

Nkurenkuru
ECOLOGY & BIODIVERSITY

**SAND MINE NEAR
ROBERTSON, WESTERN
CAPE PROVINCE**

BOTANICAL STUDY
AND
ASSESSMENT

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Dr. Jan -Hendrik Keet**

**PROPOSED EXPANSION OF THE SAND MINE AREA ON
PORTION 4 OF THE FARM ZANDBERG FONTEIN 97, SOUTH
OF ROBERTSON, WESTERN CAPE PROVINCE**

Report Title: Botanical Study and Assessment

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I. DECLARATION OF CONSULTANTS INDEPENDENCE

- » act/ed as the independent specialist in this application;
- » regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- » do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- » have and will not have any vested interest in the proposed activity proceeding;
- » have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- » am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- » have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- » am aware that a false declaration is an offense in terms of regulation 48 of GN No. R. 326.

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April 2020

II. REQUIREMENTS REGARDING A SPECIALIST ASSESSMENT

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Sections where this is addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain-	Page I, II and Appendix 3 &
a) details of-	
i. the specialist who prepared the report; and	
ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page I, II
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1 (1.4, 1.5)
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2 (2.1, 2.2)
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2.3 and 2.8
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
f) details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 5.1
g) an identification of any areas to be avoided, including buffers;	Section 5.1
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5.1
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2.8
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Section 5 and 6
k) any mitigation measures for inclusion in the EMPr;	Section 6 and 7
l) any conditions for inclusion in the environmental authorisation;	Section 6 and 7
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6 and 7
n) a reasoned opinion-	Section 7
i. as to whether the proposed activity, activities or portions thereof should be authorised;	
(iA) regarding the acceptability of the proposed activity or activities; and	
ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A

q) any other information requested by the competent authority.	N/A
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

III. LIST OF ABBREVIATIONS:

CARA:	Conservation of Agricultural Resources Act 43 of 1983
CBA:	Critical Biodiversity Area
CITES:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CR:	Critically Endangered (threat status)
DAFF:	Department of Agriculture, Forestry and Fisheries
DEA:	Department of Environmental Affairs
DEADP:WC:	Department of Environmental Affairs and Development Planning: Western Cape Province.
WCNCO:	Western Cape Nature Conservation Ordinance (No. 19 of 1974)
WCBB:	Draft Western Cape Biodiversity Bill, 2019 (No. 8094 of 2019)
DDD:	Data Deficient – Insufficient Information (threat status)
DDT:	Data Deficient – Taxonomically Problematic (threat status)
NFA:	National Forest Act 1998; No 84 of 1998
DEA:	Department of Environmental Affairs
EA:	Environmental Authorisation
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment: EIA regulations promulgated under section 24(5) of NEMA and published in Government Notice R. 543 in Government Gazette 33306 of 18 June 2010
EMPr:	Environmental Management Programme
EN:	Endangered (threat status)
ESA:	Ecological Support Areas
EX:	Extinct (threat status)
EW:	Extinct in the Wild
FEPA:	Freshwater Ecosystem Priority Area
CIS:	Conservation Important Species (species listed within IUCN and South African Red Data Lists or that are protected within relevant international, national and provincial legislation)
IAPs:	Invasive Alien Plants
IP:	Invasive Plant (indigenous or alien)
LC:	Least Concern

LC:	Least threatened
NFA:	National Forest Act 84 of 1998
NE:	Not Evaluated (threat status)
NEMA:	National Environmental Management Act 107 of 1998
NEM:BA	National Environmental: Biodiversity Act (Act No. 10 of 2004)
NFEPA:	National Freshwater Ecosystem Priority Areas, identified to meet national freshwater conservation targets (CSIR, 2011)
NT:	Near Threatened (threat status)
PES:	Present Ecological State, referring to the current state or condition of an environmental resource in terms of its characteristics and reflecting a change from its reference condition
RE:	Regionally Extinct
SANBI:	South African National Biodiversity Institute
TOPS:	Threatened and Protected Species in terms of section 56 of the National Environment: Biodiversity Act (NEM:BA) of 2004 (Species list as published within Gazette No. 30568, 14 December 2007)
VU:	Vulnerable (threat status)

IV. LIST OF DEFINITIONS:

Accelerated soil erosion: Soil erosion induced by human activities.

Acceptable cover: An acceptable cover shall mean that not less than 40% (in regions receiving less than 400 mm rain per annum), of the area rehabilitated and/or planted, shall be covered with grass and other species and that there shall be no bare patches of more than 500 cm in maximum dimension.

Asteraceous: Pertaining to vegetation dominated by members of the daisy family (Asteraceae or Compositae) e.g. asteraceous fynbos.

Alien: originating from another country or continent and originally different environment, commonly used to describe plants that are not indigenous to South Africa and have become problematic (spreading rapidly, threatening existing biodiversity).

Bare soil: Un-vegetated soil surface, unaltered by humans.

Biodiversity: The diversity (richness and abundance) of plant and animal species occurring in their natural environment (habitats). The term encompasses different ecosystems, landscapes, communities, populations, and genes as well as the ecological and evolutionary processes that allow these elements of biodiversity to persist over time.

Biome: A broad ecological spatial unit representing major life zones of large natural areas, and defined mainly by vegetation structure, climate as well as major large-scale disturbance factors (such as fire) (Mucina and Rutherford, 2006).

Cape Floristic Region (CFR): One of 37 global floristic regions (phytochoria) as defined by Takhtajan (1986), often referred to as the Cape Floristic Kingdom (CFK) which is one

of six global floristic kingdoms. Please take note that there have been some changes in the classification of this area as a Floristic Region. The CFR is now referred to as the Core Cape Subregion (CCR) which forms part of the Greater Cape Floristic Region (GCFR) which now includes parts of the succulent karoo.

Cupressoid: Pertaining to plants with small, awl-shaped leaves which clasp the stem, resembling those of a cypress.

Climax: That vegetation type or plant community structure that occurs at the end of the seral cycle. The climax communities may not be the final endpoint of the succession: frequent or even rare events, such as fire, frost, harvesting, or hurricanes, may hold the communities in a stable subclimax indefinitely (Low & Rebelo, 1998).

Compacted soil surface: A soil surface that has been hardened by an outside source, causing the soil to be more compacted than the surrounding area.

Conservation: The safeguarding of biodiversity and its processes (often referred to as Biodiversity Conservation).

Conservation Important Plant: Any plant species that is protected within relevant international, national and/or provincial legislation and any species that is listed within the Red List of South African plants (version 2017.1).

Desirable end state: the future condition or target on which the rehabilitation is designed and that will serve later as a basis for rehabilitation success evaluation. This can be based on a reference site or modelled according to available information on historic vegetation.

Ecotone: A zone in which two or more vegetation types or ecosystems merge. These areas may be rich in species from both systems or may occur as species-poor fringes.

Ecosystem Goods and Services: The goods and benefits people obtain from natural ecosystems. Various different types of ecosystems provide a range of ecosystem goods and services. Aquatic ecosystems such as rivers and wetlands provide goods such as forage for livestock grazing or sedges for craft production and services such as pollutant trapping and flood attenuation. They also provide habitat for a range of aquatic biota.

Ecological rehabilitation: The process of assisting the recovery of a degraded or damaged ecosystem in a trajectory that renders the ecosystem fully functional, stable, and able to develop further, but not necessarily returning to the original historic state.

Ecological restoration: The process of assisting the recovery of an ecosystem that has been degraded damaged or destroyed, in a trajectory that ultimately returns the ecosystem to its natural successional stage.

Ecosystem: The combination of biota within a given area, together with a suitable environment that sustains the biota and the interactions between biota. It can have a spatial unit of any size but shows some degree homogeneity as far as structure, function and species composition is concerned. Small-scale ecosystems typically link

up to larger-scale ecosystems and all contribute to the ecosystem function and services at the landscape-scale.

Endemic: Refers to a plant, animal species or a specific vegetation type that is naturally restricted to a particular defined region (not to be confused with indigenous). A species of animal may, for example, be endemic to South Africa in which case it occurs naturally anywhere in the country, or endemic only to a specific geographical area within the country, which means it is restricted to this area and grows naturally nowhere else in the country.

Ephemeroïd: Referring to the life-form of a perennial plant that makes occasional appearances above-ground and maintains perennating organs underground (e.g. bulbous plants).

Establishment of grass: All procedures necessary to produce an acceptable cover of grass on an area.

Floristic Classification: Referring to the use of plant species composition (flora) as a criterion for characterising or classifying vegetation.

Forb: A plant without secondary thickening (i.e. non-woody or herbaceous), usually living for only one or two seasons.

Function/functioning/functional: Used here to describe natural systems working or operating in a healthy way, as opposed to dysfunctional, which means working poorly or in an unhealthy way.

Fynbos: The fynbos biome takes its name from the dominant vegetation of the region, namely fynbos, which is characterised by small-leaved, evergreen shrubs whose regeneration is intimately linked to fire. The word Fynbos is derived from the Dutch 'fijn-bosch' and roughly translates to 'fine bush'. Fynbos is characterised by the presence of the following three elements; a restoid-, ericoid or (heath), or proteoid component.

Geophyte/-ic: Pertaining to a plant with underground storage organs such as bulbs, corms, tubers or rhizomes, and that resprouts during the growing season while dying back completely during unfavourable seasons.

Geoxylic Suffrutex: A plant with annual or short-lived woody above-ground shoots sprouting from a massive or extensive, perennial, underground stem.

Graminoid: Pertaining to an herbaceous growth form characterised by a 'grass-like' appearance (tufted growth, usually long and narrow leaves, secondary root system) and including plants such as grasses, restios, sedges, and rushes.

Habitat: The general features of an area inhabited by animal or plant which are essential to its survival (i.e. the natural "home" of a plant or animal species).

Indigenous: Refers to a plant or animal that occurs naturally in the place in which it is currently found.

Invasive plant: A plant which has been declared as invasive under NEM:BA, and includes all propagules of the plant (seeds and any vegetative parts capable of reproducing asexually, i.e. clonally).

Intact: Used here to describe a natural environment that is not badly damaged, and is still operating healthily.

Landscape: Consists of a mosaic of two or more ecosystems that exchange organisms, energy, water, and nutrients.

Land Type: Map unit denoting land, mappable at 1:250 000 scale, over which there is a marked uniformity of climate, terrain form and soil pattern.

Mitigate/Mitigation: Mitigating impacts refers to reactive practical actions that minimize or reduce in situ impacts. Examples of mitigation include “changes to the scale, design, location, siting, process, sequencing, phasing, and management and/or monitoring of the proposed activity, as well as restoration or rehabilitation of sites”. Mitigation actions can take place anywhere, as long as it reduces the effect on the site where a change in ecological character is likely, or the values of the site are affected by those changes (Ramsar Convention, 2012).

Period of Maintaining: The Period of Maintaining is defined as the period following directly after the Establishment Period until the end of the Period of Maintenance for the whole Contract as defined in the General Conditions of Contract unless otherwise specified.

Regic Soils: Pertaining to a blanket of soil, usually sand, which has been deposited over another soil or rock, and which has not yet had time to develop profiles or layers.

Proteoid: Vegetation-structural term used to designate fynbos shrublands dominated by the members of the family Proteaceae (such as the genera *Protea*, *Leucadendron* and *Leucospermum*).

Revegetation: The process of establishing a vegetative cover on exposed soils, regardless of species composition or structure, as long as the species are non-invasive and their presence will not impede the gradual process of ecological rehabilitation or -restoration.

Renosterveld: Renosterveld or renosterbosveld, literally translates as ‘rhinoceros vegetation’. There is confusion as to whether this refers to the historical presence of the hook-lipped rhinoceros (*Diceros bicornis*) in this veld type or, more likely, whether it is derived from ‘renosterbos-veld’. Renosterbos refers to the shrub *Elytropappus rhinocerotis*, the dominant plant in the vegetation. Renosterveld is an evergreen, fire-prone shrubland or grassland dominated by small, cupressoid-leaved, evergreen asteraceous shrubs (principally renosterbos) with an understorey of grasses and a high biomass and diversity of geophytes. Renosterveld is characterised by fertile soils, in contrast to the nutrient poor soils of fynbos, which has led to its large scale transformation as a result of agriculture.

Risk: A prediction of the likelihood and impact of an outcome; usually referring to the likelihood of a variation from the intended outcome.

Soil Erosion: is a natural process whereby the ground level is lowered by wind or water action and may occur as a result of inter alia chemical processes and or physical transport on the land surface.

Succession: A series of stages in which different plants and animals colonise an area following some kind of disturbance. The final stage of the succession is called the 'climax', but various disturbances may prevent the vegetation from attaining its potential climax.

Threatened Ecosystem: In the context of this document, refers to Critically Endangered, Endangered and Vulnerable ecosystems.

Threat Status: Threat status (of a species or community type) is a simple but highly integrated indicator of vulnerability. It contains information about past loss (of numbers and/or habitat), the number and intensity of threats, and current prospects as indicated by recent population growth or decline. Anyone of these metrics could be used to measure vulnerability. One much-used example of a threat status classification system is the IUCN Red List of Threatened Species (BBOP, 2009).

Vegetation structure: The horizontal, vertical and temporal arrangement of vegetation, i.e. spatially explicit, e.g. layers, patches, etc.

Vegetation texture: The composition of the vegetation in terms of species, growth forms, life forms, leaf morphological types, etc.

Watercourse: Means 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 any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks (National Water Act, 1998).

Wetland: Refers to land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in water saturated soil (National Water Act, 1998).

Transformation: The conversion of an ecosystem to a different ecosystem or land use type.

Topsoil: uppermost layer of soil, in natural vegetation maximally 30 cm deep, in cultivated landscapes the total depth of cultivation, containing the layer with humus, seeds, and nutrients. Topsoils that are applied to landscapes to be rehabilitated must be free of refuse, large roots and branches, stones, alien weeds and/or any other agents that would adversely affect the topsoils suitability for re-vegetation.

Weed: a plant that grows where it is not wanted, and can, therefore, be an indigenous or alien species. An unwanted plant growing in a garden is just called a weed, but the 315 listed IPs are called "declared weeds and invaders".

(Coetzee 2005, Clewell et al. 2005, SER 2004)

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Proposed expansion of the sand mine area on Portion 4 of the far Zandberg Fontein 97 south of Robertson, Western Cape Province

BOTANICAL STUDY AND ASSESSMENT

1. INTRODUCTION

1.1 Applicant

Greenmined Environmental (Pty) Ltd. on behalf of Zandberg Sandput (Pty)

1.2 Project

The project will be known as Zandberg sand mine.

1.3 Proposed Activity

Zandberg Sandput (Pty) currently holds a Mine Right for an approved area of 17.6826 ha within Portion 4 of the Farm Zandberg Fontein No 97, south of Robertson (Langeberg Local Municipality) within the Western Cape Province (Figures 1 and 2).

The Zandberg mining method entails strip mining that is representative of the small-scale mining industry where the sand is loaded with one front-end-loader (FEL) directly onto the trucks of clients that transports it from site. Little to no stockpiling is required and no washing of sand is needed. The Mining Right (MR) holder removes the topsoil of a strip of ± 1 ha within which the sand is mined in blocks of approximately 50 x 50 m. Topsoil is replaced over every mined-out strip prior to the opening of the consecutive strip.

The MR holder intends on extending the mining footprint with ± 108.39 ha and are in the process of applying for an extension of the mining right in terms of Section 102 of the MPRDA, 2002. Should the S102 application be approved mining will progress into the expansion area as the current mining footprint is mined-out. The mining method will remain the same as the method currently implemented by the MR holder. No infrastructure will be established in the extension area.

The proposed mining extension area will be reached via the existing access road from the Nuwehoogte Road to the existing mining area.

1.4 Terms of reference

To conduct a botanical study for a basic assessment of the proposed target area that will be set aside for mining purposes and provide a professional opinion on botanical issues pertaining to the target area to aid in future decisions regarding the proposed project.

1.5 Conditions of this report

Findings, recommendations, and conclusions provided in this report are based on the authors best scientific and professional knowledge and information available at the time of compilation. No form of this report may be amended or extended without the prior written consent of the author. Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or make reference to this report. Whenever such recommendations, statements or conclusions form part of the main report relating to the current investigation, this report must be included in its entirety.

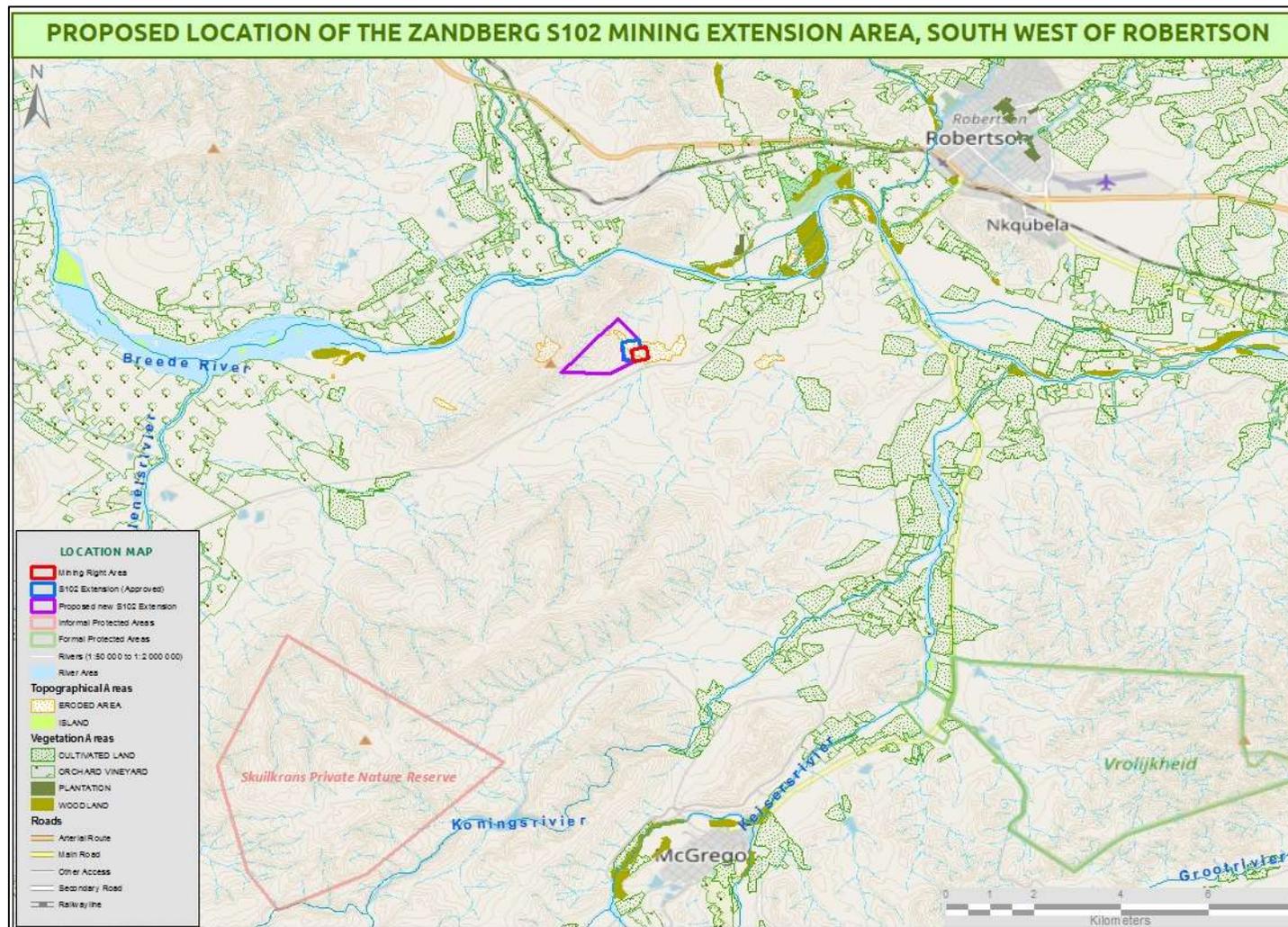


Figure 1: Location map 1 of the proposed Zandberg S102 Mining Extension Area illustrating the location of the footprint between the towns of Roberson and McGregor within the Western Cape Province.

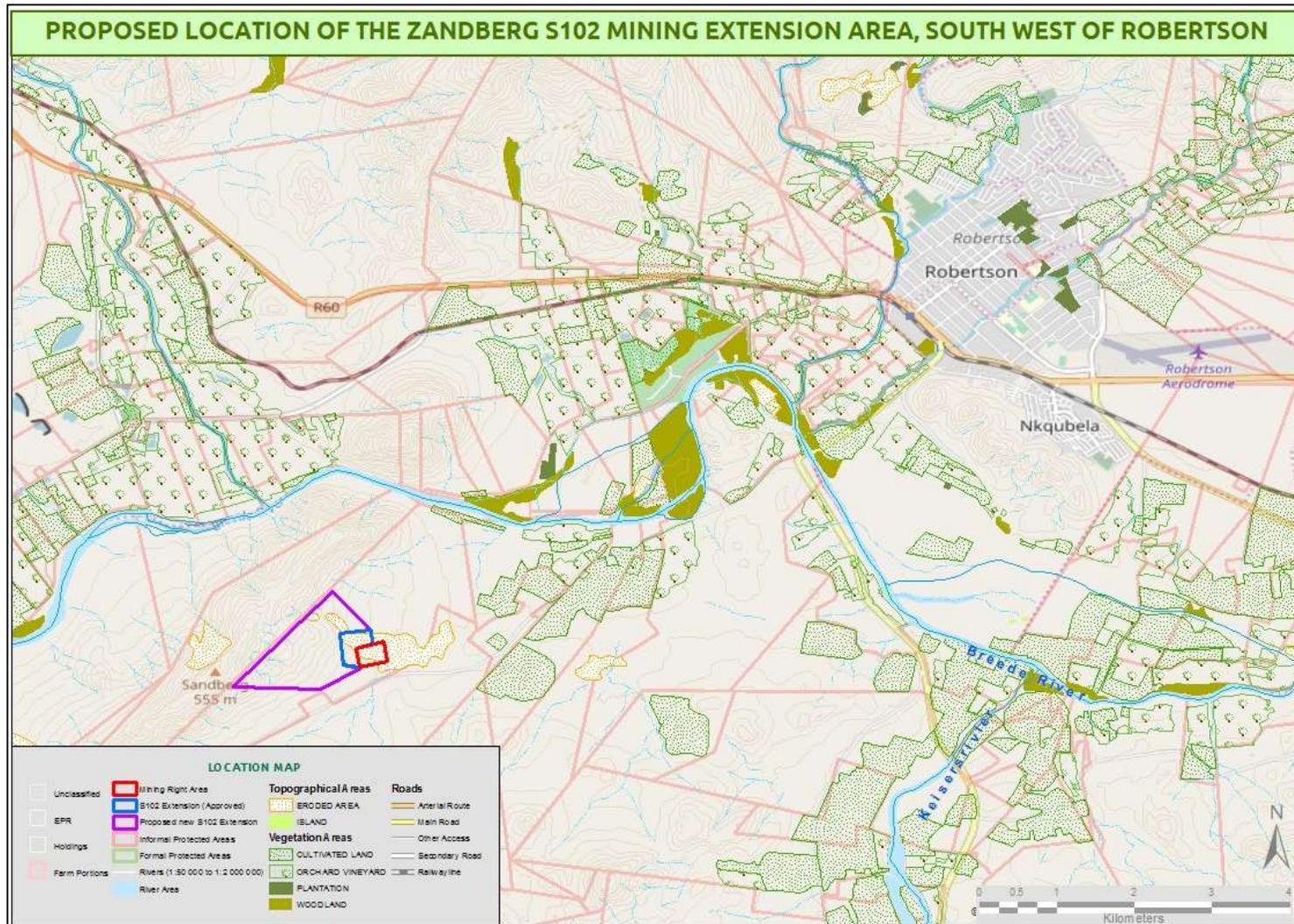


Figure 2: Location map 2 of the proposed Zandberg S102 Mining Extension Area within Portion 4 of the Farm Zandberg Fontein 97.

1.6 Relevant legislation

The following legislation was taken into account whilst compiling this report:

Provincial

- » Western Cape Nature Conservation Ordinance (No. 19 of 1974) in its entirety, with special reference to:
 - Schedule 1: Endangered Wild Animals
 - Schedule 2: Protected Wild Animals
 - Schedule 3: Endangered Flora
 - Schedule 4: Protected Flora

The above-mentioned Nature Conservation Ordinance accompanied by all amendments is regarded by the Department of Environmental Affairs and Development Planning – Western Cape Province (DEADP) as the legally binding, provincial documents, providing regulations, guidelines and procedures with the aim of protecting game and fish, the conservation of flora and fauna and the destruction of problematic (vermin and invasive) species.

National

- » National Environmental Management Act / NEMA (Act No 107 of 1998), and all amendments and supplementary listings and/or regulations
- » Environment Conservation Act (ECA) (No 73 of 1989) and amendments
- » National Environmental Management Act: Biodiversity Act / NEMA:BA (Act No. 10 of 2004) and amendments
- » National Forest Act 1998 / NFA (No 84 of 1998)
- » National Veld and Forest Fire Act (Act No. 101 of 1998)
- » Conservation of Agricultural Resources Act / CARA (Act No. 43 of 1983) and amendments

International

- » Convention on International Trade in Endangered Species of Fauna and Flora (CITES)
- » The Convention on Biological Diversity
- » The Convention on the Conservation of Migratory Species of Wild Animals

2. METHODOLOGY

2.1 Assessment Approach and Philosophy

The assessment was conducted according to the 2014 EIA Regulations, as amended 7 April 2017, as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- » That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.
- » Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should, in order of priority aim to:
 - Avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
 - Avoid degradation of the environment;
 - Avoid jeopardising ecosystem integrity;
 - Pursue the best practicable environmental option by means of integrated environmental management;
 - Protect the environment as the people's common heritage;
 - Control and minimise environmental damage; and
 - Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following forms the basis for the study approach and assessment philosophy:

The study included data searches, desktop studies, site walkovers/field survey of the property and baseline data collection, describing:

- » A description of the broad botanical characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of pattern, the following was identified or described:

Community and ecosystem level

- » The main vegetation type, its aerial extent, and interaction with neighbouring types, soils or topography;
- » Threatened or vulnerable ecosystems (cf. new SA vegetation map/National Spatial Biodiversity Assessment¹, fine-scale systematic conservation plans, etc).

Species-level

- » Red Data Book (RDB) species (giving location if possible, using GPS)
- » The viability of an estimated population size of the RDB species that are present (including the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, Low 0-40% confident). The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Other pattern issues

- » Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, sandstone outcroppings, steep southern aspects, drainage lines etc. in the vicinity.
- » The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than an infestation of undisturbed sites).
- » The condition of the site in terms of current or previous land uses.

In terms of process, the following was identified or described:

- » The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- » Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. corridors such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and

- vegetation boundaries such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
- » Any possible changes in key processes e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
 - » Furthermore, any further studies that may be required during or after the EIA process will be outlined.
 - » All relevant legislation, permits, and standards that would apply to the development will be identified.
 - » The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

2.2 Data scouring and review

Data sources from the literature and GIS spatial information was consulted and used where necessary in the study and include the following (also refer to Table 1):

Vegetation:

- » Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006 and 2012) as well as the National List of Threatened Ecosystems (2011), where relevant.
- » The IUCN conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (Version 2017.1).

Ecosystem:

- » Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011). This includes rivers, wetlands, and catchments defined under the study.
- » Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).
- » Critical Biodiversity Areas were extracted from the Western Cape Biodiversity Spatial Plan (Cape Nature, 2017), available from the SANBI BGIS web portal.

Table 1: Information and data coverages used to inform the ecological assessment.

	Data/Coverage Type	Relevance	Source
Biophysical Context	Colour Aerial Photography	Desktop mapping of habitat/ecological features	National Geo-Spatial Information (NGI)
	Latest Google Earth™ imagery	To supplement available aerial photography	Google Earth™ On-line
	1:50 000 River Line (GIS Coverage)	Highlight potential on-site and local rivers and wetlands and map local drainage network.	CSIR (2011)
	National Land-Cover	Shows the land-use and disturbances/transformations within and around the impacted zone.	DEA (2015)
	South African Vegetation Map (GIS Coverage)	Classify vegetation types and determination of reference primary vegetation	Mucina & Rutherford (2012)
	NFEPA: river and wetland inventories (GIS Coverage)	Highlight potential on-site and local rivers and wetlands	CSIR (2011)
Conservation and Distribution Context	National Biodiversity Assessment – Threatened Ecosystems (GIS Coverage)	Determination of national threat status of local vegetation types	SANBI (2011)
	Western Cape Biodiversity Spatial Plan (GIS Coverage)	Determination of provincial terrestrial/freshwater conservation priorities and biodiversity buffers	SANBI (2017)
	SANBI’s PRECIS (National Herbarium Pretoria Computerized Information System) electronic database	Determination of plant species composition within the region as well as potential conservation important plants.	http://posa.sanbi.org 2020-01-20_181608464-BRAHMSONlineData
	Red Data Books (Red Data Lists of Plants)	Determination of endangered and threatened plants,	Red List of South African Plants (2011)

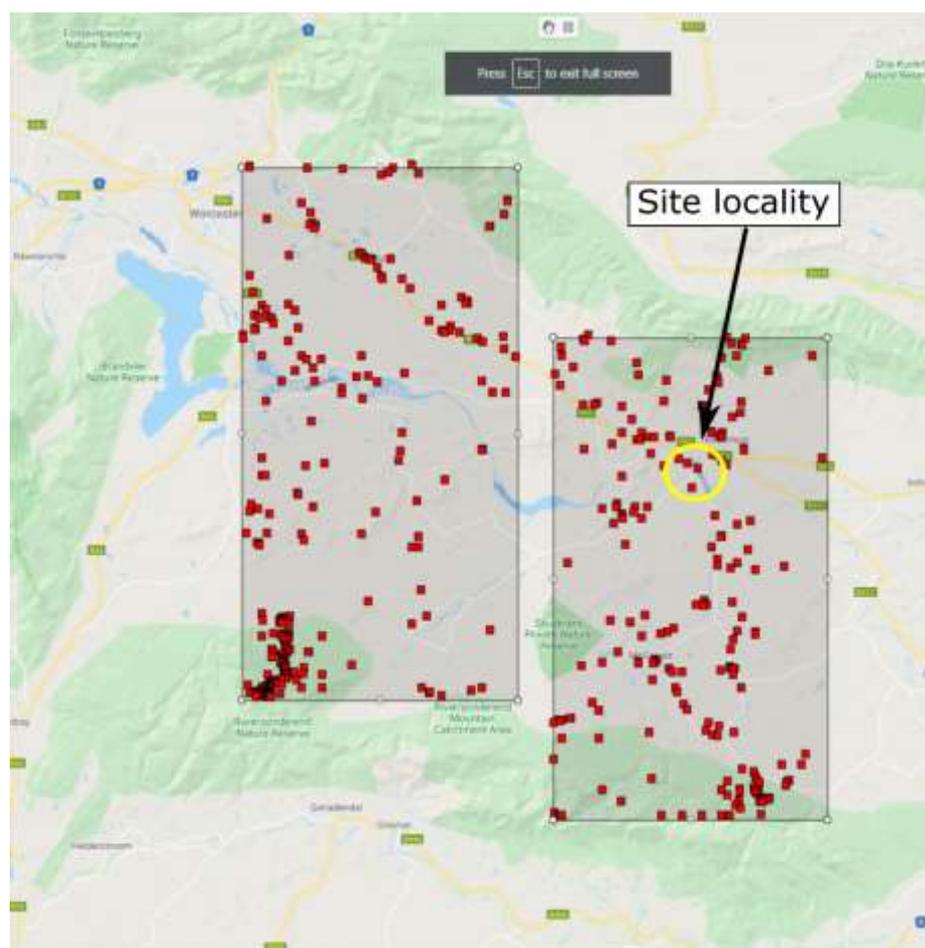


Figure 3: Site locality and areas (rectangles) indicating the extent of data extraction from POSA (red squares represent individual records). Extracted data was used to compile a list of plant species that may potentially occur within the project site and provide an indication of potential species of conservation concern that may be found within the area.

2.3 BOTANY: Methods to be followed during Field Sampling and Assessment

As part of the BA process, a detailed field survey of the vegetation of the proposed mining footprint was undertaken (on 31 January 2020) with the main purpose of:

- » Inspecting the various habitat, vegetation and landscape units that are present at the mining site and to correlate such observations with the results of the desktop study.
- » Identifying all observed species that were recorded within the development footprint.
- » Providing a list of protected and redlist species.
- » Noting the presence of sensitive habitats, for example drainage lines and unique edaphic environments.

These features were mapped onto satellite imagery of the site.

Aspects of biodiversity that were used to guide the interpretation and assessment of the study area are summarized below (Table 2).

Table 2: Summary of the different aspects of biodiversity considered in the assessment of the study site.

Intrinsic / Ecological Values
Species-level aspects of biodiversity
<ul style="list-style-type: none"> » Protected species of flora; » Threatened Species (Red Data List); » Keystone species performing a key ecological role; » Large or congregatory species population; » Endemic species or species with restricted ranges; » Previously unknown species.
Community & ecosystem-level aspects of biodiversity
<ul style="list-style-type: none"> » Distinct or diverse communities or ecosystems; » Unique ecosystems; » Locally adapted communities or assemblages; » Species-rich or diverse ecosystems; » Communities with a high proportion of endemic species or species with restricted ranges; » Communities with a high proportion of threatened and/or declining species; » The main uses and users of the area and its ecosystem goods and services: important ecosystem services, valued ecosystem goods, valued cultural areas.
Community & ecosystem-level aspects of biodiversity
<ul style="list-style-type: none"> » Key ecological processes (e.g. seed dispersal, pollination, primary production, carbon sequestration); » Areas with large congregations or species and/or breeding grounds; » Migration routes/corridors; » Importance as a link or corridor to other fragments of the same habitat, to protected or threatened or valued biodiversity areas; » Importance and role in the landscape with regard to arrange of 'spatial components of ecological processes', comprising processes tied to fixed physical features (e.g. soil or vegetation interfaces, river or sand movement corridors, upland-lowland interfaces) and flexible processes (e.g. upland-lowland gradients and macro-climatic gradients), as well as important movement or migration corridor for species.

2.4 Assessing species of conservation concern:

Species of conservation concern are species that have high conservation importance in terms of preserving South Africa's biodiversity. A description of the different SANBI categories of species of conservation concern is provided in Table 3, below.

Table 3: South African Red List Categories for species of conservation significance (adapted from SANBI, on-line at <http://redlist.sanbi.org/redcat.php>).

		Present State	
Species of Conservation Concern		Extinct (EX)	A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
		Extinct in the Wild (EW)	A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
		Regionally Extinct (RE)	A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
	Threatened Species	Critically Endangered, Possibly Extinct (CR PE)	Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
		Critically Endangered (CR)	A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
		Endangered (EN)	A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
		Vulnerable (VU)	A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
		Near Threatened (NT)	A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is, therefore, likely to become at risk of extinction in the near future.
		Critically Rare	A species is Critically Rare when it is known to occur at a single site, but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
		Rare	A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria.
		Declining	A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.
		Data Deficient – Insufficient Information (DDD)	A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.
	Other	Data Deficient – Taxonomically Problematic (DDT)	A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined so that an assessment of risk of extinction is not possible.
Least Concern (LC)		A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.	

	<p>Not Evaluated (NE)</p>	<p>A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.</p>
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As mentioned, flora of conservation significance (including threatened, protected and rare species) likely to occur in the various habitats of the study area were assessed at a desktop level using the outputs of SANBI’s PRECIS (National Herbarium Pretoria Computerized Information System) electronic database. This information was used to identify potential habitats in the project area that could support these species. Special attention was given to the identification of any Red Data species as well as the identification of suitable habitat for Red Data species observed during field investigations.

2.5 Ecological Mapping

Mapping has been done by comparing georeferenced ground survey data to the visual inspection of available Google-Earth Imagery (which is a generalised colour composite image without any actual reflectance data attached to it) and in that way extrapolating survey reference points to the entire study area. Delineations are therefore approximate, and due to the intricate mosaics and often gradual mergers of vegetation units, generalisations had to be made. Mapped units will thus show where a certain vegetation unit is predominant, but smaller inclusions of another vegetation type in this area do exist but have not been mapped separately. The latter would require a supervised classification of georeferenced raw SPOT or similar satellite imagery (with all reflectance data), which has not been available to this project due to the high cost of such imagery. Maps were created with QGIS (version 3.4.13).

2.6 Sensitivity Analysis and Criteria

The determination of specific ecosystem services and the sensitivity of ecosystem components, both biotic and abiotic, is rather complex and no single overarching criterion will apply to all habitats studied. The main aspects of an ecosystem that need to be incorporated in a sensitivity analysis, however, include the following:

- » Describing the nature and number of species present, taking into consideration their conservation value as well as the probability of such species to survive or

- re-establish itself following disturbances, and alterations to their specific habitats, of various magnitudes
- » Identifying the species or habitat features that are 'key ecosystem providers' and characterising their functional relationships (Kremen 2005)
 - » Determining the aspects of community structure that influence function, especially aspects influencing stability or rapid decline of communities (Kremen 2005)
 - » Assessing key environmental factors that influence the provision of services (Kremen 2005)
 - » Gaining knowledge about the spatial-temporal scales over which these aspects operate (Kremen 2005).

This implies that in the sensitivity analysis not only aspects that currently prevail on the area should be taken into consideration, but also if there is a possibility of a full restoration of the original environment and its biota, or at least the rehabilitation of ecosystem services resembling the original state after an area has been significantly disturbed.

