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BIODIVERSITY ASSESSMENT FOR THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR THE PROPOSED NEW SUPER FINES STORAGE FACILITY (SFSF) AT THE BLACK ROCK GLORIA MINE COMPLEX, NORTHERN CAPE PROVINCE

Prepared for

Environmental Science Associated (Pty) Ltd

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EXECUTIVE SUMMARY

MANAGEMENT MEASURES

DOCUMENT GUIDE

The following table indicates the requirements for Specialist Studies as per Appendix 6 of Government Notice 326 as published in Government Notice 40772 of 2017, amendments to the Environmental Impact Assessment (EIA) Regulations, 2014 as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

NEMA Regulations (2017) - Appendix 6	Relevant section in report
(1) A specialist report prepared in terms of these Regulations must contain -	
(a) details of -	
(i) the specialist who prepared the report; and	Appendix J
(ii) the expertise of that specialist to compile a specialist report, including a curriculum vitae;	Appendix J
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix J
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2.1 and 3.1
(cB) a description of existing impacts on site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Appendix B and C
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying alternatives;	Section 6
(g) an identification of any areas to be avoided, including buffers;	Section 6
(h) a map superimposing the activity, including the associated structures and infrastructure on the environmental sensitivities of the site, including areas to be avoided, including buffers;	Section 6
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment or activities;	Section 7 and Appendix I
(k) any mitigation measures for inclusion in the EMPr;	Section 7.3
(l) any conditions for inclusion in the environmental authorisation;	Section 7
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 7
(n) a reasoned opinion -	
(i) as to whether the proposed activity, activities or portions thereof should be authorised;	Section 8
(iA) regarding the acceptability of the proposed activity or activities; and	Section 8
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report	N/A
(p) a summary and copies, if any, comments received during any consultation process and, where applicable all responses thereto; and	N/A
(q) any other information requested by the competent authority.	N/A

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GLOSSARY OF TERMS

Alien and Invasive species	A species that is not an indigenous species; or an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
Biome	A broad ecological unit representing major life zones of large natural areas – defined mainly by vegetation structure and climate.
CBA (Critical Biodiversity Area)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation and ridges.
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can, therefore, be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
ESA (Ecological Support Area)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
IBA (Important Bird and Biodiversity Area)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Indigenous vegetation (as per the definition in (NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Invasive species	Means any species whose establishment and spread outside of its natural distribution range; they threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species; and may result in economic or environmental harm or harm to human health
Least Threatened	Least threatened ecosystems are still largely intact.
RDL (Red Data listed) species	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
SCC (Species of Conservation Concern)	The term SCC in the context of this report refers to all RDL (Red Data), and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.

LIST OF ACRONYMS

AIP	Alien Invasive Plant
BGIS	Biodiversity Geographic Information Systems
BRMO	Black Rock Mining Operations
CARA	Conservation of Agricultural Resource Act
CBA	Critical Biodiversity Area
CR	Critically Endangered
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EN	Endangered
ESA	Ecological Support Area
GIS	Geographic Information System
GPS	Global Positioning System
IBA	Important Bird Area
IUCN	International Union for the Conservation of Nature
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
MPRDA	Mineral and Petroleum Resource Development Act
NBA	National Biodiversity Assessment (2011)
NC PSDF	Northern Cape Provincial Spatial Development Framework
NCNCA	Northern Cape Nature Conservation Act
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NFA	National Forest Act
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RDL	Red Data List
RWD	Return Water Dam
SABAP 2	Southern African Bird Atlas 2
SACAD	South Africa Conservation Areas Database
SANBI	South African National Biodiversity Institute
SAPAD	South Africa Protected Area Database
SAS	Scientific Aquatic Services CC
SCC	Species of Conservation Concern
SFSF	Super Fines Storage Facility
TOPS	Threatened or Protected Species
TOPS	Threatened or Protected Species
TSF	Tailings Storage Facility
TSP	Threatened Species Programme
VU	Vulnerable

1. INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a biodiversity assessment as part of the Environmental Authorisation process for the proposed new Super Fines Storage Facility (SFSF) and associated infrastructure at the Gloria Mine Complex of the Assmang Black Rock Mine Operations (BRMO). The current tailing storage facilities (TSF) at the Gloria Mine are approaching full capacity, hence the need to construct a new SFSF to manage the future super fines generated. The area in which the proposed new SFSF will be constructed will henceforth be referred to as the "study area" (Figure 1 and 2).

1.1 Project Location

BRMO is situated at Santoy, with the Gloria Mine Complex located approximately 4.5 km northwest of the town of Hotazel and 57 km north of Kathu. The R380 is situated approximately 250 m southeast of the study area, while the R31 is located 5.9 km to the west. study area is located on Portion 1 of the farm Gloria 226, within the John Taolo Gaetsewe District Municipality, and the Joe Morolong Local Municipality. The land use of the area surrounding the BRMO Mining Right Area includes Mining and Livestock Farming.

1.2 Project Description

Ore at the Gloria Mine is mined underground using the bord and pillar method, by making use of trackless machined and underground conveyor systems. The ore is drilled, blasted and crushed underground, before being conveyed to the processing facilities on the surface. At the surface, the ore is further crushed and separated into various grades. These are then stockpiled and transported via rail and road (EScience Associates, 2019).

The manganese ore at BRMO is mechanically processed, which generates ore fines deposited as tailings. The fines are separated from other ore products during washing and screening, with the fines hydraulically transported as a suspension in process water to the fines storage facilities. The current Gloria Mine Tailings Storage Facility (TSF) is approaching full capacity. Various authorised upgrades are also underway which increases production capacity, and consequently, the construction of a new Super Fines Storage Facility (SFSF) is proposed by BRMO. The project includes the establishment of two or more storage cells making up the SFSF as well as all required supplementary infrastructure, which includes (EScience Associates, 2019):

- A Return Water Dam (RWD);
- Fines and water conveyance infrastructure (pipelines, pumps and their related civil, mechanical and electrical works);
- Access and maintenance roads;
- Fencing and access control;
- A contractor laydown area for the construction phase; and
- Topsoil and subsoil stockpiles from excavations.

Construction Phase

The construction phase broadly consists of:

- Removal and relocation of protected plant species;
- Clearing of remaining vegetation and establishment of roads, contractor laydown area and project service facilities;
- Excavation and stockpiling of topsoil;
- Excavation and stockpiling of subsoil;
- Site preparation such as levelling, compaction and drainage layout;
- Liner installation;
- Installation of fines and water conveyance infrastructures such as pipelines and pumps;
- Commissioning; and
- Erecting a fence around the SFSF.

Operational Phase

The operational phase consists of:

- Deposition of super fines and reticulation of carrier water; and
- General maintenance of the facility.

Closure and Decommissioning Phase

The closure and decommissioning phase broadly consists of:

- Shaping and capping of the storage facility;
- Removal of fines and water conveyance infrastructure, and any other structures such as shelters for personnel and a return water dam;
- Ripping and scarifying of roads, and other compacted footprints; and
- Depositing of subsoil and topsoil, rehabilitation and aftercare.

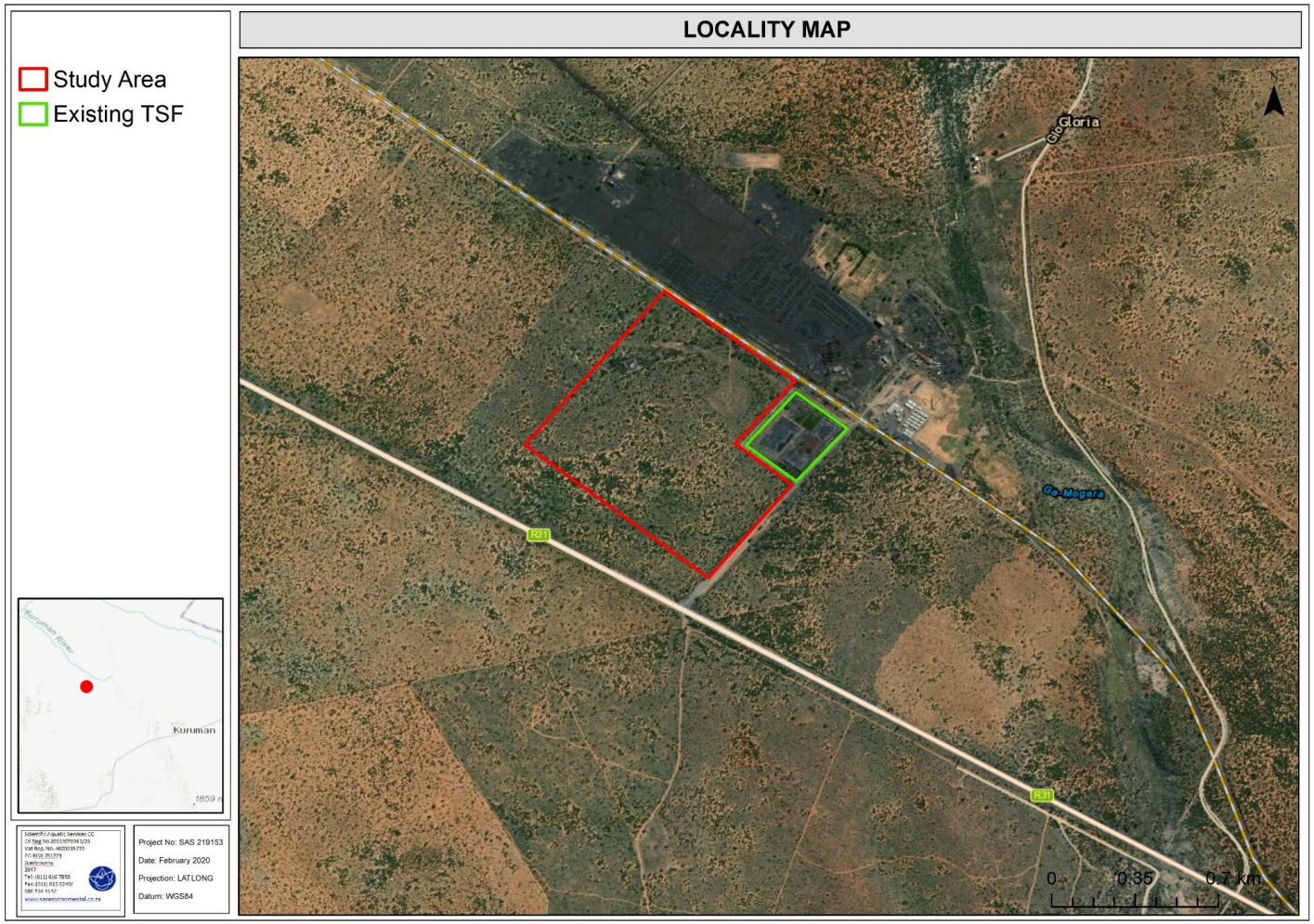


Figure 1: Digital satellite image depicting the location of the study area and existing TSF in relation to surrounding mining area.

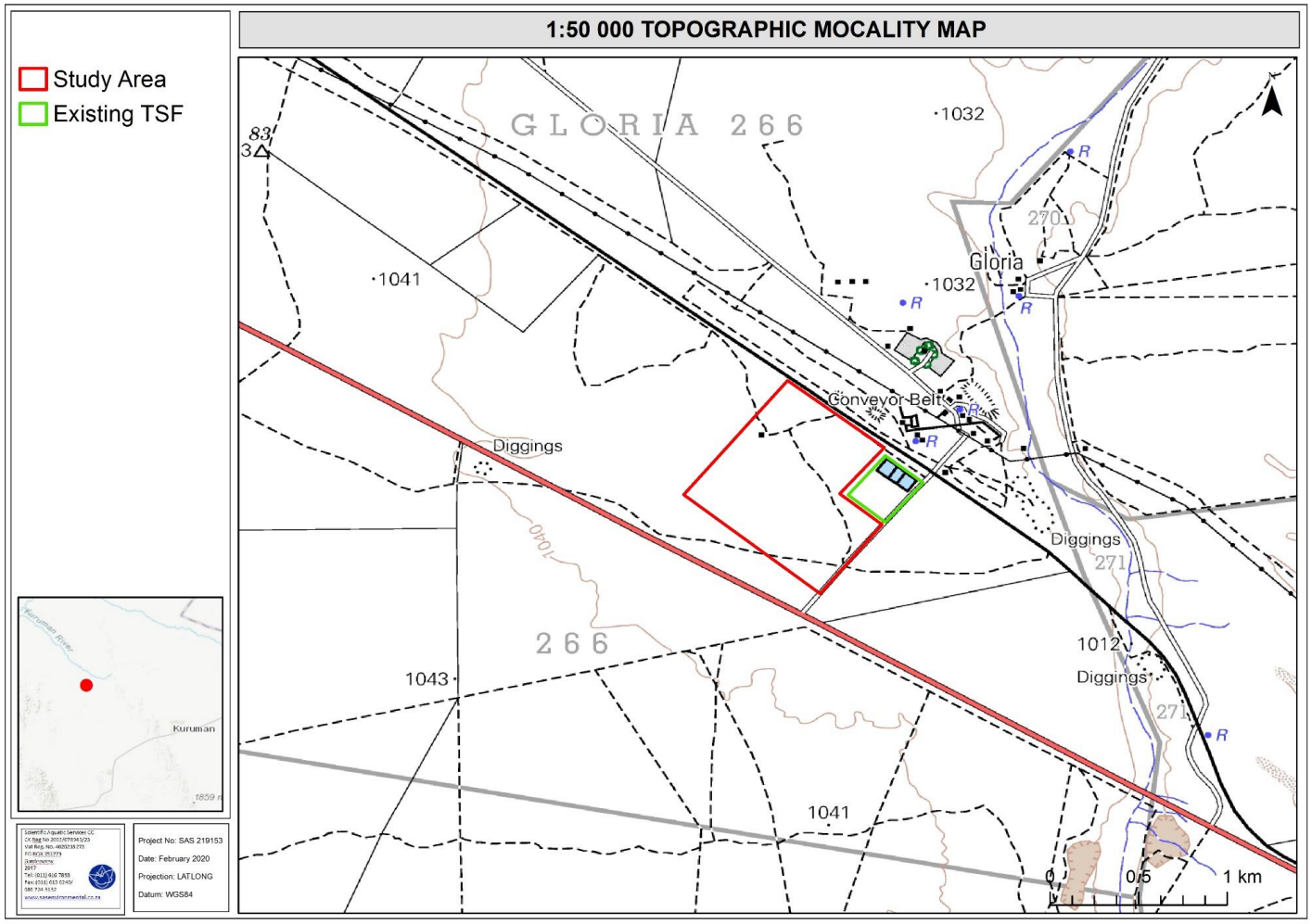


Figure 2: The study area and existing TSF depicted on a 1:50 000 topographical map in relation to the surrounding mining area.

1.2 Alternative Considered

The Environmental Impact Assessment (EIA) regulations require that alternatives are considered. The proposed development is planned to take place within the current extent of the BRMO boundary. Figure 3 illustrates the envelopes for the location alternatives considered. Locations further north of the mine have also been considered but have been eliminated on the basis that it is further away from the existing infrastructure and provides no discernible environmental or engineering advantage in comparison to the final two location alternatives (Final Scoping Report, 2019).

