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BIODIVERSITY ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED KOLOMELA MINE EXPANSION NEAR POSTMASBURG, NORTHERN CAPE

Prepared for

EXM Environmental Advisory (Pty) Ltd

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Part B: Floral Assessment

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DOCUMENT GUIDE

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

Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
No.	**SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS**	**Section in report/Notes**
2	**Terrestrial Biodiversity Specialist Assessment**	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	**Part A – C:** Cover Page **Part A:** Appendix E
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	**Part A**: Section 1
2.3	**The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:**	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	**Part B**: Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	**Part B**: Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	**Part A:** Section 3 (desktop analysis) **Part B**: Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Area (FEPA) sub catchments;	**Part A:** Section 3 (desktop analysis) **Part B**: Section 3 (flora) **Part C:** Section 3 (fauna) **For descriptions on the presence of FEPAs, please refer to the Freshwater Biodiversity Assessment (SAS 202147, 2021)*
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	**Part A**: Section 3 (desktop analysis) **Part B**: Section 3 (flora) **Part C:** Section 3 (fauna)
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Section 5.3.6
2.3.7	**The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:**	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: *a) the reasons why an area has been identified as a CBA;* *b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;* *c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);* *d) the impact on ecosystem threat status;* *e) the impact on explicit subtypes in the vegetation;* *f) the impact on overall species and ecosystem diversity of the site; and* g) *the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	**Part A**: Section 3 (desktop analysis) **Part B**: Section 3.2, 5.3.3 **Part C:** Section 3
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: *a) the impact on the ecological processes that operate within or across the site;*	

	b) the extent the proposed development will impact on the functionality of the ESA; and c) *loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- *a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	**Part A**: Section 3 (desktop analysis)
2.3.7.4	Priority areas for protected area expansion, including- *a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;*	**Part A**: Section 3 (desktop analysis)
2.3.7.5	SWSAs including: *a) the impact(s) on the terrestrial habitat of a SWSA; and* b) *the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);*	Not Applicable
2.3.7.6	FEPA sub catchments, including- *a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;*	**For descriptions on the presence of FEPAs, please refer to the Freshwater Biodiversity Assessment (SAS 202147, 2021)*
2.3.7.7	Indigenous forests, including: *a) impact on the ecological integrity of the forest; and* b) *percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.*	Not Applicable
2.4	**The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.**	
	Part B: Results of the **Floral Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities. **Part C:** Results of the **Faunal Assessment** as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities.	
3	**Terrestrial Biodiversity Specialist Assessment Report**	
3.1	**The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:**	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	**Part A:** Appendix E
3.1.2	A signed statement of independence by the specialist;	**Part A:** Appendix E
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	**Part B:** Section 1.3 (flora) **Part C:** Section 1.3 (fauna)
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	**Part A**: Appendix C **Part B:** Section 2 (flora) **Part B:** Appendix A (flora) **Part C:** Section 2 (fauna) **Part C**: Appendix A (fauna)
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	**Part B:** Section 1.3 (flora) **Part C:** Section 1.3 (fauna)
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	**Part B:** Section 4 (flora) **Part C:** Section 4 (fauna)
	Impact Assessment Requirements 3.1.7 Additional environmental impacts expected from the proposed development; 3.1.8 Any direct, indirect and cumulative impacts of the proposed development; 3.1.9 The degree to which impacts and risks can be mitigated; 3.1.10 The degree to which the impacts and risks can be reversed; 3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources; 3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	**Part B:** Section 5 (flora) **Part C:** Section 5 (fauna)
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	**Not Applicable to this report**
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	**Part A:** Executive summary **Part B:** Section 6 (flora) **Part C:** Section 6 (fauna)
3.1.15	Any conditions to which this statement is subjected.	**Part B:** Section 5.4 (flora) **Part C:** Section 5.4 (fauna)

3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	**Not Applicable to this report**
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	**Not Applicable to this report**

LIST OF ACRONYMS

AIP	Alien and Invasive Plant
BGIS	Biodiversity Geographic Information Systems
BMP	Biodiversity Management Plan
BMU	Biodiversity Management Unit
BV	Biodiversity Value
BODATSA	Botanical Database of Southern Africa
CARA	Conservation of Agricultural Resource Act, 1983 (Act No. 43 of 1983)
CBAs	Critical Biodiversity Areas
DFFE	Department of Forestry, Fisheries, and the Environment
EAP	Environmental Assessment Practitioner
E-GIS	Environmental Geographical Information Systems
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EN	Endangered
ESAs	Ecological Support Areas
GIS	Geographic Information System
GPS	Global Positioning System
GWC	Griqualand West Centre
IEM	Integrated Environmental Management
LC	Least Concern
NCCBA	Northern Cape Critical Biodiversity Areas
NCDENC	Northern Cape Department of Environment and Nature Conservation
NCNCA	Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NFA	National Forest Act, 1998 (Act No. 84 of 1998, as amended in September 2011)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
ONAs	Other Natural Areas
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RDL	Red Data Listed
SANBI	South African National Biodiversity Institute's
SAS	Scientific Aquatic Services CC
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services CC
TOPS	Threatened or Protected species (in terms of NEMBA)
VU	Vulnerable

GLOSSARY OF TERMS

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

Alien species (syn. exotic species; non-native)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Biodiversity Management Plan	A plan aimed at ensuring the long-term survival in nature of an indigenous species, a migratory species, or an ecosystem, published in terms of the Biodiversity Act. Norms and standards to guide the development of Biodiversity Management Plans for Species have been developed. At the time of writing, norms and standards for Biodiversity Management Plans for Ecosystems were in the process of being developed.
Biodiversity priority areas	Features in the landscape or seascape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. They include the following categories, most of which are identified based on systematic biodiversity planning principles and methods: protected areas, Critically Endangered and Endangered ecosystems, Critical Biodiversity Areas and Ecological Support Areas, Freshwater Ecosystem Priority Areas, high water yield areas, flagship free-flowing rivers, priority estuaries, assessment zones for land-based protected area expansion, and assessment zones for offshore protection. Marine ecosystem priority areas and coastal ecosystem priority areas have yet to be identified but will be included in future. The different categories are not mutually exclusive and, in some cases, overlap, often because a particular area or site is important for more than one reason. They should be complementary, with overlaps reinforcing the importance of an area.
Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006); after Low and Rebelo (1998).	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act;
Casual species	Those alien species that do not form self-replacing populations in the invaded region and whose persistence depends on repeated introductions of propagules (Richardson et al. 2011; Pyšek et al. 2004). The term is generally used for plants.
Critical Biodiversity Area (CBA)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation and ridges.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Critically Endangered (CR) (IUCN Red List category)	**Applied to both species/taxa and ecosystems**: 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. Critically Endangered ecosystem types are at an extremely high risk of collapse. Most of the ecosystem type has been severely or moderately modified from its natural state. The ecosystem type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost. Critically endangered species are those considered to be at extremely high risk of extinction.
Degradation	The many human-caused processes that drive the decline or loss in biodiversity, ecosystem functions or ecosystem services in any terrestrial and associated aquatic ecosystems.

Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Driver (ecological)	A driver is any natural or human-induced factor that directly or indirectly causes a change in ecosystem. A direct driver clearly influences ecosystem processes, where indirect driver influences ecosystem processes through altering one or more direct drivers.
Endangered (EN) (Red List category)	**Applied to both species/taxa and ecosystems**: 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. Endangered ecosystem types are at a very high risk of collapse. Endangered species are those considered to be at very high risk of extinction.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range.
Ground·truth	To check the accuracy of (remotely sensed data) by means of in-situ observations.
Habitat (as per the definition in NEMBA)	A place where a species or ecological community naturally occurs.
Indigenous vegetation (as per the definition in NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed alien species	All alien species that are regulated in South Africa under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), Alien and Invasive Species Regulations, 2020.
Least Threatened	Least threatened ecosystems are still largely intact.
Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g., species are still native if they increase their range as a result of watered gardens but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
Red Data Listed (RDL) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Species of Conservation Concern (SCC)	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project, including nationally and provincially protected species. Refer to Appendix B for a breakdown of SCC associated with the project.
Threatened ecosystem	An ecosystem that has been classified as Critically Endangered, Endangered or Vulnerable, based on an analysis of ecosystem threat status. A threatened ecosystem has lost or is losing vital aspects of its structure, function, or composition. The Biodiversity Act allows the Minister of Environmental Affairs or a provincial MEC for Environmental Affairs to publish a list of threatened ecosystems. To date, threatened ecosystems have been listed only in the terrestrial environment. In cases where no list has yet been published by the Minister, such as for all aquatic ecosystems, the ecosystem threat status assessment in the NBA can be used as an interim list in planning and decision making. Also see Ecosystem threat status.
Threatened species	A species that has been classified as Critically Endangered, Endangered or Vulnerable, based on a conservation assessment (Red List), using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.
Vulnerable (VU) (Red List category)	Applied to both species/taxa and ecosystems: A species is 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. An ecosystem type is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for VU and is then considered to be at a high risk of collapse.
Weeds	A plant is a weed '*if, in any specified geographical area, its populations grow entirely or predominantly in situations markedly disturbed by man (without, of course, being deliberately cultivated plants*)' (Baker 1965); in cultural terms, weeds are plants (**not necessarily alien**) that grow in sites where they are not wanted and that have detectable economic or environmental impacts (Pyšek et al. 2004).

1 INTRODUCTION

Scientific Terrestrial Services CC (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Authorisation (EA) proposed expansion activities at the Kolomela Mine, near Postmasburg, Northern Cape Province henceforth referred to as the "assessment area. For the purpose of this report, reference will be made to both the assessment area and the focus area. The assessment area includes the proposed infrastructure for the Kolomela Mine. The areas assessed by STS during the field assessment, which focused on portions of the proposed infrastructure, is referred to as the focus area.

The Sishen Iron Ore Company (Pty) Ltd, part of Kumba Iron Ore Limited (hereafter Kumba), owns and operates Kolomela Mine located approximately 8 km southwest of Postmasburg in the Tsantsabane Local Municipality, Northern Cape Province. The Kolomela Mine is located within the Tsantsabane Local Municipality, which is an administrative area in the Siyanda District Municipality of the Northern Cape. The extent of the Kolomela Mine Expansion is located in Figures 1 and 2.

The Minister of Mineral Resources granted a mining right for the mining of iron ore at Kolomela Mine on 5 May 2008, (Ref: (NC) 069 MR) and is valid until 17 September 2038, unless cancelled or suspended.

Kolomela Mine operates as a conventional open cast mine where ore is extracted by means of drilling, blasting, loading, and hauling. Ore extracted from the pits is transported to a direct shipping ore (DSO) plant which involves the crushing and screening of recovered ore material into stockpiles of 'lump' and 'fines'. The processed iron ore is loaded onto an internal railway line which is connected to a direct rail link to Transnet's Sishen-Saldanha railway line from where the iron ore is transported to the Port of Saldanha for export. Kolomela Mine also utilises a Modular Dense Media Separation (DMS) Processing Plant for the processing of low-grade ore not suitable for processing at the DSO plant. Kolomela produced 10.8 million tonnes during its first full year of production in 2013 and currently produces 13-14 million tonnes per annum (Mtpa) facilitated by enhanced stripping techniques and processing of 1-3 Mtpa of lower grade of ore at the Tierbult DMS Modular Plant.

Iron ore is currently extracted from three opencast pits, namely Klipbankfontein, Leeuwfontein and Kapstevel North. Kolomela is in the process of developing the Kapstevel South Pit, which is required to sustain the mining production at approximately 14 Mtpa (Mtpa) until 2031. The current the Life of Mine (LoM), including the Kapstevel South Pit, currently stands at 2032, but with the potential to be extended in future with the development of the Ploegfontein, Tierbult and Heuningkranz ore bodies, the mining of which are already authorised.

Kolomela proposes to expand and amend some of the existing activities and develop new infrastructure to support continued and future production at the mine. This includes:

- Amendment of the Kapstevel South Pit footprint area.
- Amendment of the Kapstevel Waste Rock Dumps and haul roads.
- Amendment of Kapstevel Evaporation Ponds and stormwater management infrastructure.
- Additional park-up, laydown and ore stockpile areas.
- Development of new DMS tailings management infrastructure
- A new Photovoltaic Solar Facility.
- A new Waste Tyre Management Facility.
- A conveyor and railway line to transfer material to and from the DMS plant.
- Amendment to the future Kapstevel DMS conveyor footprint to facilitate widened haul roads.
- Amendment of Kapstevel Waste Rock Dumps and Additional Waste Rock Dumps.
- Additional Low Grade Ore Storage Areas.
- New radio masts.
- Provision for an area of relaxation and safety berms around pits.

The existing and planned infrastructure at Kolomela mine are shown in (Figure 1).

Authorisation is thus being sought from the Department of Mineral Resources & Energy (DMRE) for activities listed under the National Environmental Management Act (No. 107 of 1998) and the National Environmental Management: Waste Act (No. 59 of 2008) as well as amendment of the environmental management programme in terms of Section 102 of the Minerals & Petroleum Resources Development Act (No. 28 of 2002).

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

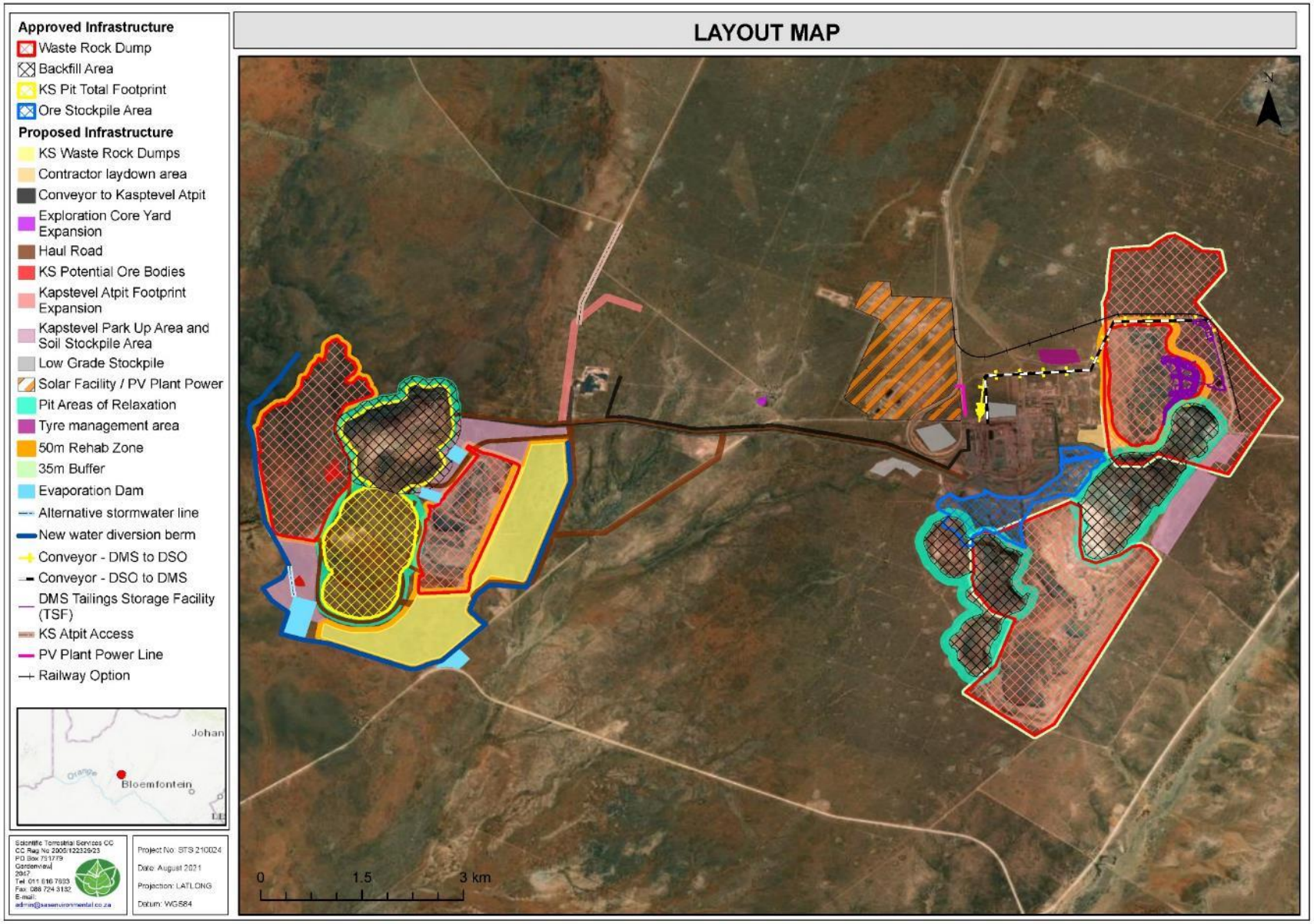


Figure 1: Conceptual illustration of the assessment zone (in which the focus area is located) and the approved and proposed infrastructure development layout in relation to the surrounding areas.

1.1 Scope of Work

Specific outcomes in terms of the report are as follows:

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

1.2 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The floral assessment was confined to the focus area and does not include the neighbouring and adjacent properties. The entire assessment zone and immediate surroundings were, however, included in the desktop analysis of which the results are presented in **Part A: Section 3**;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral communities have been accurately assessed and considered. Relevant online sources and background information (including previous studies within the assessment zone, i.e., Omni Eko, 2015) and studies conducted in nearby areas, i.e., STS 210024, 2021 and STS 200040, 2020) were further assessed to improve on the overall understanding of the focus area's ecology;
- The data presented in this report are based on one site visit, undertaken between 28 June and 2 August 2021 (mid-winter) and thus falls outside of the flowering season of several species within the region. A more comprehensive assessment would require that assessments take place in all seasons of the year. However, on-site data was

augmented with all available desktop data. Together with project experience in the area and the use of background information from studies previously conducted both within the assessment zone (Omni Eko, 2015) and in nearby areas (Zietsman & Zietsman, 2019; STS 210024, 2021 and STS 200040, 2020), the findings of this assessment are considered an accurate reflection of the floral ecological characteristics of the focus area for the purposes of informed decision-making processes;

- After the field assessment, minor alterations to the proposed project footprint were provided to the specialist. Although these areas were not specifically assessed in detail during the field assessment, the proponent provided recent photographs of the amended areas, which were used in conjunction with brief visual assessments of the areas in question whilst on site, to confidently extrapolate on the associated floral habitat; and
- An on-site visual investigation of the focus areas was conducted to confirm the assumptions made during the consultation of the background maps and to determine whether the sensitivity of the terrestrial biodiversity associated with the focus areas confirms the results of the online National Web-based Environmental Screening Tool.

2 ASSESSMENT APPROACH

An initial on-site visual investigation of the focus areas was conducted on 19 April 2021. Subsequent on-site investigations were conducted between 28 June and 2 July 2021 to confirm the assumptions made during the consultation of the background maps and to determine whether the sensitivity of the terrestrial biodiversity associated with the focus areas confirms the results of the online National Web-based Environmental Screening Tool.

2.1 General Approach

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

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

- To guide the selection of appropriate sample sites, background data and digital satellite images were consulted before going to site, during which broad habitats, vegetation

types and potentially sensitive sites were identified. The results of these analyses were then used to focus the fieldwork on specific areas of concern and to identify areas where targeted investigations were required (e.g., for SCC detection and within the direct footprint of the proposed mining project);

- All relevant resources and datasets as presented by the South African National Biodiversity Institute's (SANBI's) Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org) and the Environmental Geographical Information Systems (E-GIS) website (https://egis.environment.gov.za/), including the Northern Cape CBA Map (2016) and the online National Web-based Environmental Screening Tool, were consulted to gain background information on the physical habitat and potential floral diversity associated with the focus areas;
- Based on the broad habitat units delineated before going to site and the pre-identified points of interest, which is updated based on on-site observations and access constraints, the selected sample areas were surveyed on foot, following subjective transects, to identify the occurrence of the dominant plant species and habitat diversities, but also to detect SCC which tend to be sparsely distributed; and
- Photographs were taken of each vegetation community that is representative of typical vegetation structure of that community, as well as photos of all detected SCC (except for sensitive species as identified by the Department of Forestry, Fisheries, and the Environment (DFFE) National Web-based Screening Tool).

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

2.2 Definitions, descriptions, and taxon nomenclature

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

2.3 Sensitivity Mapping

All the ecological features of the focus areas were considered, and sensitive areas were assessed and projected onto satellite imagery. The sensitivity map should assist the Environmental Assessment Practitioner (EAP) / proponent as to the suitability of the proposed development within the focus areas.

3 RESULTS OF FLORAL ASSESSMENT

3.1 Broad-scale vegetation characteristics

The focus area is located within two vegetation types, namely the Postmasburg Thornveld (comprising most of the focus area) and the Kuruman Mountain Bushveld (comprising a small section in the west of the focus area), i.e., the reference vegetation types. Both the Postmasburg Thornveld and the Kuruman Mountain Bushveld vegetation types are listed as least concern in Mucina and Rutherford (2006), and in the updated 2018 Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a).

Mucina and Rutherford (2006) describe the reference vegetation types as follows:

- The Postmasburg Thornveld consists of flat areas that are surrounded by mountains which support open, shrubby thornveld that is characterised by a dense shrub layer and often lacks a tree layer; the grass layer is very sparse. Shrubs are generally low and have a karroid affinity; and
- The Kuruman Mountain Bushveld consists of rolling hills that have generally gentle to moderate slopes and hill pediment areas that support open shrubveld, in which *Calobota cuspidosa* is often prominent. The grass layer of this vegetation type is usually well developed.

3.2 Ground-truthed vegetation characteristics

Based on the results of the field investigation of June-July 2021, five broad habitat units were distinguished for the focus area:

- **Thornveld Habitat**: This habitat unit was associated with deep, sandy red soils and was characterised by the presence of thorny woody species, particularly *Vachellia* and *Senegalia* species. Different community compositions were supported within the habitat unit and as such, three subunits are recognised:
  - **a.** ***Senegalia-Tarconanthus*** **Thornveld**: consisting largely of open thornveld habitat that was dominated by *Senegalia mellifera* subsp. *detinens* and *Tarchonanthus camphoratus;*
  - **b.** ***Senegalia*** **Thornveld**: dominated by *Senegalia mellifera* subsp. *detinens*. Encroachment of *S. mellifera* subsp. *detinens* varied throughout the subunit, with some areas more encroached than others; and

   c. **Kalahari Thornveld**: this subunit was characterised by an open to semi-dense tree savanna in which *Vachellia erioloba* and *Boscia albitrunca* were present and interspaced by grassy plains.

2. **Calcrete Habitat:** this habitat unit consisted of shallow, gravelly shrublands (in which the grass layer is poorly developed) which were mosaiced by shrubby grassland in which shrubs (particularly *Rhigozum trichotomum*) were present (and sometimes encroaching);
3. **Moisture-driven Habitat:** The Moisture-driven Habitat includes **watercourses** as delineated within the Freshwater Ecological Assessment (SAS 202147, 2021), and includes Cryptic Wetlands and (natural, linear) Linear Drainage Lines. The Moisture-driven Habitat also includes **non-watercourse habitat** which is not considered true watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) (NWA), i.e., Seasonal Depressions and Anthropogenic Drainage Lines. Different community compositions were supported within the habitat unit and as such, three subunits are recognised within the watercourse and non-watercourse habitats:
   a. **Watercourse Habitat included:**
      i. Cryptic Wetlands: pans considered to meet the classification as watercourses in the NWA (SAS 219099, 2021) with distinct vegetation communities considered to be key indicators of wetlands in arid regions; and
      ii. Linear Drainage Line Habitat: this subunit was associated with a thickened woody formation within the drainage lines or immediately adjacent to it;
   b. **Non-watercourse Habitat:**
      i. Seasonal Depressions: these consisted of low-lying areas where water will preferentially flow or accumulate during rain events, but the floral communities lack wetland indicator vegetation (e.g., vegetation within the centre of the Seasonal Depressions especially differed from that of the Cryptic Wetlands); and
      ii. Anthropogenic Drainage Line: these areas have been artificially created and support a range of species that have an affinity for wet conditions, including *Typha capensis*.
4. **Mountain Bushveld:** this habitat unit consisted of a gently sloped hill that was largely underlain by a banded iron stone formation*;* and
5. **Transformed Habitat:** This habitat unit includes areas where vegetation is significantly degraded or entirely absent because of mining-related activities.

For a breakdown of the floral communities, habitat characteristics and conservation sensitivities associated with the above-mentioned habitat units, refer to Section 3.2.1 – 3.2.5. Figures 5 - 8 depict the habitat units associated with the focus area.

Biodiversity Management Units (BMU) have been previously identified for the Kolomela MRA (Omni Eko, 2019). For the purpose of aligning the current report with the Biodiversity Management Plan (BMP) (Omni Eko, 2019), habitat units, as identified in this report, overlap the BMUs as previously identified in the BMP (Table 1 & Figures 2 - 4). It should be noted that the BMUs are broad and have been delineated as such to allow for practical implementation of fauna and flora management practices. The habitat units delineated by STS are more refined than that of the broad BMUs. As such, variations in the extent and distribution of STS's habitat units over the BMUs are expected. The BMUs may incorporate several different vegetation units as delineated by STS. Reasons justifying these overlaps are provided below (Table 1), although it should be noted that the more refined habitat units within the broad BMUs is not surprising.

Within the BMP, a Biodiversity Value (BV) has been assigned to each BMU to indicate the relative importance of each BMU for combined floral and faunal management intervention purposes. BV values are determined by a number of interacting factors, namely extent, condition of the BMU, diversity within the BMU, functional status and ecological services provided by each BMU. BV values can be i) very high, ii) high, iii) moderate, or iv) low.

In this report, a floral sensitivity score has been assigned to each of the identified habitat units. This sensitivity score is determined by assessing

i. the propensity of a habitat unit to support SCC,
ii. floral diversity,
iii. conservation status,
iv. habitat integrity, and
v. the presence of unique landscapes.

Sensitivity scores can thus be low, moderately low, intermediate, moderately high or high. The sensitivity of the study area for fauna was determined by considering five different parameters which influence faunal habitat, these include; the presence of faunal, habitat availability, food availability, faunal diversity and habitat integrity.

Differences in the BV values and the sensitivity scores for the habitat units as provided by STS are evident. The differences in these values are attributed to the following factors:

i. the BV values are based on the combined significance value of fauna and flora, whereas separate floral and faunal sensitivity scores have been provided for the habitat units provided by STS,
ii. differences in field assessments as well as the subjective discretion of different authors has resulted in differences in the delineated BMUs vs. habitat units,
iii. the broad scale approach to identifying BMUs vs the identification of habitat units as assessed in this report which was conducted at a smaller scale, thus resulting in more refined habitat unit delineations, and
iv. differences in methodologies used to assess and develop the BV values and the sensitivity scores has resulted in differences in the scores presented.

Although differences exist between the BMUs and habitat units identified, and their associated BV and sensitivity scores, the general consensus is that they do align.

The seven BMUs identified within the MRA include:

- BMU 1: Wolhaarkop Sandveld
- BMU 2: Black Thorn Shrubland
- BMU 3: *Rhigozum* Grassland
- BMU 4: Wild Olive Woodland
- BMU 5: Camphor Bush Panveld
- BMU 6: Dwarf Karroid Shrubland
- BMU 7: Groenwaterspruit

Please note that the refined habitat units as defined in this report will be used to illustrate and discuss the significance, sensitivity and impacts associated with the proposed mining expansion activities for the mine.

Table 1: Table illustrating the overlap between the habitat units (as delineated by STS) and the BMUs. An explanation justifying the overall is also provided.

