversible loss to a critically endangered species population or ecosystem (vegetation type)

Nature of impact	Extent	Duration	Intensity	Probability	Status of the impact	Degree of confidence	Significance (before)	Significance (after)
Vegetation	S	V	L	H	-ve	H	M	L
Flora Species	S	S	L	H	-ve	H	M	L
Alien Invasive Species	S	M	L	H	-ve	H	M	L
Erosion	S	S	L	H	-ve	H	M	L
Ecological Processes (Fynbos)	S	V	L	H	-ve	H	M	L
Ecological Processes (Forest)	S	L	M	H	-ve	H	H	M
Aquatic & Riparian Processes	S	V	L	H	-ve	M	M	L
Faunal Habitat	S	V	L	H	-ve	M	M	L
Faunal Processes	S	V	L	H	-ve	H	M	L
Faunal Species	S	V	L	H	-ve	M	M	L

Table 9: Operational Phase Assessment (Refer to Sections 3.3.1 & 3.3.2 for methodology).

Nature of impact	Extent	Duration	Intensity	Probability	Status of the impact	Degree of confidence	Significance (before)	Significance (after)
Vegetation	S	V	L	H	-ve	H	M	L
Flora Species	S	S	L	H	-ve	H	M	L
Alien Invasive Species	S	M	L	H	-ve	H	M	L
Erosion	S	S	L	H	-ve	H	M	L
Ecological Processes (Fynbos)	S	V	L	H	-ve	H	M	L
Ecological Processes (Forest)	S	L	M	H	-ve	H	H	M
Aquatic & Riparian Processes	S	V	L	H	-ve	M	M	L
Faunal Habitat	S	V	L	H	-ve	M	M	L
Faunal Processes	S	V	L	H	-ve	H	M	L
Faunal Species	S	V	L	H	-ve	M	M	L

- Impacts relating to loss of vegetation and disruption to ecological processes are deemed to be **medium** before mitigation and **low to very low** after mitigation for fynbos and **high** before mitigation and **medium** after mitigation.
- Impacts relating to disturbance and displacement of faunal habitat and faunal species of conservation concern are deemed to be **medium** before mitigation and **low** after mitigation. Any impact is likely to be temporary during construction. Further to this, an access track is already present, disturbance is present already to some extent as a result of vehicular and other traffic.
- Impacts relating to disturbance of flora species of conservation concern located in the site will be **medium** before mitigation and **low** after mitigation.
- All other impacts are assessed to be of **medium** significance before mitigation and can be reduced to **low** with the implementation of the mitigation measures.

3.3.4 Terrestrial Biodiversity Impact Reversibility

In general, most direct impacts will have a moderate reversibility in the bushveld habitat, as well as transformed or degraded areas, except where hardening of surfaces or substantial removal of topsoil occurs.

3.3.5 Impacts and Risks to Irreplaceable Biodiversity Resources

The site may have occasional visits from transient faunal species from the adjacent area, although it is unlikely that the proposed pipeline and associated infrastructure would provide a direct or indirect risk to any species or population, specifically as it will not significantly exceed current baseline risks.

3.3.6 Residual Risks and Uncertainties

No significant additional ancillary linear infrastructure, such as roads, conveyors, power lines, pipelines and railways, which can impact on biodiversity and ecosystem services are expected.

3.4 Findings, Outcomes and Recommendations

3.4.1 Summary of Findings

- Areas scoring an overall LOW sensitivity include the portions of the site that are completely transformed or severely degraded, that have a low conservation status, or where there is very dense alien infestation. Loss of these areas will not significantly compromise the current conservation status of the vegetation unit at a regional level, nor is its loss likely to compromise the ecological functioning of surrounding areas. Low sensitivity areas include all portions of site that pass through the settlements, cultivated fields, plantations and other significantly disturbed areas where ecological functioning is substantially compromised.
- Areas scoring an overall MODERATE sensitivity include the portions of natural vegetation that is mostly intact, but not having specific biodiversity related issues of significance or where proposed activity will have limited overall impact and recovery will be good with minimal intervention. Moderate sensitivity areas include intact fynbos vegetation in less disturbed areas, as well as marginal forest vegetation.
- Areas scoring an overall HIGH sensitivity include those areas having intact vegetation and deemed to have a sensitivity, including being within intact Critical Biodiversity Areas and connectivity corridors, or are deemed critical habitat for fauna and/or flora species that are considered to be vulnerable and/or have confirmed presence of species of conservation concern. High sensitivity terrestrial areas on site include intact forest pockets as well as around watercourses.
- Areas scoring an overall VERY HIGH sensitivity (No-Go Areas) include areas having a Critically Endangered or Endangered conservation status, or that are irreplaceable in terms of Critical Biodiversity Areas or are critical habitat (refer to Section 3.1.10) for any faunal species that is endangered or critically endangered. For the purposes of this assessment no specific Very High sensitivity terrestrial areas have been identified.
- No-go areas – no specific no go-areas have been identified, however the preferred pipeline alternative from upper Matjiesfontein pump station to the Kurland tie-in does cross through several watercourses and forest pockets as well as through a small dam in the vicinity of the Kiaruna Private Nature Reserve. In order for this route to be acceptable, some revisions would be recommended. The watercourse crossing should not exceed standard design requirements for such a crossing and stormwater and erosion measures are recommended.
- Cumulative impacts because of the development of the site, are minimal, since most of the route doe follow the N2 National Road which is already significantly disturbed and much of the fynbos vegetation is secondary or significantly disturbed. However, removal and fragmentation of forest

patches on the preferred alternative from upper Matjiesfontein pump station to the Kurland tie-in in the vicinity of the Kiaruna Private Nature Reserve will result in a cumulative loss of forest, which although not having an elevated status currently is protected in terms of the National Forests Act.

Two distinct vegetation types are represented on the site – fynbos with several sub-units and forest. It is evident that portions of the pipeline route site are heavily degraded, particularly within the fynbos areas in proximity to the N2 National Road and associated road reserve and to a lesser extent in or surrounding forest patches. While the pipeline route does traverse several distinct fynbos units, it is noted that the units represented to share several species and this is evident in the road reserve and areas adjacent to this road reserve, where a clear differentiation between the units is not always possible. It is concluded that much of the pipeline route, where in proximity to the road, is comprised of a somewhat homogenous secondary fynbos vegetation with variable degrees of degradation from alien invasion. The road reserve is largely comprised of secondary vegetation, as this area would have been cleared when the road was constructed, and or significantly invaded vegetation, which extends to some extent into the area directly adjacent to the road reserve.

Forest is present in several patches and tends to either extend up to the fence that demarcated the road reserve or has densely invaded fynbos and/or a fynbos with forest or thicket elements. The following key characteristic support this conclusion:

- The most at risk vegetation unit (Garden Route Shale Fynbos) is designated a Vulnerable status (NBA 2018), which indicates it is under threat but can withstand further loss. The remaining vegetation units that are represented all have a least concern status, including the forest. Development of the pipeline, which will most likely rehabilitate after completion of construction in fynbos areas within 2 years, is unlikely to compromise regional conservation targets due to this rehabilitation but also due to the limited footprint of the pipeline within the regional context. Forest vegetation is unlikely to rehabilitate effectively after completion of construction, thus any removal of forest would be considered permanent or long term.
- The Western Cape Biodiversity Spatial Plan designates two key Critical Biodiversity corridors in proximity to the site, the first at the southern end of the pipeline, in proximity to the existing Matjiesfontein reservoir and the second in the vicinity of the Kiaruna Private Nature Reserve approximately midway along the pipeline. Both corridors correspond to forest corridors, with the southern one notably a mozaic between patches of forest and fynbos. Ecological Process Area are designated more widely but tend to correspond to less intact patches of vegetation surrounding these main corridors. Notably, the N2 national corridor provides a significant disruption to this corridor and most of the disturbed areas directly adjacent to this corridor are designated Ecological Process Area. The proposed pipeline will primarily fall within such areas, except for a few patches where is does extend into CBA designated patches. Ecological Support Areas are not required to meet conservation targets and the land use guidelines indicate that some habitat loss is acceptable. Since most of the proposed activity (pipeline) is considered to be temporary, any habitat loss would also be temporary and in the medium to long-term, any ecological disturbances are likely to be reversed (specifically within fynbos and not forest).
- The permanent features associated with the pipeline include the proposed new Matjiesfontein pump station, the proposed new Upper Matjiesfontein pump station and an extension to the existing Kurland WTW. Although permanent, all of these are located within areas already significantly disturbed and furthermore have a limited footprint. The ecological impact associated with these structures, although permanent, is this considered to be minimal and within acceptable limits.
- A small dam (artificial wetland) is present on the Kiaruna Private Nature Reserve that is traversed by the pipeline, which is not feasible and would require re-routing, depending on the findings of the aquatic assessment.

- The vegetation on site is representative of the respective vegetation nits, however it is noted that much of it is secondary and thus clear differentiation is not always possible as the most common elements are those that are common to all the represented units.
- Removal and fragmentation of forest patches on the preferred alternative from upper Matjiesfontein pump station to the Kurland tie-in in the vicinity of the Kiaruna Private Nature Reserve will result in a cumulative loss of forest, which although not having an elevated status currently is protected in terms of the National Forests Act. These forest pockets are protected in terms of the National Forests Act, and an opinion will be required from the respective forestry authority to clarify if they will allow the activity (i.e. will permits top remove such forest be possible). Alternative options may need further considerations for the affected portion depending on the outcome of this consultation.
- All impacts are assessed to be of ***low to moderate significance after mitigation*** and specific mitigation measures are outlined in Section 4: Management Programs as well as in the general Environmental Management Plan (Section 9.7: Annexure F: Biodiversity Environmental Management Plan).

Impacts are anticipated to be as follows:

- Impacts relating to loss of vegetation and disruption to ecological processes are deemed to be **medium** before mitigation and **low to very low** after mitigation for fynbos and **high** before mitigation and **medium** after mitigation.
- Impacts relating to disturbance and displacement of faunal habitat and faunal species of conservation concern are deemed to be **medium** before mitigation and **low** after mitigation. Any impact is likely to be temporary during construction. Further to this, an access track is already present, disturbance is present already to some extent as a result of vehicular and other traffic.
- Impacts relating to disturbance of flora species of conservation concern located in the site will be **medium** before mitigation and **low** after mitigation.
- All other impacts are assessed to be of **medium** significance before mitigation and can be reduced to **low** with the implementation of the mitigation measures.

3.4.2 Recommendations

- It is the conclusion of this terrestrial biodiversity assessment that the proposed pipeline and associated infrastructure (pump stations and reservoir) can be constructed within acceptable terrestrial biodiversity impact limits providing the recommended mitigation actions are adhered to.
- The implementation of the management actions relating to flora and fauna as well erosion and stormwater management and post construction rehabilitation will minimise biodiversity impacts.
- Should the pipeline require clearing of forest, respective permits will be required beforehand AND measures must be implemented to minimise such clearing. Such measures include a survey of the route before commencement in order to microsite the route to avoid large or important trees and may require hand excavation in certain areas to reduce the footprint so as not to significantly disturb the canopy.
- It is the conclusion of this terrestrial biodiversity assessment that due to the limited footprint and temporary nature of the proposed activity; it can be constructed within the fynbos areas without significantly compromising the broader ecological processes, nor the conservation status of the vegetation units bearing in mind specific positioning of the components within the landscape and current levels of degradation.
- The removal and clearing of forest will however increase the impacts and alternatives may require further investigation. Of the options proposed, it is recommended that the least impact option would be the preferred Matjiesfontein to new upper Matjiesfontein pipeline and the alternative upper Matjiesfontein to Kurland tie-in routes. The alternative Matjiesfontein to new upper Matjiesfontein pipeline on the north side of the N2 will follow a steep slope adjacent to the N2 and will thus require more significant earthworks which would increase impact. The preferred upper Matjiesfontein to Kurland tie-in will traverse several forest pockets and will extend some distance from the N2 road,

which will result in elevated disruptions to ecological processes and fragmentation of forest, which is not an advisable option. The alternative upper Matjiesfontein to Kurland tie-in will also traverse a forest pocket but will be near its edge. This can be further reduced by moving the pipeline from 6 m from the edge of the road reserve to the edge of the road reserve, which will result in minimal forest loss and no further fragmentation of significance.

- The forest in this section on the north side of the N2 national road extend to the current road reserve fence and also the proposed pipeline route does not extend as far away from this edge. If it were possible to shift the pipeline from 6 m to along the fence, it would result in removal of trees from the edge of the forest rather than cutting a new line through, which would also limit the impact and fragmentation. Alternatively, it is recommended that vegetation clearing and trench excavation within these forest areas be done by hand or with the use of less destructive construction plant. Final routing through any forest patches will determine the final species impact, as it will depend on the specific trees that are impacted or require removal, which will be permanent. It is recommended that a micro-siting process be undertaken before plan finalisation and construction with a land surveyor and botanist, in order to minimise impact as far as possible.
- While indigenous fynbos species including species of conservation concern are present on the site, it can be concluded that these indigenous species occupy a small proportion of the site compared to that of the exotic (i.e., non-indigenous) and common widespread species. The species that are present, are largely within a secondary context and thus would more than likely re-establish on completion of construction, with implementation of mitigation measures.

4 Management Programs

Table 10 lists specific mitigation measures that must be implemented and adhered to. These must be considered to be conditions of authorisation.

Table 10: Specific Mitigation Measures and Recommendations

IMPACT	MITIGATION MEASURES
Vegetation	• Blanket clearing of vegetation must be limited to the site. No clearing outside of footprint to take place. • Should the pipeline require clearing of forest, respective permits will be required beforehand AND measures must be implemented to minimise such clearing. Such measures include a survey of the route before commencement in order to microsite the route to avoid large or important trees and may require hand excavation in certain areas to reduce the footprint so as not to significantly disturb the canopy. • Topsoil must be striped and stockpiled separately during site preparation and replaced on completion where revegetation will take place. • Any site camps and laydown areas requiring clearing must be located within already disturbed areas away from watercourses.
Flora Species	• A flora search and rescue is recommended before commencement. • Respective permits to be obtained beforehand.
Alien Invasive Species	• Alien trees and weeds must be removed from the site as per CARA/NEMBA requirements. • A suitable weed management strategy to be implemented in construction and operation phases. • After clearing and construction is completed, an appropriate cover may be required, should natural re-establishment of grasses not take place in a timely manner along road verges. This will also minimise dust.
Erosion	• Suitable measures must be implemented in areas that are susceptible to erosion. Areas must be rehabilitated, and a suitable cover crop planted once construction is completed.

IMPACT	MITIGATION MEASURES
	• Topsoil must be stripped and stockpiled separately and replaced on completion. • If natural vegetation re-establishment does not occur, a suitable grass must be applied.
Ecological Processes	• Blanket clearing of vegetation must be limited to the development footprint, and the area to be cleared must be demarcated before any clearing commences.
Aquatic and Riparian processes	• Suitable structures to be constructed at watercourse crossings that do not alter flows. • Stormwater discharge into watercourses to be protected against erosion.
Faunal Habitat	• Blanket clearing of vegetation must be limited to the footprint. • It is important that clearing activities are kept to the minimum and take place in a phased manner, where applicable. This allows any smaller animal species to move into safe areas and prevents wind and water erosion of the cleared areas.
Faunal Processes	• The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint would be of low significance if mitigation measures are adhered to. • Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. They will most likely vacate the area once construction commences. As with all construction sites there is a latent risk that there will be some accidental mortalities. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • Reptiles such as lizards are less mobile compared to mammals, and some mortalities could arise. It is recommended that a faunal search and rescue be conducted before construction commences, although experience has shown that there could still be some mortalities as these species are mobile and may thus move onto site once construction is underway. A retile handler should be on call for such circumstances. • Should any amphibian migrations occur between wetland areas during construction, appropriate measures (including temporarily suspending works in the affected area) should be implemented.
Faunal Species	• A pre-commencement faunal search and rescue is recommended. • Respective permits to be obtained beforehand. • No animals are to be harmed or killed during the course of operations. • Workers are NOT allowed to snare any faunal species.

4.1 Site Preparation and Vegetation Clearing Plan

The following flora relocation plan is recommended for inclusion in the EMP and Flora removal permit applications:

- A pre-commencement fauna relocation is recommended. Most faunal species in proximity are likely to vacate the area once earth moving equipment commences clearing and construction, however some species may require manual relocation.
- A pre-commencement flora relocation is recommended as several protected but generally widespread species are present. In addition, due to the dense overgrown nature of the vegetation of the site, it was not feasible to sample the entire footprint, without destructive clearing which is not possible without the Environmental Authorisation in any event. It is thus possible that some may have been missed and this will add an extra layer of safety.

- Topsoil must be stripped and stockpiled adjacent to the trench for replacement after construction of the pipeline. Additional measures should be implemented to stabilise eroded areas where necessary.

4.2 Rehabilitation and Landscaping Plan

- On completion of construction, the surface of any work areas, especially if compacted due to hauling and dumping operations shall be scarified to a depth of at least 200 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
- The disturbed areas can be seeded with suitable grasses and local indigenous seed mix, if deemed to be required, however, vegetation is likely to re-establish without input.
- Excavations may not be used for the dumping of construction wastes.
- Waste (non-biodegradable refuse) will not be permitted to be deposited in the excavations and must be disposed of appropriately.
- Final rehabilitation *must* comply with the requirements mentioned in the Rehabilitation Plan.

4.3 Open Space Management/Conservation Plan

None are applicable for this project.

4.4 Maintenance Management Plan

Ongoing maintenance is likely to be required in the long-term, which could include re-excavation of portions of the pipeline for maintenance/replacement of defective components and leak repair where applicable. All measures of this report, including the EMPr should be adhered for any such maintenance requirements. Any excavated areas must be stabilised and rehabilitated as per the measures indicated in this report.

5 Organizational Capacity and Competency

Successful Implementation will be in part be dependent on the organisational capacity and competency of the applicant and any implementing agents. The following aspects are likely to pose risk to the successful mitigation of the project:

- Budget constraints – budget allocated for environmental management tends to be inadequate for construction projects.
- Organisational Structure – implementing agents may or may not have adequate capacity and competency to ensure appropriate and adequate environmental management.

6 Emergency Preparedness and Response

Emergency Preparedness Plan must be included in the EMPr and should address specific measures relating to the following emergency risks:

- Fire management and response
- Spill management and incident response
- Waste management and incident response
- Response to emergency site shutdown, including labour and protest actions.

7 Stakeholder Engagement

Possible Stakeholders relating to Biodiversity could include the following key groups:

- Neighbouring Property Owners
- Local Regional and National Conservation Authorities

No Stakeholder Engagement was conducted specifically by the Specialist. Stakeholder Engagement will be undertaken by the EAP as part of the environment application public participatory process. Any comments raised relating to Biodiversity will be addressed by the specialist in the final report.

8 Monitoring and Review

Key monitoring activities should include the following:

1. Pre-construction
   a) Ensure flora permits are in place timeously (PNCO only) – allow at least 1 or 2 months before commencement.
   b) Environmental Awareness and training (EAT) – Ensure all labour are informed and plant operators are aware of risks, issues, dos and don'ts and no-go areas.
2. Bush clearing
   a) Ensure working plant has no oil or hydraulic leaks
   b) Check delineated footprints area not exceeded
3. Construction
   a) Regular checks on trenches for trapped animals and possible drowning risks
   b) Regular checks of fences for snares
4. Rehabilitation
   a) Check quality of topsoil and weed free
   b) Check for weed regrowth and manage timeously (before seed is set)
5. Operation monitoring
   a) Weed management on ongoing basis
   b) Erosion to be addressed on ongoing basis

9 Annexures

9.1 Annexure A: References

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9.2 Annexure B: Site Photographic Record

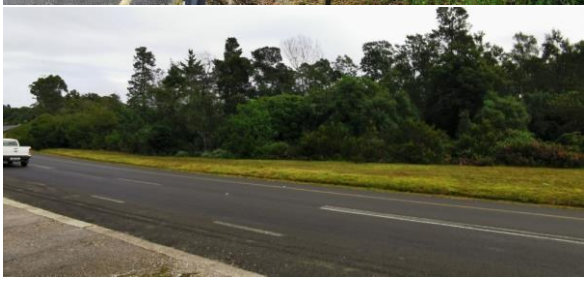


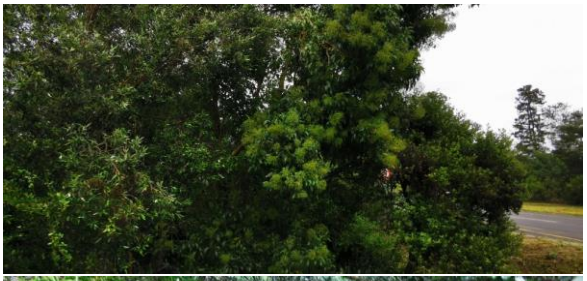












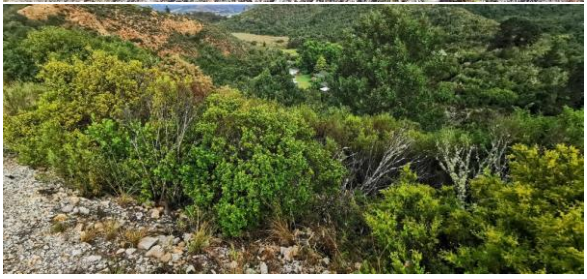


























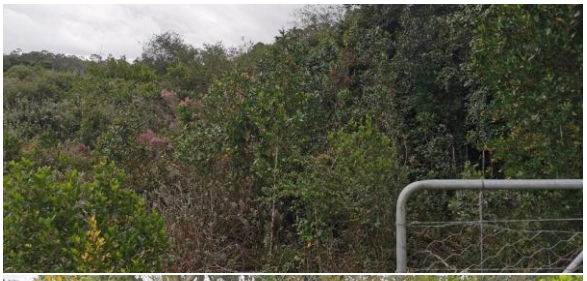







Moon Shine








9



























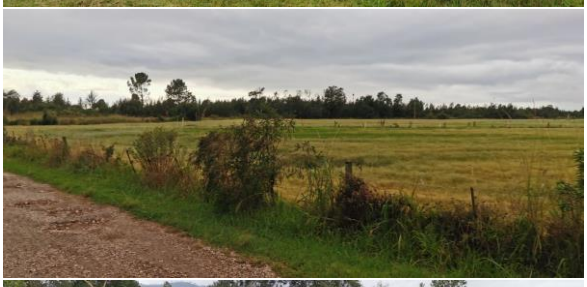








































9.3 Annexure C: Flora and Fauna Species Lists

9.3.1 Flora

Marked species were flagged from various database sources as occurring in the region and having an elevated status. All were cross checked for distribution overlay and were actively screened for presence/absence on site.

SCIENTIFIC NAME	FAMILY	STATUS[8]	COMMENT/PRESENCE
Acmadenia alternifolia	Rutaceae	VU [B1ab(ii,iii,iv)+2ab(ii,iii,iv)], NEST (M), End	GRSF. Not Recorded
Acmadenia gracilis	Rutaceae		SOSF
Acmadenia maculata	Rutaceae		SOSF
Acmadenia rupicola	Rutaceae		SOSF
Acmadenia tetragona	Rutaceae	NT [B1ab(iii)+2ab(iii)], End	GRSF, SOSF
Acrolophia cochlearis	Orchidaceae	PNCO	
Acrolophia lunata	Orchidaceae	NEST (M), En [B1ab(ii,iii,v); D], PNCO	
Afrocarpus (Podocarpus) falcatus	Podocarpaceae	NFA	SAF, Present in area
Agathosma alaris	Rutaceae		SOSF
Agathosma ovata	Rutaceae	LC, End	TSF
Agathosma planifolia	Rutaceae		SOSF
Agathosma pulchella	Rutaceae		
Allophylus decipiens	Sapindaceae		SAF
Alsophila capensis	Cyatheaceae		SAF
Amauropelta knysnaensis	Thelypteridaceae	NEST (M), VU [D2]	SAF
Amphithalea flava	Fabaceae		SOSF
Andropogon appendiculatus	Poaceae		SOSF
Anginon difforme	Apiaceae		SOSF
Angraecum pusillum	Orchidaceae	PNCO	SAF
Angraecum sacciferum	Orchidaceae	PNCO	
Anisodontea scabrosa	Malvaceae	LC, End	SOSF, TSF
Anthochortus ecklonii	Restionaceae		SOSF
Anthospermum aethiopicum	Rubiaceae	LC, End	GRSF
Apodytes geldenhuysii	Icacinaceae		SAF
Aptenia cordifolia	Aizoaceae	PNCO	
Aristida junciformis subsp. galpinii	Poaceae	LC, End	GRSF
Aspalathus angustifolia subsp. angustifolia	Fabaceae		SOSF
Aspalathus bowieana	Fabaceae	NEST (M), EN [B1ab(©,ii,iii, iv, v)]	SOSF
Aspalathus ciliaris	Fabaceae	LC, End	SOSF, TSF
Aspalathus digitifolia	Fabaceae		SOSF
Aspalathus hystrix	Fabaceae	LC, End	
Aspalathus rubens	Fabaceae		SOSF
Aspalathus teres subsp. thodei	Fabaceae	LC, End	TSF
Asparagus aethiopicus	Asparagaceae	LC, End	
Asparagus scandens	Asparagaceae		SAF
Berzelia intermedia	Bruniaceae	LC, End	TSF, SOSF
Blechnum attenuatum	Blechnaceae		SOSF
Blechnum capense	Blechnaceae		SAF
Blechnum tabulare	Blechnaceae		SAF
Brabejum stellatifolium	Proteaceae	PNCO	SAF
Brachiaria serrata	Poaceae	LC, End	GRSF

[8] **PNCO** - Provincial Nature Conservation Ordinance (1974); **ToPS** – Threatened or Protected Species; **RD** – Recent Discovery; **NEST** - National environmental Screening Tool; **GRSF** - Garden Route Shale Fynbos, **SOSF** - South Outeniqua Sandstone Fynbos, **TSF** - Tsitsikamma Sandstone Fynbos, **SAF** - Southern Afrotemperate Forest; **LC** – Least Concern, **VU** – Vulnerable, **EN** – Endangered, **CR** – Critically Endangered.