It must be noted that the proposed development is inherently concerned with the Gloria mine activities. Therefore, the activities cannot practically be located on a different property. The layout alternatives are illustrated in Figure 4. These layout options would apply to either of the location alternatives. In essence, the positioning of the various facets of the proposed development has been considered in different orientations and layouts within the proposed footprint (Final Scoping Report, 2019).

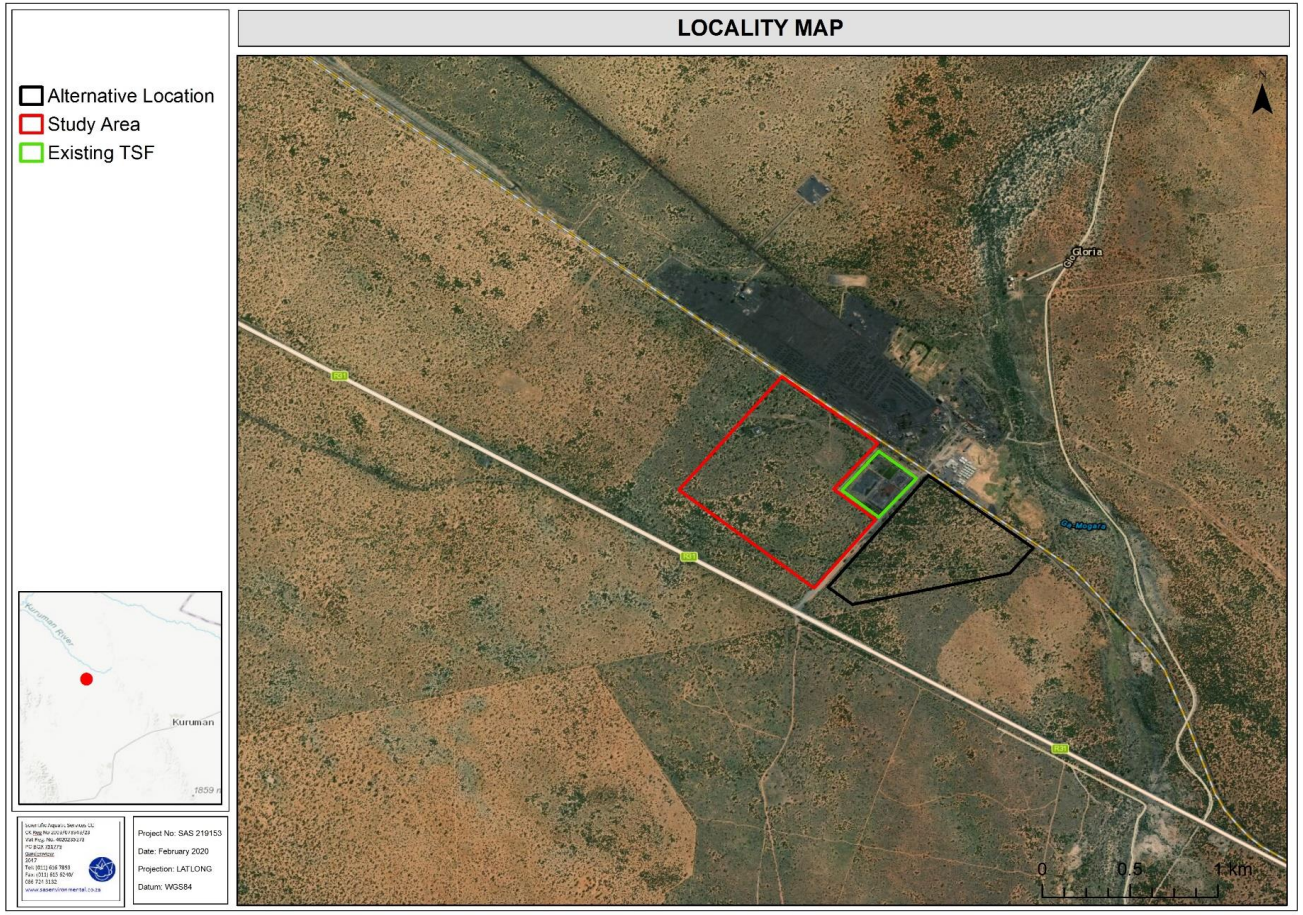


Figure 3: The proposed location alternatives.

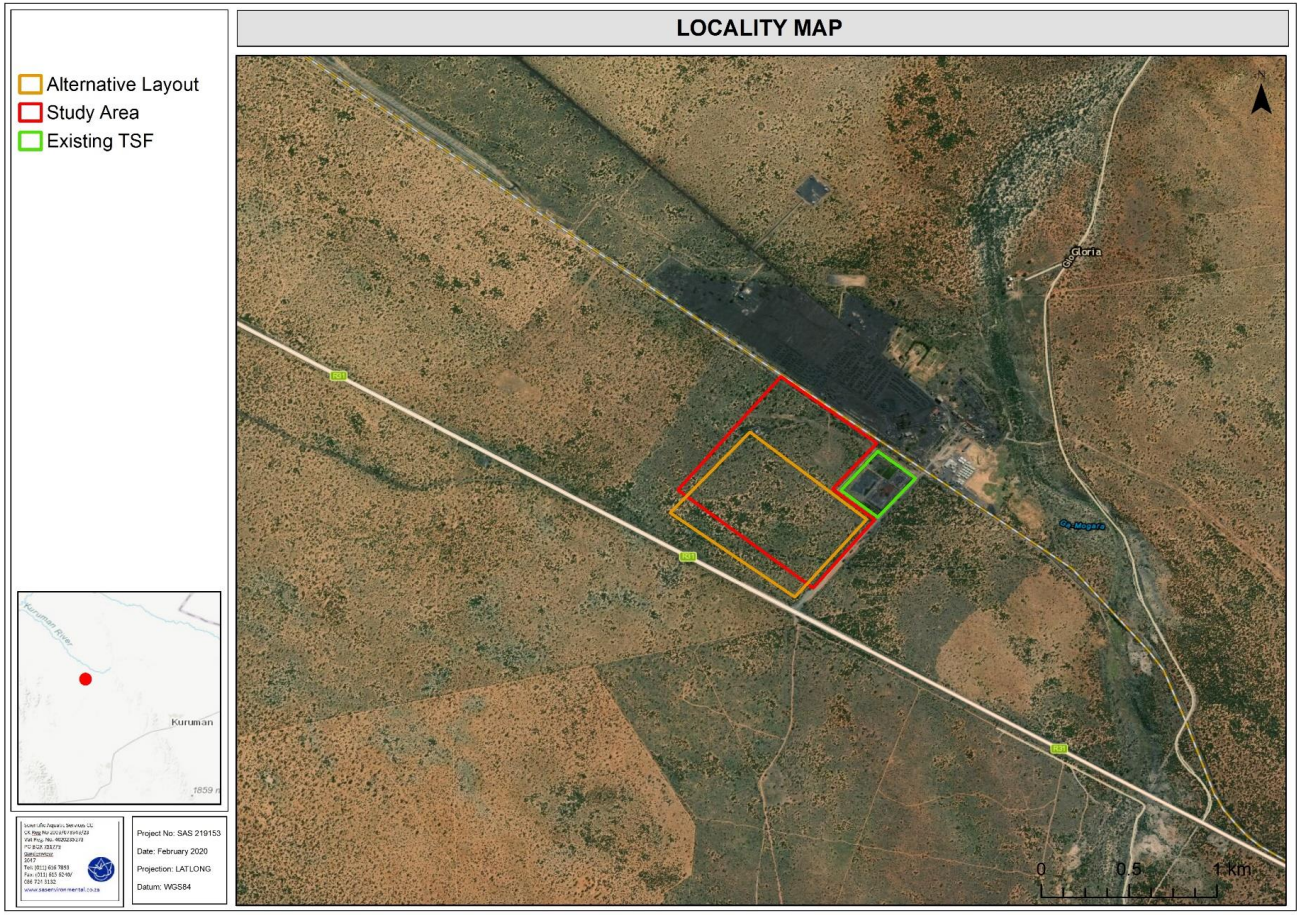


Figure 4: The proposed layout alternatives.

1.3 Project Scope

Specific outcomes in terms of this report are outlined below:

- To define the Present Ecological State (PES) of the terrestrial ecological resources associated with the study area;
- To determine and describe habitats, communities, and the ecological state of the study area;
- To conduct a faunal and floral Species of Conservation Concern (SCC) assessment, including the potential of suitable habitat to be associated with the study area;
- To identify and consider all sensitive landscapes including rocky ridges, wetlands and any other ecologically important features, if present;
- To determine the environmental impacts that the construction of the proposed mining-related development might have on the terrestrial ecology of the study area; and
- To develop mitigation and management measures for all phases of the development.

This report, after consideration and the description of the ecological integrity of the study area, must guide the Environmental Assessment Practitioner (EAP), the regulatory authorities and the developing proponent, by means of the presentation of results and recommendations as to the ecological viability of the proposed development activities.

1.4 Assumptions and Limitations

The following assumptions and limitations apply to this report:

- The ecological assessment is confined to the study area and alternative location, as defined in Figure 3 and 4 and does not include the neighbouring and adjacent properties. These were, however, considered as part of the desktop assessment. A brief investigation was conducted on the proposed alternative location;
- 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 and faunal communities had been accurately assessed and considered;
- Due to the nature and habits of most faunal taxa, it is unlikely that all species would have been observed during a field assessment of limited duration. Therefore, site observations were compared with literature studies where necessary;
- Sampling, by its nature, means that not all individuals are assessed and identified. Some species and taxa associated with the study area may have been missed during the assessment; and
- The data presented in this report is based on two site visits, undertaken on the 18th to the 20th of June 2019 (winter season) and another between the 21st to 23rd of January

2020 (summer season). A more accurate assessment would require that assessments take place in all seasons of the year. However, on-site data was significantly augmented with all available desktop data. Together with project experience in the geographical area, the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the study area and alternative location.

1.5 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- The Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)
- Government Notice 864 Alien and Invasive Species Regulations as published in the Government Gazette 40166 of 2016 as it relates to the National Environmental Management Biodiversity Act, 1998 (Act No. 107 of 1998);
- Conservation of Agricultural Resource Act, 1983 (Act No. 43 of 1983) (CARA);
- The National Forest Act, 1998 (Act No. 84 of 1998, amended 2001) (NFA); and
- The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA).

The details of each of the above-listed legislation as they pertain to this assessment are provided in **Appendix A** of this report.

2. ASSESSMENT APPROACH

2.1 General Approach

To accurately determine the PES of the terrestrial habitat of the study area and capture comprehensive data with respect to the terrestrial ecology, the following methodology was used:

- Background data and digital satellite images were consulted prior to the field assessment in order to distinguish broad habitats, vegetation types and potentially sensitive sites. The results of these analyses were then used to focus the fieldwork on specific areas of concern and to identify areas where target specific investigations were required;
- Relevant databases considered during the assessment of the study area included the South African National Biodiversity Institute (SANBI) Threatened Species

Programme (TSP), the Northern Cape Critical Biodiversity Areas (2016), the Northern Cape Spatial Development Framework (2012), Mucina and Rutherford (2012 and 2018 beta-version), National Biodiversity Assessment (NBA, 2011), Important Bird Areas in conjunction with the South African Bird Atlas Project (SABAP 2), South African Protected and Conservation Areas Databases (SAPAD & SACAD, Quarter 1, 2019), National Protected Areas Expansion Strategy (NPAES, 2011), and International Union for Conservation of Nature (IUCN);

- On-site visual assessments were conducted during the 18th and 20th of June 2019 and between the 21st and 23rd of January 2020 to confirm the assumptions made during the consultation of the background maps and data. The site assessment assisted in determining the ecological status of the habitat associated with the study area. A thorough 'walk through' on foot was undertaken to identify the occurrence of the dominant floral species and faunal and floral habitat diversities;
- Specific methodologies for the assessment, in terms of the field assessment and data analysis of faunal and floral ecological assemblages, will be presented in Appendices B and C; and
- For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix D of this report.

2.2 Sensitivity Mapping

All the ecological features associated with the study area were considered, and sensitive areas were delineated with the use of a Global Positioning System (GPS). In addition, identified locations of SCC and protected species were also marked by means of a GPS. A Geographic Information System (GIS) was used to project these features onto satellite imagery and/or topographic maps.

3. RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics associated with the study area

The following table contains data accessed as part of the desktop assessment. It is important to note that although all data sources used in this report, provide useful and often verifiable, high-quality data, the various databases do not always provide an entirely accurate indication of the study area's actual biodiversity characteristics.

Table 1: Summary of the conservation characteristics of the study area.

CONSERVATION DETAILS PERTAINING TO THE STUDY AREA (VARIOUS DATABASES)	
NBA (2011)	The study area falls within an area that is currently not protected, Ecosystem types are categorised as "not protected", "poorly protected", "moderately protected" and "well-protected" based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type. Ecosystems not occurring within any protected area, or where less than 5% of the biodiversity target has been met, are considered "not protected.
NATIONAL THREATENED ECOSYSTEMS (2011)	The study area falls within an area that is least threatened.
SAPAD (Q1, 2019); AND NPAES (2009)	The various datasets assessed does not indicate any protected, conservation, or focus areas within 10 km of the study area
IBA (2015)	The study area is not located within 10 km of an Important Bird Area (IBA).
IMPORTANCE ACCORDING TO THE MINING AND BIODIVERSITY GUIDELINES (2013)	
The study area is situated within an area currently not ranked under the mining and biodiversity guidelines of 2013.	
NORTHERN CAPE CRITICAL BIODIVERSITY AREAS (2016) (FIGURE 5)	
OTHER NATURAL AREAS (ONA)	The study area falls within an area classified as other natural areas. According to the Technical Guidelines for CBA Maps document ONA 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, 2017).
ECOLOGICAL SUPPORT AREA (ESA)	A small portion of the northern boundary of the alternative location falls within an ESA. ESAs are areas which must retain their ecological processes in order to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas. Simialrly, ESAs are required to meet biodiversity targets for representation of ecosystem types or species of special concern when it's not possible to meet them in CBAs.These areas support ecological functioning of protected areas or CBAs or a combination of these (SANBI, 2017). The majority of the farm portion falls within Ecological Support Areas.

DESCRIPTION OF THE VEGETATION TYPE(S) RELEVANT TO THE STUDY AREA ACCORDING TO MUCINA & RUTHERFORD (2012, 2018 BETA-VERSION)					
Biome	According to Mucina and Rutherford (2012), the study area falls within the Savanna Biome.				
Bioregion	The study area is located within the Kalahari Bushveld Bioregion.				
Vegetation Type	The study area falls within the Kathu Bushveld Vegetation type.				
Altitude (m)	960 - 1300				
Climate	Summer and autumn rainfall, very dry winters				
	MAP* (mm)	**MAT* (°C)**	**MFD* (Days)**	**MAPE* (mm)**	**MASMS* (%)**
	675	18.5	27	2883	85
Distribution	Northern Cape Province				
Geology & Soils	Aeolian red sand and surface calcrete, deep (>1.2m) sandu soils of Hutton and Clovelly soil forms.				
Conservation	Least threatened. Target 16%. None conserved.in statutory				
Vegetation & landscape features (Dominant Floral Taxa in Appendix E)	Medium-tall tree layer with *Acacia erioloba* in places, but mostly open and including *Boscia albitrynca* as the prominent trees. Shrub layer generally most important with for example *Senegalia mellifera* (formally known as *Acacia mellifera*), *Diospyros lycioides* and *Lycium hirsutum*. Grass layer variable in cover.				
NORTHERN CAPE PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (NC PSDF, 2012)					
The study area is situated within the Griqualand West Centre of Endemism. Please refer to Appendix F for further detail. The study area also falls within the Gamagara Corridor. The Gamagara Corridor comprises the mining belt of the John Taolo Gaetsewe and Siyanda Districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese.					