BMU (Omni Eko, 2019)	BV value	Habitat Unit Overlap (STS)	Floral Sensitivity as defined by STS	Faunal Sensitivity as defined by STS	Justification for overlap
BMU 1 Wolhaarkop Sandveld	Very High	NA	NA	NA	NA
BMU 2 - Black Thorn Shrubland	Moderate	Mountain Bushveld	Moderately High	Moderately High	• The BMP states that sensitive habitats are prevalent within the BMU. The Mountain Bushveld Habitat, as identified by STS, can be considered as one of these sensitive habitats.
BMU 3 - *Rhigozum* Grassland	High	Kalahari Thornveld	Intermediate	Intermediate	• This BMU is widespread according to the BMP. The Kalahari Thornveld, *Senegalia* Thornveld and the Calcrete Habitat all consist of a grassy layer. This grassy layer is the dominant feature in which these habitat units have been grouped at a broad scale. At a more local scale, this BMU can be micro mapped into different components as identified by STS. • Differences in methodologies, the subjective discretion of different authors, and the combined BV values vs separate floral and faunal sensitivities has resulted in differences "Habitat sensitivity" between the BMP and the present report. • Watercourse Habitat is scattered throughout the focus area and is often incorporated into the larger BMUs as "sensitive habitat". The refined habitat delineations provided by STS make provisions for these features to be mapped separately.
		Senegalia Thornveld	Moderately low	Intermediate	
		Calcrete Habitat	Intermediate	Intermediate	
		Transformed Habitat	Low	Low	
		Watercourse Habitat	Moderately High	Intermediate	
	Moderate	Calcrete Habitat	Intermediate	Intermediate	• According to the BMP, this BMU is not ecologically degraded across its entire distribution. This, together with factors such as different

BMU (Omni Eko, 2019)	BV value	Habitat Unit Overlap (STS)	Floral Sensitivity as defined by STS	Faunal Sensitivity as defined by STS	Justification for overlap
BMU 4 - Wild Olive Woodland		*Senegalia* Thornveld	Moderately Low	Intermediate	methodologies etc., has resulted in different sensitivities (as identified by STS) being identified across the BMU. • In areas close to existing mining operations (e.g., within the Transformed and *Senegalia* Thornveld habitat), factors such as edge effects have impacted the overall condition of these habitats. • Watercourse and Non-watercourse Habitat are scattered throughout the focus area and is often incorporated into the larger BMUs as "sensitive habitat" or unique features. The refined habitat delineations provided by STS make provisions for these features to be mapped separately.
		Transformed Habitat	Low	Low	
		Watercourse Habitat	Moderately high	Intermediate	
		Non-watercourse Habitat	Moderately Low	Intermediate	
BMU 5 - Camphor Bush Panveld	Very High	*Senegalia* Thornveld	Moderately Low	Intermediate	• The *Senegalia* Thornveld is likely a derivative of the *Senegalia- Tarchonanthus* Thornveld. With anthropogenic influences, this habitat has altered and is no longer extensively similar to the *Senegalia- Tarchonanthus* thornveld at a local scale. However, at a broad scale, several features of these habitat units are similar thus supporting the broad scale category of the BMU. • Watercourse and Non-watercourse Habitat are scattered throughout the focus area and is often incorporated into the larger BMUs as "sensitive habitat" or unique features. The refined habitat delineations provided by STS make provisions for these features to be mapped separately.
		Watercourse Habitat	Moderately high	Intermediate	
		Non-watercourse Habitat	Moderately Low	Intermediate	
		Senegalia- Tarchonanthus Thornveld	Intermediate	Intermediate	

BMU (Omni Eko, 2019)	BV value	Habitat Unit Overlap (STS)	Floral Sensitivity as defined by STS	Faunal Sensitivity as defined by STS	Justification for overlap
		Transformed Habitat	Low	Low	
BMU 6 - Dwarf Karroid Shrubland	Very High	Calcrete Habitat	Intermediate	Intermediate	• This BMU is widespread according to the BMP. The Kalahari Thornveld and the Calcrete Habitat all consist of a grassy layer. This grassy layer is the dominant feature in which these habitat units have been grouped at a broad scale. At a more local scale, this BMU can be micro mapped into different components as identified by STS. • Differences in methodologies, the subjective discretion of different authors, and the combined BV values vs separate floral and faunal sensitivities has resulted in differences "Habitat sensitivity" between the BMP and the present report. • Watercourse Habitat is scattered throughout the focus area and is often incorporated into the larger BMUs as "sensitive habitat". The refined habitat delineations provided by STS make provisions for these features to be mapped separately.
		Kalahari Thornveld (very small area of overlap)	Intermediate	Intermediate	
		Watercourse Habitat	Moderately high	Intermediate	
BMU 7 - Groenwaterspruit	Moderate	NA This BMU was outside of the assessment area	NA	NA	NA This BMU was outside of the assessment area thus not considered

BMU = Biodiversity Management Unit (as defined by the BMP); BV = Biodiversity Value.

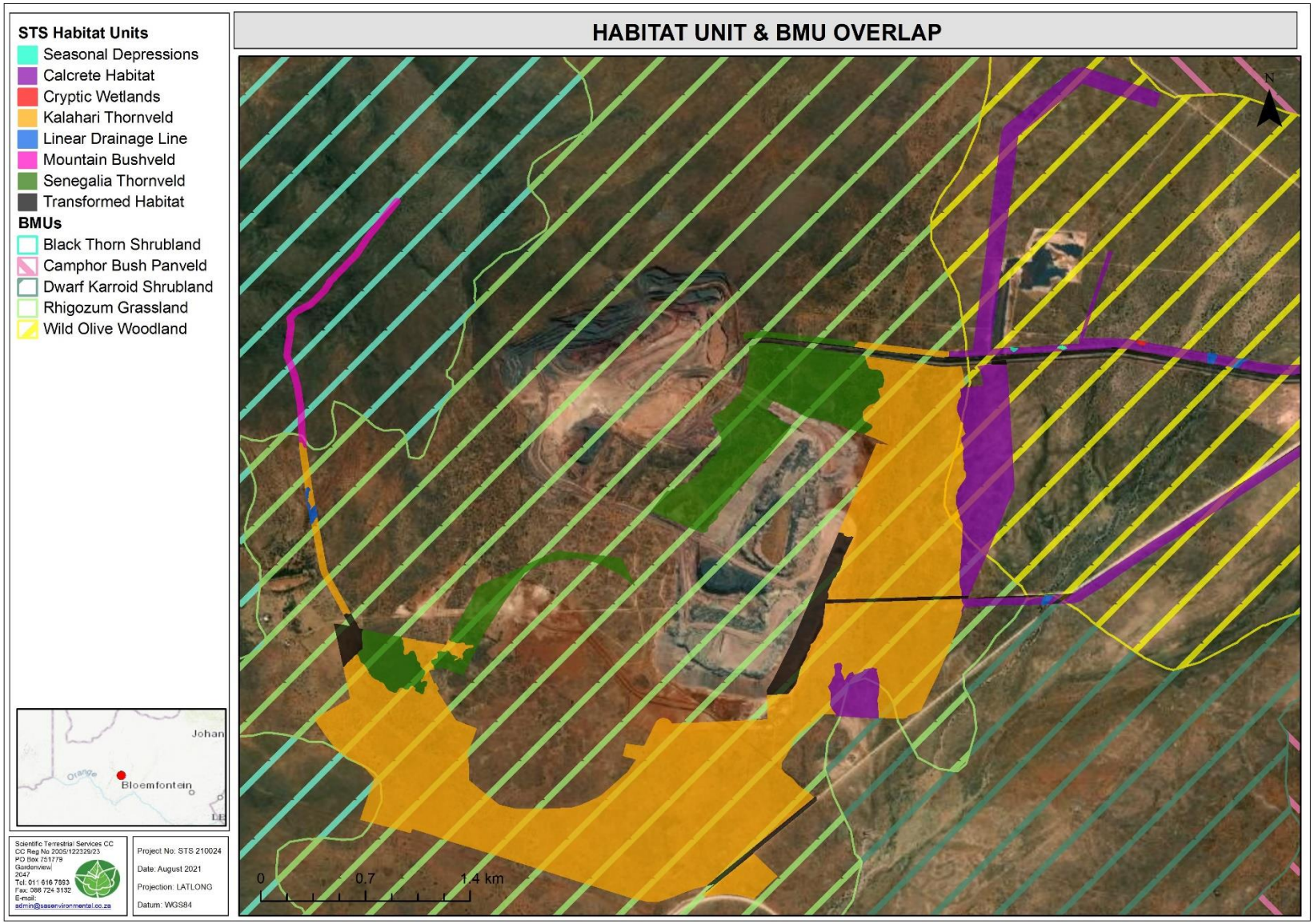


Figure 2: Conceptual illustration of the overlap of the habitat units (as defined by STS) and the BMUs associated with the western sections of the focus area.

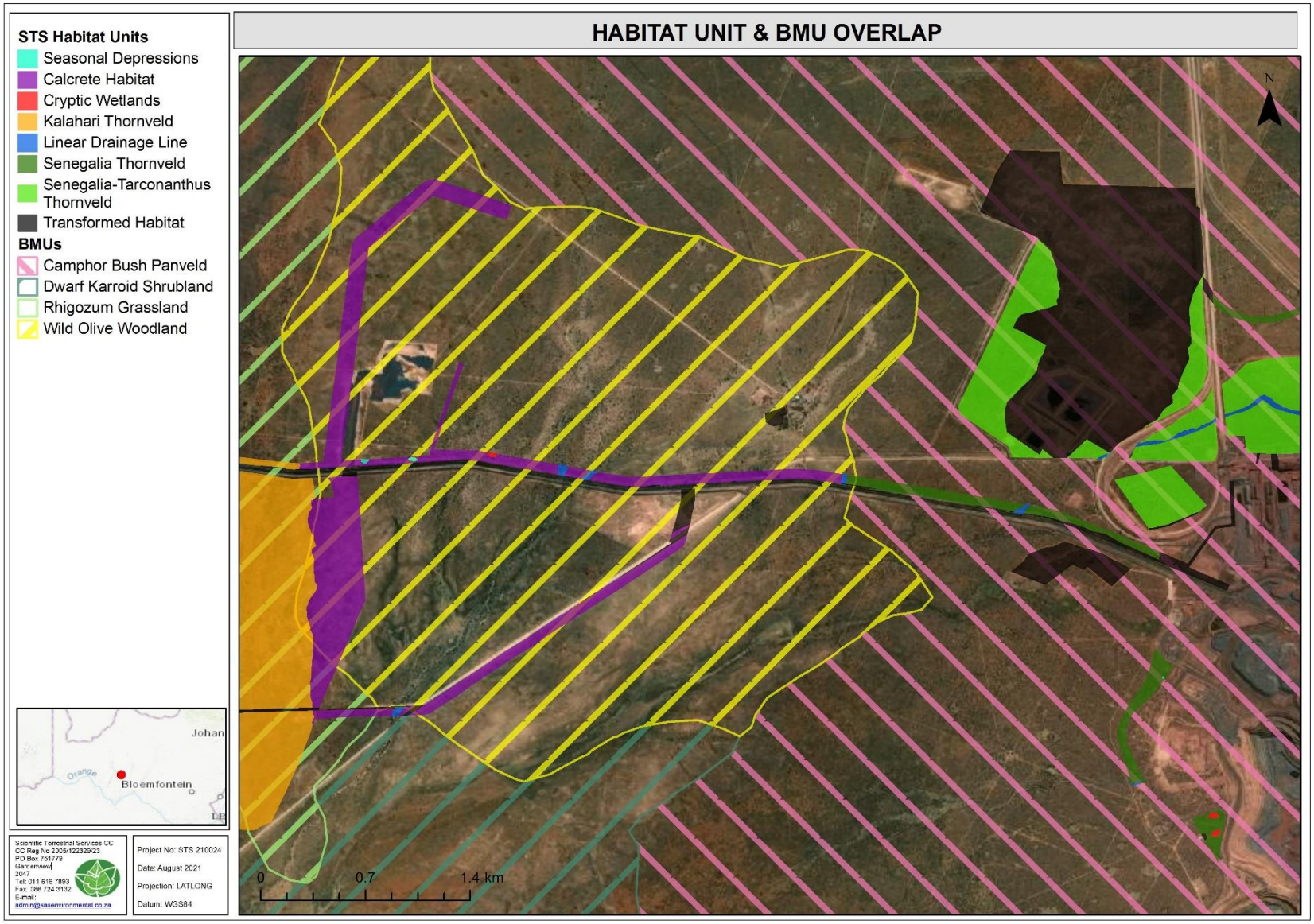


Figure 3: Conceptual illustration of the overlap of the habitat units (as defined by STS) and the BMUs associated with the central sections of the focus area.

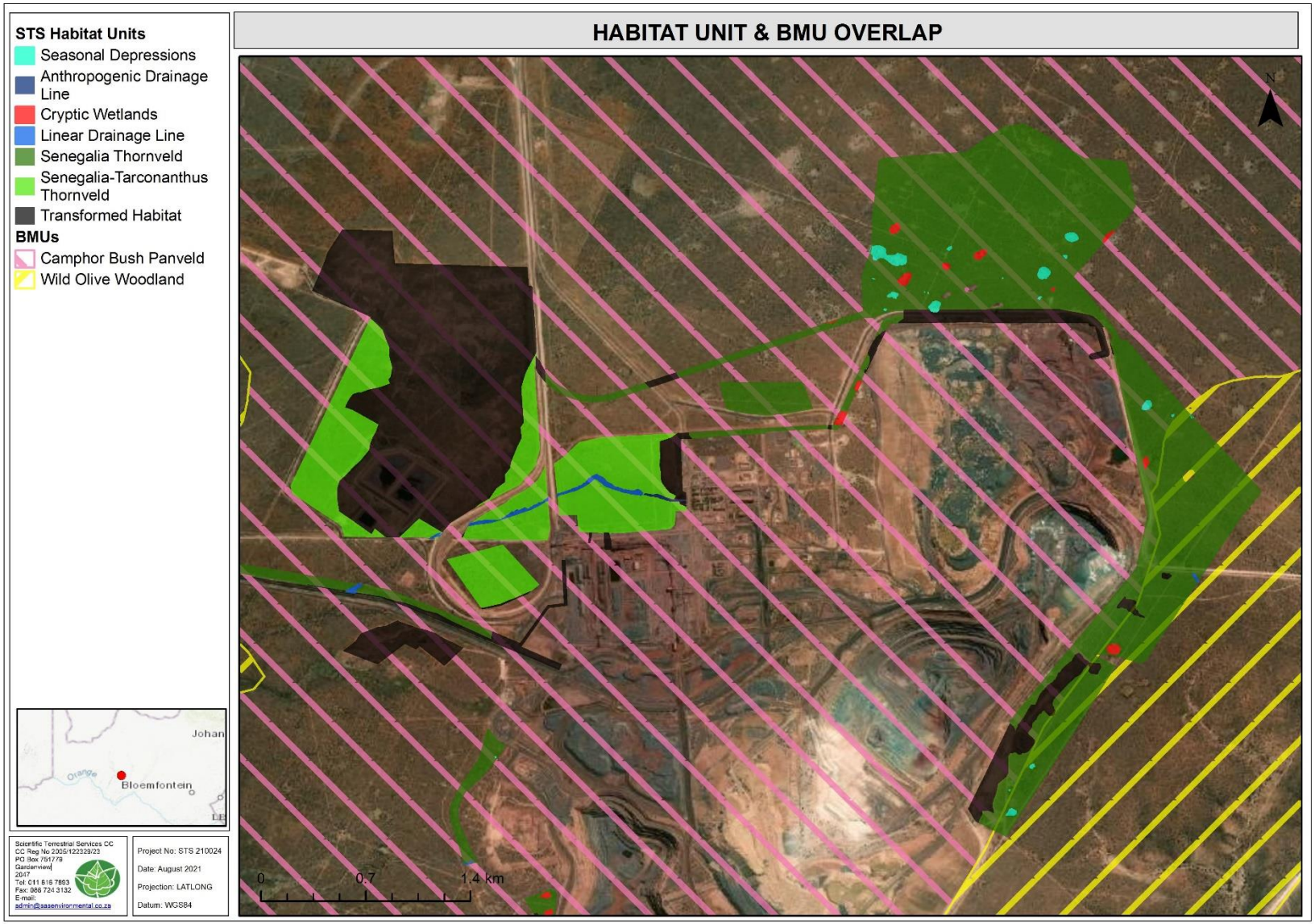


Figure 4: Conceptual illustration of the overlap of the habitat units (as defined by STS) and the BMUs associated with the eastern sections of the focus area.

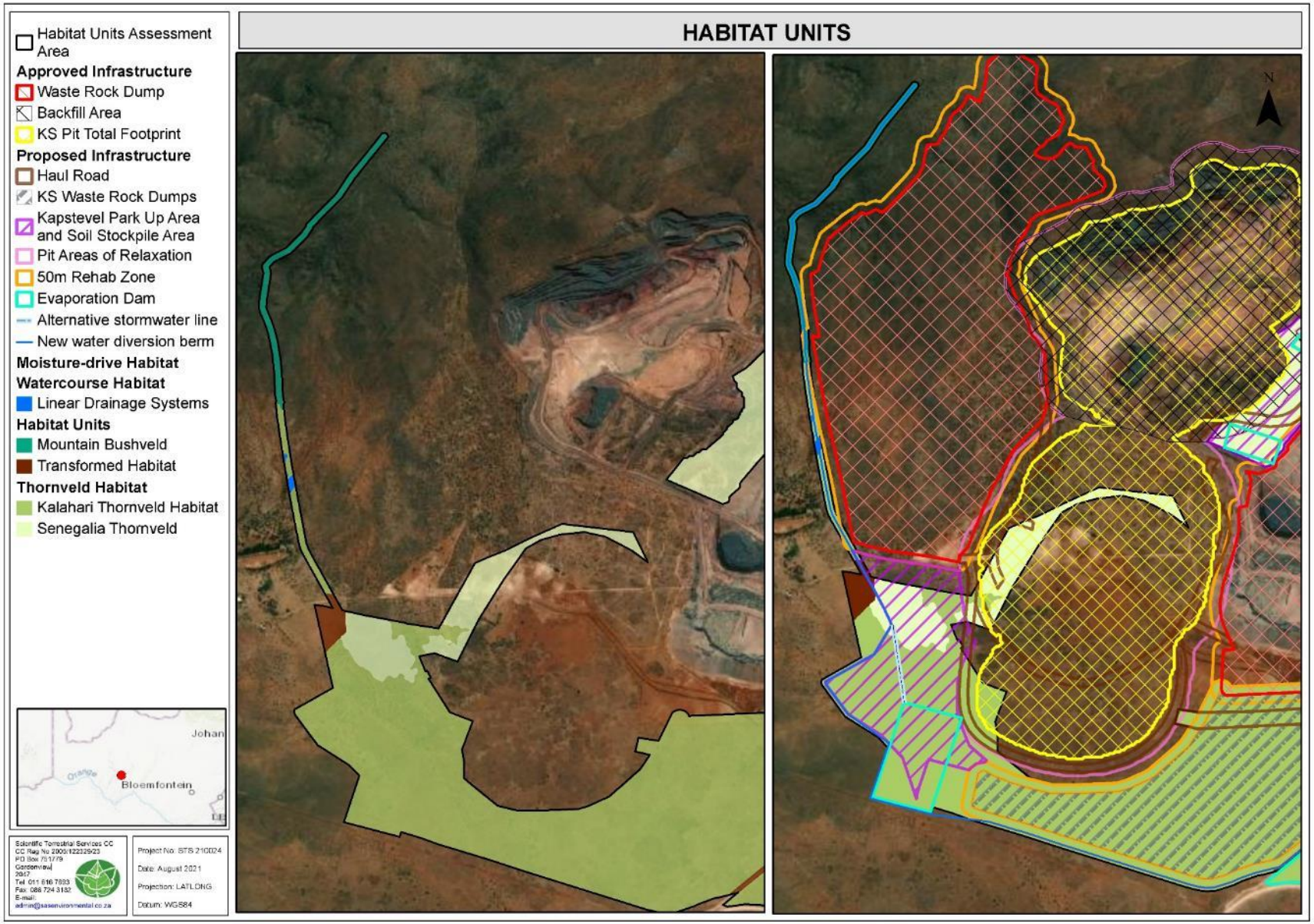


Figure 5: Conceptual illustration of the habitat units associated with the western sections of the focus area. The frame on the left depicts the only the habitat units whereas the frame on the right depicts the habitat units and the proposed and approved infrastructure layout.

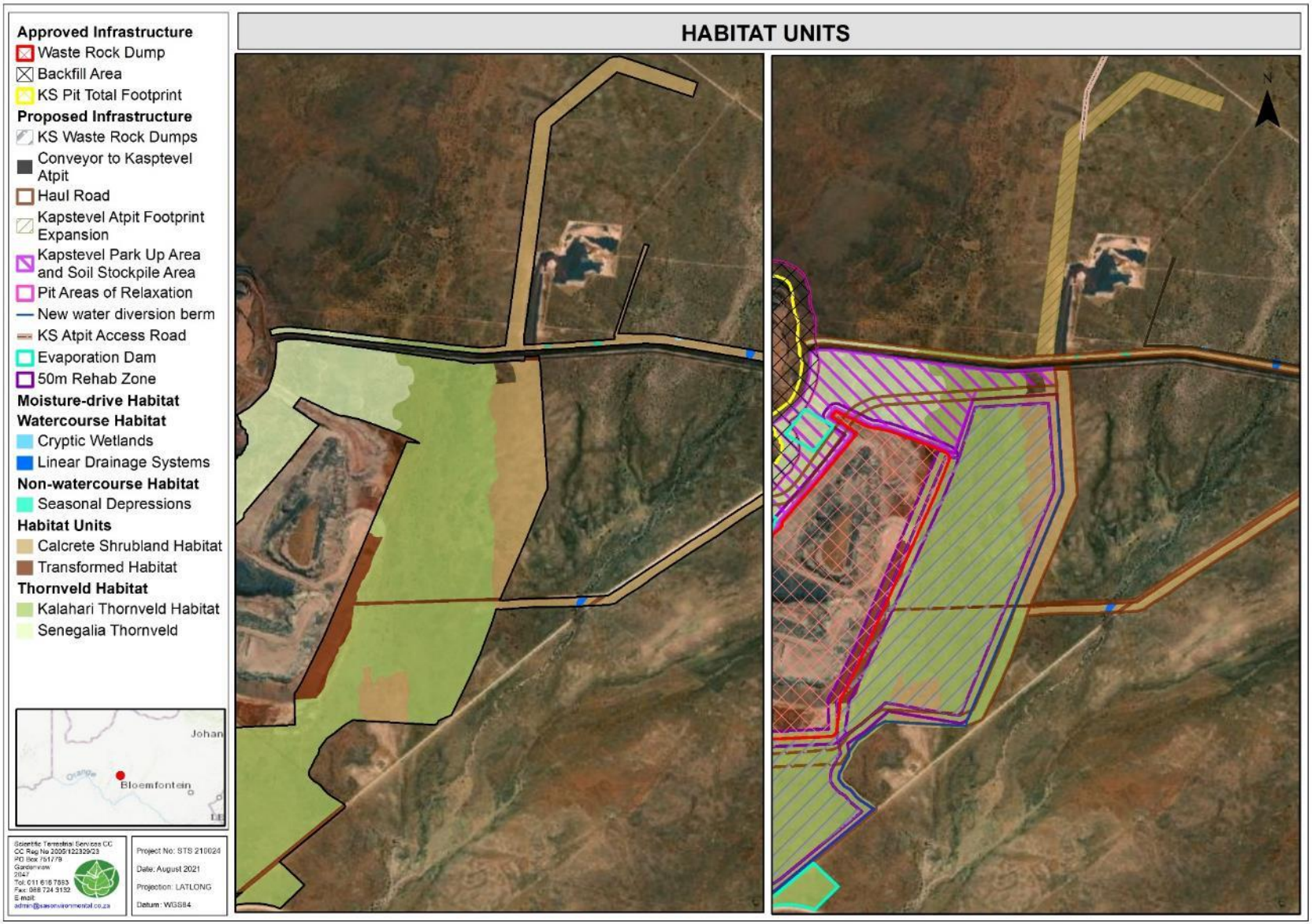


Figure 6: Conceptual illustration of the habitat units associated with the central-west sections of the focus area. The frame on the left depicts only the habitat units, whereas the frame on the right depicts the habitat units and the proposed and approved infrastructure layout.

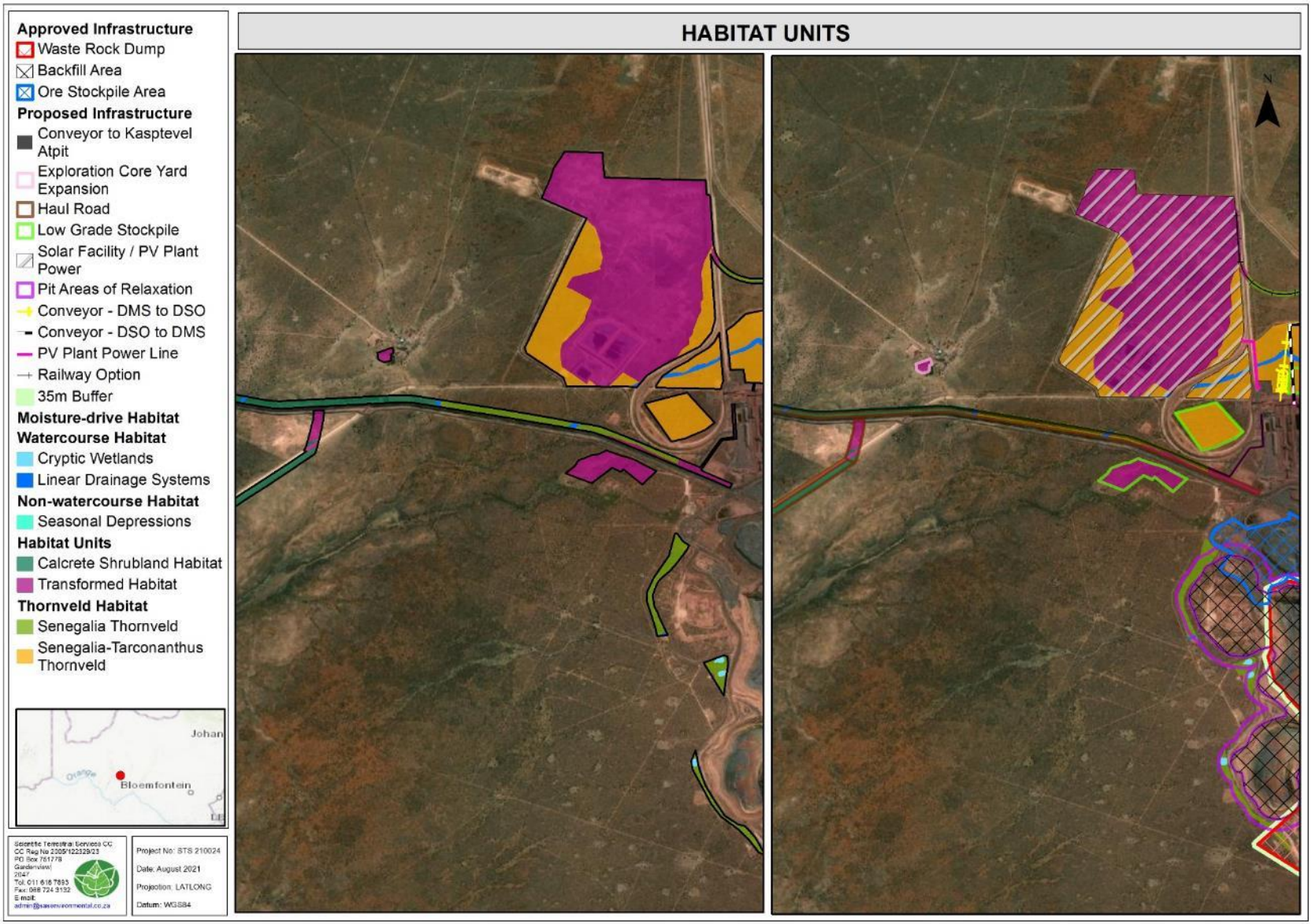


Figure 7: Conceptual illustration of the habitat units associated with the central-east sections of the focus area. The frame on the left depicts only the habitat units, whereas the frame on the right depicts the habitat units and the proposed and approved infrastructure layout.