SCIENTIFIC NAME	FAMILY	STATUS[8]	COMMENT/PRESENCE
Brachylaena neriifolia	Asteraceae		SAF
Brunia cordata	Bruniaceae		SOSF
Brunia nodiflora	Bruniaceae		SOSF
Burchellia bubalina	Rubiaceae		SAF
Caesia contorta	Hemerocalliaceae		SOSF
Cannomois parviflora	Restionaceae		SOSF
Cannomois scirpoides	Restionaceae		SOSF
Cannomois virgata	Restionaceae		SOSF
Canthium inerme	Rubiaceae		SAF
Capeobolus brevicaulis	Cyperaceae		SOSF
Carex distincta	Cyperaceae	End, End	
Carpacoce spermacocea	Rubiaceae		SOSF
Carpacoce vaginellata	Rubiaceae	LC, End	TSF
Cassine peragua	Celastraceae		SAF
Cassine schinoides	Celastraceae		SAF
Cassytha ciliolata	Lauraceae		SOSF
Centella affinis	Apiaceae		SOSF
Centella longifolia	Apiaceae	NEST (M), Rare	
Centella virgata	Apiaceae		SOSF
Chaenostoma cordatum	Scrophulariaceae	LC, End	
Chrysitrix capensis	Cyperaceae		SOSF
Cissampelos torulosa	Menispermaceae		SAF
Cliffortia ilicifolia	Rosaceae		SOSF
Cliffortia ruscifolia	Rosaceae	DDT, End	GRSF
Cliffortia schlechteri	Rosaceae		
Cliffortia serpyllifolia	Rosaceae	LC, End	TSF
Cliffortia stricta	Rosaceae		SOSF
Clivia mirabilis	Amaryllidaceae	PNCO	SAF
Commelina africana	Commelinaceae	LC, End	TSF
Cotula myriophylloides	Asteraceae		
Crassula orbicularis	Crassulaceae	LC, End	GRSF
Crassula roggeveldii	Crassulaceae	Rare, End	GRSF
Cryptocarya angustifolia	Lauraceae		SAF
Cunonia capensis	Cunoniaceae		SAF
Curtisia dentata	Cornaceae		SAF
Cyathocoma hexandra	Cyperaceae		SOSF
Cymbopogon marginatus	Poaceae		GRSF
Cynanchum africanum	Apocynaceae	LC, End	
Cyphia georgica	Lobeliaceae		GRSF
Delosperma brevipetalum	Aizoaceae	PNCO	
Delosperma litorale	Aizoaceae	PNCO	
Delosperma sp.	Aizoaceae	PNCO	
Dichrocephala integrifolia subsp. integrifolia	Asteraceae		SOSF
Dietes iridioides	Iridaceae	PNCO	SAF
Digitaria natalensis	Poaceae	LC, End	
Diheteropogon filifolius	Poaceae	LC, End	TSF
Diospyros whyteana	Ebenaceae		SAF
Disa bracteata	Orchidaceae	PNCO	
Disa cornuta	Orchidaceae	PNCO	
Disa hallackii	Orchidaceae	PNCO	
Dodonaea viscosa var. angustifolia	Sapindaceae		SOSF
Drosanthemum sp.	Aizoaceae	PNCO	
Drosera trinervia	Droseraceae		SOSF
Ehrharta calycina	Poaceae	LC, End	
Ehrharta dura	Poaceae		SOSF
Ehrharta ramosa subsp. ramosa	Poaceae	LC, End	
Ehrharta rupestris subsp. tricostata	Poaceae		SOSF
Elegia fistulosa	Restionaceae		SOSF
Elegia galpinii	Restionaceae		SOSF
Elegia juncea	Restionaceae	LC, End	TSF, SOSF, GRSF

SCIENTIFIC NAME	FAMILY	STATUS[8]	COMMENT/PRESENCE
Elytropappus rhinocerotis	Asteraceae		GRSF
Epischoenus adnatus	Cyperaceae	LC, End	TSF, SOSF
Eragrostis capensis	Poaceae	LC, End	GRSF
Erica aneimena	Ericaceae	PNCO	SOSF
Erica chloroloma	Ericaceae	NEST (M), VU [B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v)], PNCO	Not Recorded
Erica cordata	Ericaceae	PNCO	SOSF
Erica deflexa	Ericaceae	PNCO	SOSF
Erica densifolia	Ericaceae	PNCO	SOSF
Erica diaphana	Ericaceae	LC, PNCO, End	TSF
Erica discolor	Ericaceae	LC, PNCO, End	TSF, SOSF
Erica formosa	Ericaceae	PNCO	SOSF
Erica fuscescens	Ericaceae	PNCO	SOSF
Erica gillii	Ericaceae	PNCO	SOSF
Erica glandulosa	Ericaceae	LC, PNCO, End	TSF
Erica glandulosa subsp. fourcadei	Ericaceae	VU [B1ab(ii,iii,iv,v)], PNCO, BIT, End, NEST (M)	Present, occasional individuals noted, often on disturbed or secondary vegetation and within road reserve.
Erica glumiflora	Ericaceae	NEST (M), VU [B1ab(i,ii,iii,iv,v)], PNCO	Present, occasional individuals noted, often on disturbed or secondary vegetation and within road reserve.
Erica gracilis	Ericaceae	PNCO	SOSF
Erica hispidula	Ericaceae	LC, PNCO, End	GRSF, SOSF
Erica inconstans	Ericaceae	PNCO	SOSF
Erica juniperina	Ericaceae	PNCO	SOSF
Erica lanata	Ericaceae	PNCO	SOSF
Erica lehmannii	Ericaceae	PNCO	SOSF
Erica nabea	Ericaceae	PNCO	SOSF
Erica newdigateae	Ericaceae	LC, PNCO, BIT, End	
Erica onusta	Ericaceae	NEST (M), CR [B1ab(iii,v)]	
Erica outeniquae	Ericaceae	PNCO	SOSF
Erica priorii	Ericaceae	PNCO	SOSF
Erica rosacea subsp. rosacea	Ericaceae	LC, PNCO, End	TSF
Erica similis	Ericaceae	PNCO	SOSF
Erica simulans	Ericaceae	PNCO	SOSF
Erica sparsa	Ericaceae	LC, PNCO, End	TSF, SOSF
Erica sparsa var. sparsa	Ericaceae	LC, PNCO, BIT, End	
Erica stylaris	Ericaceae	PNCO, NEST (M), VU [B1ab(iii)+2ab(iii)]	
Erica trachysantha	Ericaceae	LC, PNCO, End	TSF
Erica triceps	Ericaceae	PNCO	SOSF
Erica uberiflora	Ericaceae	LC, PNCO, End	TSF, SOSF
Erica unicolor	Ericaceae	PNCO	SOSF
Erica velatiflora	Ericaceae	PNCO	SOSF
Erica versicolor	Ericaceae	PNCO	SOSF
Erica zitzikammensis	Ericaceae	DDT, PNCO, End	TSF
Eriospermum vermiforme	Eriospermaceae	EN [B1ab(ii,iii,v)+2ab(ii,iii,v)], End	GRSF
Euryops munitus	Asteraceae	LC, End	TSF
Euryops pinnatipartitus	Asteraceae	LC, End	TSF, SOSF
Faurea macnaughtonii	Proteaceae	NEST (M), Rare, PNCO	Not Recorded
Felicia tsitsikamae	Asteraceae	VU, End	TSF
Felicia westae	Asteraceae	NEST (M), EN [B1ab(©,ii,iii,iv,v)+2ab(©,ii,iii,iv,v)]	
Ficinia gracilis	Cyperaceae		SOSF
Freesia sparrmannii	Iridaceae	PNCO	SAF
Gazania krebsiana subsp. krebsiana	Asteraceae	LC, End	TSF

SCIENTIFIC NAME	FAMILY	STATUS[8]	COMMENT/PRESENCE
Geissorhiza bracteata	Iridaceae	PNCO	SOSF
Geissorhiza fourcadei	Iridaceae	LC, PNCO, End	TSF, SOSF
Geissorhiza inconspicua	Iridaceae	LC, PNCO, End	TSF, SOSF
Geissorhiza outeniquensis	Iridaceae	PNCO	SOSF
Geochloa decora	Poaceae		SOSF
Geochloa rufa	Poaceae		SOSF
Gerbera cordata	Asteraceae		SAF
Gladiolus gueinzii	Iridaceae	LC, PNCO, BIT, End	
Gladiolus roseovenosus	Iridaceae	CR [C2a(i)], PNCO, End	GRSF
Gonioma kamassi	Apocynaceae		SAF
Halleria lucida	Scrophulariaceae		SOSF
Heeria argentea	Anacardiaceae		SAF
Helichrysum cymosum	Asteraceae		GRSF
Helichrysum felinum	Asteraceae		GRSF, SOSF
Helichrysum outeniquense	Asteraceae	CR [D], End	TSF
Helichrysum teretifolium	Asteraceae	LC, End	TSF
Hermannia lavandulifolia	Malvaceae	VU [A2c]	Not Recorded
Heteropogon contortus	Poaceae	LC, End	TSF
Holothrix parviflora	Orchidaceae	LC, PNCO, BIT, End	
Hypodiscus albo-aristatus	Restionaceae		SOSF
Hypodiscus aristatus	Restionaceae		SOSF
Hypodiscus striatus	Restionaceae		SOSF
Hypodiscus synchroolepis	Restionaceae	LC, End	TSF, SOSF
Ilex mitis	Aquifoliaceae		SAF
Indigofera flabellata	Fabaceae	LC, End	TSF
Indigofera hispida	Fabaceae	NEST (M), VU [B1ab(iii)]	
Lachenalia youngii	Hyacinthaceae	LC, PNCO, BIT, End	
Lachnaea diosmoides	Thymelaeaceae		SOSF
Lachnostylis hirta	Phyllanthaceae		SAF
Lampranthus pauciflorus	Aizoaceae	EN [B1ab(ii,iii,iv,v)], PNCO	Not Recorded
Lanaria lanata	Lanariaceae		SOSF
Laurophyllus capensis	Anacardiaceae		SAF, SOSF
Lebeckia gracilis	Fabaceae	EN [A2bc; B1ab(ii,iii,iv,v)]	Not Recorded
Leucadendron comosum subsp. Comosum	Proteaceae	PNCO	SOSF
Leucadendron conicum	Proteaceae	NT [A4c], PNCO, End	TSF, SOSF
Leucadendron ericifolium	Proteaceae	PNCO	SOSF
Leucadendron eucalyptifolium	Proteaceae	LC, PNCO, End	GRSF, SOSF, TSF
Leucadendron olens	Proteaceae	PNCO	SOSF
Leucadendron salignum	Proteaceae	LC, PNCO, End	TSF, SOSF, GRSF
Leucadendron spissifolium subsp. fragrans	Proteaceae	PNCO	SOSF
Leucadendron spissifolium subsp. phillipsii	Proteaceae	LC, PNCO, End	TSF
Leucadendron uliginosum subsp. glabratum	Proteaceae	NT [B1ab(iii)+2ab(iii)], PNCO, End	TSF
Leucadendron uliginosum subsp. uliginosum	Proteaceae	PNCO	SOSF
Leucospermum cuneiforme	Proteaceae	LC, PNCO, End	TSF, SOSF
Leucospermum formosum	Proteaceae	EN [A3c+4c; B1ab(ii,iii,v)c(iv)+2ab(ii,iii,v)c(iv)], PNCO, End	GRSF
Leucospermum glabrum	Proteaceae	EN [B1ab(iii,v)c(iv)+2ab(iii,v)c(iv); C2a(i)], PNCO, End, NEST (M)	TSF, SOSF
Leucospermum hamatum	Proteaceae	PNCO	SOSF
Leucospermum wittebergense	Proteaceae	PNCO	SOSF
Limonium scabrum	Plumbaginaceae	LC, End	
Limonium scabrum var. scabrum	Plumbaginaceae	DDT, End	
Limonium sp.	Plumbaginaceae	End	
Linconia alopecuroidea	Bruniaceae		SOSF
Linum villosum	Linaceae		SOSF

SCIENTIFIC NAME	FAMILY	STATUS[8]	COMMENT/PRESENCE
Liparia hirsuta	Fabaceae		SOSF
Liparis capensis	Orchidaceae	PNCO	SAF
Lithospermum papillosum	Boraginaceae	LC, End	
Lobelia neglecta	Lobeliaceae	LC, End	SOSF
Mairia crenata	Asteraceae		SOSF
Marsilea schelpeana	Marsileaceae	NEST (M), VU [B1ab(ii,iii)+2ab(ii,iii)]	Associated with wetlands
Mastersiella purpurea	Restionaceae		SOSF
Maytenus acuminata var. acuminata	Celastraceae	LC, End	
Metalasia densa	Asteraceae	LC, End	TSF, SOSF, GRSF
Metalasia pulcherrima forma pallescens	Asteraceae	DDT, End	TSF
Metalasia trivialis	Asteraceae	LC, End	TSF, SOSF
Metrosideros angustifolia	Myrtaceae		SAF
Mimetes cucullatus	Proteaceae	PNCO	SOSF
Mimetes pauciflorus	Proteaceae	VU [A2c+3c+4c], PNCO, End, NEST (M)	TSF, SOSF
Mimetes splendidus	Proteaceae	NEST (M), EN [B1ab(©,ii)c(iv)+2ab(©,ii)c(iv); C2a(i)b], PNCO	
Mohria caffrorum	Anemiaceae	LC, End	
Muraltia knysnaensis	Polygalaceae	NEST (M), EN [B1ab(ii,iii,iv,v)], End	Not Recorded
Mystacidium capense	Orchidaceae	PNCO	SAF
Nuxia floribunda	Buddlejaceae		SAF
Ochna arborea var. arborea	Ochnaceae		SAF
Ocotea bullata	Lauraceae	NEST (M), EN [A2bd], NFA	SAF
Oedera calycina subsp. calycina	Asteraceae	LC, End	
Olea capensis subsp. macrocarpa	Oleaceae		SAF
Olinia ventosa	Oliniaceae		SAF
Oplismenus hirtellus	Poaceae		SAF
Osteospermum junceum	Asteraceae		SOSF
Osteospermum moniliferum	Asteraceae		SOSF
Osteospermum pterigoideum	Asteraceae	NEST (M), EN [B1ab(ii,iii,v)+2ab(ii,iii,v)]	
Otholobium carneum	Fabaceae	Rare, End	TSF, SOSF
Otholobium fruticans	Fabaceae	Rare, End	
Otholobium virgatum	Fabaceae	LC, End	
Oxalis incarnata	Oxalidaceae		SAF
Panicum deustum	Poaceae	LC, End	
Passerina corymbosa	Thymelaeaceae		TSF, GRSF
Passerina falcifolia	Thymelaeaceae		TSF, SOSF
Passerina pendula	Thymelaeaceae		TSF
Pelargonium auritum var. carneum	Geraniaceae	LC, End	
Pelargonium cordifolium	Geraniaceae		GRSF
Penaea acutifolia	Penaeaceae		SOSF
Pennisetum macrourum	Poaceae	LC, End	
Pentameris acinosa	Poaceae		SOSF
Pentameris distichophylla	Poaceae		SOSF
Pentameris malouinensis	Poaceae		SOSF
Pentameris thuarii	Poaceae	LC, End	
Pentaschistis pallida	Poaceae		SOSF
Phaenocoma prolifera	Asteraceae		SOSF
Phalaris arundinacea	Poaceae	DDT, End	
Phylica axillaris	Rhamnaceae		TSF, GRSF
Phylica confusa	Rhamnaceae		SOSF
Phylica curvifolia	Rhamnaceae		SOSF
Phylica imberbis	Rhamnaceae		TSF
Phylica keetii	Rhamnaceae		
Phylica pinea	Rhamnaceae		GRSF
Platycaulos anceps	Restionaceae		SOSF

SCIENTIFIC NAME	FAMILY	STATUS[8]	COMMENT/PRESENCE
Platycaulos compressus	Restionaceae		SOSF
Platylophus trifoliatus	Cunoniaceae		SAF
Podalyria burchellii	Fabaceae		SOSF
Podalyria sericea	Fabaceae		SOSF
Podocarpus elongatus	Podocarpaceae	NFA	SAF
Podocarpus latifolius	Podocarpaceae	NFA	SAF
Polygala peduncularis	Polygalaceae	LC, End	
Polypogon viridis	Poaceae	DDT, End	
Polystichum incongruum	Dryopteridaceae		SAF
Prismatocarpus rogersii	Campanulaceae		SOSF
Protea aurea subsp. Aurea	Proteaceae	LC, PNCO, End	GRSF
Protea coronata	Proteaceae	NT [A2c+3c+4c], PNCO, End	GRSF
Protea cynaroides	Proteaceae	LC, PNCO, End	TSF, SOSF
Protea eximia	Proteaceae	LC, PNCO, End	TSF
Protea lorifolia	Proteaceae	PNCO	SOSF
Protea mundii	Proteaceae	LC, PNCO, End	TSF, SOSF
Protea neriifolia	Proteaceae	LC, PNCO, End	TSF, SOSF, GRSF
Protea repens	Proteaceae	PNCO	SOSF
Psoralea affinis	Fabaceae		SOSF
Psoralea laxa	Fabaceae	LC, End	
Psoralea monophylla	Fabaceae		GRSF
Psoralea trullata	Fabaceae	NEST (M), Rare	
Psoralea vlokii	Fabaceae		SOSF
Psydrax capensis	Rubiaceae	NEST (M)	
Pteridium aquilinum	Dennstaedtiaceae		SOSF, GRSF
Pterocelastrus tricuspidatus	Celastraceae		TSF, SOSF, SAF
Pterygodium cleistogamum	Orchidaceae	NEST (M), VU [B1ab(ii,iii)], PNCO	
Pterygodium newdigateae	Orchidaceae	NEST (M), CR PE, PNCO	
Putterlickia pyracantha	Celastraceae	LC, End	
Rapanea melanophloeos	Myrsinaceae		SAF
Relhania calycina	Asteraceae		SOSF
Restio gaudichaudiana	Restionaceae		SOSF, GRSF
Restio scaberulus	Restionaceae		SOSF
Restio sieberi	Restionaceae		GRSF
Restio strictus	Restionaceae		SOSF
Restio subverticillata	Restionaceae		SAF
Restio triticeus	Restionaceae		TSF, SOSF, GRSF
Rhodocoma gigantea	Restionaceae		SOSF
Romulea fibrosa	Iridaceae	PNCO	SOSF
Romulea pratensis	Iridaceae	LC, PNCO, End	TSF
Rumohra adiantiformis	Dryopteridaceae		SAF
Ruschia duthiae	Aizoaceae	NEST (M), VU [B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v)], PNCO	
Satyrium acuminatum	Orchidaceae	PNCO	
Satyrium longicolle	Orchidaceae	PNCO	
Schoenoxiphium altum	Cyperaceae		SAF
Schoenoxiphium lanceum	Cyperaceae		SAF
Scolopia mundii	Salicaceae	LC, End	
Searsia lucida	Anacardiaceae		GRSF
Selago burchellii	Scrophulariaceae	NEST (M), VU [B1ab(ii,iii,iv,v)], End	Not Recorded
Selago corymbosa	Scrophulariaceae	LC, End	GRSF
Selago rotundifolia	Scrophulariaceae		
Senecio elegans	Asteraceae	LC, End	
Senecio glastifolius	Asteraceae		SOSF
Senecio ilicifolius	Asteraceae	LC, End	
Sensitive species 1038	Asphodelaceae	NEST (M), Rare	
Sensitive species 1171	Iridaceae	NEST (M), Rare, PNCO	
Sensitive species 131	Fabaceae	NEST (M), CR PE	
Sensitive species 181	Orchidaceae	NEST (M), CR PE, PNCO, End	

SCIENTIFIC NAME	FAMILY	STATUS[8]	COMMENT/PRESENCE
Sensitive species 419	Dioscoreaceae	NEST (M), VU [B1ab(iii,v)+2ab(iii,v)]	
Sensitive species 448	Iridaceae	NEST (M), VU [B1ab(©,ii,iii,iv,v)], PNCO	
Sensitive species 53	Orchidaceae	NEST (M), VU [B2ab(ii,iii,iv,v)], PNCO	
Sensitive species 654	Orchidaceae	NEST (M), VU [C2a(i)], PNCO	
Sensitive species 763	Orchidaceae	NEST (M), VU [A2c], End, PNCO	Not Recorded
Sparrmannia africana	Malvaceae		SAF
Sporobolus africanus	Poaceae	LC, End	
Staberoha aemula	Restionaceae		SOSF
Stoebe alopecuroides	Asteraceae		SOSF
Stoebe plumosa	Asteraceae		TSF
Strelitzia alba	Strelitziaceae		SAF
Streptocarpus rexii	Gesneriaceae		SAF
Struthiola eckloniana	Thymelaeaceae		SOSF
Syncarpha paniculata	Asteraceae		SOSF
Teedia lucida	Scrophulariaceae	LC, End	
Tetragonia decumbens	Aizoaceae	LC, PNCO, End, PNCO	
Tetragonia fruticosa	Aizoaceae	LC, PNCO, End, PNCO	
Tetragonia sp.	Aizoaceae	LC, PNCO, End, PNCO	
Tetraria capillacea	Cyperaceae		TSF, SOSF
Tetraria cuspidata	Cyperaceae		SOSF
Tetraria fimbriolata	Cyperaceae		SOSF
Tetraria involucrata	Cyperaceae		SOSF
Tetraria microstachys	Cyperaceae		SOSF
Tetraria robusta	Cyperaceae		TSF
Tetraria sylvatica	Cyperaceae		SOSF
Tetraria thermalis	Cyperaceae		SOSF
Tetraria ustulata	Cyperaceae		SOSF
Thamnochortus cinereus	Restionaceae		SOSF
Thamnochortus fruticosus	Restionaceae		TSF
Thamnochortus glaber	Restionaceae	LC, End	TSF
Themeda triandra	Poaceae	LC, End	
Themeda triandra	Poaceae		TSF, SOSF, GRSF
Thesium virgatum	Santalaceae	LC, End	SOSF
Todea barbara	Osmundaceae		SAF
Tribolium uniolae	Poaceae	LC, End	
Trichocladus crinitus	Hamamelidaceae		SAF
Tristachya leucothrix	Poaceae		TSF, GRSF
Tritoniopsis caffra	Iridaceae	PNCO	SOSF
Ursinia coronopifolia	Asteraceae	Rare, End	SOSF
Ursinia scariosa subsp. scariosa	Asteraceae	LC, End	SOSF, TSF
Ursinia trifida	Asteraceae	LC, End	SOSF
Virgilia divaricata	Fabaceae		SAF
Virgilia oroboides subsp. ferruginea	Fabaceae		SAF
Virgilia oroboides subsp. oroboides	Fabaceae		SAF
Viscum capense	Santalaceae	LC, End	
Viscum obscurum	Santalaceae	LC, End	
Watsonia fourcadei	Iridaceae	PNCO	SOSF
Widdringtonia nodiflora	Cupressaceae	LC, End	SOSF
Willdenowia teres	Restionaceae	LC, End	SOSF
Xiphotheca phylicoides	Fabaceae		SOSF
Zostera capensis	Zosteraceae		
Zyrphelis outeniquae	Asteraceae		SOSF

9.3.2 Fauna

Marked species were flagged from various database sources as occurring in the region and having an elevated status. All were cross checked for distribution overlay and were actively screened for presence/absence on site.