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

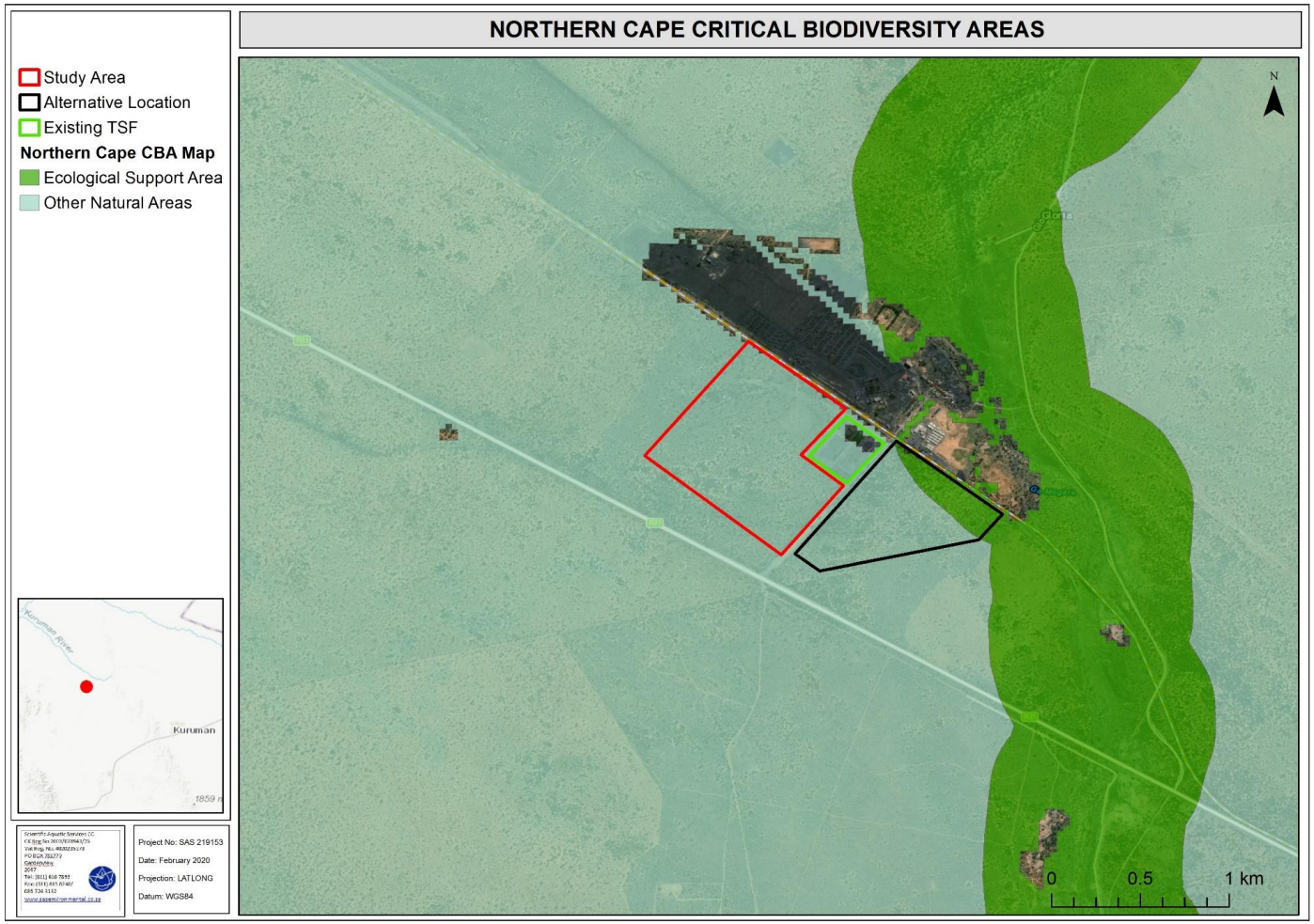


Figure 5: Other Natural Areas (ONA) associated with the study area. A small portion on the north-eastern boundary of the alternative location falls within and ESA (Northern Cape CBA Map, 2016).

4. FLORAL ASSESSMENT RESULTS

4.1 Habitat Unit

The study area is located within the existing and approved Mining Right Area (MRA) and adjacent to the existing TSF. The alternative location for the SFSF is also located within the existing and approved MRA, adjacent to the railway transport system to the north of the alternative location. The entrance road to the Gloria Mine operations splits the study area (proposed location) and the alternative location.

During the field assessments conducted during June 2019 and January 2020, one broad habitat unit namely the Kathu Bushveld was identified for the majority of the study area and the alternative location. Small pockets of transformed areas were identified within the broader habitat unit of the study area and the alternative location. This vegetation transformation were associated with existing gravel roads leading to the existing TSF as well as an existing fuel storage facility. Vegetation within the transformed habitat unit has been completely cleared or associated with limited vegetation cover.

Kathu Bushveld

Mucina & Rutherford describe the geology of the Kathu Bushveld as deep (>1.2 m) aeolian red sandy soils of Hutton and Clovelly soil forms, which was typical of the Kathu Bushveld Habitat unit associated with the focus area. Apart from the geology the species composition and vegetation structure were typical of the Kathu Bushveld vegetation type.

Bush encroachment of *Senegalia mellifera* (blackthorn or swarthaak) were also noted within the Kathu Bushveld habitat unit associated with the study area and the alternative location. Although individual species abundance differed for these vegetation communities, the species composition was similar, and both vegetation communities can be considered representative of the Kathu Bushveld vegetation type. These vegetation communities will henceforth be considered as a single habitat unit, namely the Kathu Bushveld.

The Kathu Bushveld further provide habitat for Northern Cape Nature Conservation Act, 2009 (Act No 9 of 2009) protected floral species. *Vachellia erioloba* and *V. haematoxylon* (previously known as *Acacia erioloba* and *A. haematoxylon* respectively), were located within the Kathu bushveld habitat unit fo the study area and the alternative location. Both species that are protected under the National Forests Act (Act 84 of 1998). Two floral SCC were encountered, namely *Boophone disticha* (Gifbol) and H*arpagophytum procumbens* (Devil's claw) indicated to be protected under the Northern Cape Nature Conservation Act (Act 9 of 2009).

Transformed Habitat

The Transformed habitat unit is limited in extent and includes an existing fuel storage facility and gravel roads to the existing TSF and fuel storage facility. Dumping of old building rubble was also noted adjacent to the gravel roads, leading to degraded habitat and proliferation of AIP sue to soil disturbance. These areas, although limited in extent, have been significantly altered, comprising no vegetation or of limited vegetation dominated by Alien Invasive Plants (AIP).

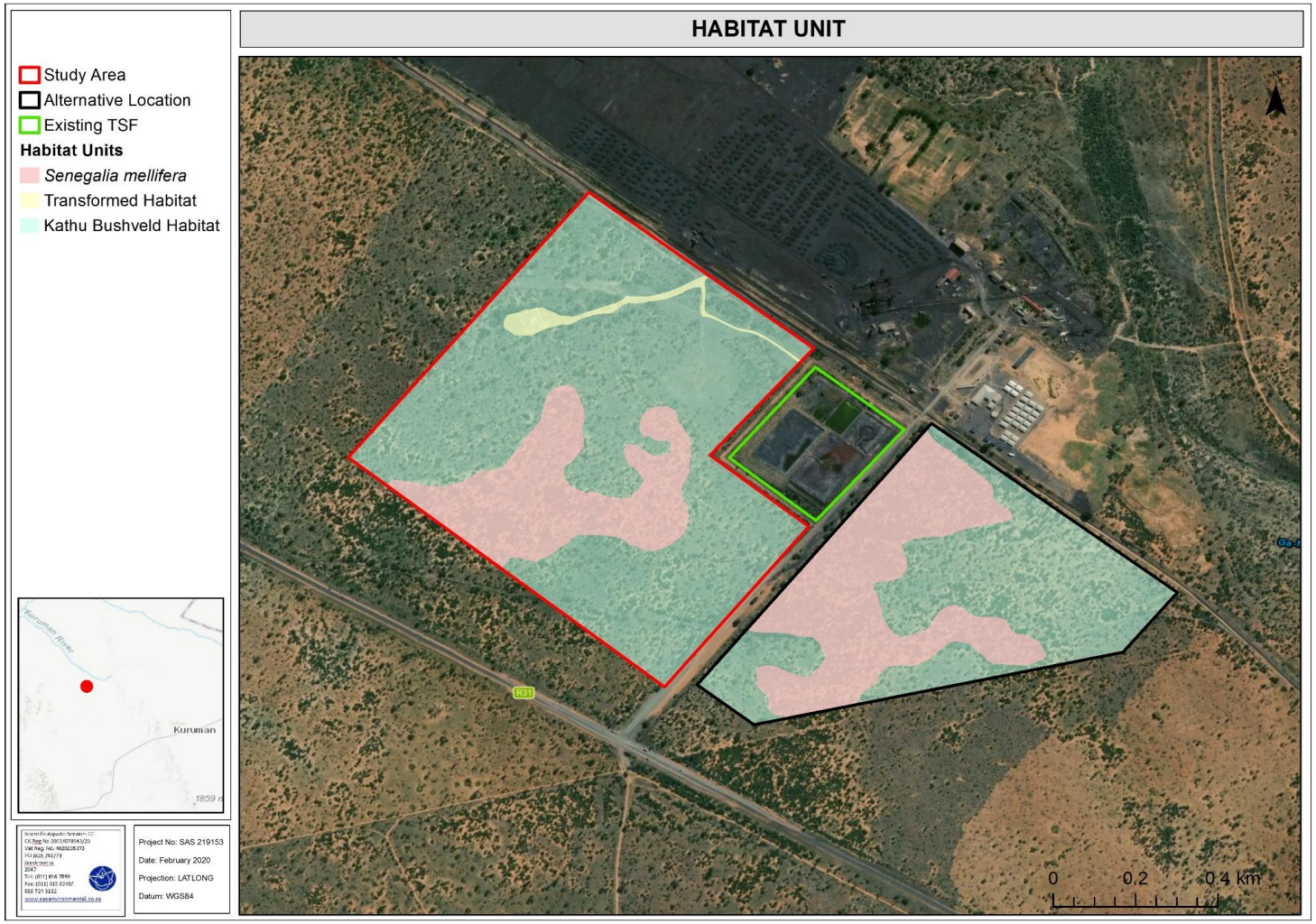
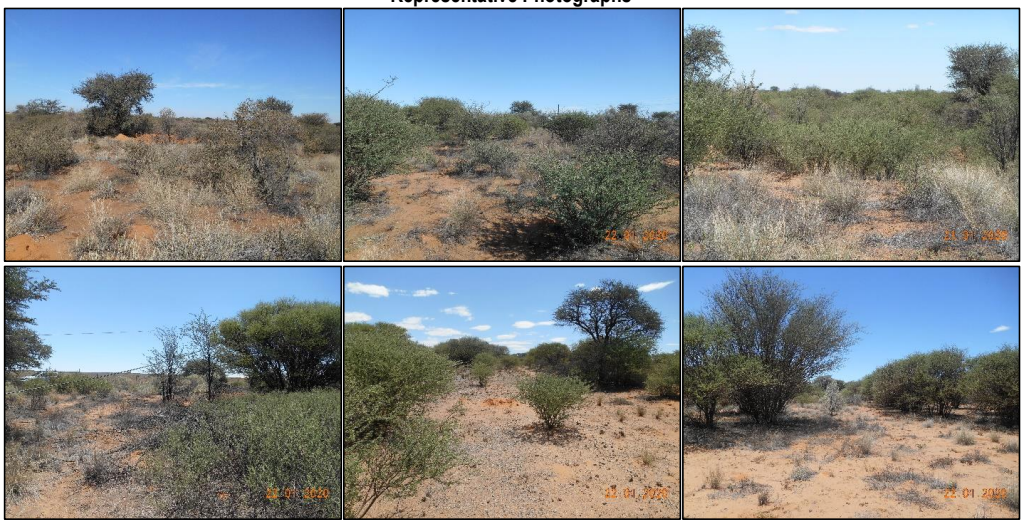


Figure 6: Habitat units associated with the study area and alternative location.

4.2 Floral Assessment Discussion

Table 2: Summary of the floral results associated with the study area and alternative location.

<table>
<tr><td colspan="2">Habitat Unit</td><td>Kathu Bushveld</td><td>Habitat Sensitivity:</td><td>Intermediate</td></tr>
<tr><td colspan="3">Sensitivity Graph:</td><td colspan="2">Representative Photographs
 
<u>Notes on photographs</u>: Top: Representative photographs of the Kathu Bushveld associated with the study area. Portions of the study area are encroached by species associated with bush encroachment such as Senegalia mellifera. Bottom: Representative photographs of the Kathu Bushveld associated with the alternative location.</td></tr>
<tr><td colspan="2">Habitat Unit</td><td>Transformed Habitat</td><td>Habitat Sensitivity:</td><td>Low</td></tr>
<tr><td colspan="3">Sensitivity Graph:</td><td colspan="2">Representative Photographs
 
<u>Notes on photographs</u>: Representative photographs of the Transformed habitat associated with the study area – Left and middle: existing fuel storage facility and right: dumping of building rubble next to the gravel road.</td></tr>
</table>

Floral SCC Discussion

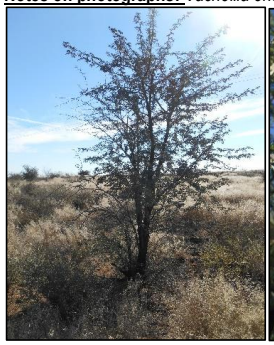
Several floral SCC were observed within the study area and the alternative location.
During the field assessment, no threatened floral species were observed within the focus area. A number of national and provi ncial protected species were, however, noted:

- National Forest Act, 1998, (Act No. 84 of 1998), as amended in September 2011 (NFA):
  - *Vachellia erioloba* & *V. haematoxylon*
- Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA):
  - Schedule 1 – Specially Protected Species: H*arpagophytum procumbens;* and
  - Schedule 2 – Protected Species: *Boophone disticha (*Family Amaryllidaceae*); Orbea sp (*Family Apocynaceae).
- National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004) Threatened or Protected Species (TOPS):
  - *Harpagophytum procumbens* (Protected).