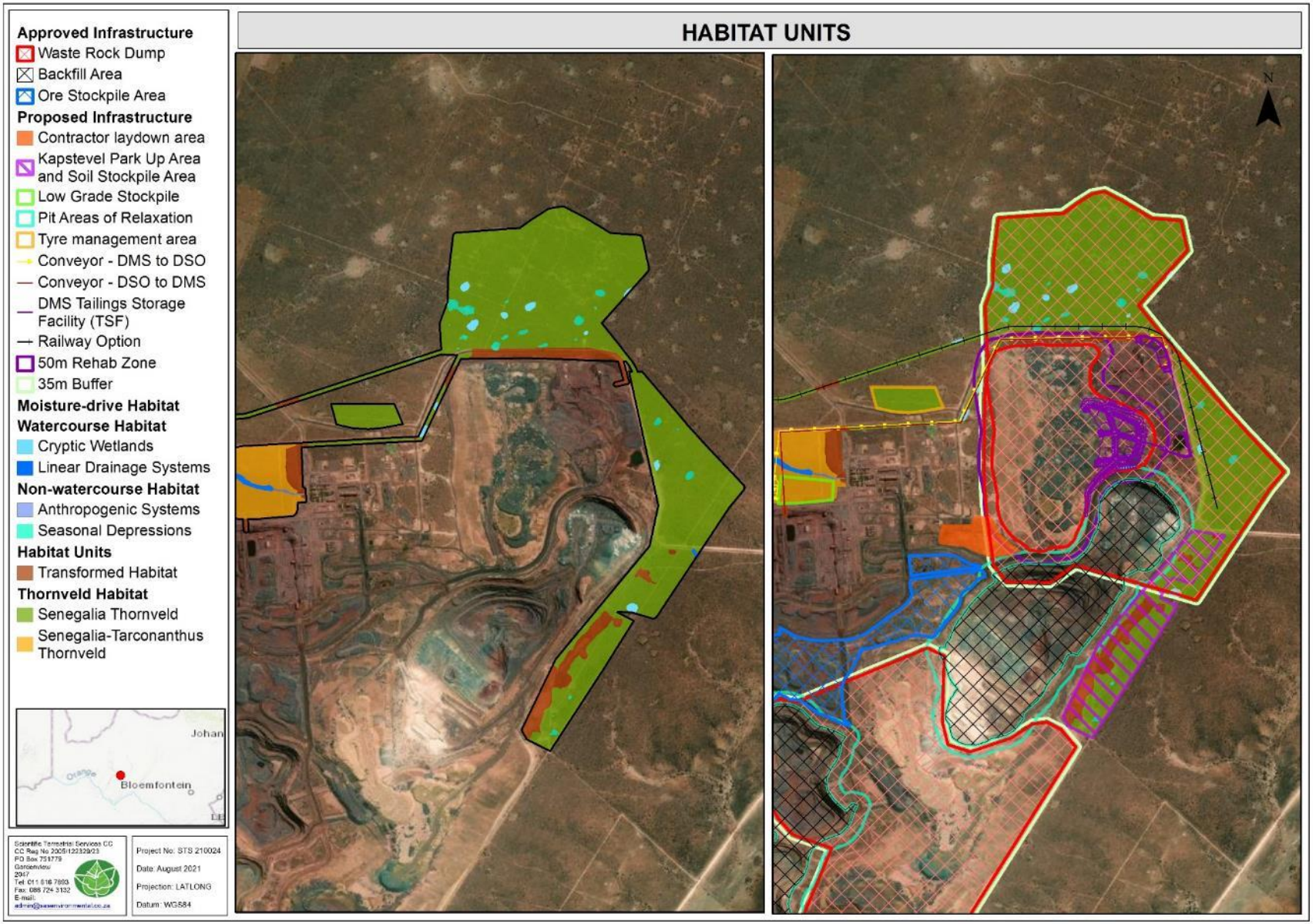


Figure 8: Conceptual illustration of the habitat units associated with the eastern sections of the focus area. The frame on the left depicts only the habitat units, whereas the frame on the right depicts the habitat units and the proposed and approved infrastructure layout.

3.2.1 Thornveld Habitat (Overlapping BMUs: *Rhigozum* Grassland (BMU3), Wild Olive Woodland (BMU4), Camphor Bush Panveld (BMU5), Dwarf Karroid Shrubland (BMU6))

REFERENCE PHOTOS

Typical habitat associated with the Thornveld Habitat Unit and its associated subunits: a) *Senegalia-Tarconanthus* Thornveld, b) *Senegalia* Thornveld, and c) Kalahari Thornveld.

***SENEGALIA-TARCONANTHUS* THORNVELD**	
HABITAT OVERVIEW	**SPECIES OVERVIEW**
The *Senegalia-Tarchonanthus* Thornveld is associated with a well-developed tree and shrub layer which was interspaced by open veld. The habitat was largely dominated by *Senegalia mellifera* subsp. *detinens* and *Tarchonanthus camphoratus*. The grass layer was mostly continuous and dominated by species such as *Enneapogon cenchroides, Eragrostis echinochloidea, Eragrostis rigidior,* and *Schmidtia kalahariensis*. This subunit is in a moderately intact ecological condition although it has been subjected to mining associated edge effects (e.g., Alien, and invasive plant (AIP) proliferation and changes in fire and herbivory regimes[1] due to the location of the subunit near existing mining infrastructure), which have resulted in some woody encroachment (particularly by *S. mellifera* subsp. *detinens* and *T. camphoratus*). This subunit does share an affinity with the reference vegetation type, i.e., the Postmasburg Thornveld, in terms of *some* species. However, the overall species composition and the structure of this habitat subunit is not considered to be representative of the reference vegetation type.	Compositional characteristics of the habitat subunit: ➢ Dominant grass species included *Enneapogon cenchroides, Eragrostis echinochloidea, Brachiaria nigropedata, Eragrostis rigidior, Fingerhuthia africana,* and *Schmidtia kalahariensis;* ➢ Representative forb and herb species included *Arctotis leiocarpa*, *Dicerocaryum eriocarpum*, *Geigeria ornativa, Hermannia comosa,* and *Sesamum triphyllum;* ➢ The woody layer was well represented; *S. mellifera* subsp. *detinens* and *T. camphoratus* dominated. Other common species included *Ziziphus mucronata, Euclea crispa, Euclea undulata* and *Grewia flava;* ➢ Common succulent species recorded included *Lycium cinereum* and *Viscum rotundifolium;*

[1] Fire and herbivory are considered important ecological drivers of savanna systems (O'Connor et al. 2014). Compositional and structural changes to floral communities are often associated with altered fire and herbivory regimes.

Vegetation structure: The vegetation structure can be described as **open to (semi-)closed thornveld** (as per Diagram A1 in Appendix A), with an almost continuous grass layer. Overall, the habitat subunit supported a moderate species diversity.	➢ AIP species were evident, although not frequently recorded within the subunit. AIP species included *Prosopis glandulosa var. torreyana, Tagetes minuta, Opuntia ficus-indica, Bidens pilosa,* and *Schkuhria pinnata.* Refer to **Appendix C** for a list of species recorded within this habitat subunit.
SENEGALIA THORNVELD	
HABITAT OVERVIEW	**SPECIES OVERVIEW**
The *Senegalia* Thornveld was dominated by *S. mellifera* subsp. *detinens*. Encroachment by *S. mellifera* subsp. *detinens* varied throughout the subunit, with some areas more encroached than others, thus resulting in varied habitat integrity within this subunit. Overall species composition was the same throughout; the woody layer was not diverse and included species such as *Grewia flava* and *Ziziphus mucronata*. The grass layer was semi-continuous and dominated by species such as *Enneapogon cenchroides, Eragrostis echinochloidea, Eragrostis rigidior,* and *Schmidtia kalahariensis.* This subunit is in a moderately low ecological condition because of the overall encroached nature of the subunit and the effects of associated mining edge effects (e.g., AIP proliferation and changes in fire and herbivory regimes due to the location of the subunit near existing mining infrastructure and open cast pits). The low species diversity and overall encroached nature of this habitat has resulted in a vegetation community that is not representative of the reference vegetation type, i.e., the Postmasburg Thornveld. Vegetation structure: The vegetation structure can be described as **open to closed thornveld** (as per Diagram A1 in Appendix A), which is encroached (in places) by thorny, woody species, particularly *S. mellifera* subsp. *detinens.* Overall, the habitat subunit supported a moderately low species diversity.	Compositional characteristics of the habitat subunit: ➢ Dominant grass species included *Enneapogon cenchroides, Melinis repens, Eragrostis echinochloidea, Eragrostis rigidior,* and *Schmidtia kalahariensis;* ➢ Representative forb and herb species included *Senna italica subsp. arachoides, Dicerocaryum eriocarpum, Cucumis africanus* and *Geigeria ornativa* ➢ The woody layer was well represented; *S. mellifera* subsp. *detinens* dominated and was encroaching in some areas. Other common species included *Ziziphus mucronata, Tapinanthus oleifolius, Asparagus laricinus* and *Grewia flava;* ➢ Common succulent species recorded included *Viscum rotundifolium;* ➢ AIP species were evident, although not frequently recorded within the subunit. AIP species included *Tagetes minuta, Chenopodium album, Bidens pilosa,* and *Schkuhria pinnata.* Refer to **Appendix C** for a list of species recorded within this habitat subunit.
KALAHARI THORNVELD	
HABITAT OVERVIEW	**SPECIES OVERVIEW**
The Kalahari Thornveld subunit was characterised by an open to semi-dense tree savanna interspaced by grassy plains. The subunit comprised of scattered *Vachellia erioloba* and *Boscia albitrucia* trees as well as other *Vachellia* and *Senegalia* species. Overall, the species diversity (particularly woody species) within this subunit was higher than that of the other Thornveld Habitat subunits. The grass layer was well developed and semi-continuous and dominated by species such as *Aristida meridionalis*, *Enneapogon cenchroides, Eragrostis echinochloidea,* and *Schmidtia kalahariensis*. This subunit is in a moderately intact ecological condition, although it has been subjected to some mining associated edge effects (e.g., AIP proliferation and changes in fire and herbivory regimes due to the location of the subunit near existing mining infrastructure and open cast pits. Despite the impacts from associated mining edge effects, the vegetation community of this subunit is most representative of the Postmasburg Thornveld vegetation type, particularly in terms of species composition and species structure.	Compositional characteristics of the habitat subunit: ➢ Dominant grass species included *Aristida meridionalis*, *Brachiaria nigropedata, Enneapogon cenchroides, Eragrostis echinochloidea, Eragrostis rigidior,* and *Schmidtia kalahariensis;* ➢ Representative forb and herb species included *Geigeria ornativa, Senecio sp., Sesamum triphyllum, Hermbstaedtia fleckii, Hermannia comosa* and *Kyphocarpa angustifolia;* ➢ The woody layer was well represented. Common species recorded included *Vachellia erioloba, Boscia albitruca*, *Vachellia hebeclada subsp. hebeclada, Vachellia tortilis subsp. heteracantha, Rhigozum trichotomum, Asparagus laricinus, Olea europaea subsp. africana* and *Searsia burchellii;* ➢ Common succulent species recorded included *Lycium cinereum, Aloe grandidentata and Viscum rotundifolium;*

Vegetation structure: The vegetation structure can be described as **open to closed thornveld** (as per Diagram A1 in Appendix A). Overall, the habitat subunit supported a moderately high species diversity.	➢ AIP species were evident, although not frequently recorded within the subunit. AIP species included *Tagetes minuta, Opuntia ficus-indica, Bidens pilosa,* and *Schkuhria pinnata.* Refer to **Appendix C** for a list of species recorded within this habitat subunit.
Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc)	
Presence of Unique Landscapes	The Thornveld Habitat Unit, and thus its three subunits, are situated within **CBA1**[2] and **ESA**[3] habitat and a **Centre of Endemism**. According to the Northern Cape CBA Reason Map (Oosthuysen & Holness, 2016) the CBA1 areas within the focus area have been identified as such because of the presence of i) conservation areas, ii) FEPA catchment areas, iii) presence of nearby rivers, iv) located within an endemic vegetation type (namely the Postmasburg Thornveld), and v) landscape structural elements. Other features as identified by the Northern Cape Critical Biodiversity Areas (NCCBA; NCDENC, 2016) database include "Other Natural Areas[4]" (i.e., ONAs). The subunits were located within the following Habitat: - The *Senegalia-Tarconanthus* Thornveld subunit is located within ONA habitat; - The *Senegalia* Thornveld subunit is located within ONA and ESA habitat; and - The Kalahari Thornveld subunit is located largely within ONA habitat, although a small section in the southeast of the subunit is located within CBA1 habitat and a small section located in the western section of the subunit is located within ESA habitat. ➢ Most of the focus area is located within areas identified as ONA. These areas are not considered to provide unique habitat within the landscape. ➢ Although the *Senegalia* Thornveld is encroached in some areas, it still has the propensity to support ecological processes (e.g., dispersal and connective corridors) and thus its classification within ESA habitat was confirmed. The classification of the small sections of the Kalahari Thornveld within CBA1 habitat (in the west of the subunit) and ESA habitat (within the southeast of the subunit) was also confirmed during the site visit. Although the Kalahari Thornveld has been somewhat impacted by mining associated edge effects, the subunit in overall good ecological condition and shares an affinity (in terms of structure and composition) with the reference vegetation type (i.e., the Postmasburg Thornveld). As such, the classification of the CBA1 and ESA habitat within the Kalahari Thornveld can be confirmed. ➢ The focus area is located within the Griqualand West Centre (GWC) of plant endemism. This semi-arid region is broadly described as Savanna, forming part of the Eastern Kalahari Bushveld Bioregion. Studies investigating the endemism of the centre report at least 23 plant species that have restricted distributions (Frisby *et al.* 2019). As such, the presence of unique habitat, suitable for potentially support GWC endemics is available.
Species of Conservation Concern	In terms of Section 56 of the National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) (NEMBA), threatened species are Red Data Listed (RDL) species falling into the Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected (P) categories of ecological status. During the June-July 2021 field assessment, no RDL species were identified within the habitat unit. The National Web-based Environmental Screening Tool indicated that the focus

[2] CBA1 (i.e., CBA irreplaceable) are areas required to meet conservation and biodiversity (pattern and process) targets. These areas are important for the persistence of a viable representative sample of ecosystems and species, as well as the long-term ecological functioning of the landscape. CBA 1 (i.e., CBA irreplaceable) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

[3] ESAs are supporting zones or areas which must be safeguarded as they are needed to prevent degradation of surrounding CBAs and formal Protected Areas. Although ESAs are not essential for meeting biodiversity targets, they do play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services (SANBI-BGIS, 2017).

[4] Ona's consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs (SANBI-BGIS, 2017).

area is in an area of **Low Sensitivity** from a Plant Species Theme perspective. As such, no SCC are expected to be associated with this habitat unit as per the screening tool. This sensitivity score was supported for this habitat as no available habitat for RDL species was recorded. Furthermore, no RDL species were recorded within the focus area by Zietsman & Zietsman (2019).

The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) provides a list of Specially Protected Species (Schedule 1) and Protected Species (Schedule 2) for the Northern Cape Province. Provincially protected species recorded and the Probability of Occurrence (POC) calculations for NCNCA protected species are presented below for each of the habitat subunits:

- *Senegalia-Tarconanthus* Thornveld:
  - ***Gymnosporia buxifolia* (POC = Confirmed; Status = LC);**
  - *Olea europaea* subsp. a*fricana* (POC = High; Status = LC);
  - *Babiana bainesii* (POC = High, Status = LC);
  - *Babiana hypogaea* (POC = High; Status = LC);
  - *Gomphocarpus fruticosus* (POC = High; Status = LC);
  - *Gomphocarpus tomentosa* (POC = High; Status = LC);
  - *Jamesbrittenia atropurpurea* (POC = High; Status = LC);
  - *Oxalis lawsonii* (POC = High; Status = LC);
  - *Chasmatophyllum musculinum* (POC = Medium; Status = LC);
  - *Crassula corallina* (POC = Medium; Status = LC); and
  - *Kalanchoe rotundifolia* (POC = Medium; Status = LC).

- *Senegalia* Thornveld:
  - ***Gymnosporia buxifolia* (POC = Confirmed; Status = LC);**
  - ***Gomphocarpus fruticosus* (POC = Confirmed; Status = LC);**
  - *Gomphocarpus tomentosa* (POC = High; Status = LC);
  - *Chasmatophyllum musculinum* (POC = Medium; Status = LC);
  - *Kalanchoe rotundifolia* (POC = Medium; Status = LC); and
  - *Olea europaea* subsp. a*fricana* (POC = Medium; Status = LC).

- Kalahari Thornveld:
  - ***Gymnosporia buxifolia* (POC = Confirmed; Status = LC);**
  - ***Olea europaea* subsp. *africana* (POC = Confirmed; Status = LC);**
  - ***Ruschia* cf. *griquensis* (POC = Confirmed; Status = LC);**
  - *Babiana bainesii* (POC = High, Status = LC);
  - *Babiana hypogaea* (POC = High; Status = LC);
  - *Gomphocarpus fruticosus* (POC = High; Status = LC);
  - *Gomphocarpus tomentosa* (POC = High; Status = LC);
  - *Jamesbrittenia atropurpurea* (POC = High; Status = LC);
  - *Kalanchoe rotundifolia* (POC = High; Status = LC);
  - *Oxalis lawsonii* (POC = High; Status = LC);
  - *Chasmatophyllum musculinum* (POC = Medium; Status = LC);
  - *Crassula corallina* (POC = Medium; Status = LC);
  - *Euphorbia duseimata* (POC = Medium; Status = LC);

- *Manulea burchellii* (POC = Medium; Status = LC);
- *Microloma aratum* (POC = Medium; Status = LC);
- *Moraea polystachya* (POC = Medium; Status = LC);
- *Pachypodium succulentum* (POC = Medium; Status = LC); and
- *Trachyandra saltii* (POC = Medium; Status = LC).

Additionally, protected tree species as per the National Forest Act, 1998 (Act No. 84 of 1998) (NFA), were observed within the Thornveld Habitat Unit. Protected tree species recorded and the POC calculations for NFA protected species are presented below for each of the habitat subunits:

- *Senegalia-Tarconanthus* Thornveld:
  - *Boscia albitrunca* (POC = High; Status = LC).
  - *Vachellia erioloba* (POC = Medium, Status = LC); and
  - *Vachellia haematoxylon* (POC = Medium; Status = LC).

- *Senegalia* Thornveld:
  - *Boscia albitrunca* (POC = Medium; Status = LC).

- Kalahari Thornveld:
  - ***Boscia albitrunca* (POC = Confirmed; Status = LC).**
  - ***Vachellia erioloba* (POC = Confirmed, Status = LC); and**
  - ***Vachellia haematoxylon* (POC = Confirmed; Status = LC).**

The Threatened or Protected Species (TOPS) List as per the 2007 Regulations provides a list of protected species for the Northern Cape. Suitable habitat was identified for the following species within the focus area:

- *Senegalia-Tarconanthus* Thornveld & *Senegalia* Thornveld:
  - *Harpagophytum procumbens* (POC =High; Status = LC).

- Kalahari Thornveld:
  - *Hoodia gordonii* (POC = Previously confirmed; Status = DDD[5]; this species was recorded on site in previous assessments of the focus area (Omni Eko, 2015)); and
  - *Harpagophytum procumbens* (POC =High; Status = LC).

Permits from the Northern Cape Department of Environment and Nature Conservation (NCDENC) and authorisation from the Department of Forestry, Fisheries, and the Environment (DFFE) should be obtained to remove, cut, or destroy any of the confirmed protected and/or threatened species before any vegetation clearing may take place.

Refer to **Appendix B** for the complete floral SCC assessment results.

[5] Data Deficient - Insufficient Information.

Some reference photos of flora within this habitat unit



From left to right: *Tarconanthus camphoratus* (a dominant woody species within the *Senegalia-Tarconanthus* Thornveld), *Eriospermum* cf. *roseum* (a geophyte recorded within the *Senegalia-Tarconanthus* Thornveld and the Kalahari Thornveld), and *Roepera pubescens* (recorded throughout the Thornveld habitat unit).



From left to right: *Hermannia comosa* (a frequently recorded herb throughout the Habitat Unit); *Boscia albitrunca* (a NFA protected tree recorded within the Kalahari Thornveld), *Searsia burchellii* (frequently recorded within the Kalahari Thornveld).

Concluding Remarks

The *Senegalia-Tarconanthus* Thornveld and the Kalahari Thornveld subunits are moderately important from a floral ecological importance and resource management perspective. The remaining subunit, the *Senegalia* Thornveld, is of a moderately low importance form a floral ecological perspective.

Key considerations:

- The reference vegetation types, as per Mucina & Rutherford (2006), in which the Thornveld Habitat is situated included the **Postmasburg Thornveld**. The low diversity altered fire and herbivory regimes[6] and fairly encroached nature associated with the *Senegalia* Thornveld subunit has resulted in a vegetation community that is no longer considered representative of the reference vegetation type. The *Senegalia-Tarconanthus* Thornveld subunit, which although has been subjected to impacts from associated mining edge effects and altered fire and herbivory regimes, does share an affinity with the reference vegetation type, i.e., the Postmasburg Thornveld, in terms of *some* species. However, the overall species composition and the structure of this habitat subunit is not considered to be representative of the reference vegetation type. The remaining area within the Thornveld Habitat unit, namely the Kalahari Thornveld subunit shared the greatest affinity with the reference vegetation type (particularly the Postmasburg Thornveld) in terms of species composition and structure. However, given the degree of altered fire regimes and heavy grazing pressure, as well as the presence of other edge effects including AIP infestation, this subunit is not considered to be fully representative of the reference vegetation type, although it is currently in an overall moderately good ecological state.

- The Thornveld habitat unit provides suitable habitat to sustain viable populations of several floral SCC as per the NCNCA, NFA and TOPS. However, threatened RDL species are less likely to be present within the Habitat Unit. If the proposed development is authorised, it will be necessary to conduct a thorough summer season walkdown of the footprint areas and all protected and threatened floral species encountered marked for relocation to suitable habitat outside the direct footprint (as far as is feasible). It should be noted that *V. erioloba* cannot be relocated. The protected species walkdown must be conducted during the flowering season of the species to ensure adequate detection and identification of the species. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation.

- In terms of the National Web-based Environmental Screening Tool outcome, the Thornveld Habitat Unit matches the "low sensitivity" assigned to the Plant Species Theme. This is because no RDL species nor any suitable habitat thereof was located within the focus area.

- In terms of the National Web-based Environmental Screening Tool outcome, the focus area was deemed to have a "high sensitivity" for the Terrestrial Biodiversity Theme. This sensitivity score was supported for the Thornveld habitat as the location of this habitat unit within CBA1 and ESA habitat was confirmed. The CBA1 habitat within the southeast section of the Kalahari Thornveld subunit as well as the ESA habitat within the western section of the Kalahari Thornveld subunit was confirmed during the site visit. The classification of ESA habitat within the *Senegalia* Thornveld Subunit was also confirmed during the site assessment. Although this subunit is prone to encroachment in some areas, it still has the propensity to provide important ecological services (e.g., dispersal and landscape corridors). Within CBAs and ESAs, development should be planned, and activities undertaken in a way that minimises impact on ecological processes, e.g., limiting fragmentation of habitat especially as CBAs and ESAs within the Northern Cape serve as climate change resilient areas and are important for landscape structural elements (Oosthuysen & Holness 2016). The proponent will need to engage with the relative authorities in respect to the infrastructure development proposed within the identified CBA and ESA areas.

- Currently, this habitat unit does not support many AIP species. However, if the proposed development is authorised, construction activities within parts of this habitat unit as well as areas that are not included within the direct development footprint (i.e., surrounding natural areas) will be at increased risk of being invaded by AIPs. It is recommended that an AIP species management plan be developed to manage AIP proliferation within the unit and the surrounding natural areas. It is vital that care is taken to limit edge effect impacts on the surrounding natural areas. It is further recommended that a bush encroachment control plan be developed and implemented for the Habitat Unit, with particular interest within the *Senegalia* Thornveld subunit.

[6] Fire and herbivory are considered important ecological drivers of savanna systems (O'Connor et al. 2014). Compositional and structural changes to floral communities are often associated with altered fire and herbivory regimes. Given that herbivory and fire within the focus area are often anthropogenically altered, the associated composition within the Thornveld Habitat unit may subsequently change in response to the altered fire and herbivory regimes.

3.2.2 Calcrete Habitat (Overlapping BMUs: *Rhigozum* Grassland (BMU3), Wild Olive Woodland (BMU4), Dwarf Karroid Shrubland (BMU6))

REFERENCE PHOTOS

Typical habitat associated with the Calcrete Habitat Unit: a) & b) typical shallow, gravelly shrublands patches that are mosaiced between c) shrubby grassland patches.

HABITAT OVERVIEW	SPECIES OVERVIEW
The Calcrete Habitat Unit comprised of a mosaiced shrubland landscape. This habitat can be described as having shallow, gravelly shrublands (in which the grass layer is poorly developed) which were mosaiced between shrubby grassland patches in which shrubs (particularly *Rhigozum trichotomum*) were present (and sometimes encroaching). The shallow, gravelly shrubland areas were characterised by small, scattered shrubs, including species such as *Lacomucinaea lineata*, and succulent species, including *Ruschia* cf. *calcarea*. The mosaiced shrubby grassland patches were dominated by grasses (including *Aristida adscensionis, Aristida congesta* subsp. *congesta*, and *Schmidtia kalahariensis*). Shrub species recorded within this shrubland grassland patches included *Rhigozum trichotomum* (which was encroaching in some areas), *Grewia flava* and *Melolobium microphyllum.* This habitat is in a moderately intact ecological condition although it has been subjected to mining associated edge effects (e.g., AIP proliferation and changes in fire and herbivory regimes[7] due to its location near existing mining activities), which have resulted in some woody encroachment (particularly by *R. trichotomum*). The habitat is, however, still largely intact, and	Compositional characteristics of the habitat unit: ➢ Dominant grass species included *Enneapogon cenchroides, Fingerhuthia africana, Aristida adscensionis, Aristida congesta* subsp. *congesta*, and *Schmidtia kalahariensis;* ➢ Representative forb and herb species included *Abutilon austro-africanum; Dicoma anomala, Eriospermum* cf. *roseum, Hermannia comosa, Pentzia calcarean* and *Kyphocarpa angustifolia* ➢ The woody layer was scattered, and common species included *Diospyros lycioides subsp. lycioides, Lacomucinaea lineata, Rhigozum trichotomum, Felicia cf. fascicularis, and Justicia divaricata;* ➢ In particular, the shallow, gravelly shrubland areas of this habitat unit provide suitable habitat for an array of succulent species. Common succulent species recorded within the habitat unit included *Ruschia cf. calcarean, Ruschia cf. griquensis, Hertia pallens* and *Crassula corallina; and*

[7] Fire and herbivory are considered important ecological drivers of savanna systems (O'Connor et al. 2014). Compositional and structural changes to floral communities are often associated with altered fire and herbivory regimes.

supports a variety of species. This Habitat Unit is considered representative of the reference Postmasburg Thornveld. Vegetation structure: The vegetation structure can be described as **sparse to open shrubland** (as per Diagram A1 in Appendix A). Overall, the habitat subunit supported a moderately high species diversity.	➢ AIP species were rarely recorded, although occasional individuals of *Bidens pilosa* and *Tagetes minuta* were recorded. Refer to **Appendix C** for a list of species recorded within this habitat unit.
Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc)	
Presence of Unique Landscapes	The Calcrete Habitat Unit is situated within **CBA1** habitat and a **Centre of Endemism**. According to the Northern Cape CBA Reason Map (Oosthuysen & Holness, 2016) the CBA1 areas within the habitat unit have been identified as such because of the presence of i) conservation areas, ii) FEPA catchment areas, iii) presence of nearby rivers, iv) located within an endemic vegetation type (namely the Postmasburg Thornveld), and v) landscape structural elements. Other features as identified by the NCCBA (NCDENC, 2016) include ONAs. ➢ Most of the focus area is located within areas identified as ONA. These areas are not considered to provide unique habitat within the landscape. ➢ The habitat unit is largely intact and supports a variety of species and is thus considered to be representative of the reference vegetation type, i.e., the Postmasburg Thornveld. As such, the classification of the CBA1 habitat within the Calcrete Habitat can be confirmed. ➢ This habitat unit, as with the remainder of the focus area, is located within the GWC of plant endemism; the presence of unique habitat that is suitable for potentially support GWC endemics is available. ➢ The Calcrete Habitat is well represented in the broader region. This habitat unit is representative of the Postmasburg Thornveld, an endemic vegetation type in South Africa, thus contributing to the uniqueness of this habitat unit on a national scale.
Species of Conservation Concern	No threatened floral SCC were recorded on site during the June-July 2021 field assessment. The National Web-based Environmental Screening Tool indicated that the focus area is in an area of **Low Sensitivity** from a Plant Species Theme perspective. As such, no SCC are expected to be associated with this habitat unit as per the screening tool. This sensitivity score was supported for this habitat as no available habitat for RDL species was recorded. Furthermore, no RDL species were recorded within the focus area by Zietsman & Zietsman (2019). The NCNCA provides a list of Specially Protected Species (Schedule 1) and Protected Species (Schedule 2) for the Northern Cape Province. Provincially protected species recorded and the POC calculations for the NCNCA protected species are presented below for the habitat unit: - ***Ruschia* cf. *griquensis* (POC = Confirmed; Status = LC);** - *Babiana bainesii* (POC = High, Status = LC); - *Babiana hypogaea* (POC = High; Status = LC); - *Bulbine abyssinica* (POC = High, Status = LC); - *Crassula muscosa* (POC = High; Status = LC); - *Euphorbia gariepina* (POC = High; Status = LC); - *Jamesbrittenia atropurpurea* (POC = High; Status = LC); - *Lithops aucampiae* (POC = High; Status = LC); - *Moraea polystachya* (POC = High; Status = LC); - *Chasmatophyllum musculinum* (POC = Medium; Status = LC); - *Euphorbia crassipes* (POC = Medium; Status = LC); - *Euphorbia wilmaniae* (POC = Medium; Status = LC); - *Freesia andersoniae* (POC = Medium; Status = LC); - *Kalanchoe rotundifolia* (POC = Medium; Status = LC); - *Microloma aratum* (POC = Medium; Status = LC); and

- *Pachypodium succulentum* (POC = Medium; Status = LC).