According to the above, sensitivity classes have been summarised as follows:

- » **Very High Sensitivity:** Areas that contain critical and/or unique habitats have a very high sensitivity; such areas usually serve as habitats for rare/endangered species or perform critical and irreplaceable ecological roles. Very high sensitivity areas are no-go areas and developments in such areas should be avoided at all costs.
- » **High Sensitivity:** High sensitivity areas are those that usually have a high biodiversity value or important ecological roles, and it is expected that impacts on such areas will likely be high; these areas include natural or transformed land. It might be difficult to mitigate all impacts appropriately in high sensitivity areas, and thus development within these areas is undesirable and should proceed with caution.
- » **Medium Sensitivity:** The impacts on medium sensitivity areas are likely to be mostly local with the risk of secondary impacts (such as erosion) being low; these areas include natural or previously transformed land. On the condition that appropriate mitigation measures are implemented, development within medium sensitivity areas will have relatively little ecological impact.
- » **Low Sensitivity:** The impact on ecological processes and plant diversity in a low sensitivity area is likely to be negligible. Areas of low sensitivity are those areas where natural vegetation has already been transformed, for example as a result of intensive agricultural practices such as crop production. The majority of developments would have little ecological impact in low sensitivity areas.

2.7 Impact Assessment Methodology

The assessment methodology is in accordance with the recently revised 2014 EIA regulations. The significance of environmental impacts is a function of the environmental aspects that are present and to be impacted on, the probability of an impact occurring and the consequence of such an impact occurring before and after implementation of proposed mitigation measures.

The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive).

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

- » the degree of which the impact can be reversed;
- » the degree to which the impact may cause irreplaceable loss of resources; and
- » the degree to which the impact can be mitigated.

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

$S=(E+D+M)P$ where;

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

The significance weightings for each potential impact are as follows;

- » < 30 points: **LOW** (i.e. where the impact would not have a direct influence on the decision to develop in the area),
- » 30 – 60 points: **MEDIUM** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- » > 60 points: **HIGH** (i.e. where the impact must have an influence on the decision process to develop in the area).

2.8 Assumptions and Limitations

This report deals exclusively with a defined area and the impacts upon flora biodiversity and natural ecosystems in that area.

- » All relevant project information provided by the applicant and engineering design team to the ecological specialist was correct and valid at the time that it was provided.
- » Probably the most significant potential limitation associated with such a sampling approach is the narrow temporal window of sampling.
 - Temporal variation plays an important role in the structure and patterns of plant biodiversity, plant communities, and plant species occurrences. As such, a single site visit may therefore not fully catalogue all plant species diversity in an area, for example due to seasonal variation of vegetation, since the temporal window of sampling is narrow. Thus, the ideal situation would be to visit a site several times during different seasons, which would ensure that most, if not all, plant species present are observed and recorded. However, time and cost constraints make multiple site visits nearly impossible, and the species observed and recorded at the time of the

site visit should therefore be critically evaluated as they might not fully represent the complete plant community.

Indeed, the site was surveyed during one of the driest months of the year, namely January. This, together with the fact that the area has experienced a prolonged drought with below average rainfall for the past seven years, means that some annual, short-lived, ephemeral (plants surviving unfavourable conditions as seeds), geophytic (species with underground storage organs), or other cryptic species may not have been observed/detected, especially those that completely die back during dormancy. Furthermore, flowers and fruits are crucial for the complete and accurate identification of plant species and any absence of such flowers and fruits might therefore prevent the complete and accurate identification of such plant species (for example species of the family Aizoaceae). Flowering and fruiting times are both species specific and conditional on certain environmental cues being met (for example adequate rainfall), and there were thus invariably some plant species that were not flowering and/or fruiting during the period in which the site visit was conducted. Due to the aforementioned potential limitations, a list of protected or endangered species known to occur in the area was used to supplement the list of species observed and recorded during the site visit. This combined list is sufficiently conservative and cautious to account for the study limitations.

3. THE IMPORTANCE OF BIODIVERSITY AND CONSERVATION

The term 'Biodiversity' is used to describe the wide variety (richness and abundance) of plant and animal species occurring in their natural environment or 'habitat'. Biodiversity encompasses not only all living things but also the series of interactions that sustain them, which are termed 'ecological processes. South Africa's biodiversity provides an important basis for economic growth and development; and keeping our biodiversity intact is vital for ensuring the on-going provision of ecosystem services, such as the production of clean water through good catchment management. The role of biodiversity in combating climate change is also well recognised and further emphasises the key role that biodiversity management plays on a global scale (Driver et al., 2012). Typical pressures that natural ecosystems face from human activities include the loss and degradation of natural habitat, invasive alien species, pollution and waste and climate change (Driver et al., 2012). High levels of infrastructural and agricultural development typically restrict the connectivity of natural ecosystems, and maintaining

connectivity is considered critical for the long-term persistence both ecosystems and species, in the face of human development and global climatic change. Loss of biodiversity puts aspects of our economy and quality of life at risk and reduces socioeconomic options for future generations as well. In essence, then, sustainable development is not possible without biodiversity.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT - BASELINE

4.1 Broad-Scale Vegetation Patterns

The majority of the site is mapped as Breede Sand Fynbos (FFd 8), with a smaller section of North Sonderend Sandstone Fynbos (FFs 13) towards the western- and south-western boundary (Mucina & Rutherford, 2006) (Figure 4). Units are described separately below.

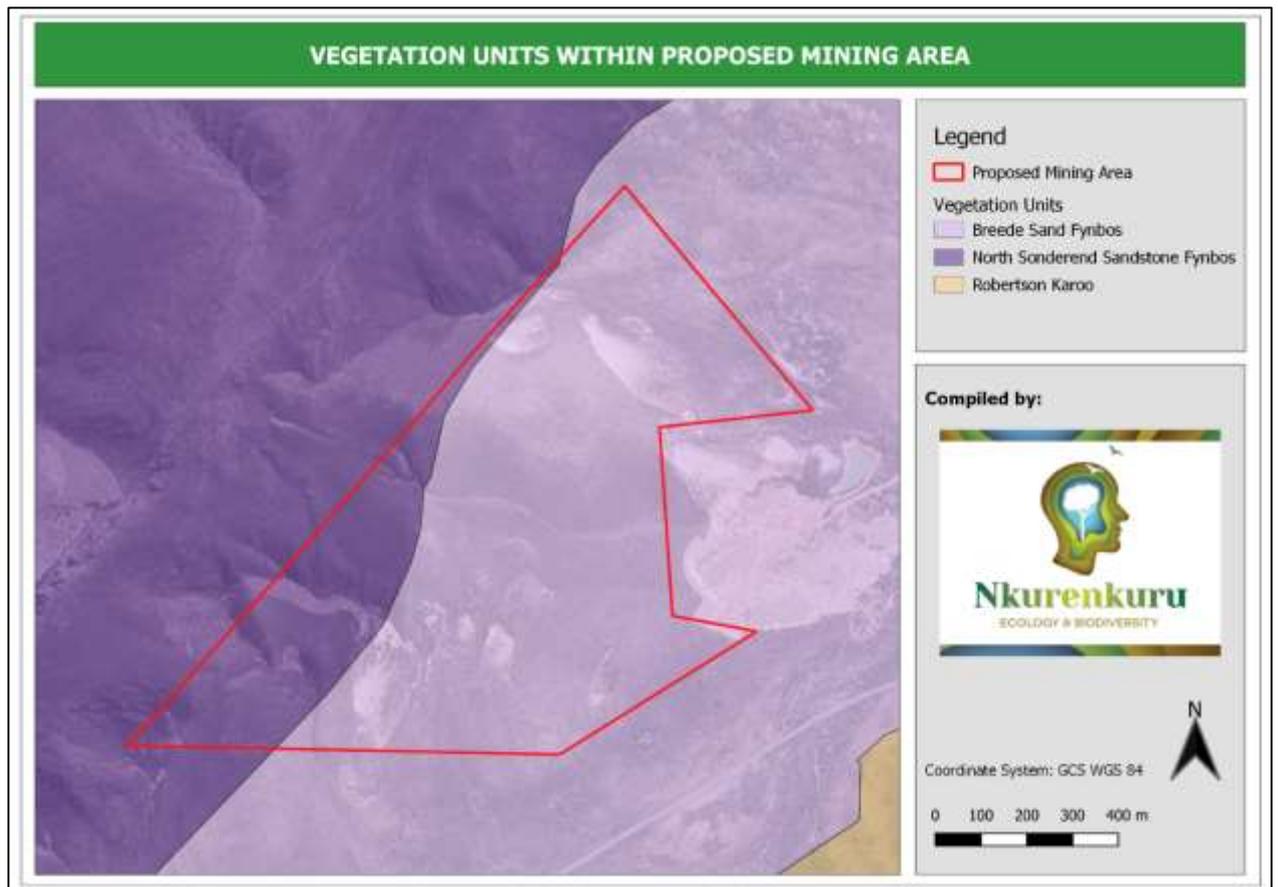


Figure 4: Map illustrating the different vegetation units found within the region.

Breede Sand Fynbos (FFd 8):

The unit overall is very fragmented and occurs as dune plumes and dune seas in the valley bottoms primarily south of the Breede River, and extends up the sides of adjacent hills. The vegetation characteristic of this consists of open proteoid tall shrubland combined with an open to medium dense restioid herbland in undergrowth. The dominant components are proteoid and restioid fynbos. Soils are of recent aeolian sand accumulations of riverine origin (Breede River).

The unit comprises only about 97 km² of land area and is classified as Vulnerable, since its conservation target is 30%, but none of the unit is conserved in statutory conservation areas, while only 2% is protected in the Hawequas and Quaggas Berg Private Nature Reserves. Furthermore, some 45% of the area has been transformed, mainly for agriculture and by building of the Brandvlei and Kwaggaskloof Dams. In fact, the largest patch of this unit is now almost entirely under water of these reservoirs. Low levels of infestation by alien *Eucalyptus*, *Acacia saligna* and *Hakea sericea* have been recorded.

Breede Sand Fynbos is a poorly studied vegetation unit. This, together with high levels of fragmentation, the non-existence of statutory conserved areas of the unit, and the moderate level of transformation of the unit, makes it a conservation priority.

Table 4: Key species associated with the Breede Sand Fynbos according to Mucina and Rutherford (2006).

DOMINANT SPECIES	
Growth Form	Key Species
Tall shrubs	<i>Leucospermum rodolentum</i> (dominant), <i>Metalasia densa</i> , <i>Protea laurifolia</i>
Low shrubs	<i>Afrolicmon longifolium</i> , <i>Aspalathus heterophylla</i> , <i>Euchaetis pungens</i> , <i>Lachnospermum fasciculatum</i> , <i>Leucadendron brunioides</i> var. <i>brunioides</i> , <i>L. salignum</i> , <i>Wiborgia fusca</i>
Succulent shrub	<i>Ruschia caroli</i>
Herbs	<i>Pelargonium senecioides</i>
Geophytic Herb	<i>Romulea setifolia</i>
Graminoids	<i>Cynodon dactylon</i> , <i>Ehrharta villosa</i> var. <i>villosa</i> , <i>Ficinia lateralis</i> , <i>Willdenowia incurvata</i>
ENDEMIC SPECIES	
Growth Form	Key Species

Geophytic herb	<i>Ixia pumilio</i>
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North Sonderend Sandstone Fynbos (FFs 13):

This unit is distributed from the northern slopes of the Riviersonderend Mountains from Villiersdorp to Bromberg and Luiperdsberg east of Stormsvlei, including Klipberg and Sandberg towards Robertson. Its altitudinal range is from 150 m to peaks exceeding 1 600 m (Jonaskop, Pilaarkop and an unnamed peak).

The unit consists of gentle to steep north-facing slopes, highly dissected in a few places, with a midslope sandy plateau and extensive gentle lower slopes. The vegetation is an open, tall, proteoid-leaved evergreen shrubland with a dense moderately tall, ericoid-leaved shrubland as understorey. While extensive proteoid and restioid fynbos dominate the middle slopes, the unit is mainly comprised of asteraceous fynbos on the western and lower slopes. Ericaceous fynbos is restricted to the highest peaks. The deep sand habitat of the northern plateau is a distinctive feature associated with many endemic species. Lithosol soils in this unit are derived from Ordovician sandstones of the Table Mountain Group (Cape Supergroup).

The unit comprises only about 531 km² of land area and is classified Least Threatened. The conservation target is 30%, and 21% of the unit is statutorily conserved in the Riviersonderend Nature Reserve, with an additional 51% mainly in a private conservation area of the same name. The unit thus enjoys a high level of conservation. Furthermore, about 2% has been transformed by cultivation for protea nurseries and fruit orchards, specifically occurring on the deep sand habitat of the northern plateau which supports many threatened taxa. Alien *Pinus pinaster* and *Hakea sericea* occasionally occur over about half of the area.

The northern slopes of the Riviersonderend Mountains are a poorly explored area. Data suggest that this unit, together with South Sonderend Sandstone Fynbos (FFs 14), form the centre of specific diversity in Proteaceae, especially for the genus *Serruria*, which may also be the case for other genera and families after further exploration. The genus *Endonema* (Penaeaceae) is endemic to the Riviersonderend.

Key species associated with the North Sonderend Sandstone Fynbos according to Mucina and Rutherford (2006).

DOMINANT SPECIES	
Growth Form	Key Species
Small trees	<i>Acacia karroo</i> , <i>Cunonia capensis</i> , <i>Metrosideros angustifolia</i> , <i>Protea nitida</i>

Tall shrubs	<i>Protea neriifolia</i> , <i>P. repens</i> , <i>Polygala fruticosa</i> , <i>Protea laurifolia</i> , <i>Searsia pyroides</i>
Low shrubs	<i>Agathosma leptospermoides</i> , <i>Athanasia oocephala</i> , <i>Cliffortia ruscifolia</i> , <i>Elytropappus glandulosus</i> , <i>Erica denticulata</i> , <i>E. globiceps</i> subsp. <i>zeyheri</i> , <i>E. jonasiana</i> , <i>E. lateralis</i> , <i>E. modesta</i> , <i>E. plukenetii</i> subsp. <i>plukenetii</i> , <i>E. serrata</i> , <i>E. taxifolia</i> , <i>E. vestita</i> , <i>Leucadendron laureolum</i> , <i>L. microcephalum</i> , <i>L. salignum</i> , <i>Leucospermum calligerum</i> , <i>Muraltia ferox</i> , <i>Paranomus adiantifolius</i> , <i>P. capitatus</i> , <i>Passerina burchellii</i> , <i>Phaenocoma prolifera</i> , <i>Prismatocarpus lycioides</i> , <i>Protea amplexicaulis</i> , <i>P. cynaroides</i> , <i>P. humiflora</i> , <i>P. lorifolia</i> , <i>P. scabra</i> , <i>P. subulifolia</i> , <i>Serurria gremialis</i> , <i>S. viridifolia</i> , <i>Stoebe spiralis</i>
Succulent shrubs	<i>Drosanthemum leptum</i> , <i>Ruschia acutangula</i>
Herbs	<i>Edmondia sesamoides</i> , <i>Ursinia oreogena</i>
Geophytic herb	<i>Gladiolus atropictus</i>
Graminoids	<i>Ehrharta ramosa</i> subsp. <i>aphylla</i> , <i>Hypodiscus squamosus</i> , <i>H. striatus</i> , <i>Ischyrolepis capensis</i> , <i>I. distracta</i> , <i>I. gaudichaudiana</i> , <i>Pentaschistis eriostoma</i> , <i>Restio filiformis</i> , <i>Thamnochortus cinereus</i>
ENDEMIC SPECIES	
Growth Form	Key Species
Low shrubs	<i>Leucadendron burchellii</i> , <i>L. immoderatum</i> , <i>L. nervosum</i> , <i>Leucospermum harpagonatum</i> , <i>Serruria stellata</i> , <i>S. williamsii</i> , <i>Spatalla argentea</i>

BODATSA species observations

A species list from the SANBI database (POSA) containing the species that have been recorded to date within the surroundings of the study area was compiled. POSA generated species lists also contain updated Red Data species status according to the Red List of South African Plants published by SANBI in Strelitzia 25 (Raimondo *et al.* 2009, updated 2013). Only protected and red data species that may potentially occur in the study area have been listed within the baseline study section of this report. The actual field survey confirmed which of the species recorded in the region actually occurs within the study area, and also indicates the presence of additional species that may not yet have been recorded in official databases.

A total of 1866 species have been recorded within the broader area based on the online plant search. Due to the fact that the impacted habitat type (sand dune) occurs as relatively small, scattered geographical patches within the region, plant species from two similar locations were extracted.

Ground truthing of the site confirmed a total of 63 plant species present.

From online data, the shrub and dwarf shrub layers were well represented with a high species diversity (dwarf shrubs = 426 species; shrubs = 504 species), similarly the lower herb/forb layer was also high in diversity with 397 species recorded in the broad region. As would be expected for this type of fynbos the graminoid layer was lower in species diversity and is primarily represented by restioids (it is expected that even though restioids are lower in species diversity, these species would be relatively high in cover abundance). Geophytic and succulent growth forms are also a prominent feature within the broader areas (geophytes = 246 species recorded; succulents = 213 species recorded).

Prominent families, in terms of species diversity, recorded within the extracted areas includes:

- » Asteraceae: 252 species;
- » Ericaceae: 162 species;
- » Fabaceae: 141 species;
- » Iridaceae: 111 species;
- » Proteaceae: 90 species;
- » Aizoaceae: 89 species;
- » Scrophulariaceae: 62 species; and
- » Restionaceae: 54 species

Another unique feature of these areas is the high number of South African endemics with a total of 1365 (73%) SA endemics recorded. High numbers of endemics were observed with the plant families Aizoaceae, Asphodelaceae, Asteraceae, Ericaceae, Iridaceae, Gerinaceae, Restionaceae and Proteaceae.

Furthermore, only 39 non-indigenous plant species were recorded within the extracted areas with 19 species being invasive. Of these 19 species, 10 species are listed within NEM:BA Act No. 10 of 2004 (Alien and Invasive Species List, 2016) namely;

- » *Acacia saligna* (Fabaceae): Category 1b
- » *Echium plantagineum* (Boraginaceae): Category 1b;
- » *Eucalyptus camaldulensis* (Myrtaceae): Category 1b within fynbos;
- » *Leptospermum laevigatum* (Myrtaceae): Category 1b;
- » *Orobanche ramosa* (Orobanchaceae): Category 1b;
- » *Ricinus communis* (Euphorbiaceae): Category 2;
- » *Salsola kali* (Amaranthaceae): Category 1b
- » *Schinus molle* (Anacardiaceae): Category 3;
- » *Sesbania punicea* (Fabaceae): Category 1b;
- » *Xanthium strumarium* (Asteraceae): Category 1b

4.2 Species of Conservation Concern

A total of 173 red data plant species are known to occur in the broad area surrounding the site, as obtained from the SANBI SIBIS database and Threatened Species Programme, Red List of South African Plants (2011). These species of conservation concern are listed below in Table 5.

The majority of these species are from the families Proteaceae (protea family; 29 species) and Fabaceae (pea family; 21 species). Furthermore, it includes 104 Threatened Species (8 Critically Endangered, 31 Endangered species, 65 Vulnerable).

The online list includes a much broader area than the actual site, and as a result, the actual number of species of conservation concern which might occur within the site should be significantly less. However, this precautionary measure of including a larger area allows for adequate information to be extracted and evaluated.

A total of 521 species have been recorded within the extracted areas which are Protected (Schedule 4) within the Nature Conservation Ordinance No. 19 of 1974. The high number of protected flora is mainly due to the fact that all species within the families Amaryllidaceae, Bruniaceae, Ericaceae, Iridaceae, Orchidaceae, Proteaceae and Rutaceae are protected and are families which are well represented within this region.

Only one national protected tree (under the National Forests Act, 1998 – Act No. 84 of 1998) has been recorded, namely *Podocarpus elongatus*.

Table 5: Red List Flora species that have been listed within the SANBI database and that have been recorded within the broad region surrounding the study site.

Family	Species	IUCN	Family	Species	IUCN
Asteraceae	<i>Zyrphelis nervosa</i>	CR	Proteaceae	<i>Protea longifolia</i>	VU
Fabaceae	<i>Wiborgiella bowieana</i>	CR	Proteaceae	<i>Protea restionifolia</i>	VU
Oxalidaceae	<i>Oxalis pseudohirta</i>	CR	Proteaceae	<i>Serruria stellata</i>	VU
Proteaceae	<i>Leucadendron globosum</i>	CR	Proteaceae	<i>Serruria viridifolia</i>	VU
Proteaceae	<i>Leucadendron thymifolium</i>	CR	Rosaceae	<i>Cliffortia cruciata</i>	VU
Proteaceae	<i>Leucospermum harpagonatum</i>	CR	Rosaceae	<i>Cliffortia integerrima</i>	VU
Proteaceae	<i>Protea caespitosa</i>	CR	Ruscaceae	<i>Eriospermum bowieanum</i>	VU
Proteaceae	<i>Serruria aemula</i>	CR	Rutaceae	<i>Agathosma leptospermoides</i>	VU
Aizoaceae	<i>Acrodon purpureostylus</i>	EN	Rutaceae	<i>Agathosma microcarpa</i>	VU
Asphodelaceae	<i>Gasteria disticha</i>	EN	Rutaceae	<i>Agathosma pulchella</i>	VU
Asteraceae	<i>Lidbeckia pinnata</i>	EN	Rutaceae	<i>Agathosma serratifolia</i>	VU

Asteraceae	<i>Stoebe rugulosa</i>	EN	Rutaceae	<i>Agathosma trichocarpa</i>	VU
Bruniaceae	<i>Brunia esterhuyseniae</i>	EN	Rutaceae	<i>Diosma passerinoides</i>	VU
Campanulaceae	<i>Merciera brevifolia</i>	EN	Rutaceae	<i>Diosma pilosa</i>	VU
Ericaceae	<i>Erica modesta</i>	EN	Rutaceae	<i>Euchaetis pungens</i>	VU
Ericaceae	<i>Erica oakesiorum</i>	EN	Stilbaceae	<i>Stilbe serrulata</i>	VU
Fabaceae	<i>Aspalathus candicans</i>	EN	Thymelaeaceae	<i>Lachnaea grandiflora</i>	VU
Fabaceae	<i>Aspalathus wurmbeana</i>	EN	Aizoaceae	<i>Brianhuntleya intrusa</i>	NT
Geraniaceae	<i>Pelargonium violiflorum</i>	EN	Aizoaceae	<i>Drosanthemum calycinum</i>	NT
Hyacinthaceae	<i>Lachenalia physocaulos</i>	EN	Asphodelaceae	<i>Trachyandra filiformis</i>	NT
Hyacinthaceae	<i>Lachenalia stayneri</i>	EN	Asteraceae	<i>Lachnospermum neglectum</i>	NT
Iridaceae	<i>Freesia marginata</i>	EN	Asteraceae	<i>Metalasia adunca</i>	NT
Iridaceae	<i>Geissorhiza geminata</i>	EN	Boraginaceae	<i>Lobostemon gracilis</i>	NT
Iridaceae	<i>Ixia atrandra</i>	EN	Euphorbiaceae	<i>Euphorbia nesemannii</i>	NT
Iridaceae	<i>Ixia collina</i>	EN	Fabaceae	<i>Aspalathus lactea</i>	NT
Iridaceae	<i>Ixia pumilio</i>	EN	Fabaceae	<i>Cyclopia genistoides</i>	NT
Iridaceae	<i>Moraea radians</i>	EN	Fabaceae	<i>Lotononis prostrata</i>	NT
Orchidaceae	<i>Disa hallackii</i>	EN	Fabaceae	<i>Wiborgia tenuifolia</i>	NT
Penaeaceae	<i>Endonema lateriflora</i>	EN	Geraniaceae	<i>Pelargonium divisifolium</i>	NT
Plumbaginaceae	<i>Limonium purpuratum</i>	EN	Hyacinthaceae	<i>Lachenalia contaminata</i>	NT
Polygalaceae	<i>Muraltia gillettiae</i>	EN	Iridaceae	<i>Babiana fragrans</i>	NT
Proteaceae	<i>Leucospermum formosum</i>	EN	Iridaceae	<i>Babiana stricta</i>	NT
Proteaceae	<i>Mimetes argenteus</i>	EN	Iridaceae	<i>Freesia caryophyllacea</i>	NT
Proteaceae	<i>Protea laticolor</i>	EN	Iridaceae	<i>Watsonia aletroides</i>	NT
Proteaceae	<i>Serruria incrassata</i>	EN	Polygalaceae	<i>Muraltia concava</i>	NT
Proteaceae	<i>Serruria williamsii</i>	EN	Polygalaceae	<i>Muraltia trinervia</i>	NT
Proteaceae	<i>Spatalla argentea</i>	EN	Proteaceae	<i>Aulax pallasia</i>	NT
Ruscaceae	<i>Eriospermum vermiforme</i>	EN	Proteaceae	<i>Aulax umbellata</i>	NT
Rutaceae	<i>Diosma parvula</i>	EN	Proteaceae	<i>Leucadendron burchellii</i>	NT
Aizoaceae	<i>Antimima leipoldtii</i>	VU	Proteaceae	<i>Leucadendron nervosum</i>	NT
Aizoaceae	<i>Drosanthemum giffenii</i>	VU	Proteaceae	<i>Leucadendron teretifolium</i>	NT
Aizoaceae	<i>Drosanthemum striatum</i>	VU	Proteaceae	<i>Protea coronata</i>	NT
Aizoaceae	<i>Erepsia oxysepala</i>	VU	Proteaceae	<i>Protea cryophila</i>	NT
Aizoaceae	<i>Stayneria neilii</i>	VU	Proteaceae	<i>Protea effusa</i>	NT
Apiaceae	<i>Centella thesioides</i>	VU	Proteaceae	<i>Protea scabra</i>	NT
Apocynaceae	<i>Duvalia elegans</i>	VU	Proteaceae	<i>Serruria elongata</i>	NT
Apocynaceae	<i>Stapelia paniculata</i>	VU	Proteaceae	<i>Serruria fasciflora</i>	NT
Apocynaceae	<i>Stapeliopsis breviloba</i>	VU	Proteaceae	<i>Spatalla curvifolia</i>	NT
Asphodelaceae	<i>Astroloba rubriflora</i>	VU	Rhamnaceae	<i>Phylica nigrita</i>	NT
Asteraceae	<i>Anaxeton brevipes</i>	VU	Rutaceae	<i>Agathosma foetidissima</i>	NT
Asteraceae	<i>Anaxeton hirsutum</i>	VU	Rutaceae	<i>Diosma pedicellata</i>	NT
Asteraceae	<i>Berkheya angusta</i>	VU	Thymelaeaceae	<i>Lachnaea filicaulis</i>	NT
Asteraceae	<i>Metalasia tenuis</i>	VU	Aizoaceae	<i>Antimima microphylla</i>	DD
Bruniaceae	<i>Brunia latebracteata</i>	VU	Aizoaceae	<i>Drosanthemum albiflorum</i>	DD
Colchicaceae	<i>Colchicum hughocymbion</i>	VU	Aizoaceae	<i>Drosanthemum collinum</i>	DD

Ericaceae	<i>Erica alfredii</i>	VU	Aizoaceae	<i>Drosanthemum globosum</i>	DD
Ericaceae	<i>Erica caledonica</i>	VU	Aizoaceae	<i>Drosanthemum papillatum</i>	DD
Ericaceae	<i>Erica colorans</i>	VU	Aizoaceae	<i>Lampranthus falcatus</i>	DD
Ericaceae	<i>Erica floccifera</i>	VU	Aizoaceae	<i>Lampranthus leipoldtii</i>	DD
Ericaceae	<i>Erica ignita</i>	VU	Aizoaceae	<i>Lampranthus occultans</i>	DD
Ericaceae	<i>Erica insolitanthera</i>	VU	Apocynaceae	<i>Ceropegia fimbriata</i>	DD
Ericaceae	<i>Erica pilosiflora</i>	VU	Apocynaceae	<i>Tavaresia meintjesii</i>	DD
Ericaceae	<i>Erica sicifolia</i>	VU	Asphodelaceae	<i>Haworthia herbacea</i>	DD
Ericaceae	<i>Erica viscidiflora</i>	VU	Asteraceae	<i>Curio crassulifolius</i>	DD
Fabaceae	<i>Amphithalea pageae</i>	VU	Asteraceae	<i>Senecio coleophyllus</i>	DD
Fabaceae	<i>Aspalathus acanthoclada</i>	VU	Asteraceae	<i>Senecio erysimoides</i>	DD
Fabaceae	<i>Aspalathus angustifolia</i>	VU	Asteraceae	<i>Senecio glutinarius</i>	DD
Fabaceae	<i>Aspalathus araneosa</i>	VU	Ericaceae	<i>Erica greyi</i>	DD
Fabaceae	<i>Aspalathus chrysantha</i>	VU	Ericaceae	<i>Erica haemastoma</i>	DD
Fabaceae	<i>Aspalathus excelsa</i>	VU	Ericaceae	<i>Erica involvens</i>	DD
Fabaceae	<i>Aspalathus florulenta</i>	VU	Ericaceae	<i>Erica longistyla</i>	DD
Fabaceae	<i>Aspalathus lactea</i>	VU	Ericaceae	<i>Erica ostiaria</i>	DD
Fabaceae	<i>Aspalathus macrocarpa</i>	VU	Ericaceae	<i>Erica ovina</i>	DD
Fabaceae	<i>Aspalathus pinguis</i>	VU	Hyacinthaceae	<i>Ornithogalum niveum</i>	DD
Fabaceae	<i>Aspalathus recurva</i>	VU	Malvaceae	<i>Anisodonteia gracilis</i>	DD
Fabaceae	<i>Aspalathus steudeliana</i>	VU	Oxalidaceae	<i>Oxalis leptocalyx</i>	DD
Fabaceae	<i>Lotononis involucrata</i>	VU	Oxalidaceae	<i>Oxalis lindaviana</i>	DD
Fabaceae	<i>Lotononis rigida</i>	VU	Oxalidaceae	<i>Oxalis pardalis</i>	DD
Iridaceae	<i>Chasmanthe bicolor</i>	VU	Polygalaceae	<i>Muraltia schlechteri</i>	DD
Iridaceae	<i>Geissorhiza brehmii</i>	VU	Rhamnaceae	<i>Phyllica lucens</i>	DD
Iridaceae	<i>Gladiolus atropictus</i>	VU	Rosaceae	<i>Cliffortia varians</i>	DD
Iridaceae	<i>Ixia dolichosiphon</i>	VU	Santalaceae	<i>Thesium brachygyne</i>	DD
Iridaceae	<i>Ixia vanzyliae</i>	VU	Santalaceae	<i>Thesium frisea</i>	DD
Oxalidaceae	<i>Oxalis meisneri</i>	VU	Santalaceae	<i>Thesium microcarpum</i>	DD
Penaeaceae	<i>Endonema retzioides</i>	VU	Santalaceae	<i>Thesium repandum</i>	DD
Proteaceae	<i>Leucadendron galpinii</i>	VU	Scrophulariaceae	<i>Pseudoselago burmannii</i>	DD
Proteaceae	<i>Protea burchellii</i>	VU			

4.3 Conservation Planning / Context

4.3.1 National Protected Areas Expansion Strategy

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area

Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, since in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine-scale planning which may identify a range of different priority sites based on local requirements, constraints, and opportunities.

The proposed expansion is located outside of any NPAES Areas (Figure 5) as well as any Formal Protected, and Informal Protected Areas. The nearest NPAES Area is located approximately 1.03 km south-east (Vrolijkheid), whilst the nearest Informal Protected Area is located ±7.8 km south-west (Skuilkrans Private Nature Reserve). The nearest Formal Protected Area, the Langeberg-Wes Mountain Catchment Area, is located 7.6 km north of the project site.

Subsequently this development will not have an impact on the national ecosystem-specific protected area targets.

4.3.2 National Level of Conservation Priorities (Threatened Ecosystems)

The vegetation types of South Africa have been categorized according to their conservation status which is, in turn, assessed according to the degree of transformation and rates of conservation. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. On a national scale, these thresholds are as depicted in the table below, as determined by the best available scientific approaches (Driver et al. 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver et al. 2005).

Table 6: Determining ecosystem status (from Driver et al. 2005). *BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

A national process has been undertaken to identify and list threatened ecosystems that are currently under threat of being transformed by other land uses. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (National Environmental Management: Biodiversity Act or

NEMBA: National list of ecosystems that are threatened and in need of protection, G 34809, GoN 1002, 9 December 2011). The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function, and composition of threatened ecosystems (SANBI, 2011). The NEMBA provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. There are four main types of implications of listing ecosystems:

- » Planning related implications which are linked to the requirement in the Biodiversity Act (Act 10 of 2004) for listed ecosystems to be taken into account in municipal IDPs and SDFs;
- » Environmental authorisation implications in terms of NEMA and the EIA regulations;
- » Proactive management implications in terms of the National Biodiversity Act;
- » Monitoring and reporting implications in terms of the Biodiversity Act.

The proposed mining site is located within two vegetation units according to Mucina and Rutherford (2006), namely Breede Sand Fynbos and North Sonderend Sandstone Fynbos. Currently, the first unit, namely Breede Sand Fynbos, is classified as Vulnerable (Figure 5), since only 2% is protected in the Hawequas and Quaggas Berg Private Nature Reserves, while none of the unit is conserved in statutory conservation areas, and some 45% of the area has been transformed. Thus, the conservation target of 30% is likely attainable, but will probably not be realized since only 2% is currently protected. The second unit, namely North Sonderend Sandstone Fynbos, is classified as Least Threatened, since 21% of the 30% conservation target is statutorily conserved in the Riviersonderend Nature Reserve, with an additional 51% mainly in a private conservation area of the same name, while only low levels of transformation has occurred.

Furthermore, this site falls within a broader area which is also listed (Figures 5) within the Threatened Ecosystem List, 2012 (NEMA:BA) as a Vulnerable Ecosystem (Breede Sand Fynbos Ecosystem) and correlates with the Breede Sand Fynbos Vegetation Type as classified by Mucina and Rutherford, 2012. This ecosystem is very fragmented, occurring as dune plumes and dune seas in the valley bottoms primarily south of the Breed River and cover a total combined area of approximately 9 000 ha.

The project site is located on a dune plume (Breede Sand Fynbos) that covers an area of approximately 597ha. Due to the low agricultural and developmental potential of this dune plume most of this ecosystem is largely intact with minimal disturbance and transformation (mostly associated with the foot of the dune in the

form of roads, small farm dams and the existing mining area), mostly containing a stable climatic vegetation cover providing stability to the highly dispersive sand plume. Small isolated patches of this sand plume / dune contain unstable areas with a sparse vegetation cover.

Due to the high impact nature of the proposed mining activities, which essentially removes all vegetation as well as the majority of topsoil, leaving an area with minimal rehabilitation potential (in terms of rehabilitation of a vegetation cover that resembles the original natural vegetation cover that was removed), this development will result in the local loss of some functions and services. However, the area that will be transformed will only cover 2.92% of total area of this sand plume. Furthermore, when taking into account the total combined size of all such dune plumes and dune seas that are covered by the Breede Sand Fynbos Vegetation Type / Ecosystem an area of less than 1% (0.19% of 9277 ha) of this vegetation type / ecosystem will be impacted. Subsequently it is unlikely that this development will influence the status of this vegetation type / ecosystem.

Table 7: Conservation status of the vegetation type occurring in and around the study area.

Vegetation Type	Target (%)	Transformed (%)	Conserved (Statutorily & other reserves)	Conservation Status	
				Driver <i>et al.</i> , 2005; Mucina & Rutherford, 2006	National Ecosystem List (NEMA:BA)
Breede Sand Fynbos	30%	45%	2%	Vulnerable	Vulnerable
North Sonderend Sandstone Fynbos	30%	2%	72%	Least Threatened	Not Listed

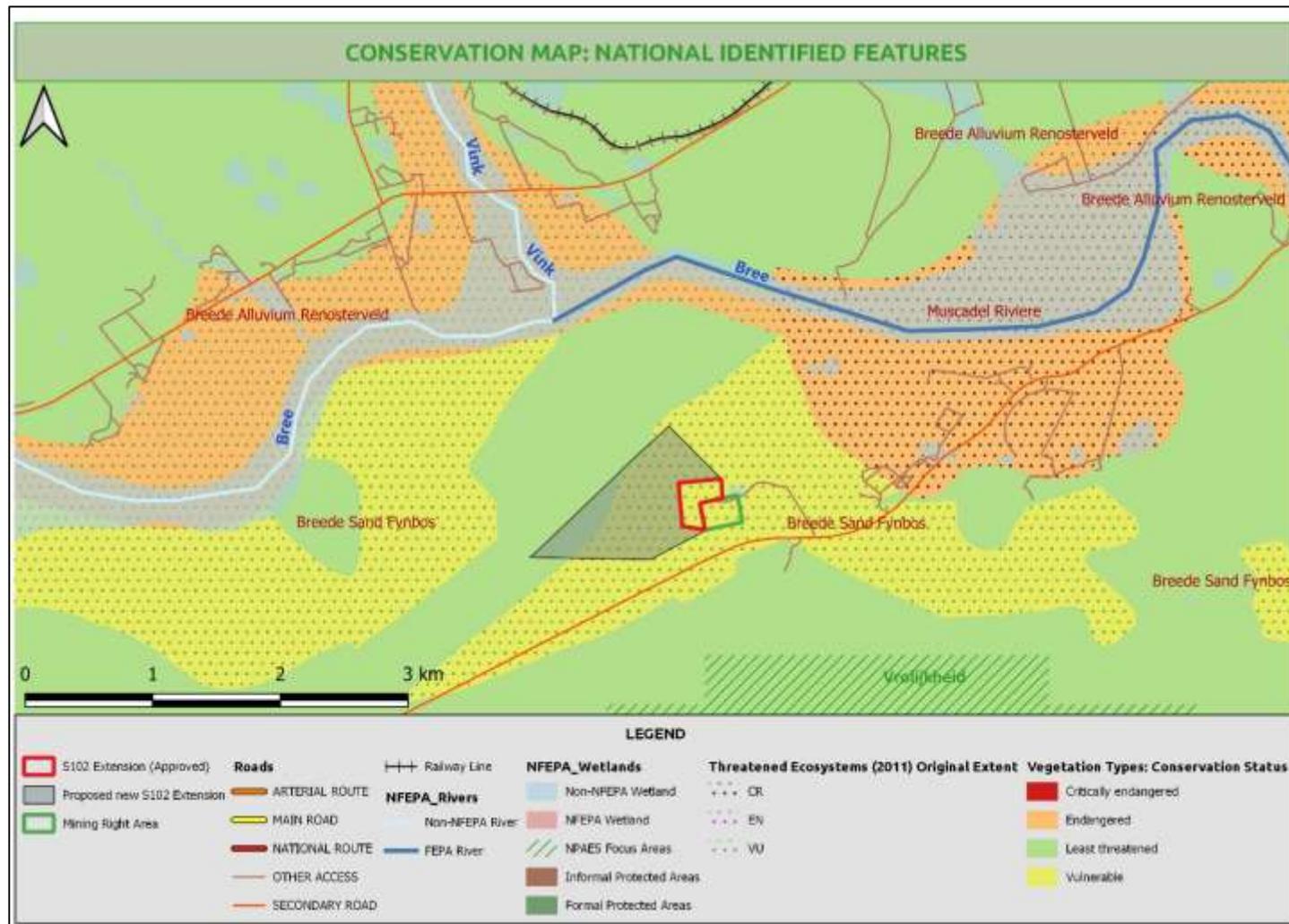


Figure 5: Map illustrating the various conservation priority areas found within the greater surroundings of the proposed mining site.