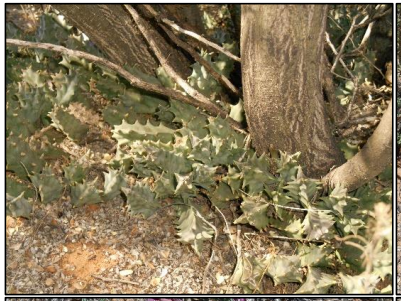
None of the protected species recorded is considered to be threatened according to the Red List of South African Plants (2017). A number of other protected floral spec ies have an increased probability to occur within the focus area. Refer to Section 4.3 below for a detailed discussion.

Prior to any ground clearing activities, permits will have to be obtained from the Department of Environment, Forestry and Fi sheries (DAFF) and the Northern Cape Department of Environment and Nature Conservation (NCDENC) for the removal/ destruction of any protected species. It is recommended that where possible trees are relocated to similar suitable habitat close to the study area but outside of the development footprint.

Notes on photographs: *Vachellia erioloba*.




Notes on photographs: *Vachellia haematoxylon*.


Notes on photographs: Top left (*Orbea* sp.); Top right (*Boophone disticha*); Bottom (*Harpagophytum procumbens* flowers and seeds).

Floral Diversity
The floral diversity for the Kathu Bushveld is considered to be moderately high, while the floral diversity of the Transformed habitat considered to be low. The species composition of the Kathu Bushveld can be described as a medium tall tree layer with *Vachellia erioloba* in places, but mostly open with a prominent shrub layer dominated by *Senegalia mellifera* and *Grewia flava*. A number of species indigenous to the Kathu Bushveld have been recorded during the site assessment and include amongst others : *Diospyros lycioides, Rhigozum brevispinosum, Terminalia sericea, Aristida meriodinalis, Eragrostis lehmanniana, Schmidtia kalihariensis, Stipagrostis ciliate, Hermbstaedtia fleckii, Nolletia arenosa (chrysocomoides),* and *Senna italica* subsp. *arachoides.* The low diversity of the Transformed habitat can be attributed to vegetation clearing that has historically taken place within this habitat unit. Refer to Appendix F for a list of all species observed within the different habitat units during the field assessment.
Conservation Importance
The Kathu Bushveld vegetation types are considered to be Least Threatened (National Threatened Ecosystems, 2011; and Mucina & Rutherford). Despite the least threatened status of these vegetation types, the National Biodiversity Assessment (2018) indicate the focus area to form part of the remaining extent of th e Southern Kalahari Mekgacha. Based on the field assessment results, the vegetation within the study area and alternative location, with the exception of the transformed habitat can be considered as the remaining extent of the Kathu Bushveld. The Northern Cape CBA Dataset (2016) indicate the study area to fall within an area classified as other natural areas. According to the Technical Guidelines for CBA Maps document , ONA 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. A small portion of the northern boundary of the alternative location falls within an ESA.
Habitat integrity / Alien and Invasive species
Establishment of the AIP *Prosopis glandulosa* was noted within the Kathu Bushveld, however, the infestation was not significant. Bush encroachment by *Senegalia mellifera* was also noted in small portions of the Kathu Bushveld, but again the impact is not considered extensive nor typical of Kathu Bushveld associated with high levels of anthro pogenic activities. The habitat integrity of the Kathu Bushveld habitat unit is considered to be moderately high. Severe habitat degradation has taken place within portions of the study area as this discussed. The transformed habitat can no longer be considered representative of the Kathu Bushveld, and the habitat integrity of this habitat unit is low.
Presence of Unique Landscape
The Kathu Bushveld habitat is considered a least threatened vegetation type and is well represented throughout the larger reg ion. Only 1% of this vegetation type is, however conserved, with large portions severely grazed by domestic livestock, which has altered the habitat integrity over large parts of the vegetation type. The Kathu Bushveld within the study area and the alternative location is considered largely intact with suitable habitat for protected floral and tree species and can be considered somewhat unique. The Transformed Habitat Unit can no longer be considered unique due to the altered habitat integrity of this habitat unit.
Business Case and Conclusion:
The majority of the study area and the alternative location is considered to be of intermediate importance from a floral perspective due to the ability of the area to support protected floral species, conservation importance attributed to the study area, and the floral diversity, and habitat integrity associated with the study area. Development within this habitat unit is unlikely to unacceptably impact on provincial and conservation targets for the Kathu Bushveld vegetation type. The proposed activities will result in the loss of a number of protected species, and the development footprint should be minimised to what is essential. All herbaceous protected floral sp ecies should be rescued and relocated to similar habitat outside of the development footprint, or be used for landscaping within the existing mine boundary. All natural areas outside of the development footprint area s should also be preserved and enhanced where possible. Due to the extensive loss of protected tree species, possible biodiversity offset strategies should be considered by the mine. Permits will have to be obtained from the Department of Environment Forestry and Fisheries (DAFF) and the Northern Cape Department of Environment and Nature Conservation (NCDENC) for the removal/ destruction of protected species. It is recommended that herbaceous species be rescued and be relocated to a djacent areas or be utilised during the rehabilitation activities. It is recommended that as far as is possible all trees >3 m be a voided during the prospecting activities as these individuals provide habitat for a number of floral and faunal species under canopies. The fact that an area to the east has been set aside as a biodiversity offset area by Tshi pi Borwa Mine must be considered as part of the prospecting layouts to ensure there is no conflict of interest. In order to minimise post-development rehabilitation and AIP control costs, it is recommended that all areas where bare soils are exposed as a result o f the development activities should immediately be rehabilitated and reseeded with an indigenous grassland seed mixture such as the Mayford Biomosome Sweet and Mixed Bushveld Seed Mixture (h ttps://mayford.co.za/veld-grass/). Removal of AIP species to a registered waste facility as well as the implementation of AIP control and maintenance measures at the onset of construction will limit the spread of AIP species to s urrounding natural habitat, and subsequently, limit the footprint area for which AIP control management will have to be implemented during the operational activities.

4.3 Floral Species of Conservation Concern Assessment

Threatened/protected species are species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) is a threatened species. Furthermore, SCC are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare and Declining. A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA).

The SCC assessment not only considers floral SCC recorded on site during the field assessment but also includes a Potential of Occurrence (POC) assessment where the assessment takes suitable habitat to support any such species into consideration. Thus, for the POC assessment, the following protected species lists were utilised:

- The Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009);
- Government Notice 256 Threatened or Protected Species (TOPS) as published in the Government Gazette 38600 of 2015 as it relates to the National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004); and
- Government Notice 908 List of Protected Tree Species as published in the Government Gazette 38215 as it relates to the National Forest Act, 1998, (Act 84 of 1998, amended in September 2011).

The following SCC/ protected species obtained a POC of 60% or more, with a number of species also recorded within the study area at the time of the assessment:

Table 3: SCC/ Protected species observed within the study area at the time of assessment or within increased likelihood to utilise the study area

Species	Threat Status	Habitat Unit	POC
Vachellia erioloba	LC	Recorded within all habitat units during the assessment	100%
Vachellia haematoxylon	LC	Recorded within all habitat units during the assessment	100%
Boscia albitrunca	LC	Suitable habitat within the Kathu Bushveld, and observed in the surrounding region during the field assessment	60%
Harpagophytum procumbens	LC	Recorded within the Kathu Bushveld Habitat Unit	100%
Hoodia gordonii	DDD	Suitable habitat within the Kathu Bushveld	60%
Lessertia frutescens subsp. *frutescens*	LC	Suitable habitat within the Kathu Bushveld	60%
Boophone disticha	LC	Observed within the Kathu Bushveld and Degraded Bushveld Habitat	100%
Orbea sp.	LC	Recorded within the Kathu Bushveld	100%
Babiana hypogaea	LC	Previously recorded by STS in the vicinity of the study area. Suitable habitat within the Kathu Bushveld	60%

Species	Threat Status	Habitat Unit	POC
Boscia albitrunca	LC	Suitable habitat within the Kathu Bushveld, and observed in the surrounding region during the field assessment	60%
Nerine laticoma	LC	Suitable habitat within the Kathu Bushveld habitat unit	60%
Harpagophytum procumbens	LC	Recorded within the Kathu Bushveld Habitat Unit	100%

From the table above it is evident that a number of protected floral species have been recorded within the study area as well as the alternative location or have a high probability of occurring within these areas. Removal of the species listed above during the proposed expansion activities is considered unavoidable. It is however considered possible to rescue and relocate the herbaceous species, and subsequently, a rescue and relocation plan should be designed and implemented for such species. The rescue and relocation plan should be overseen by a suitably qualified botanist. Permits should be obtained from the relevant authorities for the removal/ destruction of all protected species.

Figure 7: Protected tree species encountered within the study are and alternative location: *Vachellia haematoxylon* (Top) and *Vachellia erioloba* (bottom),

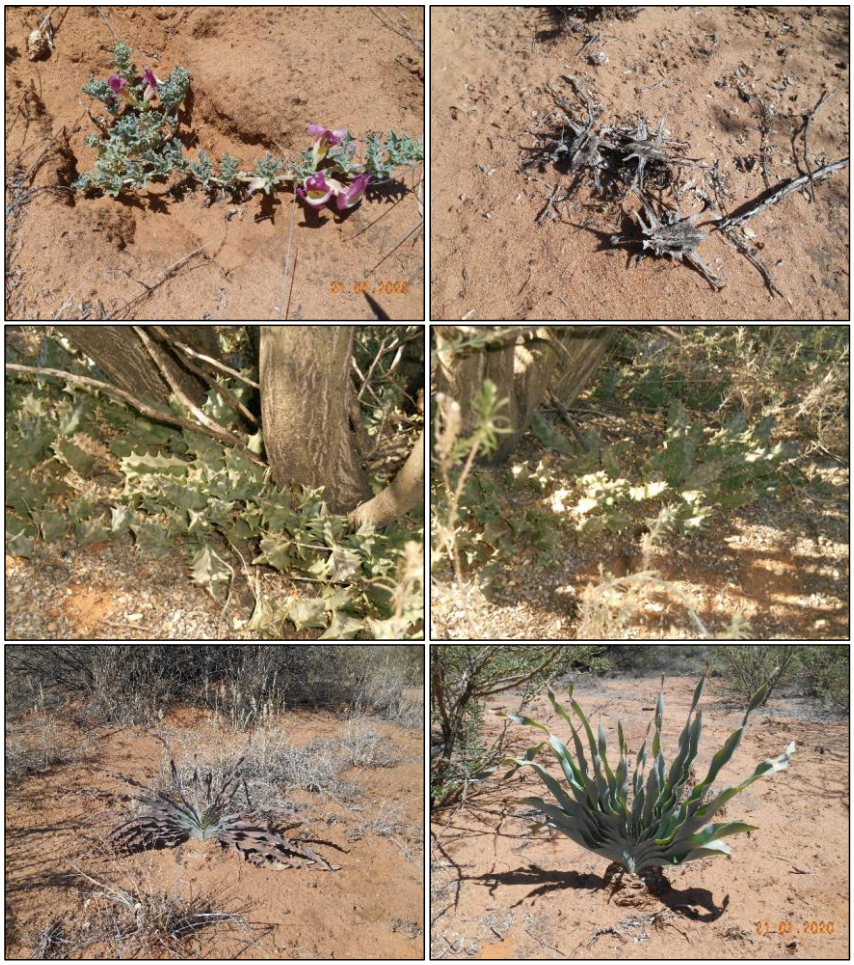


Figure 8: Protected floral species encountered within the study are and alternative location: *Harpagophytum procumbens* (Top), *Orbea sp.* (Middle), and *Boophone disticha* (Bottom).

4.4 Medicinal Plant Species

Medicinal plant species are not necessarily indigenous species, with many of them regarded as alien invasive weeds. The table below presents a list of dominant plant species with traditional medicinal value and the plant parts traditionally used, which were identified during the field assessment.

Table 4: Dominant traditional medicinal floral species identified during the field assessment. Medicinal applications and application methods are also presented (van Wyk, Oudtshoorn, Gericke, 2009). Alien species are indicated with an asterisk (*).

Species	Name	Plant parts used
Asparagus suaveolens	Wild Asparagus	Rhizomes and flashy roots
Dichrostachys cinerea	Sickle Bush	Roots
Elephantorrhiza elephantina	Eland's Bean	Roots

Tarchonanthus camphoratus	Camphor Bush	Leaves
Vachellia erioloba	Camel Thorn	Pods, Gum, Bark, Roots
Ziziphus mucronata	Buffalo Thorn	Roots, Bark and Leaves
Dicoma sp.		Leaves and Twigs
Harpagophytum procumbens	Devil's Claw	Roots
Salvia runcinata	Wild Sage	Leaves
Sansevieria aethiopica	Bowstring Hemp	Rhizomes and Leaves
Senna italica subsp. arachoides	Wild Senna	Leaves
Boophone disticha	Poison Bulb	Bulb Scales

A moderately low abundance of medicinal species was encountered during the field assessment and can be attributed to the limited floral diversity associated with the study area and the Kathu Bushveld in general. The species listed in the table above are common, widespread species and not confined to the study area; nor are they unique within the region. *Boophone disticha* and *Harpagophytum procumbens* are however protected within the Northern Cape Province. Several individuals of *B. disticha* and *H. procumbens* were found within the Kathu Bushveld habitat. These species would need to be rescued and relocated to suitable habitat outside of the disturbance footprint area, which should be undertaken by an aptly qualified contractor. Thus, if rescue and relocation are implemented for these species no other risks to their populations within the larger region, or locally, are foreseen for medicinal plants.

4.5 Alien and Invasive Plant (AIP) Species

Alien and invasive floral species are floral species of exotic origin which are invading previously pristine areas or ecological niches (Bromilow, 2001). Not all weeds are exotic in origin but, as these exotic plant species have very limited natural "check" mechanisms within the natural environment, they are often the most opportunistic and aggressively growing species within the ecosystem. They are often the most dominant and noticeable within an area. Disturbances of the ground through trampling, excavations or landscaping often leads to the dominance of exotic pioneer species that rapidly dominate the area. Under natural conditions, these pioneer species are overtaken by sub-climax and climax species through natural veld succession. This process, however, takes many years to occur, with the natural vegetation never reaching the balanced, pristine species composition prior to the disturbance. There are many species of indigenous pioneer plants, but very few indigenous species can out-compete their more aggressively growing exotic counterparts.

Alien vegetation invasion causes degradation of the ecological integrity of an area, causing (Bromilow, 2001):

- A decline in species diversity;
- Local extinction of indigenous species;

- Ecological imbalance;
- Decreased productivity of grazing pastures; and
- Increased agricultural input costs.

During the floral assessment, dominant alien and invasive plant species were identified and are listed in the below table.

Table 5: Dominant alien floral species identified during the field assessment with their invasive status as per NEMBA: Alien and Invasive Species Lists, GN R598 of 2016.

Scientific name	Common name	Origin	NEMBA Category	Habitat Unit
WOODY SPECIES				
Nicotiana glauca	Wild Tobacco	Argentina	1b	Kathu Bushveld Transformed Habitat
Prosopis glandulosa	Mesquite	Mexico	3	Kathu Bushveld Transformed Habitat
Echinopsis schickendantzii	Torch cactus	Argentina	1b	Transformed Habitat
FORB SPECIES				
Argemone ochroleuca	Mexican Poppy	Central America	1b	Kathu Bushveld Transformed Habitat
Chenopodium album	White goosefoot	Europe	N/C	Kathu Bushveld Transformed Habitat
GRAMINOID SPECIES				
Pennisetum setaceum	Fountain Grass	North Africa	1b	Transformed Habitat

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, provided that there is a permit and that steps are taken to p revent their spread.
3: Category 3 – Ornamentally used plants that may no longer be planted; existing plants may remain, except within the flood line of watercour ses and wetlands, as long as all reasonable steps are taken to prevent their spread (Bromilow, 2001).