Additionally, protected tree species recorded and the POC calculations for NFA protected species are presented below for the habitat unit:

- ***Boscia albitrunca* (POC = Confirmed; Status = LC).**

The TOPS List as per the 2007 Regulations provides a list of protected species for the Northern Cape Province. Suitable habitat was identified for the following species within the focus area:

- *Hoodia gordonii* (POC = Medium; Status = DDD).

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

Refer to **Appendix C** for the complete floral SCC assessment results.

Some reference photos of flora within this habitat unit



From left to right: *Crassula corallina, Ruschia* cf. *calcarea* (frequently recorded succulents within the Calcrete Habitat); *Salsola kalaharica* (frequently recorded within the Calcrete Habitat).

Concluding Remarks

The Calcrete Habitat is important from a floral ecological importance and resource management perspective.

Key considerations:

- The reference vegetation type, as per Mucina & Rutherford (2006), in which the Calcrete Habitat is situated includes the **Postmasburg Thornveld**. The Calcrete Habitat is still largely intact and supports a variety of species. This habitat unit is thus considered representative of the reference vegetation type, namely the endemic Postmasburg Thornveld.

- The Calcrete habitat unit provides suitable habitat to sustain viable populations of several floral SCC as per the NCNCA, NFA and TOPS. However, threatened RDL species are less likely to be recorded within the habitat unit. If the proposed development is authorised, it will be necessary to conduct a thorough summer season walkdown of the footprint areas and all protected and threatened floral species encountered marked for relocation to suitable habitat outside the direct footprint (as far as is feasible). The protected species walkdown must be conducted during the flowering season of the species to ensure adequate detection and identification of the species. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation. Many of the SCC species, particularly *Lithops aucampiae*, that are likely to be recorded within the shallow, calcrete patches of this Habitat Unit are cryptic and difficult to find. Although these species were not recorded during the June-July 2021 field assessment

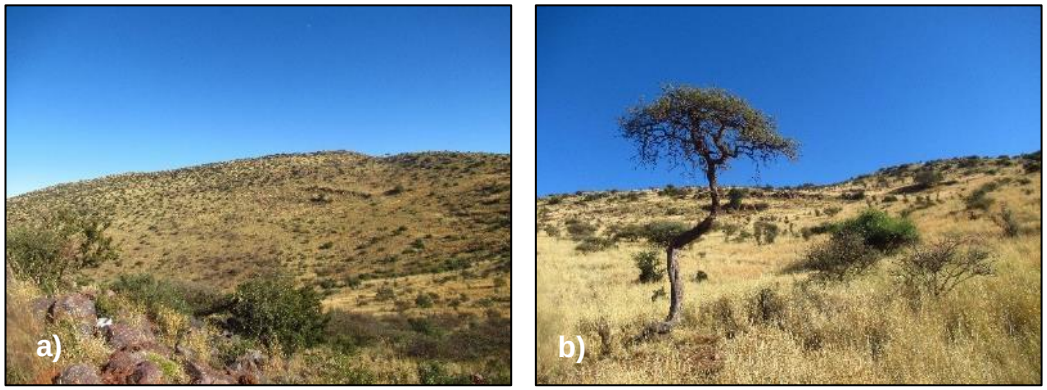
(attributed to the dormancy of these species during winter), they are likely to be present within the Habitat Unit (particularly the shallow, calcrete patches) thus necessitating the need for a summer season walkthrough.

- In terms of the National Web-based Environmental Screening Tool outcome, the Calcrete Habitat Unit matches the "low sensitivity" assigned to the Plant Species Theme. This is because no RDL species nor any suitable habitat thereof was located within the focus area.

- In terms of the National Web-based Environmental Screening Tool outcome, the focus area was deemed to have a "high sensitivity" for the Terrestrial Biodiversity Theme. This sensitivity score was supported for the Calcrete Habitat as the location of this habitat unit within CBA1 habitat was confirmed. The CBA1 habitat within the Calcrete Habitat unit was confirmed during the site visit. Within CBAs, development should be planned, and activities undertaken in a way that minimises impact on ecological processes, e.g., limiting fragmentation of habitat especially as CBAs within the Northern Cape serve as climate change resilient areas and are important for landscape structural elements (Oosthuysen & Holness 2016). The proponent will need to engage with the relative authorities in respect to the infrastructure development proposed within the identified CBAs.

- Currently, this habitat unit does not support many AIP species and only sporadic records of *Bidens pilosa* and *Tages minuta* were recorded. However, if the proposed development is authorised, construction activities within parts of this habitat unit as well as areas that are not included within the direct development footprint (i.e., surrounding natural areas) will be at increased risk of being invaded by AIPs. It is recommended that an AIP species management plan be developed to manage AIP proliferation within the unit and the surrounding natural areas.

3.2.3 Mountain Bushveld Habitat (Overlapping BMUs: Black Thorn Shrubland (BMU2))

REFERENCE PHOTOS
 **Typical habitat associated with the Mountain Bushveld Habitat Unit: a) landscape photograph of the habitat unit, and b) typical vegetation community associated with the habitat unit.**

HABITAT OVERVIEW	SPECIES OVERVIEW
The Mountain Bushveld habitat unit consisted of a hill with gentle slopes that were largely underlain by banded iron stone formations. The vegetation associated with this habitat unit was open bushveld and dominant woody species included *Diospyros austro-africana*, *Euclea crispa* subsp. *crispa*, *Olea europaea* subsp. *africana*, *Searsia tridactyla* and *Nymania capensis*. Geophytic Herbs including *Boophone disticha* and *Pellaea calomelanos* were frequently recorded within the habitat unit. The grass layer was well developed and comprised of *Brachiaria nigropedata Heteropogon contortus*, *Themeda triandra,* and *Schizachyrium sanguineum.* This habitat has not been impacted by nearby mining activities and is in a good ecological condition. Overall, the species composition and structure of this habitat unit resemble that of the reference vegetation type (namely the Kuruman Mountain Bushveld); thus, this habitat unit is considered representative of the reference vegetation type. Vegetation structure: The vegetation structure can be described as **open woodland** (as per Diagram A1 in Appendix A). Overall, the habitat unit is in good ecological condition and supported a moderately high species diversity.	Compositional characteristics of the habitat unit: ➢ Dominant grass species included *Brachiaria nigropedata, Heteropogon contortus*, *Aristida diffusa, Themeda triandra, Cymbopogon caesius,* and *Schizachyrium sanguineum;* ➢ Representative forb and herb species included *Geigeria ornativa*, *Barleria* cf. *macrostegia, Heliotropium* cf. *strigosum*, *Kyphocarpa angustifolia* and *Dicoma anomala;* ➢ Representative geophytic herbs included *Boophone disticha* and *Pellaea calomelanos;* ➢ The woody layer was well represented and common species included *Lantana rugosa, Diospyros austro-africana*, *Euclea crispa* subsp. *crispa*, *Euclea undulata, Vachellia erioloba, Searsia lancea* and *Nymania capensis;* ➢ Common succulent species recorded included *Hertia pallens; and* ➢ AIP species were mostly absent. Refer to **Appendix C** for a list of species recorded within this habitat unit.

Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc)	
Presence of Unique Landscapes	The Mountain Bushveld Habitat Unit is situated within **ESA** habitat and a **Centre of Endemism**. According to the Northern Cape CBA Reason Map (Oosthuysen & Holness, 2016; NCDENC, 2016) the CBA1 areas within the habitat unit have been identified as such because of the presence of i) conservation areas, ii) FEPA catchment areas, iii) located within an endemic vegetation type (namely the Kuruman Mountain Bushveld), and v) landscape structural elements. Most of the focus area is located within areas identified as ONA. These areas are not considered to provide unique habitat within the landscape. ➢ The habitat unit is in good ecological condition and is considered to be representative of the reference vegetation type, i.e., the Kuruman Mountain Bushveld. As such, the classification of the ESA habitat within the Mountain Bushveld Habitat can be confirmed. ➢ This habitat unit, as with the remainder of the focus area, is located within the GWC of plant endemism; the presence of unique habitat, suitable for potentially support GWC endemics is potentially available. ➢ This habitat unit is representative of the Kuruman Mountain Bushveld, an endemic vegetation type in South Africa, thus contributing to the uniqueness of this habitat unit on a national scale.
Species of Conservation Concern	No threatened floral SCC were recorded on site during the June-July 2021 field assessment. The National Web-based Environmental Screening Tool indicated that the focus area is in an area of **Low Sensitivity** from a Plant Species Theme perspective. As such, no SCC are expected to be associated with this habitat unit as per the screening tool. This sensitivity score was supported for this habitat as no available habitat for RDL species was recorded. The NCNCA provides a list of Specially Protected Species (Schedule 1) and Protected Species (Schedule 2) for the Northern Cape Province. Provincially protected species recorded and the POC calculations for the NCNCA protected species are presented below for the habitat unit: - ***Aloe grandidentata* (POC = Confirmed; Status = LC);** - ***Gymnosporia buxifolia* (POC = Confirmed; Status = LC);** - ***Nymania capensis* (POC = Confirmed; Status = LC);** - ***Olea europaea* subsp. *africana* (POC = Confirmed; Status = LC);** - ***Boophone disticha* (POC = Confirmed; Status = LC);** - *Freesia andersoniae* (POC = High, Status = LC); - *Pachypodium succulentum* (POC = High, Status = LC); - *Fockea angustifolia* (POC = Medium; Status = LC); and - *Kalanchoe rotundifolia* (POC = Medium; Status = LC). Additionally, protected tree species recorded and the POC calculations for NFA protected species are presented below for the habitat unit: - ***Vachellia erioloba* (POC = Confirmed; Status = LC); and** - *Boscia albitrunca* (POC = High; Status = LC). The TOPS List as per the 2007 Regulations provides a list of protected species for the Northern Cape Province. Suitable habitat was identified for the following species within the focus area: - *Hoodia gordonii* (POC = Medium; Status = DDD). Permits from the NCDENC and authorisation from the DFFE should be obtained to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place. Refer to **Appendix C** for the complete floral SCC assessment results.

Some reference photos of flora within this habitat unit

From left to right: (dried) *Barleria* cf. *macrostegia* (frequently recorded herb), *Boophone disticha* (frequently recorded NCNCA protected geophyte); *Nymania capensis* (protected species as per the NCNCA).

Concluding Remarks

The Mountain Bushveld Habitat is important from a floral ecological importance and resource management perspective.

Key considerations:

- The reference vegetation type, as per Mucina & Rutherford (2006), in which the Mountain Bushveld Habitat is situated includes the **Kuruman Mountain Bushveld**. The Mountain Bushveld Habitat is still largely intact and supports a variety of species. This habitat unit is thus considered representative of the reference vegetation type, namely the endemic Kuruman Mountain Bushveld.

- The Mountain Bushveld habitat unit provides suitable habitat to sustain viable populations of several floral SCC as per the NCNCA, NFA and TOPS. However, threatened RDL species are less likely to be recorded within the habitat unit. If the proposed development is authorised, it will be necessary to conduct a thorough summer season walkdown of the footprint areas and all protected and threatened floral species encountered marked for relocation to suitable habitat outside the direct footprint (as far as is feasible). It should be noted that *V. erioloba* cannot be relocated. The protected species walkdown must be conducted during the flowering season of the species to ensure adequate detection and identification of the species – November to February will be ideal for this area. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation.

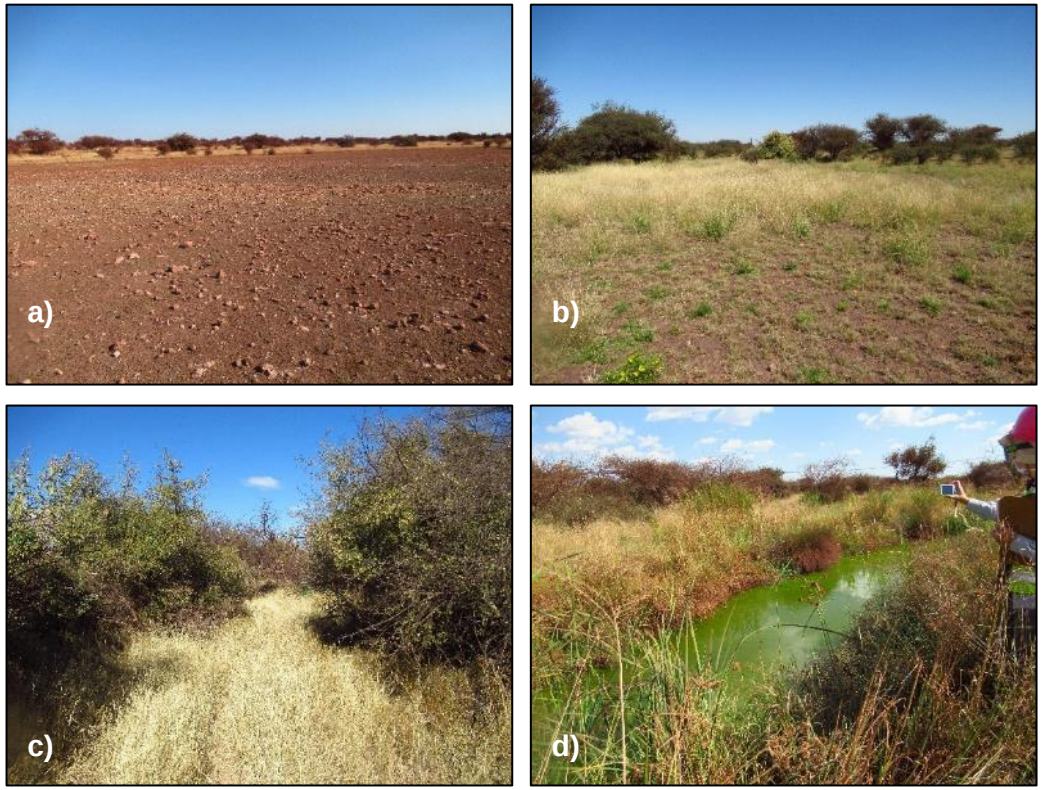
- In terms of the National Web-based Environmental Screening Tool outcome, the Mountain Bushveld Habitat Unit matches the “low sensitivity” assigned to the Plant Species Theme. This is because no RDL species nor any suitable habitat thereof was located within the focus area.

- In terms of the National Web-based Environmental Screening Tool outcome, the focus area was deemed to have a “high sensitivity” for the Terrestrial Biodiversity Theme. This sensitivity score was supported for the Mountain Bushveld Habitat as the location of this habitat unit within ESA habitat and within the endemic Kuruman Mountain Bushveld was confirmed. The ESA habitat within the Mountain Bushveld Habitat unit was confirmed during the site visit. Within ESAs, development should be planned, and activities undertaken in a way that minimises impact on ecological processes, e.g., limiting fragmentation of habitat especially as CBAs within the Northern Cape serve as climate change resilient areas and are important for landscape structural elements (Oosthuysen & Holness 2016). The proponent will need to engage with the relative authorities in respect to the infrastructure development proposed within the identified ESAs.

- Currently, this habitat unit does not support AIP species and has not been extensively impacted by mining edge effects. However, if the proposed development is authorised, construction activities within parts of this habitat unit as well as areas that are not included within the direct development footprint (i.e., surrounding natural areas) will be at increased risk of being invaded by AIPs and at increased risk of bush encroachment (by *S. mellifera* subsp. *detinens*). It is recommended that an AIP species management plan and bush encroachment control plan be developed to manage AIP and bush encroachment proliferation within the unit and the surrounding natural areas.

3.2.4 Moisture-driven Habitat Unit (Overlapping BMUs: *Rhigozum* Grassland (BMU3), Wild Olive Woodland (BMU4), Camphor Bush Panveld (BMU5), Dwarf Karroid Shrubland (BMU6))

REFERENCE PHOTOS



Typical habitat associated with a) Cryptic wetlands (dry during the site visit; support typical wetland indicator plants), b) Seasonal Depressions (typically have continuous vegetation throughout without characteristic wetland indicator species), c) Linear Drainage Line Habitat (dominant species including *Ziziphus mucronata* and *Searsia lancea* which are much denser and taller along the drainage line than within the surrounding habitat), and d) Anthropogenic Drainage Line Habitat.

The Moisture-driven Habitat includes **watercourses** as delineated within the Freshwater Ecological Assessment (SAS 202147, 2021), and includes Cryptic Wetlands and Linear Drainage Lines. The Moisture-driven Habitat also includes **non-watercourse habitat** which is not considered true watercourse as defined in the NWA, i.e., Seasonal Depressions and Anthropogenic Drainage Line Habitat. Different community compositions were supported within the habitat unit and as such, four subunits are recognised within the Watercourse and Non-watercourse habitats: Cryptic Wetlands (Watercourse Habitat), Linear Drainage Line Habitat (Watercourse Habitat), Anthropogenic Drainage Line Habitat (Non-watercourse Habitat) and Seasonal Depressions (Non-watercourse Habitat).

WATERCOURSE HABITAT	
CRYPTIC WETLAND HABITAT	
HABITAT OVERVIEW	**SPECIES OVERVIEW**
Several Cryptic Wetlands were recorded within the focus area. These wetlands, which can be described as pans that meet the classification of a watercourse (SAS 202147, 2021) are identifiable by the distinct vegetation communities that they support. Typical vegetation (e.g., *Cullen tomentosum* and *Eragrostis bicolor*) supported within these wetlands are key indicators of wetlands within arid and dry regions. These pans also generally support a characteristic lining of trees around their outer edges. These Cryptic Wetlands differ from "conventional" wetlands that are typical of those found in the more humid regions of South Africa. These typical wetland systems differ from the Cryptic Wetland characteristic of dry areas in that conventional wetlands are generally wet systems that have characteristic, continuously submerged soils. Cryptic Wetlands generally only have submerged soils after sufficient rainfall, which is very seasonal and sporadic within the arid regions in which these wetlands are found. Vegetation structure: The vegetation structure can be described as **open herbland** (as per Diagram A1 in Appendix A) that is surrounded by a semi-open tree lining.	Compositional characteristics of the habitat unit: ➢ Dominant grass species, which are considered to be indicator species of cryptic wetlands, included *Eragrostis echinochloidea, Eragrostis lehmanniana*, and *Eragrostis bicolor;* ➢ Typical indicator forb and herb species included *Cullen tomentosum*. Other species recorded within the wetlands included *Trianthema parvifolium;* ➢ The outer woody tree lining consisted of *Ziziphus mucronata* and *Searsia lancea*. Occasionally *Olea europaea* subsp. *africana* was also recorded within these linings; ➢ AIP species were mostly absent. Refer to **Appendix C** for a list of species recorded within this habitat unit.
LINEAR DRAINAGE LINE HABITAT	
HABITAT OVERVIEW	**SPECIES OVERVIEW**
This habitat subunit this subunit was associated with a thickened woody formation within the drainage lines or immediately adjacent to it. The floral community ranged from weakly to strongly riparian[8] in nature (as the species composition and structure varied from the surrounding Habitat areas)	Compositional characteristics of the habitat unit:

[8] **Riparian habitat**" (as per the National Water Act, 1998 (Act No. 36 of 1998) includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

throughout this subunit. The presence of seasonal water flow within the neighbouring drainage lines provides habitat for a higher diversity of floral species. Dominant woody species along the drainage line included *Ziziphus mucronata*, *Searsia lancea* and *Tarconanthus camphoratus*. Although the surrounding habitat also comprised of these dominant species, the overall structure of the surrounding habitat and the Linear Drainage Line Habitat, which is largely riparian in nature, differed significantly in that the vegetation within the Linear Drainage Line Habitat support a much denser and taller vegetation community than the surrounding woody communities. Vegetation structure: The vegetation structure can be described as **open to closed woodland** (as per Diagram A1 in Appendix A) that supported a moderate to dense woody species community.	➢ Grass species were well represented within the dry drainage lines. Doninant species included *Aristida congesta* subsp. *congesta, Enneapogon cenchroides, Eragrostis trichophora* and *Eragrostis truncata;* ➢ Forb and herb species were less well represented. Typical forb and herb species included *Geigeria ornativa, Hermannia comosa and Indigopheras* sp*;* ➢ The woody was varied from in density (with some areas illustrating a denser woody layer than other areas) and consisted of tall individuals of *Ziziphus mucronata, Tarconanthus camphoratus* and *Searsia lancea;* ➢ AIP species were mostly absent, although individuals of *Tagetes minuta and Bidens pilosa* were recorded. Refer to **Appendix C** for a list of species recorded within this habitat unit.
NON-WATERCOURSE HABITAT	
ANTHROPOGENIC DRAINAGE LINE HABITAT	
HABITAT OVERVIEW	**SPECIES OVERVIEW**
These areas have been artificially created and thus is not considered a true watercourse as defined in the NWA. This subunit supports a range of species that have an affinity for wet conditions, including *Typha capensis*. Vegetation structure: The vegetation structure can be described as **open woodland** (as per Diagram A1 in Appendix A) that supported a dense and diverse graminoid layer.	Compositional characteristics of the habitat subunit: ➢ The graminoid layer was well represented and dominant species included *Typha capensis*, *Digitaria eriantha*, *Fingerhuthia africana, Aristida congesta* subsp. *congesta, Enneapogon cenchroides,* and *Eragrostis trichophora;* ➢ The subunit was sparsely lined with woody species. Species recorded included *Searsia lancea* and *Tarchonanthus camphoratus*; and ➢ AIP species w*ere* prevalent within this subunit. Common species recorded included *Tagetes minuta, Bidens pilosa, Argemone ochroleuca subsp. ochroleuca* and *Solanum elaeagnifolium*. Refer to **Appendix C** for a list of species recorded within this habitat unit.
SEASONAL DEPRESSIONS	

The Seasonal Depressions consisted of low-lying areas where water preferentially flows or accumulates during rain events. The floral communities within these depressions lack wetland indicator vegetation (e.g., vegetation within the centre of the Seasonal Depressions especially differed from that of the Cryptic Wetlands). Vegetation was also continuous throughout the depressions and grass species such as *Aristida congesta* subsp. *congesta* and *Enneapogon cenchroides* (not wetland indicator species) were dominant. As with the Cryptic wetlands, the Seasonal Depressions also support a characteristic tree-lining on their outskirts. However, the composition of this tree-lining tends to be compositionally different with species such as *Tarconanthus camphoratus* and *Senegalia mellifera* subsp. *detinens* more common than the species characteristic of the Cryptic Wetlands (i.e., *Ziziphus mucronata* and *Searsia lancea*). Vegetation structure: The vegetation structure can be described as **open grassland** (as per Diagram A1 in Appendix A) that is surrounded by a semi-open tree lining.	Compositional characteristics of the habitat subunit: ➢ The grass layer was well represented, and dominant grass species included *Aristida congesta* subsp. *congesta* and *Enneapogon cenchroides;* ➢ Typical forb and herb species included. Other species recorded within the wetlands included *Trianthema parvifolium;* ➢ Representative geophytic herbs included *Hermannia comosa;* ➢ The outer woody tree lining consisted largely of *Tarconanthus camphoratus* and *Senegalia mellifera* subsp. *detinens* although occasional individuals of *Ziziphus mucronata* and Searsia lancea were also recorded; ➢ AIP species were mostly absent. Refer to **Appendix C** for a list of species recorded within this habitat unit.

Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc.)	
Presence of Unique Landscapes	The watercourse habitat (including the Cryptic Wetlands and the Linear Drainage Line Habitats) is significant from a biodiversity and conservation perspective. Important ecological corridors include the numerous Cryptic Wetlands and the Linear Drainage Lines – albeit more prominent during rainfall events. The Cryptic Wetlands are mapped within ESAs and the Linear Drainage Line is mapped within CBA1 according to the 2016 Northern Cape Critical Biodiversity Areas (NCCBA; NCDENC, 2016) dataset. ➢ The Watercourse habitat unit (including the Cryptic Wetlands and the Linear Drainage Line) is largely intact and supports a variety of species. As such, the classification of the ESA and CBA1 habitat within the Cryptic Wetlands and the Linear Drainage Line respectively can be confirmed. ➢ This habitat unit, as with the remainder of the focus area, is located within the GWC of plant endemism; the presence of unique habitat, suitable for potentially support GWC endemics is available. From a floral perspective, the non-watercourse habitat (seasonal depressions and Anthropogenic Drainage Line) is not considered to significantly contribute towards floral ecology within the focus area, nor within the greater region.
Species of Conservation Concern	No threatened floral SCC (i.e., RDL species) or TOPS listed plants were recorded on site during the June-July 2021 field assessment. The National Web-based Environmental Screening Tool indicated that the focus area is in an area of **Low Sensitivity** from a Plant Species Theme perspective. As such, no SCC are expected to be associated with this habitat unit as per the screening tool. This sensitivity score was supported for this habitat as no available habitat for RDL species was recorded. The NCNCA provides a list of Specially Protected Species (Schedule 1) and Protected Species (Schedule 2) for the Northern Cape Province. Provincially protected species recorded and the POC calculations for the NCNCA protected species are presented below for the habitat subunit: **Watercourse Habitat:** ➢ Cryptic Wetlands:

	- ***Olea europaea* subsp. *africana* (POC = Confirmed; Status = LC); and** - *Nerine laticoma* (POC = High; Status = LC). ➢ Linear Drainage Line: - ***Olea europaea* subsp. *africana* (POC = Confirmed; Status = LC);** - *Jamesbrittenia tysonii* (POC = High; Status = LC); and - *Nerine laticoma* (POC = Medium; Status = LC). **Non-watercourse Habitat**: ➢ Seasonal Depressions: - *Bulbine abyssinica* (POC = High; Status = LC); and - *Trachyandra saltii* (POC = High; Status = LC). ➢ Anthropogenic Drainage Line Habitat: - *Olea europaea* subsp. *africana* (POC = Medium; Status = LC). Additionally, protected tree species recorded and the POC calculations for NFA protected species are presented below for the habitat subunits: **Watercourse Habitat:** ➢ Cryptic Wetlands: - *Vachellia erioloba* (POC = High; Status = LC). ➢ Linear Drainage Line: - *Vachellia erioloba* (POC = Medium; Status = LC). **Non-watercourse Habitat**: ➢ Seasonal Depressions: - *Vachellia erioloba* (POC = High; Status = LC); and - *Boscia albitruca* (POC = High; Status = LC). ➢ Anthropogenic Drainage Line Habitat: - *Vachellia erioloba* (POC = Medium; Status = LC). Permits from NCDENC and DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. Refer to **Appendix B** for a list of species assessed as part of the SCC assessment.
Some reference photos of flora within this habitat unit	



From left to right: *Cullen tomentosum* (cryptic wetland indicator), *Ziziphus mucronata* (found within the tree lining of Cryptic Wetlands and Seasonal Depressions (occasionally) as well as the riparian zone of the Linear Drainage Line Habitat), and *Olea europaea* subsp. *africana* (a NCNA protected species often recorded within the tree lining of Cryptic Wetlands and within the riparian zone of the Linear Drainage Line habitat).

Concluding Remarks

The Watercourse Habitat (including the Cryptic Wetlands and the Linear Drainage Line subunits) are important from a floral ecological importance and resource management perspective. However, the Non-watercourse Habitat (including the Seasonal Depressions), is of a moderately low importance form a floral ecological perspective.

Key considerations:

- Habitat integrity varied between the Cryptic Wetlands, many of which have suffered impacts from adjacent mining pressures (i.e., dumping and vehicle movements through the features). The Cryptic Wetlands and Linear Drainage Lines comprise species that are protected either nationally or provincially, and they are important ecological corridors in the larger region. Despite the lower species diversity characterised by these features, they remain important in the greater landscape. Loss of watercourse habitat within arid regions is likely to have regional-scale impacts on the associated floral ecology.