SCIENTIFIC NAME[9]	COMMON NAME	STATUS[10]	COMMENT/PRESENCE
MAMMALS			
Aonyx capensis	African Clawless Otter	NT	May be transient, unlikely to be affected.
Chlorotalpa duthieae	Duthie's Golden Mole	NEST (M), VU	Not Recorded. May be transient, unlikely to be affected by temporary construction..
Leptailurus serval	Serval	NT	May be transient, unlikely to be affected.
Loxodonta africana	African Bush Elephant	VU	Not Present
Panthera pardus	Leopard	VU	Not Present
Sensitive species 7		NEST (M), LC	Not Recorded. May be transient, unlikely to be affected.
AVIFAUNA (BIRDS)			
Bradypterus sylvaticus	Knysna Warbler	NEST (H, M), VU (SA), VU (Intl)	Not Recorded. May be transient, unlikely to be affected due to the temporary nature of the activity.
Campethera notata	Knysna Woodpecker	NT (SA), VU (Intl)	Not Recorded. May be transient, unlikely to be affected due to the temporary nature of the activity.
Circus maurus	Black Harrier	NEST (H, M), EN (SA), EN (Intl)	Not Recorded. May be transient, unlikely to be affected due to the temporary nature of the activity.
Circus ranivorus	African Marsh Harrier	NEST (H, M), EN (SA), LC (Intl)	Not Recorded. May be transient, unlikely to be affected due to the temporary nature of the activity.
Falco concolor	Sooty Falcon		May be transient, unlikely to be affected.
Neotis denhami	Denham's Bustard	NEST (M), VU (SA), NT (Intl)	Not Recorded. May be transient, unlikely to be affected due to the temporary nature of the activity.
Ploceus capensis	Cape Weaver		May be transient, unlikely to be affected.
Ploceus rubiginosus	Chestnut Weaver		May be transient, unlikely to be affected.
Turnix hottentottus	Fynbos Buttonquail	NEST (M), EN (SA), EN (Intl)	May be transient, unlikely to be affected due to the temporary nature of the activity.
REPTILES			
Acontias meleagris	Cape Legless Skink	LC	May be transient, unlikely to be affected.
Tetradactylus fitzsimonsi	FitzSimons' Long-tailed Seps	VU [B1ab(©,iii)]	Unlikely to be present, outside of known range.
AMPHIBIANS			
Afrixalus knysnae	*Knysna Leaf-folding Frog*	NEST (M), EN [B1ab(©,ii,iii,v)+2ab(©,ii,iii,v)]	Not Recorded. May be present, unlikely to be affected due to the temporary nature of the activity.
Amietia delalandii	Delalande's River Frog	LC	May be present, unlikely to be affected.
Amietia fuscigula	Cape River Frog	LC	May be present, unlikely to be affected.

[9] Species indicated in green are listed in the DEA screening tool, those in brown are from various other database and literature sources that are known from the general area.

[10] **PNCO** - Provincial Nature Conservation Ordinance (1974); **ToPS** – Threatened or Protected Species; **RD** – Recent Discovery; **NEST** - National environmental Screening Tool; **LC** – Least Concern, **VU** – Vulnerable, **EN** – Endangered, **CR** – Critically Endangered, **BIT** – Biogeographically Important Taxa; **End** – Endemic.

SCIENTIFIC NAME[9]	COMMON NAME	STATUS[10]	COMMENT/PRESENCE
Breviceps fuscus	Plain Rain Frog	LC	May be present, unlikely to be affected.
Breviceps fuscus	Plain Rain Frog	LC	May be present, unlikely to be affected.
Cacosternum boettgeri	Common Caco	LC	May be present, unlikely to be affected.
Cacosternum nanum	Bronze Caco	LC	May be present, unlikely to be affected.
Capensibufo tradouwi	Tradouw Toadlet	LC	May be present, unlikely to be affected.
Heleophryne regis	Southern Ghost Frog	LC	May be present, unlikely to be affected.
Hyperolius horstockii	Arum Lily Frog	LC	May be present, unlikely to be affected.
Hyperolius marmoratus	Painted Reed Frog	LC	May be present, unlikely to be affected.
Sclerophrys capensis	Raucous Toad	LC	May be present, unlikely to be affected.
Semnodactylus wealii	Rattling Frog	LC	May be present, unlikely to be affected.
Strongylopus fasciatus	Striped Stream Frog	LC	May be present, unlikely to be affected.
Strongylopus grayii	Clicking Stream Frog	LC	May be present, unlikely to be affected.
Xenopus laevis	Common Platanna	LC	May be present, unlikely to be affected.
INVERTEBRATES			
Acraea horta	Garden acraea	LC	
Acraea neobule	Wandering donkey acraea	LC	
Actizera lucida	Rayed blue	LC	
Aeropetes tulbaghia	Table mountain beauty	LC	
Afrogegenes letterstedti	Brown dodger	LC	
Afrogegenes ocra	Yellow dodger	LC	
Afrogegenes sp.			
Aloeides almeida	Plain russet	LC	
Aloeides aranda	Yellow russet	LC	
Aloeides pallida littoralis	Giant russet	DD	May be transient, unlikely to be affected.
Aloeides pallida littoralis	Giant russet	Data Deficient (SABCA 2013)	
Aloeides pierus	Veined russet	LC	
Aloeides quickelbergei	Outeniqua russet	LC	
Aloeides thyra orientis	Red Copper	NEST (M)	
Amauris echeria	Chief	LC	
Aneuryphymus montanus	Yellow-winged Agile Grasshopper	NEST (M), VU [B2ab(iii,v)]	Not Recorded. May be transient, unlikely to be affected.
Anthene definita	Steel-blue-ciliate blue	LC	
Belenois aurota	Pioneer caper white	LC	
Belenois creona severina	African caper white	LC	
Belenois gidica abyssinica	African veined white	LC	
Belenois zochalia	Forest caper white	LC	
Bicyclus safitza	Black-haired bush brown	LC	
Cacyreus fracta	Water geranium bronze	LC	
Cacyreus lingeus	Bush bronze	LC	

SCIENTIFIC NAME[9]	COMMON NAME	STATUS[10]	COMMENT/PRESENCE
Cacyreus marshalli	Common geranium bronze	LC	
Capys alpheus alpheus	Orange banded protea	LC	
Cassionympha cassius	Rainforest dull brown	LC	
Cassionympha detecta	Cape dull brown	LC	
Catacroptera cloanthe cloanthe	Pirate	LC	
Catopsilia florella	African migrant	LC	
Charaxes brutus natalensis	White-barred charaxes	LC	
Charaxes varanes varanes	Pearl charaxes	LC	
Charaxes xiphares xiphares	Forest-king charaxes	LC	
Chrysoritis chrysaor	Burnished opal	LC	
Chrysoritis palmus margueritae	Water opal	LC	
Colias electo electo	African clouded yellow	LC	
Colotis antevippe gavisa	Red tip	LC	
Colotis euippe omphale	Southern round-winged orange tip	LC	
Colotis evagore antigone	Small orange tip	LC	
Cupidopsis cissus cissus	Meadow blue	LC	
Cyligramma latona		Not listed	
Cymothoe alcimeda alcimeda	Battling glider	LC	
Danaus chrysippus orientis	African plain tiger	LC	
Dira clytus clytus	Cape autumn widow	LC	
Dixeia charina charina	African ant-heap white	LC	
Durbaniella clarki jenniferae	Little rocksitter	LC	
Eagris nottoana knysna	Rufous-winged elfin	LC	
Eicochrysops messapus messapus	Cupreous ash blue	LC	
Eretis umbra umbra	Small marbled elf	LC	
Eudalaca ammon		Not listed	
Eurema brigitta	Broad-bordered grass yellow	LC	
Eurytela hiarbas angustata	Pied piper	LC	
Forest invertebrate		NEST (M)	Associated with forest and may be present in intact forest pockets.
Gomalia elma	Green-marbled skipper	LC	
Grammodes stolida		Not listed	
Hypolimnas misippus	Common diadem	LC	
Junonia hierta cebrene	Yellow pansy	LC	
Junonia oenone oenone	Dark blue pansy	LC	

SCIENTIFIC NAME[9]	COMMON NAME	STATUS[10]	COMMENT/PRESENCE
Junonia orithya madagascariensis	African blue pansy	LC	
Laelia sp.			
Lampides boeticus	Pea blue	LC	
Lepidochrysops braueri	Ice-blue giant cupid	LC	
Leptomyrina lara	Cape black-eye	LC	
Leptotes brevidentatus	Short-toothed zebra blue	LC	
Leptotes pirithous pirithous	Common zebra blue	LC	
Leptotes sp.			
Metisella malgacha malgacha	Grassveld sylph	LC	
Metisella metis paris	Gold-spotted sylph	LC	
Mylothris agathina agathina	Eastern dotted border	LC	
Myrina silenus ficedula	Common fig tree blue	LC	
Nepheronia buquetii buquetii	Buquet's vagrant	LC	
Oraidium barberae	Dwarf blue	LC	
Papilio dardanus cenea	Mocker swallowtail	LC	
Papilio demodocus demodocus	Citrus swallowtail	LC	
Papilio nireus lyaeus	Narrow green-banded swallowtail	LC	
Pelopidas mathias	Black-branded swift	LC	
Pelopidas thrax	White-branded swift	LC	
Pieris brassicae	Cabbage white	LC	
Pontia helice helice	Southern meadow white	LC	
Precis archesia archesia	Garden inspector	LC	
Pseudonympha magus	Silver-bottom brown	LC	
Sarophorus punctatus	Forest Dung Beetle	NEST (M), EN	Present within a limited range around between Plettenberg Bay & Natures Valley and inland. Associated with forest. May be present in forest.
Sommeria spilosoma		Not listed	
Spialia asterodia	Star sandman	LC	
Spialia sataspes	Boland sandman	LC	
Spialia spio	Mountain sandman	LC	
Spoladea sp.			
Tarucus thespis	Vivid pierrot	LC	
Telchinia rahira rahira	Marsh telchinia	LC	
Thestor braunsi	Braun's skolly	LC	
Thestor murrayi	Garden route skolly	LC	
Thyretes hippotes		Not listed	
Trimenia argyroplaga argyroplaga	Large silver-spotted copper	LC	
Tsitana dicksoni	Dickson's sylph	NEST (M), LC	Patchy populations between Cape Town and

SCIENTIFIC NAME[9]	COMMON NAME	STATUS[10]	COMMENT/PRESENCE
			Humansdorp. Site does not overlap known locality.
Utetheisa pulchella		Not listed	
Vanessa cardui	Painted lady	LC	
Zizeeria knysna knysna	African grass blue	LC	
Zizula hylax	Tiny grass blue	LC	

9.4 Appendix D: Systematic Planning Frameworks

9.4.1 Vegetation of Southern Africa

A general description of the vegetation units is provided below (as per Mucina & Rutherford, 2006, as amended) as a reference point for the baseline vegetation composition.

Garden Route Shale Fynbos (FFh 9)

VT 4 Knysna Forest (58%) (Acocks 1953). Mesic Mountain Fynbos (17%), South Coast Renosterveld (17%), Afro-Montane Forest (16%) (Moll & Bossi 1983). LR 2 Afromontane Forest (46%), LR 64 Mountain Fynbos (27%) (Low & Rebelo 1996). BHU 100 Knysna Afromontane Forest (41%), BHU 28 Blanco Fynbos/Renosterveld Mosaic (21%) (Cowling et al. 1999b, Cowling & Heijnis 2001).

Distribution Western and Eastern Cape Provinces: Patches along the coastal foothills of the Langeberg at Grootberg (northeast of Heidelberg), the Outeniqua Mountains from Cloete's Pass via the Groot Brak River Valley, Hoekwil, Karatara, Barrington and Knysna to Plettenberg Bay. Patches from the Bloukrans Pass along coastal platform shale bands south of the Tsitsikamma Mountains via Kleinbos and Fynboshoek to south of both Clarkson and the Kareedouw Mountains. Altitude 0–500 m.

Vegetation & Landscape Features Undulating hills and moderately undulating plains on the coastal forelands. Structurally this is tall, dense proteoid and ericaceous fynbos in wetter areas, and graminoid fynbos (or shrubby grassland) in drier areas. Fynbos appears confined to flatter more extensive landscapes that are exposed to frequent fires—most of the shales are covered with afrotemperate forest. Fairly wide belts of *Virgilia oroboides* occur on the interface between fynbos and forest. Fire-safe habitats nearer the coast have small clumps of thicket, and valley floors have scrub forest (Vlok & Euston-Brown 2002).

Geology & Soils Acidic, moist clay-loam, prismacutanic and pedocutanic soils derived from Caimans Group and Ecca (in the east) shales. Land types mainly Db and Fa.

Climate MAP 310–1 120 mm (mean: 700 mm), relatively even throughout the year, but with a slight low in winter. Mean daily maximum and minimum temperatures 27.6 °C and 6.5 °C for January and July, respectively. Frost incidence 2 or 3 days per year. See also climate diagram for FFh 9 Garden Route Shale Fynbos (Figure 4.68).

Endemic Taxa Geophytic Herbs: *Cyphia georgica*, *Disa newdigateae*, *Gladiolus roseovenosus*.

Important Taxa ([T]Cape thickets)

Growth form	Species
Tall Shrubs	*Leucadendron eucalyptifolium (d), Protea aurea subsp. Aurea (d), P. coronata (d), Leucospermum formosum, Metalasia densa, Passerina corymbosa, Protea neriifolia, Rhus lucida[T].*
Low Shrubs	*Acmadenia alternifolia, A. tetragona, Anthospermum aethiopicum, Cliffortia ruscifolia, Elytropappus rhinocerotis, Erica hispidula, Helichrysum cymosum, Leucadendron salignum, Pelargonium cordifolium, Phylica axillaris, P. pinea, Psoralea monophylla, Selago corymbosa.*
Herb	*Helichrysum felinum. Geophytic Herbs: Pteridium aquilinum (d), Eriospermum vermiforme.*
Succulent Herb	*Crassula orbicularis.*
Herbaceous Succulent Climber	*Crassula roggeveldii.*
Graminoids	*Ischyrolepis sieberi (d), Aristida junciformis subsp. Galpinii, Brachiaria serrata, Cymbopogon marginatus, Elegia juncea, Eragrostis capensis, Ischyrolepis gaudichaudiana, Restio triticeus, Themeda triandra, Tristachya leucothrix.*

Conservation Vulnerable (NBA, 2019).

Target 23%.

Conserved in the proposed Garden Route National Park (4%) and Boosmansbos Wilderness Area (1%). A further 3% are protected in other (mainly private) conservation areas such as the Robbe Hoek Forest Reserve.

Transformed: More than half of the area has already been transformed for cultivation and pine plantations. Much of the remaining veld has been converted to pasture. Remnants are found largely on steep inclines and in areas unsuitable for agriculture. Alien plants such as *Hakea sericea* and various species of *Acacia* locally infest natural remnants. Erosion very low and moderate.

South Outeniqua Sandstone Fynbos (FFs 19)

VT 4 Knysna Forest (80%), VT 70 False Macchia (18%) (Acocks 1953). Wet Mountain Fynbos (48%), Mesic Mountain Fynbos (32%) (Moll & Bossi 1983). LR 64 Mountain Fynbos (78%) (Low & Rebelo 1996). BHU 69 Outeniqua Mountain Fynbos Complex (54%), BHU 71 Tsitsikamma Mountain Fynbos Complex (23%), BHU 100 Knysna Afromontane Forest (17%) (Cowling et al. 1999b, Cowling & Heijnis 2001).

Distribution Western Cape Province: Southern slopes of the Outeniqua Mountains from the Cloetesberg northeast of Albertinia in the west to the upper reaches of the Keurbooms River where it borders on FFs 20 Tsitsikamma Sandstone Fynbos. It includes sandstone outcrops on the lowlands from the vicinity of the Goukamma River near Knysna in the west and Komkromma Point near Nature's Valley in the east. Altitude from the coast to 1 579 m on Cradock's Berg north of George.

Vegetation & Landscape Features Gentle to steep south-facing slopes, over a 160 km long area, relatively broad with some moderately sloping intramontane valleys in the west where it is over 10 km wide. The dominant vegetation is a tall, open to medium dense shrubland with medium dense, medium tall shrub understorey—mainly proteoid and restioid fynbos, with extensive ericaceous fynbos on the upper slopes. Some grassy fynbos at lower altitudes, and scrub fynbos in riverine areas. Patches of this unit are not confined to south-facing slopes, but are found on all slopes south of the highest peaks in the range. Thus, there are extensive northern slopes in some intramontane valley systems, the most significant of those found in the Doring River Wilderness Area.

Geology & Soils Acidic lithosol soils derived from Ordovician sandstones of the Table Mountain Group (Cape Supergroup). Land types mainly Ib, Gb and Fa.

Climate MAP 360–1 170 mm (mean: 785 mm), with a slight bimodal winter and a low in December. Mean daily maximum and minimum temperatures 27.8 °C and 4.8 °C for January and July, respectively. Frost incidence 2–10 days per year. See also climate diagram for FFs 19 South Outeniqua Sandstone Fynbos (Figure 4.21).

Endemic Taxa ([W]Wetlands) Low Shrubs: *Erica unicolor* (d), *Penaea acutifolia* (d), *Acmadenia gracilis*, *A. rupicola*, *Agathosma alaris*, *A. planifolia*, *Amphithalea flava*, *Aspalathus bowieana*, *A. digitifolia*, *Erica aneimena*, *E. gillii*, *E. inconstans*, *E. juniperina*, *E. lehmannii*, *E. outeniquae*, *E. priorii*, *E. velatiflora*, *Leucadendron olens*, *Leucospermum hamatum*, *Phylica curvifolia*, *Prismatocarpus rogersii*, *Psoralea vlokii*, *Xiphotheca phylicoides, Zyrphelis outeniquae*. Succulent Shrub: *Lampranthus pauciflorus.* *Herb: Linum villosum.* *Geophytic Herb: Geissorhiza outeniquensis*[W].

Important Taxa ([T]Cape thickets, [W]Wetlands)

Growth form	Species
Small Tree	*Widdringtonia nodiflora*.
Tall Shrubs	*Chrysanthemoides monilifera* (d), *Laurophyllus capensis*[T] (d), *Leucadendron conicum* (d), *L. eucalyptifolium* (d), *L. uliginosum* subsp. *Uliginosum* (d), *Metalasia densa* (d), *Protea neriifolia* (d), *P. repens* (d), *Anginon difforme*, *Dodonaea viscosa* var. *angustifolia*, *Halleria lucida*[T], *Leucospermum glabrum*, *Liparia hirsuta*, *Metalasia trivialis*, *Mimetes pauciflorus*, *Osteospermum junceum*, *Passerina falcifolia*, *Podalyria burchellii*, *P. sericea*, *Protea mundii*, *Psoralea affinis*, *Pterocelastrus tricuspidatus*[T].
Low Shrubs	*Berzelia intermedia* (d), *Brunia nodiflora* (d), *Erica cordata* (d), *E. densifolia* (d), *E. glomiflora* (d), *E. triceps* (d), *E. uberiflora* (d), *Leucadendron ericifolium* (d), *Penaea 83neorum* subsp. *83neorum* (d), *P. 83neorum* subsp. *Gigantea* (d), *Acmadenia maculata*, *A. tetragona*, *Anisodontea scabrosa*, *Aspalathus angustifolia* subsp. *Angustifolia*, *A.*

	ciliaris, *A. rubens*, *Cliffortia ilicifolia*, *C. stricta*, *Erica deflexa*, *E. discolor* variant '*speciosa*', *E. formosa*, *E. fuscescens*, *E. gracilis*, *E. hispidula*, *E. lanata*, *E. nabea*, *E. similis*, *E. simulans*, *E. sparsa*, *E. versicolor*, *Euryops pinnatipartitus*, *Lachnaea diosmoides*, *Leucadendron comosum* subsp. *Comosum*, *L. salignum*, *L. spissifolium* subsp. *Fragrans*, *Leucospermum cuneiforme*, *L. wittebergense*, *Linconia alopecuroidea*, *Lobelia neglecta*, *Mimetes cucullatus*, *Otholobium carneum*, *Phaenocoma prolifera*, *Phylica confusa*, *Protea cynaroides*, *P. lorifolia*, *Pseudobaeckea cordata*, *Relhania calycina*, *Senecio glastifolius*, *Stoebe alopecuroides*, *Struthiola eckloniana*, *Syncarpha paniculata*, *Ursinia coronopifolia*, *U. scariosa* subsp. *Scariosa*, *U. trifida*.
Semiparasitic Shrub	*Thesium virgatum*.
Herbs	*Carpacoce spermacocea*, *Centella affinis*, *C. virgata*, *Dichrocephala integrifolia* subsp. *Integrifolia*, *Helichrysum felinum*, *Mairia crenata*. Geophytic Herbs: *Pteridium aquilinum* (d), *Blechnum attenuatum*, *Caesia contorta*, *Geissorhiza bracteata*, *G. fourcadei*, *G. inconspicua*, *Lanaria lanata*, *Romulea fibrosa*, *Tritoniopsis caffra*, *Watsonia fourcadei*
Carnivorous Herb	*Drosera trinervia*[W].
Herbaceous Parasitic Climber	*Cassytha ciliolata*.
Graminoids	*Cannomois parviflora* (d), *C. virgata* (d), *Ehrharta dura* (d), *E. rupestris* subsp. *Tricostata* (d), *Elegia fistulosa* (d), *E. galpinii* (d), *E. juncea* (d), *Epischoenus adnatus* (d), *Hypodiscus albo-aristatus* (d), *H. aristatus* (d), *H. striatus* (d), *H. synchroolepis* (d), *Ischyrolepis gaudichaudiana* (d), *Merxmuellera rufa* (d), *Pentameris distichophylla* (d), *Platycaulos anceps* (d), *P. compressus* (d), *Restio fourcadei* (d), *R. triticeus* (d), *Rhodocoma gigantea*[W] (d), *Tetraria cuspidata* (d), *T. involucrata* (d), *T. microstachys* (d), *Andropogon appendiculatus*, *Anthochortus ecklonii*, *Cannomois scirpoides*, *Capeobolus brevicaulis*, *Chrysitrix capensis*, *Cyathocoma hexandra*[W], *Ficinia gracilis*, *Mastersiella purpurea*, *Merxmuellera decora*, *Pentaschistis colorata*, *P. malouinensis*, *P. pallida*, *Restio strictus*, *Staberoha aemula*, *Tetraria capillacea*, *T. fimbriolata*, *T. sylvatica*, *T. thermalis*, *T. ustulata*, *Thamnochortus cinereus*, *Themeda triandra*, *Willdenowia teres*.

Conservation Vulnerable.

Target 23%.

Conserved in (47%) in the proposed Garden Route National Park, Doring River Wilderness Area as well as in Ruitersbos and Witfontein Nature Reserves. About 2% protected in private nature reserves.

Some 28% **transformed** (pine plantations, cultivation). Alien *Pinus pinaster* and *Hakea sericea* scattered over part of the area. Erosion very low.

Remarks The western boundaries of this unit are discussed under FFs 16 South Langeberg Sandstone Fynbos. The Cedarberg Shale Bands were not adequately mapped within this unit due to a lack of proper geological coverage. The eastern boundary is also more of a transition zone and is somewhat arbitrarily taken as approximating the Keurbooms River (for the mountain section). It can be refined when sufficient distributional data become available.

References Bond (1978b, 1981), Cameron (1980), Van Daalen (1984), Vermeulen (1995).

Tsitsikamma Sandstone Fynbos (FFs 20)

VT 4 Knysna Forest (58%), VT 70 False Macchia (42%) (Acocks 1953). Wet Mountain Fynbos (33%), Mesic Mountain Fynbos (21%) (Moll & Bossi 1983). LR 64 Mountain Fynbos (54%) (Low & Rebelo 1996). BHU 71 Tsitsikamma Mountain Fynbos Complex (49%), BHU 100 Knysna Afromontane Forest (19%) (Cowling et al. 1999b, Cowling & Heijnis 2001).

Distribution Western and Eastern Cape Provinces: Tsitsikamma Mountains from Uniondale to Cape St Francis, north of the Keurbooms River and south of Langkloof. Altitude 100–1 675 m (at the highest Peak Formosa).

Vegetation & Landscape Features A relatively low mountain range with gentle to steep both northern and southern slopes over 140 km, with a few high peaks and moderately undulating plains. Relatively

broad compared to the other coastal mountain ranges varying from 10–20 km in width. Vegetation is a medium dense, tall proteoid shrubland over a dense moderately tall, ericoid-leaved shrubland—mainly proteoid, restioid and ericoid fynbos, with fynbos thicket in wetter areas.

Geology & Soils Acidic lithosol soils derived from Ordovician sandstones of the Table Mountain Group (Cape Supergroup), plinthic catenas prominent. Land types mainly Ib, Ca and Bb.

Climate MAP 480–1 230 mm (mean: 845 mm), fairly even throughout the year. Mean daily maximum and minimum temperatures 25. 5°C and 5.8 °C for February and July, respectively. Frost incidence 2–10 days per year. See also climate diagram for FFs 20 Tsitsikamma Sandstone Fynbos (Figure 4.21).