Of the alien species recorded during the field investigation (Table 3), three are listed as NEMBA Category 1b species, with one species recorded as NEMBA 3. Alien species located within the proposed development areas need to be removed regularly as part of maintenance activities - according to the NEMBA: Alien and Invasive Species Regulations, GN R864 of 2016.

Although the table indicates a low diversity of alien species observed in the study area, a variety of indigenous species commonly associated with bush encroachment were present throughout the study area. As such the low diversity of alien invasive species within the study area is not an indication that the study area is in a good ecological condition, as portions of the study area were also subject to bush encroachment, forming dense bush clumps. Species associated with bush encroachment noted include:

- *Senegalia mellifera* (Black Thorn),
- *Senegalia hebeclada* (Candle Thorn)*;*
- *Grewia flava* (Wild Rasin); and
- *Tarchonanthus camphoratus* (Camphor Bush).

The above-listed species should also be managed to prevent any further bush encroachment in the surrounding area. The mining expansion footprint should as far as possible be kept free from weeds and alien vegetation. As part of rehabilitation activities, it is recommended that monitoring of the study area occurs bi-annually for the duration the operational phase of the mine, so as to ensure that no new alien vegetation growth occurs.

5. FAUNAL ASSESSMENT RESULTS

5.1 Faunal Habitat

The study area is comprised of one habitat unit. This habitat unit has been discussed briefly below in terms of faunal utilisation and importance. For a more detailed description of this habitat unit refer to the Section 4.1 above.

Kathu Bushveld

This habitat unit encompassed the entire study area as well as that of the alternative location. The dominant woody species herein were that of *Senegalia mellifera, Vachellia erioloba* and *Vachellia haematoxylon*. Although the study area comprises of a single habitat, food resource and habitat provision for faunal species was still variable. Portions of the study area have become notably encroached with *Senegalia mellifera*, resulting in a decreased herbaceous layer in these areas. Although these areas offered lower levels of food resources, faunal species were still present as these areas provided increased protection and areas of refuge. It was apparent that a section of habitat in the eastern portion of the study area (Figure 8, right) adjacent to the current tailing's facility appeared to have been cleared in the past, as there were no large trees or shrubs growing here. Although impacted upon in the past, this area provided good habitat for ground dwelling invertebrates as well as avifauna that select for more open bushveld areas.

Overall, the advent of adjacent mining activities and limited to no veld management has impacted upon the habitat within the study, decreasing the overall habitat availability for faunal species. In addition, the construction and operation of roads and mine infrastructure to the east, south and west of the study area has undoubtedly impacted on habitat occupation, faunal species distribution and overall species abundances within the study area.

Figure 9: Habitat unit associated with the study area.

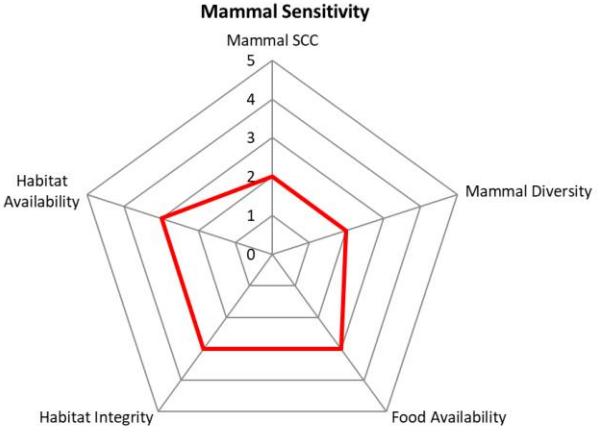
5.2 Mammals

Table 6: Field assessment results pertaining to mammal species within the study area.

Faunal Class: Mammal	Mammal Habitat Sensitivity	Intermediate

Notes on photograph:
Top and Middle left: *Elephantulus intufi* (Bushveld Sengi);
Top and Middle right: *Hystrix africaeaustralis* (Porcupine) scat and spoor;
Bottom Left: *Lepus capensis* (Cape Hare);
Bottom Right: *Sylvicapra grimmia* (Common Duiker) spoor.

Mammal Sensitivity Graph:



<table>
<tr><td>Faunal SCC/ Endemics/ TOPS</td><td>No mammal SCC were recorded during the two site assessments (winter and summer). The majority of mammal SCC in these arid regions are often secretive and not often seen, as such sign such as scat, spoor and in the case of some species burrows were searched for. Borrows were observed however many appeared inactive as they were full of debris and were evidently not in use. Burrows that did show signs of activity were that of the common faunal species Hystrix africaeaustralis (Porcupine), with no spoor of any SCC observed at these burrows. Furthermore, the overall location of the study area and close proximity to the mine and mining activities is likely to preclude mammal SCC from the area, as they will likely opt to utilise the more intact habitat to the south.</td><td>Business Case and Conclusion
Overall the study area is considered to have an intermediate mammal sensitivity Current mining and associated infrastructure has led to a decrease in habitat connectivity. Disturbance to areas within the study area as well as the dense bush encroachment by Senegalia melifera in areas has further decreased available habitat, decreasing the overall mammal diversity and abundance.

It is recommended that as far as possible, the SFSF be located within the areas which have been historically cleared, as well as areas where bush encroachment has occurred. At present, the current design layout meets these requirements. As such, the current design layout is expected to have the lowest impact on mammal species.</td></tr>
<tr><td>Faunal Diversity</td><td colspan="2">Mammal diversity has been affected in part as a result of the existing mining activities and general human activities within the study area. Moreover, the overall habitat within the study area does not show much variation, leading to similar species occurring through the study area, resulting in a decreased diversity. During the site assessment it was evident that the overall habitat and resources within the study area are unlikely to support an increased diversity of species, this was confirmed through the limited mammal sightings and limited evidence of occurrence (spoor and dung). Species that were observed include Hystrix africaeaustralis (Porcupine), Sylvicapra grimmia (Common Duiker), Cynictis penicillata (Yellow mongoose) and Tragelaphus strepsiceros (Kudu).

During the second site assessment, it was noted that the western portions of the study area (currently excluded from the layout plans) had a notable increase in mole activity, likely that of Cryptomys hottentotus (Common Mole-rat). Mole activity appeared to coincide with the more open areas in the north and west where tree and large shrub densities were lower.
  </td></tr>
<tr><td>Food Availability</td><td colspan="2">Food resources are highly cyclical and seasonal du to the arid nature of the region. As such, du ring the late winter months, as observed, food resources become very limited due to the die back of many herbaceous species. The summer months, following good rains, the herbaceous layer recovers, providing in creased food resources. Due to the small size of the study area the food resources herein can only support a limited abundance of mammal species, which will be exasperated in the winter months.</td></tr>
<tr><td>Habitat Integrity</td><td colspan="2">It is evident that at some point in the past a vegetation clearance must have occurred in the central and eastern portions of the study area were cleared, as this area is open and devoid of any medium to large shrubs. Additionally, the study area is bordered by the mine to the east, the current TSF and busy mine access road to the south and east and a national road to the west. Additionally, the property is fenced in with a perimeter mesh wire fence which limits species move ment for all but the smallest species (mongooses and rodents), reaulting in a loss of habitat connectivity with the surrounding natural areas.</td></tr>
<tr><td>Habitat Availability</td><td colspan="2">Habitat availability is considered intermediate. Vegetation disturbance in areas and the dense stands of Senegalia melifera does limit the overall provision of habitat for faunal species. The small size, decreased food resources and continuous mining activities in the surrounding area further lower the h abitat suitability of the study area. The study area at present provides only provides permanent habitat for small to medium sized mammals that occur in low densities. Larger mammals will u tilise the habitat temporarily, moving off to the more intact areas during increased times of human activity or low food resources.</td></tr>
</table>

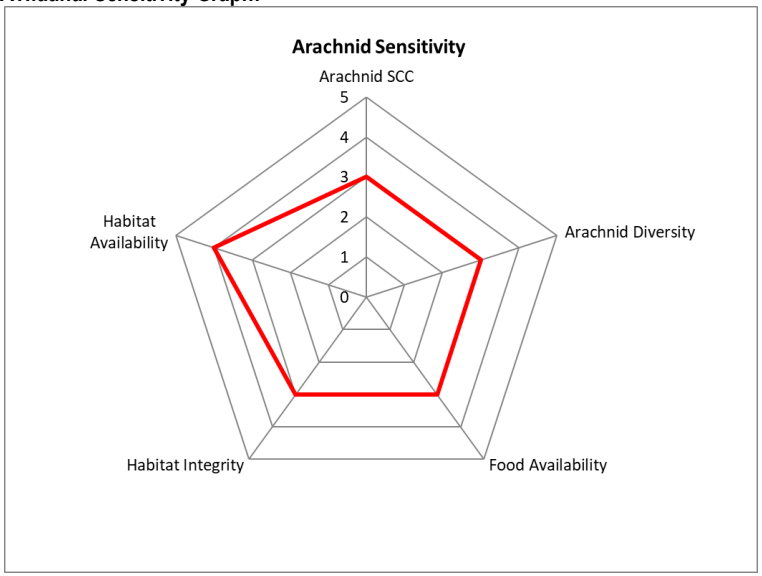
5.3 Avifauna

Table 7: Field assessment results pertaining to avifaunal species within the study area.

Faunal Class: Avifaunal	Avifaunal Habitat Sensitivity	Intermediate

Notes on photograph:
Top: *Sigelus silens* (Fiscal Flycatcher);
Middle: *Calendulauda africanoides* (Fawn-coloured Lark); and
Bottom: *Cercotrichas paena* (Kalahari-scrub Robin) (left) and *Tchagra senegalus* (Black-crowned Tchagra) (right).

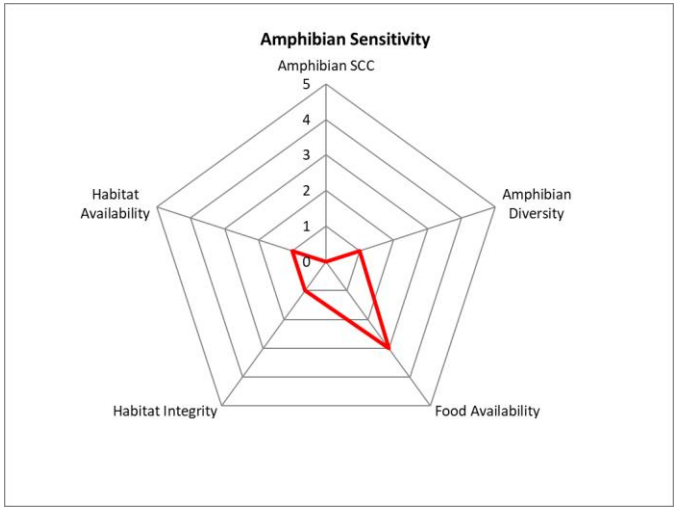
Avifaunal Sensitivity Graph:



Faunal SCC/ Endemics/ TOPS/	During the field assessment, the avifaunal SCC *Ardeotis kori* (Kori Bustard, NT) was observed foraging in the north western portion of the study area. It is however unlikely that this species will utilise the study area for breeding due to its small size, proximity to active mining areas and the availability of more suitable habitat in the surrounding areas. Additionally, the following avifaunal SCC may also occur in the study area, although this species will likely only utilise the study area for foraging as opposed to breeding, namely *Neotis ludwigii* (Ludwig's Bustard, EN).	**Business Case and Conclusion:** The avifaunal habitat sensitivity for the study area is considered to be intermediate. One avifaunal SCC was observed within the study area whilst it is possibly that a further two may forage occasionally here as well. Although the region s known to support large raptors, none were observed either directly within or flying above the study area. Furthermore, no nests were observed within any of the larger trees that would provide suitable nesting sites. Impacts rising from the clearance of vegetation and loss of habitat are unlikely to impact upon any avifaunal SCC or common species. Sufficient suitable habitat is available in the surrounding areas of which the majority of avifaunal species likely readily use already.
Faunal Diversity	The avifaunal diversity associated with the study area was intermediate and comprised mainly of common avifaunal species that have become accustom to increased levels of anthropogenic activities. Since habitat structure is often considered the primary determinant of bird assemblages it is anticipated that the largely homogenous structure of the study area will be mirrored by a relatively narrow assemblage of birds. Species observed on site include: *Streptopelia capicola* (Cape turtledove), *Pycnonotus nigricans* (Red-eyed Bulbul), *Prinia masulosa* (Karoo Prinia), *Afrotis afraoides* (Northern Black Korhaan), *Upupa africana* (African Hoopoe), *Cisticola fulvicapillus* (Neddicky) and others. Please refer to Appendix C for the full list of species identified on site.	
Food Availability	The study area is considered to have an intermediate amount of forage for avian species. The Kathu Bushveld habitat unit offers sufficient food for a intermediate diversity of avian species. Insectivorous species will utilise the increased, yet seasonal, abundance of insect species that were observed whilst herbivorous species will feed upon seeds and other edible plant material (young shoots, flowers etc). Such food resources are however seasonal in these arid environments and as such during the winter months species will have to forage further in order to acquire sufficient food to meet their metabolic requirements.	
Habitat Integrity	Habitat integrity has been impacted upon as a result of unsuitable veld management practices and the ongoing mine activities in the adjacent areas. This combined with the bush encroachment in areas has led to a decline in the overall integrity and suitability of the habitat.	
Habitat Availability	Habitat availability is considered moderately high within the study area. The Kathu Bushveld offers habitat for avifaunal species yet the lack in heterogeneity of the landscape reduces the habitat available for specialist birds who have specific niche requirements. Although the habitat lacks diversity, the vegetation present provides ample areas for nesting, roosting as well as foraging. The structure of the vegetation supports various species, albeit of an intermediate diversity, from ground foraging species to those that actively hunt for prey within the dense thorn scrub.	

5.4 Amphibians

Table 8: Field assessment results pertaining to amphibian species within the study area.

Faunal Class: Amphibians	Amphibian Habitat Sensitivity	Low	Faunal Discussion
Amphibian Sensitivity Graph:  			The study area provided no suitable habitat for amphibian species in any form. There are no permanent or seasonal streams or pans that may be utilised for breeding or temporary habitation. As a result of the unsuitable amphibian habitat present, it is unlikely that any amphibian species will occur within the study area, nor have any been recorded for the larger QDS in which the study area falls. Although no amphibians were observed nor are any likely to occur, the study area does still provide suitable food resources for such species in the form of invertebrates, which form the primary food source of many amphibian species. Invertebrate abundance within the study area was moderately high which provides sufficient food, although, without sufficient suitable habitat, having sufficient food resources holds no ground to confirming a likelihood of amphibian species.
			Business Case and Conclusion
			The amphibian habitat sensitivity within the study area is considered low. No suitable habitat for species, either permanent or seasonal was observed within the study area. The proposed development of the SFSF within the study area is unlikely to have any significant impact on amphibian species within the region.