- The Watercourse Habitat (including both the Cryptic Wetlands and the Linear Drainage Line subunits) provide suitable habitat to sustain viable populations of several floral SCC as per the NCNCA and the NFA. However, threatened RDL and TOPS species are less likely to be recorded within the Watercourse Habitat. To avoid the loss of potentially occurring floral SCC, the presence of such species should be confirmed before vegetation clearing commences. A thorough summer season walkdown of the footprint areas should take place where all floral SCC are marked for rescue and relocation or removal (where permit application would be required). This walkdown must take place during the growing season (ideally after adequate rains) when species identification will be more accurate, and many geophytes will emerge from their winter dormancy. It is recommended that no mining expansion impact on the Cryptic Wetlands and Linear Drainage Line Habitat.

- The non-watercourse habitat (especially the Seasonal Depressions and Anthropogenic Drainage Line) is deemed less important from an ecological perspective, and these features are either species-poor or comprise a homogenous vegetation community, with a low probability of floral SCC occurring within them.

- In terms of the National Web-based Environmental Screening Tool outcome, both the Watercourse Habitat (i.e., the Cryptic Wetlands and the Linear Drainage Line) and the Non-watercourse Habitat (i.e., the Seasonal Depressions) match the “low sensitivity” assigned to the Plant Species Theme. This is because no RDL species nor any suitable habitat thereof was located within the focus area.

- Sections of the Watercourse Habitat (particularly the Linear Drainage Line Habitat) was located (and confirmed) within CBA1 habitat. Furthermore, the Cryptic Wetlands, the Anthropogenic Drainage Lines and the Seasonal Depressions were located (and confirmed) to be within ESA habitat. In terms of the National Web-based Environmental Screening Tool outcome, the focus area was deemed to have a "high sensitivity" for the Terrestrial Biodiversity Theme. This sensitivity score was supported for the Moisture-driven Habitat Unit as a whole as the location of this habitat unit within CBA1 and ESA habitat was confirmed. This assigned sensitivity was further supported due to the presence of naturally occurring watercourses within the focus area.

- Within CBAs and ESAs, development should be planned, and activities undertaken in a way that minimises impact on ecological processes, e.g., limiting fragmentation of habitat especially as CBAs and ESAs within the Northern Cape serve as climate change resilient areas and are important for landscape structural elements (Oosthuysen & Holness 2016). The proponent will need to engage with the relative authorities in respect to the infrastructure development proposed within the identified CBA and ESA areas.

- Currently, the Moisture-driven Habitat does not support many AIP species (although the Anthropogenic Drainage Line Habitat does support a higher diversity and abundance of AIPs than the remaining subunits). However, if the proposed development is authorised, construction activities within parts of this habitat unit, as well as areas that are not included within the direct development footprint (i.e., surrounding natural areas especially areas downstream of the Linear Drainage lines system), will be at increased risk of being invaded by AIPs. It is recommended that an AIP species management plan be developed to manage AIP proliferation within the unit and the surrounding natural areas. It is vital that care is taken to limit edge effect impacts on the surrounding natural areas.

3.2.5 Transformed Habitat Unit (Overlapping BMUs: *Rhigozum* Grassland (BMU3), Wild Olive Woodland (BMU4), Camphor Bush Panveld (BMU5))

REFERENCE PHOTOS



Typical vegetation and landscape features associated with the Transformed Habitat Unit

HABITAT OVERVIEW	SPECIES OVERVIEW
This habitat unit consists of areas that have been transformed or largely modified because of mining activates. This habitat unit includes areas where i) vegetation is significantly degraded (and largely consists of a homogeneous floral community species that favour disturbed habitats), or ii) where vegetation is largely absent because of mining-related activities. Overall, the Transformed Habitat has been severely impacted by anthropogenic activities and associated edge effects (e.g., dumping, AIP proliferation, and soil disturbance) which has resulted in the degradation of the unit and overall low species diversity. This habitat unit has experienced a shift, in terms of species composition, structure and function, from the reference vegetation type and is thus not considered to be representative thereof. Vegetation structure: The vegetation structure can be defined as **transformed habitat in which no specific vegetation structure was evident.** Floral diversity was low to moderately low within this habitat unit. AIPs were most prolific within this habitat unit.	Compositional characteristics of the habitat unit: ➢ Graminoids species richness was low. Common grass species observed on site included *Melinis repens, Heteropogon contortis, Cynodon dactylon, Eragrostis rigidior,* and *Aristida congesta* subsp. *congesta;* ➢ Representative forb and herb species included *Solanum incanum, Tribulus zeyheri* subsp. *zeyheri* and *Gomphocarpus fruiticosus;* ➢ The tree layer was largely absent although individuals of *Rhigozum trichotomum, Senegalia mellifera subsp. detinens* and *Asparagus laricinus* were occasionally recorded within the unit; and ➢ AIPs were most prominent within the habitat unit and included the following species: *Prosopis glandulosa var. torreyana, Solanum elaeagnifolium, Chenopodium album, Tagetes minuta, Alternanthera pungens,* and *Pennisetum setaceum.* Refer to **Appendix C** for a list of species recorded within this Habitat Unit.

Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc.)	
Presence of Unique Landscapes	Within areas identified as an **ESA** and a **Centre of Endemism**: - Sections of this habitat unit throughout the focus area are located within ESAs. However, given the level of transformation that this habitat has experienced, it is no longer considered to be representative of an ESA. The floral communities are indicative of disturbed habitat and do not have the complement of species that would render this habitat unit a representative of the ESA in which it occurs. - Habitat indicative of the GWC is not present within this habitat unit and as such no unique habitat related to the centre of endemism is likely to be available. - Given the above, no unique habitat was identified within this habitat unit.
Species of Conservation Concern	No threatened floral SCC were recorded on site during the April 2021 field assessment. The National Web-based Environmental Screening Tool indicated that the focus area is in an area of **low Sensitivity** from a Plant Species Theme perspective. As such, no SCC are expected to be associated with this habitat unit as per the screening tool. This sensitivity score was supported for this habitat as no available habitat for RDL species was recorded. The NCNCA provides a list of Specially Protected Species (Schedule 1) and Protected Species (Schedule 2) for the Northern Cape Province. Suitable habitat is available within the habitat to support / potentially support provincially protected species including: - ***Gomphocarpus fruticosus*** **(POC = Confirmed; Status = LC); and** - ***Gomphocarpus tomentosus*** **(POC = Confirmed; Status = LC).** No NFA protected tree species or TOPS listed species were observed within the habitat unit. Permits from the NCDENC should be obtained to remove, cut, or destroy any of the above-mentioned protected species before any vegetation clearing may take place. Refer to **Appendix B** for the complete floral SCC assessment results.

Some reference photos of flora within this habitat unit

From left to right: *Prosopis glandulosa var. torreyana* (NEMBA Category 3 AIP species[9]), *Pennesitum setaceum* (NEMBA Category 1b AIP species), *Gomphocarpus fruticosus* (a provincially protected SCC as per the NCNCA).

Concluding Remarks

This habitat unit is not considered to be important from a floral ecological and resource management perspective.

Key considerations:

- Due to its transformed nature, and associated shift in compositional characteristics of this habitat unit from its original state, the habitat unit is not considered represent the reference vegetation type, namely the Postmasberg Thornveld. Despite the habitat unit not being representative of the reference vegetation type, this unit provides suitable habitat to sustain viable populations of some floral SCC, particularly the NCNCA protected species, *G. fruticosus* and *G. tomentosa*. No suitable habitat was available for RDL species. The proposed development within this habitat unit is unlikely to disrupt any significant ecological processes or impede any ecological corridors (from a purely floral perspective). Although *G. fruticosus* and *G. tomentosa* are protected under the NCNCA, it is well represented within the national region, especially along roadsides where it easily grows in disturbed soil.

- If the proposed development is authorised, it will be necessary to conduct a thorough walkdown of the footprint areas and all protected and floral species marked for possible relocation (where feasible). Permits from the NCDENC should be obtained to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place.

- In terms of the National Web-based Environmental Screening Tool outcome, these areas align with the low sensitivity assigned to the Plant Species Theme as the habitat does not support extensive floral diversity and is not deemed important for the conservation of protected species. In terms of the Very High Sensitivity assigned to the Terrestrial Biodiversity Theme, this habitat unit does not align with the screening tool outcome as having a "very high sensitivity". Although sections of this habitat unit were identified as being located within ESAs, the available habitat within the Transformed Habitat is no longer considered to be representative of an ESA.

[9] **NEMBA Category:** **1a: Category 1a** – Invasive species that require compulsory control; **1b: Category 1b** – Invasive species that require control by means of an invasive species management programme; **2: Category 2** – Commercially used plants that may be grown in demarcated areas if there is a permit and that steps are taken to prevent their spread; **3: Category 3** – Ornamentally used plants that may no longer be planted; existing plants may remain, except within the flood line of watercourses and wetlands, if all reasonable steps are taken to prevent their spread (Bromilow, 2001).

- Due to the area already being exposed to disturbances and edge effect impacts from current and historic mining activities (e.g., excavation), this habitat unit is susceptible to AIP proliferation. Care must be taken to limit edge effect impacts on the surrounding natural areas. Furthermore, it is recommended that an AIP species management plan be developed to manage AIP proliferation within the subunit, and further the Transformed Habitat Unit as a whole.

- Given the lower diversity, and overall transformed nature of this Habitat Unit, mining expansion activities within this unit should be optimised.

3.3 Alien and Invasive Plant (AIP) Species

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

3.3.1 Legal Context

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

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

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

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

Duty of care related to listed invasive species are referred to in NEMBA Section 73[11]. The motivation for this duty of care is both environmentally and economically driven. Management of alien species in South Africa is estimated to cost at least ZAR 2 billion (US$142 million) each year - this being the amount currently spent by the national government's DEFF - i.e. the Working for Water programme (van Wilgen, 2020). Managing AIPs early on will reduce clearing costs in the long run.

3.3.2 Site Results

A total of 13 AIP species were recorded during the June-July 2021 field assessment. Of the 13 AIPs recorded during the field assessment, six species are listed under NEMBA Category 1b, and was species is listed as NEMBA Category 3. The remaining six species are not listed under NEMBA, but these species are identified as problem plants as they can have a negative impact on the indigenous floral communities within the focus area. Refer to Table 2 below for more information on the AIPs recorded on site.

Although the extent of AIPs within the focus area is low, AIPs can easily proliferate in areas of disturbance. As such, it is recommended that the current invasive alien plan be implemented regularly with follow up during the growing season.

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

Table 2: Dominant alien floral species identified during the field assessment with their invasive status as per NEMBA: Alien and Invasive Species Lists, GN R1003 of 2020 (NL = Not Listed).

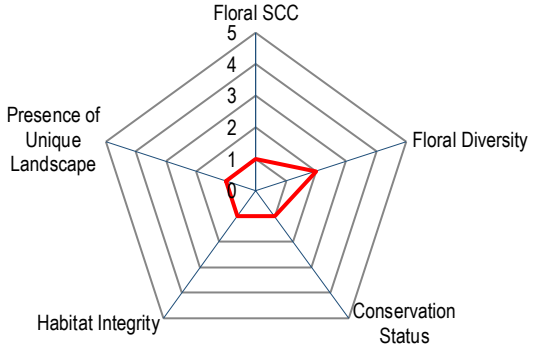
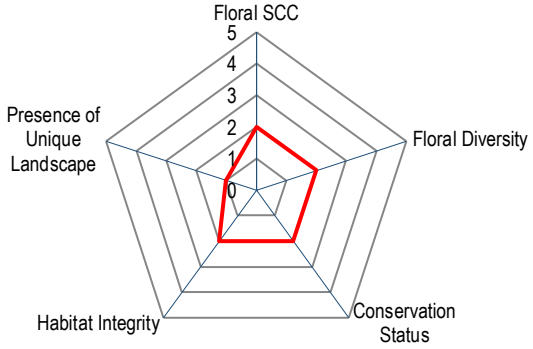
Scientific name	Common Name	Origin	NEMBA Category	*Senegalia-Tarchonanthus* Thornveld	*Senegalia* Thornveld	Kalahari Thornveld	Calcrete Habitat	Cryptic Wetlands	Linear Drainage Line	Seasonal Depressions	Mountain Bushveld	Transformed Habitat
Woody Species												
Prosopis glandulosa var. *torreyana*	Honey mesquite	North America	3 in NC	x	x							x
Schinus molle	Peruvian pepper	South America	NL									x
Solanum elaeagnifolium	Silverleaf Nightshade	Central America	1b						x			x
Herbaceous Species												
Alternanthera pungens	Khaki joyweed	South America	NL									x
Argemone ochroleuca subsp. *ochroleuca*	White-flowered Mexican poppy	Central America	1b									x
Bidens bipinnata	Spanish needles, Blackjack	South & Central America	NL	x	x	x	x	x	x	x	x	x
Chenopodium album	Goosefoot	Unknown	NL	x	x							x
Portulaca oleracea	Common purslane	Unknown	NL	x	x							x
Salsola kali	Tumbleweed	Europe	1b	x	x							x
Tagetes minuta	Stinking roger	South America	NL	x	x	x	x	x	x	x		x
Succulent Species												
Austrocylindropuntia cylindrica	Cane cactus	Central America	1b	x	x							
Opuntia ficus-indica	Sweet prickly pear	Central America	1b	x	x							x
Graminoid Species												
Pennisetum setaceum	Fountain grass	North Africa	1b									x

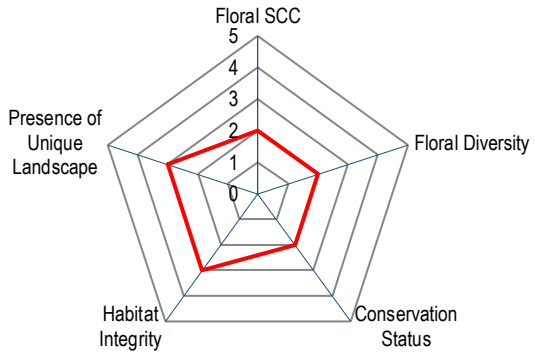
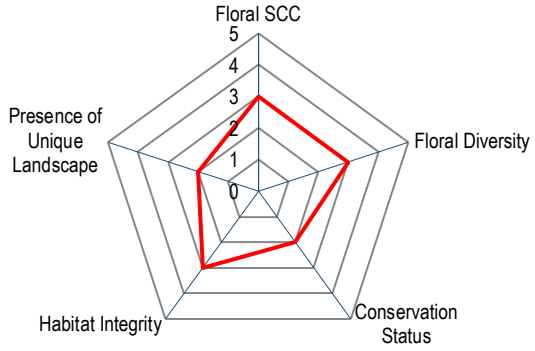
4 SENSITIVITY MAPPING

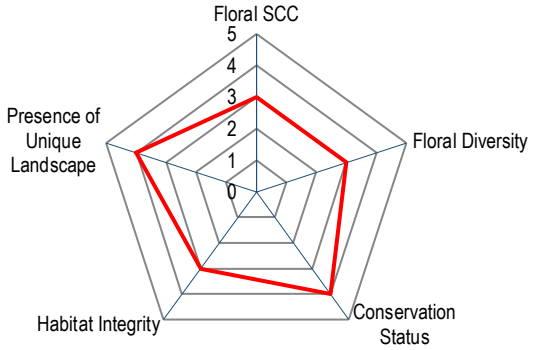
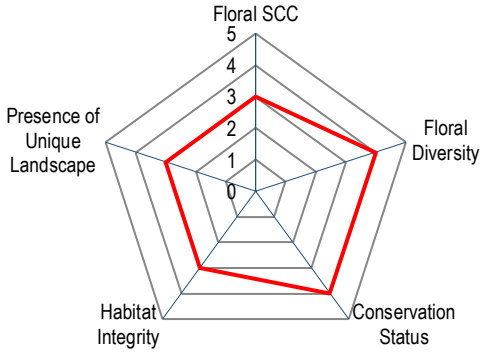
The National Web-based Screening Tool identified the focus area to be in a **low sensitivity** area for the Plant Species Theme but in a **very high sensitivity** area for the Terrestrial Biodiversity Theme (triggering features include CBA1, ESA and Freshwater Priority Areas). Based on the ground-truthed results of the site visit, Table 3 below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

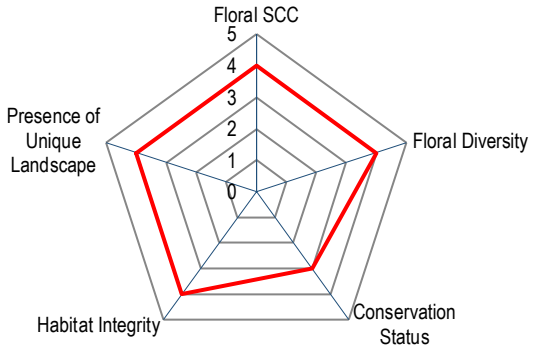
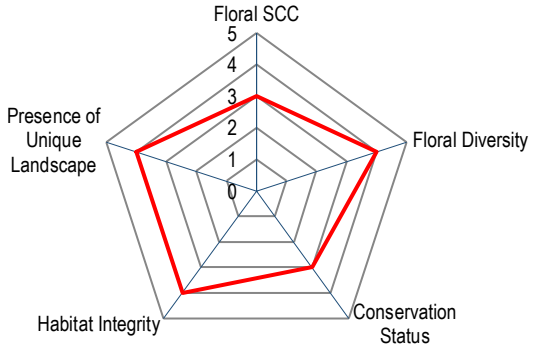
Figures 9 - 12 conceptually illustrates the areas considered to be of varying ecological sensitivity and how they will be impacted by the proposed infrastructure development. The areas are depicted according to their sensitivity in terms of the presence or potential for floral SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity (compared to a reference type).

Table 3: A summary of the sensitivity of each habitat unit and implications for development.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Low 	Optimise development potential.	Transformed Habitat Unit	- Indigenous floral diversity and abundance low. - Vegetation largely homogenous and / or AIP species common. - Habitat not representative of the reference states. - Floral SCC are largely lacking, only scattered and isolated species remain (e.g., *Gomphocarpus fruticosus* and *Gomphocarpus tomentosa*, both of which thrive in disturbed conditions). - The potential for the habitat to support viable populations of SCC is deemed low.
Moderately Low 	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	*Senegalia* Thornveld Subunit	- Habitat has been degraded due to mining edge effects (e.g., AIP proliferation) and current bush encroachment (due to altered fire and herbivory regimes). - The floral communities have shifted away from the reference vegetation type and are encroached in some areas. - Although encroached in places, two floral SCC were recorded within this subunit (i.e., *Gymnosporia buxifolia* and *Gomphocarpus fruticosus*). Suitable habitat to support viable populations of other SCC is present although the propensity thereof to support extensive populations of SCC is deemed to be low.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Moderately Low 	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	Seasonal Depressions & Anthropogenic Drainage Line Habitats (within the Moisture-driven Habitat)	- Low floristic diversity. - Habitat is not considered to significantly contribute towards floral ecology within the focus area or within the greater region. - No floral SCC were recorded during the site assessment although some suitable habitat to support viable populations of other SCC is present, the propensity thereof to support extensive populations of SCC is deemed to be low.
Intermediate 	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	*Senegalia-Tarconanthus* Thornveld	- Habitat in a moderately intact ecological condition and supports a moderate diversity of indigenous floral species with AIP species infrequently recorded. - The habitat forms part of a larger, connected (unfragmented) thornveld habitat and is thus of importance from a biodiversity and conservation perspective. - Provincially protected species, as per the NCNCA, were recorded within this habitat unit. Suitable habitat to support viable populations of other SCC is present, the propensity thereof to support extensive populations of SCC is deemed to be moderate. - Located within the GWC where available habitat for potential endemics is available.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Intermediate 	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	Calcrete Habitat	- Habitat is intact and representative of the reference states, but some degradation has occurred due to mine edge effect impacts (e.g., AIP proliferation) and encroaching woody species (particularly *Rhizogum trichotomum*). - Representative of important biodiversity features, namely CBA1. - The habitat is largely represented by indigenous species with several SCC floral species present. Suitable habitat to support viable populations of other SCC is present, the propensity thereof to support extensive populations of SCC is deemed to be moderate. - Located within the GWC where available habitat for potential endemics is available.
Intermediate 	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	Kalahari Thornveld	- Habitat is intact and shares an affinity with the reference vegetation (i.e., the Postmasburg Thornveld) but some degradation has occurred due to mine edge effect impacts and altered fire and herbivory regimes. - The habitat is largely represented by indigenous species with several nationally (NFA) and provincially (Schedule 2) protected floral species are present. - Representative of important biodiversity features, namely CBA1 and ESA. - Located within the GWC where available habitat for potential endemics is available.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Moderately high 	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	Mountain Bushveld	- Habitat largely intact and supports a diversity of indigenous floral species with very few AIP species. - Habitat is intact, having not been impacted by associated mining edge effects, and is representative of the reference vegetation (i.e., the Kuruman Mountain Bushveld). - Representative of important biodiversity features, namely ESAs. - Habitat is suitable to sustain viable populations of several nationally protected species, as per the NFA, and provincially protected floral species, as per the NCNCA. - Located within the GWC where available habitat for potential endemics is located.
Moderately High 	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	Watercourse Habitat (i.e., the Cryptic Wetlands and the Linear Drainage Line Habitats)	- Habitat represented by higher conservation significance, especially because of the presence of watercourses within an arid region. - The habitat is considered unique from a floral composition perspective, in terms of the biophysical structure as well as the presence of ecological corridors. - Floral SCC did not include RDL species, but several nationally (NFA) and provincially (Schedule 2) protected floral species were present. - Representative of important biodiversity features, namely CBA1 and ESA. - Located within the GWC where available habitat for potential endemics is located.

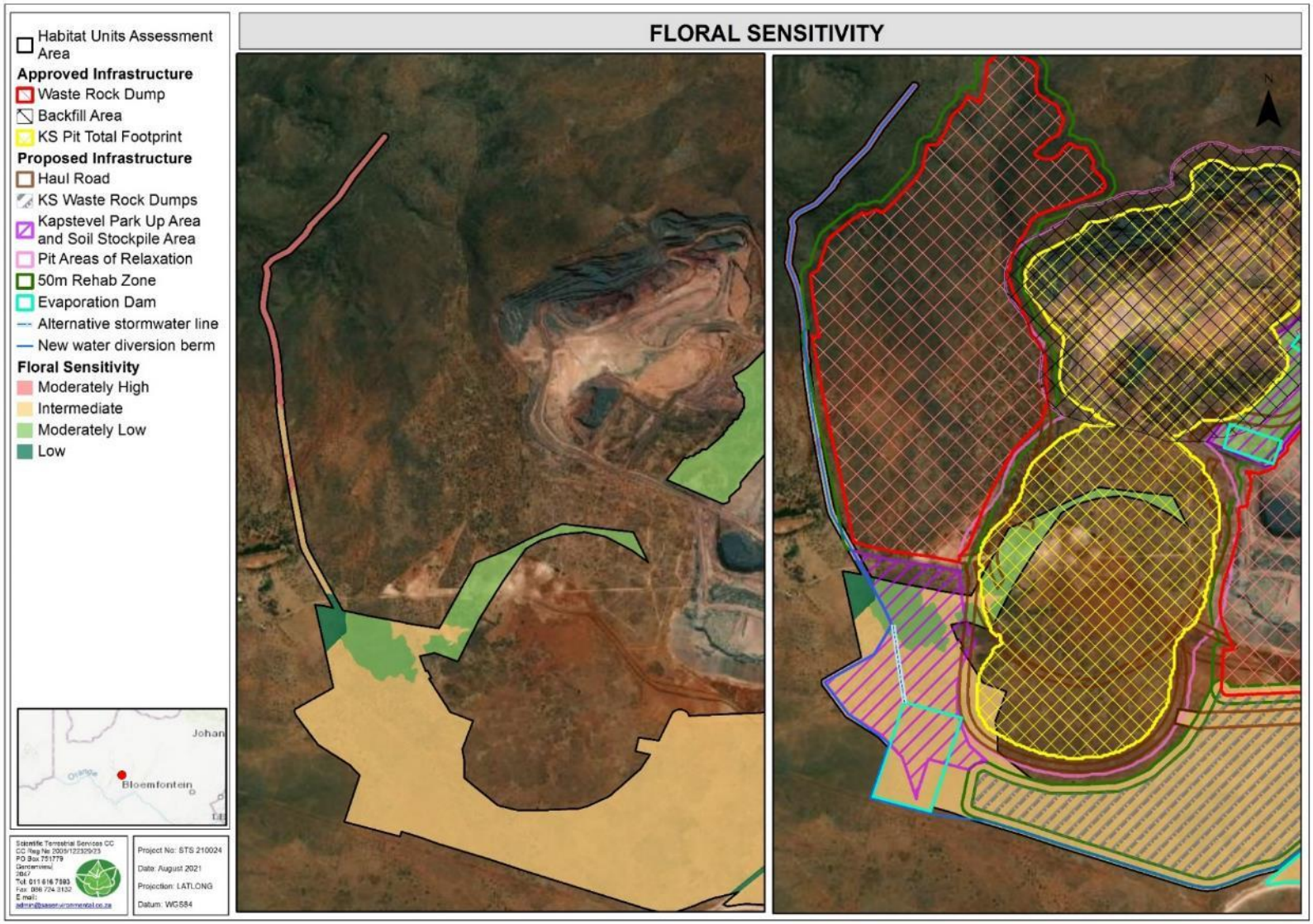


Figure 9: Conceptual illustration of the floral sensitivity associated with the western sections of the focus area. The frame on the left depicts the only sensitivity whereas the frame on the right depicts the floral sensitivity overlain on the proposed and approved infrastructure layout.

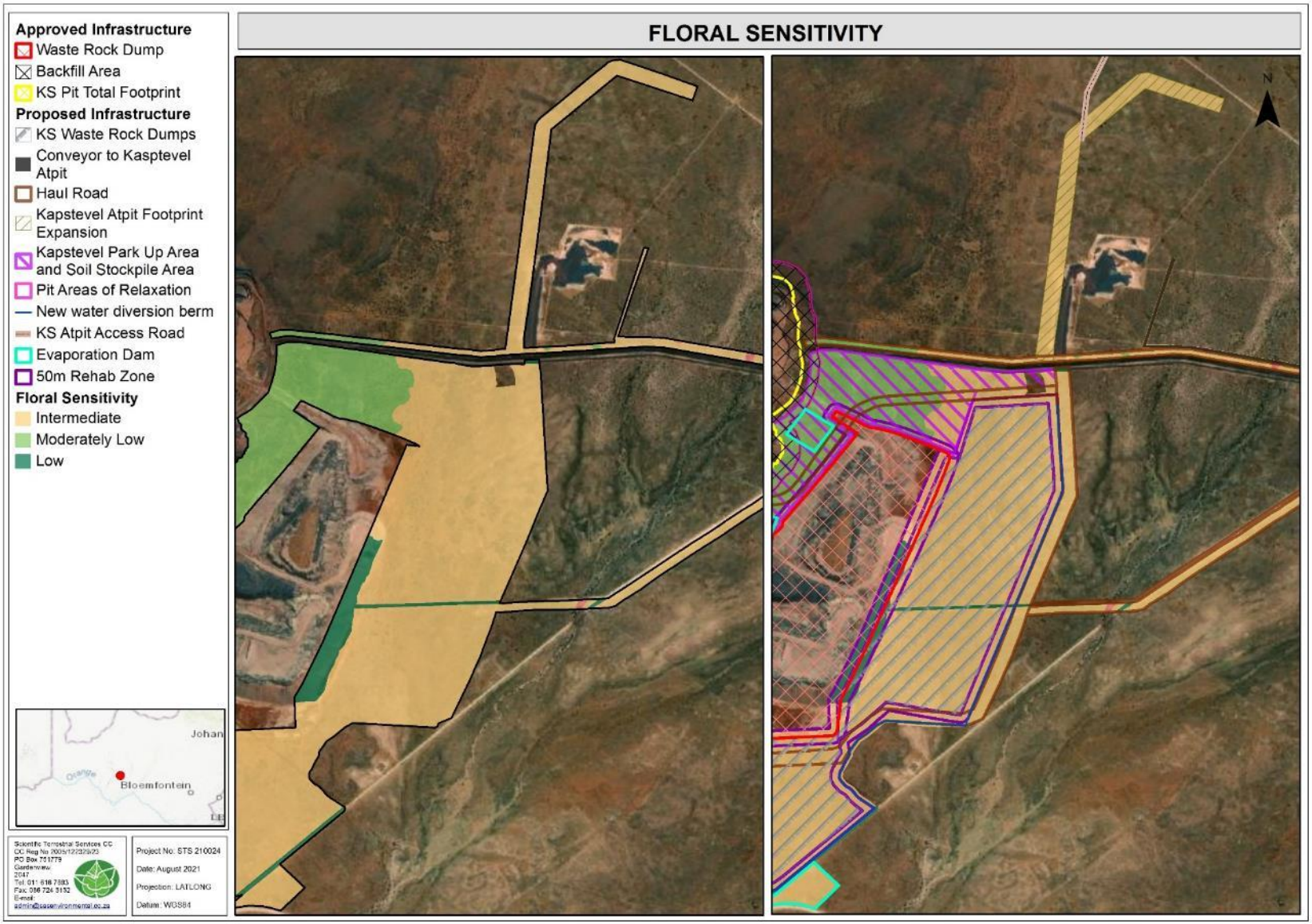


Figure 10: Conceptual illustration of the floral sensitivity associated with the central-west sections of the focus area. The frame on the left depicts the only sensitivity whereas the frame on the right depicts the floral sensitivity overlain on the proposed and approved infrastructure layout.