Endemic Taxa Low Shrubs: *Aspalathus teres* subsp. *Thodei*, *Erica trachysantha*, *E. zitzikammensis*, *Felicia tsitsikamae*, *Helichrysum outeniquense*.

Important Taxa ([T]Cape thickets)

Growth Form	Species
Tall Shrubs	*Cliffortia serpyllifolia* (d), *Leucadendron conicum* (d), *L. eucalyptifolium* (d), *L. uliginosum* subsp. *Glabratum*, *Leucospermum glabrum*, *Metalasia densa*, *M. trivialis*, *Mimetes pauciflorus*, *Passerina corymbosa*, *P. falcifolia*, *Protea eximia*, *P. mundii*, *P. neriifolia*, *Pterocelastrus tricuspidatus*[T].
Low Shrubs	*Erica discolor* variant '*speciosa*' (d), *E. sparsa* (d), *Ursinia scariosa* subsp. *Scariosa* (d), *Agathosma ovata*, *Anisodontea scabrosa*, *Aspalathus ciliaris*, *Berzelia intermedia*, *Carpacoce vaginellata*, *Erica diaphana*, *E. glandulosa*, *E. rosacea* subsp. *Rosacea*, *E. uberiflora*, *Euryops munitus*, *E. pinnatipartitus*, *Helichrysum teretifolium*, *Indigofera flabellata*, *Leucadendron salignum*, *L. spissifolium* subsp. *Phillipsii*, *Leucospermum cuneiforme*, *Metalasia pulcherrima* f. *pallescens*, *Otholobium carneum*, *Passerina pendula*, *Penaea 85neorum* subsp. *Gigantea*, *Phylica axillaris*, *P. imberbis*, *Protea cynaroides*, *Stoebe plumosa*.
Herbs	*Commelina africana*, *Gazania krebsiana* subsp. *Krebsiana*.
Geophytic Herbs	*Geissorhiza fourcadei*, *G. inconspicua*, *Romulea pratensis*.
Graminoids	*Restio triticeus* (d), *Tetraria capillacea* (d), *Diheteropogon filifolius*, *Elegia juncea*, *Epischoenus adnatus*, *Heteropogon contortus*, *Hypodiscus synchroolepis*, *Tetraria robusta*, *Thamnochortus fruticosus*, *T. glaber*, *Themeda triandra*, *Tristachya leucothrix*.

Conservation Vulnerable.

Target 23%.

Conserved in (about 40%) the proposed Garden Route National Park (including Tsitsikamma and Soetkraal).

Some 33% **transformed** (cultivation, pine plantations). With scattered alien *Pinus pinaster* and *Hakea sericea*. Erosion very low.

Remark 1 Wetter habitats, especially in berg wind shadows east of dissected valleys, support afrotemperate forests. Most of the bigger patches of the forest are positioned on and around the shales of the Gydo Formation.

Remark 2 The coastal strip contains a narrow shoreward band of dune fynbos communities that were not mapped but included within this unit.

References Bond (1978a), Cowling (1984), Bond et al. (1988), Hanekom et al. (1989).

Southern Afrotemperate Forest (Foz 1)

Knysna Forests (Acocks 1988). Southern Cape Forests (Phillipson & Russell 1988, Geldenhuys 1993e). Afrotemperate Forests p.p. (Low & Rebelo 1996). Knysna-Tsitsikamma Forests, Swellendam Area Forests, Cape Peninsula Forests and South-western Cape Forests (Bailey et al. 1999). Western Cape Talus Forest, Western Cape Afrotemperate Forest and Southern Cape Afrotemperate Forest (Von Maltitz et al. 2003).

Distribution Western Cape, Eastern Cape and also (only few patches) in Northern Cape Provinces: The largest complex is found in the southern Cape along the narrow coastal strip (250 km long) between Humansdorp in the east and Mossel Bay (Knysna-Tsitsikamma forest region)—here occurring on sheltered seaward slopes, plateaux and coastal scarps. The easternmost outlier forest patches occur near Port Elizabeth, while westwards floristically impoverished forms of these forests occur along the feet of south- and east-facing slopes and in deep kloofs and ravines of the Cape Fold Belt mountains as far as the Cape Peninsula in the west. The northernmost localities are near Vanrhynsdorp Pass and in the Matsikamma Mountains. At altitudes ranging from about 10 m (Tsitsikamma region) to 600 m (most of patches), with notable outliers occurring as high as 1 060 m.

Vegetation & Landscape Features Tall, multilayered afrotemperate forests dominated by yellowwoods (*Afrocarpus falcatus* and *Podocarpus latifolius*), *Ocotea bullata, Olea capensis subsp. Macrocarpa, Pterocelastrus tricuspidatus, Platylophus trifoliatus etc. In scree and deep-gorge habitats Cunonia capensis, Heeria argentea, Metrosideros angustifolia, Podocarpus elongatus* and *Rapanea melanophloeos* predominate. The shrub understorey and herb layers are well developed, especially in mesic and wet habitats.

Geology & Soils varying from shallow (and skeletal) Mispah, Glenrosa and Houwhoek forms to sandy humic Fernwood form, derived from Table Mountain Group sandstones and shales of the Cape Supergroup and partly also from Cape Granite.

Biogeographically Important Taxa ([C]Endemic of Capensis, [W]Western distribution limit): Tall Trees: *Brabejum stellatifolium*[C], *Ochna arborea var. arborea*[W]. Small Trees: *Gonioma kamassi*[W] *(d), Heeria argentea*[C] *(d), Metrosideros angustifolia*[C] *(d), Allophylus decipiens*[W], *Brachylaena neriifolia*[C], *Cassine schinoides*[C], *Lachnostylis hirta*[C], *Virgilia divaricata*[C]. Woody Climber: *Asparagus scandens*[C]. Epiphytic Herb: *Mystacidium capense*[W]. Tall Shrub: *Laurophyllus capensis*[C]. Herb: *Gerbera cordata*[W], *Streptocarpus rexii*[W]. Geophytic Herbs: *Liparis capensis*[C]. Graminoids: *Ischyrolepis subverticillata*[C], *Schoenoxiphium lanceum*[C].

Endemic Taxa Tall Tree: *Platylophus trifoliatus* (d). Small Trees: *Apodytes geldenhuysii, Cryptocarya angustifolia, Virgilia oroboides subsp. Ferruginea, V. oroboides subsp. Oroboides*. Megaherb: *Strelitzia alba* (d). Geophytic Herbs: *Amauropelta knysnaensis, Clivia mirabilis, Freesia sparrmannii, Polystichum incongruum*. Graminoid: *Schoenoxiphium altum*.

Important Taxa

Growth Form	Species
Tall Trees	*Afrocarpus falcatus (d), Cunonia capensis (d), Curtisia dentata (d), Nuxia floribunda (d), Ocotea bullata (d), Olinia ventosa (d), Podocarpus elongatus (d), P. latifolius (d), Pterocelastrus tricuspidatus (d), Rapanea melanophloeos (d), Ilex mitis, Olea capensis subsp. Macrocarpa.*
Small Trees	*Canthium inerme (d), Cassine peragua (d), Diospyros whyteana.*
Tree Fern	*Cyathea capensis (d).*
Herbaceous Climber	*Cissampelos torulosa.*
Epithytic Herb	Angraecum pusillum.
Tall Shrubs	Burchellia bubalina (d), Trichocladus crinitus (d), Sparrmannia africana.
Geophytic Herbs	Blechnum capense (d), B. tabulare (d), Dietes iridioides (d), Rumohra adiantiformis (d), Todea barbara (d), Oxalis incarnata.
Graminoid	Oplismenus hirtellus (d).

Conservation Least threatened. Target 34%. More than half of the extent of these forests enjoy statutory conservation in the proposed Garden Route National Park (including Tsitsikamma and Wilderness National Parks, several nature reserves and a number of otherwise protected forests formerly under DWAF jurisdiction), Table Mountain National Park, and many nature reserves managed

by CapeNature in the Western Cape Province (including Cederberg Wilderness Area, Kogelberg Biosphere Reserve, Boosmansbos Wilderness Area, nature reserves of Jonkershoek, Assegaaibos, Limietberg, Hottentots Holland, Riviersonderend, Marloth, Outeniqua, Swartberg etc.); small portions are also protected in the Oorlogskloof Nature Reserve (northern Cape) and in the Groendal Wilderness Area and Loerie Nature Reserve (Eastern Cape). Number of privately owned nature reserves in both Western and Eastern Cape also protect some patches of this forest. Unknown portion of the original area (only about 300 ha in the southern Cape; see Geldenhuys 1991) has been transformed for plantations.

Remarks Southern Afrotemperate Forests are species-poorer than those of the mistbelt, but they still support some woody (palaeo)endemic elements such as *Cunonia capensis, Cryptocarya angustifolia, Heeria argentea, Metrosideros angustifolia, Platylophus trifoliatus, Podocarpus latifolius* and *Afrocarpus falcatus*.

References Phillips (1931), Laughton (1937), Taylor (1955, 1996), Von Breitenbach (1974), Campbell & Moll (1977), McKenzie et al. (1977), McKenzie (1978), Geldenhuys (1982, 1987, 1992a, 1993c, e, 1994b, 1997a), Hanekom et al. (1989), Masson & McKenzie (1989), Masson (1990), McKenzie et al. (1990), Vermeulen (1995), Von Maltitz et al. (2003), Geldenhuys & Mucina (2006).

9.4.2 National Biodiversity Assessment

The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa and informs policies, strategic objectives, and activities for managing and conserving biodiversity more effectively. The NBA is especially important for informing the National Biodiversity Strategy and Action Plan (NBSAP), the National Biodiversity Framework (NBF) and the National Protected Area Expansion Strategy (NPAES), and also informs other national strategies and frameworks across a range of sectors, such as the National Spatial Development Framework, the National Water and Sanitation Master Plan and the National Biodiversity Economy Strategy. Ecosystem protection level is an indicator that tracks how well represented an ecosystem type is in the protected area network. It has been used as a headline indicator in national reporting in South Africa since 2005. It is computed by intersecting maps of ecosystem types and ecological condition with the map of protected areas. Ecosystem types are then categorised based on the proportion of the biodiversity target for each ecosystem type that is included in one or more protected areas. For terrestrial ecosystems, biodiversity targets are set for each ecosystem type using established species–area accumulation curves (ranging between 16 % and 34%).

9.4.3 Sub-Tropical Ecosystem Planning (STEP)

The site is within the Subtropical Ecosystem Planning (STEP) planning domain; however no distinct thicket units are identified within or in close proximity to the site footprint. Thicket elements are noted, which are likely elements represented from thicket that is present in the broader area as well as there being some shared species between thicket and forest.

Implications:

- Vegetation is a non-thicket unit; however, thicket elements could be present.
- Vegetation on site is described in Section 3.1.

9.4.4 Western Cape Biodiversity Spatial Plan (WCBSP, 2017)

The Western Cape is endowed with world-renowned biodiversity and natural resources. Together with this unparalleled endowment comes international responsibilities as well as significant opportunities for our people and the biodiversity economy. The Western Cape Biodiversity Spatial Plan (WCBSP, 2017)

represents the "state of the art" provincial systematic biodiversity planning product. It represents the priority biodiversity areas and ecological infrastructure that need to be secured in the long-term in order that we, together with CapeNature, fulfil our core provincial mandate for biodiversity management.

The development and implementation of the Western Cape Biodiversity Spatial Plan (WCBSP, 2017) is a core output for the Provincial Biodiversity Strategy and Action Plan (2016) which is aligned to the Aichi Targets for the United Nations Convention on Biological Diversity as well as the National Biodiversity Strategy and Action Plan (2015). This *Western Cape Biodiversity Spatial Plan Handbook* thus provides all stakeholders with the strategic and practical guidance on how to ensure that planning and decision-making build resilience of our ecological infrastructure. Critically, the WCBSP must be used to inform how we invest in ecological infrastructure to ensure that our natural resources are managed to improve resilience and water security into the future. This will be crucial in enabling "future proof" development as part of our response to climate change, including adaptation and disaster risk reduction.

The CBA map (Figure 10) indicates areas of land as well as aquatic features which must to be safeguarded in their natural state if biodiversity is to persist and ecosystems are to continue functioning. Land in this category is referred to as a Critical Biodiversity Area. CBAs incorporate:

(i) areas that need to be safeguarded in order to meet national biodiversity thresholds
areas required to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or
important locations for biodiversity features or rare species.

Ecological Support Areas (ESAs) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may be an ecological process area that connects and therefore sustains Critical Biodiversity Areas or a terrestrial feature. None are present within the site or immediate vicinity.

Table 11: Criteria defining Critical Biodiversity Areas (Source: WCBSP, 2017)

CBA MAP CATEGORY:	DEFINING CRITERIA
Protected Areas (Present)	Areas that are proclaimed as protected areas under national or provincial legislation. Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. A benchmark for biodiversity.
Critical Biodiversity Areas 1 (CBA) (Present)	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. Maintain in a natural or near natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
Critical Biodiversity Areas 1 (CBA 2) (Present)	Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. Maintain in a functional, natural or near-natural state, with no further loss of natural habitat. These areas should be rehabilitated.
Ecological Support Areas 1 (ESA 1) (Present)	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PA's or CBAs and are often vital for delivering ecosystem services. Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
Ecological Support Areas 2 (ESA 2) (Present)	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PA's or CBAs and are often vital for delivering ecosystem services. Restore and/or manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services.

CBA MAP CATEGORY:	DEFINING CRITERIA
Other Natural Areas (ONA) (Present)	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem. Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.
No Natural Area Remaining (NNAR) (Present)	Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructure functions, even if they are never prioritised for conservation action. Manage in a biodiversity-sensitive manner, aiming to maximise ecological functionality. Offers the most flexibility regarding potential land uses, but some authorisation may still be required for high impact land uses.

9.4.5 Garden Route Biodiversity Sector Plan (GRBSP, 2010)

The Garden Route Biodiversity Sector Plan (GRBSP, 2010) identified the vegetation as being Sedgefield Coastal Grassland, Tsitsikamma Riverine Forest, Tsitsikamma Forest Fynbos and Tsitsikamma Plateau Forest. The Garden Route BSP further indicates the site as being on the south-western edge of a designated Critical Biodiversity Area.

The authors of the GRBSP recognize the occurrence of Grassland habitat types in the typically Fynbos and Thicket domain, while Mucina and Rutherford (2006) do not. This may be due to difference in scale of mapping as the local Grasslands are not very extensive, but it may also be due to a slight difference in opinion as they mapped some of the more extensive Grassland areas as Grassy Fynbos. In the opinion of the authors of the GRBSP, Grassland habitat types differ from Grassy Fynbos – or for that matter any Fynbos type, as they mapped some of the WCBSP delineated Grassland as Dune- and Shale Fynbos – in largely lacking Restionaceae and Proteaceae, also with only a few Ericaceae present. In its natural state the vegetation is dominated by Poaceae, but a rich assembly of herbs can be present – especially soon after a fire. In the past these Grasslands were probably largely retained by herbivores, with some interaction between herbivory and fires to maintain the graminoid component as the dominant plants. In many cases this process has collapsed and the graminoid component became overgrown with ericoid shrubs, especially Passerina species. The latter degraded condition further creates the impression that the vegetation is a "grassy Fynbos type".

Implications:

The vegetation classification of the site differs between the National Vegetation Map classification and the Garden Route Biodiversity Spatial Plan.

This difference could be a result of differences in mapping scales; however, it is noted that the revised National Vegetation Map (2018) has not taken the GRBSP (2010) classification.

The GRBSP is not a gazetted Bioregional Plan, hence its findings and recommendations are for guideline purposes. The Terrestrial Biodiversity Assessment will try and address this discrepancy.

9.4.6 Other Biodiversity Sector Plans

The site is outside of the planning domain of any other Biodiversity Sector Plans.

9.4.7 Strategic Water Source Areas

Strategic water source areas (Figure 30) are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy. Strategic water source areas are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy.

Strategic water source areas can be regarded as natural "*water factories*", supporting growth and development needs that are often far away. Deterioration of water quality and quantity in these areas can have a disproportionately large negative effect on the functioning of downstream ecosystems and the overall sustainability of growth and development in the regions they support. Appropriate management of these areas, which often occupy only a small fraction of the land surface area, can greatly support downstream sustainability of water quality and quantity.

In South Africa, such management is particularly important for enhancing downstream water quality and quantity. Not only are the country's surface water resources extremely limited – South Africa is considered to be one of the driest countries (per capita), with 98 per cent of its surface water already developed – but the country also has a growing water quality problem.

Overloading with nutrients and other pollutants from urban, agricultural and industrial waste has resulted in many dams shifting to an algae-dominated, or eutrophic, state. Sixty-five per cent of the country's dams are now estimated to be eutrophic or borderline eutrophic, with most of these algal blooms containing cyanobacteria (blue-green algae) that is toxic to human health. This renders water of high quality unavailable if not treated, which coupled with failing water infrastructure, represents a major challenge to water security in the near future. Water managers are inevitably faced with finding new and innovative ways of improving both water quality and quantity to meet the increasing water demands of the country. Managing strategic water source areas is one way to meet this challenge.

Figure 30: South Africa Water Source Areas [Source: Nel, et al, 2013]

9.4.8 Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project responds to the high levels of threat prevalent in river, wetland and estuary ecosystems of South Africa. It provides strategic spatial priorities for conserving the country's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or '*FEPAs*'.

Biodiversity targets set minimum, quantitative requirements for biodiversity conservation. They reflect scientific best judgement and will need to be refined as knowledge evolves. Quantitative biodiversity targets were set for fish species, river ecosystem types, wetland ecosystem types, priority estuaries, wetland clusters and free-flowing rivers:

1. Threatened and near-threatened freshwater fish species – all populations (100%) of considered to be critically endangered or endangered species, and at least ten populations of species that are in the International Union for Conservation of Nature (IUCN) vulnerable or near threatened categories and some populations of special concern (e.g., very restricted distributions in South Africa)
2. River ecosystem types – 20% of total length per type
3. Wetland ecosystem types – 20% of total area per type
4. Wetland clusters – 20% of total area per wetland vegetation group
5. Free-flowing rivers – 20% of total length per ecoregion group
6. Priority estuaries – 100% of all priority estuaries, which already took into account biodiversity targets of 20% for estuary ecosystem types and habitat, 50% of the populations of threatened species; 40% of the populations of exploited estuarine species; 30% of the populations of all other estuarine species.

Terrestrial and aquatic resources are interdependent, with one affecting the other. For example, to ensure the healthy functioning of rivers, wetlands and estuaries, it is essential to protect mountain catchment areas where the water originates, and to safeguard riverside vegetation because these plants prevent soil erosion, sedimentation and water pollution (Vromans et al., 2012).

The health of a river ecosystem is largely dependent on the presence of natural vegetation or "riparian habitat" along its banks, including good vegetative cover within the surrounding landscape (catchment area). Riparian bank vegetation filters pollutants, helps maintain water temperatures, supplies organic matter ('food') in support of aquatic life (fish, insects etc.) and acts as a buffer to adjacent land-uses. The roots of the riparian plants also reduce the effects of floods, by binding riverbanks and thus preventing erosion. Furthermore, bank storage is increased by slowing run off during floods. For these reasons, it is essential that new developments are separated from a river and its "riparian habitat" by a buffer area.

9.4.9 Key Biodiversity Areas

Important Bird Areas

Important Bird and Biodiversity Areas (IBA's) are sites of international significance for the conservation of the world's birds and other biodiversity. They also provide essential benefits to people, such as food, materials, water, climate regulation and flood attenuation, as well as opportunities for recreation and spiritual fulfilment. By conserving IBA's, we look after all the ecosystem goods and services they provide, which means in effect that we support a meaningful component of the South African economy (such as water management and agriculture). Since the late 1970s, more than 12 000 IBA's have been identified in virtually all of the world's countries and territories, both on land and at sea. In 1998, 122 South African IBA's were identified and listed in Barnes (1998). This inventory was revised to 112 IBA's

in 2015. IBA's have also had considerable and increasing relevance when responses have been developed to several wider environmental issues, such as habitat loss, ecosystem degradation, climate change and the sustainable use of resources. The core aims of the IBA Programme are:

- To identify, monitor and conserve the sites and habitats that support South Africa's priority bird species.
- To develop a network of partners, from grassroots to national level, who collaborate to conserve IBA's.
- To gather new data regularly and monitor IBA's in order to track status and trends across the network and so that up-to-date information can be passed on to decision-makers, enabling them to take appropriate conservation action.
- To confirm periodically that existing IBA's continue to meet the selection criteria and to identify other critical sites that may qualify for recognition as IBA's as new information becomes available.
- To build capacity in the IBA Programme by sourcing funding, and to acquire and develop appropriate skills in staff and volunteers so that these objectives can be implemented at a regional scale.

The extension of the IBA approach to several other wildlife groups has led to the identification of Important Plant Areas, Prime Butterfly Areas, Important Mammal Areas and Key Biodiversity Areas for Freshwater Biodiversity. South Africa is also the first mega diverse country to practically test the Key Biodiversity Areas (KBA's) standards across a full range of species groups and ecosystems but is not yet published.

9.5 Vegetation and Ecological Processes and Corridors

9.5.1 Critical Biodiversity Areas

Given that the objective of CBAs is to identify biodiversity priority areas which should be maintained in a natural to near natural state, development within these areas is not encouraged. The following issues need to be considered when considering development within a CBA:

- Are there alternative areas within the site but outside of the CBA that could be developed?
- Does the project undermine the overall ecological functioning of the broad CBA area?
- Can mitigation measures reduce the impact of the development on ecological processes?

9.5.2 Ecosystem Processes

Distinct ecological processes are generally associated with surface geology and soils, climate, topography, drainage systems, and the make-up of the remaining native vegetation. These features could be missed or only partly incorporated into land use plans unless they are specifically identified and targeted. Ideally, areas maintaining adaptive diversification (e.g., environmental gradients) or containing historically isolated populations should be identified and protected. The spatial aspect of ecological processes also needs to be determined and such insights incorporated in conservation planning. Finally, connectivity within these areas should be ensured to maintain species migration and gene flow. However, the spatial components of processes have rarely been considered in conservation planning – an approach that is also especially useful for development planning in biodiversity hotspots. Three types of ecological processes are discussed below.

9.5.3 Ecosystem Services

"Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fibre; regulating services that affect climate, floods, disease, wastes, and

water quality; cultural services, recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling". (Millennium Ecosystem Assessment (MEA), 2005)

Terrestrial (or land) ecosystems provide valuable ecosystem services that contribute to human well-being. They can provide[11]:

- buffers against natural hazards such as fire and floods®
- carbon sequestration (storage), important for reducing the impacts of climate change®
- regulation of water supply®
- grazing for wild animals and livestock®
- natural spaces for recreation & tourism®
- the air we breathe®
- spiritual, ritual and ceremonies®
- horticultural & wildflower industries
- natural heritage®
- food, timber, fibre and medicinal plants®

Rivers are central to human welfare and economic development. They provide:

- water for agricultural, industrial and domestic uses®
- flood attenuation and regulation®
- food and medicinal plants ®
- transport and/or purification of biodegradable wastes®
- tourism, recreational and cultural use®
- enhanced property values

Estuaries, together with an associated buffer of natural vegetation, perform several valuable functions, especially in relation to:

- subsistence fishing
- commercial fisheries (as they provide a refuge for commercial fishes when they are young)
- wildlife habitat e.g., nursery and refuge (providing habitat for amphibians, birds, fish and mammals for all or portions of their life cycles)
- tourism, recreational, cultural use and craft materials
- enhanced property values

Ecological corridors provide valuable ecosystem services that are often impossible or very costly to replicate or offset. For example, they:

- support the migration (movement) and long-term survival of plant and animal species and their ecological processes (e.g., fire, pollination, seed dispersal), in response to global climate change
- are important areas for storing carbon to reduce the impacts of global climate change
- are important areas for regulating water supply (e.g., filtering and storing drinking water, keeping excess nutrients out of wetlands and rivers, ensuring a high-water yield from mountain catchments)
- supply good quality water from mountain catchment areas, both surface and groundwater.
- the supply of water quality and quantity is not only for human consumption but for ensuring the survival of downstream estuaries, wetlands (vleis) and streams (which in turn provide us with other ecosystem services).

[11] Within the study area, terrestrial ecosystem services are marked (e).

- are of important scenic value, contributing to tourism and the 'sense of place'. ®
- Coastal & marine areas
- Subsistence & commercial fishing (food)
- Medicinal & Cosmetic resources e.g., kelp & microscopic plants for the feed, food, cosmetics, & pharmaceutical industries.
- Mining (sand and heavy mineral)
- Recreational value (sport and fishing)
- Retail value (market-value of housing) ®

Net Primary production®: This critical ecological process involves the process of photosynthesis – which translates into the amount of carbon plants can fix on an annual basis. This is important for each LM within the district as the amount of carbon fixed translates directly into the amount of forage produced and thus made available for grazing. Consequently, livestock management directly impacts upon forage production as overgrazing reduces the vegetations' ability to maintain this ecosystem process. This ecological process is especially significant for the ORT, as the main land use comprises of livestock grazing. Therefore, this factor has a direct bearing on both the amount of food available for livestock, and the amount of plant material available regarding reducing runoff in wetland areas.