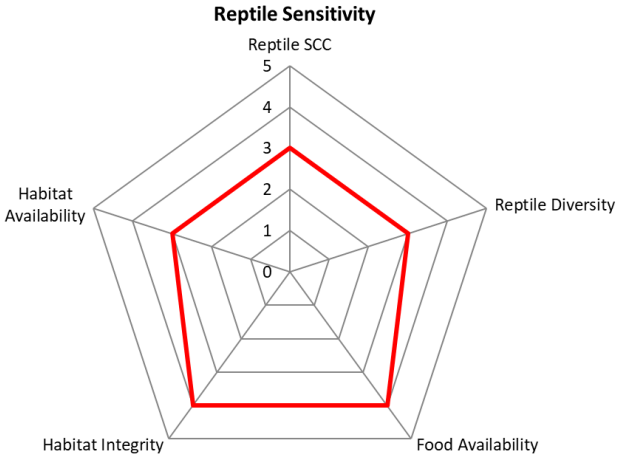
5.5 Reptiles

Table 9: Field assessment results pertaining to reptile species within the study area.

Faunal Class: Reptiles	Reptile Habitat Sensitivity	Intermediate

Notes on Photograph:
Top left: *Trachylepis occidentalis* (Western Three-striped skink);
Top right: *Pedioplanis namaquensis* (Namaqua Sand Lizard);
Bottom: *Pedioplanis lineoocellata lineoocellata* (Spotted Sand Lizzard).

Reptile Sensitivity Graph:



Faunal SCC/ Endemics/ TOPS/	No reptile SCC were observed during the field assessment. There is a possibility that two SCC, namely: *Chamaeleo dilepis* (Common flap-neck chameleon) and the *Python sebae* (African rock python) may occur on the site within the Kathu Bushveld. African Rock pythons often utilize burrows dug by Aardvark to breed in and escape to when disturbed. However, anthropogenic activities around the site and limited food resources will likely reduce the habitat suitability for a python.	**Business Case and Conclusion** Although a limited reptile assemblage was observed within the study area, it is still important to ensure that the impacts from the proposed SFSF development be kept as low as possible, ensuring that no excessive vegetation clearance takes place. This can be achieved by avoiding unnecessary disturbance and minimising construction footprints. The construction of the SFSF will result in the displacement of reptile species from the direct footprint, however the remaining

Faunal Diversity	The study area is expected to have an intermediate reptile diversity, with three species (above) being observed during the assessment. Reptiles are inherently secretive in nature, seeking shelter or moving away before they can be observed, which makes it difficult to accurately assess reptile diversity. As such, it is expected that the study area may support a number of other reptiles, notably predatory snakes such as *Naja nivea* (Cape Cobra) and *Bitus arientans arientans* (Puff Adder).	natural areas are still considered sufficient to meet the habitat requirements of the current reptile species in the study area.
Food Availability	Small mammals and insects, the primary prey of reptiles, do not have extensive spatial requirements and are able to breed and survive in even disturbed locations. The study area had a sufficient abundance of mall mammals to support several predatory snakes, whilst insect abundance is sufficient to support several insectivorous reptile species. Larger predatory snakes however are unlikely to hunt exclusively within the study area, using the neighbouring properties as well.	
Habitat Integrity	Habitat integrity has been impacted upon as a result of unsuitable veld management practices and the ongoing mine activities in the adjacent areas, however the overall integrity of the study area for reptiles specifically is still considered moderately high.	
Habitat Availability	The entire study area provides intermediate habitat availability for reptile species. The Kathu Bushveld unit is well utilised by reptiles as sufficient burrows and vegetation structure are available for habitation, however rocky areas that would provide additional niche habitat are lacking. Adjacent mining activity edge effects and continued human movement through the area may impact on reptile occupancy of the site, however many of the reptile species have already adapted to such and the shift in occupancy rates is unlikely to be significant.	

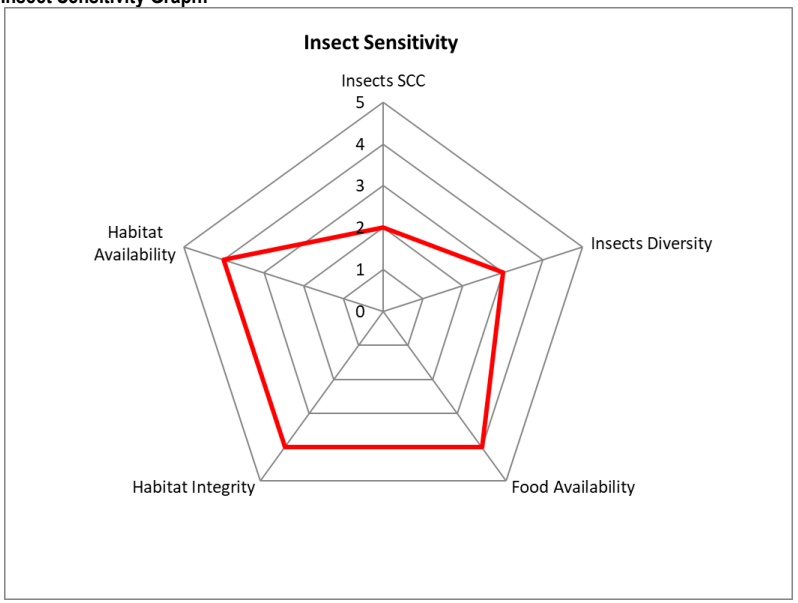
5.6 Insects

Table 10: Field assessment results pertaining to insect species within the study area.

Faunal Class: Insects	Insect Habitat Sensitivity	Intermediate

Notes on Photograph:
Top: Left -. *Cynthia cardui* (Painted Lady) (left) and – *Platypluera* sp. (Cicada). **Middle:** *Pachylomerus femoralis* (Flattened Giant Dung Beetle) (left) and *Garret asp* (Dung Beetle) (right). **Bottom:** *Sternocera* sp (Giant Jewel Bug) (left) and *Zonocerus elegans* (Elegant Grasshopper) (right).

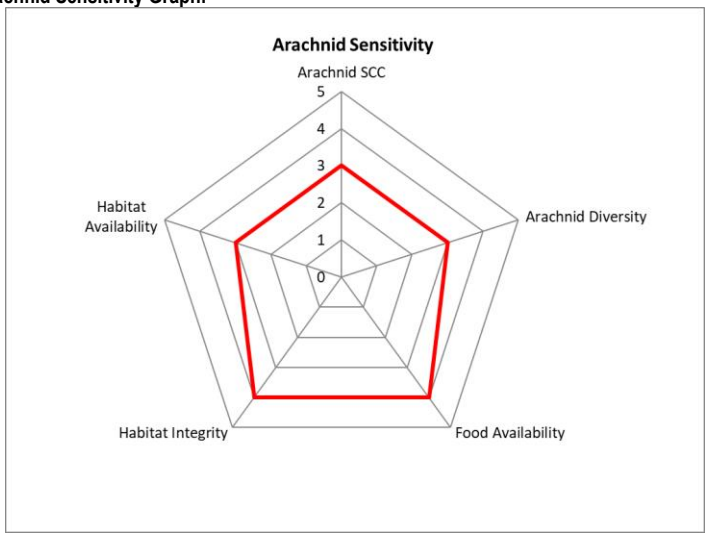
Insect Sensitivity Graph:



Faunal SCC/ Endemics/ TOPS/	No insect SCC were observed during the site assessment nor are any likely to occur within the study area.	**Business Case and Conclusion** The insect habitat sensitivity is considered intermediate. The floral characteristics of the habitat does not support a wide diversity of insect species yet offer suitable habitat for an abundant number of insects. These species in turn are utilised as a food source by numerous other faunal species whilst also performing important ecological roles (pollination, removal of detrital matter and dung). The development of the SFSF is unlikely to have a significant impact of insect species in the region, however strict mitigation measures must still be enforced in order to limit disturbances as far as possible.
Faunal Diversity	Insect diversity of the study area was moderately high with the highest diversity observed during January site assessment. Rain is often an extremely important environmental cue for insects to breed or enter a new stage within their life cycles, and as was observed, diversity is higher following summer rains. Coleopterans, Orthopterans and Hymenopterans were the most abundant species within the study area, yet the diversity was restricted to a few commonly occurring species. Several Nymphalidae (Monarch butterflies) and Lycaenidae (Coppers and Blues), which are all specially protected within the Northern Cape Nature Conservation Act (Act No. 9 of 2009) (NCNCA), where observed within the study area, these could not be identified to species level as the specimens were skittish and did not allow for easy capture and photographing. For a full list of species observed see Appendix D.	
Food Availability	Food availability within the study area for insects is considered moderately high, however this may fluctuate seasonally. Flowering plant species attracted many invertebrates and appeared to be an important food resource for many insects within the location during this period, however during the winter months this resource will not be available. The vegetation within the study area is mostly homogenous with no special features limiting the forage for specialist insects.	
Habitat Integrity	Habitat integrity for insects within the study area is considered to be moderately high. Although developments in the surrounding areas have led to a loss in habitat connectivity, this is unlikely to affect insect assemblages at present.	
Habitat Availability	Suitable habitat for insects is provided throughout the site. Niche habitats for specialist insect species were limited as the topography was flat with no natural ridges or rocky locations and very little change occurred throughout the study area. The homogeneity of vegetation is likely mimicked by the invertebrate species assemblage; therefore, it is expected that mostly common insect species will be encountered within study area due to the lack of specialist or niche habitat. Thus, although there is sufficient habitat for insects it will likely only cater for those species which are ubiquitous.	

5.7 Arachnids

Table 11: Field assessment results pertaining to arachnid species within the study area.

Faunal Class: Arachnids	Arachnid Habitat Sensitivity	Intermediate	Photograph:
Notes on Photograph: *Argiope australis* (Common Garden Orbweb Spider).			
Arachnid Sensitivity Graph: 			

Faunal SCC/ Endemics/ TOPS/	No arachnid SCC were observed within the study area. *Opistophthalmus carinatus* (Robust Burrowing Scorpion) and *O. wahlbergii* (Kalahari Burrower) which are listed in Schedule 2 of the NCNCA (2009) as protected, may occur within the study area. *O. ater,* a NEMBA TOPS species considered as critically endangered may also be present.
Faunal Diversity	Arachnid diversity on site was lower than expected with limited species being observed and mostly only the signs thereof, such as the remaining web structures of the Funnel-web spider, likely belonging to spiders within the genus *Agelena.* Individual Order Solefugae (Solefuge/Sun Spider) were also observed within the study area along with *Argiope australis* (Common Garden Orbweb Spider) which was observed spanning webs between the dense *Senegalia melifera* trees. No scorpions were observed during the site assessment however

	evidence of their presence was observed in the form of scorpion burrows, which occurred throughout the site at low densities. Whilst very few arachnid species were observed, it is expected that their diversity is underestimated in most environments due to their cryptic and crepuscular/nocturnal behaviour. The largely homogenous landscape will likely be inhabited by an intermediate diversity of arachnid species. For a full list of species observed see Appendix D.
Food Availability	Although an intermediate diversity of insect species was observed within the study area, the abundance of insects was higher which serves as a suitable food resources for arachnids. Even though arachnids may take larger prey in the form of small reptiles, these will only suffice for larger specimens which likely account for a small percentage of the total abundance. Arachnid food resources are likely to be cyclical with the seasons and insect abundances, as such species will likely have to forage for longer and further during the winter months or become more sedentary and thus requiring a lower calorie intake.
Habitat Integrity	Habitat integrity for arachnids within the study area is considered to be moderately high. Although developments in the surrounding areas have led to a loss in habitat connectivity, this is unlikely to affect arachnid assemblages at present.
Habitat Availability	Habitat availability is limited by the largely homogenous landscape structure, which is devoid of any natural rocky outcrops or ridges, leading to an intermediate habitat availability for arachnid species. The Kathu bushveld, though largely natural, provides suitable habitat for an intermediate diversity of arachnids.
Business Case and Conclusion	The study is considered to be of intermediate sensitivity for arachnids. No arachnid SCC were observed within the study area, however there remains the possibility that 3 species may occur herein. It is unlikely that the proposed SFSF development will impact on the diversity of arachnids within the area even though habitat for arachnids will be disturbed leading to an overall reduction in arachnid abundance. However, avoiding unnecessary disturbance, minimising construction footprints and ensuring that all disturbed areas are rehabilitated is still vital as arachnids only make a small component of faunal assemblages within ecosystems.

5.8 Faunal Species of Conservational Concern Assessment

During field assessments, it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. As such, and to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) matrix is used, utilising a number of factors to determine the probability of faunal SCC occurrence within the study area. Species listed in Appendix C whose known distribution ranges and habitat preferences include the study area were taken into consideration.

Only one SCC listed in Appendix C, *Ardeotis kori* (Kori Bastard), was observed foraging within the study area. It is however unlikely that this species will utilise the study area for breeding due to the close proximity to the active mining area.

In addition to the species listed above, the following faunal SCC may occur within, either permanently or temporarily, the study area:

- *Opistophthalmus ater* (CR, TOPS);
- *Opistophthalmus carinatus* (Protected, NCCA 2009);
- *Opistophthalmus wahlbergii* (Protected, NCCA 2009);
- *Neotis ludwigii* (Ludwig's Bustard, EN);
- *Chamaeleo dilepis* (Common flap-neck chameleon, (Protected, NCCA 2009); and
- *Python sebae* (African rock python, (Protected, NCCA 2009).

The arachnid SCC all have suitable habitat located within the study area with overlapping distributions with that of the study area. All the arachnid SCC are protected by the NCCA (2009) as a result of illegal collecting. The lack of rocky areas will decrease habitat preference for these species, yet the suitable substrate (sandy soils) will increase their probability of occurrence in the study area together with the moderate abundance of food.

Avifaunal SCC may utilise the study area for forging purposes, however due to the location and continuous neighbouring mining activities it is unlikely that either of these species will utilise the study area for breeding, especially since more suitable breeding localities are available in the neighbouring areas. Suitable habitat for two reptile SCC was observed on the site. *Chamaeleo dilepis* (Common flap-neck chameleon) inhabits coastal forest, moist and dry savannah, woodlands and bushy grasslands. The Kathu Bushveld unit has both more open and closed savannah with many low acacia trees which would be suitable for the species. Moreover, the insect abundance will likely ensure enough food is available for the Common flap-neck chameleon. *Python sebae* (African rock python) may occur on the site within the Kathu Bushveld where evidence of fossorial species was observed as these

species would all be suitable prey items for African rock pythons and attract them to the study area. The burrows observed will also provide a location in which female pythons could lay their eggs.

Due to the possible presence of faunal SCC and suitable habitat within the study area, it can be concluded that the proposed development may affect faunal SCC conservation in the region, however given the small size of the study area and suitable habitat in the neighbouring areas, these impacts can be suitably managed. Should any faunal SCC listed in Appendix C of this report be encountered during the development of the proposed activities, all operations must be stopped immediately, and a biodiversity specialist must be consulted in order to determine the best way forward.