4.3.3 Critical Biodiversity Areas and Broad Scale Ecological Processes

Critical Biodiversity Areas have been identified for all municipal areas of the Western Cape Province (CapeNature, 2017) and are published on the SANBI website (bgis.sanbi.org). This biodiversity assessment identifies CBAs which represent biodiversity priority areas that should be maintained in a natural to near-natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to maintain ecosystem functioning and meet national biodiversity objectives (refer to Table 8 for the different land management objectives set out for each CBA category). According to these maps, large tracks of land within the region falls either within Critical Biodiversity Areas 2 (CBA2) or Ecological Support Areas (ESA).

The entire mining footprint is located almost entirely within a CBA1, together with some randomly scattered pixels of CBA2, and a small unclassified portion (Figure 6). The insignificant and random nature of the CBA2 pixels are likely a side-effect of the algorithm used to generate the CBA spatial layers, and ground-truthing confirmed the entire site to conform to CBA1 criteria, including the portion not originally classified. Areas classified as CBA1 are regarded as "areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure" (WCSBP 2017). Thus, CBA1 areas are in a natural condition (or nearly so), with little to no transformation and no secondary vegetation. The desired outcome for such areas is to maintain them "in a natural or near natural state, with no further loss of habitat", and only "low-impact, biodiversity-sensitive land uses" are appropriate.

Table 8: Relationship between Critical Biodiversity Areas categories (CBAs) and land management objectives

CBA category	Land Management Objective
Protected Areas (PA) & CBA 1	<p>Natural landscapes:</p> <ul style="list-style-type: none"> » Ecosystems and species are <u>fully intact</u> and <u>undisturbed</u>. » These are areas with <u>high irreplaceability</u> or <u>low flexibility</u> in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met. » These are landscapes that are <u>at or past</u> their limits of acceptable change.
CBA 2	<p>Near-natural landscapes:</p> <ul style="list-style-type: none"> » Ecosystems and species <u>largely intact</u> and <u>undisturbed</u>. » Areas with <u>intermediate irreplaceability</u> or <u>some flexibility</u> in terms of the area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve targets. » These are landscapes that are <u>approaching but have not passed</u> their limits of acceptable change.

<p>ESA</p>	<p>Functional landscapes:</p> <ul style="list-style-type: none"> » Ecosystem <u>moderately to significantly disturbed</u> but still able to <u>maintain basic functionality</u>. » Individual species or other biodiversity indicators may be <u>severely disturbed or reduced</u>. » These are areas with <u>low irreplaceability</u> with respect to biodiversity pattern targets only.
<p>ONA (Other Natural Areas) and Transformed</p>	<p>Production landscapes: Manage land to optimise sustainable utilisation of natural resources.</p>

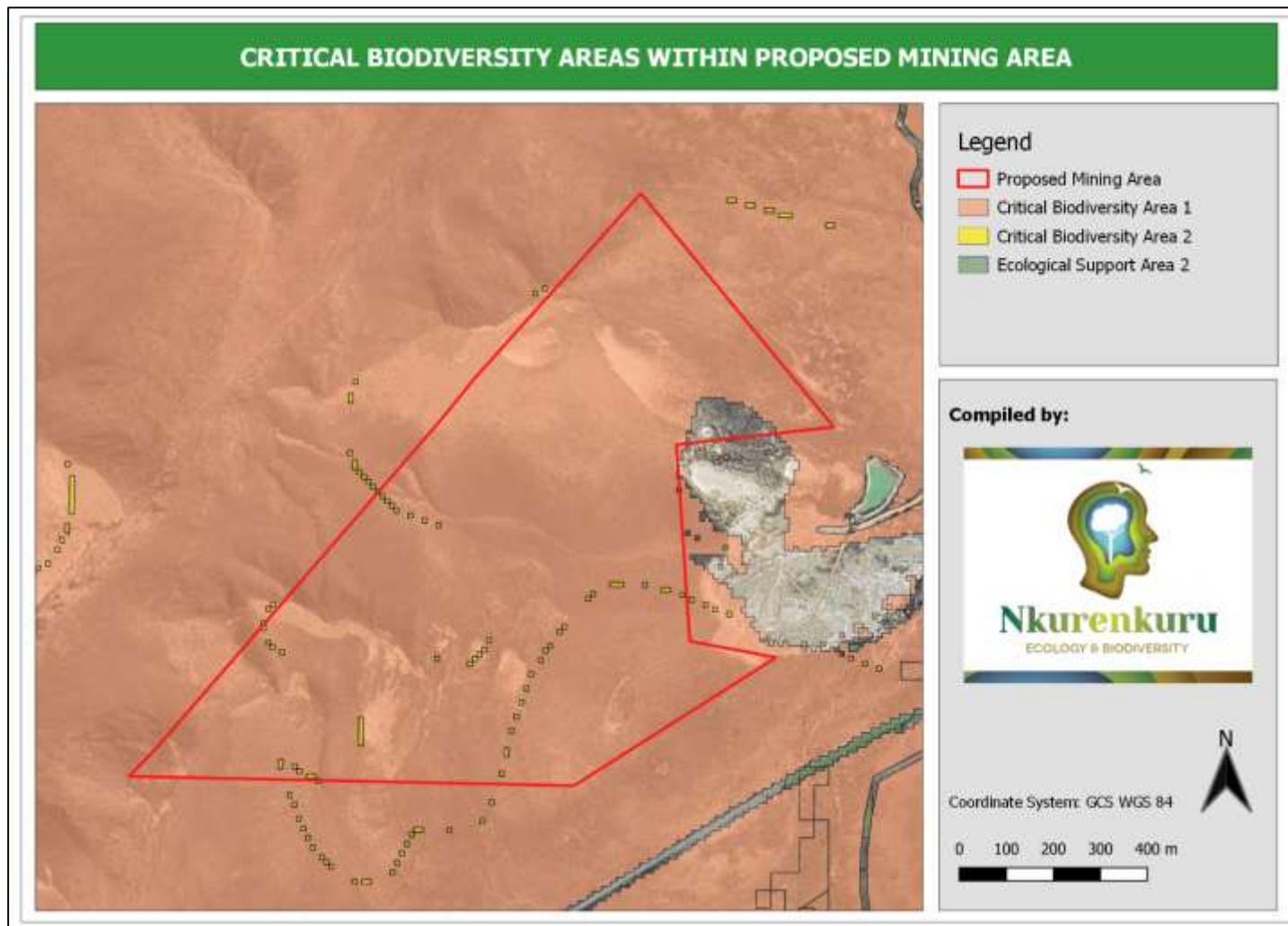


Figure 6: Map illustrating the various provincial conservation priority areas found within the project area as well as the surrounding landscape.

5. FINDINGS OF THE BOTANICAL ASSESSMENT

5.1 Site Specific Vegetation Description - Fine Scale Vegetation Patterns

In this section, the different habitats and vegetation patterns observed within the study site are described. As these are field-based observations taken directly from the site, they are of greater reliability and pertinence than the results of the National Vegetation Map which represents a coarse scale and does not represent the detail of the site adequately. The habitat map derived for the study site is provided in Figure 8 and their sensitivity ratings are provided in Figure 10.

The vegetation of the study site resembles pristine forms of Breede Sand Fynbos throughout the majority of the site, together with pristine North Sonderend Sandstone Fynbos in the Western and southwestern corner, adjacent to drainage lines (Figure 9).

In terms of Breede Sand Fynbos, there was some variability in habitat types (Figure 8), mostly related to vegetation cover, for example the existence of mobile dunes with sparse vegetation cover, progressing towards semi-mobile dunes with moderate cover, to stabilised sands/dunes with high vegetation cover.

The majority of the vegetation was relatively uniform. The tall shrub layer had Proteaceae species alternating in dominance, such as *Protea laurifolia*, *Leucospermum calligerum*, and *Leucadendron salignum*, together with scattered individuals of *Wiborgia obcordata*. The medium to small shrub layer was dominated by *Aspalathus lactea*, *A. quinquefolia*, and *Euchaetis pungens*. Although the site was relatively absent of forb species, smaller shrubs and plants that were abundant included *Aristea dichotoma*, *Prismatocarpus brevilobus*, *Wahlenbergia nodosa*, and *Polpoda capensis*. Finally, the graminoid layer was dominated by *Thamnochortus lucens* and *Willdenowia incurvata*, with less dominant *Pentameris pallida* and *Stipagrostis zeyheri*. The vegetation unit in its entirety was pristine, with no signs of previous transformation or secondary vegetation. Also, no invasive alien plant species were observed.

In terms of North Sonderend Sandstone Fynbos, the extent of the vegetation unit was less than what has been mapped according to the Vegetation Map of South Africa (Mucina & Rutherford 2006). This is to be expected, since the latter represents mapping conducted at coarse spatial scales. The true extent of the North Sonderend Sandstone Fynbos vegetation unit was limited to a southwestern slope adjacent to a drainage line in the western part of the site, together with the slopes

of the southwestern corner of the site, which is characterised by an increased elevation. The vegetation type is thus confined to the steep mountainous slopes bordering the proposed mining area, and that intrudes partly into the site in the western and southwestern sections. The tall shrub layer again included species from the Proteaceae, such as *Protea laurifolium* and *Leucadendron salignum*, together with *Serruria gremialis*, and the rock-loving species *Maytenus oleoides* was observed growing in between many of the exposed sandstone crevices. A few scattered individuals of *P. nitida* were observed, although they were not within the boundaries of the site. The medium height shrub layer was dominated by *Aspalathus burchelliana* and *A. hirta*. The graminoid layer was dominated by the grass *Capeochloa cincta*. The vegetation bordering the drainage lines was mostly similar to that of the North Sonderend Sandstone Fynbos vegetation, i.e. being mostly characterised by *A. burchelliana* and *A. hirta*, *S. gremialis*, *Maytenus oleoides*, and *C. cincta*, but also included *Podalyria rotundifolia* and *Cliffortia ruscifolia* as semi co-dominants.

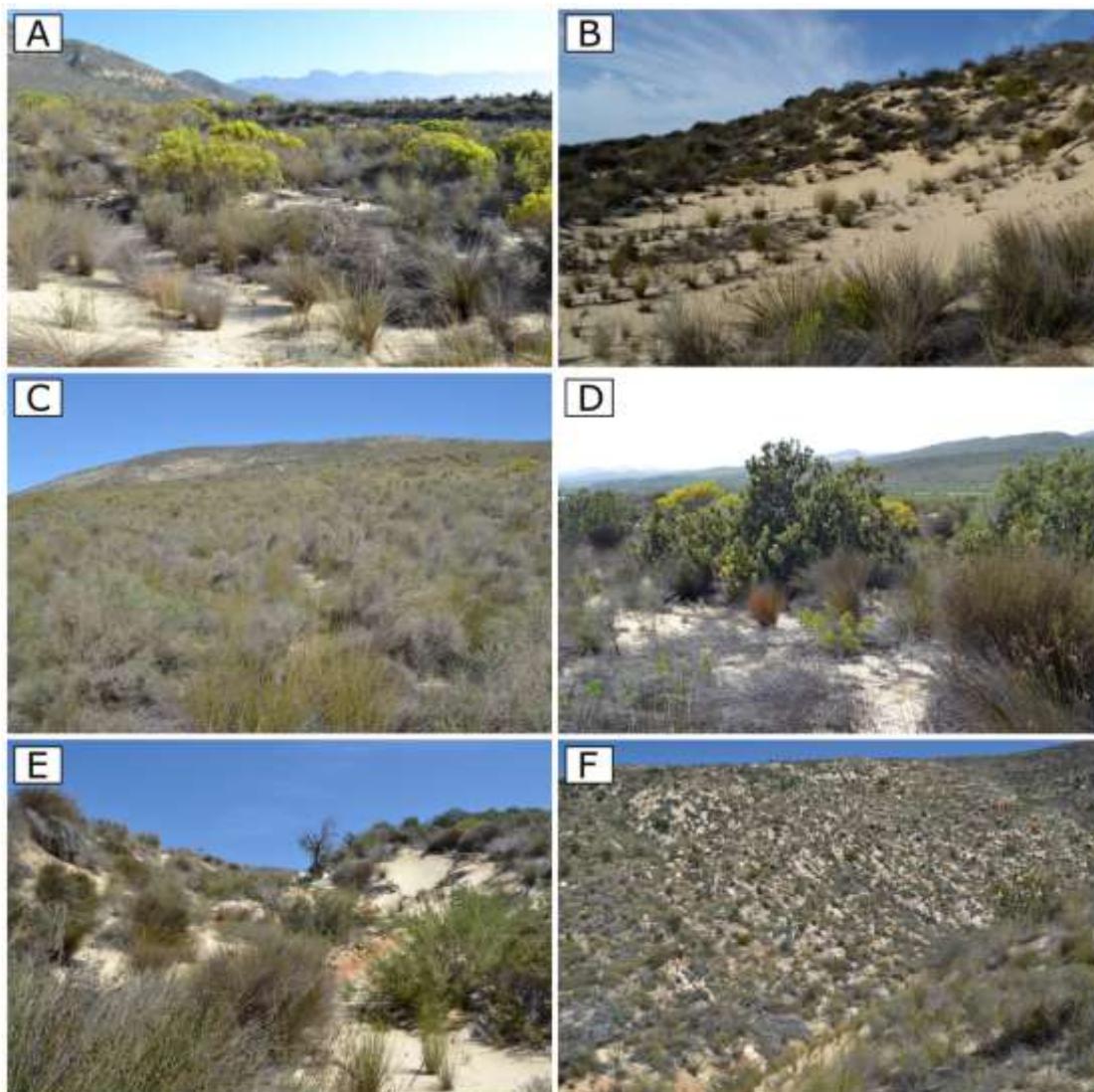


Figure 7 (A-F): Representative photos of the proposed mining site. A) and B) vegetation of semi-mobile dunes showing prominent *Leucadendron salignum* (light green in A), as well as moderate to sparse vegetation cover, C) dense vegetation cover of stabilised sands/dunes with dominant *Aspalathus* and *Thamnochortus*, D) patch of *Protea laurifolia* growing together with *Leucadendron salignum* and *Willdenowia incurvata* on the lower foot slopes of the site near the south-eastern border, E) view upstream of a drainage showing exposed sandstone lithology, and F) north-east facing slope of North Sonderend Sandstone Fynbos bordering a drainage line in the south-western part of the site.

Table 9: Summary of results for the fynbos habitat occupying the stabilised dune plume.

Fynbos of the stabilised portions	Habitat Sensitivity	High	Photographs:	
	No-Go Areas	All areas south of the drainage line dissecting the project site into roughly two halves.		
	Present Ecological Status (PES)	A: Unmodified, natural		
Substrate	<ul style="list-style-type: none"> » Deep aeolian sand » Regic Sand: Recently deposited aeolian sand with very minimal evidence of pedogenesis apart from some very slight coloration of the surface due to the accumulation of organic material. » Moderately fine textured with a loose friable consistency. » Stabilised with a dense well developed fynbos cover. 			
Species richness	Low: 40 Indigenous Species		Dominant and diagnostic species:	<i>Aspalathus lactea, Leucadendron salignum, Thamnochortus lucens, Willdenowia incurvata</i>
Alien Invasive Plants	None recorded		Conservation Important Flora:	Red Data (ICUN Listed): <i>Aspalathus lactea, Euchaetis pungens, Lachnaea uniflora, Metalasia adunca</i> ; Provincially Protected: <i>Aristea dichotoma, Erica similis, E. sonderiana, Leucadendron salignum, Leucospermum callgerum, Protea laurifolia</i>
Slope & Geomorphological Setting	» Dune plume that have settled along the south-eastern slope of the Sandberg Mountain Range (narrow mountain range running in south-west to north-east direction).		Naturalness:	High

	<ul style="list-style-type: none"> » Steep slopes are associated with incised drainage valleys running parallel to the mountain range. » Moderate-steep to steep slopes 		Mostly natural and undisturbed area covered by a well developed, dense, climax fynbos type providing stability to the dune plume.
Disturbance	<ul style="list-style-type: none"> » Minimal to no disturbance 	Anthropogenic importance and potential	Agricultural Potential: Low <ul style="list-style-type: none"> » Game Farming: Some grazing potential for scarce game / wildlife such as Cape Mountain Zebra (<i>Equus zebra zebra</i>), Grey Rhebok (<i>Pelea capreolus</i>), Bontebok (<i>Damaliscus pygargus dorcas</i>) and Cape Grysbok (<i>Raphicerus melanotis</i>)
Habitat & Biotic Integrity:	<p>Very-High</p> <ul style="list-style-type: none"> » The majority of the mountain range and associated dune plumes are in a natural to near-natural condition with minimal disturbance. » Sand plumes can be regarded as unique complex habitats inhabited by habitat specialists, subsequently these habitats contribute to habitat and niche diversity within the region. » Dense fynbos vegetation helps slow down surface runoff and stabilise sand plumes. » Potential/suitable habitat for rare / conservation important faunal species such as Cape Mountain Zebra (<i>Equus zebra zebra</i>), Grey Rhebok (<i>Pelea capreolus</i>), Bontebok (<i>Damaliscus pygargus dorcas</i>), Cape Grysbok (<i>Raphicerus melanotis</i>), Cape Golden Mole (<i>Chrysochloris asiatica</i>), White-tailed Mouse (<i>Mystromys albicaudatus</i>), Cape Spiny Mouse (<i>Acomys subspinosus</i>) » A permanent vegetation cover is necessary to maintain the functionality and stability of this ecosystem 	Conservation value	High <ul style="list-style-type: none"> » Listed as Vulnerable within the National Threatened Ecosystem List (2011) » Listed as a Vulnerable Vegetation Type by Mucina & Rutherford (2012) » Located within a CBA1 area which is vital for meeting provincial conservation targets. » Recorded Red Data flora species » Recorded Provincially Protected (Schedule 4) flora » Natural to near natural habitat. » Potential / suitable habitat for conservation important faunal species.

<p>Conclusion and Mitigation Requirements</p>	<ul style="list-style-type: none"> » This area is of a high ecological sensitivity and high conservation value. » It is recommended that this habitat located south of the drainage system, dissecting the project site into two halves, should be excluded from the development and should henceforth be regarded as a No-Go Area. » The portion north of the drainage line, which is approximately 33 ha in size, is regarded as acceptable loss, furthermore, due to the small extent, and the location adjacent to the existing mining area, is highly unlikely to have an impact on the status of the vegetation type / ecosystem as well as meeting the conservation targets set out by the province. » Development activities within this allowed area are unlikely to have a significant impact on regional ecological functionality if strict mitigation measures are implemented, especially in terms of the establishment of a stable vegetation cover post-mining and the management and eradication of potential Invasive Alien Plants (IAPs). » Operational activities should only be restricted to the development footprint as indicated within this study. » Pre-construction/operation Botanical walk-through should occur in order to GPS tag all conservation important species that may be at risk of being disturbed / destroyed by the mining activities. » No conservation important species may be re-located / disturbed or destroyed without the necessary Permits in place (obtained from the relevant nature conservation authorities) » A vegetation rehabilitation and management plan is also vital for the stabilisation of soils and the prevention of potential erosion from occurring or becoming exacerbated. » An invasive alien plant management plan should be compiled and address the mitigation and management of such species throughout the operational phase as well as post-operational phase. » Phased development / mining should occur were small strips are mined at a time and as a strip becomes exhausted (in terms of the mined resource), immediate rehabilitation should be initiated, whilst mining of a new strip commence. » Rehabilitation progress, erosion and IAP monitoring can occur simultaneously post-operational phase and should occur bi-annually for a minimum of two years.
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Table 10: Summary of results for the fynbos habitat occupying the semi-mobile and mobile sections of the dune plume.

Fynbos of the mobile and semi-mobile dune plumes	Habitat Sensitivity	Moderate-High	Photographs:		
	No-Go Areas	All areas south of the drainage line dissecting the project site into roughly two halves.			
	Present Ecological Status (PES)	A: Unmodified, natural			
Substrate	<ul style="list-style-type: none"> » Active portions of the dune plume with sparse to moderate vegetation cover » Deep aeolian sand » Regic Sand: Recently deposited aeolian sand with almost no evidence of pedogenesis. » Fine textured with a loose friable consistency. 				
Species richness	Low: 40 Indigenous Species		Dominant and diagnostic species:	<i>Aspalathus lactea, Aspalathus quinquefolia, Leucadendron salignum, Metalasia adunca, Polpoda capensis, Willdenowia incurvata, Willdenowia sulcata</i>	
Alien Invasive Plants	None recorded		Conservation Important Flora:	Red Data (ICUN Listed): <i>Aspalathus lactea, Euchaetis pungens, Metalasia adunca</i> ; Provincially Protected: <i>Aristea dichotoma, Erica similis, E. sonderiana, Euchaetis pungens, Leucadendron salignum</i>	
Slope & Geomorphological Setting	<ul style="list-style-type: none"> » Typically these mobile to semi-mobile portions of the dune plume (that have settled along the south-eastern slope of the Sandberg Mountain Range) are 		Naturalness:	High These are natural active portions of the dune plume and even though vegetation cover may be sparse or even absent, the	

	<p>associated with the lower- and footslope sections of the north-facing aspect of this dune plume.</p> <ul style="list-style-type: none"> » Moderate slopes 		<p>vegetation that is present is completely natural and characteristic of such areas.</p>
Disturbance	<ul style="list-style-type: none"> » No anthropogenic or artificial disturbances » This is a dynamic, active portion of the dune exposed to natural disturbances such as sand deposition and removal. 	Anthropogenic importance and potential	Agricultural Potential: Very Low
Habitat & Biotic Integrity:	<p>Moderate-Low</p> <ul style="list-style-type: none"> » Natural to near-natural condition with minimal disturbance. » Low floral diversity. » Unique, dynamic and complex habitat, inhabited by habitat specialists (however diversity is expected to be low), subsequently this habitat type contributes to somewhat to habitat and niche diversity within the region. » Fynbos vegetation within semi-mobile areas provide some stabilisation to these areas, preventing the mobile areas from encroaching into the natural dense vegetated portions surrounding these areas. » Ecosystem functions and services are minimal. 	Conservation value	<p>Moderate-High</p> <ul style="list-style-type: none"> » Listed as Vulnerable within the National Threatened Ecosystem List (2011) » Listed as a Vulnerable Vegetation Type by Mucina & Rutherford (2012) » Located within a CBA1 area which is vital for meeting provincial conservation targets. » Recorded Red Data flora species » Recorded Provincially Protected (Schedule 4) flora » Natural to near natural habitat. » Natural vegetation within semi-mobile areas provide some stabilisation to these areas and provide a valuable function / service in preventing the mobile areas from encroaching into the natural dense vegetated portions surrounding these areas which have a high conservation value.
Conclusion and Mitigation Requirements	<ul style="list-style-type: none"> » This area is of a Moderate-High ecological sensitivity and a Moderate-High conservation value. » The presence and maintenance of a vegetation cover within the semi-mobile areas is extremely important in preventing the potential encroachment of the mobile areas into the densely vegetated, stable areas, resulting in the destabilisation of these areas. » It is recommended that these habitats located south of the drainage system, dissecting the project site into two halves, should be excluded from the development and should henceforth be regarded as a No-Go Area. » These habitats located north of the drainage line, are regarded as acceptable loss, and furthermore, due to the small extent, and the location adjacent to the existing mining area, is highly unlikely to have an impact on the status of the vegetation type / ecosystem as well as meeting the conservation targets set out by the province. » Development activities within this allowed area are unlikely to have a significant impact on regional ecological functionality if strict mitigation measures are implemented, especially in terms of the establishment of a stable vegetation cover post-mining and the management and eradication of potential Invasive Alien Plants (IAPs). » Operational activities should only be restricted to the development footprint as indicated within this study. » Pre-construction/operation Botanical walk-through should occur in order to GPS tag all conservation important species that may be at risk of being disturbed / destroyed by the mining activities. » No conservation important species may be re-located / disturbed or destroyed without the necessary Permits in place (obtained from the relevant nature conservation authorities) 		

	<ul style="list-style-type: none"> » A vegetation rehabilitation and management plan are also vital for the stabilisation of soils and the prevention of potential erosion from occurring or becoming exacerbated. » An invasive alien plant management plan should be compiled and address the mitigation and management of such species throughout the operational phase as well as post-operational phase. » Phased development / mining should occur were small strips are mined at a time and as a strip becomes exhausted (in terms of the mined resource), immediate rehabilitation should be initiated, whilst mining of a new strip commence. <p>Rehabilitation progress, erosion and IAP monitoring can occur simultaneously post-operational phase and should occur bi-annually for a minimum of two years.</p>
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Table 11: Summary of results for the fynbos habitat occupying sandstone slopes and outcrops.

Fynbos occurring on sandstone	Habitat Sensitivity	Moderate-High	Photographs: 
	No-Go Areas	As the resource that will be mined (sand) is absent from these habitats it is recommended that these habitats are regarded as No-Go Areas	
	Present Ecological Status (PES)	A: Unmodified, natural	
Substrate	<ul style="list-style-type: none"> » Poorly developed soils, shallow to absent. » Exposed bedrock, boulders and larger stones. » Deeper soil pockets exist between rock crevices 		
Slope & Geomorphological Setting	<ul style="list-style-type: none"> » Steep slopes of the crest and upper slopes of the Sandberg Mountain Range as well as exposed outcrops fringing some of the drainage lines. » These sandstones are as mentioned, either exposed as outcrops, or occur where the regic sand thins out or have been eroded (wind and water erosion) along the upper portions of the mountain range 		

Species richness	Low: 25 Indigenous Species in the small section that was surveyed	Dominant and diagnostic species:	<i>Aspalathus burchelliana</i> , <i>Aspalathus hirta</i> , <i>Capeochloa cincta</i> , <i>Maytenus oleoides</i> , <i>Protea laurifolia</i> , <i>Serruria gremialis</i> , <i>Stayneria neilii</i>
Alien Invasive Plants	None recorded	Conservation Important Flora:	Red Data (ICUN Listed): <i>Aspalathus burchelliana</i> , <i>Stayneria neilii</i> ; Provincially Protected: <i>Agathosma stipitata</i> , <i>Erica imbricata</i> , <i>Leucadendron salignum</i> , <i>Paranomus dispersus</i> , <i>Protea laurifolia</i> , <i>Serruria gremialis</i>
Disturbance	» Minimal to no disturbance	Naturalness:	High Mostly natural and undisturbed area covered by a well-developed, dense, climax fynbos type typical of this vegetation type.
Habitat & Biotic Integrity:	High » The majority of the mountain range is in a natural condition with minimal disturbance. » This area is characterised by unique complex micro-habitats inhabited by habitat specialists, subsequently these micro-habitats contribute to habitat and niche diversity within the region. Such micro-habitats include: Rocky outcrops, steep crests and slopes as well as cool south facing slopes, deeper soil pockets that have filled up in rock crevices etc. » The shade effect created by some of the larger boulders and outcrops result in higher moisture retention and usually provide protection against fire and high levels of solar radiation. Subsequently these areas usually comprise of unique vegetation, including larger shrubs, trees and geophytes that are not present within the surrounding habitats. » Steep south-facing slopes and kloofs are known to be important sites for biodiversity and provide refuges in the face of potential climate change. » Micro habitats created by deep sandy pockets » Dense fynbos vegetation helps slow down surface runoff and moisture retention and contribute to the stability of the downslope sand plumes. » Potential/suitable habitat for rare / conservation important faunal species such as Cape Mountain	Anthropogenic importance and potential	Agricultural Potential: Low » Game Farming: Some habitat potential for scarce game / wildlife such as Cape Mountain Zebra (<i>Equus zebra zebra</i>), Grey Rhebok (<i>Pelea capreolus</i>), Bontebok (<i>Damaliscus pygargus dorcas</i>), Cape Grysbok (<i>Raphicerus melanotis</i>) and Klipspringer (<i>Oreotragus oreotragus</i>)
		Conservation value	High » Located within a CBA1 area which is vital for meeting provincial conservation targets. » Recorded Red Data flora species » Recorded Provincially Protected (Schedule 4) flora » Natural habitat. » Steep south-facing slopes and kloofs are known to be important sites for biodiversity and provide refuges in the face of potential climate change. » Contribution to species diversity within the region. » Potential / suitable habitat for conservation important faunal species.

	<p>Zebra (<i>Equus zebra zebra</i>), Grey Rhebok (<i>Pelea capreolus</i>), Bontebok (<i>Damaliscus pygargus dorcis</i>), Cape Grysbok (<i>Raphicerus melanotis</i>), Klipspringer (<i>Oreotragus oreotragus</i>) White-tailed Mouse (<i>Mystromys albicaudatus</i>), Cape Spiny Mouse (<i>Acomys subspinosus</i>), Cape Rock Sengi (<i>Elephantulus edwardii</i>), Hewitt's Red Rock Rabbit (<i>Pronolagus saundersiae</i>) and Namaqua and Grant's Rock Mouse (<i>Micaelamys namaquensis</i> & <i>M. granti</i>).</p> <ul style="list-style-type: none"> » The presence and maintenance of the population of smaller mammals including Rock Hyrax (<i>Procavia capensis</i>), which have been confirmed on site, are vital for sustaining the local carnivores and raptors of the area which may include, Cape leopard (<i>Panthera pardus pardus</i>) and Verreaux's eagle (<i>Aquila verreauxii</i>) » A permanent vegetation cover is necessary to maintain the functionality and stability of this ecosystem 		
<p>Conclusion and Mitigation Requirements</p>	<ul style="list-style-type: none"> » This area is of a high ecological sensitivity and high conservation value. » Due to the fact that the resource proposed to be mined (sand) is largely absent from this area it is proposed that these habitats are excluded from the mining footprint and are regarded as No-Go Areas. 		

Table 12: Summary of results for the drainage lines.

<p>Fynbos occurring on sandstone bordering drainage lines</p>	<p>Habitat Sensitivity</p>	<p>High</p>	<p>Photographs:</p>
	<p>No-Go Areas</p>	<p>All drainage lines should be regarded as No-Go Areas</p>	
	<p>Present Ecological Status (PES)</p>	<p>A: Unmodified, natural</p>	

<p>Substrate</p>	<ul style="list-style-type: none"> » Upper slopes: <ul style="list-style-type: none"> ○ Soils mostly absent (eroded by water runoff) ○ Exposed bedrock, and large boulders. » Lower slopes: <ul style="list-style-type: none"> ○ Variable soil depth. ○ Soils removed in some areas due to erosion exposing bedrock and boulders ○ Some areas containing moderately deep fine textured alluvial and aeolian soils (areas where surface flow have sufficiently slowed down for deposition to occur). 		
<p>Slope & Geomorphological Setting</p>	<ul style="list-style-type: none"> » Moderate to steep slopes » Mostly parallel to the south-west to north-east running, narrow mountain range. » Typically relatively short ephemeral drainage systems containing surface flow only for a short period of time following rainfall events. » Some of the drainage lines drain into a larger semi-seasonal to ephemeral watercourse that feed into the Breëde River. The other drainage lines disappear into the dune plume. » The upper portions of these drainage systems form moderately deep, narrow incised valleys within the dune plume and mountain slopes. 		
<p>Species richness</p>	<p>Low: 25 Indigenous Species</p>	<p>Dominant and diagnostic species:</p>	<p><i>Aspalathus burchelliana</i>, <i>Aspalathus hirta</i>, <i>Capeochloa cincta</i> <i>Cliffortia ruscifolia</i>, <i>Colpoon compressum</i>, <i>Maytenus oleoides</i> <i>Podalyria rotundifolia</i>, <i>Serruria gremialis</i></p>
<p>Alien Invasive Plants</p>	<p>None recorded</p>	<p>Conservation Important Flora:</p>	<p>Red Data (ICUN Listed): <i>Aspalathus burchelliana</i>; Provincially Protected: <i>Serruria gremialis</i></p>
<p>Disturbance</p>	<ul style="list-style-type: none"> » Minimal to no disturbance 	<p>Naturalness:</p>	<p>High Mostly natural and undisturbed area covered by a well-developed vegetation layer including larger shrubs and graminoids.</p>

Habitat & Biotic Integrity:	High <ul style="list-style-type: none"> » Most of the drainage lines are natural and undisturbed within the surveyed area. » The prominent drainage line traversing the central portion of the project study have been intercepted by the sand mine. » This habitat is characterised by unique complex microhabitats which contribute to habitat and niche diversity within the region. » The shade effect created by some of the larger boulders stones result in higher moisture retention. » Vegetation helps slow down surface runoff and moisture retention. » A permanent vegetation cover is necessary to maintain the functionality and stability of this ecosystem. » Ecosystem functions and services includes: <ul style="list-style-type: none"> o Absorption and reduction of occasional flash floods. o Important corridor for abiotic and biotic material transfer, as well as for wildlife. o Keystone species maintain habitat and create specific microhabitats for a multitude of organisms. o Dense herbaceous vegetation helps slow down floods, 'catch' sediments, and retain nutrients. o Vegetation filters out possible pollutants to prevent their discharge into the lower lying freshwater resources. 	Anthropogenic importance and potential	Agricultural Potential: Low <ul style="list-style-type: none"> » Due to the sporadic nature of these drainage lines none of them contain farm dams for storing surface runoff. » Most of the surface runoff within these drainage lines simply dissipate into the sand plume feeding the aquifers which are an important source of water for livestock.
		Conservation value	High <ul style="list-style-type: none"> » Located within a CBA1 area which is vital for meeting provincial conservation targets. » Recorded Red Data flora species » Recorded Provincially Protected (Schedule 4) flora » Natural habitat. » Biotic and abiotic corridor for material and wildlife movement. » Absorption and retention of runoff and source of water input for aquifers. » Niche habitats, » Some species restricted to these areas
Conclusion and Mitigation Requirements	<ul style="list-style-type: none"> » This area is of a high ecological sensitivity and high conservation value. » Due to the fact that the resource proposed to be mined (sand) is largely absent from this area it is proposed that these habitats are excluded from the mining footprint and are regarded as No-Go Areas. » It is expected that the obliteration of these upper tributaries may gradually lead to a die-off of larger trees and shrubs and other species depending on higher soil moisture levels in downstream drainage lines beyond the development due to the reduction of occasional floods as upper tributaries are obliterated. 		

In terms of ecological sensitivity and conservation value / importance, the pristine nature of the vegetation (no invasive aliens, no transformation, no secondary vegetation), the numerous unique micro-habitats present, and the various important functions and services provided by these habitats and their vegetation cover, as well as the fact that the majority of the area is located within a CBA1, regarded as important for meeting the provincial conservation targets, means that the entire site can be classified as highly sensitive (Figure 10). However, the northern section of the site can be regarded as acceptable loss to the development as this area (north of the prominent drainage line) covers a very small portion of the dune plume with no exposed sandstone outcrops or drainage lines and is furthermore located adjacent to the existing mining area. Subsequently this area is largely a uniform habitat type, and development within this section will not impact the status of the vegetation / ecosystem type, red data species or influence the conservation targets set out for this CBA1 area. Furthermore, by restricting mining activities to this area adjacent to the existing mining area, potential impacts are "compressed" in a confined area avoiding further habitat fracturing as well as influencing important biological corridors.

Due to high habitat (micro-habitat), fine scale vegetation pattern and plant species turnover associated with the southern half of the project site as well as the functions and services associated with some of these habitat type, it is recommended that this southern portion is excluded from the proposed mining footprint. Also, this area is regarded as an important portion of the CBA1. All drainage lines are regarded as high sensitivity, No-Go features.

The northern portion of the dune plume regarded as acceptable for the proposed activity covers approximately 30% of the original extent that is being proposed. The remaining area should be set aside to function as a biodiversity offset area.