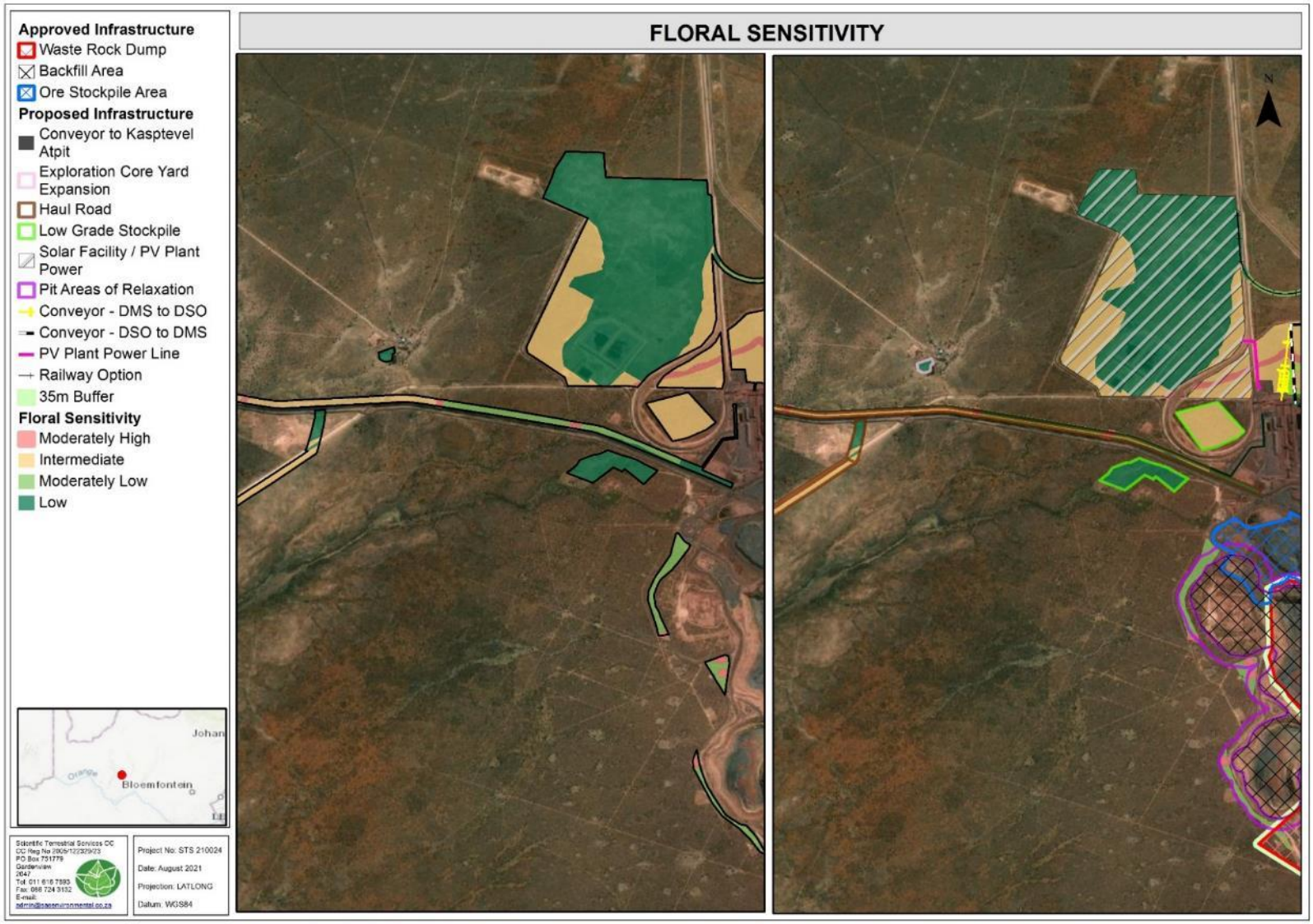


Figure 11: Conceptual illustration of the floral sensitivity associated with the central-east sections of the focus area. The frame on the left depicts the only sensitivity whereas the frame on the right depicts the floral sensitivity overlain on the proposed and approved infrastructure layout.

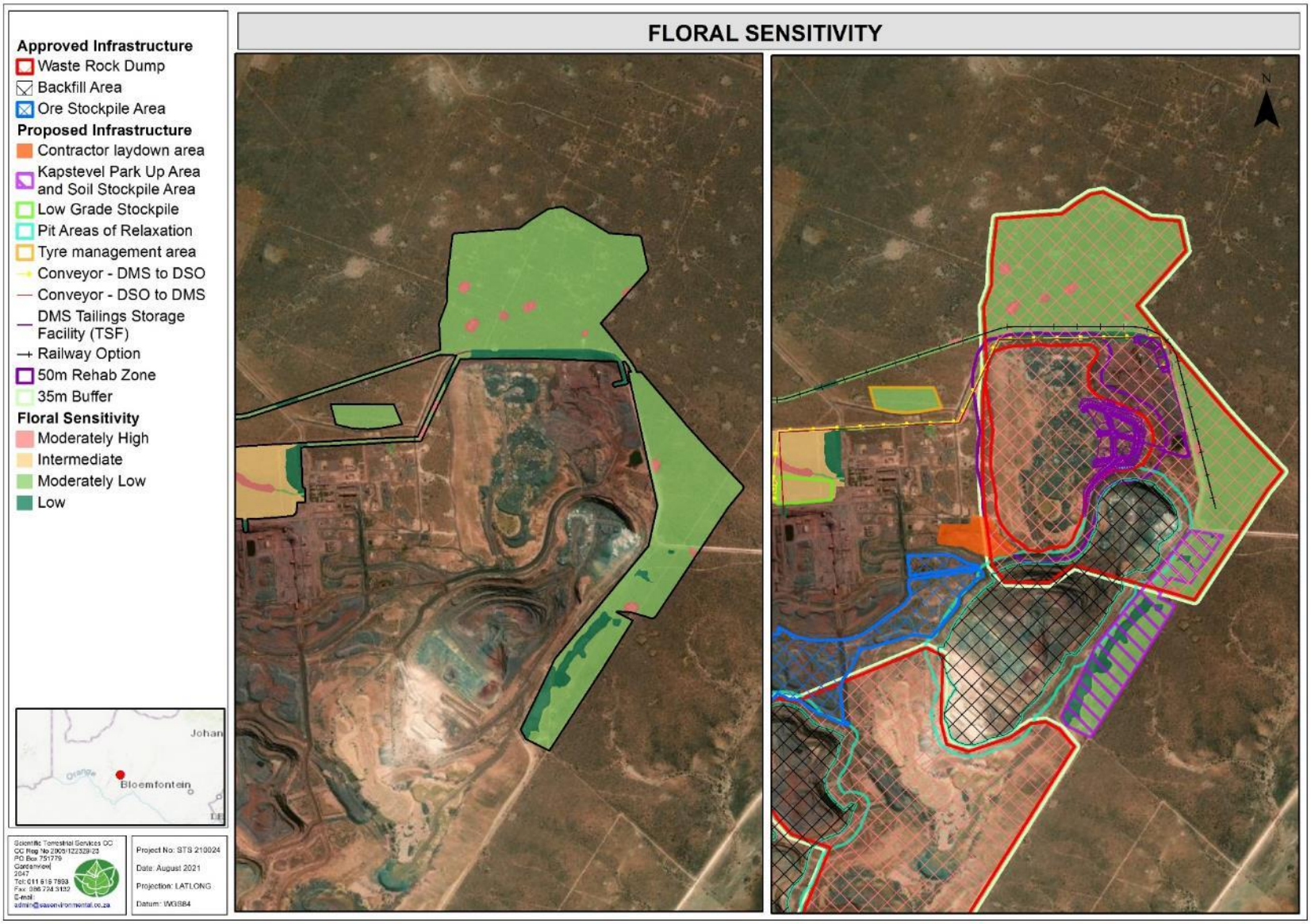


Figure 12: Conceptual illustration of the floral sensitivity associated with the eastern sections of the focus area. The frame on the left depicts the only sensitivity whereas the frame on the right depicts the floral sensitivity overlain on the proposed and approved infrastructure layout.

5 IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed development for the focus area. The impact assessment is based on the layout provided by the proponent as illustrated in Figure 1.

5.1 Activities and Aspect Register

The sections below provide the significance of perceived impacts arising from the proposed development for the focus area.

An impact discussion and assessment of all potential i) pre-construction and planning phase, ii) mining (i.e., construction and operational) phase, and iii) decommissioning and closure phase impacts are provided in Section 5.2 and 5.3. All mitigatory measures required to minimise the perceived impacts are presented in Section 5.4 and Table 6.

Proposed Mine Expansion Activities**:**

Kolomela proposes to expand and amend some of the existing activities and also develop new infrastructure to support continued and future production at the mine. This includes:

- Amendment of the Kapstevel South Pit footprint area.
- Amendment of the Kapstevel Waste Rock Dumps and haul roads.
- Amendment of Kapstevel Evaporation Ponds and stormwater management infrastructure.
- Additional park-up, laydown and ore stockpile areas.
- Development of new DMS tailings management infrastructure
- A new Photovoltaic Solar Facility.
- A new Waste Tyre Management Facility.
- A conveyor and railway line to transfer material to and from the DMS plant.
- Amendment to the future Kapstevel DMS conveyor footprint to facilitate widened haul roads.
- Amendment of Kapstevel Waste Rock Dumps and Additional Waste Rock Dumps.
- Additional Low Grade Ore Storage Areas.
- New radio masts.
- Provision for an area of relaxation and safety berms around pits.

Table 4: Activities and Aspects likely to impact on the faunal and floral resources of the focus area.

ACTIVITIES AND ASPECTS REGISTER
Preconstruction & Planning Phase
- Potential failure to conduct a walkdown (within the flowering season) of the footprint area before construction activities where floral SCC are marked for rescue and relocation to suitable habitat outside the development footprint. A rescue and Relocation Plan is recommended. - **Impact**: Permanent loss of floral SCC from the focus area.
- Potential failure to obtain permits for nationally protected (as per the NFA and TOPS) and provincial protected (as per the NCNCA) floral species that are required prior to the commencement of the mining phase for the relocation (where feasible) or destruction of protected flora. - **Impact**: Avoidable or manageable loss of protected floral species within the approved footprint of the proposed development footprint. Furthermore, there is an increased chance that recommendations (e.g., offsets required for NFA species etc) made by the relative authorities (DFFE (for nationally protected species) or NCDENC (for provincially protected species)) will not be implemented which will result in loss of protected species that could otherwise be mitigated.
- Potential failure to relocate floral SCC to suitable habitat outside the development footprint. - **Impact**: Loss of floral SCC within the development footprint areas in the focus area.
- Inconsiderate planning, infrastructure placement and design, leading to the loss of potential sensitive floral species and/or habitat for such species, as well as unnecessary edge effect impacts on areas outside of the proposed development footprint. - **Impact:** Degradation and modification of the receiving environment, loss of floral habitat.
- Potential failure to update the existing AIP Management/Control plan before the commencement of construction activities, resulting in the spread of AIPs from the development footprint to surrounding natural habitat. - **Impact:** Spreading of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat.
- Potential failure to update the current Rehabilitation Plan and implement appropriate activities thereof before the commencement of mining phase activities. - **Impact**: Rehabilitation of disturbed areas should occur concurrently and without a Rehabilitation plan in place prior to the construction phase, there could be potential delays in the implementation of the rehabilitation plan at later stages, thus leading to the loss of viable soils for optimal plant growth.
- Inadequate design of infrastructure leading to pollution of soils because of, e.g., leaks from infrastructure failure. - **Impact**: Contaminated soils lead to a loss of viable growing conditions for plants and results in a decrease of floral habitat, diversity, and SCC – rehabilitation effort will also be increased as a result.
- Potential failure to set up an Erosion Control Plan, as well as designing inadequate stormwater management measures that could lead to increased erosion. Loss of a nutrient-rich topsoil layer and degradation of soil structure may also result. - **Impact:** Loss of floral habitat outside of the direct, authorised mining footprint.
Mining (i.e., Construction & Operational) Phase
- Site clearing and the removal of vegetation. - **Impact:** Loss of floral habitat, diversity, and the possible loss of floral SCC.
- Potential failure to monitor the success of relocated floral SCC. - **Impact:** Loss of SCC individuals.
- Proliferation of AIP species that colonise in areas of increased disturbances and that outcompete native species, including the further transformation of adjacent natural habitat. - **Impact:** Loss of favourable floral habitat outside of the direct development footprint, including a decrease in species diversity and a potential loss of floral SCC.
- Additional pressure on floral habitat by increased human movement associated with the proposed construction and mining activities, including increased vehicular movement, contributing to: • Overexploitation through the removal and/or collection of important or sensitive floral SCC beyond the direct footprint area; • Increased introduction and spread of AIPs; and • Increased risk of fire frequency. - **Impact:** Loss of sensitive floral habitat and the potential loss of floral SCC.
- Potentially poorly managed edge effects: • Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to the continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the floral habitat; and

ACTIVITIES AND ASPECTS REGISTER
• Compaction of soils outside of the focus area due to indiscriminate driving of construction vehicles through natural vegetation. - **Impact:** Loss of floral habitat, diversity, and SCC within the direct footprint of the proposed development. Loss of surrounding floral diversity and floral SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.
- Dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs. - **Impact:** Loss of floral habitat, diversity, and SCC through displacement by AIPs.
- Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants[12] and potentially further decreasing optimal growing /re-establishing conditions. - **Impact:** Declines in plant functioning leading to loss of floral species and habitat for optimal growth.
- Habitat fragmentation because of construction activities. - **Impact:** Loss or alteration of floral habitat and species diversity.
- Possible increased fire frequency during construction. - **Impact: L**oss or alteration of floral habitat and species diversity.
- Risk of discharge and contamination from all operational facilities may pollute receiving environment with special mention of the salinisation of soils and nearby freshwater habitats (e.g., Cryptic Wetlands and Linear Drainage Line habitat). - **Impact:** Leading to altered floral and aquatic habitat and loss of floral diversity.
- On-going disturbance during the mining phase may lead to erosion and sedimentation of surrounding floral habitat. - **Impact:** Degradation of favourable habitat and limited potential for floral re-establishment leading to loss of floral habitat and diversity within the local area.
- Seepage affecting soils and the groundwater regime. - **Impact:** Altered floral habitat and loss of floral diversity.
Decommissioning & Closure Phase
- Ineffective rehabilitation of exposed and impacted areas, increasing erosion risk and AIP proliferation within the surrounding areas. - **Impact:** Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation.
- Potential poor management and failure to monitor rehabilitation efforts, leading to: • Landscapes left fragmented, resulting in reduced dispersal capabilities of floral species and an overall decrease in floral diversity; • Compacted soils limiting the re-establishment of natural vegetation; • Increased risk of erosion in areas left disturbed. - **Impact:** Long-term (or permanent) loss of floral habitat, diversity, and SCC.
- Disturbance of soils as part of demolition activities. - **Impact:** Loss of favourable growing conditions for floral communities.
- On-going risk of contamination from mining facilities beyond closure. - **Impact:** Permanent impact on floral habitat.
- On-going seepage and runoff may affect the groundwater regime and nearby watercourses beyond closure. - **Impact:** Loss of floral habitat and associated species.

5.2 Floral Impact Assessment Results

The table below (Table 5) indicates the perceived risks to the floral ecology associated with all phases of the proposed development. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The

[12] Sett, R. (2017). Responses in plants exposed to dust pollution. Horticulture International Journal, 1(2), 00010.).

mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

The impacts on i) the *Senegalia* Thornveld and the Seasonal Depressions, ii) the Calcrete Habitat and iii) the Kalahari Thornveld were assessed together as the impacts associated with these groupings are anticipated to be similar.

Table 5: Impact on the floral habitat, diversity, and SCC from the proposed development activities. (Watercourse Habitat = Cryptic Wetlands and Linear Drainage Line Habitat; Non-watercourse Habitat = Seasonal Depressions and Anthropogenic Drainage line Habitat).

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
PRE-CONSTRUCTION & PLANNING PHASE																
Impact of floral Habitat and Diversity																
Transformed Habitat	3	1	1	2	3	**4**	**6**	**24** **Very Low**	2	1	1	1	2	**3**	**4**	**12** **Very Low**
Senegalia Thornveld & Seasonal Depressions	3	2	2	2	2	**5**	**6**	**30** **Low**	2	2	1	1	1	**4**	**3**	**12** **Very Low**
Tarconanthus-Senegalis Thornveld	3	3	3	2	2	**6**	**7**	**42** **Low**	2	3	2	1	1	**5**	**4**	**20** **Very Low**
Calcrete Habitat & Kalahari Thornveld	4	3	4	3	4	**7**	**11**	**77** **Medium-High**	3	3	3	2	2	**6**	**7**	**42** **Low**
Mountain Bushveld	3	4	3	3	4	**7**	**10**	**70** **Medium-Low**	2	4	2	2	3	**6**	**7**	**42** **Low**
Watercourse Habitat (i.e., Cryptic Wetlands & Episodic Drainage Line Habitat)	4	4	4	3	5	**8**	**12**	**96** **Medium-High**	3	4	3	2	4	**7**	**9**	**63** **Medium-Low**
Non-watercourse Habitat (i.e., Seasonal Depressions & Anthropogenic Drainage Line Habitat)	3	2	2	3	3	**5**	**8**	**40** **Low**	2	2	2	2	2	**4**	**6**	**24** **Very Low**
Impact on Floral SCC																

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
Transformed Habitat	1	1	1	1	3	**2**	**5**	**10** Very Low	1	1	1	1	2	**2**	**4**	**8** Very Low
Senegalia Thornveld & Seasonal Depressions	3	2	2	2	2	**5**	**6**	**30** Low	2	2	1	1	1	**4**	**3**	**12** Very Low
Tarconanthus-Senegalis Thornveld	3	3	4	2	3	**6**	**9**	**54** Medium-Low	2	3	3	1	2	**5**	**6**	**30** Low
Calcrete Habitat & Kalahari Thornveld	5	3	4	3	4	**8**	**11**	**88** Medium-High	4	3	3	2	3	**7**	**8**	**56** Medium-Low
Mountain Bushveld	4	4	3	3	3	**8**	**9**	**72** Medium-Low	3	4	2	2	3	**7**	**7**	**49** Low
Watercourse Habitat (i.e., Cryptic Wetlands & Episodic Drainage Line Habitat)	4	4	4	3	5	**8**	**12**	**96** Medium-High	3	4	3	2	4	**7**	**9**	**63** Medium-Low
Non-watercourse Habitat (i.e., Seasonal Depressions & Anthropogenic Drainage Line Habitat)	3	2	2	3	4	**5**	**9**	**45** Low	2	2	2	2	3	**4**	**7**	**28** Low
MINING (I.E., CONSTRUCTION & OPERATIONAL) PHASE																
Impact of floral Habitat and Diversity																
Transformed Habitat	2	1	2	2	4	**3**	**8**	**24** Very Low	1	1	1	1	4	**2**	**6**	**12** Very Low
	5	2	3	2	4	**7**	**9**	**63**	4	2	1	1	4	**6**	**6**	**36**

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
Senegalia Thornveld & Seasonal Depressions								Medium-Low								Low
Tarconanthus-Senegalis Thornveld	5	3	3	2	4	8	9	72 Medium-Low	4	3	2	1	4	7	7	49 Low
Calcrete Habitat & Kalahari Thornveld	5	3	3	3	4	8	10	80 Medium-High	4	3	2	2	4	7	8	56 Medium-Low
Mountain Bushveld	4	4	3	3	3	8	9	72 Medium-Low	3	4	2	2	2	7	6	42 Low
Watercourse Habitat (i.e., Cryptic Wetlands & Episodic Drainage Line Habitat)	5	4	4	3	4	9	11	99 Medium-High	4	4	3	2	4	8	9	72 Medium-Low
Non-watercourse Habitat (i.e., Seasonal Depressions & Anthropogenic Drainage Line Habitat)	5	2	2	2	4	7	8	56 Medium-Low	4	2	1	1	3	6	5	30 Low
Impact on Floral SCC																
Transformed Habitat	2	1	2	2	4	3	8	24 Very Low	1	1	1	1	4	2	6	12 Very Low
Senegalia Thornveld & Seasonal Depressions	2	2	2	2	4	4	8	32 Low	1	2	1	1	4	3	6	18 Very Low
Tarconanthus-Senegalis Thornveld	2	3	2	2	4	5	8	40 Low	1	3	1	1	4	4	6	24 Very Low

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
Calcrete Habitat & Kalahari Thornveld	5	3	3	3	4	**8**	**10**	**80** Medium-High	4	3	2	2	4	**7**	**8**	**56** Medium-Low
Mountain Bushveld	3	4	3	3	4	**7**	**10**	**70** Medium-Low	2	4	2	2	4	**6**	**8**	**48** Low
Watercourse Habitat (i.e., Cryptic Wetlands & Episodic Drainage Line Habitat)	4	4	3	3	4	**8**	**10**	**80** Medium-High	3	4	2	2	4	**7**	**8**	**56** Medium-Low
Non-watercourse Habitat (i.e., Seasonal Depressions & Anthropogenic Drainage Line Habitat)	2	2	2	2	3	**4**	**7**	**28** Low	1	2	1	1	2	**3**	**4**	**12** Very Low
DECOMMISSIONING & CLOSURE PHASE																
Impact of floral Habitat and Diversity																
Transformed Habitat	2	1	2	2	3	**3**	**7**	**21** Very Low	1	1	1	1	3	**2**	**5**	**10** Very Low
Senegalia Thornveld & Seasonal Depressions	2	2	2	2	3	**4**	**7**	**28** Low	1	2	1	1	3	**3**	**5**	**15** Very Low
Tarconanthus-Senegalis Thornveld	2	3	2	2	3	**5**	**7**	**35** Low	1	3	1	1	3	**4**	**5**	**20** Very Low
Calcrete Habitat & Kalahari Thornveld	4	3	4	3	3	**7**	**10**	**70** Medium-Low	3	3	3	2	2	**6**	**7**	**42** Low
Mountain Bushveld	3	4	4	3	3	**7**	**10**	**70**	2	4	3	2	2	**6**	**7**	**42**

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
								Medium-Low								Low
Watercourse Habitat (i.e., Cryptic Wetlands & Episodic Drainage Line Habitat)	4	4	4	3	5	8	12	96 Medium-High	3	4	3	2	5	7	10	70 Medium-Low
Non-watercourse Habitat (i.e., Seasonal Depressions & Anthropogenic Drainage Line Habitat)	2	2	2	2	3	4	7	28 Low	1	2	1	1	2	3	4	12 Very Low
Impact on Floral SCC																
Transformed Habitat	2	1	2	2	3	3	7	21 Very Low	1	1	1	1	3	2	5	10 Very Low
Senegalia Thornveld & Seasonal Depressions	2	2	2	2	3	4	7	28 Low	1	2	1	1	3	3	5	15 Very Low
Tarconanthus-Senegalis Thornveld	2	2	2	2	3	4	7	28 Low	1	3	1	1	3	4	5	20 Very Low
Calcrete Habitat & Kalahari Thornveld	4	3	3	3	4	7	10	70 Medium-Low	3	3	2	2	4	6	8	48 Low
Mountain Bushveld	3	4	3	3	3	7	9	63 Medium-Low	2	4	2	2	2	6	6	36 Low
Watercourse Habitat (i.e., Cryptic Wetlands & Episodic Drainage Line Habitat)	3	4	3	3	3	7	9	63 Medium-Low	3	4	2	2	3	7	7	49 Low

Habitat Unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
Non-watercourse Habitat (i.e., Seasonal Depressions & Anthropogenic Drainage Line Habitat)	2	2	2	2	3	**4**	**7**	**28** **Low**	1	2	1	1	2	**3**	**4**	**12** **Very Low**

5.3 Impact Discussion

Prior to mitigation measures implemented, the impact of the proposed development on the floral ecology of the focus area is anticipated to vary between the different habitat units for the proposed development within the focus area.

Prior to mitigation measures, the impact significance scores were as follows:

- Preconstruction and Planning Phase: This phase scored an impact significance ranging between high and very low;
- Mining (i.e., Construction & Operational) Phase: This phase scored an impact significance ranging between high and very low; and
- Decommissioning & Closure Phase: This phase scored an impact significance range between medium-high and very low.

With mitigation measures implemented, the direct and indirect impacts on the floral ecology for the focus area may be reduced to medium-low and very low levels for all the phases associated with the proposed development. As part of the rehabilitation actions, disturbed areas not within the development footprint must be rehabilitated appropriately and AIP establishment controlled within such areas.

5.3.1 Impact on Floral Habitat and Diversity

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed development. The proposed development will result in the clearance of vegetation that ranges in sensitivity from low to moderately high.

The data gathered during the site visit indicate that i) the Transformed Habitat Unit (overlapping with BMU3, BMU4, and BMU5) was of **low sensitivity**, ii) the *Senegalia* Thornveld (overlapping with BMU3, BMU4, and BMU5) and the Non-watercourse Habitat (i.e., Seasonal Depression Habitat and Anthropogenic Drainage Line Habitat, overlapping with BMU4 and BMU5) were of **moderately low sensitivity**, iii) the Calcrete Habitat (overlapping with BMU3, BMU4, and BMU6), the *Tarchonanthus-Senegalia* Thornveld (overlapping with BMU5) and the Kalahari Thornveld (overlapping with BMU3 and BMU6) were of **intermediate sensitivity**, and iv) the Watercourses (Cryptic Wetlands and Linear Drainage lines, overlapping with BMU3, BMU4, BMU5 and BMU6) as well as the Mountain Bushveld (overlapping with BMU2) were of **moderately high sensitivity**. The proposed mining activities will impact on these habitat units to varying degrees and is discussed in more detail below.

Loss of natural habitat areas such as the Calcrete Habitat, Kalahari Thornveld, Mountain Bushveld Habitat, and the Watercourse Habitat will be unfavourable and will result in local loss of floral habitat and diversity. These habitat units are representative of their reference states,

albeit somewhat modified due to current and historic disturbances. Considering that the Postmasburg Thornveld and the Kuruman Mountain Bushveld are endemic vegetation types (Skowno et al, 2019) further impact on the remaining extent of the currently least concern, but poorly protected, vegetation types could increase their threat status. Loss of Cryptic Wetlands and Linear Drainage Lines (i.e., the Watercourse Habitat) should be avoided as these are significant biodiversity features for which impacts cannot be fully mitigated or restricted to the local scale – residual impacts are thus deemed unavoidable.

Loss of natural habitat in areas such as the *Senegalia* Thornveld and the Non-watercourse Habitat (i.e., Seasonal Depressions and Anthropogenic Drainage Lines) is not deemed to be significant. With the implementation of mitigation measures, the impacts associated with these habitat units can be reduced to low and very low impacts.

Very Low insignificant impacts are anticipated for the Transformed Habitat Unit due to the transformed nature of this habitat. Overall, this habitat supported a low diversity of floral species. Given that the floral communities within this habitat unit have shifted significantly away from the reference vegetation type a significant loss of floral communities is not anticipated.