Water production: In more arid areas, many municipalities and towns rely on groundwater or local water resources to supply to town with drinking water. Thus, the higher rainfall areas are key recharge zones for these groundwater resources. Consequently, land use management of these catchment areas are critical for the maintenance of the quality and quantity of water sourced from each area. For example, water courses and wetlands that have been cleared for agricultural purposes, or overgrazed, will not only cause soil erosion, but most importantly cause increased water runoff, thus reducing the amount of water that feeds back into the water table for consumption. Groundwater is also a critical resource for agriculture and food production.

Species movement corridors and climatic refuges: Global climate change is undoubtedly a threat in the coming decades. A key action to mitigate its effects is the maintenance of species' ability to migrate to new locations as the climatic conditions which they require move across the landscape. These corridor and refuge migration strategies occur on both a micro and macro level. On the macro scale corridors provide for species movement at landscape scales. This entails the ability of fauna and flora to undertake large scale movements towards areas which continue to provide the conditions required by a species for growth and reproduction. Movements could entail migrations of up to hundreds of kilometres, and corridors of mostly natural or near natural vegetation across the landscape are needed to permit this to occur. Climactic refuges can be localized areas that have moderated climates – such as mountain kloofs and south facing slopes. These areas provide cooler habitats where species under threat from changing climates can colonise or species and vegetation not widely found in surrounding area.

9.5.4 Ecological Support Areas

These include supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may be an ecological process area that connects and therefore sustains Critical Biodiversity Areas or a terrestrial feature. The ESA'S are not well defined in the ECBCP (refer to Section 2.3.7). ESAs are generally extensions to the CBA area incorporating small areas that are perhaps no longer natural, or are comprised of secondary vegetation, generally following the drainage line ecological corridors within the wider surrounding landscape that will improve connectivity.

9.5.5 Critical/Important Terrestrial Habitats

Special Habitats include areas that are rare within a region, or which support important species, ecosystems or ecological processes. Species of Special Concern refers to red data species and

important habitats include the locations where these species are known to occur. Red data species are plant, animal or other organisms (e.g., reptiles, insects etc) that have been assessed and classified according to their potential for extinction in the near future. All known species are listed in the Red Data Book and classified as Extinct, Critically Endangered, Endangered, Vulnerable, Near Threatened or Least Concern. Red Data species are those species classified as Extinct, Critically Endangered, Endangered or Vulnerable. Some of the red data species are listed within the NEMBA Threatened or Protected Species (TOPS), and some are protected by provincial ordinances. Critical habitats include those areas that are known locations for such red data species that are under threat of extinction.
The Eastern Cape Biodiversity Conservation plan (ECBCP) does not identify specific Important Critical or Important Terrestrial Habitats; however, the following are generally considered to be important habitats, none of which none are present within the site.

Rocky Outcrops

Rocky outcrops can provide habitat for geophytic species that often have limited distributions. No rocky outcrops are present within the footprint. No outcrops are present.

Wetland habitat

No wetlands are directly affected.

Priority Estuaries

No Estuaries are affected by the proposed activity.

Forest

No forest is present.

Fynbos

No Fynbos is present.

Colonies or Populations of Threatened or Protected Species

No colonies or populations of threatened or protected species are present or in proximity to the road that may be directly or indirectly affected.

9.5.6 Alien Invasive Species

On 18 September 2020, the Minister of Environmental Affairs published the Alien and Invasive Species Regulations ("the Regulations") which came into effect on the 18 October 2020 in a bid to curb the negative effects of IAPs. The Regulations call on landowners and sellers of land alike to assist the Department of Environmental Affairs to conserve our indigenous fauna and flora and to foster sustainable use of our land. Non-adherence to the Regulations by a landowner or a seller of land can result in a criminal offence punishable by a fine of up to R 5 million (R 10 million in case of a second offence) and/or a period of imprisonment of up to 10 years.

Category 1a and 1b listed invasive species must be controlled and eradicated. Category 2 plants may only be grown if a permit is obtained, and the property owner ensures that the invasive species do not spread beyond his or her property. The growing of Category 3 species is subject to various exemptions and prohibitions. Some invasive plants are categorised differently in different provinces. For example: the Spanish Broom plant is categorised as a category 1b (harmful) invasive plant in Eastern Cape and Western Cape, but it is a category 3 (less harmful) invasive plant in the other seven provinces.

Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties. Alien Invasive Plants require removal according to the Conservation of Agricultural Resources Act 43 of 1983 (CARA) and the National Environmental Management: Biodiversity Act (10 of 2004; NEMBA): Alien and Invasive Species Lists (GN R598 and GN R599 of 2014). Alien control programs are long-term management projects and a clearing plan, which includes follow up actions for rehabilitation of the cleared area, is essential. This will save time, money and significant effort. Collective management and planning with neighbours allow for more cost-effective clearing and maintenance considering aliens seeds as easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing. A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas and prioritize sensitive areas such as riverbanks and wetlands. Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms but are often the most difficult to detect and control.

Eradication protocol

The act required the removal of these species, being the responsibility of the landowner, as described in Table 12 below.

Table 12: Legislation regarding invasive alien species.

The National Environmental Management Act: Alien and Invasive Species Act (18 September 2020) stipulates the following:

6. Control measures

(1) In order to achieve the objects of this Act the Minister may prescribe control measures which shall be complied with by land users to whom they apply.

(2) Such control measures may relate to –

(I) the control of weeds and invader plants.

(3) A control measure may –

(a) contain a prohibition or an obligation with regard to any matter referred to in subsection (2).

(5) Any land user who refuses or fails to comply with any control measure which is binding on him, shall be guilty of an offence.

In this regard, Government Notice R. 598 – National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Regulations, 2014 (Gazette number 37885), dated August 2014, further stipulates the following:

CHAPTER 2: CATEGORIES OF LISTED INVASIVE SPECIES

2. Category 1a: Listed Invasive Species

(1) Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combatted or eradicated.

(2) A person in control of a Category 1a Listed Invasive Species must-

(a) comply with the provisions of section 73(2) of the Act.

(b) immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and

© allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.

If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such programme.

3. Category 1b: Listed Invasive Species

(1) Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled.

(2) A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act.
(3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
(4) A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

4. Category 2: Listed Invasive Species

(1) Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.
(2) Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.
(3) A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.
(4) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
(5) 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 1 b Listed Invasive Species and must be managed according to Regulation 3.
(6) Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

5. Category 3: Listed Invasive Species

(1) Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.
(2) Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.
(3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

CHAPTER 7: ISSUING, AMENDMENT AND CANCELLATION OF PERMITS

29. Sale or transfer of alien and listed invasive species

(1) If a permit-holder sells a specimen of an alien or listed invasive species or sells the property on which a specimen of an alien or listed invasive species is under the permit-holder's control, the new owner of such specimen or such property must apply for a permit in terms of Chapter 7 of the Act.
(2) The new permit-holder contemplated in sub-regulation (1) will be subject to the same conditions as the permit-holder who has sold the specimen of an alien or listed invasive species, or the property on which a specimen of an alien or listed invasive species occurs, unless specific circumstances require all such permit conditions to be revised, in which case full reasons must be giving in writing by the issuing authority.
(3) The seller of any immovable property must, prior to the conclusion of the relevant sale agreement, notify the purchaser of that property in writing of the presence of listed invasive species on that property.

CHAPTER 9: COMPLIANCE AND ENFORCEMENT

35. Offences and penalties

(1) Any offence committed in terms of section 101 of the Act shall, upon conviction, carry the penalties referred to in section 102 of the Act.

(2) Any person who contravenes or fails to comply with a provision of these regulations is guilty of an offence and is liable, on conviction, to-
(a) a fine not exceeding five million rand, and in the case of a second or subsequent conviction, to a fine not exceeding R 10 million; or
(b) imprisonment for a period not exceeding 10 years; or
© to both such fine and imprisonment.

The seller of any immovable property must also, prior to the conclusion of the relevant sale agreement, notify the purchaser of that property in writing of the presence of listed IAPs on the property. Property sales agreements dated 1 October 2014 and onwards, should also incorporate a clause in terms of which the purchaser acknowledges that he has acquainted himself with the extent and the nature of the property he is buying and that he accepts the property as such, including the vegetation on the property.

Specific eradication and management procedures must be stipulated in the EMP as to the methods to be implemented to remove and control the various alien invasive species as they tend to require species specific techniques. A management plan should be incorporated into the construction EMP, and a detailed action plan compiled and implemented by the ECO. Any seed-bearing material is to be disposed of at a registered landfill.

9.6 Annexure E: Abbreviations and Glossary

9.6.1 Abbreviations

CARA	Conservation of Agricultural Resources Act, Act 43 of 1983
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs (*now DEFF, see below*)
DFFE	The Department of Environmental Affairs was renamed the Department of Forestry Fisheries and the Environment, incorporating the forestry and fisheries functions from the previous Department of Agriculture, Forestry and Fisheries.
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DEDEAT	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism
DEMC	Desired Ecological Management Class
DWS	Department of Water Affairs and Sanitation
DWAF	Department of Water Affairs and Forestry (former department name)
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMC	Ecological Management Class
EMP	Environmental Management Plan
EMPr	Environmental Management Programme report
ER	Environmental Representative
ESS	Ecosystem Services
IAP's	Interested and Affected Parties
IEM	Integrated Environmental Management
LM	Local Municipality
masl	meters above sea level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, Act 107 of 1998
NFA	National Forests Act
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NFA	National Forest Act, Act 84 of 1998
PEMC	Present Ecological Management Class
PES	Present Ecological State
PNCO	Provincial Nature and Environment Conservation Ordinance (No. 19 of 1974).
RDL	Red Data List
RHS	Right Hand Side
RoD	Record of Decision
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SoER	State of the Environment Report
SSC	Species of Special Concern
ToPS	Threatened of Protected Species
ToR	Terms of Reference
+ve	Positive
-ve	Negative

9.6.2 Glossary

Alien Invasive Species (AIS)	An alien species whose introduction and/or spread threaten biological diversity (Convention on Biological Diversity). Note: "*Alien invasive species*" is considered to be equivalent to "*invasive alien species*". An alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity (*IUCN*).
Best Environmental Practice	The application of the most appropriate combination of environmental control measures and strategies (Stockholm Convention).
Best Management Practice	Established techniques or methodologies that, through experience and research, have proven to lead to a desired result (BBOP).
Biodiversity	Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.
Biodiversity Offset	Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function and people's use and cultural values associated with biodiversity (BBOP).
Bioremediation	The use of organisms such as plants or microorganisms to aid in removing hazardous substances from an area. Any process that uses microorganisms, fungi, green plants, or their enzymes to return the natural environment altered by contaminants to its original condition.
Boundary	Landscape patches have a boundary between them which can be defined or fuzzy (Sanderson and Harris, 2000). The zone composed of the edges of adjacent ecosystems is the boundary.
Connectivity	The measure of how connected or spatially continuous a corridor, network, or matrix is. For example, a forested landscape (the matrix) with fewer gaps in forest cover (open patches) will have higher connectivity.
Corridors	Have important functions as strips of a landscape differing from adjacent land on both sides. Habitat, ecosystems or undeveloped areas that physically connect habitat patches. Smaller, intervening patches of surviving habitat can also serve as "steppingstones" that link fragmented ecosystems by ensuring that certain ecological processes are maintained within and between groups of habitat fragments.
Critically Endangered (CR)	A category on the IUCN Red List of Threatened Species which indicates a taxon is considered to be facing an extremely high risk of extinction in the wild (*IUCN*).
Cultural Ecosystem Services	The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g., knowledge systems, social relations, and aesthetic values (Millennium Ecosystem Assessment).
Cumulative Impacts	The total impact arising from the project (under the control of the developer), other activities (that may be under the control of others, including other developers, local communities, government) and other background pressures and trends which may be unregulated. The project's impact is therefore one part of the total cumulative impact on the environment. The analysis of a project's incremental impacts combined with the effects of other projects can often give a

	more accurate understanding of the likely results of the project's presence than just considering its impacts in isolation (BBOP).
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat(IUCN).
Degraded Habitat/Land	Land that has been impacted upon by human activities (including introduction of invasive alien plants, light to moderate overgrazing, accelerated soil erosion, dumping of waste), but still retains a degree of its original structure and species composition (although some species loss would have occurred) and where ecological processes still occur (albeit in an altered way). Degraded land is capable of being restored to a near-natural state with appropriate ecological management.
Disturbance	An event that significantly alters the pattern of variation in the structure or function of a system, while fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. Disturbance is generally considered a natural process.
Ecological Processes	Ecological processes typically only function well where natural vegetation remains, and where the remaining vegetation is well-connected with other nearby patches of natural vegetation. Loss and fragmentation of natural habitat severely threatens the integrity of ecological processes. Where basic processes are intact, ecosystems are likely to recover more easily from disturbances or inappropriate actions if the actions themselves are not permanent. Conversely, the more interference there has been with basic processes, the greater the severity (and longevity) of effects. Natural processes are complex and interdependent, and it is not possible to predict all the consequences of loss of biodiversity or ecosystem integrity. When a region's natural or historic level of diversity and integrity is maintained, higher levels of system productivity are supported in the long run and the overall effects of disturbances may be dampened.
Ecology	Ecology (from Greek: οἶκος, "house" and -λογία, "study of") is the study of the relationships between living organisms, including humans, and their physical environment. Ecology considers organisms at the individual, population, community, ecosystems, and biosphere level. Ecology overlaps with the closely related sciences of biogeography, evolutionary biology, genetics, ethology and natural history. Ecology is a branch of biology, and it is not synonymous with environmentalism.
Ecosystem Status	Ecosystem status of terrestrial ecosystems is based on the degree of habitat loss that has occurred in each ecosystem, relative to two thresholds: one for maintaining healthy ecosystem functioning, and one for conserving the majority of species associated with the ecosystem. As natural habitat is lost in an ecosystem, its functioning is increasingly compromised, leading eventually to the collapse of the ecosystem and to loss of species associated with that ecosystem (Millennium Ecosystem Assessment).
Ecosystem Services	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Supporting Ecosystem services are those that are necessary for the maintenance of all other ecosystem services. Some examples include biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat.
Ecosystem	All the organisms of a habitat, such as a lake or forest, together with the physical environment in which they live. A dynamic complex of plant, animal and micro-

	organism communities and their non-living environment interacting as a functional unit.
Ecotone	The transitional zone between two communities. Ecotones can arise naturally, such as a lakeshore, or can be human created, such as a cleared agricultural field from a forest. The ecotonal community retains characteristics of each bordering community and often contains species not found in the adjacent communities. Classic examples of ecotones include fencerows; forest to marshlands transitions; forest to grassland transitions; or land-water interfaces such as riparian zones in forests. Characteristics of ecotones include vegetational sharpness, physiognomic change, and occurrence of a spatial community mosaic, many exotic species, ecotonal species, spatial mass effect, and species richness higher or lower than either side of the ecotone.
Edge	The portion of an ecosystem near its perimeter, where influences of the adjacent patches can cause an environmental difference between the interior of the patch and its edge. This edge effect includes a distinctive species composition or abundance in the outer part of the landscape patch. For example, when a landscape is a mosaic of perceptibly different types, such as a forest adjacent to a grassland, the edge is the location where the two types adjoin. In a continuous landscape, such as a forest giving way to open woodland, the exact edge location is fuzzy and is sometimes determined by a local gradient exceeding a threshold, as an example, the point where the tree cover falls below thirty-five percent.
Emergent Tree	Trees that grow above the top of the canopy
Endangered (En)	Endangered terrestrial ecosystems have lost significant amounts (more than 60 % lost) of their original natural habitat, so their functioning is compromised. A taxon (species) is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild (*IUCN*).
Endemic	A plant or animal species, or a vegetation type, which is naturally restricted to a defined region or limited geographical area. Many endemic species have widespread distributions and are common and thus are not considered to be under any threat. They are however noted to be unique to a region, which can include South Africa, a specific province or a bioregion, vegetation type, or a localised area. In cases where it is highly localised or known only from a few or a few localities, and is under threat, it may be red listed either in terms of the South Africa Threatened Species Programme, NEMBA Threatened or Protected Species (ToPS) or the IUCN Red List of Threated Species.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Exotic	Non-indigenous; introduced from elsewhere, may also be a *weed* or alien *invasive* species. Exotic species may be invasive or non-invasive.
Ecological Structure	The composition, or configuration, and the proportion of different patches across the landscape. Relates to species diversity, the greater the diversity, the more complex the structure. A description of the organisms and physical features of environment including nutrients and climatic conditions.
Ecological Function	How each of the elements in the landscape interacts based on its life cycle events [Producers, Consumers, Decomposers Transformers]. Includes the capacity of natural processes and components to provide goods and services that satisfy human needs, either directly or indirectly.
Ecological Pattern	The contents and internal order of the landscape, or its spatial (and temporal) components. May be homogenous or heterogenous. Result from the ecological processes that produce them.

Ecological Process	Includes *Physical processes* [Climate (precipitation, insolation), hydrology, geomorphology]; *Biological processes* [Photosynthesis, respiration, reproduction]; *Ecological processes* [Competition, predator-prey interactions, environmental gradients, life histories]
Fragmentation (Habitat Fragmentation)	The 'breaking apart' of continuous habitat into distinct pieces. Causes land transformation, an important current process in landscapes as more and more development occurs.
Habitat Banking	A market where credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time (IEEP).
Habitat	The home of a plant or animal species. Generally, those features of an area inhabited by animal or plant which are essential to its survival.
IFC PS6	International Finance Corporation Performance Standard 6 – A standard guiding biodiversity conservation and sustainable management of living natural resources for projects financed by the International Finance Corporation (IFC)
Indicator	Information based on measured data used to represent an attribute, characteristic, or property of a system.
Indicator species	A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem. They reflect the quality and changes in environmental conditions as well as aspects of community composition.
Indigenous	Native; occurring naturally in a defined area.
Indigenous Species (Native species)	A species that has been observed in the form of a naturally occurring and self-sustaining population in historical times (*Bern Convention 1979*). A species or lower taxon living within its natural range (past or present) including the area which it can reach and occupy using its natural dispersal systems (*modified after the Convention on Biological Diversity*)
Indirect Impact	Impacts triggered in response to the presence of a project, rather than being directly caused by the project's own operations (BBOP)
Intact Habitat / Vegetation	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and functioning of ecological processes.
Intrinsic Value	The inherent worth of something, independent of its value to anyone or anything else.
Keystone Species	Species whose influence on ecosystem function and diversity are disproportionate to their numerical abundance. Although all species interact, the interactions of some species are more profound and far-reaching than others, such that their elimination from an ecosystem often triggers cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the food web.
Landscape	An area of land that contains a mosaic of ecosystems, including human-dominated ecosystems (Millennium Ecosystem Assessment).
Landscape Approach	Dealing with large-scale processes in an integrated and multidisciplinary manner, combining natural resources management with environmental and livelihood considerations (FAO).
Landscape connectivity	The degree to which the landscape facilitates or impedes movement among resource patches.
Least threatened / Least Concern (LC)	These ecosystems have lost only a small proportion (more than 80 % remains) of their original natural habitat and are largely intact (although they may be degraded to varying degrees, for example by invasive alien species, overgrazing, or overharvesting from the wild).

	A taxon (species) is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category (IUCN).
Matrix	The "*background ecological system*" of a landscape with a high degree of connectivity.
Natural Forest (Indigenous Forest)	The definition of "*natural forest*" in the National Forests Act of 1998 (NFA) Section 2(1)(xx) is as follows: 'A natural forest means a group of indigenous trees • whose crowns are largely contiguous • or which have been declared by the Minister to be a natural forest under section 7(2) This definition should be read in conjunction with Section 2(1)(x) which states that 'Forest' includes: • A natural forest, a woodland, and a plantation • The forest-produce in it; and • The ecosystems which it makes up. The legal definition must be supported by a technical definition, as demonstrated by a court case in the Umzimkulu magisterial district, relating to the illegal felling of Yellowwood (Podocarpus latifolius) and other species in the Gonqogonqo forest. From scientific definitions (also see Appendix B) we can define natural forest as: • A generally multi-layered vegetation unit • Dominated by trees that are largely evergreen or semi-deciduous • The combined tree strata have overlapping crowns, and crown cover is >75% • Grasses in the herbaceous stratum (if present) are generally rare • Fire does not normally play a major role in forest function and dynamics except at the fringes • The species of all plant growth forms must be typical of natural forest (check for indicator species) • The forest must be one of the national forest types
Near Threatened (NT)	A taxon (species) is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN).
Patch	A term fundamental to landscape ecology, is defined as a relatively homogeneous area that differs from its surroundings. Patches are the basic unit of the landscape that change and fluctuate, a process called patch dynamics. Patches have a definite shape and spatial configuration and can be described compositionally by internal variables such as number of trees, number of tree species, height of trees, or other similar measurements.
Protected Area	A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Range restricted species	Species with a geographically restricted area of distribution. Note: Within the IFC PS6, restricted range refers to a limited extent of occurrence (EOO): • For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 square kilometres (km2).
Refugia	A location which supports an isolated or relict population of a once more widespread species. This isolation can be due to climatic changes, geography, or human activities such as deforestation and overhunting.
Resilience	The capacity of a natural system to recover from disturbance (OECD).

Rehabilitation	Measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised. Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure (BBOP).
Restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. An ecosystem has recovered when it contains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy. It would sustain itself structurally and functionally, demonstrate resilience to normal ranges of environmental stress and disturbance, and interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions (IFC).
Riparian	Pertaining to, situated on or associated with the banks of a watercourse, usually a river or stream.
River Corridors	River corridors perform several ecological functions such as modulating stream flow, storing water, removing harmful materials from water, and providing habitat for aquatic and terrestrial plants and animals. These corridors also have vegetation and soil characteristics distinctly different from surrounding uplands and support higher levels of species diversity, species densities, and rates of biological productivity than most other landscape elements. Rivers provide for migration and exchange between inland and coastal biotas.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED).
Terrestrial	Occurring on, or inhabiting, land.
Threatened Species	Umbrella term for any species categorised as Critically Endangered, Endangered or Vulnerable by the IUCN Red List of Threatened Species (*IUCN*). Any species that is likely to become extinct within the foreseeable future throughout all or part of its range and whose survival is unlikely if the factors causing numerical decline or habitat degradation continue to operate (EU).
Traditional Ecological Knowledge	Knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, and forestry (CBD).
Transformation	In ecology, transformation refers to adverse changes to biodiversity, typically habitats or ecosystems, through processes such as cultivation, forestry, drainage of wetlands, urban development or invasion by alien plants or animals. Transformation results in habitat fragmentation – the breaking up of a continuous habitat, ecosystem, or land-use type into smaller fragments.
Transformed Habitat/Land	Land that has been significantly impacted upon as a result of human interferences/disturbances (such as cultivation, urban development, mining, landscaping, severe overgrazing), and where the original structure, species composition and functioning of ecological processes have been irreversibly altered. Transformed habitats are not capable of being restored to their original states.
Tributary	A small stream or river flowing into a larger one.

Untransformed Habitat/Land	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and functioning of ecological processes.
Vulnerable (Vu)	Vulnerable terrestrial ecosystems have lost some (more than 60 % remains) of their original natural habitat and their functioning will be compromised if they continue to lose natural habitat. A taxon (species) is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild (*IUCN*).
Watercourse	Natural or man-made channel through or along which water may flow. A river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows. and a reference to a watercourse includes, where relevant, its bed and banks;
Weed	An indigenous or non-indigenous plant that grows and reproduces aggressively, usually a ruderal pioneer of disturbed areas. Weeds may be unwanted because they are unsightly, or they limit the growth of other plants by blocking light or using up nutrients from the soil. They can also harbour and spread plant pathogens. Weeds are generally known to proliferate through the production of large quantities of seed.
Wetlands	A collective term used to describe lands that are sometimes or always covered by shallow water or have saturated soils, and where plants adapted for life in wet conditions usually grow.
Catchment	In relation to a watercourse or watercourses or part of a watercourse, means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points.
Estuary	a partially or fully enclosed body of water - (a) which is open to the sea permanently or periodically; and (b) within which the sea water can be diluted, to an extent that is measurable, with fresh water drained from land.
Instream habitat	Includes the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse;
Riparian Habitat	Includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

9.7 Annexure F: Biodiversity Environmental Management Plan

Specific measures relating to management of Biodiversity Impacts that must be included I the project Environmental Management Programme (EMPr). This Environmental Management Plan (EMP) contains guidelines, operating procedures and rehabilitation control requirements, which will be binding on the holder of the environmental authorisation after approval of the EMP. The impacts identified and listed in 3.3 will be managed / controlled as set out under mitigating measures (3.3) and as detailed in this section for the more significant impacts during the operational phase.