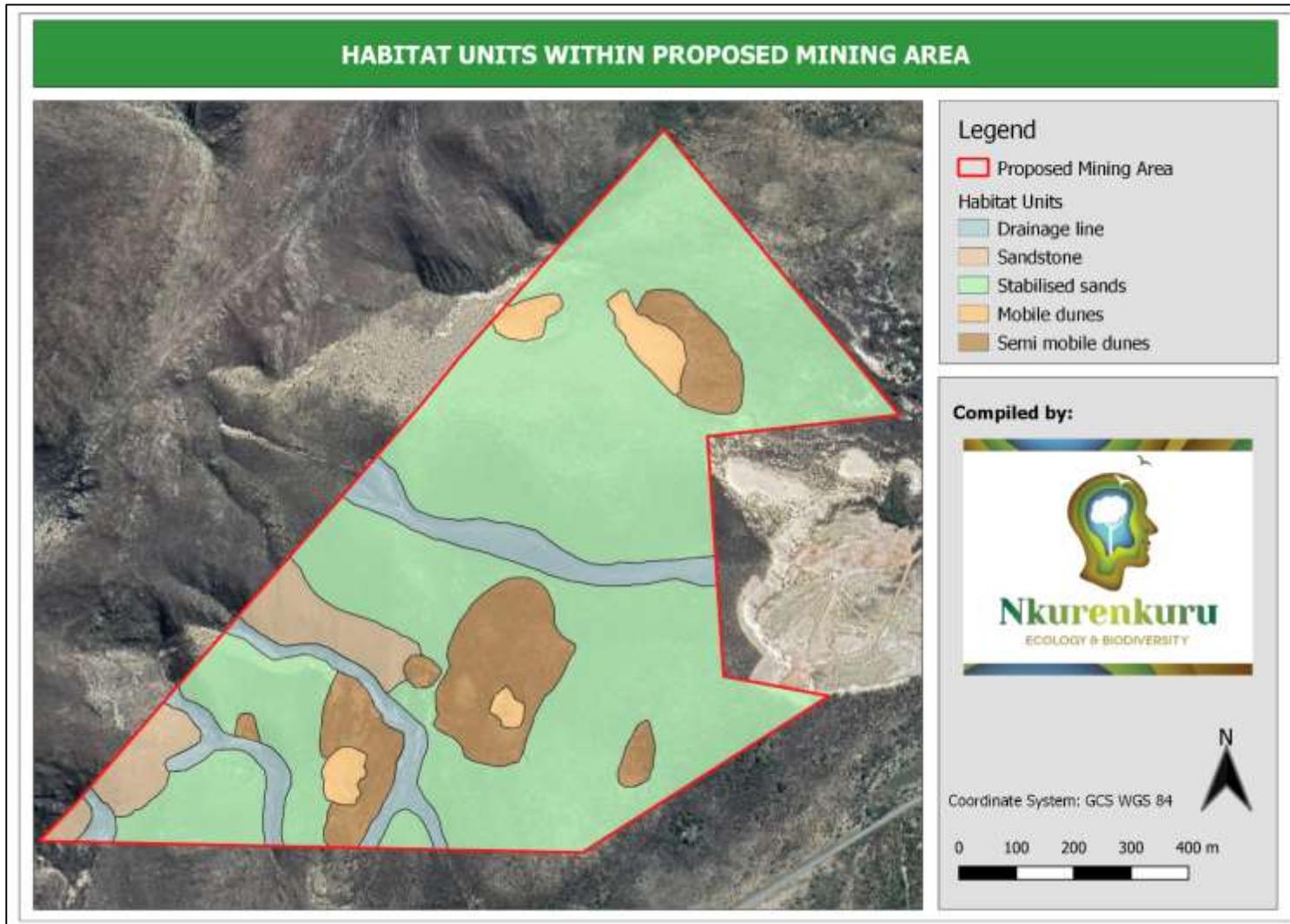


Figure 8: Map illustrating the habitat units identified within the survey site.

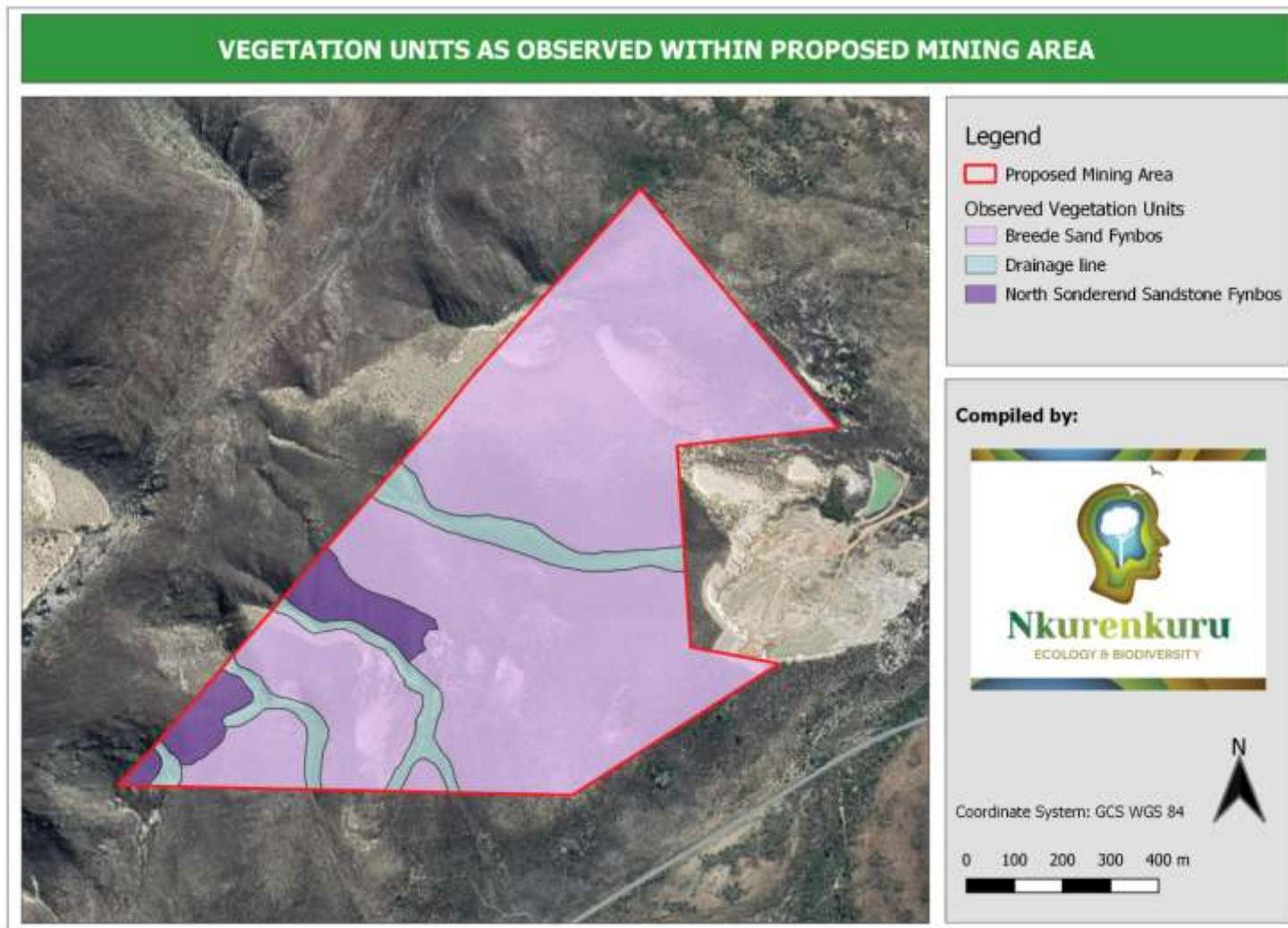


Figure 9: Map illustrating the ground truth (actual) extent of the vegetation types within the proposed mining area.

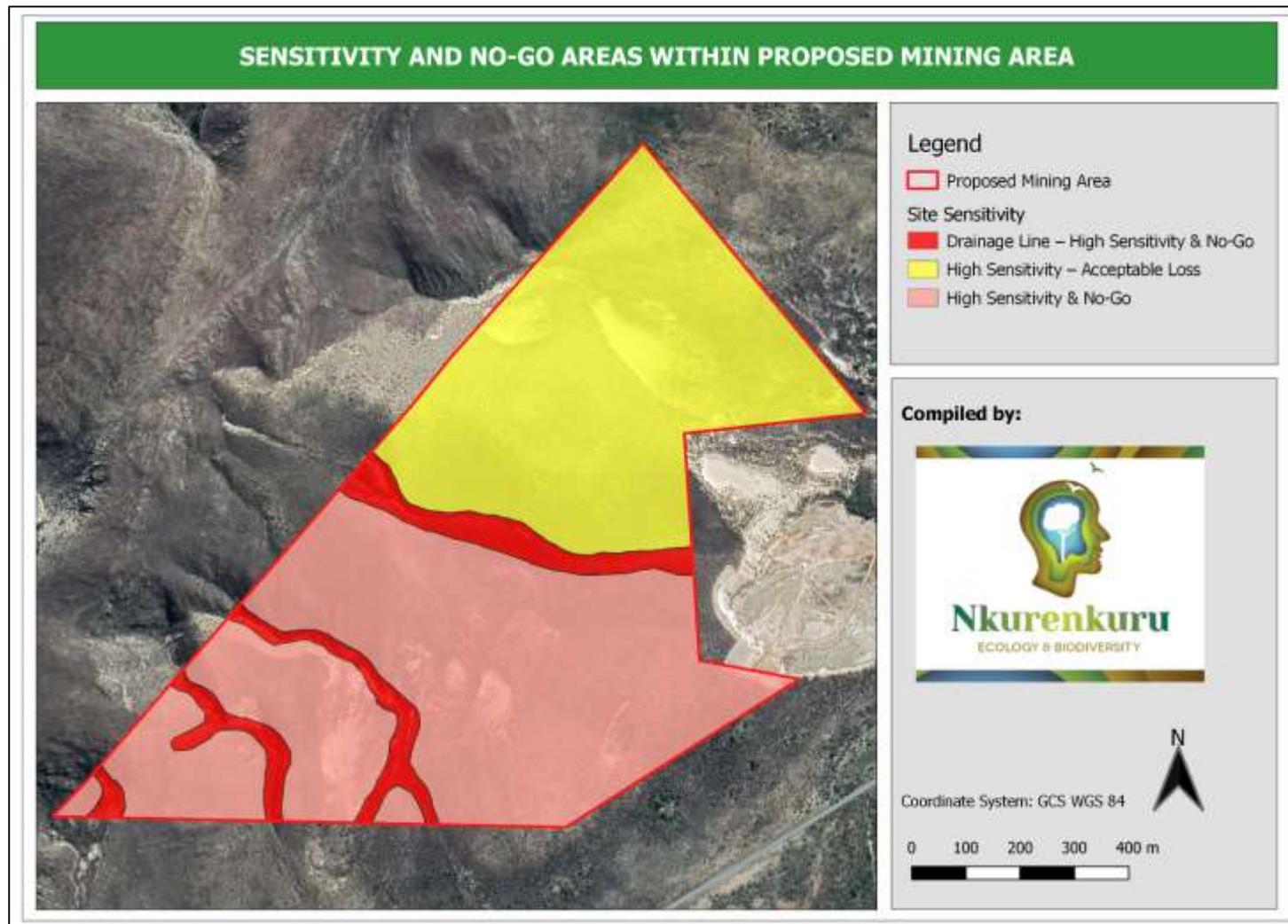


Figure 10: Map illustrating the ecological sensitivity of the project site.

5.2 Species of Conservation Concern

Species of conservation concern are species of flora (plants) and fauna (animals) that have a high conservation importance in terms of preserving South Africa's high biological diversity and include not only threatened species that have been classified as 'at high risk of extinction in the wild' (i.e. Critically Endangered CR, Endangered EN, Vulnerable VU), but also those classified in the categories Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient. Protected species are listed in international conventions, national acts and provincial ordinances that regulate activities such as the hunting, collection, and trade of species. If a subpopulation of a species of conservation concern is found to occur on a proposed development site, it would be one indicator that development activities could result in significant loss of biodiversity, bearing in mind that loss of subpopulations of these species will either increase their extinction risk or may, in fact, contribute to their extinction

5.2.1 Flora of conservation significance

As previously mentioned, a species list was obtained from the SANBI database (POSA) for the study area and surrounding environment. According to this list a total of about 104 plant Species of Conservation Concern is known to occur in the broad area surrounding the site.

Ground truthing confirmed a total of 7 Species of Conservation Concern to be present on site, 5 of which are Threatened Species (listed below). Furthermore, two of these species, namely *Aspalathus burchelliana* (EN) and *Lachnaea uniflora* (VU), were not present in the list obtained online (POSA) during the desktop phase, which proves the value of ground-truthing sites to validate such online species lists.

Furthermore, a total of 12 provincially protected (Schedule 4) floral species have been recorded within the project site.

Table 13: Conservation Important Flora Species recorded within the surveyed site.

Family	Species	Conservation Status	
		IUCN Red List	WCNCO (Schedule 4)
Fabaceae	<i>Aspalathus burchelliana</i>	EN	
Aizoaceae	<i>Stayneria neilii</i>	VU	
Fabaceae	<i>Aspalathus lactea</i>	VU	
Rutaceae	<i>Euchaetis pungens</i>	VU	Protected
Thymelaeaceae	<i>Lachnaea uniflora</i>	VU	

Asteraceae	<i>Metalasia adunca</i>	NT	
Aizoaceae	<i>Ruschia pungens</i>	DD	
Asphodelaceae	<i>Aloe perfoliata</i>	LC	Protected
Ericaceae	<i>Erica imbricata</i>	LC	Protected
Ericaceae	<i>Erica similis</i>	LC	Protected
Ericaceae	<i>Erica sonderiana</i>	LC	Protected
Iridaceae	<i>Aristea dichotoma</i>	LC	Protected
Proteaceae	<i>Leucadendron salignum</i>	LC	Protected
Proteaceae	<i>Leucospermum calligerum</i>	LC	Protected
Proteaceae	<i>Paranomus dispersus</i>	LC	Protected
Proteaceae	<i>Protea laurifolia</i>	LC	Protected
Proteaceae	<i>Serruria gremialis</i>	LC	Protected
Rutaceae	<i>Agathosma stipitata</i>	LC	Protected

6. ASSESSMENT OF PROPOSED IMPACTS

6.1 Assumptions

The following is assumed and/or known:

- » A thorough botanical walkthrough of all footprint areas will be conducted to detect and relocate, where possible, all plant species of conservation concern by a suitably qualified botanist prior to commencement of activities.
- » Throughout the duration of the mining activities, the footprint will be routinely cleared of all alien invasive plants if detected.
- » The site establishment itself will be associated with clearing of vegetation within the footprint **only**.
- » After decommissioning, a continuous vegetation layer will be the most important aspect of ecosystem functionality within and beyond the project site.
- A weakened or absent vegetation layer not only exposes the soil surface but also lacks the binding and absorption capacity that creates the buffering functionality of vegetation to prevent or lessen erosion as a result of floods.

6.2 Localised vs. cumulative impacts: some explanatory notes

Ecosystems consist of a mosaic of many different patches. The size of natural patches affects the number, type, and abundance of species they contain. At the periphery of patches, influences of neighbouring patches become apparent, known

as the 'edge effect'. Patch edges may be subjected to increased levels of heat, dust, desiccation, disturbance, invasion of exotic species and other factors. Edges seldom contain species that are rare, habitat specialists or species that require larger tracts of undisturbed core habitat. Fragmentation due to development reduces core habitat and greatly extends edge habitat, which causes a shift in the species composition, which in turn puts great pressure on the dynamics and functionality of ecosystems (Perlman & Milder 2005).

Cumulative impacts of developments on population viability of species can be reduced significantly if new developments are kept as close as possible to existing developed and/or transformed areas or, where such is not possible, different sections of development be kept as close together as possible.

If the entire proposed footprint of 108.3851ha is approved it is highly likely that this development will contribute to the cumulative impacts of the area:

- » Affecting the conservation targets set out by the province for this region;
- » Impact the conservation targets set out for the vegetation type and ecosystem (at national level).
- » Compromise the ecological functioning of the larger "natural" environment; and
- » Disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations.

However, a loss of only the 30% (of the proposed footprint) located to the north will not contribute to the cumulative impacts as described above and as such this area is regarded as acceptable for the development.

Excessive clearing of vegetation can and will influence runoff and stormwater flow patterns and dynamics, which could cause excessive accelerated erosion of plains and intermittent drainage lines, and this could also have detrimental effects on the lower-lying areas.

- All drainage lines are regarded as No-Go Areas
- Rehabilitation and revegetation of all surfaces disturbed or altered during the operational phase is desirable.

Disturbance of indigenous vegetation creates a major opportunity for the establishment of invasive species and their uncontrolled spread into adjacent natural habitats.

- » A regular monitoring and eradication protocol must be part of all the developments' long-term management plans.

After decommissioning, a continuous vegetation layer will be the most important aspect of ecosystem functionality within and beyond the project site.

- A weakened or absent vegetation layer not only exposes the soil surface but also lacks the binding and absorption capacity that creates the buffering functionality of vegetation to prevent or lessen erosion and the destabilization of the dune plume as a result of floods and wind.

6.3 Identification of Potential Impacts and Associated Activities

Potential impacts resulting from the proposed project would stem from a variety of different activities and risk factors associated with the site-establishment and operation phases of the project including the following:

6.3.1 Site-establishment and Operational Phase

- » Human presence and uncontrolled access to the site may result in negative impacts on fauna and flora through poaching of fauna and uncontrolled collection of plants for traditional medicine or other purposes.
- » Site clearing and exploration activities for site establishment.
- » Vegetation clearing could impact locally listed plant species. Vegetation clearing would also lead to the loss of vegetation communities and habitats for fauna and potentially the loss of faunal species, habitats, and ecosystems. On a larger and cumulative scale (if numerous and uncontrolled developments are allowed to occur in the future) the loss of these vegetation communities and habitats may potentially lead to a change in the conservation status of the affected vegetation type as well as the ability of this vegetation type and associated features to fulfil its ecological responsibilities (functions).
- » Soil compaction and increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may potentially impact the downstream watercourses and aquatic habitats. These potential impacts may result in a reduction in the buffering capacities of the landscape during extreme weather events.
- » Invasion by alien plants may be attributed to excessive disturbance to vegetation, creating a window of opportunity for the establishment of these alien invasive species. In addition, regenerative material of alien invasive species may be introduced to the project site by machinery

traversing through areas with such plants or materials that may contain regenerative materials of such species.

- » Presence and operation of mining vehicles and machinery on the project site. This will create a physical impact as well as generate noise, potential pollution and other forms of disturbances at the site.
- » The facility will require management and if this is not done effectively, it could impact adjacent intact areas through impacts such as erosion and the invasion of alien plant species.

6.3.2 Cumulative Impacts

- » The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the country's ability to meet its conservation targets.
- » Transformation of intact habitat would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna, avifauna, and flora and impair their ability to respond to environmental fluctuations.

6.4 Assessment of Impacts

The impacts identified above are assessed below, during the site-establishment and operation phases of the facility as well as before and after mitigation.

6.4.1 Assessment of impacts associated with Site-establishment and Operational Phases

Impact 1: Potential Impacts on vegetation and listed and protected plant species

Impact Nature: Vegetation clearing will lead to the loss of current habitat within the proposed mining footprint and is an inevitable consequence of this type of activity.

This will lead to localised or more extensive reduction in the overall extent of vegetation. There are factors that may aggravate this potential impact. For example, where this vegetation has already been stressed due to degradation and transformation at a regional level, or has a very restricted distribution, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat and a change in the conservation status (current conservation situation). Consequences of the potential impact of loss of indigenous natural vegetation occurring may include:

- » negative change in conservation status of habitat (Driver et al. 2005);
- » increased vulnerability of remaining portions to future disturbance;
- » general loss of habitat for sensitive species;
- » loss in variation within sensitive habitats due to loss of portions of it;
- » general reduction in biodiversity;
- » increased fragmentation (depending on location of impact);

<ul style="list-style-type: none"> » disturbance to processes maintaining biodiversity and ecosystem goods and services; and » loss of ecosystem goods and services. <p>Plant species are especially vulnerable to mining development due to the fact that they cannot move out of the path of the construction activities, but are also affected by overall loss of habitat.</p> <p>Threatened species include those classified as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened plant species, loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations. Consequences may include:</p> <ul style="list-style-type: none"> » fragmentation of populations of affected species; » reduction in area of occupancy of affected species; and » loss of genetic variation within affected species. <p>These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chance of survival of the species.</p>		
	Without Mitigation	With Mitigation
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (7)	Moderate (5)
Probability	Definite (5)	Highly Probable (4)
Significance	High (70)	Medium (44)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	Some loss of resources	Very limited loss of resources
Can impacts be mitigated?	To a limited extent. Even though a stable vegetation cover will allow for some functionality to return, an establishment of a natural fynbos cover representative of the region is near impossible. As such the most appropriate mitigation measure will be to minimize the extent of the footprint to a level where the loss can be regarded as acceptable without impacting the status of the vegetation type as well as potential individual listed plant species	
Residual Impacts	» A permanent altered vegetation cover.	

Impact 2: Potential impacts on local fauna especially threatened animals due to disturbance and a loss of available habitat and migration routes

Impact Nature: Threatened animal species are indirectly affected primarily by the overall loss of habitat, since direct construction impacts can often be avoided due to movement of individuals from the path of construction. Animals are generally mobile and, in most cases, can move away from a potential threat.

Threatened species include those classified as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened animal species, loss of a population or individuals could lead to a direct change in the conservation status of the species. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations or the habitat that they depend on. Consequences may include:

- » fragmentation of populations of affected species;
- » reduction in area of occupancy of affected species; and
- » loss of genetic variation within affected species.

These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chances of the species overall survival chances.

	Without Mitigation	With Mitigation
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	Medium (52)	Low (27)
Status	Negative	Negative
Reversibility	Limited extent with effective rehabilitation	Relative high reversibility with effective rehabilitation
Irreplaceable loss of resources	Some loss of resources	Very limited loss of resources
Can impacts be mitigated?	To a limited extent. Even though, with effective rehabilitation of a stable vegetation cover will allow for some faunal species to return to the area, most of these species will be generalists and opportunistic species. Habitat (fynbos) specialists will likely not return to the area. As such the most appropriate mitigation measure will be to minimize the extent of the footprint to a level where the loss of habitat will not impact the local faunal community structure, allowing for most of the species to persist outside of the mining area.	
Residual Impacts	» A permanent altered habitat that will be inhabited by some of the more adaptable and generalist species, with a likelihood of the fynbos habitat specialists not returning to the area.	

Impact 3: Impact on drainage areas.

Impact Nature: There are no wetlands within the proposed mining footprint, but there are a number of ephemeral drainage lines. At their headwater/upper portions these drainage lines tend to be steep-sided mini valleys. Mining will lead to direct, local loss of or damage to these areas and their catchments and may impact the replenishment of downslope aquifers as most of these drainage lines dissipate into the sand dune with runoff seeping down into aquifers. These drainage lines are an

important habitat for a number of species in the study area, including those with a restricted distribution or species with an elevated conservation status.		
	Without Mitigation	With Mitigation
Extent	Local and downstream habitats including downslope aquifers (3)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Definite (5)	Improbable (2)
Significance	High (75)	Low (18)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	Some loss of resources	Avoid loss of resources
Can impacts be mitigated?	The only possible mitigation measure will be avoidance of these habitat types.	
Residual Impacts	<ul style="list-style-type: none"> » Without mitigation these drainage systems will be lost resulting in an altered surface hydrology as well as the contribution the area made to the replenishment of downslope aquifers. » With mitigation measures implemented (avoidance of these features), there will be no residual impact on these drainage lines. 	

Impact 4: Potential increased erosion risk and destabilisation of the dune plume during and post-operational phase

Impact Nature: During the operational phase, there will be a lot of disturbed and loose soil at the site which will render the area vulnerable to erosion. It is critically important that proper erosion control measures and structures are put in place and maintained over the lifespan of the project.		
	Without Mitigation	With Mitigation
Extent	Local and immediate surroundings (3)	Local (1)
Duration	Long-term (4)	Short-term (1)
Magnitude	High (8)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	High (60)	Low (16)
Status	Negative	Negative
Reversibility	Moderate	High

Irreplaceable loss of resources	Some loss of resources	Unlikely
Can impacts be mitigated?	Yes, to a large extent	
Residual Impacts	With appropriate avoidance and mitigation, residual impacts will be very low avoiding any residual impacts outside of the mining footprint.	

Impact 5: Increased alien plant invasion during the operational phase

Impact Nature: Increased alien plant invasion is one of the greatest risk factors associated with this activity. The disturbed and bare ground that is likely to be present at the site during and after the operational phase would leave the site vulnerable to alien plant invasion during the operation phase if not managed. Furthermore, the National Environmental Management Biodiversity Act (Act No. 10 of 2004), as well as the Conservation of Agricultural Resources Act, (Act No. 43 of 1983) requires that listed alien species are controlled in accordance with the Act.

Major factors contributing to invasion by alien invader plants includes inter alia high disturbance (such as clearing for construction activities) and negative grazing practices (Zachariades et al. 2005). Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003, Watkins et al. 2003). Consequences of this may include:

- » loss of indigenous vegetation;
- » change in vegetation structure leading to change in various habitat characteristics;
- » change in plant species composition;
- » change in soil chemical properties;
- » loss of sensitive habitats;
- » loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
- » fragmentation of sensitive habitats;
- » change in flammability of vegetation, depending on alien species;
- » hydrological impacts due to increased transpiration and runoff; and
- » impairment of watercourse function.

	Without Mitigation	With Mitigation
Extent	Local and immediate surroundings (3)	Local (1)
Duration	Permanent (5)	Short-term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	Medium (56)	Low (12)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	Potential loss of resources	Unlikely
Can impacts be mitigated?	Yes, to a large extent	

Residual Impacts	With appropriate mitigation such as regular monitoring and eradication residual impacts will be very low and will likely comprise of few alien plants establishing for short periods of time between monitoring and eradication phases.
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6.4.2 Assessment of Cumulative Impacts

Cumulative Impact 1: *Reduced ability to meet conservation obligations and targets*

Impact Nature: The loss of unprotected vegetation types on a cumulative basis from the broader area impacts the Province's ability to meet its conservation targets.				
	Overall impact of the proposed project considered in isolation		Cumulative impact of the project and other projects within the area	
	<i>If the entire proposed footprint is to be mined</i>	<i>If the recommended ±30% of the original footprint area is approved to be mined</i>	<i>If the entire proposed footprint is to be mined</i>	<i>If the recommended ±30% of the original footprint area is approved to be mined</i>
Extent	Regional (2)	Local (1)	Regional (5)	Regional (3)
Duration	Permanent (5)	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Minor (3)	High (8)	Moderate (6)
Probability	Highly Probable (4)	Improbable (2)	Highly Probable (4)	Probable (3)
Significance	Medium (52)	Low (18)	High (72)	Medium (42)
Status	Negative	Negative	Negative	Negative
Reversibility	Low	Low	Low	Low
Irreplaceable loss of resources	Some loss of resources	Unlikely	Loss of local resources	Limited loss of resources
Can impacts be mitigated?	To a limited extent. Even though a stable vegetation cover will allow for some functionality to return, an establishment of a natural fynbos cover representative of the region is near impossible. As such the most appropriate mitigation measure will be to minimize the extent of the footprint to a level where the loss can be regarded as acceptable without impacting the status of the vegetation type as well as potential individual listed plant species			

Cumulative Impact 2: *Impacts on Broad-Scale Ecological Processes*

Impact Nature: Transformation of intact habitat could potentially compromise ecological processes as well as ecological functioning of important habitats and would contribute to the fragmentation of

the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations.				
	Overall impact of the proposed project considered in isolation		Cumulative impact of the project and other projects within the area	
	<i>If the entire proposed footprint is to be mined</i>	<i>If the recommended ±30% of the original footprint area is approved to be mined</i>	<i>If the entire proposed footprint is to be mined</i>	<i>If the recommended ±30% of the original footprint area is approved to be mined</i>
Extent	Regional (2)	Local (1)	Regional (3)	Regional (2)
Duration	Permanent (5)	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	Moderate (5)	Small (1)	High (7)	Moderate (5)
Probability	Highly Probable (4)	Improbable (2)	Highly Probable (4)	Probable (3)
Significance	Medium (48)	Low (18)	High (60)	Medium (36)
Status	Negative	Negative	Negative	Negative
Reversibility	Low	Low	Low	Low
Irreplaceable loss of resources	Some loss of resources	Unlikely	Loss of local resources	Limited loss of resources
Can impacts be mitigated?	To a limited extent. Even though a stable vegetation cover will allow for some functionality to return, an establishment of a natural fynbos cover representative of the region is near impossible. As such the most appropriate mitigation measure will be to minimize the extent of the footprint to a level where the loss can be regarded as acceptable without impacting the status of the vegetation type as well as potential individual listed plant species			

6.5 Impact Mitigation and Management

IMPACT	MITIGATION
Site-Establishment and Operation Phase	
<p>Impact 1: Potential Impacts on vegetation and listed and protected plant species</p>	<ul style="list-style-type: none"> » The southern portion of the proposed mining footprint should be excluded from the final layout and should be regarded as a No-Go area (as indicated in the sensitivity map) and treated as a Biodiversity Offset Area. » A pre-construction walk-through of the final mining footprint, by a suitably qualified botanist, for species of conservation concern that would be affected (also to comply with the Western Cape Nature Conservation Ordinance and DEADP permit conditions). » Permits must be kept on-site and in the possession of the flora search and rescue team at all times. » Pre-construction environmental induction for all staff on site must be provided to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas, etc. » Contractor’s EO must provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when the majority of vegetation clearing is taking place. » Blanket clearing of vegetation must be limited to the proposed mining footprint and associated infrastructure. No clearing outside of the minimum required footprint to take place. » Phased mining and vegetation clearance should be done, wherein small strips are mined at a time. All vegetation outside of the active strips should not be disturbed until it is time for that specific area to be mined. Furthermore, upon finishing a strip , immediate rehabilitation should occur wherein a stable vegetation cover is established with a grass cover. » Topsoil must be stripped and stockpiled separately during site preparation and replaced over disturbed areas on completion » All vehicles to remain on demarcated roads and no unnecessary driving in the veld outside these areas should be allowed. » Regular dust suppression during operation. » No plants may be translocated or otherwise uprooted or disturbed for rehabilitation or other purposes without express permission from the Contractor’s EO and without the relevant permits. » No fires must be allowed on-site.

<p>Impact 2: Potential impacts on local fauna especially threatened animals due to disturbance and a loss of available habitat and migration routes</p>	<ul style="list-style-type: none"> » The southern portion of the proposed mining footprint should be excluded from the final layout and should be regarded as a No-Go area (as indicated in the sensitivity map) and treated as a Biodiversity Offset Area. » Any fauna directly threatened by the operational activities should be removed to a safe location by the ECO or other suitably qualified person, e.g. the Contractor's EO. » All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition. » All hazardous materials used should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » All vehicles should adhere to a low speed limit (30km/h is recommended) to avoid collisions with susceptible species such as snakes and tortoises. » When possible, no activity should be undertaken at the site between sunset and sunrise, except for security personnel guarding the development. » No litter, food or other foreign material should be thrown or left around the site and should be placed in demarcated and fenced rubbish and litter areas that are animal proof.
<p>Impact 3: Impact on drainage areas.</p>	<ul style="list-style-type: none"> » The southern portion of the proposed mining footprint, including all drainage areas, should be excluded from the final layout and should be regarded as a No-Go area (as indicated in the sensitivity map) and treated as a Biodiversity Offset Area.
<p>Impact 4: Potential increased erosion risk and destabilisation of the dune plume during and post-operational phase</p>	<ul style="list-style-type: none"> » Any erosion problems within the mining area as a result of the mining activities observed should be rectified immediately and monitored thereafter to ensure that they do not re-occur. » Mining within steep slopes will need to ensure that adequate slope protection is provided. » Blanket clearing of vegetation must be limited to the proposed mining footprint and associated infrastructure. No clearing outside of the minimum required footprint to take place. » Phased mining and vegetation clearance should be done, wherein small strips are mined at a time. All vegetation outside of the active strips should not be disturbed until it is time for that specific area to be mined. Furthermore, upon finishing a strip, immediate rehabilitation should occur wherein a stable vegetation cover is established with a grass cover. » Roads and other disturbed areas within the project area should be regularly monitored for erosion problems and problem areas should receive follow-up monitoring to assess the success of the remediation.

	<ul style="list-style-type: none"> » Silt/sediment traps/barriers should be used where there is a danger of topsoil or material stockpiles eroding and entering downstream drainage lines and other sensitive areas. » These sediment/silt barriers should be regularly maintained and cleared so as to ensure effective drainage of the areas » Topsoil should be removed and stored separately from subsoil. Topsoil should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas. » Stockpiles must be protected from erosion, stored on flat areas where possible, and be surrounded by appropriate berms. » Any erosion points created during construction should be filled and stabilized immediately. » Practical phased development and vegetation clearing should be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time. » Construction of gabions and other stabilisation features must be undertaken to prevent erosion, where deemed necessary.
<p>Impact 5: Increased alien plant invasion during the operational phase</p>	<ul style="list-style-type: none"> » Alien species must be removed from the site as per NEMBA requirements. » A suitable weed management strategy to be implemented in the construction and operation phases. » Regular monitoring for alien plants at the site should occur and could be conducted simultaneously with erosion monitoring. » When alien plants are detected, these should be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur and increase to problematic levels. » Clearing methods should aim to keep disturbance to a minimum and must be undertaken in accordance with relevant guidelines. » No planting or importing of any alien species to the site for landscaping, rehabilitation or any other purpose should be allowed.
<p>Cumulative Impacts</p>	

<p>Cumulative Impact 1: Reduced ability to meet conservation obligations and targets</p>	<ul style="list-style-type: none"> » The southern portion of the proposed mining footprint should be excluded from the final layout and should be regarded as a No-Go area (as indicated in the sensitivity map) and treated as a Biodiversity Offset Area. » The activity footprints of various proposed mining locations and other development proposals in the area must be kept to a minimum and a stable vegetation should be encouraged to return during the post-operational phase. » Reduce the footprint of mining areas within sensitive habitat types as much as possible.
<p>Cumulative Impact 2: Impacts on Broad-Scale Ecological Processes</p>	<ul style="list-style-type: none"> » The southern portion of the proposed mining footprint should be excluded from the final layout and should be regarded as a No-Go area (as indicated in the sensitivity map) and treated as a Biodiversity Offset Area. » The activity footprints of various proposed mining locations and other development proposals in the area must be kept to a minimum and a stable vegetation should be encouraged to return during the post-operational phase. » Reduce the footprint of mining areas within sensitive habitat types as much as possible.

7. CONCLUSION

The existing Zandberg Sand Mine is located within Portion 4 of the Farm Zandberg Fontein 97 located approximately 7 km south-west of the town of Robertson. The Mining Right Holder (Zandberg Sandput (Pty) Ltd) intends on expanding the MR footprint with an additional 108.3251ha. Subsequently a Section 102 is being applied for.

Nkurenkuru Ecology and Biodiversity (Pty) Ltd has been appointed by the GreenMined Environmental (Pty) Ltd to conduct a botanical assessment of the proposed target area for the expansion in order to provide a professional opinion on botanical issues pertaining to the target area to aid in future decisions regarding the proposed project. This report sets out the findings of the botanical study and assessment.

From a botanical and ecological perspective, it was found that the entire project site is located within a near-natural to natural area with minimal disturbance. The bulk of the proposed footprint is located within a Vegetation Type listed as Vulnerable. Furthermore, the entire site is located within a CBA1, with the area being confirmed, during the site visit, to comply with the criteria classifying this area as a CBA1. A development of this nature and to this proposed extent would not be acceptable within a CBA1 and furthermore do not comply with the land use practices allowed for within such CBAs.

However, during this assessment an area of approximately $\pm 30\%$ of the original proposed footprint was identified as acceptable for this development, as this area (north of the prominent drainage line) covers a very small portion of the dune plume which is covered by a relative uniform vegetation cover. Subsequently this area is largely a uniform habitat type, and development within this section will not impact the status of the vegetation / ecosystem type, red data species or influence the conservation targets set out for this CBA1 area. Furthermore, by restricting mining activities to this area adjacent to the existing mining area, potential impacts are "compressed" in a confined area avoiding further habitat fracturing as well as avoiding any important biological corridors.

Subsequently from an ecological perspective no objective or motives were identified which would hinder the establishment of the mine within this recommended northern section of the original proposed mining footprint.

The southern portion (including all drainage lines and sandstone outcrops) should be regarded as a No-Go area (excluded from the footprint) and should furthermore be treated as a Biodiversity Offset Area.

Therefore, it is the opinion of the specialist that the development may be authorised within the specified area, subject to the implementation of the recommended mitigation measures.

As part of this Assessment a detailed field survey of the vegetation was undertaken on the 31st of January 2020.

Specific outcomes required from this report include the following:

- » To define the Present Ecological State (PES) of the terrestrial ecological resources in the vicinity of the study site;
- » To conduct a floral Species of Conservation Concern (SCC) assessment;
- » To identify and consider all sensitive landscape and ecologically important features;
- » To determine the environmental impacts that the proposed mine might have on the terrestrial ecology associated with the footprint area; and
- » To develop mitigation and management measures for all phases of the development.

General Results

- » The project site is located on a dune plume that covers an area of approximately 597ha. This dune plume has settled along the south-eastern slope of the Sandberg Mountain Range, which is a narrow range running in a south-west to north-east direction.
- » This dune plume is dissected (mostly within the southern portion of the dune) by short, narrow ephemeral drainage lines running perpendicular to the mountain range and either draining into the large drainage system to the east, or merely dissipate into the sand plume to eventually seep into the underlying aquifers.
- » Where the dune plume thins out along the upper slopes of the Sandberg Mountain sandstone outcrops become exposed. Sandstone outcrops also occur lower down as isolated features where erosion has exposed them, especially along the steeper slopes associated with some of the drainage lines.
- » Five habitat types have been identified namely;
 - Dense, well developed fynbos occurring on the stabilised portions of the dune plume;
 - Sparse Fynbos occurring on the semi-mobile portions of the dune plume;

- Active, mobile portions of the dune plume largely devoid of vegetation;
- Drainage lines; and
- Fynbos associated with sandstone

National and regional conservation context:

- » The vegetation of the study site resembles pristine forms of Breede Sand Fynbos throughout the majority of the site, together with pristine North Sonderend Sandstone Fynbos in the Western and southwestern corner, adjacent to drainage lines. Breede Sand Fynbos has been classified as Vulnerable by Mucina and Rutherford (2006) with 45% being already transformed and a conservation target of 30%. Furthermore, this area is also listed as Vulnerable within the Threatened Ecosystem List (NEMA:BA).
- » From a provincial conservation perspective, the entire mining footprint is located almost entirely within a CBA1, with randomly scattered pixels of CBA2, and a small portion not having been classified. The insignificant and random nature of the CBA2 pixels are likely a side-effect of the algorithm used to generate the CBA spatial layers, and ground-truthing confirmed the entire site to conform to CBA1 criteria, including the portion not originally classified. Areas classified as CBA1 are regarded as "areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure" (WCSBP 2017).