5.3.2 Impacts on Floral SCC

The focus area is associated with several protected floral species including seven provincially protected species (in terms of the NCNCA), namely *Gymnosporia buxifolia, Gomphocarpus fruticosus, Olea europaea* subsp. Africana*, Ruschia* cf*. griquensis, Nymania capensis, Boophone disticha,* and *Gomphocarpus tomentosa,* and three nationally protected tree species (in terms of the NFA), *Vachellia erioloba, Boscia albitruca* and *Vachellia haematoxylon*. Permits from the NCDENC (for provincially protected species) and authorisation from the DFFE (for nationally protected species) should be obtained to remove, cut, or destroy any of the above-mentioned protected species before any vegetation clearing may take place.

A walkdown of the entire construction footprint is recommended during the summer season after the region has received sufficient rainfall and all SCC identified and marked. Where possible, development layouts should be designed to avoid disturbing SCC, particularly NFA protected tree species. SCC that cannot be avoided during the development and mining activities should be rescued and relocated to suitable surrounding habitat within the focus area during development the development phase. In instances where SCC cannot be avoided (as in the case of *V. erioloba* that does not transplant well), and relocation of such species not feasible, permits from the NCDENC and authorisation from the DFFE should be obtained to

remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place.

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

The proposed development will not impact on any threatened ecosystems. The development will, however, impact on CBA1 and ESA habitat (particularly within the central section of the focus area). Areas confirmed as having as CBA1 habitat included the Calcrete Habitat, the Kalahari Thornveld, and the Watercourse Habitat (including the Cryptic Wetlands and the Linear Drainage Lines). Areas confirmed as having as ESA habitat included the Senegalia Thornveld, the Kalahari Thornveld, the Mountain Bushveld, and the Moisture-driven Habitat (including the Cryptic Wetlands, the Linear Drainage Lines, and the Seasonal Depressions).

CBA1 are areas that are considered irreplaceable or near irreplaceable (i.e., high selection frequency) for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas. ESAs are areas that must retain their ecological processes to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for the representation of ecosystem types or Species of special concern when it is not possible to meet them in CBAs; support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017).

According to this Northern Cape Critical Biodiversity Areas Reasons layer, the triggering biodiversity and ecological features for the CBA and ESAs within the Focus area include the following: All-natural wetlands, FEPA catchment, Conservation Areas, Landscape structural elements, endemic Postmasburg Thornveld and endemic Kuruman Mountain Bushveld. Due to their ecological importance, it is recommended that impacts to CBA1 and ESAs be avoided as far as possible and kept to approved areas only.

5.3.4 Probable Latent Impacts

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

- Permanent loss of and altered floral species diversity and habitat;
- Permanent loss of niche floral habitat (Mountain Bushveld Habitat and Watercourse Habitat (i.e., Cryptic Wetlands and Linear Drainage Line Habitat);
- Edge effect impacts such as further habitat fragmentation, AIP proliferation;

- Permanent loss of protected floral species (both NCNCA and NFA protected species) and suitable habitat thereof; and
- Ongoing bush encroachment, particularly from *Senegalia mellifera* subsp. *detinens* and potentially *Tarconanthus camphoratus,* within the remainder of the focus area as well as the adjacent natural vegetation communities.

5.3.5 Cumulative Impacts

The current greatest threat to the floral ecology that are likely to contribute to cumulative impacts on the floral communities within the surrounding areas are loss of protected SCC (both NCNCA and NFA protected species) and associated habitat because of the associated development, bush encroachment, and the proliferation of AIP species, resulting in the overall loss of native floral communities within the local area.

5.4 Integrated Impact Mitigation

The table below (Table 5) highlights the key, general integrated mitigation measures that are applicable to the proposed development to suitably manage and mitigate the ecological impacts that are associated with all phases of the proposed development.

Provided that all management and mitigation measures are implemented, as stipulated in this report, the overall risk to floral diversity, habitat and SCC can be mitigated and minimised.

Table 6: A summary of the mitigatory requirements for floral resources.

Project phase	Preconstruction & Planning Phase
Impact Summary	Loss of floral habitat, species, and SCC
Proposed mitigation and management measures:	
Floral Habitat and Diversity - Minimise loss of indigenous vegetation where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as any other specialist studies; - It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, is placed outside of sensitive habitat units, i.e., Mountain Bushveld Habitat and Watercourse Habitat (i.e., Cryptic Wetlands and Linear Drainage Line Habitat). Where Watercourse Habitat will be crossed, strict mitigation measures and recommendations as made in the Freshwater assessment must be implemented; - Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat and should, where possible, be restricted to areas within the existing Transformed Habitat; and - The existing AIP Management/Control Plan should be updated (if necessary) by a qualified professional. No chemical control of AIPs to occur without a certified professional and no chemical control to be permitted in nearby watercourses and/or Watercourse Habitat (i.e., Cryptic Wetlands and Linear Drainage Line Habitat). **Floral SCC** - Due to the potential for a higher diversity of floral SCC (including potential RDL species) occurring within the focus area than what was observed during the field investigation (seasonal constraints), it is recommended that a walkdown of the footprint area take place prior to vegetation clearing. This walkdown must coincide with the flowering period of all potentially occurring SCC (typically October – March, but November – January is more ideal) and should be conducted by a suitably qualified specialist. Where possible, these species must be relocated to suitable habitat outside of the direct	

footprint area. If this is not possible, the necessary permits from the relevant provincial and national authorities must be obtained before these species are destroyed. Permit and licence applications will be required from i) the NCDENC for the removal / relocation of provincially protected species (i.e., as per the NCNCA) and ii) the DFFE for the removal / relocation of provincially NFA protected tree species; and

- Where feasible, the relocation of protected plant species (both provincially and nationally protected) and potentially occurring RDL plant species must take place prior to the commencement of the construction phase. Good record-keeping will be necessary to record this process and to document all successes and failures associated with the relocation.

Project phase	Mining (i.e., Construction & Operational) Phase
Impact Summary	Loss of floral habitat, species, and SCC

Proposed mitigation and management measures:

Mining footprint

- It is recommended that all construction personnel be educated in environmental awareness;
- The construction footprint must be kept as small as possible according to the approved footprints to minimise impact on the surrounding environment (edge effect management). The approved footprint area must be demarcated to avoid unnecessary clearing and destructing of natural vegetation. Construction related activities must be kept outside of surrounding habitat in which no construction is planned;
- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint;
- All areas of increased ecological sensitivity (i.e., Mountain Bushveld Habitat and Watercourse Habitat (i.e., Cryptic Wetlands and Linear Drainage Line Habitat)) outside of the footprint area should be designated as No-Go areas and be off limits to all unauthorised construction vehicles and personnel;
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities;
- No additional habitat is to be disturbed during the mining phase of the project. All mining activities and their expansion as the material is deposited, should be restricted to the authorised footprint areas. Regular monitoring and recording of the footprint areas must be done;
- Planning of temporary roads and access routes should take the site sensitivity plan into consideration. If possible, such roads should be constructed outside of the sensitive habitat and planned in a manner that will not lead to habitat fragmentation. It is recommended that existing roads be utilised or that areas of low sensitivity (i.e., the Transformed Habitat) be appropriately utilised for the construction of roads;
- No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and rubble removed because of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste;
- If any spills occur, they must be cleaned up immediately to avoid soil contamination which has the potential to hinder floral rehabilitation down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and
- Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed areas not used for construction purposes.

Edge effect Management

- To limit edge effect impacts to the surrounding natural habitat, the below must be followed:
  - No construction rubble to be disposed of outside of demarcated areas;
  - All soils compacted as a result of construction activities outside of the project footprint should be ripped, profiled and reseeded;
  - Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities (Sett 2017) – any chemicals used for this purpose must not be permitted to enter surrounding Watercourse Habitat (i.e., Cryptic Wetlands and Linear Drainage Line Habitat);
  - Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil. All exposed soil must be protected for the duration of the construction phase with a suitable geotextile (e.g., Geojute or hessian sheeting); and
  - Manage the spread of AIP species which may affect remaining natural habitat within surrounding areas.

Floral SCC

- Any unauthorised collection of floral material must be prohibited;
- Monitoring of any rescued and relocated floral SCC must commence during the construction and operational phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful;
- Harvesting of protected floral species by construction personnel should be strictly prohibited; and

- Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed development footprint area.

Fire

- No illicit fires must be allowed during the construction of the proposed development; and
- Fire breaks should be maintained during the construction and operational phases.

Dust

- A dust management plan, as compliant with Government Notice 704 of 1999 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) (NWA), is in practice at the Mine. Dust management measures must be extended to the proposed new activities.

Stormwater

- Adequate stormwater management must be incorporated into the design of the proposed development to prevent erosion and possible water contamination leading to the loss of floral habitat through the discharge of dirty water into the receiving environment. In this regard, special mention is made of:
  - Sheet runoff from cleared areas and access roads needs to be curtailed;
  - Runoff from paved surfaces should be slowed down by the strategic placement of berms; and
  - Runoff from dust suppression activities.

Rehabilitation

- Concurrent rehabilitation should be implemented according to the existing Kolomela Rehabilitation Plan;
- Any natural areas beyond the direct footprint that have been affected by the construction and operation activities must be rehabilitated using indigenous species;
- If feasible a nursery should be set up to cultivate indigenous floral species for rehabilitation. A nursery permit would be required;
- Revegetation of disturbed areas should be carried out to restore habitat availability and minimise soil erosion and surface water runoff. This should be done concurrently with mining operations where possible to limit the exposure of bare soils to the prevailing elements; and
- All soils compacted because of construction and operational activities falling outside of the project area should be ripped, profiled and revegetated (with indigenous species). Special attention should be paid to AIP control within these areas.

Project phase	Decommissioning & Closure Phase
Impact Summary	Loss of floral habitat, species, and SCC

Proposed mitigation and management measures:

Rehabilitation

- All infrastructure and footprint areas should be rehabilitated in accordance with the Kolomela rehabilitation plan;
- Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure;
- Floral monitoring should proceed annually as part of the existing floral monitoring plan for Kolomela; and
- All rehabilitated areas should be rehabilitated as per the recommended post-closure land use. From an ecological perspective, rehabilitation should take place to a point where natural processes will allow for improved ecological functioning.

Floral SCC

- Monitoring of rescued and relocated floral SCC (where applicable) should continue during the decommissioning and closure phase until it is evident that the species have successfully established; and
- Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC or suitable habitat for such species outside of the proposed development footprint.

Alien Vegetation

- Edge effects such as erosion and AIP proliferation, which may affect adjacent habitat, need to be strictly managed adjacent to the footprint areas and as part of the Decommissioning and Closure Phase;
- Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards;
- Ongoing AIP monitoring and clearance should take place throughout the Decommissioning and Closure Phase of the project, and the mine layout and immediate surrounding area (30 m from the perimeters) should be regularly monitored during rehabilitation activities for AIP re-establishment to prevent spread into surrounding natural areas; and

- An AIP Management and Control Plan must be designed and implemented to monitor and control alien floral recruitment in disturbed areas. The AIP control plan must be implemented for a period of at least five years after Decommissioning and Closure.

6 CONCLUSION

STS was appointed to conduct a Biodiversity Assessment as part of the EIA and EA process for the proposed Kolomela Mine Expansion near Postmasburg, Northern Cape Province.

During the field assessment, five broad habitat units were identified within the focus area, namely Thornveld Habitat (which comprised of three subunits, namely *Tarchonanthus-Senegalia* Thornveld, *Senegalia* Thornveld and Kalahari Thornveld), Calcrete Habitat, Moisture-driven Habitat (which comprised of Watercourse Habitat (i.e., Cryptic Wetlands and Linear Drainage Line Habitat) and Non-Watercourse Habitat (i.e., Seasonal Depressions)), Mountain Bushveld Habitat and Transformed Habitat. The sensitivities, from a floral perspective, of each of the habitat units and subunits was as follows: i) the Transformed Habitat Unit (overlapping with BMU3, BMU4, and BMU5) was of **low sensitivity**, ii) the *Senegalia* Thornveld (overlapping with BMU3, BMU4, and BMU5) and the Non-watercourse Habitat (i.e., Seasonal Depression Habitat and Anthropogenic Drainage Line Habitat, overlapping with BMU4 and BMU5) were of **moderately low sensitivity**, iii) the Calcrete Habitat (overlapping with BMU3, BMU4, and BMU6), the *Tarchonanthus-Senegalia* Thornveld (overlapping with BMU5) and the Kalahari Thornveld (overlapping with BMU3 and BMU6) were of **intermediate sensitivity**, and iv) the Watercourses (Cryptic Wetlands and Linear Drainage lines, overlapping with BMU3, BMU4, BMU5 and BMU6) as well as the Mountain Bushveld (overlapping with BMU2) were of **moderately high sensitivity**. The proposed mining activities will impact on these habitat units to varying degrees and is discussed in more detail below.

Several floral SCC were recorded within the focus area and included provincially protected species, as per the NCNCA, namely *Gymnosporia buxifolia, Gomphocarpus fruticosus, Olea europaea* subsp. Africana*, Ruschia* cf*. griquensis, Nymania capensis, Boophone disticha,* and *Gomphocarpus tomentosa,* and three nationally protected tree species (in terms of the NFA), namely *Vachellia erioloba, Boscia albitruca* and *Vachellia haematoxylon*. No nationally threatened SCC (i.e., RDL species), in terms of NEMBA Section 52(2), were recorded during the site assessment. A walkdown of the entire construction footprint is recommended during the summer season after the region has received sufficient rainfall and all SCC identified and marked. Where possible, development layouts should be designed to avoid disturbing SCC, particularly NFA protected tree species (where feasible). SCC that cannot be avoided during

the development / mining activities should be rescued and relocated to suitable surrounding habitat within the focus area during development the development phase. In instances where SCC cannot be avoided, and relocation of such species not feasible (as in the case of *V. erioloba* that does not transplant well), permits from the NCDENC (for provincially protected species) and authorisation from the DFFE (for nationally protected species) should be obtained to remove, cut, or destroy any of the above-mentioned protected and/or threatened species before any vegetation clearing may take place.

The proposed development will not impact on any threatened ecosystems. The development will, however, impact on CBA1 and ESA habitat (particularly within the central section of the focus area). Areas confirmed as having as CBA1 habitat included the Calcrete Habitat, the Kalahari Thornveld, and the Watercourse Habitat (including the Cryptic Wetlands and the Linear Drainage Lines). Areas confirmed as having as ESA habitat included the Senegalia Thornveld, the Kalahari Thornveld, the Mountain Bushveld, and the Moisture-driven Habitat (including the Cryptic Wetlands, the Linear Drainage Lines, and the Seasonal Depressions).

CBA1 are areas that are considered irreplaceable or near irreplaceable (i.e., high selection frequency) for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas. ESAs are areas that must retain their ecological processes to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for the representation of ecosystem types or Species of special concern when it is not possible to meet them in CBAs; support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017). Due to their ecological importance, it is recommended that impacts to CBA1 and ESAs be avoided as far as possible and kept to approved areas only.

Prior to mitigation measures implemented, the impact significance on the floral habitat and diversity within the focus area was deemed to range between medium**-low and low** for the Rocky Habitat, between **high and very low**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity for the focus area can be reduced to **medium-low and very low** significance levels. For the impacts associated with SCC, prior to the implementation of mitigation measures, the impact significance was deemed to range between **medium-high and very low** across the focus area. With the implementation of mitigation measures, the direct and indirect impacts on the SCC communities for the focus area can be reduced to **medium-low and very low** significance levels.

It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term

use of the ecological resources in the focus area will be made in support of the principle of sustainable development.

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APPENDIX A: Floral Method of Assessment

Floral Species of Conservational Concern Assessment

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

The National Web-Based Environmental Screening Tool

The Screening Tool was accessed to obtain a list of potentially occurring species of conservation concern for the focus area. Each of the themes in the Screening Tool consists of theme-specific spatial datasets which have been assigned a sensitivity level namely, "*low*", "*medium*", "*high*" and "*very high*" sensitivity. The four levels of sensitivity are derived and identified in different ways, e.g., for **confirmed** areas of occupied habitat for SCC a Very High and High Sensitivity is assigned and for areas of suitable habitat where SCC may occur based on spatial models only, a Medium Sensitivity is assigned. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below[13]:

- **Very High**: Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km^2 are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) D criteria of the IUCN or species listed as Critically/ Extremely Rare under South Africa's National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale.

- **High**: Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2000) that have a spatial confidence level of less than 250 m with segments of remaining natural habitat.

- **Medium**: Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level.

- **Low**: Areas where no SCC are known or expected to occur.

[13] More details on the use of the Screening Tool for Species of Conservation Concern can be found in the below resources:

- South African National Biodiversity Institute (SANBI). 2020. Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.0.
- The National Web based Environmental Screening Tool website: https://screening.environment.gov.za/screeningtool/#/pages/welcome

BRAHMS Online Website

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

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

NEMBA TOPS Species

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

Provincial: Specially Protected and Protected Species

The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), provides a list of Specially Protected Species (Schedule 1) (Section 49(1) of the NCNCA) and Protected Species (Schedule 2) (Section 50(1) of the NCNCA) for the Northern Cape Province. These species formed part of the SCC assessment.

Nationally Protected Trees

The National Forest Act, 1998 (Act No. 10 of 1998) (NFA), affords protection to a list of tree species. All nationally protected trees, whose distribution overlap with the focus area, were included as SCC in this report.

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

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

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

Low POC	Medium POC	High POC	Confirmed

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

Floral Habitat Sensitivity

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

- **Floral SCC:** The confirmed presence or potential for floral SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Unique Landscapes:** The presence of unique landscapes or the presence of an ecologically intact habitat unit in a transformed region;
- **Conservation Status:** The conservation status of the ecosystem or vegetation type in which the habitat unit is situated based on local, regional and national databases. Whether the habitat is representative of a Critical Biodiversity Area or forms part of an Ecological Support Area is also taken into consideration;
- **Floral Diversity:** The recorded floral diversity compared to a suitable reference condition such as surrounding natural areas or available floristic databases; and
- **Habitat Integrity:** The degree to which the habitat unit is transformed based on observed disturbances which may affect habitat integrity.

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

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

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

Vegetation Surveys

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

The vegetation survey incorporates the subjective (or stratified) sampling method. Subjective sampling is a sampling technique in which the specialist relies on his or her own professional experience when choosing sample sites within the focus area. This allows representative recordings of floral communities

and optimal detection of SCC. Subjective sampling is used to consider different areas (or habitat units) which are identified within the main body of a habitat/focus area.

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

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

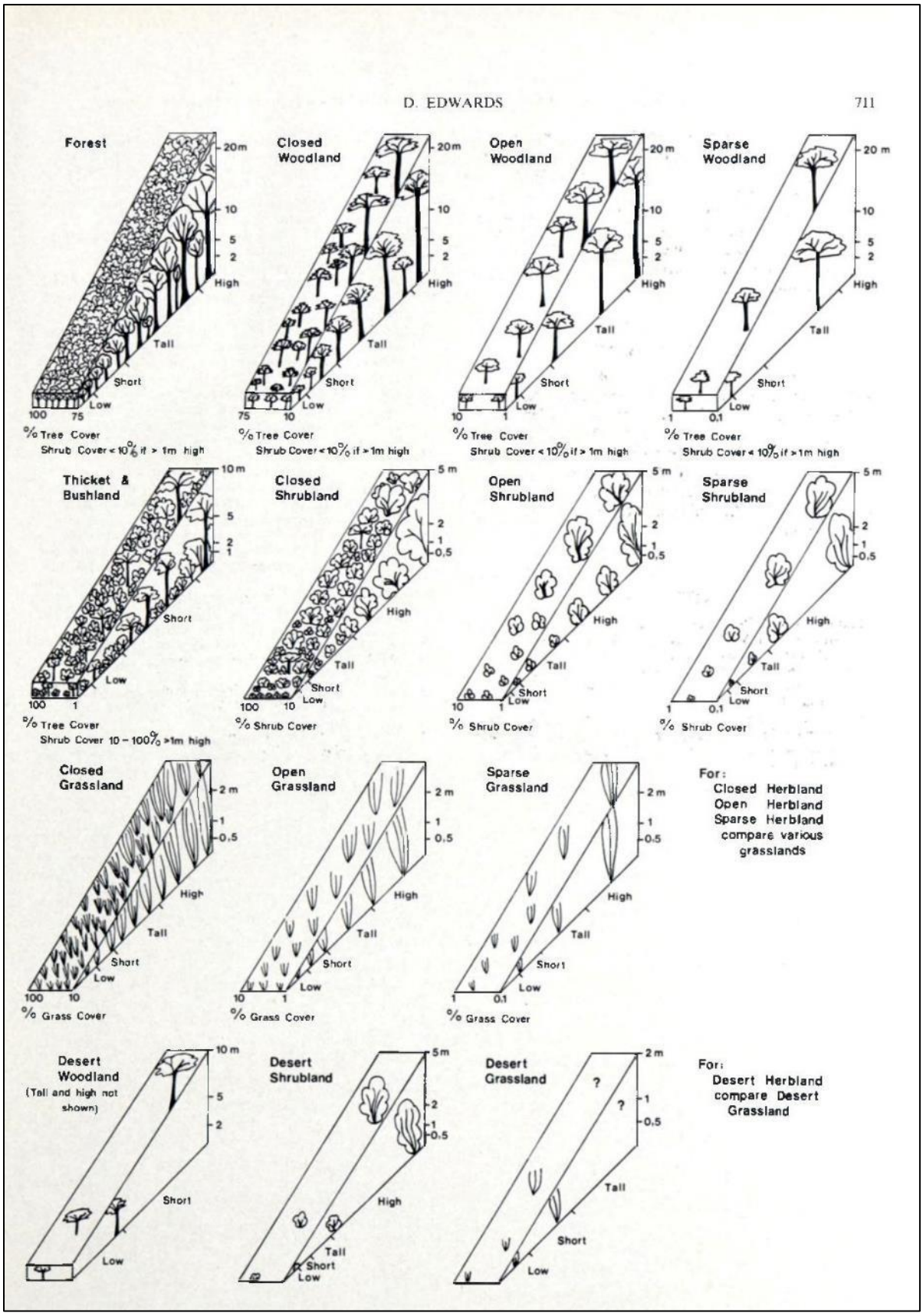

Figure A1: Diagrammatic representation of structural groups and formation classes. Only dominant growth forms are shown.

APPENDIX B: Floral SCC

South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. This scientific system is designed to measure species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action. For the POC assessment, a list of Red Data Listed (RDL) species previously recorded within the 10 km of the focus area was pulled from the Botanical Database of Southern Africa (BODATSA) (http://posa.sanbi.org/). This list was further cross-checked with the NCNCA (2009) flora list (Schedule 1 and Schedule 2) to identify provincially protected species previously recorded for the area.

Definitions of the national Red List categories

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

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

- **Data Deficient - Insufficient Information (DDD)** A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
- **Data Deficient - Taxonomically Problematic (DDT)** A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
- **Not Evaluated (NE)** A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in **Plants of southern Africa: an online checklist** are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

The below table presents the results of the POC assessment.

POC for RDL Floral SCC obtained from BODATSA

Table B1: Red Data Listed plant species recorded in the QDS 2822B. Species list obtained from the new Plants of southern Africa (new POSA) online catalogue. Information on species distributions and conservation status were derived from the Red List of South African Plants website (http://redlist.sanbi.org/index.php).

Scientific Name	IUCN	Habitat description	POC
Aloidendron dichotomum	VU	**Range**: From Nieuwoudtville east to Olifantsfontein and northwards to the Brandberg in Namibia. **Major habitats:** Richtersveld Mountain Shrubland, Namaqualand Shale Shrubland, Namaqualand Klipkoppe Shrubland, Northern Knersvlakte Vygieveld, Bushmanland Arid Grassland, Blouputs Karroid Thornveld, Lower Gariep Broken Veld, Kahams Mountain Desert, Eastern Gariep Rocky Desert, Upper Gariep Alluvial Vegetation. **Description:** On north-facing rocky slopes (particularly dolomite) in the south of its range. Any slopes and sandy flats in the central and northern parts of range.	Low

PROVINCIALLY PROTECTED SPECIES

Table B2: POC assessment results for provincially protected floral species as per the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA). Threatened status and additional information on species threat status, habitat and distribution was obtained from The Red List of South African Plants (http://redlist.sanbi.org/index.php). The Potential of Occurrence (POC) of these floral SCC within the focus area is also provided.

CR PE = Critically Endangered (Possibly Extinct); **EN=** Endangered**; EW =** Extinct in the Wild; **NT =** Near Threatened; **VU=** Vulnerable; **P=** Protected **LC** = Least Concern; **POC** = Probability of Occurrence.