9.7.1 Protection of Flora and Fauna

The following actions must be implemented at construction phase.

- Search and rescue operations for Species of Conservation Concern *must* be undertaken before the commencement of site clearing activities.
- Indigenous vegetation encountered on the sites that are to be conserved and left intact.
- It is important that clearing activities are kept to the minimum and take place in a phased manner. This allows animal species to move into safe areas and prevents wind and water erosion of the cleared areas.
- Stripped vegetation *should* be temporarily stored during operations and to be used later to stabilise slopes. This excludes exotic invasive species.
- No animals are to be harmed or killed during the course of operations.
- Workers are NOT allowed to collect any flora or snare any faunal species. All flora and fauna remain the property of the landowner and *must* not be disturbed, upset or used without their expressed consent.
- It is the responsibility of the Contractor to provide sufficient fuel for cooking and heated as needed by the staff.
- No domestic animals are permitted on the sites.
- Trees and shrubs that are directly affected by the operations may be felled or cleared but only by the expressed written permission of the ECO.
- Rehabilitation of vegetation of the site *must* be done as described in the Rehabilitation Plans.

Flora search and Rescue

The following flora relocation plan is recommended:

- Once the final layout has been determined the botanist will be consulted in order to finalise the plant relocation and vegetation clearing plan.
- Respective permits to be obtained.
- Flora search and rescue is to be conducted before vegetation clearing takes place.
- Areas should only be stripped of vegetation as and when required and once species of special concern have been relocated for that area.
- Once site clearing is to commence, the area to be cleared of vegetation will be surveyed by the vegetation and plant search and rescue team clearing under the supervision of the botanist to identify and remove species suitable for rescue and commence removal of plants.
- These species are to be replanted immediately in a suitable area of similar vegetation, where future development is unlikely to occur, or within a protected area.

9.7.2 Alien and Invasive Plan Management Plan

The following mitigation measures have been identified in order to ensure that the introduction and spread of alien invasive vegetation is minimised:

- Alien species must be removed from the site as per the National Environmental Management: Biodiversity Act (No. 10 of 2004) requirements.

- A suitable weed management strategy must be implemented in the construction phase and carried through the operational phase.
- Weeds and alien species *must* be cleared by hand before the rehabilitation phase of the areas. Removal of alien plants are to be done according to the Working for Water Guidelines.
- The Contractor is responsible for the removal of alien species within all areas disturbed during construction activities. Disturbed areas include (but are not limited to) access roads, construction camps, site areas and temporary storage areas.
- In consultation with relevant authorities, the Engineer may order the removal of alien plants (when necessary). Areas within the confines of the site are to be included.
- All alien plant material (including brushwood and seeds) should be removed from site and disposed of at a registered waste disposal site. Should brushwood be utilised for soil stabilization or mulching, it must be seed free.
- After clearing is completed, an appropriate cover crop may be required, should natural re-establishment of grasses not take place in a timely manner.

9.7.3 Fires

- The Contractor must ensure that an emergency preparedness plan is in place in order to fight accidental fires or veld fires, should they occur. The adjacent landowners/users/managers *should* also be informed or otherwise involved.
- Enclosed areas for food preparation should be provided and the Contractor *must* strictly prohibit the use of open fires for cooking and heating purposes.
- The use of branches of trees and shrubs for fire-making *must* be strictly prohibited.
- The Contractor *should* take all reasonable and active steps to avoid increasing the risk of fire through their activities on-site. No fires may be lit except at places approved by the ECO.
- The Contractor *must* ensure that the basic fire-fighting equipment is to the satisfaction of the Local Emergency Services.
- The Contractor *must* supply all living quarters, site offices, kitchen areas, workshop areas, materials, stores and any other relevant areas with tested and approved fire-fighting equipment.
- Fires and "hot work" *must* be restricted to demarcated areas.
- A braai facility may be considered at the discretion of the Contractor and in consultation with the ECO. The area *must* be away from flammable stores. All events must be under management's supervision and a fire extinguisher *will* be immediately available. "Low-smoke" fuels must be used (e.g., charcoal) and smoke control regulations, if applicable, must be considered.
- The Contractor *must* take precautions when working with welding or grinding equipment near potential sources of combustion. Such precautions include having a suitable, tested and approved fire extinguisher immediately at hand and the use of welding curtains.

9.7.4 Soil Aspects

- Sufficient topsoil must be stored for later use during decommissioning, particularly from outcrop areas.
- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the botanist and horticulturalist prior to commencement of any operations.
- The removed topsoil shall be stored on high ground within the site footprint outside the 1:50 flood level within demarcated areas.
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The application of a suitable grass seed/runner mix will facilitate this and reduce the minimise weeds.

9.7.5 Dust

- To manage complaints relation to impacts on the nearby communities, a dust register *will* be developed.
- If required, water spray vehicles *will* be used to control wind cause by strong winds during activities on the works.
- No over-watering of the site or road surfaces.
- Wind screens *should* be used to reduce wind and dust in open areas.

9.7.6 Infrastructural Requirements

Topsoil

- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the Regional Manager prior to commencement of any operations.
- The removed topsoil shall be stored on high ground within the footprint outside the 1:50 flood level within demarcated areas (Appendix 1)
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The use of a suitable grass seed/runner mix will facilitate soil protection and minimise weeds/weed growth.

Stormwater and Erosion Control

- Stormwater Management Plans *must* be developed for the site and should include the following:
    - The management of stormwater during construction.
    - The installation of stormwater and erosion control infrastructure.
    - The management of infrastructure after completion of construction.
- Temporary drainage works may be required to prevent stormwater to prevent silt laden surface water from draining into river systems in proximity to the site. Stormwater *must* be prevented from entering or running off site.
- To ensure that site is not subjected to excessive erosion and capable of drainage runoff with minimum risk of scour, their slopes *should* be profiled at a maximum 1:3 gradient.
- Diversion channels *should* be constructed ahead of the open cuts, and above emplacement areas and stockpiles to intercept clean runoff and divert it around disturbed areas into the natural drainage system downstream of the site.
- Rehabilitation is necessary to control erosion and sedimentation of all eroded areas (where works will take place).
- Existing vegetation *must* be retained as far as possible to minimise erosion problems.
- It is importation that the rehabilitation of site is planned and completed in such a way that the runoff water will not cause erosion.
- Visual inspections *will* be done on a regular basis with regard to the stability of water control structure, erosion and siltation.
- Sediment-laden runoff from cleared areas *must* be prevented from entering rivers and streams.
- No river or surface water may be affected by silt emanating from the site.

Site Office / Camp Sites

- No site offices or camp sites will be constructed on the site under current operating conditions, existing structures will be used.

Operating Procedures in the Site

- Construction shall only take place within the approved demarcated site.

- Construction may be limited to the areas indicated by the Regional Manager on assessment of the application.
- The holder of the environmental authorisation shall ensure that operations take place only in the demarcated areas as described in this report.
- Watering to minimise the effect of dust generation should be carried out as frequently as necessary. Noise should also be kept within reason.
- No workers will be allowed to damage or collect any indigenous plant or snare any animal.
- Grass and vegetation of the immediate environment or adapted grass / vegetation will be re-established on completion of construction activities, where applicable.
- No firewood to be collected on site and the lighting of fires must be prohibited.
- Cognisance is to be taken of the potential for endangered species occurring in the area. It is considered unlikely, however, that these species will be affected by the proposed activity.

Excavations

Whenever any excavation is undertaken, the following procedures shall be adhered to:

- Topsoil shall be handled as described in this EMP.
- Excavations shall take place only within the approved demarcated site.
- Excavations must follow the contour lines where possible.
- The construction site will not be left in any way to deteriorate into an unacceptable state.
- The excavated area must serve as a final depositing area for waste rock and overburden during the rehabilitation process.
- Once excavations have been filled with overburden, rocks and coarse natural materials and profiled with acceptable contours (including erosion control measures), the previous stored topsoil shall be returned to its original depth over the area.
- The area shall be fertilised, if necessary, to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally occurring flora.

Rehabilitation of Processing and Excavation Areas

- On completion of construction, the surface of the processing areas especially if compacted due to hauling and dumping operations shall be scarified to a depth of at least 200 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
- The area shall be fertilised, if necessary, to allow vegetation to establish rapidly. The site shall be seeded with suitable grasses and local indigenous seed mix.
- Excavations may be used for the dumping of construction wastes. This *shall* be done in such a way as to aid rehabilitation.
- Waste (non-biodegradable refuse) will not be permitted to be deposited in the excavations.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the activity, be corrected and the area be seeded with a vegetation seed mix to his or her satisfaction. This *must* be done in conjunction with the ECO.
- Final rehabilitation *must* comply with the requirements mention in the Rehabilitation Plan.

9.7.7 Rehabilitation Plan

Rehabilitation Objective

The overall objective of the rehabilitation plan is to minimize adverse environmental impacts associated with the activity whilst maximizing the future utilization of the property. Significant aspects to be borne in mind in this regard is, revegetation of undeveloped footprint and stability and

environmental risk. The depression and immediate area of the working must also be free of alien vegetation. Additional broad rehabilitation strategies / objectives include the following:

- Rehabilitating the worked-out areas to take place concurrently within prescribed framework established in the EMP.
- All infrastructure, equipment, plant and other items used during the construction period will be removed from the site.
- Waste material of any description, including scrap, rubble and tyres, will be removed entirely from the site and disposed of at a recognised landfill facility. It will not be permitted to be buried or burned on site.
- Final rehabilitation shall be completed within a period specified by the Regional Manager.

Topsoil and Subsoil Replacement

Topsoil and subsoil will be stripped and stockpiled separately and only used in rehabilitation work towards the end of the operation. This is in contract to the gravel activity where rehabilitation and topsoil replacement was earmarked at the completion of each phase.
Stripped overburden will be backfilled into the worked-out areas where needed. Stripped topsoil will be spread over the re-profiled areas to an adequate depth to encourage plant regrowth. The vegetative cover will be stripped with the thin topsoil layer to provide organic matter to the relayed material and to ensure that the seed store contained in the topsoil is not diminished. Reseeding may be required should the stockpiles stand for too long and be considered barren from a seed bank point of view. Stockpiles should ideally be stored for no longer than a year.
The topsoil and overburden will be keyed into the reprofiled surfaces to ensure that they are not eroded or washed away. The topsoiled surface will be left fairly rough to enhance seedling establishment, reduce water runoff and increase infiltration.

Revegetation

All prepared surfaces will be seeded with suitable grass species to provide an initial ground cover and stabilize the soil surface. The following grass seed that is commonly available and suitable.

Botanical name	Common name	Approx seed mixture /Ha
Cynodon dactylon	Kweek	12 kg/ Ha
Eragrostis curvula	Weeping Love Grass	6 kg/ Ha
Eragrostis tef	Teff	2 kg/ Ha
Digitaria eriantha	Smuts Grass	4 kg/ Ha
Other indigenous veld grasses can be added to the seed mix		± 4 kg/Ha

The overall revegetation plan will, therefore, be as follows:

- Ameliorate the aesthetic impact of the site
- Stabilise disturbed soil and rock faces
- Minimize surface erosion and consequent siltation of natural water course located on site
- Control wind-blown dust problems
- Enhance the physical properties of the soil
- Re-establish nutrient cycling
- Re-establish a stable ecological system

Every effort must be made to avoid unnecessary disturbance of the natural vegetation during operations.

Drainage and Erosion Control

To control the drainage and erosion at site the following procedures will be adopted:

- Areas where construction is completed should be rehabilitated immediately.
- Areas to be disturbed in future activities will be kept as small as possible (i.e., conducting the operations in phases), thereby limiting the scale of erosion.
- Slopes will be profiled to ensure that they are not subjected to excessive erosion but capable of drainage runoff with minimum risk of scour (maximum 1:3 gradient).
- All existing disturbed areas will be re-vegetated to control erosion and sedimentation
- Existing vegetation will be retained as far as possible to minimize erosion problems.

Visual Impacts Amelioration

The overall visual impact of the proposed activities will be minimised by the following mitigating measures:

- Confining the footprint to an area as small as possible
- Re-topsoiling and vegetating all disturbed areas

9.7.8 Monitoring and Reporting

Adequate management, maintenance and monitoring will be carried out annually by the applicant to ensure successful rehabilitation of the property until a closure certificate is obtained.
To minimise adverse environmental impacts associated with operations it is intended to adopt a progressive rehabilitation programme, which will entail carrying out the proposed rehabilitation procedures concurrently with activity.

9.7.9 Closure objectives and extent of alignment to pre-construction environment

Closure Objectives

The closure of the site will involve removal of all debris and rehabilitation of areas disturbed during the construction phase of the project. This will comprise the scarification of compacted areas, reshaping of areas, topsoiling and rehabilitating all prepared surfaces.

9.8 Annexure G: General Impact Rating Scale

To ensure a direct comparison between various specialist studies, six standard rating scales are defined and used to assess and quantify the identified impacts. This is necessary since impacts have several parameters that need to be assessed.
These scales are:

1. The Severity/ Benefit Scale, which assesses the importance of the impact from a purely technical perspective.
2. The Spatial Impact Scale, which assesses the extent or magnitude of the impact (the area that will be affected by the impact).
3. The Temporal Impact Scale, which assesses how long the impact will be felt. Some impacts are of a short duration, whereas others are permanent.
4. The Degree of Certainty Scale, which provides a measure of how confident the author feels about their prediction.
5. The Likelihood Scale, which provides an indication of the risk or chance of an impact taking place.
6. The Environmental Significance Scale, which assesses the importance of the impact in the overall context of the affected system or party.

To ensure integration of social and ecological impacts, to facilitate specialist assessment of impact significance, and to reduce reliance on value judgments, the severity of the impact within the scientific field in which it takes place (e.g., vegetation, fauna etc.) was assessed first. Thereafter, each impact was assessed within the context of time and space, and the probability of the impact occurring was quantified using the degree of certainty scale.
The impact was then assessed in the context of the whole environment to establish the "environmental significance" of the impact to the flora and vegetation.
The scales are described in detail below.

9.8.1 The Severity/ Beneficial Scale

The *severity scale* was used to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on an affected system (for ecological impacts) or an affected party. This methodology attempts to remove any value judgments from the assessment, although it relies on the professional judgment of the specialist.

NEGATIVE IMPACT	POSITIVE IMPACT
Very severe An irreversible and permanent change to the affected system(s)) which cannot be mitigated. For example, change in topography resulting from a quarry.	Very Beneficiary A permanent and very substantial benefit to the affected system(s) with no alternative to achieve this benefit.
Severe Long-term impacts on the affected system(s) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial A long-term impact and substantial benefit to the affected system(s). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
Moderately severe Medium- to long-term impact on the affected system(s) that could be mitigated.	Moderately beneficial A medium- to long-term impact of real benefit to the affected system(s) Other ways of optimising are equally difficult, expensive and time consuming (or a combination of these), as achieving them in this way.
Slight	Slightly beneficial A short- to medium-term impact and negligible benefit to the affected system(s) Other ways of

NEGATIVE IMPACT	POSITIVE IMPACT
Medium- to short term impacts on the affected system(s) Mitigation is very easy, cheap, less time consuming or not necessary.	optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.
No effect The system(s) is not affected by the proposed development.	Do not know/Cannot know In certain cases, it may not be possible to determine the severity of the impact.

The severity of impacts can be evaluated with and without mitigation order to demonstrate how serious the impact is when nothing is done about it. For beneficial impacts, optimisation means anything that can enhance the benefits. However, mitigation or optimisation must be practical, technically feasible and economically viable.

9.8.2 Spatial and Temporal Scales

Two additional factors were considered when assessing the impacts, namely the relationship of the impact to Spatial and Temporal Scales.
The *spatial scale* (shown in italics) defines the impact at the following scales.

SPATIAL SCALE	EXPLANATION
Localised	at a localised scale (i.e., few hectares in extent). The specific area to which this scale refers is defined for the impact to which it refers.
Study Area	the site, some effects to surrounding area (*~10 km*)
District	the site, some effects to wider surrounding area (*~100 km*)
Regional	the site, some effects to surrounding area (*+250 km*)
National	Impacts will affect at a country level
International	Impacts extend beyond country boundary

The *temporal scale* (shown in italics) defines the impact at the following scales.

TEMPORAL SCALE	EXPLANATION
Short Term	Less than 5 years. Many construction phase impacts will be of a short duration
Medium Term	Between 5 and 20 years
Long Term	Between 20 and 40 years, and from a human perspective essentially permanent.
Permanent	Over 40 years and resulting in a permanent and lasting change.

9.8.3 The Degree of Certainty and the Likelihood Scale

It is also for each specialist to state the degree of certainty, or the confidence attached to their prediction of significance. For this reason, a 'degree of certainty' scale (shown in bold) must be used.

DEGREE	DESCRIPTION
Definite:	More than 90% sure of fact. To use this one will need to substantial supportive data.
Probable:	Between 70% and 90% sure of fact.
Possible:	Between 40% and 70% sure of fact.
Unsure:	Less than 40% sure of fact.

The risk or likelihood (shown in normal font) of impacts being manifested differs. There is no doubt that some impacts would occur, but certain other (usually secondary data) impacts are not as likely and

may or may not result. Although these impacts maybe severe, the likelihood of them occurring may affect their overall significance and must therefore be considered. It is therefore necessary for the author to state his estimate of the likelihood of an impact occurring, using the following likelihood scale:

DEGREE	DESCRIPTION
Very unlikely	The chance of these impacts occurring is extremely slim, e.g., natural forces destroying a dam wall.
Unlikely	The risk of these impacts occurring is slight.
May occur	The risk of these impacts is more likely, although it is not definite.
Very Likely	Slight chance that this impact will not occur.
Definite	There is no chance that this impact will not occur.

9.8.4 The Environmental Significance Scale

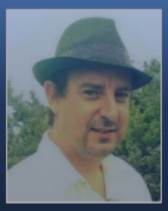
The environmental significance scale is an attempt to evaluate the significance of an impact, the severity or benefit of which has already been assessed. This evaluation needs to be assessed in the relevant context, as an impact can either be ecological or social, or both. Since the severity of impacts with and without mitigation will already have been assessed, significance was only evaluated after mitigation. In many cases, this mitigation will take place, as it has been incorporated into project design. A six-point significance scale is applied as follows:

SIGNIFICANCE	DESCRIPTION
Very High (6)	Impacts considered to have a major and permanent change to natural environment and are rate as VERY HIGH, usually resulting to severe or very severe/ beneficial to highly beneficial effects.
High (5)	Long term change and are rated as HIGH resulting to severe or moderately severe effects/ beneficial to moderately beneficial.
Moderate (4)	Medium to long-term effects. Impacts are rated as MODERATE with moderately severe or moderately beneficial effects.
Low (3)	Medium to short term effects. Impacts are rated as MODERATE resulting in moderately severe or moderately beneficial effects.
Insignificant (2)	Short term effects are present. Impacts are rated as SLIGHT resulting in SLIGHTLY BENEFICIAL effects. Residual effects are present but are of no consequence.
No Significance (1)	No primary or secondary effects, resulting in NO SIGNIFICANT impact.
Do not Know (0)	Not possible to determine the significance of impacts

9.8.5 Absence of Data

In certain instances, an assessment must be produced in the absence of all the relevant and necessary data, due to paucity or lack of scientific information on the study area. It is more important to identify all the likely environmental impacts than to precisely evaluate the more obvious impacts. It is important to be on the conservative side in reporting likely environmental impacts. Because assessing impacts with a lack of data is more dependent on scientific judgment, the rating on the certainty scale cannot be too high. It is for these reasons that a degree of certainty scale has been provided, as well as the categories DON'T KNOW or CAN'T KNOW.

9.9 Appendix H: Declaration, Specialist Profile and Registration



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ABOUT ME

16 years broad professional experience in Biodiversity, Ecological and Vegetation Assessments on over 220 projects in southern, western and central Africa. Senior Environmental Consultant and EAP on over 50 projects in the mining, infrastructure, housing and agricultural sectors. Environmental monitoring and auditing on over 50 civil infrastructure and construction projects. Have managed all aspects of projects from inception through to implementation. GIS mapping and analytics.

EDUCATION

Bachelor of Science
Rhodes University
2001 (Botany & Environmental Science)

Bachelor of Science (Honours)
Rhodes University
2002 (Botany)

Professional Natural Scientist
SACNASP
2016

SERVICES

Terrestrial Biodiversity/Ecological Assessments
Environmental & Ecological Risk-Assessments
Bioremediation, Restoration & Rehabilitation Plans
Environmental Management Plans & Programmes
GIS Mapping & Analysis & Web maps
Alien Invasive Management (Terrestrial)
Environmental Auditing & Monitoring (ECO)
Flora Search & Rescue & Relocation
Independent Environmental & Ecological review
Permit and License applications
Environmental & Mining Applications

EXPERIENCE AND CLIENTS

Key Sectors

- *Wind, Solar Energy Facilities*
- *Infrastructure and Housing*
- *Agriculture and Forestry*
- *Mining and Industrial*

Key Projects

- *Over 220 independent Biodiversity/Ecological Assessments throughout southern, western and central Africa.*
- *Mining applications and construction auditing on over 40 projects and more than 300 gravel borrow pits for the Eastern Cape Department of Roads and Public Works, Department of Transport and the South African National Roads Agency (SANRAL) throughout the Eastern Cape.*
- *South-End Precinct Mixed Use Development for Mandela Bay Development Agency - Environmental application, Ecological assessments and Construction monitoring.*
- *Coega Development Corporation IDZ projects – Ecological assessments, Flora search & rescue and Construction monitoring.*
- *Environmental applications, construction monitoring and auditing for a wide range of projects, including infrastructure and housing for various clients including the Department of Transport and SANRAL.*
- *Various agricultural expansion and infrastructure projects.*
- *Various wind and solar energy and associated infrastructure projects.*
- *Numerous infrastructure projects including electrical, water and roads.*
- Various Environmental Management and Rehabilitation Plans.

SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Jamie Robert Claude Pote

Registration Number: 115233

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Ecological Science (Professional Natural Scientist)

Effective **20 July 2016** Expires **31 March 2023**

Chairperson

Chief Executive Officer

To verify this certificate scan this code

MR JAMIE POTE BSC (HONS) PR.SCI.NAT.