Flora specific results

- » Ground truthing of the site confirmed a total of 63 species present.
- » Of the 63 species recorded 7 species were listed as Red Data Species (4 species as vulnerable, whilst the remaining 3 species were listed as Endangered, Near Threatened and Data Deficient).
- » Furthermore, a total of 12 species were recorded which are provincially protected.
- » In terms of ecological sensitivity and conservation value / importance, the pristine nature of the vegetation (no invasive aliens, no transformation, no secondary vegetation), the numerous unique micro-habitats present, and the various important functions and services provided by these habitats and their vegetation cover, means that the entire site can be classified as highly sensitive.
- » The conservation value and associated functions and services of the identified habitat units can be summarized as follow:
 - Dense, well developed fynbos occurring on the stabilised portions of the dune plume;
 - Listed as Vulnerable within the National Threatened Ecosystem List (2011)

- Listed as a Vulnerable Vegetation Type by Mucina & Rutherford (2012)
- Located within a CBA1 area which is vital for meeting provincial conservation targets.
- Recorded Red Data flora species
- Recorded Provincially Protected (Schedule 4) flora
- Natural to near natural habitat.
- Potential / suitable habitat for conservation important faunal species.
- Semi-mobile and mobile portions of the dune plume;
 - Listed as Vulnerable within the National Threatened Ecosystem List (2011)
 - Listed as a Vulnerable Vegetation Type by Mucina & Rutherford (2012)
 - Located within a CBA1 area which is vital for meeting provincial conservation targets.
 - Recorded Red Data flora species
 - Recorded Provincially Protected (Schedule 4) flora
 - Natural to near natural habitat.
 - Unique, dynamic and complex habitat, inhabited by habitat specialists (however diversity is expected to be low), subsequently this habitat type contributes to somewhat to habitat and niche diversity within the region.
 - Natural vegetation within semi-mobile areas provide some stabilization to these areas and provide a valuable function / service in preventing the mobile areas from encroaching into the natural dense vegetated portions surrounding these areas which have a high conservation value.
- Fynbos associated with sandstone
 - Located within a CBA1 area which is vital for meeting provincial conservation targets.
 - Recorded Red Data flora species
 - Recorded Provincially Protected (Schedule 4) flora
 - Natural habitat.
 - Steep south-facing slopes and kloofs are known to be important sites for biodiversity and provide refuges in the face of potential climate change.
 - Contribution to species diversity within the region.
 - Potential / suitable habitat for conservation important faunal species.

- Dense fynbos vegetation helps slow down surface runoff and moisture retention and contribute to the stability of the downslope sand plumes.
- Drainage lines;
 - Located within a CBA1 area which is vital for meeting provincial conservation targets.
 - Listed as Vulnerable within the National Threatened Ecosystem List (2011)
 - Listed as a Vulnerable Vegetation Type by Mucina & Rutherford (2012)
 - Natural habitat.
 - Biotic and abiotic corridor for material and wildlife movement.
 - Absorption and retention of runoff and source of water input for aquifers.

Sensitivity and associated development recommendations

- » As already described the entire project area is regarded as highly sensitive.
- » The northern section of the site can be regarded as acceptable for the development as this area (north of the prominent drainage line) covers a very small portion of the dune plume with no exposed sandstone outcrops or drainage lines and is furthermore located adjacent to the existing mining area. Subsequently this area is largely a uniform habitat type, and development within this section will not impact the status of the vegetation / ecosystem type, red data species or influence the conservation targets set out for this CBA1 area.
- » Furthermore, by restricting mining activities to this area adjacent to the existing mining area, potential impacts are "compressed" in a confined area avoiding further habitat fracturing as well as influencing important biological corridors.
- » Due to high habitat (micro-habitat), fine scale vegetation pattern and plant species turnover associated with the southern half of the project site as well as the functions and services associated with some of these habitat type, it is recommended that this southern portion is excluded from the proposed mining footprint. Also, this area is regarded as an important portion of the CBA1. All drainage lines are regarded as high sensitivity, No-Go features.
- » The northern portion of the dune plume regarded as acceptable for the proposed activity covers approximately 30% of the original extent that is being proposed. The remaining area should be treated as a biodiversity offset area.

Cumulative Impacts

- » If the entire proposed footprint of 108.3851ha is approved it is highly likely that this development will contribute to the cumulative impacts of the area:
 - Affecting the conservation targets set out by the province for this region;
 - Impact the conservation targets set out for the vegetation type and ecosystem (at national level).
 - Compromise the ecological functioning of the larger “natural” environment; and
 - Disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations.

- » However, loss of only the 30% (of the proposed footprint) located to the north will not contribute significantly to the cumulative impacts as described above and as such this area is regarded as acceptable for the development.

Terrestrial Impact Assessment

- » The most significant impacts associated with the development will be vegetation destruction and disturbance, some local habitat loss and potential temporary faunal disturbance. Furthermore, these disturbed areas may become potentially prone to erosion and invasion with invasive alien plants.
- » A summary of pre- and post-mitigation impact significance ratings for the different impacts and risks factors identified for the proposed development are provided below.

Phase	Impact	Significance Without Mitigation	Significance With Mitigation
Site Establishment & Operation	Potential Impacts on vegetation and listed and protected plant species	High (70)	Medium (44)
	Potential impacts on local fauna especially threatened animals due to disturbance and a loss of available habitat and migration routes	Medium (52)	Low (27)
	Impact on drainage areas	High (75)	Low (18)
	Potential increased erosion risk and destabilisation of the dune plume during and post-operational phase	High (60)	Low (16)
	Increased alien plant invasion	Medium (56)	Low (12)

Cumulative		Overall impact of the proposed project considered in isolation		Cumulative impact of the project and other projects within the area	
		<i>If the entire proposed footprint is to be mined</i>	<i>If the recommended ±30% of the original footprint area is approved to be mined</i>	<i>If the entire proposed footprint is to be mined</i>	<i>If the recommended ±30% of the original footprint area is approved to be mined</i>
		Reduced ability to meet conservation obligations and targets	Medium (52)	Low (18)	High (72)
Impacts on Ecological Support Areas and Broad-Scale Ecological Processes	Medium (48)	Low (18)	High (60)	Medium (36)	

Important recommendations and mitigation measures

- » The southern portion of the proposed mining footprint should be excluded from the final layout and should be regarded as a No-Go area (as indicated in the sensitivity map) and treated as a Biodiversity Offset Area.
- » However, the northern section of the site can be regarded as acceptable loss to the development as this area (north of the prominent drainage line) covers a very small portion of the dune plume with no exposed sandstone outcrops or drainage lines and is furthermore located adjacent to the existing mining area. Subsequently this area is largely a uniform habitat type, and development within this section will not impact the status of the vegetation / ecosystem type, red data species or influence the conservation targets set out for this CBA1 area. Furthermore, by restricting mining activities to this area adjacent to the existing mining area, potential impacts are “compressed” in a confined area avoiding further habitat fracturing as well as influencing important biological corridors
- » Phased mining and vegetation clearance should be done, wherein small strips are mined at a time. All vegetation outside of the active strips should not be disturbed until it is time for that specific area to be mined. Furthermore, upon finishing a strip , immediate rehabilitation should occur wherein a stable vegetation cover is established with a grass cover.
- » Even though a stable vegetation cover will allow for some functionality to return, an establishment of a natural fynbos cover representative of the region is near impossible.
- » The following aspects should be noted regarding the rehabilitation of sand fynbos:
 - Sand Fynbos occurs on acidic, deep, loose, sandy soils which are easily destabilized and prone to wind erosion.

- Wind-blown sand damages vegetation and makes it difficult to establish vegetation cover, therefore anti-soil erosion measures may be required.
 - Disturbed areas are slow to self-repair, therefore active restoration (e.g. sowing and planting) will be required.
 - Ecological restoration does not substitute for sustainably managing and protecting intact native ecosystems.
 - Fynbos ecosystems are prone to invasion by alien species and alien plant invasion is the second biggest cause of biodiversity loss after direct habitat loss. The management and eradication of Invasive Alien Plants (IAPs) are therefore a critical portion of the rehabilitation process and a detailed IAP Management Plan is should be in place.
- » It is recommended to use a mix of commercial seed and native seed, including both annuals and perennials to diversify rooting depths. For dryland areas, the commercial seed mix should be less than half the standard sowing rate and include annuals (e.g. wheat or rye) and perennials e.g. Kweek (*Cynodon dactylon*). Add commonly available fynbos seeds (collected from as near to the site as possible), including annuals (e.g. *Arctotis arctotoides*, *Dimorphotheca chrysanthemifolia*, *D. nudiaulis*, *Helichrysum cymosum*, *Osteospermum oppositifolium*), grasses (*Ehrharta villosa*, *E. calycina*, *Festuca scabra* and *Stipagrostis zeyheri*,), succulents (*Carpobrotus edulus*, *Ruschia pungens*) and shrubs (e.g. *Athanasia quinqueidentata*, *Chrysocoma ciliata*, *Elytropappus rhinocerotis*, *Metalasia adunca*, *Stoebe nervigera*, *Eriocephalus africanus*, *Helichrysum odoratissimum* and *Agatoshma stipitata*). The collection of local fynbos seed, if possible, is preferable for establishing fynbos species in favour of introducing Kweek, as Kweek may suppress fynbos establishment, particularly in wetter areas.

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9. APPENDICES

Appendix 1: Plant Species List of confirmed within the proposed mining footprint

Family	Species	Family	Species
Aizoaceae	<i>Carpobrotus edulis</i>	Fabaceae	<i>Lebeckia sepiaria</i>
Aizoaceae	<i>Ruschia pungens</i>	Fabaceae	<i>Podalyria rotundifolia</i>
Aizoaceae	<i>Stayneria neilii</i>	Fabaceae	<i>Rafnia capensis</i>
Anacardiaceae	<i>Searsia dissecta</i>	Fabaceae	<i>Wiborgia obcordata</i>
Apiaceae	<i>Anginon difforme</i>	Geraniaceae	<i>Pelargonium hermanniifolium</i>
Asphodelaceae	<i>Aloe perfoliata</i>	Geraniaceae	<i>Pelargonium ovale</i>
Asphodelaceae	<i>Trachyandra revoluta</i>	Iridaceae	<i>Aristea dichotoma</i>
Asteraceae	<i>Athanasia quinqueidentata</i>	Molluginaceae	<i>Polpoda capensis</i>
Asteraceae	<i>Chrysocoma ciliata</i>	Poaceae	<i>Capeochloa cincta</i>
Asteraceae	<i>Disparago ericoides</i>	Poaceae	<i>Ehrharta villosa</i>
Asteraceae	<i>Elytropappus rhinocerotis</i>	Poaceae	<i>Pentameris pallida</i>
Asteraceae	<i>Lachnospermum fasciculatum</i>	Poaceae	<i>Stipagrostis zeyheri</i>
Asteraceae	<i>Metalasia acuta</i>	Proteaceae	<i>Leucadendron salignum</i>
Asteraceae	<i>Metalasia adunca</i>	Proteaceae	<i>Leucospermum calligerum</i>
Asteraceae	<i>Oedera squarrosa</i>	Proteaceae	<i>Paranomus dispersus</i>
Asteraceae	<i>Osteospermum junceum</i>	Proteaceae	<i>Protea laurifolia</i>
Asteraceae	<i>Pteronia incana</i>	Proteaceae	<i>Serruria gremialis</i>
Asteraceae	<i>Stoebe nervigera</i>	Restionaceae	<i>Elegia filacea</i>
Campanulaceae	<i>Prismatocarpus brevilobus</i>	Restionaceae	<i>Restio sieberi</i>
Campanulaceae	<i>Wahlenbergia nodosa</i>	Restionaceae	<i>Thamnochortus lucens</i>
Celastraceae	<i>Maytenus oleoides</i>	Restionaceae	<i>Willdenowia incurvata</i>
Cyperaceae	<i>Ficinia deusta</i>	Restionaceae	<i>Willdenowia sulcata</i>
Cyperaceae	<i>Scirpoides thunbergii</i>	Rosaceae	<i>Cliffortia ruscifolia</i>
Ebenaceae	<i>Diospyros glabra</i>	Rubiaceae	<i>Anthospermum galioides</i>
Ericaceae	<i>Erica imbricata</i>	Rutaceae	<i>Agathosma stipitata</i>
Ericaceae	<i>Erica similis</i>	Rutaceae	<i>Euchaetis pungens</i>
Ericaceae	<i>Erica sonderiana</i>	Santalaceae	<i>Colpoon compressum</i>
Fabaceae	<i>Aspalathus burchelliana</i>	Santalaceae	<i>Thesium euphrasioides</i>
Fabaceae	<i>Aspalathus hirta</i>	Sapindaceae	<i>Dodonaea viscosa</i>
Fabaceae	<i>Aspalathus juniperina</i>	Scrophulariaceae	<i>Selago fruticosa</i>
Fabaceae	<i>Aspalathus lactea</i>	Thymelaeaceae	<i>Lachnaea uniflora</i>
Fabaceae	<i>Aspalathus quinquefolia</i>		

Appendix 2: Plant Species List of the region (POSA Generated List)

Family	Species	Family	Species	Family	Species
Achariaceae	<i>Kiggelaria africana</i>	Crassulaceae	<i>Crassula tetragona</i>	Malvaceae	<i>Hermannia holosericea</i>
Aizoaceae	<i>Acrodon purpureostylus</i>	Crassulaceae	<i>Crassula vaillantii</i>	Malvaceae	<i>Hermannia hyssopifolia</i>
Aizoaceae	<i>Acrosanthes humifusa</i>	Crassulaceae	<i>Tylecodon paniculatus</i>	Malvaceae	<i>Hermannia incana</i>
Aizoaceae	<i>Aizoon karoicum</i>	Crassulaceae	<i>Tylecodon sp.</i>	Malvaceae	<i>Hermannia linearifolia</i>
Aizoaceae	<i>Antimima leipoldtii</i>	Crassulaceae	<i>Tylecodon ventricosus</i>	Malvaceae	<i>Hermannia pinnata</i>
Aizoaceae	<i>Antimima microphylla</i>	Cucurbitaceae	<i>Citrullus lanatus</i>	Malvaceae	<i>Hermannia pulverata</i>
Aizoaceae	<i>Antimima sp.</i>	Cucurbitaceae	<i>Cucumis myriocarpus</i>	Malvaceae	<i>Hermannia rigida</i>
Aizoaceae	<i>Antimima stokoei</i>	Cucurbitaceae	<i>Kedrostis capensis</i>	Malvaceae	<i>Hermannia sp.</i>
Aizoaceae	<i>Antimima turneriana</i>	Cucurbitaceae	<i>Kedrostis nana</i>	Malvaceae	<i>Malva arborea</i>
Aizoaceae	<i>Arenifera sp.</i>	Cyperaceae	<i>Carex spartea</i>	Menispermaceae	<i>Cissampelos capensis</i>
Aizoaceae	<i>Brianhunleya intrusa</i>	Cyperaceae	<i>Chrysitrix capensis</i>	Molluginaceae	<i>Pharnaceum aurantium</i>
Aizoaceae	<i>Carpobrotus mellei</i>	Cyperaceae	<i>Chrysitrix capensis</i>	Molluginaceae	<i>Psammotropha anguina</i>
	<i>Cephalophyllum</i>				<i>Psammotropha</i>
Aizoaceae	<i>purpureo-album</i>	Cyperaceae	<i>Chrysitrix junciformis</i>	Molluginaceae	<i>quadrangularis</i>
Aizoaceae	<i>Cephalophyllum sp.</i>	Cyperaceae	<i>Cyperus longus</i>	Montiniaceae	<i>Montinia caryophyllacea</i>
	<i>Cephalophyllum</i>				
Aizoaceae	<i>subulatoides</i>	Cyperaceae	<i>Cyperus marginatus</i>	Moraceae	<i>Ficus cordata</i>
Aizoaceae	<i>Conophytum ficiforme</i>	Cyperaceae	<i>Epischoenus sp.</i>	Myricaceae	<i>Morella integra</i>
Aizoaceae	<i>Conophytum truncatum</i>	Cyperaceae	<i>Ficinia deusta</i>	Myrsinaceae	<i>Myrsine africana</i>
					<i>Eucalyptus</i>
Aizoaceae	<i>Delosperma pageanum</i>	Cyperaceae	<i>Ficinia dunensis</i>	Myrtaceae	<i>camaldulensis</i>
Aizoaceae	<i>Delosperma sp.</i>	Cyperaceae	<i>Ficinia ecklonea</i>	Myrtaceae	<i>Eucalyptus longifolia</i>
					<i>Leptospermum</i>
Aizoaceae	<i>Delosperma subincanum</i>	Cyperaceae	<i>Ficinia levynsiae</i>	Myrtaceae	<i>laevigatum</i>
					<i>Metrosideros</i>
Aizoaceae	<i>Drosanthemum albiflorum</i>	Cyperaceae	<i>Ficinia nigrescens</i>	Myrtaceae	<i>angustifolia</i>
	<i>Drosanthemum</i>				
Aizoaceae	<i>ambiguum</i>	Cyperaceae	<i>Ficinia oligantha</i>	Oleaceae	<i>Olea europaea</i>
	<i>Drosanthemum</i>				
Aizoaceae	<i>asperulum</i>	Cyperaceae	<i>Ficinia polystachya</i>	Onagraceae	<i>Epilobium hirsutum</i>
	<i>Drosanthemum</i>				
Aizoaceae	<i>brevifolium</i>	Cyperaceae	<i>Ficinia ramosissima</i>	Orchidaceae	<i>Acrolophia capensis</i>
Aizoaceae	<i>Drosanthemum calycinum</i>	Cyperaceae	<i>Ficinia sp.</i>	Orchidaceae	<i>Bartholina burmanniana</i>
Aizoaceae	<i>Drosanthemum collinum</i>	Cyperaceae	<i>Ficinia stolonifera</i>	Orchidaceae	<i>Ceratandra atrata</i>
Aizoaceae	<i>Drosanthemum giffenii</i>	Cyperaceae	<i>Ficinia zeyheri</i>	Orchidaceae	<i>Ceratandra bicolor</i>
Aizoaceae	<i>Drosanthemum globosum</i>	Cyperaceae	<i>Fuirena hirsuta</i>	Orchidaceae	<i>Ceratandra globosa</i>
Aizoaceae	<i>Drosanthemum hispidum</i>	Cyperaceae	<i>Isolepis hystrix</i>	Orchidaceae	<i>Disa bifida</i>
Aizoaceae	<i>Drosanthemum lique</i>	Cyperaceae	<i>Isolepis trachysperma</i>	Orchidaceae	<i>Disa bivalvata</i>
	<i>Drosanthemum</i>				
Aizoaceae	<i>papillatum</i>	Cyperaceae	<i>Neesenbeckia punctoria</i>	Orchidaceae	<i>Disa comosa</i>
	<i>Drosanthemum</i>				
Aizoaceae	<i>parvifolium</i>	Cyperaceae	<i>Schoenoxiphium sp.</i>	Orchidaceae	<i>Disa cornuta</i>
	<i>Drosanthemum</i>				
Aizoaceae	<i>praecultum</i>	Cyperaceae	<i>Schoenus compar</i>	Orchidaceae	<i>Disa ferruginea</i>
Aizoaceae	<i>Drosanthemum sp.</i>	Cyperaceae	<i>Schoenus complanatus</i>	Orchidaceae	<i>Disa filicornis</i>
	<i>Drosanthemum</i>				
Aizoaceae	<i>speciosum</i>	Cyperaceae	<i>Schoenus exilis</i>	Orchidaceae	<i>Disa hallackii</i>
Aizoaceae	<i>Drosanthemum striatum</i>	Cyperaceae	<i>Schoenus gracillimus</i>	Orchidaceae	<i>Disa inflexa</i>
Aizoaceae	<i>Erepsia anceps</i>	Cyperaceae	<i>Schoenus pictus</i>	Orchidaceae	<i>Disa maculata</i>
Aizoaceae	<i>Erepsia gracilis</i>	Cyperaceae	<i>Schoenus pseudoloreus</i>	Orchidaceae	<i>Disa micropetala</i>
			<i>Schoenus</i>		
Aizoaceae	<i>Erepsia oxysepala</i>	Cyperaceae	<i>quadrangularis</i>	Orchidaceae	<i>Disa obliqua</i>
Aizoaceae	<i>Galenia africana</i>	Cyperaceae	<i>Tetraria bromoides</i>	Orchidaceae	<i>Disa ocellata</i>
Aizoaceae	<i>Galenia cymosa</i>	Cyperaceae	<i>Tetraria capillacea</i>	Orchidaceae	<i>Disa racemosa</i>
Aizoaceae	<i>Galenia filiformis</i>	Cyperaceae	<i>Tetraria fimbriolata</i>	Orchidaceae	<i>Disa rosea</i>
Aizoaceae	<i>Galenia fruticosa</i>	Cyperaceae	<i>Tetraria fourcadei</i>	Orchidaceae	<i>Disa tenuicornis</i>

Family	Species	Family	Species	Family	Species
Aizoaceae	<i>Galenia pubescens</i>	Cyperaceae	<i>Tetraria involucreta</i>	Orchidaceae	<i>Disa tenuifolia</i>
Aizoaceae	<i>Galenia secunda</i>	Cyperaceae	<i>Tetraria sp.</i>	Orchidaceae	<i>Disa tripetaloides</i>
Aizoaceae	<i>Glottiphyllum difforme</i>	Cyperaceae	<i>Tetraria triangularis</i>	Orchidaceae	<i>Disa uncinata</i>
Aizoaceae	<i>Lampranthus coralliflorus</i>	Cyperaceae	<i>Tetraria ustulata</i>	Orchidaceae	<i>Disperis bolusiana</i>
Aizoaceae	<i>Lampranthus emarginatus</i>	Cytinaceae	<i>Cytinus sanguineus</i>	Orchidaceae	<i>Disperis bolusiana</i>
Aizoaceae	<i>Lampranthus falcatus</i>	Ditrichaceae	<i>Ceratodon purpureus</i>	Orchidaceae	<i>Disperis capensis</i>
Aizoaceae	<i>Lampranthus haworthii</i>	Ditrichaceae	<i>Ditrichum difficile</i>	Orchidaceae	<i>Disperis circumflexa</i>
Aizoaceae	<i>Lampranthus leipoldtii</i>	Ditrichaceae	<i>Pleuridium ecklonii</i>	Orchidaceae	<i>Disperis paludosa</i>
Aizoaceae	<i>Lampranthus occultans</i>	Droseraceae	<i>Drosera ramentacea</i>	Orchidaceae	<i>Holothrix secunda</i>
Aizoaceae	<i>Lampranthus sp.</i>	Ebenaceae	<i>Diospyros austro-africana</i>	Orchidaceae	<i>Holothrix villosa</i>
Aizoaceae	<i>Leipoldtia schultzei</i>	Ebenaceae	<i>Diospyros glabra</i>	Orchidaceae	<i>Pterygodium catholicum</i>
Aizoaceae	<i>Leipoldtia sp.</i>	Ebenaceae	<i>Euclea undulata</i>	Orchidaceae	<i>Pterygodium orobanchoides</i>
Aizoaceae	<i>Malephora crocea</i>	Ericaceae	<i>Erica abietina</i>	Orchidaceae	<i>Pterygodium platypetalum</i>
Aizoaceae	<i>Malephora thunbergii</i>	Ericaceae	<i>Erica accommodata</i>	Orchidaceae	<i>Pterygodium volucris</i>
Aizoaceae	<i>Mesembryanthemum articulatum</i>	Ericaceae	<i>Erica accommodata</i>	Orchidaceae	<i>Satyrium bicallosum</i>
Aizoaceae	<i>Mesembryanthemum bicorne</i>	Ericaceae	<i>Erica adnata</i>	Orchidaceae	<i>Satyrium bicorne</i>
Aizoaceae	<i>Mesembryanthemum coriarium</i>	Ericaceae	<i>Erica alfredii</i>	Orchidaceae	<i>Satyrium coriifolium</i>
Aizoaceae	<i>Mesembryanthemum englishiae</i>	Ericaceae	<i>Erica alopecurus</i>	Orchidaceae	<i>Satyrium erectum</i>
Aizoaceae	<i>Mesembryanthemum grossum</i>	Ericaceae	<i>Erica altevivens</i>	Orchidaceae	<i>Satyrium humile</i>
Aizoaceae	<i>Mesembryanthemum junceum</i>	Ericaceae	<i>Erica altiphila</i>	Orobanchaceae	<i>Harveya bodkinii</i>
Aizoaceae	<i>Mesembryanthemum longistylum</i>	Ericaceae	<i>Erica anemodes</i>	Orobanchaceae	<i>Harveya purpurea</i>
Aizoaceae	<i>Mesembryanthemum nitidum</i>	Ericaceae	<i>Erica anguliger</i>	Orobanchaceae	<i>Harveya squamosa</i>
Aizoaceae	<i>Mesembryanthemum nodiflorum</i>	Ericaceae	<i>Erica arachnocalyx</i>	Orobanchaceae	<i>Hyobanche rubra</i>
Aizoaceae	<i>Mesembryanthemum pallens</i>	Ericaceae	<i>Erica arcuata</i>	Orobanchaceae	<i>Hyobanche sanguinea</i>
Aizoaceae	<i>Mesembryanthemum sp.</i>	Ericaceae	<i>Erica articularis</i>	Orobanchaceae	<i>Melasma scabrum</i>
Aizoaceae	<i>Mesembryanthemum tetragonum</i>	Ericaceae	<i>Erica axillaris</i>	Orobanchaceae	<i>Orobanche ramosa</i>
Aizoaceae	<i>Mesembryanthemum varians</i>	Ericaceae	<i>Erica benthamiana</i>	Orthodontiaceae	<i>Leptotheca gaudichaudii</i>
Aizoaceae	<i>Roosia grahambeckii</i>	Ericaceae	<i>Erica bergiana</i>	Oxalidaceae	<i>Oxalis eckloniana</i>
Aizoaceae	<i>Ruschia caroli</i>	Ericaceae	<i>Erica bicolor</i>	Oxalidaceae	<i>Oxalis eckloniana</i>
Aizoaceae	<i>Ruschia extensa</i>	Ericaceae	<i>Erica binaria</i>	Oxalidaceae	<i>Oxalis leptocalyx</i>
Aizoaceae	<i>Ruschia lineolata</i>	Ericaceae	<i>Erica borboniifolia</i>	Oxalidaceae	<i>Oxalis lindaviana</i>
Aizoaceae	<i>Ruschia multiflora</i>	Ericaceae	<i>Erica boucheri</i>	Oxalidaceae	<i>Oxalis livida</i>
Aizoaceae	<i>Ruschia orientalis</i>	Ericaceae	<i>Erica brevifolia</i>	Oxalidaceae	<i>Oxalis meisneri</i>
Aizoaceae	<i>Ruschia sp.</i>	Ericaceae	<i>Erica bruniades</i>	Oxalidaceae	<i>Oxalis obtusa</i>
Aizoaceae	<i>Ruschia subpaniculata</i>	Ericaceae	<i>Erica caffra</i>	Oxalidaceae	<i>Oxalis pardalis</i>
Aizoaceae	<i>Scopelogenia verruculata</i>	Ericaceae	<i>Erica caffra</i>	Oxalidaceae	<i>Oxalis pes-caprae</i>
Aizoaceae	<i>Stayneria neilii</i>	Ericaceae	<i>Erica caledonica</i>	Oxalidaceae	<i>Oxalis polyphylla</i>
Aizoaceae	<i>Tetragonia fruticosa</i>	Ericaceae	<i>Erica calycina</i>	Oxalidaceae	<i>Oxalis pseudohirta</i>
Aizoaceae	<i>Tetragonia nigrescens</i>	Ericaceae	<i>Erica calycina</i>	Oxalidaceae	<i>Oxalis sp.</i>
Aizoaceae	<i>Tetragonia robusta</i>	Ericaceae	<i>Erica calycina</i>	Oxalidaceae	<i>Oxalis zeyheri</i>
Aizoaceae	<i>Tetragonia saligna</i>	Ericaceae	<i>Erica calycina</i>	Penaeaceae	<i>Endonema lateriflora</i>
Aizoaceae	<i>Tetragonia sarcophylla</i>	Ericaceae	<i>Erica carduifolia</i>	Penaeaceae	<i>Endonema retzioides</i>
Aizoaceae	<i>Tetragonia spicata</i>	Ericaceae	<i>Erica cerinthoides</i>	Peraceae	<i>Clutia alaternoides</i>
Aizoaceae	<i>Tetragonia verrucosa</i>	Ericaceae	<i>Erica cerinthoides</i>	Peraceae	<i>Clutia laxa</i>
Aizoaceae	<i>Trichodiadema calvatum</i>	Ericaceae	<i>Erica cernua</i>	Peraceae	<i>Clutia marginata</i>

Family	Species	Family	Species	Family	Species
Aizoaceae	<i>Trichodiadema densum</i>	Ericaceae	<i>Erica coarctata</i>	Peraceae	<i>Clutia polifolia</i>
Aizoaceae	<i>Vloxia montana</i>	Ericaceae	<i>Erica coccinea</i>	Peraceae	<i>Clutia pubescens</i>
Alliaceae	<i>Tulbaghia capensis</i>	Ericaceae	<i>Erica colorans</i>	Peraceae	<i>Clutia rubricaulis</i>
Amaranthaceae	<i>Amaranthus muricatus</i>	Ericaceae	<i>Erica conspicua</i>	Peraceae	<i>Clutia sp.</i>
Amaranthaceae	<i>Amaranthus thunbergii</i>	Ericaceae	<i>Erica corifolia</i>	Plantaginaceae	<i>Plantago afra</i>
Amaranthaceae	<i>Atriplex lindleyi</i>	Ericaceae	<i>Erica cristata</i>	Plumbaginaceae	<i>Limonium longifolium</i>
Amaranthaceae	<i>Atriplex semibaccata</i>	Ericaceae	<i>Erica cristiflora</i>	Plumbaginaceae	<i>Limonium purpuratum</i>
Amaranthaceae	<i>Atriplex vestita</i>	Ericaceae	<i>Erica cristiflora</i>	Plumbaginaceae	<i>Limonium sp.</i>
Amaranthaceae	<i>Chenopodium album</i>	Ericaceae	<i>Erica curvifolia</i>	Poaceae	<i>Agrostis avenacea</i>
Amaranthaceae	<i>Chenopodium mucronatum</i>	Ericaceae	<i>Erica cymosa</i>	Poaceae	<i>Andropogon appendiculatus</i>
Amaranthaceae	<i>Chenopodium murale</i>	Ericaceae	<i>Erica daphniflora</i>	Poaceae	<i>Anthoxanthum dregeanum</i>
Amaranthaceae	<i>Manochlamys albicans</i>	Ericaceae	<i>Erica daphniflora</i>	Poaceae	<i>Anthoxanthum ecklonii</i>
Amaranthaceae	<i>Salsola adversariifolia</i>	Ericaceae	<i>Erica denticulata</i>	Poaceae	<i>Aristida junciformis</i>
Amaranthaceae	<i>Salsola aphylla</i>	Ericaceae	<i>Erica denticulata</i>	Poaceae	<i>Brachypodium distachyon</i>
Amaranthaceae	<i>Salsola kali</i>	Ericaceae	<i>Erica distorta</i>	Poaceae	<i>Bromus pectinatus</i>
Amaranthaceae	<i>Salsola sp.</i>	Ericaceae	<i>Erica dodii</i>	Poaceae	<i>Capeochloa arundinacea</i>
Amaranthaceae	<i>Sarcocornia natalensis</i>	Ericaceae	<i>Erica embothiifolia</i>	Poaceae	<i>Capeochloa cincta</i>
Amaranthaceae	<i>Sarcocornia pillansii</i>	Ericaceae	<i>Erica embothiifolia</i>	Poaceae	<i>Cenchrus ciliaris</i>
Amaranthaceae	<i>Sarcocornia sp.</i>	Ericaceae	<i>Erica embothiifolia</i>	Poaceae	<i>Chloris truncata</i>
Amaryllidaceae	<i>Boophone disticha</i>	Ericaceae	<i>Erica equisetifolia</i>	Poaceae	<i>Cymbopogon marginatus</i>
Amaryllidaceae	<i>Brunsvigia orientalis</i>	Ericaceae	<i>Erica erasmia</i>	Poaceae	<i>Cynodon dactylon</i>
Amaryllidaceae	<i>Brunsvigia striata</i>	Ericaceae	<i>Erica eremioides</i>	Poaceae	<i>Cynodon incompletus</i>
Amaryllidaceae	<i>Crossyne guttata</i>	Ericaceae	<i>Erica eriocephala</i>	Poaceae	<i>Digitaria eriantha</i>
Amaryllidaceae	<i>Gethyllis spiralis</i>	Ericaceae	<i>Erica esteriana</i>	Poaceae	<i>Ehrharta calycina</i>
Amaryllidaceae	<i>Gethyllis transkarooica</i>	Ericaceae	<i>Erica exleena</i>	Poaceae	<i>Ehrharta capensis</i>
Amaryllidaceae	<i>Gethyllis villosa</i>	Ericaceae	<i>Erica floccifera</i>	Poaceae	<i>Ehrharta delicatula</i>
Amaryllidaceae	<i>Haemanthus coccineus</i>	Ericaceae	<i>Erica glauca</i>	Poaceae	<i>Ehrharta erecta</i>
Amaryllidaceae	<i>Haemanthus sanguineus</i>	Ericaceae	<i>Erica globiceps</i>	Poaceae	<i>Ehrharta longiflora</i>
Amaryllidaceae	<i>Hessea breviflora</i>	Ericaceae	<i>Erica globiceps</i>	Poaceae	<i>Ehrharta ramosa</i>
Amaryllidaceae	<i>Hessea stellaris</i>	Ericaceae	<i>Erica glutinosa</i>	Poaceae	<i>Ehrharta rupestris</i>
Amaryllidaceae	<i>Nerine humilis</i>	Ericaceae	<i>Erica goatcheriana</i>	Poaceae	<i>Ehrharta rupestris</i>
Amaryllidaceae	<i>Nerine sarniensis</i>	Ericaceae	<i>Erica greyi</i>	Poaceae	<i>Ehrharta thunbergii</i>
Amaryllidaceae	<i>Nerine sp.</i>	Ericaceae	<i>Erica haemastoma</i>	Poaceae	<i>Ehrharta triandra</i>
Anacampserotaceae	<i>telephiastrum</i>	Ericaceae	<i>Erica hispidula</i>	Poaceae	<i>Ehrharta villosa</i>
Anacardiaceae	<i>Schinus molle</i>	Ericaceae	<i>Erica hispiduloides</i>	Poaceae	<i>Eragrostis curvula</i>
Anacardiaceae	<i>Searsia burchellii</i>	Ericaceae	<i>Erica humifusa</i>	Poaceae	<i>Eragrostis obtusa</i>
Anacardiaceae	<i>Searsia dissecta</i>	Ericaceae	<i>Erica ignita</i>	Poaceae	<i>Eragrostis rotifer</i>
Anacardiaceae	<i>Searsia glauca</i>	Ericaceae	<i>Erica imbricata</i>	Poaceae	<i>Eustachys paspaloides</i>
Anacardiaceae	<i>Searsia laevigata</i>	Ericaceae	<i>Erica inaequalis</i>	Poaceae	<i>Festuca arundinacea</i>
Anacardiaceae	<i>Searsia lancea</i>	Ericaceae	<i>Erica inflata</i>	Poaceae	<i>Festuca scabra</i>
Anacardiaceae	<i>Searsia lucida</i>	Ericaceae	<i>Erica insolitanthera</i>	Poaceae	<i>Geochloa rufa</i>
Anacardiaceae	<i>Searsia pallens</i>	Ericaceae	<i>Erica intervallaris</i>	Poaceae	<i>Hemarthria altissima</i>
Anacardiaceae	<i>Searsia rehmanniana</i>	Ericaceae	<i>Erica involvens</i>	Poaceae	<i>Hordeum murinum</i>
Anacardiaceae	<i>Searsia rosmarinifolia</i>	Ericaceae	<i>Erica jonasiana</i>	Poaceae	<i>Hordeum murinum</i>
Anacardiaceae	<i>Searsia scytophylla</i>	Ericaceae	<i>Erica karooica</i>	Poaceae	<i>Hyparrhenia hirta</i>
Anacardiaceae	<i>Searsia tomentosa</i>	Ericaceae	<i>Erica labialis</i>	Poaceae	<i>Koeleria capensis</i>
Anacardiaceae	<i>Searsia undulata</i>	Ericaceae	<i>Erica lachnaeifolia</i>	Poaceae	<i>Lamarckia aurea</i>
Andreaeaceae	<i>Andreaea subulata</i>	Ericaceae	<i>Erica lateralis</i>	Poaceae	<i>Leptochloa fusca</i>
Anemiaceae	<i>Mohria caffrorum</i>	Ericaceae	<i>Erica lawsonii</i>	Poaceae	<i>Melinis repens</i>
Apiaceae	<i>Anginon difforme</i>	Ericaceae	<i>Erica leptopus</i>	Poaceae	<i>Parapholis incurva</i>
Apiaceae	<i>Anginon fruticosum</i>	Ericaceae	<i>Erica leucantha</i>	Poaceae	<i>Pentameris acinosa</i>
Apiaceae	<i>Anginon swellendamensis</i>	Ericaceae	<i>Erica leucanthera</i>	Poaceae	<i>Pentameris airoides</i>
Apiaceae	<i>Annesorhiza macrocarpa</i>	Ericaceae	<i>Erica leucodesmia</i>	Poaceae	<i>Pentameris aristidoides</i>