Species	Habitat and distribution details	IUCN	POC
Schedule 2 Protected Species FAMILY AIZOACEAE (MESEMBRYANTHEMACEAE) - All species except those listed as Schedule			
Chasmatophyllum musculinum	Succulent **Provincial distribution**: Eastern Cape, Free State, Gauteng, Mpumalanga, Northern Cape, North West, Western Cape **Major habitats: Terrestrial** **Description:** Wide, but sparse distribution within the southern African interior. Habitat can range from rocky areas to deeper soils (Smith et al. 1998). **Suitable habitat on site:** Thornveld Habitat and Calcrete Habitat.	LC	**Medium**
Ebracteola wilmaniae	Succulent **Range**: Widespread across the Northern Cape and North West Province, from Zeerust to Prieska. **Major habitats:** Grassland, Savanna. **Description:** Lithosols in chert or dolomite outcrops in grassland.	LC	**Low**
Lithops aucampiae subsp. *aucampiae* var. *aucampiae*	Succulent **Range**: Northern Cape. Kimberly to Upington. **Major habitats:** Savanna. **Description:** Red quartzite. **Suitable habitat on site:** Calcrete Habitat	LC	**High**
Galenia collina	Dwarf shrub **Provincial distribution:** Northern Cape, Western Cape. **Major habitats:** Terrestrial. **Description:** None provided.	LC	**Low**
Galenia prostrata	Dwarf shrub **Provincial distribution:** Eastern Cape, Free State, Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** None provided. **Population trend:** Stable.	LC	**Low**
Nananthus aloides	Succulent **Range**: Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** Widespread in the climatically severe southern African interior. It grows mostly at the edge of pans in finely decomposed limestone, the plants often sunken into the ground, or among stones (The encyclopaedia of succulents). **Population trend:** None provided.	LC	**Low**
Plinthus cryptocarpus	Dwarf shrub **Range**: Northern Cape **Major habitats:** Terrestrial. **Description:** None provided. **Population trend:** None provided.	LC	**Low**
Prepodesma orpenii	Succulent **Range**: Northern Cape. **Major habitats:** Terrestrial. **Description:** Arid subtropics. It grows in dry plane lands on barren loamy shales or in crevices between quartzitic limestone stones (The encyclopaedia of succulents). **Population trend:** Stable.	LC	**Low**

Species	Habitat and distribution details	IUCN	POC
Ruschia griquensis	Succulent; shrub **Range**: Free State, Northern Cape. **Major habitats:** Terrestrial **Description:** The plant sprawls on exposed, stony ground. **Population trend:** Stable. **Suitable habitat on site:** Calcrete Habitat & Kalahari Thornveld	LC	**Confirmed**
Tetragonia arbuscula	Succulent; dwarf shrub **Range**: Eastern Cape, Free State, Northern Cape, Western Cape. **Major habitats:** Terrestrial. **Description:** Not provided. **Population trend:** Not provided.	LC	**Low**
Tetragonia calycina	Succulent; dwarf shrub **Range**: Eastern Cape, Free State, Northern Cape, Western Cape. **Major habitats:** Terrestrial. **Description:** Not provided. **Population trend:** Not provided.	LC	**Low**
Schedule 2 Protected Species FAMILY APOCYNACEAE - All species except those listed as Schedule			
Brachystelma circinatum	Succulent; geophyte **Range**: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Western Cape. **Major habitats:** Terrestrial. **Description:** Grows in various stony places and has adapted to different environmental factors (The encyclopaedia of succulents). **Population trend:** Not provided.	LC	**Low**
Cynanchum orangeanum	Herb **Range**: Eastern Cape, Free State, Northern Cape, North West. **Major habitats:** Terrestrial. **Population trend:** Not provided.	LC	**Low**
Fockea angustifolia	Succulent; climber **Range**: Free State, KwaZulu-Natal, Limpopo, Northern Cape, North West **Major habitats:** Terrestrial. **Description:** Occurs in dry areas on stony hillsides on granite or limestone (Pooley, 2005). **Suitable habitat on site:** Mountain Bushveld Habitat	LC	**Medium**
Gomphocarpus fruticosus	Herb; shrub **Range**: Widespread across South Africa, extending northwards to Angola, Zambia and Mozambique. **Major habitats:** Albany Thicket, Desert, Fynbos, Grassland, Indian Ocean Coastal Belt, Nama Karoo, Savanna, Succulent Karoo. **Description:** Dry sandy soils in open or disturbed places, often on riverbanks. **Suitable habitat on site:** Throughout study area and particularly within the Transformed Habitat	LC	**Confirmed**
Gomphocarpus tomentosus	Herb; shrub **Range**: Widespread across the central and north-eastern interior of South Africa, extending northwards within southern Africa to southern Angola, Zimbabwe and southern Mozambique. **Major habitats:** Grassland, Nama Karoo, Savanna. **Description:** Sandy open or disturbed areas. **Suitable habitat on site:** Throughout study area and particularly within the Transformed Habitat	LC	**Confirmed**
Huernia barbata subsp. *ingeae*	Succulent **Range**: Northern Cape. **Major habitats:** Terrestrial. **Description:** Not provided.	LC	**Low**
Microloma armatum	Dwarf shrub; shrub **Range**: Widespread, but sparsely distributed across southern Namibia and the Northern Cape Province, South Africa, extending as far south as Karoopoort east of Ceres in the Western Cape.	LC	**Medium**

Species	Habitat and distribution details	IUCN	POC
	Major habitats: Nama Karoo, Savanna, Succulent Karoo. **Description:** Arid shrubland and thornveld. Sometimes restricted to rock formations. **Suitable habitat on site:** Thornveld and Calcrete Habitat.		
Pachypodium succulentum	Succulent; shrub **Range**: Eastern Cape, Northern Cape, Western Cape. **Major habitats:** Terrestrial. **Description:** It occurs in rocky grassland, koppies, steep hills and succulent scrub vegetation in the Western, Eastern and Northern Cape and western Free State, at altitudes up to 1 400 m (SANBI PlantZAfrica). **Suitable habitat on site:** Kalahari Thornveld, Calcrete Habitat and Mountain Bushveld. **This species is listed on Appendix II of CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora).	LC	**High**
Schedule 2 Protected Species FAMILY ASPHODELACEAE - All species except those listed as Schedule 1, and the species *Aloe ferox*			
Aloidendron dichotomum	**Range**: From Nieuwoudtville east to Olifantsfontein and northwards to the Brandberg in Namibia. **Major habitats:** Terrestrial. **Description:** On north-facing rocky slopes (particularly dolomite) in the south of its range. Any slopes and sandy flats in the central and northern parts of range. **Population trend:** Decreasing.	VU	**Low**
Bulbine abyssinica	Succulent; geophyte; herb **Range**: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape. **Major habitats:** Terrestrial. **Description:** It favours rocky grassland and shallow soil overlying rock but can also be found in woodland and along seepage areas. **Suitable habitat on site:** Calcrete Habitat & Linear Drainage Lines	LC	**High**
Trachyandra saltii	Succulent; geophyte **Range**: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** In rocky montane grassland, margins of forest and vleis and open woodland, often on stony or sandy soils, including Kalahari sand. **Suitable habitat on site:** Calcrete Habitat, Thornveld habitat and Linear Drainage Line Habitat	LC	**Medium**
Schedule 2 Protected Species FAMILY CAPPARACEAE - *Boscia* spp., i.e. Shepherd's trees, all species			
Boscia albitrunca	Shrub; tree **Range**: Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** This species is found in the drier parts of southern Africa, in areas of low rainfall. **Suitable habitat on site:** Kalahari Thornveld	LC	**Confirmed**
Schedule 2 Protected Species FAMILY CELASTRACEAE - *Gymnosporia* spp. All species			
Gymnosporia buxifolia	Shrub; tree **Range**: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape. **Major habitats:** Terrestrial. **Description:** Its natural habitat is in grasslands, fynbos, Nama-karoo, forests, thickets and savanna-bushveld. It occurs on hillsides, dry slopes of valleys, sometimes in riverbeds, often on termite mounds and it is often found as undergrowth to taller trees.	LC	**Confirmed**

Species	Habitat and distribution details	IUCN	POC
	Suitable habitat on site: Thornveld Habitat and Mountain Bushveld.		
Schedule 2 Protected Species FAMILY CRASSULACEAE - All species except those listed in Schedule 1			
Crassula corallina	Succulent; herb **Range**: Northern Cape (Subsp. *corallina*, also occurs in the Eastern Cape, Free State, North West, Western Cape). **Major habitats:** Terrestrial. **Description:** It grows in quartzite outcrops in desert-like habitat and dry floodplain (The encyclopaedia of succulents). **Suitable habitat on site:** habitat within the deep sany soils in the south west sections of the *Senegalia-Tarconathus* Open Thornveld. **Suitable habitat on site:** Calcrete Habitat.	LC	**Confirmed**
Crassula muscosa	Succulent; herb **Range**: This species is widespread across Namaqualand, Bushmanland and the Karoo, extending to the coastal lowlands of the Western Cape and the western half of the Eastern Cape. It also occurs in Namibia. **Major habitats:** Terrestrial, including Postmasburg Thornveld. **Description:** Occurs sheltered under shrubs or in rocky places in karroid shrubland, valley bushveld and fynbos. **Suitable habitat on site:** Calcrete Habitat.	NE	**Medium**
Kalanchoe rotundifolia	Succulent; dwarf shrub **Range**: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** A very common plant found growing as a pioneer plant usually in shade or half-shade, single or in large communities under trees or shrubs in bushland, woodland, open and secondary forests, savanna, open veld; sandy, limestone, brackish or rocky soils or on rocks, either in dry or wet habitats, sometimes in salt marshes. **Suitable habitat on site:** Thornveld Habitat, Calcrete Habitat and Mountain Bushveld Habitat.	LC	**Medium**
Schedule 2 Protected Species FAMILY EUPHORBIACEAE - *Euphorbia* spp. All species			
Euphorbia crassipes or potentially *Euphorbia fusca* The separation of these two species as distinct is not universally accepted.	Dwarf succulent **Range**: Northern Cape. **Major habitats:** Namibia to Kliprand, Pofadder, Prieska and Kimberley. **Description:** Gravelly flats. **Suitable habitat on site:** Calcrete Habitat and Thornveld Habitat.	LC	**Medium**
Euphorbia davyi	Dwarf, spineless succulent shrub **Range**: Gauteng, Limpopo, North West. **Major habitats:** Terrestrial. **Description:** Rocky outcrops in grassland.	LC	**Low**
Euphorbia duseimata	Succulent; dwarf shrub **Range**: Free State, Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** Sandy or turfy soils, Kalahari Thornveld and Bushveld. **Suitable habitat on site:** Kalahari Thornveld	LC	**Medium**
Euphorbia gariepina	Succulent **Range**: Northern Cape and Namibia. From the Orange River to 160 km north of Windhoek. **Major habitats:** Terrestrial. **Description:** Sandy, gravelly soils. **Suitable habitat on site:** Calcrete Habitat	LC	**High**
Euphorbia wilmaniae	Spineless dwarf succulent **Range**: Northern Cape. Griqualand West Centre endemic species. **Major habitats:** Terrestrial.	LC	**Medium**

Species	Habitat and distribution details	IUCN	POC
	Description: Among boulders and rocks, often concealed in the crevices of the rocks. **Suitable habitat on site:** Calcrete Habitat		
Schedule 2 Protected Species FAMILY HYACINTHACEAE - *Eucomis* spp. Pineapple flower, all species			
Eucomis autumnalis	Geophyte **Range**: South Africa, Swaziland, Lesotho, Botswana, Zimbabwe and Malawi. **Major habitats:** Grassland **Description:** Damp, open grassland and sheltered places from the coast to 2450 m.	NE	**Low**
Schedule 2 Protected Species FAMILY IRIDACEAE - All species except those listed in Schedule 1			
Babiana bainesii	Geophyte; herb **Range**: Limpopo, Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** Grassland, usually among small rocks. **Suitable habitat on site:** *Senegalia-Tarconathus* Open Thornveld and Rocky Habitat Units.	LC	**High**
Babiana hypogaea	Geophyte; herb **Range**: Free State, Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** Red sand plains. Usually in Kalahari Sand or stony laterite in open woodland or grassland. **Suitable habitat on site:** Thornveld and Calcrete Habitat Units.	LC	**High**
Duthieastrum linifolium	Geophyte; herb **Range**: Free State, Northern Cape, North West. **Major habitats:** Terrestrial. **Description:** None provided	LC	**Low**
Freesia andersoniae	Geophyte; herb **Range**: Eastern Cape, Free State, Northern Cape, North West. Widespread across the central interior of South Africa. **Major habitats:** Grassland, Nama Karoo, Savanna. **Description:** Wedged among rocks on lower slopes of dolerite and dolomite outcrops. **Suitable habitat on site:** Calcrete Habitat & Mountain Bushveld.	LC	**High**
Gladiolus orchidiflorus	Geophyte; herb **Range**: Free State, Northern Cape, Western Cape. **Major habitats:** Terrestrial. **Description:** Found on clay and sandstone soils from Namibia to Cape Flats and also to Free State and flowers in the spring.	LC	**Low**
Moraea polystachya	Geophyte; herb **Range**: Eastern Cape, North West, Western Cape. **Major habitats:** Terrestrial. **Description:** The habitat is well-drained flats and slight slopes, with collectors often referring to the presence of calcrete deposits. **Suitable habitat on site:** Kalahari Thornveld and Calcrete Habitat.	LC	**High**
Schedule 2 Protected Species FAMILY MELIACEAE - *Nymania capensis* (Thunb.) (Lindb.) Chinese Lantern			
Nymania capensis	Tree; shrub **Range**: Eastern Cape, Northern Cape, Western Cape. **Major habitats:** **Description:** It favours hot, dry, rocky habitats, but also occurs near dry, sandy rivers.	LC	**Medium**

Species	Habitat and distribution details	IUCN	POC
	Suitable habitat on site: Mountain Bushveld Habitat.		
Schedule 2 Protected Species **FAMILY OLEACEAE - *Olea europaea* subsp. *africana* (Mill.) (P.S. Green) Wild olive**			
Olea europaea subsp. *africana*	Tree **Range**: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape **Major habitats:** Terrestrial. **Description:** This tree is found in a variety of habitats, often near water, e.g. on rocky hillsides, on stream banks and in woodland (where it can reach 12 m) (SANBI PlantZAfrica). **Suitable habitat on site:** Thornveld Habitat, Mountain Bushveld Habitat, Moisture-driven Habitat. .	**LC**	**Confirmed**
Schedule 2 Protected Species **FAMILY OXALIDACEAE - *Oxalis* spp. Sorrel, all species except those species listed in Schedule 1**			
Oxalis lawsonii	Geophyte **Range**: Free State, Northern Cape, North West. **Major habitats:** Terrestrial. **Suitable habitat on site:** *Senegalia-Tarconathus* Open Thornveld. .	LC	**Confirmed**
Schedule 2 Protected Species **FAMILY SCROPHULARIACEAE - *Jamesbrittenia* spp. All species**			
Jamesbrittenia atropurpurea	Shrub; dwarf shrub **Range**: Eastern Cape, Free State, Gauteng, Northern Cape, North West, Western Cape. **Major habitats:** Terrestrial. **Description:** This species grows in clay or loam flats, slopes and ridges among scrub. **Suitable habitat on site:** Throughout Thornveld and Calcrete Habitat Units.	LC	**High**
Jamesbrittenia tysonii	Dwarf shrub **Range**: Eastern Cape, Northern Cape. **Major habitats:** Terrestrial. **Description:** It grows on slopes, along seasonal watercourses among scrub adapted to semi-arid terrain; also, on degraded land (Operation Wildflower). **Suitable habitat on site:** Linear Drainage Lines	LC	**High**
Manulea burchellii	Herb **Range**: Northern Cape. **Major habitats:** Terrestrial. **Description:** None provided **Suitable habitat on site:** In red sandy soils of the Thornveld Habitat.	LC	**Medium**

NATIONALLY PROTECTED SPECIES

NEMBA TOPS List for South Africa[14]

Table B3: TOPS list for South Africa – plant species.

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	**Common Name**	**POC**	**Provincial Distribution**	**Conservation Status**
Adenia wilmsii	No common name	**Low**	**Provincial distribution**: Mpumalanga **Range**: Lydenburg to Waterval Boven **Description**: Dolerite outcrops or red loam soil, in open woodland, 1300-1500 m.	**EN; P**
Adenium swazicum	Swaziland Impala Lily	**Low**	**Range**: Kruger National Park to Swaziland along the Lebombo Mountains and adjacent areas in south-western Mozambique.	**VU**
Adenium swazicum	Swaziland Impala Lily	**Low**	**Provincial distribution**: Mpumalanga	**VU**
Aloe albida	Grass Aloe	**Low**	**Provincial distribution**: Mpumalanga **Range**: Aloe albida has a restricted range in the mountains south of Barberton, Mpumalanga, extending to Malolotja in north-western Swaziland.	**NT**
***Aloe pillansii* (now *Aloidendron pillansii*)**	False Quiver Tree	**Low**	**Provincial distribution**: Northern Cape **Range**: Richtersveld and southern Namibia.	**EN**
Aloe simii	No common name	**Low**	**Provincial distribution**: Mpumalanga **Range**: This species is endemic to a small area in the transition area between the Mpumalanga Lowveld and Escarpment, where it occurs from Sabie southwards to White River and around Nelspruit. **Description**: It occurs along drainage lines and in wetlands in open woodland and grassland, 600-1100 m.	**EN; P**
Clivia mirabilis	"Oorlogskloof' Bush Lily	**Low**	**Provincial distribution**: Northern Cape, Western Cape	**VU; P**
Diaphananthe millarii	Tree Orchid	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal **Range**: East London and Durban.	**VU**
Disa macrostachya	No common name	**Low**	**Provincial distribution**: Northern Cape	**EN; P**
Disa nubigena	No common name	**Low**	**Provincial distribution**: Western Cape	**Rare; P**
Disa physodes	No common name	**Low**	**Provincial distribution**: Western Cape	**CR; P**
Disa procera	No common name	**Low**	**Provincial distribution**: Western Cape	**EN; P**
Disa sabulosa	No common name	**Low**	**Provincial distribution**: Western Cape	**EN; P**
Encephalartos aemulans	Ngotshe Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**CR**
Encephalartos altensteinii	Bread **Palm**	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**VU; P**
Encephalartos arenarius	Dune Cycad	**Low**	**Provincial distribution**: Eastern Cape	**EN**
Encephalartos brevifoliolatus	Escarpment Cycad	**Low**	**Provincial distribution**: Limpopo	**EW**
Encephalartos caffer	Breadfruit Tree	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**NT; P**
Encephalartos cerinus	Waxen Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**CR**
Encephalartos cupidus	Blyde River Cycad	**Low**	**Provincial distribution**: Limpopo, Mpumalanga **Description**: Grassland, on steep, rocky slopes or cliffs and sometimes near seepage areas bordering gallery forests.	**CR**
Encephalartos dolomiticus	Wolkberg Cycad	**Low**	**Provincial distribution**: Limpopo	**CR**

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

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	**Common Name**	**POC**	**Provincial Distribution**	**Conservation Status**
Encephalartos dyerianus	Lowveld Cycad	**Low**	**Provincial distribution**: Limpopo	**CR; P**
Encephalartos eugene-maraisii	Waterberg Cycad	**Low**	**Provincial distribution**: Limpopo	**EN**
Encephalartos friderici-guilielmi	No common name	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**NT; P**
Encephalartos ghellinckii	No common name	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**VU; P**
Encephalartos heenanii	Woolly Cycad	**Low**	**Provincial distribution**: Mpumalanga **Description**: Open areas of montane grasslands amidst scarp forest in deep valleys and ravines.	**CR**
Encephalartos hirsutus	Venda Cycad	**Low**	**Provincial distribution**: Limpopo	**CR**
Encephalartos horridus	Eastern Cape Blue Cycad	**Low**	**Provincial distribution**: Eastern Cape	**EN**
Encephalartos humilis	No common name	**Low**	**Provincial distribution**: Mpumalanga **Description:** Montane and mistbelt grassland, rocky sandstone slopes.	**VU; P**
Encephalartos inopinus	Lydenburg Cycad	**Low**	**Provincial distribution**: Limpopo	**CR**
Encephalartos laevifolius	Kaapsehoop Cycad	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga **Description**: Steep, rocky slopes in mistbelt grassland, 1300-1500 m.	**CR**
Encephalartos lanatus	No common name	**Low**	**Provincial distribution**: Gauteng and western Mpumalanga **Description**:Sheltered, wooded ravines in sandstone ridges, 1200-1500 m.	**NT; P**
Encephalartos latifrons	Albany Cycad	**Low**	**Provincial distribution**: Eastern Cape	**CR**
Encephalartos lebomboensis	Lebombo Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal, Mpumalanga **Description**: Cliffs and rocky ravines in savanna and grassland.	**EN**
Encephalartos lehmannii	No common name	**Low**	**Provincial distribution**: Eastern Cape	**NT; P**
Encephalartos longifolius	No common name	**Low**	**Provincial distribution**: Eastern Cape	**NT; P**
Encephalartos middelburgensis	Middelburg Cycad	**Low**	**Provincial distribution**: Gauteng, Mpumalanga **Description**: Open grasslands and in sheltered valleys.	**CR**
Encephalartos msinganus	Msinga, Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**CR**
Encephalartos natalensis	Natal Giant Cycad	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**NT; P**
Encephalartos ngoyanus	Ngoye Dwarf Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**VU**
Encephalartos nubimontanus	Blue Cycad	**Low**	**Provincial distribution**: Limpopo	**EW**
Encephalartos paucidentatus	No common name	**Low**	**Provincial distribution**: Mpumalanga **Description**: Forest, occurs on steep rocky slopes and alongside streams in deep gorges.	**VU; P**
Encephalartos princeps	No common name	**Low**	**Provincial distribution**: Eastern Cape	**VU; P**
Encephalartos senticosus	No common name	**Low**	**Provincial distribution**: KwaZulu-Natal	**VU; P**
Encephalartos transvenosus	Modjadje Cycad	**Low**	**Provincial distribution**: Limpopo	**LC; P**
Encephalartos trispinosus	No common name	**Low**	**Provincial distribution**: Eastern Cape	**VU; P**
Encephalartos woodii	Wood's Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**EW**
Euphorbia clivicola	No common name	**Low**	**Provincial distribution**: Limpopo	**CR; P**
Euphorbia meloformis	No common name	**Low**	**Provincial distribution**: Eastern Cape	**NT; P**
Euphorbia obesa	No common name	**Low**	**Provincial distribution**: Eastern Cape	**EN; P**
Harpagophytum procumbens	Devil's Claw	**Medium**	**Provincial distribution**: Free State, Limpopo, Northern Cape, North West	**LC; P**
Harpagophytum zeyherii	Devil's Claw	**Low**	**Provincial distribution**: Gauteng, Limpopo, Mpumalanga, North West	**LC; P**
Hoodia currorii	Ghaap	**Low**	**Provincial distribution**: Limpopo	**P**
Hoodia gordonii	Ghaap	**Low**	**Provincial distribution**: Free State, Northern Cape, Western Cape	**DDD; P**

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

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

Protected tree species as per the NFA

Table B4: Protected trees as defined by The National Forest Act, 1998, (Act No. 84 of 1998) (NFA) for the focus area. Additional information on species threat status as defined in The Red List of South African Plants (http://redlist.sanbi.org/index.php) is presented.

Family	Scientific Name	IUCN	Description	POC
Brassicaceae	*Boscia albitrunca*	LC	**Range**: Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West. **Description**: hot dry areas as well as the bushveld, open woodland and are associated with termite mounds. **Suitable Habitat on Site**: Thornveld Habitat and Calcrete Habitat. Potential habitat within the Mountain Bushveld Habitat.	**Confirmed**
Fabaceae	*Vachellia erioloba*	LC	**Range**: Free State, Gauteng, Limpopo, Mpumalanga, Northern Cape, North West Province. **Description**: Savanna, semi-desert, and desert areas with deep, sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops. **Suitable Habitat on Site**: Thornveld Habitat and the Mountain Bushveld Habitat. Potential habitat within the Watercourse Habitat.	**Confirmed**
Fabaceae	*Vachellia haematoxylon*	LC	**Range**: Northern Cape **Description**: Found in arid areas, usually on sandy soils. **Suitable Habitat on Site**: Thornveld Habitat.	**Confirmed**

APPENDIX C: Floral Species List

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

Scientific name	*Senegalia-Tarchonanthus* Thornveld	*Senegalia* Thornveld	Kalahari Thornveld	Calcrete Habitat	Cryptic Wetlands	Linear Drainage Line	Seasonal Depressions	Anthropogenic Drainage Line Habitat	Mountain Bushveld	Transformed Habitat
Woody Species										
**Prosopis glandulosa* var. *torreyana*	x	x								x
**Schinus molle*										x
**Solanum elaeagnifolium*						x				x
Aptosimum lineare	x	x	x						x	x
Aptosimum marlothii	x	x	x							
Asparagus laricinus	x	x						x		x
Asparagus nelsii	x	x	x						x	
Barleria rigida	x	x	x	x						
Blepharis sp.										x
***Boscia albitrunca* (NFA & NCNCA)**			x						x	
Croton gratissimus									x	
Diospyros lycioides subsp. *lycioides*	x	x	x			x	x	x	x	
Ehretia rigida subsp. *rigida*	x	x	x							
Eriocephalus cf. *ericoides*	x	x	x	x		x	x	x	x	
Euclea undulata	x	x	x	x					x	
Felicia sp.	x	x	x							x
Grewia flava	x	x	x							

Scientific name	*Senegalia-Tarchonanthus* Thornveld	*Senegalia* Thornveld	Kalahari Thornveld	Calcrete Habitat	Cryptic Wetlands	Linear Drainage Line	Seasonal Depressions	Anthropogenic Drainage Line Habitat	Mountain Bushveld	Transformed Habitat
***Gymnosporia buxifolia* (NCNCA)**	x	x	x						x	
Hermannia cf. *burchellii*	x	x	x			x		x	x	x
Indigophera sp.	x	x	x							
Justicia divaricata	x	x	x	x				x	x	x
Lantana rugosa	x	x	x			x				x
Lycium hirsutum	x	x	x							x
Monechma incanum	x	x	x	x						
***Nymania capensis* (NCNCA)**									x	
***Olea europaea* subsp. *africana* (NCNCA)**			x		x	x				
Pentzia cf. *calcarea*	x	x	x	x	x	x				x
Rhigozum obovatum	x	x	x	x						x
Rhigozum trichotomum	x	x	x	x						x
Salsola kalaharica				x						
Searsia burchellii	x	x	x	x		x				
Searsia lancea	x	x	x	x	x	x	x	x	x	
Searsia leptodictya	x		x			x			x	
Searsia tridactyla	x	x	x			x				
Senegalia mellifera subsp. *detinens*	x	x	x	x					x	x
Senna italica	x	x								x
Solanum tomentosum	x	x	x							x
Tapinanthus oleifolius	x	x	x			x		x	x	
Tarchonanthus camphoratus	x	x	x		x	x	x	x		x
***Vachellia erioloba* (NFA)**			x						x	

Scientific name	*Senegalia-Tarchonanthus* Thornveld	*Senegalia* Thornveld	Kalahari Thornveld	Calcrete Habitat	Cryptic Wetlands	Linear Drainage Line	Seasonal Depressions	Anthropogenic Drainage Line Habitat	Mountain Bushveld	Transformed Habitat
Vachellia hebeclada subsp. *hebeclada*			x							
Vachellia tortilis subsp. *heteracantha*	x	x	x						x	
Vangueria infausta	x		x						x	
Waltheria indica	x	x						x		x
Ziziphus mucronata	x	x	x		x	x	x	x	x	x
Herbaceous Species										
**Alternanthera pungens*										x
**Argemone ochroleuca* subsp. *ochroleuca*										x
**Bidens bipinnata*	x	x	x	x	x	x	x		x	x
**Chenopodium album*	x	x								x
**Portulaca oleracea*	x	x								x
**Salsola kali*	x	x								x
**Tagetes minuta*	x	x	x	x	x	x	x			x
Abutilon austro-africanum				x			x			
Barleria lichtensteiniana									x	
Blepharis furcata									x	
***Boophone disticha* (NCNCA)**									x	
Commelina cf. *africana*	x	x	x					x		x
Cucumis africanus	x	x	x			x				x
Cullen tomentosum					x					
Dicoma anomala				x					x	
Dicoma capensis				x					x	
Eriospermum cf. *porphyrium*	x		x	x					x	

Scientific name	*Senegalia-Tarchonanthus* Thornveld	*Senegalia* Thornveld	Kalahari Thornveld	Calcrete Habitat	Cryptic Wetlands	Linear Drainage Line	Seasonal Depressions	Anthropogenic Drainage Line Habitat	Mountain Bushveld	Transformed Habitat
Geigeria ornativa	x	x	x	x		x	x		x	x
Gisekia africana var. *africana*									x	
Helichrysum sp	x	x	x						x	
Hermannia comosa	x	x	x	x		x			x	
Hermannia depressa	x	x	x						x	
Hermannia linearifolia	x	x	x						x	
Hermbstaedtia fleckii	x	x	x	x					x	
Kyphocarpa angustifolia	x	x	x	x		x	x	x		x
Pellaea calomelanos			x	x					x	
Sansevieria aethiopica			x						x	
Sansevieria pearsonii									x	
Sesamum triphyllum	x	x								x
Sida ovata	x	x								x
Tribulus zeyheri subsp. *zeyheri*	x	x	x							
Succulent Species										
**Austrocylindropuntia cylindrica*	x	x								
**Opuntia ficus-indica*	x	x								x
***Aloe grandidentata* (NCNCA)**									x	
Kleinia longiflora	x	x	**x**						x	
Lycium cinereum	x	x	**x**	x				x	x	
***Ruschia* cf. *calcarea* (NCNCA)**				x						
***Ruschia* cf. *griquensis* (NCNCA)**				x						
Viscum rotundifolium	x	x	**x**						x	

Scientific name	*Senegalia-Tarchonanthus* Thornveld	*Senegalia* Thornveld	Kalahari Thornveld	Calcrete Habitat	Cryptic Wetlands	Linear Drainage Line	Seasonal Depressions	Anthropogenic Drainage Line Habitat	Mountain Bushveld	Transformed Habitat
Graminoid Species										
**Pennisetum setaceum*										x
Aristida adscensionis				x		x		x	x	x
Aristida congesta subsp. *congesta*	x	x	x		x	x	x	x	x	x
Aristida diffusa				x					x	x
Brachiaria nigropedata	x	x	x						x	x
Brachiaria serrata						x			x	
Bulbostylis burchellii									x	
Cenchrus ciliaris	x	x	x	x		x		x	x	x
Chloris virgata						x		x		
Cymbopogon pospischilii	x	x	x				x	x	x	x
Cynodon dactylon	x	x	x							x
Cyperus sp.						x		x		
Digitaria eriantha subsp. *eriantha*						x		x	x	x
Diheteropogon amplectens								x	x	
Enneapogon cenchroides	x	x	x	x		x		x	x	x
Eragrostis annulata										
Eragrostis bicolor					x					
Eragrostis echinochloidea	x	x	x		x	x				
Eragrostis lehmanniana	x	x	x		x	x	x	x	x	
Eragrostis obtusa				x			x	x		
Eragrostis pallens	x		x							
Eragrostis trichophora	x		x	x				x		x

Scientific name	*Senegalia-Tarchonanthus* Thornveld	*Senegalia* Thornveld	Kalahari Thornveld	Calcrete Habitat	Cryptic Wetlands	Linear Drainage Line	Seasonal Depressions	Anthropogenic Drainage Line Habitat	Mountain Bushveld	Transformed Habitat
Eragrostis truncata				x						
Fingerhuthia africana	x		x	x					x	
Heteropogon contortus	x	x	x						x	x
Melinis repens	x	x	x					x		x
Panicum coloratum								x	x	
Pogonarthria squarrosa			x							
Schmidtia kalahariensis	x		x	x				x	x	
Schmidtia pappophoroides	x	x	x						x	x
Setaria verticillata	x		x							
Sporobolus fimbriatus				x						
Stipagrostis obtusa	x		x					x	x	
Stipagrostis uniplumis	x	x	x					x	x	
Themeda triandra	x		x	x						
Tragus racemosus	x	x								x
Typha capensis								x		
Urochloa panicoides	x	x	x			x				x