PROJECT EXPERIENCE

PERFORMANCE STANDARD BIODIVERSITY AND CRITICAL HABITAT ASSESSMENTS

- Critical Habitat & Biodiversity Assessment - Roggeveld Wind Energy Project 2020
- Biodiversity Assessment for Kalukundi Copper/Cobalt Mine, Democratic Republic of Congo 2008

WIND FARM AND PHOTOVOLTAIC INFRASTRUCTURE PROJECTS

- Ecological Assessment for Windcurrent Wind Farm, Eastern Cape 2012
- Ecological Assessment for Universal Windfarm, NMB 2011
- Ecological Assessment for Inca Energy Windfarm, Northern Cape 2011
- Ecological Assessment for Broadlands Photovoltaic Farm, Eastern Cape 2011
- Botanical Assessment for Electrawinds Windfarm Coega, NMB 2010
- Botanical Assessment and Open Space Management Plan for Mainstream WEF Phase 2, Eastern Cape 2010

SPECIALISED ECOLOGICAL REPORTS

- Rehabilitation Plan for Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- Green Star Rating Ecological Assessment for SANRAL office, Bay West City, NMBM 2015
- Section 24G Assessment and Rehabilitation Plan for Bingo Farm, Eastern Cape 2014
- Mapping and Ecological services for Congo Agriculture, Republic of Congo 2013
- Rehabilitation Plan for Nieu Bethesda, Eastern Cape 2011
- Mapping of pipeline for Kenton Water Board, Eastern Cape 2010
- Rehabilitation Plan for N2 Upgrade - Coega to Colchester, NMB 2010
- Representative for landowner group for Seaview burial Park, NMB 2010
- Botanical Sensitivity Analysis for LSDF, Greenbushes-Hunters Retreat, NMB 2008
- Forestry Rehabilitation Assessment Report for Amahlathi Forest Rehabilitation, Eastern Cape 2007
- Botanical & Riparian Assessment for Orange River Weirs-Boegoeberg, Douglas Dam and Sendelingsdrif, Northern Cape 2006
- Botanical Assessment for State of the Environment Report for Chris Hani District Municipality SoER, Eastern Cape 2003

GENERAL INFRASTRUCTURE DEVELOPMENT PROJECTS

- Ecological Assessment for Vermaak Boerdery Hydro Turbine (Cookhouse), Eastern Cape 2020
- Ecological Assessment for Amalinda crossing, BCM, Eastern Cape 2019
- Ecological Assessment for Cookhouse Bridge rehabilitation and temporary deviation, Eastern Cape 2019
- Ecological Assessment for Nelson Mandela University Access Road, NMB 2019
- Botanical Assessment for Zachtevlei Dam (Lady Grey), Eastern Cape 2017
- Botanical Assessment for Gcebula River bridge (Peddie), Eastern Cape 2017
- Botanical Assessment for Kouga Dam wall upgrade, Eastern Cape 2012
- Botanical Assessment for Jansenville Cemetery, Eastern Cape 2009
- Botanical Assessment for Radar Mast construction for South African Weather Service – BCM & NMB 2008
- Botanical Assessment and GIS mapping for golf course realignment for East London Golf Course, BCM, Eastern Cape 2007
- Botanical Assessment for PE Airport Extention, NMB 2006
- Botanical Assessment for Kidd's Beach Desalination Plant, BCM, Eastern Cape 2006

ROAD AND RAILWAY INFRASTRUCTURE PROJECTS

- Ecological Assessment for CDC IDZ Mn Terminal, conveyor and railway line, NMB 2013

- Ecological Assessment Review for Penhoek Road widening, Eastern Cape 2012
- Ecological Assessment for R61 road widening, Eastern Cape 2012
- Botanical Assessment for Chelsea RD - Walker Drive Ext., NMB 2010
- Botanical Assessment for Motherwell - Blue Water Bay Road, NMB 2010
- Ecological Assessment for Port St John Road, Eastern Cape 2010
- Botanical Basic Assessment for Bholani Village Rd, Port St Johns, Eastern Cape 2009
- Botanical Report, EMP and Rehab Plan for Coega-Colchester N2 Upgrade, NMB 2009
- Botanical Assessment for Manganese Conveyor Screening Report, NMB 2008
- Ecological Assessment for Road Layout for Whiskey Creek- Kenton, Eastern Cape 2006

MINING PROJECTS

- Ecological Assessment for Bochum Borrow Pits, Limpopo 2013
- Ecological Assessment and Mining and Rehabilitation Plan for Greater Soutpansberg Mining Project, Limpopo (3 proposed Mines) 2013
- Ecological Assessment for Thulwe Road Borrow Pits, Limpopo 2013
- Ecological Assessment and Mining and Rehabilitation Plan for Baghana Mining, Ghana 2010
- Botanical Assessment for Zwartenbosch Quarry, Eastern Cape 2008
- Botanical description & map production for Quarry - Rudman Quarry, Eastern Cape 2008
- Botanical Basic Assessment, Rehab Plan & Maps for Borrow Pit - Rocklands/Patensie, Eastern Cape 2008
- Botanical Assessment & Maps for Sandman Sand Gravel Mine, Eastern Cape 2008
- Botanical Assessment & GIS maps for Shamwari Borrow Pit, Eastern Cape 2008
- Detailed Botanical Assessment, EMP and Rehab Plan for Kalukundi Copper/Cobalt Mine, Democratic Republic of Congo 2008
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit Humansdorp/Oyster Bay, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Cala, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Camdeboo, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Somerset East, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Nkonkobe, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Ndlambe, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Blue Crane Route, Eastern Cape 2008
- Botanical Assessment, EMP and Rehabilitation Plan for AWRM - Cathcart, Eastern Cape 2008
- Botanical Assessment, GIS maps and Rehab Plan for Mthatha Prospecting, Eastern Cape 2008
- Regional Botanical Map for mining prospecting permit, Welkom 2008
- Botanical Assessment for Scoping Report and Detailed Botanical Assessment and Rehab Plan for Elitheni Coal Mine, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Oyster Bay, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Bathurst/GHT, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit – Jeffreys Bay, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Storms river/Kareedouw, Eastern Cape 2007
- Biophysical Assessment for Humansdorp Quarry, Eastern Cape 2006
- Botanical Assessment, Rehab Plan & Maps for Quarry-Cathcart & Somerset East, Eastern Cape 2006
- Botanical Assessment, Rehab Plan & Maps for Quarry - Despatch Quarry, NMB 2006
- GIS Mapping & Botanical Assessment and Rehab Plan for Quarry - JBay Crushers, Eastern Cape 2006
- Botanical Assessment, EMP and Rehabilitation Plan for Polokwane Silicon Smelter, Limpopo 2006
- Application for Mining Permit for Bruce Howarth Quarry, Eastern Cape 2006

POWERLINE INFRASTRUCTURE PROJECTS

- Ecological Assessment: Dieprivier-Karreedouw 132kV Powerline realignment, Kouga LM 2016
- Eskom Ecological Walkdown: Dieprivier-Karreedouw 132 kV Powerline, Kouga LM 2016
- Eskom Solar one Ecological Walkdown: Nieuwehoop 400 kV powerline 2015
- Rehabilitation Plan and Auditing for Grassridge-Poseidon Powerline Rehab, Eastern Cape 2013
- Ecological Assessment for Dieprivier Karreedouw 132kV Powerline, Eastern Cape 2012

- Flora and Fauna search and Rescue plan for Van Stadens Windfarm Powerline, NMB 2012
- Botanical Assessment for Dedisa-Grassridge Powerline, Eastern Cape 2010
- Ecological Assessment for Grahamstown-Kowie Powerline, Eastern Cape 2010
- Species of Special Concern Mapping Transmission Line for San Souci to Nivens Drift 132kV powerline, NMB 2009
- Botanical Assessment for Eskom Powerline - Albany-Kowie, Eastern Cape 2009
- Botanical Assessment for Eskom 132 kV Dedisa Grassridge Power line-Coega, NMB 2006
- Botanical Assessment for Eskom Power line – Tyalara-Wilo, Eastern Cape 2006
- Botanical Assessment for Steynsburg - Teebus 132 kV powerline, Eastern Cape 2004

PIPELINE INFRASTRUCTURE PROJECTS

- Terrestrial Biodiversity Assessment for Thornhill Phase 2 Sanitation Link, Ndlambe, Eastern Cape 2020
- Botanical Assessment for Ngqamakhwe Regional Water Supply Scheme (Phase 3) 2018
- Ecological Assessment for Butterworth Emergency Bulk Water Supply Scheme 2017
- Ecological Assessment for Karringmelkspruit Emergency Bulk Water Supply (Lady Grey) 2017
- Ecological Assessment for Wanhoop-Willowmore Bulk Water Supply, Eastern Cape 2016
- Ecological Assessment for Steytlerville Bulk Water Supply, Eastern Cape (Phase 4) 2013
- Ecological Assessment for Steytlerville Bulk Water Supply, Eastern Cape (Phase 5) 2013
- Detailed Ecological Assessment for Suikerbos Pipeline, Gauteng 2012
- Basic Botanical Assessment for Wanhoop farm pipeline, Eastern Cape 2010
- Basic Botanical Assessment for Chatty Sewer, NMB 2010
- Species of Special Concern Mapping for Seaview Pipeline, NMB 2009
- Species of Special Concern Mapping for Chelsea Bulk Water Pipeline, NMB 2009
- Map Production for Russell Rd Stormwater, NMB 2008
- Basic Botanical Assessment for Albany Pipeline, Eastern Cape 2008
- Environmental Risk Assessment for Elands River pipeline, Eastern Cape 2007
- Detailed Botanical Assessment for Motherwell Pipeline, NMB 2007
- Detailed Botanical Assessment, GIS maps for Erasmuskloof Pipeline, Eastern Cape 2007
- Botanical & Floristic Report for Hankey pipeline, Eastern Cape 2006
- Detailed Botanical Assessment for Port Alfred water pipeline, Eastern Cape 2004

HOUSING DEVELOPMENT PROJECTS

- Terrestrial Biodiversity Assessment for Erf 1820 Mthatha, KSDM, Eastern Cape 2020
- Ecological Assessment for Erf 599 Walmer Mixed Use Development, Nelson Mandela Bay 2019
- Ecological Assessment for erf 14, Kabega, Port Elizabeth 2017
- Ecological Assessment for Fairwest Rental Housing, Port Elizabeth 2017
- Ecological Assessment for Hankey Housing, Kouga District Municipality 2015
- Ecological Assessment for Lebowakgoma Housing, Limpopo 2013
- Ecological Assessment for Giyani Development, Limpopo 2013
- Ecological Assessment for Palmietfontein Development, Limpopo 2013
- Ecological Assessment for Seshego Development, Limpopo 2013
- Botanical Assessment for Sheerness Road, BCM, Eastern Cape 2013
- Ecological Assessment for Ethembeni Housing, NMB 2012
- Ecological Assessment for Pelana Housing, Limpopo 2012
- Flora Search and Rescue Plan for Kwanobuhle Housing, Western Cape 2011
- Botanical Assessment for The Crags 288/03, Western Cape 2010
- Ecological Assessment Revision Report for Fairview Housing, NMB 2010
- Botanical Assessment, EMP and Open Space Management Plan for Hornlee Housing Development, Western Cape 2010
- Botanical Assessment for Little Ladywood, Western Cape 2010
- Botanical Assessment and Open Space Management Plan for Motherwell NU31, NMB 2010
- Botanical Assessment and Open Space Management Plan for Plett 443/07, Western Cape 2010

- Botanical Assessment for Willow Tree Farm, NMB 2010
- Botanical Assessment for Kouga RDP Housing, Eastern Cape 2009
- Botanical Assessment for Fairview Erf 1226 (Wonderwonings), NMB 2009
- Species List Compilation for Zeekoerivier Humansdorp, Eastern Cape 2009
- Botanical Assessment for Woodlands Golf Estate (Farm 858), BCM, Eastern Cape 2009
- Botanical Assessment for Plettenberg Bay - 438/4, Western Cape 2009
- Vegetation Assessment for Kwanokuthula RDP housing project, Western Cape 2008
- Site screening assessment for Greenbushes Site screening, NMB 2008
- Botanical Assessment for Fairfax development, Eastern Cape 2008
- Botanical Assessment for Plettenberg Bay Brakkloof 50&51, Western Cape 2008
- Botanical Assessment, GIS mapping for Theescombe Erf 325, NMB 2008
- Site Screening for Mount Road, NMB 2008
- Botanical Assessment for Greenbushes Farm 40 Swinburne 404, NMB 2008
- Botanical Assessment for Greenbushes 130, NMB 2008
- Botanical Assessment for Greenbushes Kuyga no. 10, NMB 2008
- Botanical Assessment for Plettenberg Bay - 438/24, Western Cape 2007
- Botanical Assessment for Plettenberg Bay - Olive Hills 438/7, Western Cape 2007
- Botanical Assessment for Gonubie Portion 809/9, BCM, Eastern Cape 2006
- Botanical Assessment for Glengariff Farm 723, BCM, Eastern Cape 2006
- Botanical Assessment for Gonubie Portion 809/10, BCM, Eastern Cape 2006
- Botanical Assessment for Gonubie Portion 809/4 & 5, BCM, Eastern Cape 2006
- Botanical Assessment for Plettenberg bay - Ladywood 438/1&3, Western Cape 2006
- Botanical Assessment and Rehab Plan for Winterstrand Desalination Plant, BCM 2006
- Botanical Assessment for Bosch Hoogte, NMB 2006
- Botanical Assessment for Plettenberg bay Farm 444/38, Western Cape 2006
- Botanical Assessment for Plettenberg Bay - 444/27, Western Cape 2006
- Botanical Assessment for Leisure Homes, BCM, Eastern Cape 2006
- Botanical Basic Assessment for Trailees Wetland Assessment, Eastern Cape 2005
- Botanical Assessment and Rehab Plan for Arlington Racecourse - PE, NMB 2005
- Botanical Assessment for Smart Stone, NMB 2005
- Botanical Assessment for Peninsular Farm (Port Alfred), Eastern Cape 2005
- Botanical Assessment for Mount Pleasant - Bathurst, Eastern Cape 2005
- Botanical Assessment and RoD amendments for Colchester Erven 1617 & 1618 (Riverside), NMB 2005
- Basic Botanical Assessment for Parsonsvlei 3/4, Eastern Cape 2005
- Botanical Assessment for Bridgemead – Malabar PE, NMB 2004

AGRICULTURAL PROJECTS

- Ecological Assessment for Citrus expansion on Hitgeheim Farm, Sunland, Eastern Cape 2015
- Ecological Assessment for Doornkraal Pivot (Hankey), Eastern Cape 2014
- Ecological Assessment for Citrus expansion on Farm 960, Patensie 2014
- Ecological Assessment for Tzaneen Chicken Farm, Limpopo 2013
- Botanical Assessment and Open Space Management Plan for Kudukloof, NMB 2010
- Botanical Assessment and Open Space Management Plan for Landros Veeplaats, NMB 2010
- Botanical Assessment and Flora Relocation Plan for Wildemans Plaas, NMB 2006

GOLF ESTATE AND RESORT DEVELOPMENT PROJECTS

- Species List& Comments Report for Kidds Beach Golf Course, BCM, Eastern Cape 2009
- Botanical Assessment for Plettenberg Bay -Farm 288/03, Western Cape 2009
- Botanical Assessment for Rockcliff Golf Course, BCM, Eastern Cape 2008
- Botanical Assessment for Rockcliff Resort Development, BCM, Eastern Cape 2007
- Botanical Assessment, EMP and Rehabilitation Plan for Tiffendel Ski Resort, Eastern Cape 2006

MIXED USE DEVELOPMENT PROJECTS

- Ecological Assessment for South-End Precinct Mixed Use Development, Nelson Mandela Bay 2018
- Botanical Assessment, EMP and Open Space Management Plan for Bay West City, NMB 2010
- Botanical Assessment, GIS maps, Open Space and Rehab Plans for Fairview Erf 1082, NMB 2009
- Botanical Assessment and GIS maps for Utopia Estate PE, NMB 2008
- Botanical Assessment and GIS mapping for Madiba Bay Leisure Park, NMB 2007
- Botanical Assessment and GIS mapping for Madiba Bay Leisure Park, NMB 2007
- Botanical Basic Assessment for Cuyler Manor (Farm 320), Uitenhage, NMB 2007

BUSINESS AND INDUSTRIAL DEVELOPMENT PROJECTS

- Ecological Assessment for Parsonsvlei Erf 984 & 1134 Parsonsvlei, NMB 2020
- Ecological Assessment for Walmer Erf 11667 - Bidfood Warehousing Development, NMB 2020
- Ecological Assessment for Portion 87 of the Farm Little Chelsea No 10, NMB 2020
- Ecological Assessment for Bay West City ENGEN Service Station, NMB 2015
- Ecological Assessment for Green Star grading for SANRAL, NMB 2014
- Ecological Assessment for OTGC Tank Farm, NMB 2012
- Botanical Assessment and Open Space Management Plan for Petro SA Refinery, Coega IDZ, NMB 2010
- Botanical Assessment for Bluewater Bay Erf 805, NMB 2009
- Ecological Assessment for Bay West City, NMB 2007
- Botanical Assessment for Kenton Petrol Station, Eastern Cape 2005
- Botanical Assessment and RoD amendments for Colchester Petrol Station, NMB 2005

ECO-ESTATE DEVELOPMENT PROJECTS

- Botanical Re-Assessment of Swanlake Eco Estate, Aston Bay, Eastern Cape 2018
- Detailed Botanical Assessment and Open Space Management Plan for Olive Hills, Western Cape 2010
- Botanical Assessment and EMP for Zwartenbosch Road, Eastern Cape 2010
- Botanical Assessment - Poultry Farm for Coega Kammaskloof Farm 191, NMB 2008
- Botanical Assessment - Housing development for Coega Ridge, NMB 2008
- Botanical Assessment, Rehabilitation Plan, EMP and GIS maps for Amanzi Estate, NMB, 2008
- Botanical Assessment for Roydon Game farm, Queenstown, Eastern Cape 2007
- Botanical Assessment for Winterstrand Estate (Farm 1008), BCM, Eastern Cape 2007
- Botanical Assessment for Homeleigh Farm 820, BCM, Eastern Cape 2007
- Botanical Basic Assessment, Rehab Plan & Maps for Candlewood, Tsitsikamma, Western Cape 2007
- Botanical Assessment, EMP and Rehab Plan for Carpe Diem Eco development, Eastern Cape 2007
- Botanical Assessment, EMP and Rehabilitation Plan for Seaview Eco-estate, NMB 2006
- Botanical Assessment for Kidd's Beach portion 1076, BCM, Eastern Cape 2006
- Botanical Assessment for Palm Springs, Kidds Beach East London, BCM, Eastern Cape 2006
- Botanical Assessment for Nahoon Farm 29082, BCM, Eastern Cape 2006
- Botanical Assessment for Rosehill Farm, Eastern Cape 2005
- Botanical Assessment for Resolution Game Farm, Eastern Cape 2005
- Botanical Assessment for Gonubie Portion 809/11, BCM, Eastern Cape 2005
- Botanical Assessment for Kidd's Beach portion 1075, BCM, Eastern Cape 2005

FLORA AND FAUNA RELOCATION PLANS, PERMITS AND IMPLEMENTATION

- Flora Search and Rescue for Nelson Mandela University Phase 2 & 3 Residences, Eastern Cape 2020
- Flora Search and Rescue for Fairwest Housing Estate, Nelson Mandela Bay, Eastern Cape 2019
- Flora Search and Rescue for Utopia Estate, Nelson Mandela Bay, Eastern Cape 2019
- Flora Search and Rescue for Citrus expansion on Boschkraal Citrus Farm, Sunland, Eastern Cape 2018
- Flora Search and Rescue for Wanhoop pipeline, Willowmore, Eastern Cape 2018
- Flora Search and Rescue for Citrus expansion on Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017

- Flora Search and Rescue for Steytlerville Bulk Water Supply, Eastern Cape (Phase 5) 2016
- Flora Search and Rescue for Citrus expansion on Farm 960, Patensie (AIN du Preez Boerdery) 2016
- Flora Search and Rescue for Steytlerville Bulk Water Supply & WTW, Eastern Cape (Phase 4) 2015
- Flora and Fauna Search and Rescue for Riversbend Citrus Farm, NMB 2014
- Flora and Fauna Search and Rescue for Mainstream Windfarm, Eastern Cape 2013
- Flora Search and Rescue for Steytlerville Bulk Water Supply, Eastern Cape (Phase 1, 2 & 3) 2013
- Flora and Fauna Search and Rescue for OTGC Tank Farm, Coega IDZ, NMB 2013
- Flora and Fauna Search and Rescue for Jeffreys Bay School, Eastern Cape 2013
- Flora Search and Rescue Plan for Red Cap Wind Farm, Eastern Cape 2012
- Flora Relocation for Disco Poultry Farm, NMB 2010
- Flora Relocation for Mainstream Windfarm, Eastern Cape 2010

ENVIRONMENTAL MANAGEMENT PLANS

- Final Environmental Management Programme (EMPr) and Maintenance Management Plan for South End Precinct Mixed Use Zone, Nelson Mandala Bay Municipality 2020
- Final Environmental Management Programme (EMPr) for Coega Land-Based Aquaculture Development Zone (ADZ), Coega Industrial Development Zone (IDZ), Nelson Mandela Bay Municipality 2019
- Basic Botanical Assessment for Kromensee EMP (Jeffries Bay), Eastern Cape 2010
- Wetland Management Plan for NMB Portnet, NMB 2010
- Baseline Botanical Study, Vegetation mapping and EMP for Local Nature Reserve for Plettenberg Bay Lookout LNA, Western Cape 2009
- Biodiversity & Ecological Processes for Bathurst-Commonage, Eastern Cape 2006
- EMP for Kromensee EMP (Jeffries Bay), Eastern Cape 2006
- Floral Survey for Mbotyi Conservation Assessment, Eastern Cape 2005
- Identifying and Assessment on Aquatic Weeds for Pumba Private Game Reserve, Eastern Cape 2005

ENVIRONMENTAL MANAGEMENT, AUDITING, COMPLIANCE AND MONITORING PROJECTS

- ECO for DRPW IRM Road Maintenance projects, Baviaans LM 2019
- ECO for DRPW IRM Road Maintenance projects, Senqu LM 2019
- ECO for DRPW IRM Road Maintenance projects, Kouga/Koukamma LM 2019
- ECO for DRPW IRM Road Maintenance projects, Sakhisizwe/Engcobo LM 2019
- ECO for DRPW IRM Road Maintenance projects, Elundini LM 2019
- ECO for DRPW IRM Road Maintenance projects, Emalahleni/Intsika Yethu LM 2019
- ECO for Construction of Fairwest Village Housing Project 2019
- ECO for Construction of Utopia Estate 2019
- ECO for Construction of NMU West End Student Residences Phases 1 & 3 2019
- ECO for DRPW IRM Road Maintenance projects, Raymond Mahlaba LM 2018
- ECO for DRPW IRM Road Maintenance projects, Inkwanca (Enoch Mgijima) LM 2018
- ECO for Citrus expansion on Farm 960, Patensie (AIN du Preez Boerdery) 2017
- ECO for Citrus expansion on Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- DEO for improvement of national route R67 section 5 from Whittlesea (km 0.00) to Swart Kei river (km 15.40) – Murray & Roberts 2017
- ECO for SANRAL RRP Road Maintenance projects, Mbizana LM 2017
- ECO and Botanical Specialist for the special maintenance of national route R61 Section 2 from Elinus Farm (km 42.2) to N10 (km 85.0) (SANRAL) 2016
- Environmental Control Officer (ECO): Construction of NSRI Slipway - Port Elizabeth Harbour 2016
- ECO for SANRAL RRP Road Maintenance projects, Mbashe LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Nkonkobe LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Mbizana LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Senqu LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Elundini LM 2016

- ECO and Environmental Management for closure of Bushmans River Landfill site 2016
- ECO for DRPW IRM Road Maintenance projects, Amahlathi Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Makana/Ndlambe Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Mbashe/Mqume Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Port St Johns, Mbizana, Ingquza Hill LM's 2015
- ECO for Riversbend Citrus Farm, NMB 2014
- ECO for Alfred Nzo DM Road resurfacing - DR08071, DR08649, DR08092, DR08418, DR08452, DR08015, DR08085, DR08639 & DR08073, Eastern Cape - MSBA 2014
- ECO Audits for Koukamma Flood Damage Road Repairs – Hatch Goba 2014
- EMP and ECO for Utopia Estate, NMB 2013
- Final EMP submission for Seaview Garden Estate, NMB 2012
- ECO audits for NMB Road surfacing, NMB (multiple contacts) 2011
- EMP submission and ECO for Seaview Garden Estate, NMB 2010
- ECO for Mainstream Windfarm wind monitoring mast installation, Eastern Cape 2010
- EMP and ECO for Sinati Golf Estate EMP, BCM, Eastern Cape 2009
- Flora Relocation Plan and Permit application for Wildemans Plaas, NMB 2006

BASIC ASSESSMENT APPLICATION PROJECTS (DEDEAT)

- Basic Assessment Application for Parsonsvlei Erf 984 & 1134 Parsonsvlei 2020
- Basic Assessment Application for Vermaak Boerdery Hydro Turbine (Cookhouse) 2020
- Basic Assessment Application for Walmer Erf 11667 Bidfood Warehousing Development 2020
- Basic Assessment Application for Portion 87 of the Farm Little Chelsea No 10 2020
- Basic Assessment Application for Nelson Mandela University Access Road, NMB 2019
- Basic Assessment Application for Erf 599 Walmer Mixed Use Development, Nelson Mandela Bay 2019
- Basic Assessment Application for Cookhouse Bridge rehabilitation and temporary deviation 2019
- Basic Assessment Application for Erf 14 Kabega, NMBM 2017
- Basic Assessment Application for Hankey Housing, Kouga District Municipality 2017
- Basic Assessment Application for Fairwest Rental Housing, Nelson Mandela Bay 2017
- Basic Assessment Application for Citrus expansion on Hitgeheim Farm, Sunland, Eastern Cape 2015
- Basic Assessment Application for Hankey Housing, Kouga District Municipality 2015
- Basic Assessment Application for Citrus expansion on farm 960, Patensie (AIN du Preez Boerdery) 2014
- Basic Assessment Application for South-End Precinct Mixed Use Development, Nelson Mandela Bay 2018

ENVIRONMENTAL SCREENING PROJECTS

- Environmental Screening Report for Proposed Life Hospital parking expansion, NMB 2019
- Environmental Screening Report for Erf 984 & 1134 development, Parsonsvlei, NMB 2019
- Environmental Screening Report for proposed Khayalethu School, Buffalo City 2018
- Environmental Screening Report for Proposed Housing Development of Erf 8700, Kabega Park, NMB 2017
- Environmental Screening Report for Proposed Housing Development of Erf 14, Kabega Park, NMB 2017
- Environmental Screening Report for Proposed Fairwest Social Housing project, Fairview, NMB 2016
- Environmental Screening Report for Development of Little Chelsea No 25, NMB 2016
- Terrestrial Vegetation Risk Assessment for proposed Skietnek Citrus Farm development (Kirkwood) 2015
- Preliminary Environmental Risk Assessment: NSRI Slipway Port Elizabeth 2015
- Environmental Screening Report for Proposed Development of a Dwelling on Erf 899, Theescombe 2015
- Environmental Screening Report for Proposed Development on Erf 559, Walmer, Port Elizabeth 2015
- Environmental Screening Report for Proposed Housing Scheme Development of Erf 8709, Wells Estate 2015
- Environmental Screening Report for Development of Portion 10 of Little Chelsea No 87, NMB 2015