Family	Species	Family	Species	Family	Species
Apiaceae	<i>Annesorhiza triternata</i>	Ericaceae	<i>Erica longistyla</i>	Poaceae	<i>Pentameris colorata</i>
Apiaceae	<i>Centella dolichocarpa</i>	Ericaceae	<i>Erica longistyla</i>	Poaceae	<i>Pentameris curvifolia</i>
Apiaceae	<i>Centella glabrata</i>	Ericaceae	<i>Erica lucida</i>	Poaceae	<i>Pentameris densifolia</i>
Apiaceae	<i>Centella linifolia</i>	Ericaceae	<i>Erica lutea</i>	Poaceae	<i>Pentameris distichophylla</i>
Apiaceae	<i>Centella macrocarpa</i>	Ericaceae	<i>Erica melanthera</i>	Poaceae	<i>Pentameris ellisii</i>
Apiaceae	<i>Centella restioides</i>	Ericaceae	<i>Erica mitchellensis</i>	Poaceae	<i>Pentameris eriostoma</i>
Apiaceae	<i>Centella sp.</i>	Ericaceae	<i>Erica modesta</i>	Poaceae	<i>Pentameris macrocalycina</i>
Apiaceae	<i>Centella thesioides</i>	Ericaceae	<i>Erica monsoniana</i>	Poaceae	<i>Pentameris malouinensis</i>
Apiaceae	<i>Chamarea sp.</i>	Ericaceae	<i>Erica multumbellifera</i>	Poaceae	<i>Pentameris obtusifolia</i>
Apiaceae	<i>Lichtensteinia obscura</i>	Ericaceae	<i>Erica nudiflora</i>	Poaceae	<i>Pentameris oreophila</i>
Apiaceae	<i>Lichtensteinia trifida</i>	Ericaceae	<i>Erica oakesiorum</i>	Poaceae	<i>Pentameris pallida</i>
Apiaceae	<i>Notobubon ferulaceum</i>	Ericaceae	<i>Erica obtusata</i>	Poaceae	<i>Pentameris patula</i>
Apiaceae	<i>Torilis arvensis</i>	Ericaceae	<i>Erica odorata</i>	Poaceae	<i>Pentameris pusilla</i>
Apocynaceae	<i>Astephanus triflorus</i>	Ericaceae	<i>Erica odoriflora</i>	Poaceae	<i>Pentameris pyrophila</i>
Apocynaceae	<i>Carissa bispinosa</i>	Ericaceae	<i>Erica ostiaria</i>	Poaceae	<i>Pentameris reflexa</i>
Apocynaceae	<i>Ceropegia fimbriata</i>	Ericaceae	<i>Erica ovina</i>	Poaceae	<i>Pentameris rigidissima</i>
Apocynaceae	<i>Duvalia elegans</i>	Ericaceae	<i>Erica ovina</i>	Poaceae	<i>Pentameris rosea</i>
Apocynaceae	<i>Gomphocarpus cancellatus</i>	Ericaceae	<i>Erica paniculata</i>	Poaceae	<i>Pentameris veneta</i>
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Ericaceae	<i>Erica pannosa</i>	Poaceae	<i>Pentaschistis sp.</i>
Apocynaceae	<i>Microloma sagittatum</i>	Ericaceae	<i>Erica parilis</i>	Poaceae	<i>Phalaris minor</i>
Apocynaceae	<i>Secamone alpini</i>	Ericaceae	<i>Erica perlata</i>	Poaceae	<i>Phragmites australis</i>
Apocynaceae	<i>Stapelia hirsuta</i>	Ericaceae	<i>Erica petricola</i>	Poaceae	<i>Poa bulbosa</i>
Apocynaceae	<i>Stapelia hirsuta</i>	Ericaceae	<i>Erica petrophila</i>	Poaceae	<i>Polypogon monspeliensis</i>
Apocynaceae	<i>Stapelia paniculata</i>	Ericaceae	<i>Erica peziza</i>	Poaceae	<i>Puccinellia angusta</i>
Apocynaceae	<i>Stapeliopsis breviloba</i>	Ericaceae	<i>Erica phacelanthera</i>	Poaceae	<i>Schismus barbatus</i>
Apocynaceae	<i>Tavaresia meintjesii</i>	Ericaceae	<i>Erica phillipsii</i>	Poaceae	<i>Setaria verticillata</i>
Aquifoliaceae	<i>Ilex mitis</i>	Ericaceae	<i>Erica pilosiflora</i>	Poaceae	<i>Stipagrostis obtusa</i>
Araceae	<i>Zantedeschia aethiopica</i>	Ericaceae	<i>Erica pinea</i>	Poaceae	<i>Stipagrostis zeyheri</i>
Araliaceae	<i>Cussonia paniculata</i>	Ericaceae	<i>Erica plukenetii</i>	Poaceae	<i>Tenaxia disticha</i>
Archidiaceae	<i>Archidium capense</i>	Ericaceae	<i>Erica plukenetii</i>	Poaceae	<i>Tenaxia stricta</i>
Arnelliaceae	<i>Gongylanthus renifolius</i>	Ericaceae	<i>Erica plukenetii</i>	Poaceae	<i>Themeda triandra</i>
Asparagaceae	<i>Asparagus aethiopicus</i>	Ericaceae	<i>Erica plumosa</i>	Poaceae	<i>Tribolium brachystachyum</i>
Asparagaceae	<i>Asparagus burchellii</i>	Ericaceae	<i>Erica polifolia</i>	Poaceae	<i>Tribolium curvum</i>
Asparagaceae	<i>Asparagus capensis</i>	Ericaceae	<i>Erica pumila</i>	Poaceae	<i>Tribolium echinatum</i>
Asparagaceae	<i>Asparagus confertus</i>	Ericaceae	<i>Erica quadrangularis</i>	Poaceae	<i>Tribolium hispidum</i>
Asparagaceae	<i>Asparagus declinatus</i>	Ericaceae	<i>Erica racemosa</i>	Poaceae	<i>Tribolium obtusifolium</i>
Asparagaceae	<i>Asparagus exuvialis</i>	Ericaceae	<i>Erica rigidula</i>	Poaceae	<i>Tribolium sp.</i>
Asparagaceae	<i>Asparagus kraussianus</i>	Ericaceae	<i>Erica rosacea</i>	Poaceae	<i>Vulpia bromoides</i>
Asparagaceae	<i>Asparagus mucronatus</i>	Ericaceae	<i>Erica rubens</i>	Podocarpaceae	<i>Afrocarpus falcatus</i>
Asparagaceae	<i>Asparagus retrofractus</i>	Ericaceae	<i>Erica rufescens</i>	Podocarpaceae	<i>Podocarpus elongatus</i>
Asparagaceae	<i>Asparagus sp.</i>	Ericaceae	<i>Erica savileae</i>	Polygalaceae	<i>Muraltia alopecuroides</i>
Asparagaceae	<i>Asparagus undulatus</i>	Ericaceae	<i>Erica selaginifolia</i>	Polygalaceae	<i>Muraltia concava</i>
Asphodelaceae	<i>Astroloba rubriflora</i>	Ericaceae	<i>Erica senilis</i>	Polygalaceae	<i>Muraltia dumosa</i>
Asphodelaceae	<i>Bulbine alooides</i>	Ericaceae	<i>Erica serrata</i>	Polygalaceae	<i>Muraltia ericaefolia</i>
Asphodelaceae	<i>Bulbine asphodeloides</i>	Ericaceae	<i>Erica sessiliflora</i>	Polygalaceae	<i>Muraltia gillettiae</i>
Asphodelaceae	<i>Bulbine cepacea</i>	Ericaceae	<i>Erica setacea</i>	Polygalaceae	<i>Muraltia histeria</i>
Asphodelaceae	<i>Bulbine favosa</i>	Ericaceae	<i>Erica setociliata</i>	Polygalaceae	<i>Muraltia horrida</i>
Asphodelaceae	<i>Bulbine foleyii</i>	Ericaceae	<i>Erica setosa</i>	Polygalaceae	<i>Muraltia macrocarpa</i>
Asphodelaceae	<i>Bulbine frutescens</i>	Ericaceae	<i>Erica sicifolia</i>	Polygalaceae	<i>Muraltia muraltioides</i>
Asphodelaceae	<i>Bulbine lagopus</i>	Ericaceae	<i>Erica similis</i>	Polygalaceae	<i>Muraltia ononidifolia</i>
Asphodelaceae	<i>Bulbine mesembryanthoides</i>	Ericaceae	<i>Erica sonderiana</i>	Polygalaceae	<i>Muraltia rhamnoides</i>

Family	Species	Family	Species	Family	Species
	<i>Bulbine</i>				
Asphodelaceae	<i>mesembryanthoides</i>	Ericaceae	<i>Erica sp.</i>	Polygalaceae	<i>Muraltia schlechteri</i>
Asphodelaceae	<i>Bulbine praemorsa</i>	Ericaceae	<i>Erica sphaerocephala</i>	Polygalaceae	<i>Muraltia sp.</i>
Asphodelaceae	<i>Bulbinella chartacea</i>	Ericaceae	<i>Erica spumosa</i>	Polygalaceae	<i>Muraltia trinervia</i>
Asphodelaceae	<i>Bulbinella nutans</i>	Ericaceae	<i>Erica steinbergiana</i>	Polygalaceae	<i>Muraltia trinervia</i>
Asphodelaceae	<i>Bulbinella nutans</i>	Ericaceae	<i>Erica strigosa</i>	Polygalaceae	<i>Polygala bracteolata</i>
Asphodelaceae	<i>Bulbinella trinervis</i>	Ericaceae	<i>Erica subulata</i>	Polygalaceae	<i>Polygala erioptera</i>
Asphodelaceae	<i>Bulbinella triquetra</i>	Ericaceae	<i>Erica taxifolia</i>	Polygalaceae	<i>Polygala fruticosa</i>
Asphodelaceae	<i>Gasteria carinata</i>	Ericaceae	<i>Erica tenuifolia</i>	Polygalaceae	<i>Polygala scabra</i>
Asphodelaceae	<i>Gasteria carinata</i>	Ericaceae	<i>Erica tenuis</i>	Polygalaceae	<i>Polygala umbellata</i>
Asphodelaceae	<i>Gasteria disticha</i>	Ericaceae	<i>Erica terniflora</i>	Polygalaceae	<i>Polygala wittebergensis</i>
Asphodelaceae	<i>Gasteria disticha</i>	Ericaceae	<i>Erica tomentosa</i>	Polygonaceae	<i>Oxygonum alatum</i>
					<i>Persicaria</i>
Asphodelaceae	<i>Gasteria pillansii</i>	Ericaceae	<i>Erica totta</i>	Polygonaceae	<i>madagascariensis</i>
Asphodelaceae	<i>Gasteria retusa</i>	Ericaceae	<i>Erica transparents</i>	Polygonaceae	<i>Rumex cordatus</i>
Asphodelaceae	<i>Gasteria sp.</i>	Ericaceae	<i>Erica trichadenia</i>	Polygonaceae	<i>Rumex sagittatus</i>
Asphodelaceae	<i>Haworthia arachnoidea</i>	Ericaceae	<i>Erica tumida</i>	Polytrichaceae	<i>Polytrichum commune</i>
Asphodelaceae	<i>Haworthia arachnoidea</i>	Ericaceae	<i>Erica urceolata</i>	Polytrichaceae	<i>Polytrichum juniperinum</i>
Asphodelaceae	<i>Haworthia cooperi</i>	Ericaceae	<i>Erica vallis-gratiae</i>	Polytrichaceae	<i>Polytrichum piliferum</i>
Asphodelaceae	<i>Haworthia herbacea</i>	Ericaceae	<i>Erica vanheurckii</i>	Potamogetonaceae	<i>Potamogeton pectinatus</i>
Asphodelaceae	<i>Haworthia herbacea</i>	Ericaceae	<i>Erica verecunda</i>	Pottiaceae	<i>Acaulon recurvatum</i>
					<i>Didymodon</i>
Asphodelaceae	<i>Haworthia maculata</i>	Ericaceae	<i>Erica versicolor</i>	Pottiaceae	<i>xanthocarpus</i>
					<i>Pseudocrossidium</i>
Asphodelaceae	<i>Haworthia maculata</i>	Ericaceae	<i>Erica vestita</i>	Pottiaceae	<i>crintum</i>
Asphodelaceae	<i>Haworthia mirabilis</i>	Ericaceae	<i>Erica villosa</i>	Pottiaceae	<i>Syntrichia antarctica</i>
Asphodelaceae	<i>Haworthia mirabilis</i>	Ericaceae	<i>Erica viscaria</i>	Pottiaceae	<i>Syntrichia ruralis</i>
Asphodelaceae	<i>Haworthia mirabilis</i>	Ericaceae	<i>Erica viscidiflora</i>	Pottiaceae	<i>Tortella xanthocarpa</i>
Asphodelaceae	<i>Haworthia mirabilis</i>	Ericaceae	<i>Erica walkeria</i>	Pottiaceae	<i>Tortula atrovirens</i>
Asphodelaceae	<i>Haworthia mirabilis</i>	Euphorbiaceae	<i>Euphorbia burmannii</i>	Proteaceae	<i>Aulax cancellata</i>
Asphodelaceae	<i>Haworthia reticulata</i>	Euphorbiaceae	<i>Euphorbia clandestina</i>	Proteaceae	<i>Aulax pallasia</i>
Asphodelaceae	<i>Haworthia reticulata</i>	Euphorbiaceae	<i>Euphorbia inaequilatera</i>	Proteaceae	<i>Aulax umbellata</i>
Asphodelaceae	<i>Haworthia reticulata</i>	Euphorbiaceae	<i>Euphorbia mauritanica</i>	Proteaceae	<i>Leucadendron arcuatum</i>
Asphodelaceae	<i>Haworthia reticulata</i>	Euphorbiaceae	<i>Euphorbia nesemannii</i>	Proteaceae	<i>Leucadendron barkerae</i>
					<i>Leucadendron</i>
Asphodelaceae	<i>Haworthia sp.</i>	Euphorbiaceae	<i>Euphorbia serpens</i>	Proteaceae	<i>brunioides</i>
					<i>Leucadendron</i>
Asphodelaceae	<i>Kniphofia uvaria</i>	Euphorbiaceae	<i>Ricinus communis</i>	Proteaceae	<i>brunioides</i>
Asphodelaceae	<i>Trachyandra falcata</i>	Fabaceae	<i>Acacia cultriformis</i>	Proteaceae	<i>Leucadendron burchellii</i>
Asphodelaceae	<i>Trachyandra filiformis</i>	Fabaceae	<i>Acacia saligna</i>	Proteaceae	<i>Leucadendron comosum</i>
Asphodelaceae	<i>Trachyandra flexifolia</i>	Fabaceae	<i>Amphithalea ciliaris</i>	Proteaceae	<i>Leucadendron comosum</i>
Asphodelaceae	<i>Trachyandra hirsutiflora</i>	Fabaceae	<i>Amphithalea ericifolia</i>	Proteaceae	<i>Leucadendron cordatum</i>
					<i>Leucadendron</i>
Asphodelaceae	<i>Trachyandra montana</i>	Fabaceae	<i>Amphithalea monticola</i>	Proteaceae	<i>eucalyptifolium</i>
Asphodelaceae	<i>Trachyandra revoluta</i>	Fabaceae	<i>Amphithalea ornata</i>	Proteaceae	<i>Leucadendron galpinii</i>
					<i>Leucadendron</i>
Asphodelaceae	<i>Tulista pumila</i>	Fabaceae	<i>Amphithalea pageae</i>	Proteaceae	<i>glaberrimum</i>
Aspleniaceae	<i>Asplenium cordatum</i>	Fabaceae	<i>Argyrolobium collinum</i>	Proteaceae	<i>Leucadendron globosum</i>
			<i>Aspalathus</i>		<i>Leucadendron</i>
Aspleniaceae	<i>Asplenium trichomanes</i>	Fabaceae	<i>acanthoclada</i>	Proteaceae	<i>laureolum</i>
					<i>Leucadendron</i>
Asteraceae	<i>Amellus strigosus</i>	Fabaceae	<i>Aspalathus acuminata</i>	Proteaceae	<i>microcephalum</i>
Asteraceae	<i>Amphiglossa tomentosa</i>	Fabaceae	<i>Aspalathus angustifolia</i>	Proteaceae	<i>Leucadendron nervosum</i>
					<i>Leucadendron</i>
Asteraceae	<i>Anaxeton asperum</i>	Fabaceae	<i>Aspalathus araneosa</i>	Proteaceae	<i>pubescens</i>
Asteraceae	<i>Anaxeton brevipes</i>	Fabaceae	<i>Aspalathus astroites</i>	Proteaceae	<i>Leucadendron rubrum</i>
					<i>Leucadendron</i>
Asteraceae	<i>Anaxeton hirsutum</i>	Fabaceae	<i>Aspalathus biflora</i>	Proteaceae	<i>salicifolium</i>
Asteraceae	<i>Arctotheca calendula</i>	Fabaceae	<i>Aspalathus bodkinii</i>	Proteaceae	<i>Leucadendron salignum</i>

Family	Species	Family	Species	Family	Species
Asteraceae	<i>Arctotis acuminata</i>	Fabaceae	<i>Aspalathus bracteata</i>	Proteaceae	<i>Leucadendron spissifolium</i>
Asteraceae	<i>Arctotis arctotoides</i>	Fabaceae	<i>Aspalathus candicans</i>	Proteaceae	<i>Leucadendron spissifolium</i>
Asteraceae	<i>Arctotis dregei</i>	Fabaceae	<i>Aspalathus cephalotes</i>	Proteaceae	<i>Leucadendron teretifolium</i>
Asteraceae	<i>Arctotis revoluta</i>	Fabaceae	<i>Aspalathus chrysantha</i>	Proteaceae	<i>Leucadendron thymifolium</i>
Asteraceae	<i>Arctotis sp.</i>	Fabaceae	<i>Aspalathus ciliaris</i>	Proteaceae	<i>Leucospermum calligerum</i>
Asteraceae	<i>Arctotis sulcocarpa</i>	Fabaceae	<i>Aspalathus cliffortioides</i>	Proteaceae	<i>Leucospermum cuneiforme</i>
Asteraceae	<i>Athanasia crithmifolia</i>	Fabaceae	<i>Aspalathus cordata</i>	Proteaceae	<i>Leucospermum formosum</i>
Asteraceae	<i>Athanasia humilis</i>	Fabaceae	<i>Aspalathus corrudifolia</i>	Proteaceae	<i>Leucospermum harpagonatum</i>
Asteraceae	<i>Athanasia pachycephala</i>	Fabaceae	<i>Aspalathus crenata</i>	Proteaceae	<i>Leucospermum oleifolium</i>
Asteraceae	<i>Athanasia quinquedentata</i>	Fabaceae	<i>Aspalathus cymbiformis</i>	Proteaceae	<i>Leucospermum royenifolium</i>
Asteraceae	<i>Athanasia trifurcata</i>	Fabaceae	<i>Aspalathus dianthopora</i>	Proteaceae	<i>Leucospermum utriculosum</i>
Asteraceae	<i>Berkheya angusta</i>	Fabaceae	<i>Aspalathus divaricata</i>	Proteaceae	<i>Leucospermum wittebergense</i>
Asteraceae	<i>Berkheya armata</i>	Fabaceae	<i>Aspalathus excelsa</i>	Proteaceae	<i>Mimetes argenteus</i>
Asteraceae	<i>Berkheya coriacea</i>	Fabaceae	<i>Aspalathus florulenta</i>	Proteaceae	<i>Mimetes cucullatus</i>
Asteraceae	<i>Berkheya heterophylla</i>	Fabaceae	<i>Aspalathus fusca</i>	Proteaceae	<i>Paranomus candicans</i>
Asteraceae	<i>Berkheya heterophylla</i>	Fabaceae	<i>Aspalathus grandiflora</i>	Proteaceae	<i>Paranomus capitatus</i>
Asteraceae	<i>Berkheya onobromoides</i>	Fabaceae	<i>Aspalathus hirta</i>	Proteaceae	<i>Paranomus dispersus</i>
Asteraceae	<i>Berkheya rigida</i>	Fabaceae	<i>Aspalathus hispida</i>	Proteaceae	<i>Paranomus sp.</i>
Asteraceae	<i>Chrysocoma acicularis</i>	Fabaceae	<i>Aspalathus incurva</i>	Proteaceae	<i>Protea acaulos</i>
Asteraceae	<i>Chrysocoma ciliata</i>	Fabaceae	<i>Aspalathus juniperina</i>	Proteaceae	<i>Protea amplexicaulis</i>
Asteraceae	<i>Chrysocoma longifolia</i>	Fabaceae	<i>Aspalathus keeromsbergensis</i>	Proteaceae	<i>Protea aurea</i>
Asteraceae	<i>Chrysocoma valida</i>	Fabaceae	<i>Aspalathus lactea</i>	Proteaceae	<i>Protea aurea</i>
Asteraceae	<i>Cineraria lobata</i>	Fabaceae	<i>Aspalathus lactea</i>	Proteaceae	<i>Protea burchellii</i>
Asteraceae	<i>Cineraria lobata</i>	Fabaceae	<i>Aspalathus laricifolia</i>	Proteaceae	<i>Protea caespitosa</i>
Asteraceae	<i>Cineraria platycarpa</i>	Fabaceae	<i>Aspalathus laricifolia</i>	Proteaceae	<i>Protea canaliculata</i>
Asteraceae	<i>Cineraria sp.</i>	Fabaceae	<i>Aspalathus longipes</i>	Proteaceae	<i>Protea coronata</i>
Asteraceae	<i>Conyza scabrada</i>	Fabaceae	<i>Aspalathus macrocarpa</i>	Proteaceae	<i>Protea cryophila</i>
Asteraceae	<i>Corymbium africanum</i>	Fabaceae	<i>Aspalathus microphylla</i>	Proteaceae	<i>Protea cynaroides</i>
Asteraceae	<i>Corymbium africanum</i>	Fabaceae	<i>Aspalathus nigra</i>	Proteaceae	<i>Protea effusa</i>
Asteraceae	<i>Corymbium cymosum</i>	Fabaceae	<i>Aspalathus pachyloba</i>	Proteaceae	<i>Protea eximia</i>
Asteraceae	<i>Corymbium sp.</i>	Fabaceae	<i>Aspalathus pachyloba</i>	Proteaceae	<i>Protea humiflora</i>
Asteraceae	<i>Corymbium villosum</i>	Fabaceae	<i>Aspalathus pachyloba</i>	Proteaceae	<i>Protea lacticolor</i>
Asteraceae	<i>Cotula australis</i>	Fabaceae	<i>Aspalathus pachyloba</i>	Proteaceae	<i>Protea laevis</i>
Asteraceae	<i>Cotula coronopifolia</i>	Fabaceae	<i>Aspalathus parviflora</i>	Proteaceae	<i>Protea laurifolia</i>
Asteraceae	<i>Crassothonna cacalioides</i>	Fabaceae	<i>Aspalathus pinguis</i>	Proteaceae	<i>Protea longifolia</i>
Asteraceae	<i>Crassothonna cylindrica</i>	Fabaceae	<i>Aspalathus quinquefolia</i>	Proteaceae	<i>Protea lorifolia</i>
Asteraceae	<i>Crassothonna protecta</i>	Fabaceae	<i>Aspalathus radiata</i>	Proteaceae	<i>Protea magnifica</i>
Asteraceae	<i>Cullumia patula</i>	Fabaceae	<i>Aspalathus recurva</i>	Proteaceae	<i>Protea neriifolia</i>
Asteraceae	<i>Cullumia patula</i>	Fabaceae	<i>Aspalathus rugosa</i>	Proteaceae	<i>Protea nitida</i>
Asteraceae	<i>Cullumia sulcata</i>	Fabaceae	<i>Aspalathus sp.</i>	Proteaceae	<i>Protea punctata</i>
Asteraceae	<i>Cullumia sulcata</i>	Fabaceae	<i>Aspalathus spectabilis</i>	Proteaceae	<i>Protea repens</i>
Asteraceae	<i>Curio crassulifolius</i>	Fabaceae	<i>Aspalathus spicata</i>	Proteaceae	<i>Protea restionifolia</i>
Asteraceae	<i>Curio talinoides</i>	Fabaceae	<i>Aspalathus spinescens</i>	Proteaceae	<i>Protea scabra</i>
Asteraceae	<i>Cymbopappus adenosolen</i>	Fabaceae	<i>Aspalathus spinosa</i>	Proteaceae	<i>Protea scolopendriifolia</i>
Asteraceae	<i>Dicerotheramnus adpressus</i>	Fabaceae	<i>Aspalathus spinosa</i>	Proteaceae	<i>Protea speciosa</i>

Family	Species	Family	Species	Family	Species
Asteraceae	<i>Dicerotheramnus rhinocerotis</i>	Fabaceae	<i>Aspalathus spinosa</i>	Proteaceae	<i>Protea subulifolia</i>
Asteraceae	<i>Dicoma fruticosa</i>	Fabaceae	<i>Aspalathus spinosissima</i>	Proteaceae	<i>Protea sulphurea</i>
Asteraceae	<i>Dimorphotheca chrysanthemifolia</i>	Fabaceae	<i>Aspalathus stenophylla</i>	Proteaceae	<i>Protea witzenbergiana</i>
Asteraceae	<i>Dimorphotheca montana</i>	Fabaceae	<i>Aspalathus steudeliana</i>	Proteaceae	<i>Serruria acrocarpa</i>
Asteraceae	<i>Dimorphotheca nudicaulis</i>	Fabaceae	<i>Aspalathus stokoei</i>	Proteaceae	<i>Serruria aemula</i>
Asteraceae	<i>Dimorphotheca tragus</i>	Fabaceae	<i>Aspalathus submissa</i>	Proteaceae	<i>Serruria dodii</i>
Asteraceae	<i>Dimorphotheca zeyheri</i>	Fabaceae	<i>Aspalathus tridentata</i>	Proteaceae	<i>Serruria elongata</i>
Asteraceae	<i>Disparago ericoides</i>	Fabaceae	<i>Aspalathus triquetra</i>	Proteaceae	<i>Serruria fasciflora</i>
Asteraceae	<i>Dolichotheix ericoides</i>	Fabaceae	<i>Aspalathus tuberculata</i>	Proteaceae	<i>Serruria gremialis</i>
Asteraceae	<i>Edmondia fasciculata</i>	Fabaceae	<i>Aspalathus wurmbeana</i>	Proteaceae	<i>Serruria incrassata</i>
Asteraceae	<i>Edmondia pinifolia</i>	Fabaceae	<i>Calobota cytisoides</i>	Proteaceae	<i>Serruria phylloides</i>
Asteraceae	<i>Edmondia sesamoides</i>	Fabaceae	<i>Crotalaria excisa</i>	Proteaceae	<i>Serruria sp.</i>
Asteraceae	<i>Erigeron canadensis</i>	Fabaceae	<i>Crotalaria excisa</i>	Proteaceae	<i>Serruria stellata</i>
Asteraceae	<i>Eriocephalus africanus</i>	Fabaceae	<i>Cyamopsis sp.</i>	Proteaceae	<i>Serruria viridifolia</i>
Asteraceae	<i>Eriocephalus ericoides</i>	Fabaceae	<i>Cyclopia genistoides</i>	Proteaceae	<i>Serruria williamsii</i>
Asteraceae	<i>Euryops abrotanifolius</i>	Fabaceae	<i>Cyclopia meyeriana</i>	Proteaceae	<i>Sorocephalus lanatus</i>
Asteraceae	<i>Euryops longipes</i>	Fabaceae	<i>Desmodium repandum</i>	Proteaceae	<i>Spatalla argentea</i>
Asteraceae	<i>Euryops montanus</i>	Fabaceae	<i>Hypocalyptus coluteoides</i>	Proteaceae	<i>Spatalla confusa</i>
Asteraceae	<i>Euryops othonnoides</i>	Fabaceae	<i>Hypocalyptus sophoroides</i>	Proteaceae	<i>Spatalla curvifolia</i>
Asteraceae	<i>Euryops rehmannii</i>	Fabaceae	<i>Indigofera amoena</i>	Proteaceae	<i>Spatalla incurva</i>
Asteraceae	<i>Euryops sp.</i>	Fabaceae	<i>Indigofera candicans</i>	Proteaceae	<i>Spatalla parilis</i>
Asteraceae	<i>Euryops tenuissimus</i>	Fabaceae	<i>Indigofera depressa</i>	Proteaceae	<i>Spatalla sp.</i>
Asteraceae	<i>Felicia amoena</i>	Fabaceae	<i>Indigofera heterophylla</i>	Proteaceae	<i>Vexatorella obtusata</i>
Asteraceae	<i>Felicia bellidioides</i>	Fabaceae	<i>Indigofera incana</i>	Pteridaceae	<i>Cheilanthes capensis</i>
Asteraceae	<i>Felicia bellidioides</i>	Fabaceae	<i>Indigofera jucunda</i>	Pteridaceae	<i>Cheilanthes contracta</i>
Asteraceae	<i>Felicia cymbalarioides</i>	Fabaceae	<i>Indigofera ovata</i>	Pteridaceae	<i>Cheilanthes hastata</i>
Asteraceae	<i>Felicia denticulata</i>	Fabaceae	<i>Indigofera sp.</i>	Pteridaceae	<i>Cheilanthes induta</i>
Asteraceae	<i>Felicia fascicularis</i>	Fabaceae	<i>Indigofera verrucosa</i>	Pteridaceae	<i>Cheilanthes parviloba</i>
Asteraceae	<i>Felicia filifolia</i>	Fabaceae	<i>Lebeckia pauciflora</i>	Ptychomitriaceae	<i>Ptychomitrium crispatum</i>
Asteraceae	<i>Felicia minima</i>	Fabaceae	<i>Lebeckia sepriaria</i>	Ranunculaceae	<i>Anemone knowltonia</i>
Asteraceae	<i>Felicia sp.</i>	Fabaceae	<i>Lessertia frutescens</i>	Ranunculaceae	<i>Clematis brachiata</i>
Asteraceae	<i>Felicia venusta</i>	Fabaceae	<i>Lessertia pauciflora</i>	Restionaceae	<i>Anthochortus crinalis</i>
Asteraceae	<i>Gazania krebsiana</i>	Fabaceae	<i>Lessertia rigida</i>	Restionaceae	<i>Anthochortus ecklonii</i>
Asteraceae	<i>Gerbera crocea</i>	Fabaceae	<i>Liparia capitata</i>	Restionaceae	<i>Askidiosperma paniculatum</i>
Asteraceae	<i>Gnaphalium confine</i>	Fabaceae	<i>Liparia umbellifera</i>	Restionaceae	<i>Cannomois aristata</i>
Asteraceae	<i>Gorteria diffusa</i>	Fabaceae	<i>Lotononis caeruleascens</i>	Restionaceae	<i>Cannomois nitida</i>
Asteraceae	<i>Gorteria integrifolia</i>	Fabaceae	<i>Lotononis involucrata</i>	Restionaceae	<i>Cannomois parviflora</i>
Asteraceae	<i>Helichrysum acrophilum</i>	Fabaceae	<i>Lotononis prostrata</i>	Restionaceae	<i>Cannomois robusta</i>
Asteraceae	<i>Helichrysum asperum</i>	Fabaceae	<i>Lotononis rigida</i>	Restionaceae	<i>Cannomois scirpoides</i>
Asteraceae	<i>Helichrysum asperum</i>	Fabaceae	<i>Lotononis sp.</i>	Restionaceae	<i>Cannomois sp.</i>
Asteraceae	<i>Helichrysum asperum</i>	Fabaceae	<i>Melolobium exudans</i>	Restionaceae	<i>Cannomois spicata</i>
Asteraceae	<i>Helichrysum asperum</i>	Fabaceae	<i>Melolobium lampolobum</i>	Restionaceae	<i>Cannomois virgata</i>
Asteraceae	<i>Helichrysum cymosum</i>	Fabaceae	<i>Melolobium sp.</i>	Restionaceae	<i>Elegia aggregata</i>
Asteraceae	<i>Helichrysum excisum</i>	Fabaceae	<i>Otholobium candicans</i>	Restionaceae	<i>Elegia ebracteata</i>
Asteraceae	<i>Helichrysum felinum</i>	Fabaceae	<i>Otholobium mundianum</i>	Restionaceae	<i>Elegia esterhuyensiana</i>
Asteraceae	<i>Helichrysum foetidum</i>	Fabaceae	<i>Otholobium nitens</i>	Restionaceae	<i>Elegia fucata</i>
Asteraceae	<i>Helichrysum hamulosum</i>	Fabaceae	<i>Otholobium spicatum</i>	Restionaceae	<i>Elegia galpinii</i>
Asteraceae	<i>Helichrysum hebelepis</i>	Fabaceae	<i>Otholobium striatum</i>	Restionaceae	<i>Elegia grandis</i>
Asteraceae	<i>Helichrysum lancifolium</i>	Fabaceae	<i>Otholobium virgatum</i>	Restionaceae	<i>Elegia hookeriana</i>
Asteraceae	<i>Helichrysum leontonyx</i>	Fabaceae	<i>Podalyria biflora</i>	Restionaceae	<i>Elegia juncea</i>
Asteraceae	<i>Helichrysum litorale</i>	Fabaceae	<i>Podalyria burchellii</i>	Restionaceae	<i>Elegia marlothii</i>

Family	Species	Family	Species	Family	Species
Asteraceae	<i>Helichrysum marifolium</i>	Fabaceae	<i>Podalyria calyprata</i>	Restionaceae	<i>Elegia neesii</i>
Asteraceae	<i>Helichrysum moesianum</i>	Fabaceae	<i>Podalyria leipoldtii</i>	Restionaceae	<i>Elegia persistens</i>
Asteraceae	<i>Helichrysum odoratissimum</i>	Fabaceae	<i>Podalyria myrtillifolia</i>	Restionaceae	<i>Elegia racemosa</i>
Asteraceae	<i>Helichrysum odoratissimum</i>	Fabaceae	<i>Podalyria rotundifolia</i>	Restionaceae	<i>Elegia spathacea</i>
Asteraceae	<i>Helichrysum patulum</i>	Fabaceae	<i>Podalyria variabilis</i>	Restionaceae	<i>Elegia stokoei</i>
Asteraceae	<i>Helichrysum pulchellum</i>	Fabaceae	<i>Psoralea oligophylla</i>	Restionaceae	<i>Hydrophilus rattrayi</i>
Asteraceae	<i>Helichrysum revolutum</i>	Fabaceae	<i>Psoralea oreophila</i>	Restionaceae	<i>Hypodiscus albo-aristatus</i>
Asteraceae	<i>Helichrysum rosum</i>	Fabaceae	<i>Psoralea restioides</i>	Restionaceae	<i>Hypodiscus aristatus</i>
Asteraceae	<i>Helichrysum rotundatum</i>	Fabaceae	<i>Psoralea sp.</i>	Restionaceae	<i>Hypodiscus laevigatus</i>
Asteraceae	<i>Helichrysum rotundifolium</i>	Fabaceae	<i>Psoralea usitata</i>	Restionaceae	<i>Hypodiscus striatus</i>
Asteraceae	<i>Helichrysum rutilans</i>	Fabaceae	<i>Psoralea verrucosa</i>	Restionaceae	<i>Platycaulos major</i>
Asteraceae	<i>Helichrysum sp.</i>	Fabaceae	<i>Rafnia acuminata</i>	Restionaceae	<i>Restio bifurcus</i>
Asteraceae	<i>Helichrysum sphaeroideum</i>	Fabaceae	<i>Rafnia amplexicaulis</i>	Restionaceae	<i>Restio bolusii</i>
Asteraceae	<i>Helichrysum spiralepis</i>	Fabaceae	<i>Rafnia capensis</i>	Restionaceae	<i>Restio brachiatus</i>
Asteraceae	<i>Helichrysum stellatum</i>	Fabaceae	<i>Rafnia capensis</i>	Restionaceae	<i>Restio capensis</i>
Asteraceae	<i>Helichrysum stoloniferum</i>	Fabaceae	<i>Rafnia capensis</i>	Restionaceae	<i>Restio curviramis</i>
Asteraceae	<i>Helichrysum tinctum</i>	Fabaceae	<i>Rafnia elliptica</i>	Restionaceae	<i>Restio debilis</i>
Asteraceae	<i>Helichrysum zwartbergense</i>	Fabaceae	<i>Rafnia rostrata</i>	Restionaceae	<i>Restio distractus</i>
Asteraceae	<i>Heterolepis aliena</i>	Fabaceae	<i>Rhynchosia adenodes</i>	Restionaceae	<i>Restio distylis</i>
Asteraceae	<i>Heterolepis peduncularis</i>	Fabaceae	<i>Rhynchosia capensis</i>	Restionaceae	<i>Restio filiformis</i>
Asteraceae	<i>Hippia pilosa</i>	Fabaceae	<i>Sesbania punicea</i>	Restionaceae	<i>Restio gaudichaudianus</i>
Asteraceae	<i>Hippia sp.</i>	Fabaceae	<i>Trifolium repens</i>	Restionaceae	<i>Restio laniger</i>
Asteraceae	<i>Hymenolepis dentata</i>	Fabaceae	<i>Vachellia karroo</i>	Restionaceae	<i>Restio nanus</i>
Asteraceae	<i>Hymenolepis gnidioides</i>	Fabaceae	<i>Wiborgia fusca</i>	Restionaceae	<i>Restio ocreatus</i>
Asteraceae	<i>Hymenolepis incisa</i>	Fabaceae	<i>Wiborgia mucronata</i>	Restionaceae	<i>Restio paniculatus</i>
Asteraceae	<i>Hypochaeris glabra</i>	Fabaceae	<i>Wiborgia obcordata</i>	Restionaceae	<i>Restio patens</i>
Asteraceae	<i>Ifloga anomala</i>	Fabaceae	<i>Wiborgia sericea</i>	Restionaceae	<i>Restio pumilus</i>
Asteraceae	<i>Lachnospermum fasciculatum</i>	Fabaceae	<i>Wiborgia tenuifolia</i>	Restionaceae	<i>Restio pygmaeus</i>
Asteraceae	<i>Lachnospermum neglectum</i>	Fabaceae	<i>Wiborgiella bowieana</i>	Restionaceae	<i>Restio quadratus</i>
Asteraceae	<i>Lactuca inermis</i>	Fabaceae	<i>Wiborgiella sp.</i>	Restionaceae	<i>Restio rigidus</i>
Asteraceae	<i>Lasiopogon brachypterus</i>	Fabroniaceae	<i>Ischyrodon lepturus</i>	Restionaceae	<i>Restio rudolfii</i>
Asteraceae	<i>Lasiospermum bipinnatum</i>	Fissidentaceae	<i>Fissidens megalotis</i>	Restionaceae	<i>Restio scaberulus</i>
Asteraceae	<i>Lasiospermum pedunculare</i>	Fissidentaceae	<i>Fissidens palmifolius</i>	Restionaceae	<i>Restio sejunctus</i>
Asteraceae	<i>Leysera gnaphalodes</i>	Fissidentaceae	<i>Fissidens pygmaeus</i>	Restionaceae	<i>Restio sieberi</i>
Asteraceae	<i>Lidbeckia pinnata</i>	Fissidentaceae	<i>Fissidens rufescens</i>	Restionaceae	<i>Restio sp.</i>
Asteraceae	<i>Macledium spinosum</i>	Fumariaceae	<i>Cysticapnos vesicaria</i>	Restionaceae	<i>Restio stereocaulis</i>
Asteraceae	<i>Mairia crenata</i>	Funariaceae	<i>Funaria hygrometrica</i>	Restionaceae	<i>Restio stokoei</i>
Asteraceae	<i>Metalasia acuta</i>	Gentianaceae	<i>Chironia baccifera</i>	Restionaceae	<i>Restio strictus</i>
Asteraceae	<i>Metalasia adunca</i>	Gentianaceae	<i>Chironia jasminoides</i>	Restionaceae	<i>Restio strobilifer</i>
Asteraceae	<i>Metalasia brevifolia</i>	Gentianaceae	<i>Chironia linoidea</i>	Restionaceae	<i>Restio triticeus</i>
Asteraceae	<i>Metalasia densa</i>	Gentianaceae	<i>Orphium frutescens</i>	Restionaceae	<i>Restio unispicatus</i>
Asteraceae	<i>Metalasia fastigiata</i>	Gentianaceae	<i>Sebaea exacoides</i>	Restionaceae	<i>Restio venustus</i>
Asteraceae	<i>Metalasia massonii</i>	Geraniaceae	<i>Pelargonium abrotanifolium</i>	Restionaceae	<i>Restio virgeus</i>
Asteraceae	<i>Metalasia montana</i>	Geraniaceae	<i>Pelargonium alternans</i>	Restionaceae	<i>Staberoha aemula</i>
Asteraceae	<i>Metalasia phillipsii</i>	Geraniaceae	<i>Pelargonium alternans</i>	Restionaceae	<i>Staberoha cernua</i>
Asteraceae	<i>Metalasia pulcherrima</i>	Geraniaceae	<i>Pelargonium auritum</i>	Restionaceae	<i>Staberoha vaginata</i>