6. Alternative Site Discussion

A second site located to the south of the study area on the opposite side of the mine entrance road has been proposed as an alternative location for the proposed SFSF. This area was assessed at a high level in order to gain an understanding of the current ecological condition of the site in order to inform the site decision process better.

During the walkthrough, it was noted that this site is notably more degraded than the study area, with a notable loss of herbaceous species and an increased density of *Senegalia mellifera*. The alternative location was most likely used for grazing historically, resulting in the long-term depredation of the habitat and alteration of the vegetation structure. Although the floral species diversity was lower within the alternative location than the study area, the alternative location still provided suitable habitat for protected tree species such as *Vachellia erioloba* and *Vachellia haematoxylon* and specially protected and protected floral species such as *Harpagophytum procumbens and Boophone disticha.* Habitat and food resource provision within the alternative location is significantly lower than that of the study area. Faunal diversity corresponded accordingly with limited diversity and abundance of species being observed. Overall the alternative location is in significantly poorer condition than that of the study area.

Taking the above into consideration, placement of the SFSF within the alternative location would likely result in lower impacts to faunal and protected floral species in comparison than that of the current study area.

7. SENSITIVITY MAPPING

Figure 9 below conceptually illustrates the habitat units encountered within the study area and the associated ecological sensitivity. The area is depicted according to its sensitivity in terms of:

- the presence or potential for floral and faunal SCC,
- habitat integrity and levels of disturbance,
- threat status of the habitat type,
- the presence of unique landscapes, and
- overall levels of diversity.

Table 12 below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

Table 12: A summary of the sensitivity of each habitat unit and implications for development.

Habitat Unit	Sensitivity	Conservation Objective	Development Implications
Katha Bushveld	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	Any disturbance of flora and faunal habitat must be managed to reduce any significant impacts. In this regard, ensuring that no habitat outside that of the footprint is disturbed is considered paramount to the project. In addition, disturbed areas that do not form part of the active SFSF must be rehabilitated. Care must be taken to prevent any negative impacts on the surrounding habitat and as such edge effects should be limited. Moreover, all mitigation measures should be correctly implemented as set out within this report.
Transformed Habitat	Low	Optimise development potential.	These areas are associated with existing infrastructure and bush encraochment, and as such, no development constraints are applicable to these areas.

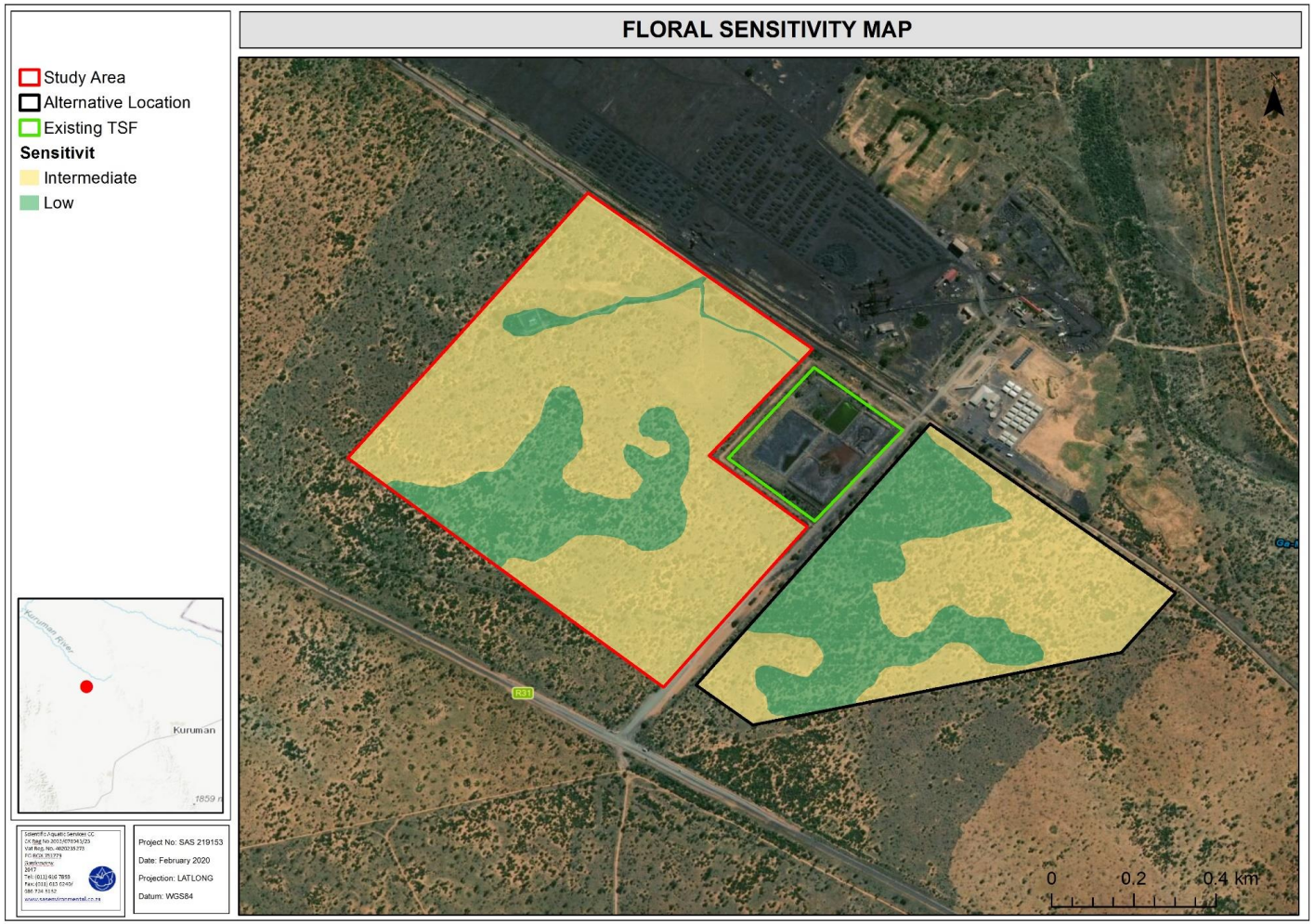


Figure 10: Floral habitat sensitivity map for the study area.

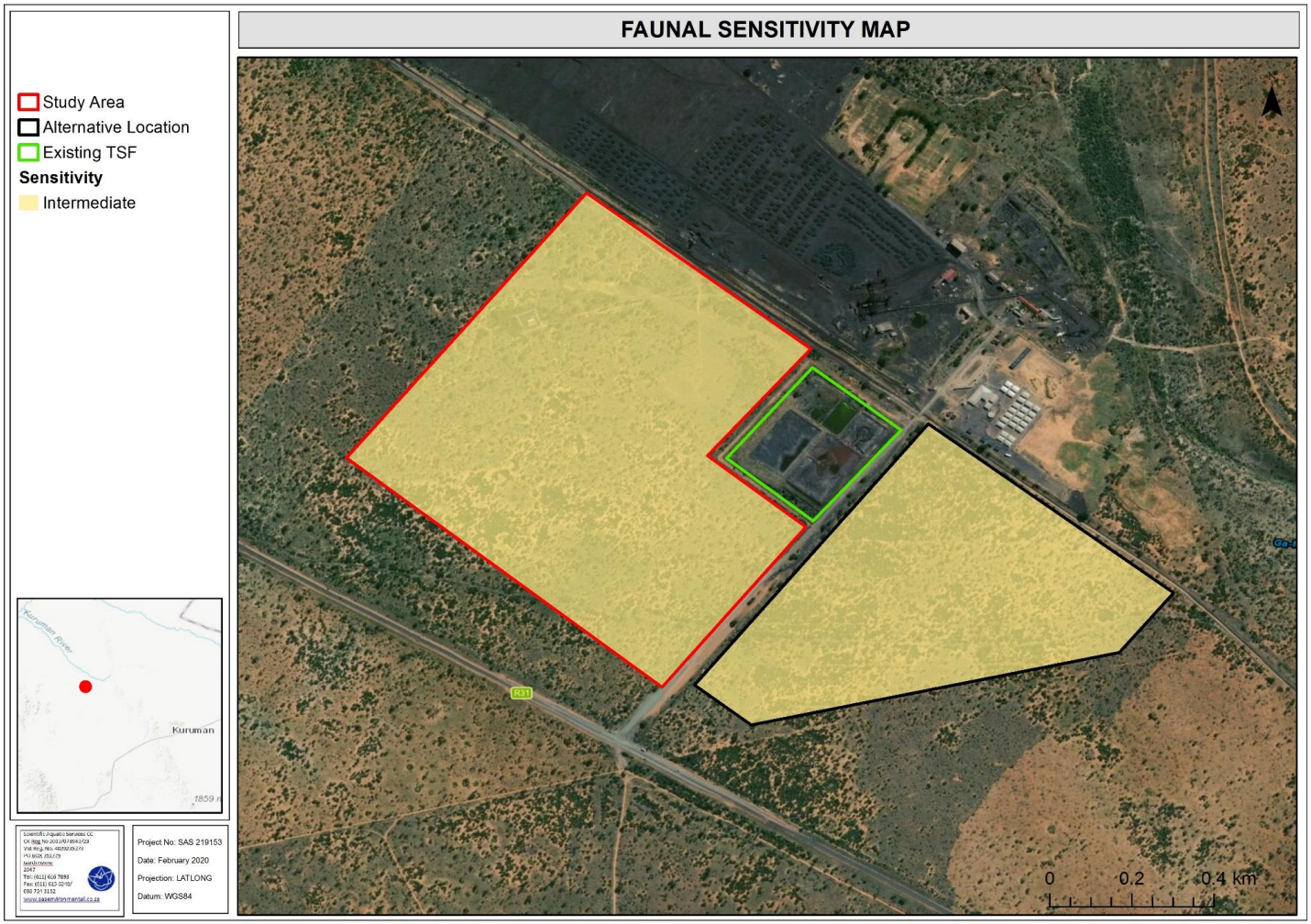


Figure 11: Faunal habitat sensitivity map for the study area

8. IMPACT ASSESSMENT

The tables below serve to summarise the significance of perceived impacts on the faunal ecology of the study area, according to the method described in Part A (Appendix C), with each individual impact identified presented in Section 9.1 and 9.2 of this report. The impacts are considered with and without mitigation having taken place. A summary of the potential construction, as well as rehabilitation and maintenance impacts, are provided in Section 8.1 to Section 8.3. All the required mitigatory measures needed to minimise the impact is presented in Section 8.4.

The impact assessment is based on the proposed layout as provided by the proponent (See Section 1.2), which indicates the following:

The planned expansion activities assessed in this section of the report are as follows:

- A Return Water Dam (RWD);
- Fines and water conveyance infrastructure (pipelines, pumps and their related civil, mechanical and electrical works);
- Access and maintenance roads;
- Fencing and access control;
- A contractor laydown area for the construction phase; and
- Topsoil and subsoil stockpiles from excavations.

Table 13: Activities and aspects likely to impact on the impact faunal resources of the study area. Blocks with a red colour were regarded as having a higher impact significance and were rated higher in the impact assessment. Green blocks suggest the lower impact aspects.

ACTIVITIES AND ASPECTS REGISTER
Planning Phase
- Potential failure to implement the required mitigation measures before and at the commencement of construction activities: • Potential failure to have a Rehabilitation Plan developed, and implemented, before the commencement of mining-related expansion activities; and • Potential failure to implement an Alien and Invasive Plant (AIP) Management/Control Plan before construction activities commence. - **Impact**: Long-term or permanent degradation and modification of the receiving environment, loss of SCC and fauna habitat.
- Potential failure to obtain the necessary permits for removal of protected faunal species, and potential failure to implement rescue and relocation of protected species. - **Impact**: Permanent loss of protected faunal species from the study area
- Potential inadequate design of infrastructure leading to pollution of soils as a result of, e.g., seepage/leaks from infrastructure failure. - **Impact:** Contaminated soils lead to a loss of viable growing conditions for plants and results in a decrease of faunal habitat, diversity and SCC – rehabilitation effort will also be increased as a result.
Construction and Operational Phase
- Site clearing and the removal of vegetation. - **Impact:** Loss of faunal habitat and potential loss of faunal SCC.
- The proliferation of AIP species that colonise areas of increased disturbances and that outcompete native

ACTIVITIES AND ASPECTS REGISTER
species, including the further transformation of adjacent or nearby natural areas. - **Impact:** Loss of favourable faunal habitat outside of the direct development footprint, including a decrease in faunal diversity and potential loss of faunal SCC.
- Potential failure to correctly stockpile topsoil removed during construction activities leading to: • Potential contamination of topsoil stockpiles with AIP propagules; • Compaction of stockpiled topsoil leading to loss of viable soils for rehabilitation; and • Inefficient vegetating of stockpiled topsoil resulting in loss and degradation of soils. - **Impact:** Loss of viable soils for rehabilitation, thus hampering the potential for faunal species to successfully recolonize during rehabilitation activities. Ultimately a loss of faunal diversity will result.
- Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting proliferation of AIPs. - **Impact:** Long-term loss of favourable habitat for the establishment of faunal species. Loss of faunal diversity.
- Potentially poorly managed edge effects: • Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to a continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the faunal habitat. - **Impact:** Loss of faunal habitat, diversity and SCC within and adjacent to the footprint area of the SFSF. Loss of surrounding faunal diversity and faunal SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.
- Habitat fragmentation resulting from the expansion activities and poorly rehabilitated areas. - **Impact:** Long-term changes in faunal structure, altered genetic fitness and potential loss of SCC.
- Potential overexploitation through the removal and/or collection/hunting of important or sensitive faunal SCC beyond the direct footprint area. - **Impact:** Local loss of faunal SCC abundance and diversity.
- Risk of contamination from all operational facilities may pollute the receiving environment. - **Impact:** Altered faunal habitat.
- Potential seepage affecting soils and the groundwater regime. - **Impact:** Altered faunal habitat.
- Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities. - **Impact:** Leading to a loss of faunal habitat.
- Potential dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs. - **Impact:** Loss of faunal habitat, diversity and SCC.
- Dust generated during construction and operational activities accumulating on the surrounding floral species, altering the photosynthetic ability of plants[1] and potentially further decreasing optimal growing/re-establishing conditions. - **Impact:** Decline in plant functioning leading to loss of faunal habitat and food resources.
Decommissioning & Closure Phase
- Potential ineffective rehabilitation of exposed and impacted areas potentially leading to a shift in vegetation type. - **Impact:** Permanent loss of faunal habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.
- Potential poor management and failure to monitor rehabilitation efforts, leading to: • Landscapes left fragmented, resulting in reduced dispersal capabilities of faunal species and a decrease in faunal diversity; • Compacted soils limiting the re-establishment of natural vegetation; and • Increased risk of erosion and AIP proliferation in areas left disturbed. - **Impact:** Loss of faunal habitat and diversity. The above aspects will also have a notable impact on area utilisation by common faunal species and SCC. - Potentially poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species. - **Impact:** Permanent loss of surrounding natural faunal habitat, diversity and SCC.
- On-going risk of contamination from mining facilities beyond closure. - **Impact:** Permanent impact on faunal habitat.