MINING PERMIT/ENVIRONMENTAL MANAGEMENT PROGRAMME APPLICATIONS (DMR)

- Mining BAR/EMP's for Blue Crane Route LM Borrow Pits – (DoT) 2019
- Mining BAR/EMP's for 24 Borrow Pits in 6 districts within the Eastern Cape– (SANRAL) 2018
- Mining BAR/EMP's for Ingquza Hill LM Borrow Pits – (SANRAL) 2017
- Mining BAR/EMP's for Baviaans LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Senqu LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Kouga/Koukamma LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Inkwanca (Enoch Mgijima) LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Kouga/Koukamma LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Sakhisizwe/Engcobo LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Raymond Mahlaba LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Camdeboo LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Elundini LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Emalahleni/Intsika Yethu LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Nkonkobe LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Mbhashe LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Mbizana LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Senqu LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Elundini LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Emalahleni LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Emalahleni LM Borrow Pits – (DRPW) 2016
- Mining BAR/EMP's for Ikwezi/Baviaans LM Borrow Pits – (DRPW) 2016
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - MR00716 (Tarkastad) (DRPW) 2015
- Mining BAR/EMP's for Chris Hani DM Borrow Pits – Intsika Yethu and Emalahleni (DRPW) 2015
- Mining BAR/EMP's for Joe Gqabi DM Borrow Pits – Senqu (DRPW) 2015
- Mining BAR/EMP's for Makana/Ndlambe LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Amahlathi LM Borrow Pits – Amatole (DRPW) 2015
- Mining BAR/EMP's for Mbashe/Mqume LM Borrow Pits – Amatole (DRPW) 2015
- Mining BAR/EMP's for Sundays River Valley LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Kouga LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - MR00716 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR02581 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08041, DR08247, DR08248 & DR08504 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08599, DR08601 & DR08570 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08235, DR08551 & DR08038 (DRPW) 2014
- Mining BAR/EMP's for Alfred Nzo DM Borrow Pits - DR08092, DR08093 & DR08649 (DRPW) 2014
- Mining BAR/EMP's for Alfred Nzo DM Borrow Pits - DR08090, DR08412, DR08425, DR08129, DR08109, DR08106, DR08104 & DR08099 – Matatiele (DRPW)

SECTION 24G APPLICATIONS

- 12 000 ML Dam constructed on farm 960, Patensie (MGM Trust) 2015
- Illegal clearing of 20 Ha of lands on Hitgeheim Farm, Sunland, Eastern Cape 2015

GIS AND IT DEVELOPMENT

- Development of *iAuditor* Environmental Audit templates (DRPW audits) 2014
- Landsat Image classification and analysis (Congo Agriculture) 2010
- Development of GIS databases and mapping tools for Manifold GIS software 2008

CONFERENCES AND PUBLICATIONS

- Pote, J., Shackleton, C.M., Cocks, M. & Lubke, R. 2006. Fuelwood harvesting and selection in Valley Thicket, South Africa. Journal of Arid Environments, 67: 270-287.
- Pote, J., Cocks, M., Dold, T., Lubke, R.A. and Shackleton, C. 2004. The homegarden cultivation of indigenous medicinal plants in the Eastern Cape. Indigenous Plant Use Forum, 5 - 8 July 2004, Augsburg Agricultural School, Clanwilliam, Western Cape.
- Pote, J. & Lubke, R.A. 2003. The selection of indigenous species suitable for use as fuelwood and building materials as a replacement of invasive species that are currently used by the under-privileged in the Grahamstown commonage. Working for Water Inaugural Research Symposium 19 - 21 August 2003, Kirstenbosch. Poster presentation.
- Pote, J. & Lubke, R.A. 2003. The screening of indigenous pioneer species for use as a substitute cover crop for rehabilitation after removal of woody alien species by WfW in the grassy fynbos biome in the Eastern Cape. Working for Water Inaugural Research Symposium 19 - 21 August 2003, Kirstenbosch, South Africa.

OTHER RESEARCH EXPERIENCE

- Resource assessment of bark stripped trees in indigenous forests in Weza/Kokstad area (June 2000; Dr C. Geldenhuis & Mr. M. Kaplin).
- Working for Water research project for indigenous trees for woodlots (December 2000/January 2001; Prof R.A. Lubke, Rhodes University).
- Project coordinator and leader of the REFYN project – A BP conservation gold award: Conservation and Restoration of Grassy-Fynbos. A multidisciplinary project focusing on management, restoration and public awareness/education (2001 – 2002).
- Conservation Project Management Training Workshops: Royal Geographical Society, London 2001 – Fieldwork Techniques, Habitat Assessment, Biological Surveys, Project Planning, Public Relations and Communications, Risk Assessment, Conservation Education
- Selection and availability of wood in Crossroads village, Eastern Cape, South Africa. Honours Research Project 2002. Supervisors: Prof. R.A. Lubke & Prof. C. Shackleton.
- Floral Morphology, Pollination and Reproduction in Cyphia (LOBELIACEAE). Honours Research Project 2002. Supervisor: Mr. P. Phillipson.
- Forestry resource assessment of bark-stripped species in Amatola District (December 2002; Prof R.A. Lubke).
- Homegarden Cultivation of Medicinal Plants in the Amathole area. Postgraduate Research Project (2003-2005; Prof R.A. Lubke, Prof C.M. Shackleton and Ms C.M., Cocks).

9.10 Appendix I: Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity

SCOPE

The protocol (*Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation (GN 320, 20 March 2020)*) provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation.

The protocol (*Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of sections 24(5)(a) and (h) and 44 of NEMA, gazetted on 30 October 2020*), provides the criteria for the assessment and reporting of impacts on plant and animal species for activities requiring environmental authorisation.

These protocols replace the requirements of Appendix 6 of the Environmental Impact Assessment Regulation12.

The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (https://screening.environment.gov.za/screeningtool). The requirements for terrestrial biodiversity are for landscapes or sites which support various levels of biodiversity. The relevant terrestrial biodiversity data in the screening tool has been provided by the South African National Biodiversity Institute13.

SITE SENSITIVITY VERIFICATION AND MINIMUM REPORT CONTENT REQUIREMENTS

Prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the screening tool must be confirmed by undertaking a site sensitivity verification.

1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.
2. The site sensitivity verification must be undertaken using:
   a. a desk top analysis, using satellite imagery,
   b. a preliminary on-site inspection; and
   c. any other available and relevant information.
3. The outcome of the site sensitivity verification must be recorded in the form of a report that:
   a. confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.
   b. contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and
   c. is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

TERRESTRIAL BIODIVERSITY SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

12 The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act 107 of 1998).

13 The biodiversity dataset has been provided by the South African National Biodiversity Institute (for details of the dataset, click on the options button to the right of the various biodiversity layers on ther screening tool).

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
1	General Information	
1.1	An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being "very high sensitivity" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.	✓
1.2	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being 'low sensitivity' for terrestrial biodiversity, must submit a Terrestrial Biodiversity Compliance Statement.	✓
1.3	However, where the information gathered from the site sensitivity verification differs from the designation of 'very high' terrestrial biodiversity sensitivity on the screening tool and it is found to be of a 'low' sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.	✓
1.4	Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a 'low' terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.	✓
1.5	If any part of the proposed development footprint falls within an area of 'very high' sensitivity, the assessment and reporting requirements prescribed for the 'very high' sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.	✓
	VERY HIGH SENSITIVITY RATING for terrestrial biodiversity features	
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.	✓
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	✓
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 with impact these;	✓
2.3.2	ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	✓
2.3.3	the ecological corridors that the proposed development would impede including migration and movement of flora and 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);	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
2.3.5	a description of terrestrial biodiversity and ecosystems on the preferred site, including:	✓
(a)	main vegetation types;	✓
(b)	threatened ecosystems, including fisted 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;	✓
2.3.6	the assessment must identify any alternative development footprints within the preferred site which would be of 'low' sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	✓
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;	✓
(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 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;	✓
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;	✓
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 I network;	✓
2.3.7.5	Strategic Water Source Areas (SWSAs) including:	✓
(a)	the impact(s) on the terrestrial habitat of SWSA; and	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
(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),	✓
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;	✓
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.	✓
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report	✓
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;	✓
3.1.2	a signed statement of independence by the specialist;	✓
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,	✓
3.1.4	description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modeling used, where relevant;	✓
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;	✓
3.1.6	a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	✓
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),	✓
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,	✓
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 a not; and	✓
3.1.15	any conditions to which this statement is subjected.	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
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.	✓
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	✓
	LOW SENSITIVITY RATING – for terrestrial biodiversity features	
4	Terrestrial Biodiversity Compliance Statement	✓
4.1	The compliance statement must be prepared by a specialist registered with the SACNASP and having expertise in the field of ecological sciences.	✓
4.2	The compliance statement must:	✓
4.2.1	be applicable to the preferred site and proposed development footprint;	✓
4.2.2	confirm that the site is of 'low' sensitivity for terrestrial biodiversity; and	✓
4.2.3	indicate whether or not the proposed development will have any impact on the biodiversity feature.	✓
4.3	The compliance statement must contain, as a minimum, the following information:	✓
4.3.1	the contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	✓
4.3.2	a signed statement of independence by the specialist;	✓
4.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
4.3.4	a baseline profile description of biodiversity and ecosystems of the site;	✓
4.3.5	the methodology used to verify the sensitivities of the terrestrial biodiversity features on the site, including equipment and modeling used, where relevant;	✓
4.3.6	in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures propped, the land can be returned to the current state within two years of completion of the construction phase;	✓
4.3.7	where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;	✓
4.3.8	a description of the assumptions made and any uncertainties or gaps in knowledge or data; and	✓
4.3.9	any conditions to which this statement is subjected.	✓
4.4	A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	✓

ANIMAL SPECIES SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
1	General Information	
1.1	An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "very high" or "high" sensitivity for terrestrial animal species must submit a Terrestrial Animal Species Specialist Assessment Report.	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
1.2	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of "medium sensitivity" for terrestrial animal species must submit either a Terrestrial Animal Species Specialist Assessment Report or a Terrestrial Animal Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.	✓
1.3	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of "low" sensitivity for terrestrial animal species must submit a Terrestrial Animal Species Compliance Statement.	✓
1.4	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high", for terrestrial animal species sensitivity and it is found to be of a "low" sensitivity, then a Terrestrial Animal Species Compliance Statement must be submitted.	✓
1.5	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial animal species sensitivity and it is found to be of a "very high" or "high" terrestrial animal species sensitivity, a Terrestrial Animal Species Specialist Assessment must be conducted.	✓
1.6	If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high" or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol means, the area on which the proposed development will take place and includes the area that will be disturbed or impacted.	✓
1.7	The Terrestrial Animal Species Specialist Assessment and the Terrestrial Animal Species Compliance Statement must be undertaken within the study area.	✓
1.8	Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.	✓
1.9	Where the nature of the activity is expected to have an impact on SCC beyond the boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline14, and the study area must include the PAOI, as determined.	✓
	VERY HIGH AND HIGH SENSITIVITY RATING for terrestrial animal species	
2	Terrestrial Animal Species Specialist Assessment	✓
	VERY HIGH SENSITIVITY RATING Critical habitat for range-restricted species15 of conservation concern, that have a global range of less than 10 km2.	✓

14 Available at https://bgis.sanbi.org/
15 Species with a geographically restricted area of distribution.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
	SCC listed on the IUCN Red List of Threatened Species16 or on South Africa's National Red List website17 as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. Species aggregations that represent ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle. The number of mature individuals that ranks the site among the largest 10 aggregations known for the species. These areas are irreplaceable for SCC. **HIGH SENSITIVITY RATING** Confirmed habitat for SCC. SCC, listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable, according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare. These areas are unsuitable for development due to a very likely impact on SCC.	
2.1	The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with a field of practical experience relevant to the taxonomic group ("taxa") for which the assessment is being undertaken.	✓
2.2	The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline18; and must:	✓
2.2.1	identify the SCC which were found, observed or are likely to occur within the study area;	✓
2.2.2	provide evidence (photographs or sound recordings) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility19, immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);	✓
2.2.3	identify the distribution, location, viability20 and provide a detailed description of population size of the SCC, identified within the study area;	✓
2.2.4	identify the nature and the extent of the potential impact of the proposed development on the population of the SCC located within the study area;	✓
2.2.5	determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases, including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;	✓
2.2.6	determine the potential impact of the proposed development on the habitat of the SCC located within the study area;	✓

16 https://www.iucnredlist.org/
17 This category includes the categories Extremely Rare, Critically Rare, and Rare
18 Available at https://bgis.sanbi.org/
19 The preferred platform is iNaturalist.org but any other national or international virtual museum.
20 the ability to survive and reproduce in the long term.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
2.2.7	include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, include a motivation for the deviation;	✓
2.2.8	identify any dynamic ecological processes occurring within the broader landscape that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;	✓
2.2.9	identify any potential impact of ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long-term viability;	✓
2.2.10	determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;	✓
2.2.11	discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species21; or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity; and	✓
2.2.12	identify any alternative development footprints within the preferred site which would be of "low" or "medium" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	✓
2.3	The findings of the assessment must be written up in a Terrestrial Animal Species Specialist Assessment Report.	✓
3	Terrestrial Animal Species Specialist Assessment Report	✓
3.1	This report must include as a minimum the following information:	✓
3.1.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;	✓
3.1.2	a signed statement of independence by the specialist;	✓
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;	✓
3.1.4	a description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	✓
3.1.5	a description of the mean density of observations/number of sample sites per unit area22 and the site inspection observations;	✓
3.1.6	a description of the assumptions made and any uncertainties or gaps in knowledge or data;	✓

21 Undescribed species are to be assessed as "High Sensitivity".
22 Species Environmental Assessment Guideline

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
3.1.7	details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported23;	✓
3.1.8	the online database name, hyperlink, and record accession numbers for disseminated evidence of SCC found within the study area;	✓
3.1.9	the location of areas not suitable for development and to be avoided during construction where relevant;	✓
3.1.10	a discussion on the cumulative impacts;	✓
3.1.11	impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	✓
3.1.12	a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and	✓
3.1.13	a motivation must be provided if there were any development footprints identified as per paragraph 2.2.12 above that were identified as having "low" or "medium" terrestrial animal species sensitivity and were not considered appropriate.	✓
3.2	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	✓
4	MEDIUM SENSITIVITY SPECIES OF CONSERVATION CONCERN CONFIRMATION	
	MEDIUM SENSITIVITY RATING – for terrestrial animal species: Suspected habitat for SCC based either on historical records (prior to 2002) or being a natural area included in a habitat suitability model for this species24. SCC listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare.	✓
4.1	Medium sensitivity data represents suspected habitat for SCC based on occurrence records for these species collected prior to 2002 or is based on habitat suitability modelling.	✓
4.2	The presence or likely presence of the SCC identified by the screening tool must be investigated through a site inspection by a specialist registered with the SACNASP with a field of practice relevant to the taxonomic groups ("taxa") for which the assessment is being undertaken.	✓
4.3	The assessment must be undertaken within the study area.	✓

23 The actual name of the sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain. It should be referred to as a sensitive plant or animal and its IUCN extinction risk category should be included e.g., Critically Endangered sensitive plant or Endangered sensitive butterfly.

24 The methodology by which habitat suitability models have been developed are explained within the Species Environmental Assessment Guideline.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
4.4	The site inspection to determine the presence or likely presence of SCC must be undertaken in accordance with the Species Environmental Assessment Guidelines.	✓
4.5	The site inspection is to confirm the presence, likely presence or confirmed absence of a SCC identified within the site identified as "medium" sensitivity by the screening tool.	✓
4.6	Where SCC are found on site or have been confirmed to be likely present, a Terrestrial Animal Species Specialist Assessment must be submitted in accordance with the requirements specified for "very high" and "high" sensitivity in this protocol.	✓
4.7	Similarly, where no SCC are found on site during the site inspection or the presence is confirmed to be unlikely, a Terrestrial Animal Species Compliance Statement must be submitted.	✓
5	LOW SENSITIVITY RATING – for terrestrial animal species	
	Terrestrial Animal Species Compliance Statement Areas where no natural habitat remains. Natural areas where there is no suspected occurrence of SCC.	✓
5.1	The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Zoological Science or Ecological Science).	✓
5.2	The compliance statement must:	✓
5.2.1	be applicable to the study area;	✓
5.2.2	confirm that the study area, is of "low" sensitivity for terrestrial animal species; and	✓
5.2.3	indicate whether or not the proposed development will have any impact on SCC.	✓
5.3	The compliance statement25 must contain, as a minimum, the following information:	✓
5.3.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;	✓
5.3.2	a signed statement of independence by the specialist;	✓
5.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
5.3.4	a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;	✓
5.3.5	the mean density of observations/ number of samples sites per unit area.	✓
5.3.6	where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;	✓
5.3.7	a description of the assumptions made and any uncertainties or gaps in knowledge or data; and	✓
5.3.8	any conditions to which the compliance statement is subjected.	✓

25 An example of a what is contained in a Compliance Statement for Animal Species Impact Assessment can be found in the Species Environmental Impact Assessment Guideline

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
6	A signed copy of the Terrestrial Animal Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	✓

PLANT SPECIES SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
1	General Information	
1.1	An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "very high" or "high" sensitivity for terrestrial plant species must submit a Terrestrial Plant Species Specialist Assessment Report.	✓
1.2	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of "medium sensitivity" for terrestrial plant species must submit either a Terrestrial Plant Species Specialist Assessment Report or a Terrestrial Plant Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.	✓
1.3	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of "low" sensitivity for terrestrial plant species must submit a Terrestrial Plant Species Compliance Statement.	✓
1.4	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high", for terrestrial plant species sensitivity and it is found to be of a "low" sensitivity, then a Terrestrial Plant Species Compliance Statement must be submitted.	✓
1.5	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial plant species sensitivity and it is found to be of a "very high" or "high" terrestrial plant species sensitivity, a Terrestrial Plant Species Specialist Assessment must be conducted.	✓
1.6	If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high" or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol means, the area on which the proposed development will take place and includes the area that will be disturbed or impacted.	✓
1.7	The Terrestrial Plant Species Specialist Assessment and the Terrestrial Plant Species Compliance Statement must be undertaken within the study area.	✓
1.8	Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.	✓
1.9	Where the nature of the activity is expected to have an impact on SCC beyond the boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
	Environmental Assessment Guideline26, and the study area must include the PAOI, as determined.	
	VERY HIGH AND HIGH SENSITIVITY RATING for terrestrial plant species	
2	Terrestrial Plant Species Specialist Assessment	✓
	VERY HIGH SENSITIVITY RATING Critical habitat for range-restricted species27 of conservation concern, that have a global range of less than 10 km2. SCC listed on the IUCN Red List of Threatened Species28 or on South Africa's National Red List website29 as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. Species aggregations that represent ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle. The number of mature individuals that ranks the site among the largest 10 aggregations known for the species. These areas are irreplaceable for SCC. **HIGH SENSITIVITY RATING** Confirmed habitat for SCC. SCC, listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable, according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare. These areas are unsuitable for development due to a very likely impact on SCC.	✓
2.1	The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with a field of practical experience relevant to the taxonomic group ("taxa") for which the assessment is being undertaken.	✓
2.2	The assessment must be undertaken within the study area.	✓
2.3	The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline30; and must:	✓
2.3.1	Identify the SCC which were found, observed or are likely to occur within the study area;	✓
2.3.2	provide evidence (photographs) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility31, immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);	✓
2.3.3	identify the distribution, location, viability32 and provide a detailed description of population size of the SCC, identified within the study area;	✓

26 Available at https://bgis.sanbi.org/
27 Species with a geographically restricted area of distribution.
28 https://www.iucnredlist.org/
29 This category includes the categories Extremely Rare, Critically Rare, and Rare
30 Available at https://bgis.sanbi.org/
31 The preferred platform is iNaturalist.org but any other national or international virtual museum.
32 the ability to survive and reproduce in the long term.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
2.3.4	identify the nature and the extent of the potential impact of the proposed development on the population of the SCC located within the study area;	✓
2.3.5	determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases, including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;	✓
2.3.6	determine the potential impact of the proposed development on the habitat of the SCC located within the study area;	✓
2.3.7	include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, include a motivation for the deviation;	✓
2.3.8	identify any dynamic ecological processes occurring within the broader landscape that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;	✓
2.3.9	identify any potential impact of ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long-term viability;	✓
2.3.10	determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;	✓
2.3.11	discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species33;	✓
2.3.12	identify any alternative development footprints within the preferred site which would be of "low" or "medium" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	✓
2.4	The findings of the assessment must be written up in a Terrestrial Plant Species Specialist Assessment Report.	✓
3	Terrestrial Plant Species Specialist Assessment Report	✓
3.1	This report must include as a minimum the following information:	✓
3.1.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;	✓
3.1.2	a signed statement of independence by the specialist;	✓
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;	✓
3.1.4	a description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	✓
3.1.5	a description of the assumptions made and any uncertainties or gaps in knowledge or data;	✓

33 Undescribed species are to be assessed as "High Sensitivity".

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
3.1.6	a description of the mean density of observations/number of sample sites per unit area34 and the site inspection observations;	✓
3.1.7	details of all SCC found or suspected to occur on site, ensuring sensitive species35 are appropriately reported;	✓
3.1.8	the online database name, hyperlink, and record accession numbers for disseminated evidence of SCC found within the study area;	✓
3.1.9	the location of areas not suitable for development and to be avoided during construction where relevant;	✓
3.1.10	a discussion on the cumulative impacts;	✓
3.1.11	impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	✓
3.1.12	a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and	✓
3.1.13	a motivation must be provided if there were any development footprints identified as per paragraph 2.3.12 above that were identified as having "low" or "medium" terrestrial plant species sensitivity and were not considered appropriate.	✓
3.2	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	✓
4	MEDIUM SENSITIVITY SPECIES OF CONSERVATION CONCERN CONFIRMATION	
	MEDIUM SENSITIVITY RATING – for terrestrial plant species: Suspected habitat for SCC based either on there being records for this species collected in the past, prior to 2002, or being a natural area included in a habitat suitability model36. SCC listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare.	✓
4.1	Medium sensitivity data represents suspected habitat for SCC based on occurrence records for these species collected prior to 2002 or is based on habitat suitability modelling.	✓
4.2	The presence or likely presence of the SCC identified by the screening tool must be investigated through a site inspection by a specialist registered with the SACNASP with a field of practice relevant to the taxonomic groups ("taxa") for which the assessment is being undertaken.	✓

34 Species Environmental Assessment Guideline

35 The actual name of the sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain. It should be referred to as a sensitive plant or animal and its IUCN extinction risk category should be included e.g., Critically Endangered sensitive plant or Endangered sensitive butterfly.

36 The methodology by which habitat suitability models have been developed are explained within the Species Environmental Assessment Guideline.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
4.3	The assessment must be undertaken within the study area.	✓
4.4	The site inspection to determine the presence or likely presence of SCC must be undertaken in accordance with the Species Environmental Assessment Guidelines.	✓
4.5	The site inspection is to confirm the presence, likely presence or confirmed absence of a SCC identified within the site identified as "medium" sensitivity by the screening tool.	✓
4.6	Where SCC are found on site or have been confirmed to be likely present, a Terrestrial Plant Species Specialist Assessment must be submitted in accordance with the requirements specified for "very high" and "high" sensitivity in this protocol.	✓
4.7	Similarly, where no SCC are found on site during the site inspection or the presence is confirmed to be unlikely, a Terrestrial Plant Species Compliance Statement must be submitted.	✓
5	LOW SENSITIVITY RATING – for terrestrial plant species	
	Terrestrial Plant Species Compliance Statement Areas where no natural habitat remains. Natural areas where there is no suspected occurrence of SCC.	✓
5.1	The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Botanical Science or Ecological Science).	✓
5.2	The compliance statement must:	✓
5.2.1	be applicable to the study area;	✓
5.2.2	confirm that the study area, is of "low" sensitivity for terrestrial plant species; and	✓
5.2.3	indicate whether or not the proposed development will have any impact on SCC.	✓
5.3	The compliance statement37 must contain, as a minimum, the following information:	✓
5.3.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;	✓
5.3.2	a signed statement of independence by the specialist;	✓
5.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
5.3.4	a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;	✓
5.3.5	where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;	✓
5.3.6	a description of the assumptions made and any uncertainties or gaps in knowledge or data;	✓

37 An example of a what is contained in a Compliance Statement for Plant Species Impact Assessment can be found in the Species Environmental Impact Assessment Guideline

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
5.3.7	the mean density of observations/ number of samples sites per unit area38; and	✓
5.3.8	any conditions to which the compliance statement is subjected.	✓
6	A signed copy of the Terrestrial Plant Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	✓

38 Refer to the Species Environmental Assessment Guideline

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