Family	Species	Family	Species	Family	Species
Asteraceae	<i>Metalasia tenuis</i>	Geraniaceae	<i>Pelargonium burgerianum</i>	Restionaceae	<i>Thamnochortus cinereus</i>
Asteraceae	<i>Myrovernix longifolius</i>	Geraniaceae	<i>Pelargonium conradiae</i>	Restionaceae	<i>Thamnochortus lucens</i>
Asteraceae	<i>Myrovernix scaber</i>	Geraniaceae	<i>Pelargonium crispum</i>	Restionaceae	<i>Thamnochortus obtusus</i>
Asteraceae	<i>Oedera genistifolia</i>	Geraniaceae	<i>Pelargonium divisifolium</i>	Restionaceae	<i>Thamnochortus sp.</i>
Asteraceae	<i>Oedera imbricata</i>	Geraniaceae	<i>Pelargonium elegans</i>	Restionaceae	<i>Thamnochortus stokoei</i>
Asteraceae	<i>Oedera rehanioides</i>	Geraniaceae	<i>Pelargonium elongatum</i>	Restionaceae	<i>Willdenowia bolusii</i>
Asteraceae	<i>Oedera sp.</i>	Geraniaceae	<i>Pelargonium glutinosum</i>	Restionaceae	<i>Willdenowia glomerata</i>
Asteraceae	<i>Oedera squarrosa</i>	Geraniaceae	<i>Pelargonium grossularioides</i>	Restionaceae	<i>Willdenowia incurvata</i>
Asteraceae	<i>Oldenburgia papionum</i>	Geraniaceae	<i>Pelargonium hermanniifolium</i>	Rhacocarpaceae	<i>Rhacocarpus purpurascens</i>
Asteraceae	<i>Oncosiphon piluliferus</i>	Geraniaceae	<i>Pelargonium hirtum</i>	Rhamnaceae	<i>Noltea africana</i>
Asteraceae	<i>Osteospermum calendulaceum</i>	Geraniaceae	<i>Pelargonium hispidum</i>	Rhamnaceae	<i>Phylica aemula</i>
Asteraceae	<i>Osteospermum junceum</i>	Geraniaceae	<i>Pelargonium incarnatum</i>	Rhamnaceae	<i>Phylica axillaris</i>
Asteraceae	<i>Osteospermum monstrosum</i>	Geraniaceae	<i>Pelargonium iocastum</i>	Rhamnaceae	<i>Phylica callosa</i>
Asteraceae	<i>Osteospermum oppositifolium</i>	Geraniaceae	<i>Pelargonium karoicum</i>	Rhamnaceae	<i>Phylica constricta</i>
Asteraceae	<i>Osteospermum polygaloides</i>	Geraniaceae	<i>Pelargonium laevigatum</i>	Rhamnaceae	<i>Phylica excelsa</i>
Asteraceae	<i>Osteospermum rigidum</i>	Geraniaceae	<i>Pelargonium lanceolatum</i>	Rhamnaceae	<i>Phylica insignis</i>
Asteraceae	<i>Osteospermum scariosum</i>	Geraniaceae	<i>Pelargonium lobatum</i>	Rhamnaceae	<i>Phylica litoralis</i>
Asteraceae	<i>Osteospermum sp.</i>	Geraniaceae	<i>Pelargonium longifolium</i>	Rhamnaceae	<i>Phylica lucens</i>
Asteraceae	<i>Osteospermum spinosum</i>	Geraniaceae	<i>Pelargonium luteolum</i>	Rhamnaceae	<i>Phylica nigrita</i>
Asteraceae	<i>Othonna arborescens</i>	Geraniaceae	<i>Pelargonium myrrhifolium</i>	Rhamnaceae	<i>Phylica oleifolia</i>
Asteraceae	<i>Othonna auriculifolia</i>	Geraniaceae	<i>Pelargonium ocellatum</i>	Rhamnaceae	<i>Phylica parviflora</i>
Asteraceae	<i>Othonna bulbosa</i>	Geraniaceae	<i>Pelargonium ovale</i>	Rhamnaceae	<i>Phylica plumosa</i>
Asteraceae	<i>Othonna chromochaeta</i>	Geraniaceae	<i>Pelargonium papilionaceum</i>	Rhamnaceae	<i>Phylica rogersii</i>
Asteraceae	<i>Othonna gymnodiscus</i>	Geraniaceae	<i>Pelargonium patulum</i>	Rhamnaceae	<i>Phylica selaginoides</i>
Asteraceae	<i>Othonna lobata</i>	Geraniaceae	<i>Pelargonium peltatum</i>	Rhamnaceae	<i>Phylica sp.</i>
Asteraceae	<i>Othonna parviflora</i>	Geraniaceae	<i>Pelargonium proliferum</i>	Rhamnaceae	<i>Phylica spicata</i>
Asteraceae	<i>Othonna quinquedentata</i>	Geraniaceae	<i>Pelargonium pseudofumarioides</i>	Rhamnaceae	<i>Phylica stanantha</i>
Asteraceae	<i>Othonna ramulosa</i>	Geraniaceae	<i>Pelargonium radiatum</i>	Rhamnaceae	<i>Phylica vulgaris</i>
Asteraceae	<i>Othonna sp.</i>	Geraniaceae	<i>Pelargonium scabrum</i>	Rhamnaceae	<i>Phylica vulgaris</i>
Asteraceae	<i>Pentzia incana</i>	Geraniaceae	<i>Pelargonium senecioides</i>	Rhamnaceae	<i>Trichocephalus stipularis</i>
Asteraceae	<i>Phaenocoma prolifera</i>	Geraniaceae	<i>Pelargonium setulosum</i>	Ricciaceae	<i>Riccia albournata</i>
Asteraceae	<i>Phymaspermum trifidum</i>	Geraniaceae	<i>Pelargonium sp.</i>	Ricciaceae	<i>Riccia concava</i>
Asteraceae	<i>Plecostachys polifolia</i>	Geraniaceae	<i>Pelargonium tetragonum</i>	Ricciaceae	<i>Riccia limbata</i>
Asteraceae	<i>Polyarrhena imbricata</i>	Geraniaceae	<i>Pelargonium trifoliolatum</i>	Ricciaceae	<i>Riccia purpurascens</i>
Asteraceae	<i>Printzia aromatica</i>	Geraniaceae	<i>Pelargonium triste</i>	Ricciaceae	<i>Riccia sorocarpa</i>
Asteraceae	<i>Printzia polifolia</i>	Geraniaceae	<i>Pelargonium undulatum</i>	Roridulaceae	<i>Roridula dentata</i>
Asteraceae	<i>Pseudognaphalium luteoalbum</i>	Geraniaceae	<i>Pelargonium violiflorum</i>	Rosaceae	<i>Cliffortia atrata</i>
Asteraceae	<i>Pteronia camphorata</i>	Gleicheniaceae	<i>Gleichenia polypodioides</i>	Rosaceae	<i>Cliffortia burchellii</i>
Asteraceae	<i>Pteronia camphorata</i>	Grimmiaceae	<i>Grimmia laevigata</i>	Rosaceae	<i>Cliffortia crenata</i>
Asteraceae	<i>Pteronia camphorata</i>	Grimmiaceae	<i>Grimmia pulvinata</i>	Rosaceae	<i>Cliffortia cruciata</i>
Asteraceae	<i>Pteronia fasciculata</i>	Grimmiaceae	<i>Racomitrium lanuginosum</i>	Rosaceae	<i>Cliffortia dregeana</i>
Asteraceae	<i>Pteronia fastigiata</i>	Grubbiaceae	<i>Grubbia rosmarinifolia</i>	Rosaceae	<i>Cliffortia dregeana</i>
Asteraceae	<i>Pteronia flexicaulis</i>	Grubbiaceae	<i>Grubbia rourkei</i>	Rosaceae	<i>Cliffortia erectisepala</i>
Asteraceae	<i>Pteronia hirsuta</i>	Haemodoraceae	<i>Dilatris corymbosa</i>	Rosaceae	<i>Cliffortia exilifolia</i>
Asteraceae	<i>Pteronia incana</i>	Haemodoraceae	<i>Dilatris ixioides</i>	Rosaceae	<i>Cliffortia integerrima</i>

Family	Species	Family	Species	Family	Species
Asteraceae	<i>Pteronia oblanceolata</i>	Haemodoraceae	<i>Dilatris viscosa</i>	Rosaceae	<i>Cliffortia obovata</i>
Asteraceae	<i>Pteronia pallens</i>	Haemodoraceae	<i>Wachendorfia multiflora</i>	Rosaceae	<i>Cliffortia odorata</i>
Asteraceae	<i>Pteronia paniculata</i>	Hemerocallidaceae	<i>Caesia contorta</i>	Rosaceae	<i>Cliffortia pungens</i>
Asteraceae	<i>Pteronia sp.</i>	Hyacinthaceae	<i>Albuca acuminata</i>	Rosaceae	<i>Cliffortia repens</i>
Asteraceae	<i>Pulicaria scabra</i>	Hyacinthaceae	<i>Albuca canadensis</i>	Rosaceae	<i>Cliffortia ruscifolia</i>
Asteraceae	<i>Rhynchosidium pumilum</i>	Hyacinthaceae	<i>Albuca goswinii</i>	Rosaceae	<i>Cliffortia sericea</i>
	<i>sessiliflorum</i>	Hyacinthaceae	<i>Albuca sp.</i>	Rosaceae	<i>Cliffortia theodori-friesii</i>
Asteraceae	<i>Senecio abbreviatus</i>	Hyacinthaceae	<i>Albuca virens</i>	Rosaceae	<i>Cliffortia tricuspidata</i>
Asteraceae	<i>Senecio agapetes</i>	Hyacinthaceae	<i>Albuca viscosa</i>	Rosaceae	<i>Cliffortia tuberculata</i>
Asteraceae	<i>Senecio aloides</i>	Hyacinthaceae	<i>Drimia exuviata</i>	Rosaceae	<i>Cliffortia varians</i>
	<i>Senecio bipinnatus</i>	Hyacinthaceae	<i>Drimia intricata</i>	Rubiaceae	<i>Anthospermum aethiopicum</i>
	<i>Senecio coleophyllus</i>	Hyacinthaceae	<i>Drimia karoica</i>	Rubiaceae	<i>Anthospermum galioides</i>
Asteraceae	<i>Senecio erosus</i>	Hyacinthaceae	<i>Drimia media</i>	Rubiaceae	<i>Anthospermum sp.</i>
	<i>Senecio erysimoides</i>	Hyacinthaceae	<i>Eucomis regia</i>	Rubiaceae	<i>Anthospermum spathulatum</i>
	<i>Senecio glutinarius</i>	Hyacinthaceae	<i>Lachenalia campanulata</i>	Rubiaceae	<i>Anthospermum spathulatum</i>
Asteraceae	<i>Senecio hastatus</i>	Hyacinthaceae	<i>Lachenalia contaminata</i>	Rubiaceae	<i>Carpacoce vaginellata</i>
Asteraceae	<i>Senecio lanceus</i>	Hyacinthaceae	<i>Lachenalia juncifolia</i>	Rubiaceae	<i>Galium capense</i>
Asteraceae	<i>Senecio lineatus</i>	Hyacinthaceae	<i>Lachenalia perryae</i>	Rubiaceae	<i>Galium spurium</i>
Asteraceae	<i>Senecio littoreus</i>	Hyacinthaceae	<i>Lachenalia physocaulos</i>	Rubiaceae	<i>Galium tomentosum</i>
Asteraceae	<i>Senecio paarlensis</i>	Hyacinthaceae	<i>Lachenalia pusilla</i>	Rubiaceae	<i>Nenax sp.</i>
	<i>Senecio paniculatus</i>	Hyacinthaceae	<i>Lachenalia sp.</i>	Ruscaceae	<i>Eriospermum bowieanum</i>
	<i>Senecio pinifolius</i>	Hyacinthaceae	<i>Lachenalia stayneri</i>	Ruscaceae	<i>Eriospermum breviscapum</i>
Asteraceae	<i>Senecio purpureus</i>	Hyacinthaceae	<i>Massonia depressa</i>	Ruscaceae	<i>Eriospermum capense</i>
Asteraceae	<i>Senecio rigidus</i>	Hyacinthaceae	<i>Massonia echinata</i>	Ruscaceae	<i>Eriospermum cernuum</i>
Asteraceae	<i>Senecio rosmarinifolius</i>	Hyacinthaceae	<i>Ornithogalum capillare</i>	Ruscaceae	<i>Eriospermum dielsianum</i>
	<i>Senecio sarcoides</i>	Hyacinthaceae	<i>Ornithogalum dubium</i>	Ruscaceae	<i>Eriospermum paradoxum</i>
Asteraceae	<i>Senecio sophioides</i>	Hyacinthaceae	<i>Ornithogalum hispidum</i>	Ruscaceae	<i>Eriospermum proliferum</i>
	<i>Senecio sp.</i>	Hyacinthaceae	<i>Ornithogalum neopatersonia</i>	Ruscaceae	<i>Eriospermum sp.</i>
	<i>Senecio striatifolius</i>	Hyacinthaceae	<i>Ornithogalum niveum</i>	Ruscaceae	<i>Eriospermum vermiforme</i>
Asteraceae	<i>Seriphium plumosum</i>	Hyacinthaceae	<i>Ornithogalum pilosum</i>	Ruscaceae	<i>Eriospermum zeyheri</i>
Asteraceae	<i>Seriphium spirale</i>	Hyacinthaceae	<i>Ornithogalum sp.</i>	Rutaceae	<i>Acmadenia sp.</i>
Asteraceae	<i>Stoebe aethiopica</i>	Hyacinthaceae	<i>Veltheimia capensis</i>	Rutaceae	<i>Adenandra uniflora</i>
Asteraceae	<i>Stoebe capitata</i>	Hypoxidaceae	<i>Empodium gloriosum</i>	Rutaceae	<i>Adenandra villosa</i>
Asteraceae	<i>Stoebe muricata</i>	Hypoxidaceae	<i>Empodium plicatum</i>	Rutaceae	<i>Agathosma alticola</i>
Asteraceae	<i>Stoebe prostrata</i>	Hypoxidaceae	<i>Pauridia aquatica</i>	Rutaceae	<i>Agathosma bifida</i>
Asteraceae	<i>Stoebe rugulosa</i>	Hypoxidaceae	<i>Pauridia capensis</i>	Rutaceae	<i>Agathosma capensis</i>
Asteraceae	<i>Syncarpha affinis</i>	Hypoxidaceae	<i>Pauridia flaccida</i>	Rutaceae	<i>Agathosma cerefolium</i>
Asteraceae	<i>Syncarpha canescens</i>	Hypoxidaceae	<i>Pauridia serrata</i>	Rutaceae	<i>Agathosma foetidissima</i>
	<i>Syncarpha flava</i>	Iridaceae	<i>Aristea bakeri</i>	Rutaceae	<i>Agathosma leptospermoides</i>
Asteraceae	<i>Syncarpha gnaphaloides</i>	Iridaceae	<i>Aristea cuspidata</i>	Rutaceae	<i>Agathosma microcarpa</i>
	<i>Syncarpha paniculata</i>	Iridaceae	<i>Aristea juncifolia</i>	Rutaceae	<i>Agathosma odoratissima</i>
Asteraceae	<i>Syncarpha staezelina</i>	Iridaceae	<i>Aristea racemosa</i>	Rutaceae	<i>Agathosma ovata</i>
Asteraceae	<i>Syncarpha variegata</i>	Iridaceae	<i>Aristea recisa</i>	Rutaceae	<i>Agathosma pulchella</i>
Asteraceae	<i>Syncarpha vestita</i>	Iridaceae	<i>Aristea spiralis</i>	Rutaceae	<i>Agathosma serpyllacea</i>
	<i>Tarchonanthus camphoratus</i>	Iridaceae	<i>Babiana fragrans</i>	Rutaceae	<i>Agathosma serratifolia</i>
Asteraceae	<i>Troglophyton capillaceum</i>	Iridaceae	<i>Babiana patula</i>	Rutaceae	<i>Agathosma sp.</i>

Family	Species	Family	Species	Family	Species
Asteraceae	<i>Ursinia anethoides</i>	Iridaceae	<i>Babiana stricta</i>	Rutaceae	<i>Agathosma stipitata</i>
Asteraceae	<i>Ursinia anthemoides</i>	Iridaceae	<i>Bobartia filiformis</i>	Rutaceae	<i>Agathosma tabularis</i>
Asteraceae	<i>Ursinia cakilefolia</i>	Iridaceae	<i>Bobartia indica</i>	Rutaceae	<i>Agathosma trichocarpa</i>
Asteraceae	<i>Ursinia nana</i>	Iridaceae	<i>Bobartia orientalis</i>	Rutaceae	<i>Agathosma virgata</i>
Asteraceae	<i>Ursinia nudicaulis</i>	Iridaceae	<i>Chasmanthe bicolor</i>	Rutaceae	<i>Coleonema juniperinum</i>
Asteraceae	<i>Ursinia oreogena</i>	Iridaceae	<i>Ferraria variabilis</i>	Rutaceae	<i>Diosma apetala</i>
Asteraceae	<i>Ursinia paleacea</i>	Iridaceae	<i>Freesia caryophyllacea</i>	Rutaceae	<i>Diosma hirsuta</i>
Asteraceae	<i>Ursinia pilifera</i>	Iridaceae	<i>Freesia marginata</i>	Rutaceae	<i>Diosma parvula</i>
Asteraceae	<i>Ursinia punctata</i>	Iridaceae	<i>Freesia refracta</i>	Rutaceae	<i>Diosma passerinoides</i>
Asteraceae	<i>Xanthium strumarium</i>	Iridaceae	<i>Geissorhiza aspera</i>	Rutaceae	<i>Diosma pedicellata</i>
Asteraceae	<i>Zyrphelis lasiocarpa</i>	Iridaceae	<i>Geissorhiza bolusii</i>	Rutaceae	<i>Diosma pilosa</i>
Asteraceae	<i>Zyrphelis microcephala</i>	Iridaceae	<i>Geissorhiza brehmii</i>	Rutaceae	<i>Diosma ramosissima</i>
Asteraceae	<i>Zyrphelis nervosa</i>	Iridaceae	<i>Geissorhiza confusa</i>	Rutaceae	<i>Diosma recurva</i>
Aytoniaceae	<i>Asterella marginata</i>	Iridaceae	<i>Geissorhiza geminata</i>	Rutaceae	<i>Diosma rourkei</i>
Aytoniaceae	<i>Asterella sp.</i>	Iridaceae	<i>Geissorhiza heterostyla</i>	Rutaceae	<i>Diosma sp.</i>
Balanophoraceae	<i>Mystropetalon thomii</i>	Iridaceae	<i>Geissorhiza heterostyla</i>	Rutaceae	<i>Empleurum unicapsulare</i>
Bartramiaceae	<i>Anacolia breutelii</i>	Iridaceae	<i>Geissorhiza longifolia</i>	Rutaceae	<i>Euchaetis</i>
Bartramiaceae	<i>Bartramia capensis</i>	Iridaceae	<i>Geissorhiza</i>	Rutaceae	<i>esterhuyseniae</i>
Bartramiaceae	<i>Breutelia substricta</i>	Iridaceae	<i>ornithogaloides</i>	Rutaceae	<i>Euchaetis flexilis</i>
Bartramiaceae	<i>Philonotis dregeana</i>	Iridaceae	<i>Geissorhiza ovata</i>	Rutaceae	<i>Euchaetis pungens</i>
Blechnaceae	<i>Blechnum australe</i>	Iridaceae	<i>Geissorhiza pusilla</i>	Rutaceae	<i>Macrostylis sp.</i>
Blechnaceae	<i>Blechnum punctulatum</i>	Iridaceae	<i>Geissorhiza scillarlis</i>	Salicaceae	<i>Salix mucronata</i>
Boraginaceae	<i>Echium plantagineum</i>	Iridaceae	<i>Geissorhiza similis</i>	Salicaceae	<i>Salix mucronata</i>
Boraginaceae	<i>Heliotropium supinum</i>	Iridaceae	<i>Gladiolus alatus</i>	Santalaceae	<i>Thesium brachygyne</i>
Boraginaceae	<i>Lobostemon echioides</i>	Iridaceae	<i>Gladiolus atropictus</i>	Santalaceae	<i>Thesium capitatum</i>
Boraginaceae	<i>Lobostemon gracilis</i>	Iridaceae	<i>Gladiolus blommesteinii</i>	Santalaceae	<i>Thesium carinatum</i>
Boraginaceae	<i>Lobostemon laevigatus</i>	Iridaceae	<i>Gladiolus brevitubus</i>	Santalaceae	<i>Thesium euphorbioides</i>
Boraginaceae	<i>Lobostemon sp.</i>	Iridaceae	<i>Gladiolus carinatus</i>	Santalaceae	<i>Thesium flexuosum</i>
Boraginaceae	<i>Lobostemon strigosus</i>	Iridaceae	<i>Gladiolus carneus</i>	Santalaceae	<i>Thesium fragile</i>
Boraginaceae	<i>Lobostemon trigonus</i>	Iridaceae	<i>Gladiolus debilis</i>	Santalaceae	<i>Thesium frisea</i>
Boraginaceae	<i>Trichodesma africanum</i>	Iridaceae	<i>Gladiolus floribundus</i>	Santalaceae	<i>Thesium imbricatum</i>
Brassicaceae	<i>Brassica sp.</i>	Iridaceae	<i>Gladiolus grandiflorus</i>	Santalaceae	<i>Thesium juncifolium</i>
Brassicaceae	<i>Heliophila acuminata</i>	Iridaceae	<i>Gladiolus guthriei</i>	Santalaceae	<i>Thesium microcarpum</i>
Brassicaceae	<i>Heliophila africana</i>	Iridaceae	<i>Gladiolus hirsutus</i>	Santalaceae	<i>Thesium</i>
Brassicaceae	<i>Heliophila bulbostyla</i>	Iridaceae	<i>Gladiolus inflatus</i>	Santalaceae	<i>nigromontanum</i>
Brassicaceae	<i>Heliophila carnosa</i>	Iridaceae	<i>Gladiolus inflexus</i>	Santalaceae	<i>Thesium occidentale</i>
Brassicaceae	<i>Heliophila cornuta</i>	Iridaceae	<i>Gladiolus patersoniae</i>	Santalaceae	<i>Thesium patulum</i>
Brassicaceae	<i>Heliophila crithmifolia</i>	Iridaceae	<i>Gladiolus permeabilis</i>	Santalaceae	<i>Thesium pinifolium</i>
Brassicaceae	<i>Heliophila elata</i>	Iridaceae	<i>Gladiolus permeabilis</i>	Santalaceae	<i>Thesium prostratum</i>
Brassicaceae	<i>Heliophila meyeri</i>	Iridaceae	<i>Gladiolus rhodanthus</i>	Santalaceae	<i>Thesium repandum</i>
Brassicaceae	<i>Heliophila meyeri</i>	Iridaceae	<i>Gladiolus uysiae</i>	Santalaceae	<i>Thesium scabrum</i>
Brassicaceae	<i>Heliophila nubigena</i>	Iridaceae	<i>Gladiolus venustus</i>	Santalaceae	<i>Thesium sp.</i>
Brassicaceae	<i>Heliophila pectinata</i>	Iridaceae	<i>Hesperantha acuta</i>	Santalaceae	<i>Thesium strictum</i>
Brassicaceae	<i>Heliophila pendula</i>	Iridaceae	<i>Hesperantha acuta</i>	Santalaceae	<i>Viscum continuum</i>
Brassicaceae	<i>Heliophila pinnata</i>	Iridaceae	<i>Hesperantha falcata</i>	Santalaceae	<i>Viscum rotundifolium</i>
Brassicaceae	<i>Heliophila scoparia</i>	Iridaceae	<i>Hesperantha pilosa</i>	Sapindaceae	<i>Dodonaea viscosa</i>
Brassicaceae	<i>Heliophila scoparia</i>	Iridaceae	<i>Hesperantha radiata</i>	Scrophulariaceae	<i>Buddleja glomerata</i>
Brassicaceae	<i>Heliophila sp.</i>	Iridaceae	<i>Ixia atrandra</i>	Scrophulariaceae	<i>Buddleja saligna</i>
Brassicaceae	<i>Heliophila suavissima</i>	Iridaceae	<i>Ixia bellendenii</i>	Scrophulariaceae	<i>Buddleja salviifolia</i>
Brassicaceae	<i>Heliophila subulata</i>	Iridaceae	<i>Ixia collina</i>	Scrophulariaceae	<i>Chaenostoma</i>
Brassicaceae	<i>Heliophila thunbergii</i>	Iridaceae	<i>Ixia confusa</i>	Scrophulariaceae	<i>aethiopicum</i>
Brassicaceae	<i>Heliophila tricuspidata</i>	Iridaceae	<i>Ixia dolichosiphon</i>	Scrophulariaceae	<i>Chaenostoma</i>
Brassicaceae		Iridaceae	<i>Ixia flexuosa</i>	Scrophulariaceae	<i>caeruleum</i>
				Scrophulariaceae	<i>Chaenostoma decipiens</i>
				Scrophulariaceae	<i>Chaenostoma revolutum</i>
				Scrophulariaceae	<i>Chaenostoma</i>
				Scrophulariaceae	<i>subnudum</i>

Family	Species	Family	Species	Family	Species
Brassicaceae	<i>Heliophila tulbaghensis</i>	Iridaceae	<i>Ixia latifolia</i>	Scrophulariaceae	<i>Chaenostoma uncinatum</i>
Brassicaceae	<i>Lepidium africanum</i>	Iridaceae	<i>Ixia pumilio</i>	Scrophulariaceae	<i>Cromidon gracile</i>
Brassicaceae	<i>Lepidium capense</i>	Iridaceae	<i>Ixia sp.</i>	Scrophulariaceae	<i>Diascia parviflora</i>
Brassicaceae	<i>Lepidium desertorum</i>	Iridaceae	<i>Ixia stenophylla</i>	Scrophulariaceae	<i>Diascia sacculata</i>
Brassicaceae	<i>Lepidium pinnatum</i>	Iridaceae	<i>Ixia vanzyliae</i>	Scrophulariaceae	<i>Freylinia lanceolata</i>
Brassicaceae	<i>Sisymbrium capense</i>	Iridaceae	<i>Lapeirousia jacquini</i>	Scrophulariaceae	<i>Freylinia undulata</i>
Bruniaceae	<i>Audouinia laxa</i>	Iridaceae	<i>Lapeirousia plicata</i>	Scrophulariaceae	<i>Gosela eckloniana</i>
Bruniaceae	<i>Berzelia lanuginosa</i>	Iridaceae	<i>Lapeirousia pyramidalis</i>	Scrophulariaceae	<i>Hebenstretia sp.</i>
Bruniaceae	<i>Berzelia squarrosa</i>	Iridaceae	<i>Moraea alticola</i>	Scrophulariaceae	<i>Hemimeris gracilis</i>
Bruniaceae	<i>Brunia angulata</i>	Iridaceae	<i>Moraea amabilis</i>	Scrophulariaceae	<i>Hemimeris racemosa</i>
Bruniaceae	<i>Brunia cordata</i>	Iridaceae	<i>Moraea angusta</i>	Scrophulariaceae	<i>Jamesbrittenia atropurpurea</i>
Bruniaceae	<i>Brunia esterhuyseniae</i>	Iridaceae	<i>Moraea bellendenii</i>	Scrophulariaceae	<i>Limosella sp.</i>
Bruniaceae	<i>Brunia latebracteata</i>	Iridaceae	<i>Moraea bipartita</i>	Scrophulariaceae	<i>Lyperia antirrhinoides</i>
Bruniaceae	<i>Brunia macrocephala</i>	Iridaceae	<i>Moraea fugax</i>	Scrophulariaceae	<i>Manulea sp.</i>
Bruniaceae	<i>Brunia microphylla</i>	Iridaceae	<i>Moraea gawleri</i>	Scrophulariaceae	<i>Microdon dubius</i>
Bruniaceae	<i>Brunia monogyna</i>	Iridaceae	<i>Moraea helicoidea</i>	Scrophulariaceae	<i>Microdon parviflorus</i>
Bruniaceae	<i>Brunia monostyla</i>	Iridaceae	<i>Moraea longistyla</i>	Scrophulariaceae	<i>Microdon polygaloides</i>
Bruniaceae	<i>Brunia noduliflora</i>	Iridaceae	<i>Moraea ochroleuca</i>	Scrophulariaceae	<i>Nemesia bodkinii</i>
Bruniaceae	<i>Brunia paleacea</i>	Iridaceae	<i>Moraea polyanthos</i>	Scrophulariaceae	<i>Nemesia brevicealcarata</i>
Bruniaceae	<i>Brunia palustris</i>	Iridaceae	<i>Moraea pyrophila</i>	Scrophulariaceae	<i>Nemesia calcarata</i>
Bruniaceae	<i>Brunia phyllicoides</i>	Iridaceae	<i>Moraea radians</i>	Scrophulariaceae	<i>Nemesia pageae</i>
Bruniaceae	<i>Brunia variabilis</i>	Iridaceae	<i>Moraea ramosissima</i>	Scrophulariaceae	<i>Nemesia sp.</i>
Bruniaceae	<i>Brunia villosa</i>	Iridaceae	<i>Moraea setifolia</i>	Scrophulariaceae	<i>Nemesia versicolor</i>
Bruniaceae	<i>Brunia virgata</i>	Iridaceae	<i>Moraea sp.</i>	Scrophulariaceae	<i>Oftia africana</i>
Bruniaceae	<i>Staavia capitella</i>	Iridaceae	<i>Moraea thomasiae</i>	Scrophulariaceae	<i>Phyllopodium alpinum</i>
Bruniaceae	<i>Staavia pinifolia</i>	Iridaceae	<i>Moraea tripetala</i>	Scrophulariaceae	<i>Polycarena rariflora</i>
Bryaceae	<i>Brachymenium acuminatum</i>	Iridaceae	<i>Moraea tripetala</i>	Scrophulariaceae	<i>Pseudoselago ascendens</i>
Campanulaceae	<i>Merciera brevifolia</i>	Iridaceae	<i>Moraea unguiculata</i>	Scrophulariaceae	<i>Pseudoselago bella</i>
Campanulaceae	<i>Merciera eckloniana</i>	Iridaceae	<i>Romulea atrandra</i>	Scrophulariaceae	<i>Pseudoselago burmannii</i>
Campanulaceae	<i>Prismatocarpus campanuloides</i>	Iridaceae	<i>Romulea dichotoma</i>	Scrophulariaceae	<i>Pseudoselago gracilis</i>
Campanulaceae	<i>Prismatocarpus debilis</i>	Iridaceae	<i>Romulea tetragona</i>	Scrophulariaceae	<i>Pseudoselago humilis</i>
Campanulaceae	<i>Prismatocarpus diffusus</i>	Iridaceae	<i>Romulea tortuosa</i>	Scrophulariaceae	<i>Pseudoselago langebergensis</i>
Campanulaceae	<i>Prismatocarpus fruticosus</i>	Iridaceae	<i>Sparaxis bulbifera</i>	Scrophulariaceae	<i>Pseudoselago parvifolia</i>
Campanulaceae	<i>Prismatocarpus lycopodioides</i>	Iridaceae	<i>Sparaxis sp.</i>	Scrophulariaceae	<i>Pseudoselago quadrangularis</i>
Campanulaceae	<i>Prismatocarpus pedunculatus</i>	Iridaceae	<i>Syringodea sp.</i>	Scrophulariaceae	<i>Pseudoselago sp.</i>
Campanulaceae	<i>Prismatocarpus tenellus</i>	Iridaceae	<i>Thereianthus juncifolius</i>	Scrophulariaceae	<i>Pseudoselago spuria</i>
Campanulaceae	<i>Roella ciliata</i>	Iridaceae	<i>Tritonia flabellifolia</i>	Scrophulariaceae	<i>Selago albida</i>
Campanulaceae	<i>Siphocodon spartioides</i>	Iridaceae	<i>Tritonia flabellifolia</i>	Scrophulariaceae	<i>Selago bilacunosa</i>
Campanulaceae	<i>Theilera guthriei</i>	Iridaceae	<i>Tritonia pallida</i>	Scrophulariaceae	<i>Selago brevifolia</i>
Campanulaceae	<i>Wahlenbergia albens</i>	Iridaceae	<i>Tritonia pallida</i>	Scrophulariaceae	<i>Selago canescens</i>
Campanulaceae	<i>Wahlenbergia androsacea</i>	Iridaceae	<i>Tritoniopsis antholyza</i>	Scrophulariaceae	<i>Selago corymbosa</i>
Campanulaceae	<i>Wahlenbergia exilis</i>	Iridaceae	<i>Tritoniopsis lata</i>	Scrophulariaceae	<i>Selago eckloniana</i>
Campanulaceae	<i>Wahlenbergia neorigida</i>	Iridaceae	<i>Tritoniopsis pulchella</i>	Scrophulariaceae	<i>Selago glabrata</i>
Campanulaceae	<i>Wahlenbergia nodosa</i>	Iridaceae	<i>Watsonia aletroides</i>	Scrophulariaceae	<i>Selago gracilis</i>
Campanulaceae	<i>Wahlenbergia paniculata</i>	Iridaceae	<i>Watsonia angusta</i>	Scrophulariaceae	<i>Selago levynsiae</i>
Campanulaceae	<i>Wahlenbergia parvifolia</i>	Iridaceae	<i>Watsonia marginata</i>	Scrophulariaceae	<i>Selago nigrescens</i>
Campanulaceae	<i>Wahlenbergia procumbens</i>	Iridaceae	<i>Watsonia meriana</i>	Scrophulariaceae	<i>Selago seticaulis</i>
Campanulaceae	<i>Wahlenbergia sp.</i>	Iridaceae	<i>Watsonia paucifolia</i>	Scrophulariaceae	<i>Selago sp.</i>
Campanulaceae	<i>Wahlenbergia thunbergiana</i>	Iridaceae	<i>Watsonia schlechteri</i>	Scrophulariaceae	<i>Selago thomii</i>

Family	Species	Family	Species	Family	Species
Caryophyllaceae	<i>Dianthus albens</i>	Iridaceae	<i>Watsonia spectabilis</i>	Scrophulariaceae	<i>Selago triquetra</i>
Caryophyllaceae	<i>Dianthus caespitosus</i>	Iridaceae	<i>Xenoscapa fistulosa</i>	Scrophulariaceae	<i>Teedia lucida</i>
Caryophyllaceae	<i>Dianthus caespitosus</i>	Juncaceae	<i>Juncus bufonius</i>	Scrophulariaceae	<i>Teedia pubescens</i>
Caryophyllaceae	<i>Dianthus micropetalus</i>	Juncaceae	<i>Juncus effusus</i>	Scrophulariaceae	<i>Zaluzianskya isanthera</i>
Caryophyllaceae	<i>Silene undulata</i>	Juncaceae	<i>Juncus kraussii</i>	Scrophulariaceae	<i>Zaluzianskya synaptica</i>
Caryophyllaceae	<i>Silene undulata</i>	Juncaceae	<i>Juncus lomatophyllus</i>	Solanaceae	<i>Lycium ferocissimum</i>
Caryophyllaceae	<i>Spergularia sp.</i>	Lamiaceae	<i>Ballota africana</i>	Solanaceae	<i>Lycium oxycarpum</i>
Celastraceae	<i>Cassine parvifolia</i>	Lamiaceae	<i>Leonotis leonurus</i>	Solanaceae	<i>Physalis viscosa</i>
Celastraceae	<i>Gloveria integrifolia</i>	Lamiaceae	<i>Leonotis ocymifolia</i>	Solanaceae	<i>Solanum guineense</i>
Celastraceae	<i>Gymnosporia buxifolia</i>	Lamiaceae	<i>Mentha longifolia</i>	Solanaceae	<i>Solanum linnaeanum</i>
Celastraceae	<i>Maytenus acuminata</i>	Lamiaceae	<i>Salvia africana</i>	Stilbaceae	<i>Halleria elliptica</i>
Celastraceae	<i>Maytenus oleoides</i>	Lamiaceae	<i>Salvia aurea</i>	Stilbaceae	<i>Stilbe albiflora</i>
Colchicaceae	<i>Colchicum capense</i>	Lamiaceae	<i>Salvia chamelaeagnea</i>	Stilbaceae	<i>Stilbe serrulata</i>
Colchicaceae	<i>Colchicum hughocymbion</i>	Lamiaceae	<i>Stachys aethiopica</i>	Targioniaceae	<i>Targionia hypophylla</i>
Colchicaceae	<i>Ornithoglossum undulatum</i>	Lauraceae	<i>Cassytha filiformis</i>	Tecophilaeaceae	<i>Cyanella lutea</i>
Colchicaceae	<i>Wurmbea marginata</i>	Lentibulariaceae	<i>Utricularia bisquamata</i>	Thymelaeaceae	<i>Gnidia laxa</i>
Colchicaceae	<i>Wurmbea spicata</i>	Lepicoleaceae	<i>Lepicolea ochroleuca</i>	Thymelaeaceae	<i>Gnidia linoides</i>
Colchicaceae	<i>Wurmbea variabilis</i>	Leucobryaceae	<i>Campylopus atroluteus</i>	Thymelaeaceae	<i>Gnidia nitida</i>
Convolvulaceae	<i>Convolvulus sagittatus</i>	Leucobryaceae	<i>Campylopus catarractilis</i>	Thymelaeaceae	<i>Gnidia oppositifolia</i>
Crassulaceae	<i>Adromischus caryophyllaceus</i>	Leucobryaceae	<i>Campylopus introflexus</i>	Thymelaeaceae	<i>Gnidia sericea</i>
Crassulaceae	<i>Adromischus filicaulis</i>	Leucobryaceae	<i>Campylopus pilifer</i>	Thymelaeaceae	<i>Gnidia setosa</i>
Crassulaceae	<i>Adromischus maculatus</i>	Leucobryaceae	<i>Campylopus pyriformis</i>	Thymelaeaceae	<i>Gnidia sp.</i>
Crassulaceae	<i>Adromischus sp.</i>	Limeaceae	<i>Limeum dinteri</i>	Thymelaeaceae	<i>Gnidia tenella</i>
Crassulaceae	<i>Adromischus triflorus</i>	Limeaceae	<i>Limeum telephioides</i>	Thymelaeaceae	<i>Lachnaea filamentosa</i>
Crassulaceae	<i>Cotyledon orbiculata</i>	Lobeliaceae	<i>Lobelia capillifolia</i>	Thymelaeaceae	<i>Lachnaea filicaulis</i>
Crassulaceae	<i>Cotyledon orbiculata</i>	Lobeliaceae	<i>Lobelia coronopifolia</i>	Thymelaeaceae	<i>Lachnaea grandiflora</i>
Crassulaceae	<i>Cotyledon sp.</i>	Lobeliaceae	<i>Lobelia linearis</i>	Thymelaeaceae	<i>Lachnaea macrantha</i>
Crassulaceae	<i>Crassula atropurpurea</i>	Lobeliaceae	<i>Lobelia pinifolia</i>	Thymelaeaceae	<i>Lachnaea pomposa</i>
Crassulaceae	<i>Crassula atropurpurea</i>	Lobeliaceae	<i>Lobelia setacea</i>	Thymelaeaceae	<i>Lachnaea pudens</i>
Crassulaceae	<i>Crassula atropurpurea</i>	Lobeliaceae	<i>Monopsis scabra</i>	Thymelaeaceae	<i>Lachnaea sp.</i>
Crassulaceae	<i>Crassula biplanata</i>	Lobeliaceae	<i>Wimmerella pygmaea</i>	Thymelaeaceae	<i>Passerina burchellii</i>
Crassulaceae	<i>Crassula capitella</i>	Lophocoleaceae	<i>Clasmatocolea vermicularis</i>	Thymelaeaceae	<i>Passerina obtusifolia</i>
Crassulaceae	<i>Crassula decumbens</i>	Lycopodiaceae	<i>Lycopodium zanclophyllum</i>	Thymelaeaceae	<i>Passerina truncata</i>
Crassulaceae	<i>Crassula dejecta</i>	Lycopodiaceae	<i>Pseudolycopodiella caroliniana</i>	Thymelaeaceae	<i>Struthiola argentea</i>
Crassulaceae	<i>Crassula inanis</i>	Malvaceae	<i>Abutilon dinteri</i>	Thymelaeaceae	<i>Struthiola ciliata</i>
Crassulaceae	<i>Crassula multiflora</i>	Malvaceae	<i>Anisodonteia fruticosa</i>	Thymelaeaceae	<i>Struthiola eckloniana</i>
Crassulaceae	<i>Crassula muscosa</i>	Malvaceae	<i>Anisodonteia gracilis</i>	Thymelaeaceae	<i>Struthiola leptantha</i>
Crassulaceae	<i>Crassula natans</i>	Malvaceae	<i>Anisodonteia scabrosa</i>	Thymelaeaceae	<i>Struthiola myrsinites</i>
Crassulaceae	<i>Crassula nemorosa</i>	Malvaceae	<i>Anisodonteia sp.</i>	Thymelaeaceae	<i>Struthiola rigida</i>
Crassulaceae	<i>Crassula papillosa</i>	Malvaceae	<i>Anisodonteia triloba</i>	Verbenaceae	<i>Chascanum cuneifolium</i>
Crassulaceae	<i>Crassula pellucida</i>	Malvaceae	<i>Hermannia alnifolia</i>	Violaceae	<i>Viola decumbens</i>
Crassulaceae	<i>Crassula pubescens</i>	Malvaceae	<i>Hermannia althaeifolia</i>	Violaceae	<i>Viola sp.</i>
Crassulaceae	<i>Crassula pubescens</i>	Malvaceae	<i>Hermannia burkei</i>	Zygophyllaceae	<i>Roepera divaricata</i>
Crassulaceae	<i>Crassula rupestris</i>	Malvaceae	<i>Hermannia comosa</i>	Zygophyllaceae	<i>Roepera flexuosa</i>
Crassulaceae	<i>Crassula saxifraga</i>	Malvaceae	<i>Hermannia confusa</i>	Zygophyllaceae	<i>Roepera foetida</i>
Crassulaceae	<i>Crassula sp.</i>	Malvaceae	<i>Hermannia cuneifolia</i>	Zygophyllaceae	<i>Roepera fulva</i>
Crassulaceae	<i>Crassula strigosa</i>	Malvaceae	<i>Hermannia filifolia</i>	Zygophyllaceae	<i>Roepera spinosa</i>
Crassulaceae	<i>Crassula subulata</i>	Malvaceae	<i>Hermannia filifolia</i>	Zygophyllaceae	<i>Tribulus terrestris</i>
Crassulaceae	<i>Crassula tetragona</i>	Malvaceae	<i>Hermannia flammula</i>	Zygophyllaceae	<i>Zygophyllum sp.</i>

Appendix 3. Specialist CV.

CURRICULUM VITAE:

Gerhard Botha



Name: : Gerhardus Alfred Botha

Date of Birth : 11 April 1986

Identity Number : 860411 5136 088

Postal Address : PO Box 12500
Brandhof
9324

Residential Address : 3 Jock Meiring Street
Park West
Bloemfontein
9301

Cell Phone Number : 084 207 3454

Email Address : gabotha11@gmail.com

Profession/Specialisation : Ecological and Biodiversity Consultant

Nationality: : South African

Years Experience: : 8

Bilingualism : Very good – English and Afrikaans

Professional Profile:

Gerhard is a Managing Director of Nkurenkuru Ecology and Biodiversity (Pty) Ltd. He has a BSc Honours degree in Botany from the University of the Free State Province and is currently completing a MSc Degree in Botany. He began working as an environmental specialist in 2010 and has since gained extensive experience in conducting ecological and biodiversity assessments in various development field, especially in the fields of conventional as well as renewable energy generation, mining and infrastructure development. Gerhard is a registered Professional Natural Scientist (Pr. Sci. Nat.)

Key Responsibilities:

Specific responsibilities as an Ecological and Biodiversity Specialist include, inter alia, professional execution of specialist consulting services (including flora, wetland and fauna studies, where required), impact assessment reporting, walk through surveys/ground-truthing to inform final design, compilation of management plans, compliance monitoring and audit reporting, in-house ecological awareness training to on-site personnel, and the development of project proposals for procuring new work/projects.

Skills Base and Core Competencies

- Research Project Management
- Botanical researcher in projects involving the description of terrestrial and coastal ecosystems.
- Broad expertise in the ecology and conservation of grasslands, savannahs, karroid wetland, and aquatic ecosystems.
- Ecological and Biodiversity assessments for developmental purposes (BAR, EIA), with extensive knowledge and experience in the renewable energy field (Refer to Work Experiences and References)
- Over 3 years of avifaunal monitoring and assessment experience.
- Mapping and Infield delineation of wetlands, riparian zones and aquatic habitats (according to methods stipulated by DWA, 2008) within various South African provinces of KwaZulu-Natal, Mpumalanga, Free State, Gauteng and Northern Cape Province for inventory and management purposes.
- Wetland and aquatic buffer allocations according to industry best practice guidelines.
- Working knowledge of environmental planning policies, regulatory frameworks, and legislation
- Identification and assessment of potential environmental impacts and benefits.
- Assessment of various wetland ecosystems to highlight potential impacts, within current and proposed landscape settings, and recommend appropriate mitigation and offsets based on assessing wetland ecosystem service delivery (functions) and ecological health/integrity.
- Development of practical and achievable mitigation measures and management plans and evaluation of risk to execution
- Qualitative and Quantitative Research
- Experienced in field research and monitoring
- Working knowledge of GIS applications and analysis of satellite imagery data
- Completed projects in several Provinces of South Africa and include a number of projects located in sensitive and ecological unique regions.

Education and Professional Status

Degrees:

- 2015: Currently completing a M.Sc. degree in Botany (Vegetation Ecology), University of the Free State, Bloemfontein, RSA.
- 2009: B.Sc. Hons in Botany (Vegetation Ecology), University of the Free State, Bloemfontein, RSA.
- 2008: B.Sc. in Zoology and Botany, University of the Free State, University of the Free State, Bloemfontein,

RSA.

Courses:

- 2013: Wetland Management (ecology, hydrology, biodiversity, and delineation) – University of the Free State accredited course.
- 2014: Introduction to GIS and GPS (Code: GISA 1500S) – University of the Free State accredited course.

Professional Society Affiliations:

- The South African Council of Natural Scientific Professions: Pr. Sci. Nat. Reg. No. 400502/14 (Botany and Ecology).

Employment History

- December 2017 – Current: Nkurenkuru Ecology and Biodiversity (Pty) Ltd
- 2016 – November 2017: ECO-CARE Consultancy
- 2015 - 2016: Ecologist, Savannah Environmental (Pty) Ltd
- 2013 – 2014: Working as ecologist on a freelance basis, involved in part-time and contractual positions for the following companies
 - Enviroworks (Pty) Ltd
 - GreenMined (Pty) Ltd
 - Eco-Care Consultancy (Pty) Ltd
 - Enviro-Niche Consulting (Pty) Ltd
 - Savannah Environmental (Pty) Ltd
 - Esicongweni Environmental Services (EES) cc
- 2010 - 2012: Enviroworks (Pty) Ltd

Publications

Publications:

- Botha, G.A. & Du Preez, P.J. 2015. A description of the wetland and riparian vegetation of the Nxamasere palaeo-river's backflooded section, Okavango Delta, Botswana. *S. Afr. J. Bot.*, **98**: 172-173.

Congress papers/posters/presentations:

- Botha, G.A. 2015. A description of the wetland and riparian vegetation of the Nxamasere palaeo-river's backflooded section, Okavango Delta, Botswana. 41st Annual Congress of South African Association of Botanists (SAAB). Tshipise, 11-15 Jan. 2015.
- Botha, G.A. 2014. A description of the vegetation of the Nxamasere floodplain, Okavango Delta, Botswana. 10th Annual University of Johannesburg (UJ) Postgraduate Botany Symposium. Johannesburg, 28 Oct. 2014.

Other

- Guest speaker at IAIA Free State Branch Event (29 March 2017)

- Guest speaker at the University of the Free State Province: Department of Plant Sciences (3 March 2017):

References:

- Christine Fouché
Manager: GreenMined (Pty) LTD
Cell: 084 663 2399
- Professor J du Preez
Senior lecturer: Department of Plant Sciences
University of the Free State
Cell: 082 376 4404

CURRICULUM VITAE:

Jan-Hendrik Keet, PhD



Address: Unit 29 Avignon, Hillcrest Road
Land en Zeezicht, Somerset West
South Africa
7130
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Expertise and experience

- Current profession: Post Doctoral Researcher – Centre for Invasion Biology (Department of Botany and Zoology), Stellenbosch University
- Specialisation: Botany, ecology, invasive plant species, and invasion biology
- Years of experience: 7 years
- Published in various national and international scientific journals

Skills and competencies

- Invasive species biology
- Plant biogeography and ecology
- Plant identification and taxonomy
- Vegetation surveys and mapping
- Soil microbiomes, function, and chemistry

- Geographic Information Systems
- Data analysis and Statistics in R Statistical Software

Tertiary education

- 2015 – 2019: Stellenbosch University, Stellenbosch, South Africa. Doctor of Philosophy (Botany)
- 2013 – 2014: University of the Free State, Bloemfontein, South Africa. Magister Scientiae (Botany)
- 2012: University of the Free State, Bloemfontein, South Africa. Bachelor of Science Honours (Botany) - cum laude
- 2009 – 2011: University of the Free State, Bloemfontein, South Africa. Bachelor of Science (Chemistry with Physics and Biology) - cum laude

Employment history

- 2011: Part-time demonstrator. Department of Plant Sciences, University of the Free State, Bloemfontein, South Africa
- 2010: Part-time lab assistant. Department of Chemistry, University of the Free State, Bloemfontein, South Africa
- 2007 – 2009: Shop Manager. Christian Tees, Brandwag Centre, Bloemfontein

Certifications

- SAGIC Invasive Species Consultant (Cape Town, South Africa), March 2016
- GIS Intermediate (NQF level 5): Hydrological modelling and terrain analysis using digital elevation models (University of the Free State, South Africa), 2014
- Good Laboratory Practice seminar presented by Merck Millipore South Africa, 2012
- Laboratory Safety seminar presented by Merck Millipore South Africa, 2012

Appendix 4. Specialist's Work Experience and References

WORK EXPERIENCES & References



Gerhard Botha

ECOLOGICAL RELATED STUDIES AND SURVEYS

<i>Date Completed</i>	<i>Project Description</i>	<i>Type of Assessment/Study</i>	<i>Client</i>
2019	Sirius Three Solar PV Facility near Upington, Northern Cape	Ecological Assessment (Basic Assessment)	Aurora Power Solutions
2019	Sirius Four Solar PV Facility near Upington, Northern Cape	Ecological Assessment (Basic Assessment)	Aurora Power Solutions
2019	Lichtenburg 1 100MW Solar PV Facility, Lichtenburg, North-West Province	Ecological Assessment (Scoping and EIA Phase Assessments)	Atlantic Renewable Energy Partners
2019	Lichtenburg 2 100MW Solar PV Facility, Lichtenburg, North-West Province	Ecological Assessment (Scoping and EIA Phase Assessments)	Atlantic Renewable Energy Partners

2019	Lichtenburg 3 100MW Solar PV Facility, Lichtenburg, North-West Province	Ecological Assessment (Scoping and EIA Phase Assessments)	Atlantic Renewable Energy Partners
2019	Moeding Solar PV Facility near Vryburg, North-West Province	Ecological Assessment (Basic Assessment)	Moeding Solar
2019	Expansion of the Raunmix Aliwal North Quarry, Eastern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	GreenMined
2018	Kruisvallei Hydroelectric 22kV Overhead Power Line, Clarens, Free State Province	Faunal and Flora Rescue and Protection Plan	Zevobuzz
2018	Kruisvallei Hydroelectric 22kV Overhead Power Line, Clarens, Free State Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Zevobuzz
2018	Proposed Kruisvallei Hydroelectric Power Generation Scheme in the Ash River, Free State Province	Ecological Assessment (Basic Assessment)	Zevobuzz
2018	Proposed Zonnebloem Switching Station (132/22kV) and 2X Loop-in Loop-out Power Lines (132kV), Mpumalanga Province	Ecological Assessment (Basic Assessment)	Eskom
2018	Clayville Thermal Plant within the Clayville Industrial Area, Gauteng Province	Ecological Comments Letter	Savannah Environmental
2018	Iziduli Emoyeni Wind Farm near Bedford, Eastern Cape Province	Ecological Assessment (Re-assessment)	Emoyeni Wid Farm Renewable Energy
2018	Msenge Wind Farm near Bedford, Eastern Cape Province	Ecological Assessment (Re-assessment)	Amakhala Emoyeni Renewable Energy
2017	H2 Energy Power Station near Kwamhlanga, Mpumalanga Province	Ecological Assessment (Scoping and EIA phase assessments)	Eskom
2017	Karusa Wind Farm (Phase 1 of the Hidden Valley Wind Energy Facility near Sutherland, Northern Cape Province)	Ecological Assessment (Re-assessment)	ACED Renewables Hidden Valley
2017	Soetwater Wind Farm (Phase 2 of the Hidden Valley Wind Energy Facility near Sutherland, Northern Cape Province)	Ecological Assessment (Re-assessment)	ACED Renewables Hidden Valley
2017	S24G for the unlawful commencement or continuation of activities within a watercourse, Honeydew, Gauteng Province	Ecological Assessment	Savannah Environmental
2016 - 2017	Noupoort CSP Facility near Noupoort, Northern Cape Province	Ecological Assessment (Scoping and EIA phase assessments)	Cresco
2016	Buffels Solar 2 PV Facility near Orkney, North West Province	Ecological Assessment (Scoping and EIA phase assessments)	Kabi Solar
2016	Buffels Solar 1 PV Facility near Orkney, North West Province	Ecological Assessment (Scoping and EIA phase assessments)	Kabi Solar
2016	132kV Power Line and On-Site Substation for the Authorised Golden Valley II Wind Energy Facility near Bedford, Eastern Cape Province	Ecological Assessment (Basic Assessment)	Terra Wind Energy
2016	Kalahari CSP Facility: 132kV Ferrum-Kalahari-UNTU & 132kV Kathu IPP-Kathu 1 Overhead Power Lines, Kathu, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Kathu Solar Park
2016	Kalahari CSP Facility: Access Roads, Kathu, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Kathu Solar Park
2016	Karoshok Solar Valley Development – Additional CSP Facility including tower infrastructure associated with authorised CSP Site 2 near Upington, Northern Cape Province	Ecological Assessment (Scoping Assessment)	Emvelo

2016	Karoshhoek Solar Valley Development –Ilanga CSP 7 and 8 Facilities near Upington, Northern Cape Province	Ecological Assessment (Scoping Assessment)	Emvelo
2016	Karoshhoek Solar Valley Development –Ilanga CSP 9 Facility near Upington, Northern Cape Province	Ecological Assessment (Scoping Assessment)	Emvelo
2016	Lehae Training Academy and Fire Station, Gauteng Province	Ecological Assessment	Savannah Environmental
2016	Metal Industrial Cluster and Associated Infrastructure near Kuruman, Northern Cape Province	Ecological Assessment (Scoping Assessment)	Northern Cape Department of Economic Development and Tourism
2016	Semonkong Wind Energy Facility near Semonkong, Maseru District, Lesotho	Ecological Pre-Feasibility Study	Savannah Environmental
2015 - 2016	Orkney Solar PV Facility near Orkney, North West Province	Ecological Assessment (Scoping and EIA phase assessments)	Genesis Eco-Energy
2015 - 2016	Woodhouse 1 and Woodhouse 2 PV Facilities near Vryburg, North West Province	Ecological Assessment (Scoping and EIA phase assessments)	Genesis Eco-Energy
2015	CAMCO Clean Energy 100kW PV Solar Facility, Thaba Eco Lodge near Johannesburg, Gauteng Province	Ecological Assessment (Basic Assessment)	CAMCO Clean Energy
2015	CAMCO Clean Energy 100kW PV Solar Facility, Thaba Eco Lodge near Johannesburg, Gauteng Province	Ecological Assessment (Basic Assessment)	CAMCO Clean Energy
2015	Sirius 1 Solar PV Project near Upington, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Aurora Power Solutions
2015	Sirius 2 Solar PV Project near Upington, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Aurora Power Solutions
2015	Sirius 1 Solar PV Project near Upington, Northern Cape Province	Invasive Plant Management Plan	Aurora Power Solutions
2015	Sirius 2 Solar PV Project near Upington, Northern Cape Province	Invasive Plant Management Plan	Aurora Power Solutions
2015	Sirius 1 Solar PV Project near Upington, Northern Cape Province	Plant Rehabilitation Management Plan	Aurora Power Solutions
2015	Sirius Phase 2 Solar PV Project near Upington, Northern Cape Province	Plant Rehabilitation Management Plan	Aurora Power Solutions
2015	Sirius 1 Solar PV Project near Upington, Northern Cape Province	Plant Rescue and Protection Plan	Aurora Power Solutions
2015	Sirius Phase 2 Solar PV Project near Upington, Northern Cape Province	Plant Rescue and Protection Plan	Aurora Power Solutions
2015	Expansion of the existing Komsberg Main Transmission Substation near Sutherland, Northern Cape Province	Ecological Assessment (Basic Assessment)	ESKOM
2015	Karusa Wind Farm near Sutherland, Northern Cape Province)	Invasive Plant Management Plan	ACED Renewables Hidden Valley
2015	Proposed Karusa Facility Substation and Ancillaries near Sutherland, Northern Cape Province	Ecological Assessment (Basic Assessment)	ACED Renewables Hidden Valley
2015	Eskom Karusa Switching Station and 132kV Double Circuit Overhead Power Line near Sutherland, Northern Cape Province	Ecological Assessment (Basic Assessment)	ESKOM
2015	Karusa Wind Farm near Sutherland, Northern Cape Province)	Plant Search and Rescue and Rehabilitation Management Plan	ACED Renewables Hidden Valley
2015	Karusa Wind Energy Facility near Sutherland, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	ACED Renewables Hidden Valley

2015	Soetwater Facility Substation, 132kV Overhead Power Line and Ancillaries, near Sutherland, Northern Cape Province	Ecological Assessment (Basic Assessment)	ACED Renewables Hidden Valley
2015	Soetwater Wind Farm near Sutherland, Northern Cape Province)	Invasive Plant Management Plan	ACED Renewables Hidden Valley
2015	Soetwater Wind Energy Facility near Sutherland, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	ACED Renewables Hidden Valley
2015	Soetwater Wind Farm near Sutherland, Northern Cape Province	Plant Search and Rescue and Rehabilitation Management Plan	ACED Renewables Hidden Valley
2015	Expansion of the existing Scottburgh quarry near Amandawe, KwaZulu-Natal	Botanical Assessment (for EIA)	GreenMined Environmental
2015	Expansion of the existing AFRIMAT quarry near Hluhluwe, KwaZulu-Natal	Botanical Assessment (for EIA)	GreenMined Environmental
2014	Tshepong 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Ecological Assessment (Basic Assessment)	BBEnergy
2014	Nyala 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Ecological Assessment (Basic Assessment)	BBEnergy
2014	Eland 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Ecological Assessment (Basic Assessment)	BBEnergy
2014	Transalloys circulating fluidised bed power station near Emalahleni, Mpumalanga Province	Ecological Assessment (for EIA)	Trans-Alloys
2014	Umbani circulating fluidised bed power station near Kriel, Mpumalanga Province	Ecological Assessment (Scoping and EIA)	Eskom
2014	Gihon 75MW Solar Farm: Bela-Bela, Limpopo Province	Ecological Assessment (for EIA)	NETWORX Renewables
2014	Steelpoort Integration Project & Steelpoort to Wolwekraal 400kV Power Line	Fauna and Flora Pre-Construction Walk-Through Assessment	Eskom
2014	Audit of protected <i>Acacia erioloba</i> trees within the Assmang Wrenchville housing development footprint area	Botanical Audit	Eco-Care Consultancy
2014	Rehabilitation of the N1 National Road between Sydenham and Glen Lyon	Peer review of the ecological report	EKO Environmental
2014	Rehabilitation of the N6 National Road between Onze Rust and Bloemfontein	Peer review of the ecological report	EKO Environmental
2011	Illegally ploughed land on the Farm Wolwekop 2353, Bloemfontein	Vegetation Rehabilitation Plan	EnviroWorks
2011	Rocks Farm chicken broiler houses	Botanical Assessment (for EIA)	EnviroWorks
2011	Botshabelo 132 kV line	Ecological Assessment (for EIA)	CENTLEC
2011	De Aar Freight Transport Hub	Ecological Scoping and Feasibility Study	EnviroWorks
2011	The proposed establishment of the Tugela Ridge Eco Estate on the farm Kruisfontein, Bergville	Ecological Assessment (for EIA)	EnviroWorks
2010 - 2011	National long-haul optic fibre infrastructure network project, Bloemfontein to Beaufort West	Vegetation Rehabilitation Plan for illegally cleared areas	NEOTEL
2010 - 2011	National long-haul optic fibre infrastructure network project, Bloemfontein to Beaufort West	Invasive Plant Management Plan	NEOTEL
2010 - 2011	National long-haul optic fibre infrastructure network project, Bloemfontein to Beaufort West	Protected and Endangered Species Walk-Through Survey	NEOTEL
2011	Optic Fibre Infrastructure Network, Swartland Municipality	Botanical Assessment (for EIA) - Assisted Dr. Dave McDonald	Dark Fibre Africa
2011	Optic Fibre Infrastructure Network, City of Cape Town Municipality	Botanical Assessment (for EIA) - Assisted Dr. Dave McDonald	Dark Fibre Africa
2010	Construction of an icon at the southernmost tip of Africa, Agulhas National Park	Botanical Assessment (for EIA)	SANPARKS
2010	New boardwalk from Suiderstrand Gravel Road to Rasperpunt, Agulhas National Park	Botanical Assessment (for EIA)	SANPARKS
2010	Farm development for academic purposes (Maluti FET College) on the Farm Rosedale 107, Harrismith	Ecological Assessment (Screening and Feasibility Study)	Agri Development Solutions
2010	Basic Assessment: Barcelona 88/11kV substation and 88kV loop-in lines	Botanical Assessment (for EIA)	Eskom Distribution
2011	Illegally ploughed land on the Farm Wolwekop 2353, Bloemfontein	Vegetation Rehabilitation Plan	EnviroWorks

WETLAND DELINEATION AND HYDROLOGICAL ASSESSMENTS

<i>Date Completed</i>	<i>Project Description</i>	<i>Type of Assessment/Study</i>	<i>Client</i>
In progress	Steynsrus PV 1 & 2 Solar Energy Facilities near Steynsrus, Free State Province	Wetland Assessment	Cronimet Mining Power Solutions
2019	Lichtenburg 1 100MW Solar PV Facility, Lichtenburg, North-West Province	Surface Hydrological Assessment (Scoping and EIA Phase)	Atlantic Renewable Energy Partners
2019	Lichtenburg 2 100MW Solar PV Facility, Lichtenburg, North-West Province	Surface Hydrological Assessment (Scoping and EIA Phase)	Atlantic Renewable Energy Partners
2019	Lichtenburg 3 100MW Solar PV Facility, Lichtenburg, North-West Province	Surface Hydrological Assessment (Scoping and EIA Phase)	Atlantic Renewable Energy Partners
2019	Moeding Solar PV Facility near Vryburg, North-West Province	Wetland Assessment (Basic Assessment)	Moeding Solar
2018	Kruisvallei Hydroelectric 22kV Overhead Power Line, Clarens, Free State Province	Wetland Assessment (Basic Assessment)	Zevobuzz
2017	Nyala 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Wetland Assessment	BBEnergy
2017	Eland 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Wetland Assessment	BBEnergy
2017	Olifantshoek 10MVA 132/11kV Substation and 31km Power Line	Surface Hydrological Assessment (Basic Assessment)	Eskom
2017	Expansion of the Elandspruit Quarry near Ladysmith, KwaZulu-Natal Province	Wetland Assessment	Raumix
2017	S24G for the unlawful commencement or continuation of activities within a watercourse, Honeydew, Gauteng Province	Aquatic Assessment & Flood Plain Delineation	Savannah Environmental
2017	Noupoort CSP Facility near Noupoort, Northern Cape Province	Surface Hydrological Assessment (EIA phase)	Cresco
2016	Wolmaransstad Municipality 75MW PV Solar Energy Facility in the North West Province	Wetland Assessment (Basic Assessment)	BlueWave Capital
2016	BlueWave 75MW PV Plant near Welkom Free State Province	Wetland Delineation	BlueWave Capital
2016	Harmony Solar Energy Facilities: Amendment of Pipeline and Overhead Power Line Route	Wetland Assessment (Basic Assessment)	BBEnergy

AVIFAUNAL ASSESSMENTS

<i>Date Completed</i>	<i>Project Description</i>	<i>Type of Assessment/Study</i>	<i>Client</i>
2019	Sirius Three Solar PV Facility near Upington, Northern Cape	Avifauna Assessment (Basic Assessment)	Aurora Power Solutions

2019	Sirius Four Solar PV Facility near Upington, Northern Cape	Avifauna Assessment (Basic Assessment)	Aurora Power Solutions
2019	Moeding Solar PV Facility near Vryburg, North-West Province	Avifauna Assessment (Basic Assessment)	Moeding Solar
2018	Proposed Zonnebloem Switching Station (132/22kV) and 2X Loop-in Loop-out Power Lines (132kV), Mpumalanga Province	Avifauna Assessment (Basic Assessment)	Eskom
2017	Olifantshoek 10MVA 132/11kV Substation and 31km Power Line	Avifauna Assessment (Basic Assessment)	Eskom
2016	TEWA Solar 1 Facility, east of Upington, Northern Cape Province	Wetland Assessment (Basic Assessment)	Tewa Isitha Solar 1
2016	TEWA Solar 2 Facility, east of Upington, Northern Cape Province	Wetland Assessment	Tewa Isitha Solar 2

ENVIRONMENTAL IMPACT ASSESSMENT

- Barcelona 88/11kV substation and 88kV loop-in lines – BA (for Eskom).
- Thabong Bulk 132kV sub-transmission inter-connector line – EIA (for Eskom).
- Groenwater 45 000 unit chicken broiler farm – BA (for Areemeng Mmogo Cooperative).
- Optic Fibre Infrastructure Network, City of Cape Town Municipality – BA (for Dark Fibre Africa (Pty) Ltd).
- Optic Fibre Infrastructure Network, Swartland Municipality – BA (for Dark Fibre Africa).
- Construction and refurbishment of the existing 66kV network between Ruigtevallei Substation and Reddersburg Substation – EMP (for Eskom).
- Lower Kruisvallei Hydroelectric Power Scheme (Ash river) – EIA (for Kruisvallei Hydro (Pty) Ltd).
- Construction of egg hatchery and associated infrastructure – BA (For Supreme Poultry).
- Construction of the Klipplaatdrif flow gauging (Vaal river) – EMP (DWAF).

ENVIRONMENTAL COMPLIANCE AUDITING AND ECO

- National long haul optic fibre infrastructure network project, Bloemfontein to Laingsburg – ECO (for Enviroworks (Pty) Ltd.).
- National long haul optic fibre infrastructure network project, Wolmaransstad to Klerksdorp – ECO (for Enviroworks (Pty) Ltd.).
- Construction and refurbishment of the existing 66kV network between Ruigtevallei Substation and Reddersburg Substation – ECO (for Enviroworks (Pty) Ltd.).
- Construction and refurbishment of the Vredefort/Nooitgedacht 11kV power line – ECO (for Enviroworks (Pty) Ltd.).
- Mining of Dolerite (Stone Aggregate) by Raumix (Pty) Ltd. on a portion of Portion 0 of the farm Hillside 2830, Bloemfontein – ECO (for GreenMined Environmental (Pty) Ltd.).
- Construction of an Egg Production Facility by Bainsvlei Poultry (Pty) Ltd on Portions 9 & 10 of the farm, Mooivlakte, Bloemfontein – ECO (for Enviro-Niche Consulting (Pty) Ltd.).

- Environmental compliance audit and botanical account of Afrisam's premises in Bloemfontein – Environmental Compliance Auditing (for Enviroworks (Pty) Ltd.).

OTHER PROJECTS:

- Keeping and breeding of lions (*Panthera leo*) on the farm Maxico 135, Ficksburg – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Keeping and breeding of lions (*Panthera leo*) on the farm Mooihoek 292, Theunissen – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Keeping and breeding of wild dogs (*Lycaon pictus*) on the farm Mooihoek 292, Theunissen – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Existing underground and aboveground fuel storage tanks, TWK AGRI: Pongola – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks on Erf 171, TWK AGRI: Amsterdam – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 14 000 L of fuel (diesel) aboveground on Erf 32, TWK AGRI: Carolina – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 23 000 L of fuel (diesel) above ground on Portion 10 of the Farm Oude Bosch, Humansdorp – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 16 000 L of fuel (diesel) aboveground at Panbult Depot – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks, TWK AGRI: Mechanisation and Engineering, Piet Retief – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks on Portion 38 of the Farm Lothair, TWK AGRI: Lothair – Environmental Management Plan (for TWK Agricultural Ltd).

WORK EXPERIENCES & References



Jan-Hendrik Keet, PhD

Publications

- Hirsch H, Allsopp MH, Canavan S, Cheek M, Geerts S, Geldenhuys CJ, Harding G, Hurley BP, Jones W, **Keet J-H**, Klein H, Ruwanza S, van Wilgen BW, Wingfield MJ, Richardson DM (2019) *Eucalyptus camaldulensis* in South Africa – past, present, future, *Transactions of the Royal Society of South Africa*, <https://doi.org/10.1080/0035919X.2019.1669732>.
- Le Roux JJ, Hui C, Castillo ML, Iriondo, JM, **Keet J-H**, Khapugin, AA, Médail F, Rejmánek M, Theron G, Yannelli FA, Hirsch H (2019) Recent anthropogenic plant extinctions differ in biodiversity hotspots and coldspots. *Current Biology*, <https://doi.org/10.1016/j.cub.2019.07.063>.

- **Keet J-H, Ellis A G, Hui C, Le Roux JJ (2019)** Strong spatial and temporal turnover of soil bacterial communities in South Africa's hyperdiverse fynbos biome. *Soil Biology and Biochemistry* **136**: 107541, <https://doi.org/10.1016/j.soilbio.2019.107541>.
- Le Roux JJ, Ellis AG, Van Zyl L-M, Hosking ND, **Keet J-H, Yannelli F (2018)** Importance of soil legacy effects and successful mutualistic interactions during Australian acacia invasions in nutrient-poor environments. *Journal of Ecology* **105**(6): 2071-2081, <https://doi.org/10.1111/1365-2745.1296>.
- **Keet J-H, Ellis A G, Hui C, Le Roux JJ (2017)** Legume–rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness. *Annals of Botany* **119**(8): 1319-1331, <https://doi.org/10.1093/aob/mcx028>.
- Le Roux JJ, **Keet J-H, Mutiti B, Ellis AG (2017)** Cultivation may not dramatically alter rhizobial community diversity or structure associated with rooibos tea (*Aspalathus linearis* Burm.f.) in South Africa. *South African Journal of Botany* **110**: 87-96, <https://doi.org/10.1016/j.sajb.2017.01.014>.
- Le Roux JJ, Hui C, **Keet J-H, Ellis AG (2017)** Co-introduction vs ecological fitting as pathways to the establishment of effective mutualisms during biological invasions. *New Phytologist* **215**:1354–1360. <https://doi.org/10.1111/nph.14593>.
- Nsikani M, Novoa A, Van Wilgen B, **Keet J-H, Gaertner M (2017)** *Acacia saligna*'s soil legacy effects persist up to ten years after clearing: Implications for ecological restoration. *Austral Ecology* **42**(8): 880-889, <https://doi.org/10.1111/aec.12515>.
- **Keet J-H, Cindi D, Du Preez PJ (2016)** Assessing the invasiveness of *Berberis aristata* and *B. julianae* (Berberidaceae) in South Africa: management options and legal recommendations. *South African Journal of Botany* **105**: 299-28, <https://doi.org/10.1016/j.sajb.2016.04.012>.

Conferences

- 46th South African Association of Botanists conference (Qwa-Qwa, South Africa), January 2020, ***Alnus glutinosa* (L.) Gaertn. [Black Alder]: an emerging invader in South Africa**
- International Association for Food Protection (IAFP; Louisville, Kentucky, USA), July 2019.
- Ecological Society of America Conference, (New Orleans, Louisiana, USA), August 2018 **Invasive legumes dramatically impact soil bacterial community structures but not function**
- Legumes for Life Workshop (Stellenbosch, South Africa), May 2018 **Legume-rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness**
- Fynbos Forum Conference (Swellendam, South Africa), July 2017 **Assessing the impacts of invasive legumes on soil conditions and microbial community composition in a biodiversity hotspot**
- 43rd South African Association of Botanists Conference (Cape Town, South Africa), January 2017, **Legume-rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness** *Best PhD presentation*

- 43rd Annual Research Symposium on the Management of Biological Invasions Conference (Worcester, South Africa), May 2016, **Legume-rhizobium symbiotic promiscuity does not determine plant invasiveness**
- Evolutionary dynamics of tree invasions: drivers, dimensions, and implications for management (Stellenbosch, South Africa), November 2015
- Neobiota: 8th International Conference on Biological Invasions (Antalya, Turkey), November 2014, **Assessing the threat and potential for management of *Berberis* spp. (Berberidaceae) in South Africa**
- 42nd Annual Symposium on the Management of Invasive Alien Plants (Karridene Beach Hotel, Durban, South Africa)
- XXth Association for the Taxonomic Study of the Flora of Tropical Africa International Conference (Stellenbosch, South Africa), January 2014
- 41st Annual Symposium on the Management of Invasive Alien Plants (Cape St. Francis, South Africa), May 2013

EIA and other surveys

- Specialist Invasive Alien Plant Species Report: Prepared for: Mpac Corrugated, Kuils River (Western Cape), July 2019
- Proposed Township development, Country view, Gauteng: Biodiversity Impact Assessment (Flora) – Specialist Report prepared for Zone Land Solutions (PTY) Ltd, July 2015
- Colenso Anthracite Coal Mining and Power Station Project: Biodiversity Impact Assessment (Flora) – Specialist Report prepared for Zone Land Solutions (PTY) Ltd, July 2015