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

8.1 Floral Impact Assessment

8.1.1 Impact on Floral Diversity and Habitat

The habitat sensitivity associated with the study area range from intermediate to low as discussed in Section 7 of this report. The study area, as well as the alternative location, fall within the Kathu Bushveld Habitat, considered to be of intermediate floral sensitivity. Small pockets of transformed areas were identified within the broader habitat unit of the study area and the alternative location. This vegetation transformation was associated with existing gravel roads leading to the existing TSF as well as an existing fuel storage facility.

The most significant impact is expected to arise from the development of the SFSF within the study area due to the extensive loss of protected tree species that cannot be relocated.

Due to the significant impact arising from the development of the SFSF, the implementation of all mitigation measures stipulated in this report is of high importance. Implementation of mitigation will restrict the impact to the development footprint and limit edge effects on surrounding natural Kathu Bushveld habitat outside of the development footprint. Of particular importance is the control of AIP species, to limit the spread of such species to surrounding sensitive habitat.

8.1.2 Impact on Floral SCC

During the field assessment, a number of NFA and NCNCA protected floral species were observed throughout the study area, and include *Vachellia erioloba, V. haematoxylon, Boophone disticha, Harpagophytum procumbens,* and *Orbea sp.* Removal/ destruction of any of these will require permits from DAFF and NCDENC. Loss of individuals from the study area although considered a high impact, is not considered detrimental for the conservation of these species within the province. Loss of individuals should still be minimised by implementing a rescue and relocation plan for herbaceous species, as well as by limiting the development footprint to what is essential and actively managing edge effects on the surrounding natural area.

8.1.3 Possible latent impacts

Even with mitigation, latent impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key latent impacts that have been identified and which are relevant to the study area and proposed development:

- Continued loss of floral habitat of increased sensitivity, i.e. Kathu Bushveld;
- Continued loss of and altered floral species diversity;
- Alien and invasive plant proliferation, particularly in sensitive habitats where bare soils are left exposed; and

- Permanent loss of floral SCC and suitable habitat.

8.1.4 Possible cumulative impacts

The proposed SFSF activities will result in the clearance of indigenous vegetation. The immediate area is associated with the existing Black Rock mine, with the Mamatwan and Tshipi Mines, and United Manganese of Kalahari Mines also situated in the surrounding region. Mining activities associated with these mines has led to the degradation of the surrounding natural habitat. As such the area that will be cleared is no longer considered pristine. The additional impact attributed to the expansion activities is not considered to contribute significantly to the conservation and ecology of the larger area. The expansion activities will, however, lead to the permanent loss of floral SCC, and as such all mitigation measures as listed below should be implemented to limit the number of individuals that will be affected.

8.1.5 Floral Assessment Summary

The tables below serve to summarise the findings of the impact assessment undertaken with reference to the perceived impacts stemming from the proposed development activities as found in Appendix D & J. The tables below indicate the significance of the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures, as stipulated in this report, are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Based on the impact assessment of potential impacts on floral habitat, diversity and SCC associated with the study area, it is evident that during the construction and operational phases, the perceived impact on floral SCC, habitat and diversity is of medium-low to low significance prior to the implementation of mitigation measures. With mitigation measures fully implemented all impacts can be reduced to low and very-low significance levels.

Table 14: A summary of the impact significance on floral resources in the construction phase.

Impact	Habitat Unit	Unmanaged	Mitigated
Impact on floral habitat and species diversity	*Kathu Bushveld Habitat*	Medium-high	Medium-Low
	Transformed Habitat	Low	Low
Impact on floral SCC	*Kathu Bushveld Habitat*	Medium-high	Medium-Low
	Transformed Habitat	Low	Very Low

Table 15: A summary of the impact significance on floral resources in the operational phase.

Impact	Habitat Unit	Unmanaged	Mitigated
Impact on floral habitat and species diversity	*Kathu Bushveld Habitat*	Medium-Low	Low
	Transformed Habitat	Medium-Low	Low
Impact on floral SCC	*Kathu Bushveld Habitat*	Medium-Low	Low
	Transformed Habitat	Low	Very Low

Table 16: A summary of the impact significance on floral resources in the decommissioning and closure phase.

Impact	Habitat Unit	Unmanaged	Mitigated
Impact on floral habitat and species diversity	*Kathu Bushveld Habitat*	Medium-Low	Low
	Transformed Habitat	Low	Very Low
Impact on floral SCC	*Kathu Bushveld Habitat*	Low	Very Low
	Transformed Habitat	Low	Very Low

8.2 Faunal Impact Discussion

8.2.1 Loss of Faunal Habitat and Ecological Integrity

Construction of the SFSF will result in the loss of faunal habitat of intermediate sensitivity within the study area (Kathu Bushveld Habitat) as a result of the clearing of natural vegetation within the footprint area. This loss of habitat and the current planned placement of the SFSF will further lead to the loss of habitat connectivity whilst increased activities within the study area during all phases will likely lead to the further dispersal of faunal species out of the adjacent areas. The loss of habitat connectivity and increased anthropogenic activities in the study area will further impact on the overall ecological integrity of the study area.

8.2.2 Loss of Faunal Diversity

Faunal diversity within the study area is considered to be intermediate for all faunal assemblages except amphibians with a low diversity. The sensitivities are as a result of both the constant adjacent anthropogenic activities associated with the current mining operations within the general area as well as the lower quality of habitat available to faunal species. The construction of the proposed SFSF will initially result in the loss of species diversity as a result of habitat clearing as well as species relocating to areas away from the disturbance. During the operational phase some of the species may return to the areas adjacent to the SFSF, provided there is still suitable habitat remaining.

8.2.3 Impact on Important Faunal Species of Conservation Concern

Eight protected faunal species may inhabit different regions of the study area namely *Ardeotis kori* (Kori Bastard), *Opistophthalmus ater* (CR, TOPS), *Opistophthalmus carinatus* (Protected, NCCA 2009), *Opistophthalmus wahlbergii* (Protected, NCCA 2009), *Neotis*

ludwigii (Ludwig's Bustard, EN), *Chamaeleo dilepis* (Common flap-neck chameleon, Protected, NCCA 2009) and *Python sebae* (African rock python, Protected, NCCA 2009).
Of the above listed species, only *Ardeotis kori* (Kori Bastard) was observed foraging within the study area. None of the avifaunal SCC are expected to utilise the study area for breeding, as such the development of the SFSF will only result in the loss of potential foraging grounds for these species. It must be noted however that the surrounding natural areas are likely to provide better more suitable foraging grounds for these species, with the study area serving only as a secondary foraging ground. As such, the development of the SFSF is unlikely to significantly impact on these avifaunal SCC. Reptile and arachnid SCC may occur within the study area and as such the clearance of vegetation, notably for these slow moving and often sedentary species poses an significant risk, especially as the scorpions and *Python sebae* (African rock python) will often seek refuge in underground burrows when threatened or when resting. Earth moving activities will place these species in direct harm and as such suitable mitigation measures must be implemented in order to minimise these risks.

8.2.4 Probable Residual Impacts

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

- Continued loss of faunal habitat;
- Potential decline in faunal abundance;
- Altered faunal assemblages and guild specific services;
- Loss of faunal SCC habitat and possible SCC occurrence both within the study area and in the surrounding habitats through edge effects;
- Potential increase of hunting/ trapping of mammal faunal species; and
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and significant loss of faunal habitat, species diversity and faunal SCC will most likely be permanent.

8.2.5 Possible cumulative Impacts

The construction of the SFSF will result in the loss of faunal habitat within a region that has already been subjected widespread habitat loss as a result of the onset and expansion of mining activities. The development of the SFSF will further result in the displacement of faunal species, some of which may have relocated to the study area as a result of habitat loss or degradation in other areas. Displaced species will have to search out new habitat in the surrounding areas, placing them in direct competition for space sand resources with

species that are already occurring in these areas. Such competition may lead to the loss of species abundance and diversity in these undeveloped areas due to a lack of resources or space sufficient for the current and displaced species. In addition to species displacement, should any spills or leaks occur, it may result in significant habitat degradation and/or loss in the areas adjacent to the SFSF where the spill occurs, further adding to the loss of habitat originally experienced through the construction of the SFSF.

8.2.6 Faunal Impact Assessment Summary

The tables below serve to summarise the findings of the impact assessment undertaken with reference to the perceived impacts stemming from the proposed development activities as found in Appendix J. The tables below indicate the significance of the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post mitigation impact scores will increase.

Table 17: A summary of the impact significance on faunal resources in the construction phase

Habitat Unit	Impact	Unmanaged	Mitigated
Kathu Bushveld	*Loss of faunal habitat and ecological integrity*	Medium Low	Medium Low
	Loss of faunal diversity	Medium Low	Low
	Impact on faunal SCC	Medium Low	Low

Table 18: A summary of the impact significance on faunal resources in the operational phase

Habitat Unit	Impact	Unmanaged	Mitigated
Kathu Bushveld	*Loss of faunal habitat and ecological integrity*	Medium Low	Low
	Loss of faunal diversity	Low	Low
	Impact on faunal SCC	Medium Low	Low

Table 19: A summary of the impact significance on faunal resources in the decommissioning and closure phase

Habitat Unit	Impact	Unmanaged	Mitigated
Kathu Bushveld	*Loss of faunal habitat and ecological integrity*	Medium Low	Low
	Loss of faunal diversity	Medium Low	Low
	Impact on faunal SCC	Medium Low	Low

8.3 Impact Statement – The Alternative Location

The alternative site is located to the south of the current study area on the opposite side of the mine access road. Historical farming practices, likely grazing of livestock, has resulted in the notable disturbance of habitat and loss of the herbaceous layer. As such, the faunal diversity and abundance within this site is notably lower.

Impacts on the floral and faunal habitat, species diversity and SCC within the alternative site, should the SFSF be located here, will likely be lower than that of the current proposed site.

This is due to lower faunal habitat sensitivity, decreased species diversity and lower probability of faunal SCC occurring in the alternative site.

8.4 Integrated Impact Mitigation

The table below highlights the key, general integrated mitigation measures that are applicable to the proposed development of the SFSF in order to suitably manage and mitigate the ecological impacts that are associated with all activity phases.

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

Table 20: A summary of the mitigatory requirements for floral and faunal resources.

Project phase	*Pre-construction Phase*
Impact Summary	*Loss of flora and faunal habitat, species and SCC*
Management Measures	***Proposed mitigation and management measures:***
	- Minimise loss of indigenous vegetation and faunal habitat where possible through effective planning and limiting the SFSF footprint to what is essential. - It is recommended that prior to the commencement of the site clearing, the footprint area be demarcated through the use of shade-net fencing / wooden poles to prevent habitat creep into surrounding natural areas. - Where possible, and feasible, all access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat. - Prior to the commencement of construction activities on site an alien vegetation management plan should be compiled for implementation throughout all development phases. - The necessary permits need to be obtained from DEFF and NCDENC prior to the implementation of rescue and relocation activities. - Once all floral SCC and NCNCA protected floral species within the development footprint has been identified, a rescue and relocation plan should be designed for herbaceous species – this plan must give guidance on a species level with regards to their relocation potential and requirements. Rescue activities need to take place prior to the commencement of any activities. Rescue and transplanting of floral species should be overseen by a contractor/ mine employee with assistance from a suitably qualified botanist. The success of rehabilitation actions needs to be monitored quarterly for a minimum period of a year post-relocation.
Project phase	*Construction Phase*
Impact Summary	*Loss of floral, faunal habitat, species and SCC*
Management Measures	***Proposed mitigation and management measures:***
	Development footprint
	- The footprint areas of all surface infrastructure must be minimised to what is absolutely essential within the designated study area; - Vegetation outside of the footprint area is not to be cleared; - Vegetation clearance and commencement of construction activities should either be scheduled to coincide with low rainfall conditions and dust suppression implemented; - Excavated topsoil must be stored with associated native vegetation debris for subsequent use in rehabilitation; - Contractor laydown areas and additional temporary infrastructure areas should be placed in previously disturbed sites as far as possible; - No dumping of general waste or construction material on site should take place. As such it is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; - If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder faunal rehabilitation later down the line. Spill kits should be kept on site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised preventing the ingress of hydrocarbons into the topsoil; - Natural habitat outside of the direct footprint areas must be avoided, and no construction vehicles, personnel, or any other construction related activities are to encroach upon these areas; - No hunting/trapping or collecting of faunal species is allowed; and - No informal fires by construction personnel are allowed.
	Alien Vegetation
	- Edge effects of all construction activities, such as erosion and alien plant species proliferation, which may affect adjacent Kathu Bushveld, need to be strictly managed adjacent to the natural portions of Kathu Bushveld; - An Alien and Invasive Plant Management and Control Plan must be designed and implemented in order to monitor and control alien faunal recruitment; and - Where areas are disturbed during construction activities, spread of alien invasive species within these areas should be continually monitored and controlled throughout the construction phase.
	Floral SCC
	- No collection of floral SCC or medicinal floral species within the study area or larger region must be allowed by mining personnel.

	- Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC and protected floral species outside of the proposed e footprint area. **Faunal SCC** - No collection/ trapping or hunting of faunal SCCs may be allowed by any construction personnel; - During the surveying and site-pegging phases, all faunal SCC that will be affected by surface infrastructure must be marked and, where possible, relocated to suitable habitat surrounding the disturbance footprint. The relevant permits must be applied for from the Northern Cape Department of Environment and Nature Conservation (NCDENC) prior to the commencement of the construction phase; - Should any other faunal species protected under National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) be encountered within the study area authorisation to relocate such species must be obtained from the NCDENC or the Department of Environmental Affairs (DEA); and - Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal SCC outside of the proposed footprint area; - Should any SCC be observed on the site a biodiversity specialist should be contacted in order to advise the best way forward; - Prior to vegetation clearing activities in the Kathu Bushveld habitat, the site should be inspected for the presence of burrowing scorpion burrows and pythons. If located, these species should be carefully excavated ensuring no harm to fauna, and relocated to similar surrounding habitat outside of the footprint area; - Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. - Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own; and - Should any snakes be encountered, either a suitably trained staff member or expert should be contacted to capture and relocate the specimen. No harm should done to any snakes located within the study area. **Dust** - An effective dust management plan must be designed and implemented in order to mitigate the impact of dust on flora throughout the construction phase. **Fire** - No illicit fires must be allowed during the construction phases of the proposed mining development. **Rehabilitation** - Any natural areas beyond the proposed footprint, that have been affected by the construction activities, must be rehabilitated using indigenous species; - All soils compacted as a result of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas; - Revegetation of disturbed areas should be carried out in order to restore habitat availability and minimise soil erosion; and - When rehabilitating, it is imperative that as far as possible the habitat that was present prior to disturbances is recreated, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area.

Project phase	*Operational Phase*
Impact Summary	*Loss of floral, faunal habitat, species and SCC*
Management Measures	**Proposed mitigation and management measures:** **Development footprint** - The footprint and daily operation of all surface infrastructure areas must be strictly monitored to ensure that edge effects from the operational facilities do not affect the surrounding faunal habitat beyond the footprint; and - No hunting/trapping or collecting of faunal species is allowed; **Alien Vegetation** - Edge effects of all operational activities, such as alien plant species proliferation which may affect adjacent natural habitat within surrounding areas, need to be strictly managed adjacent to the SFSF footprint; - Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the operational phase of the SFSF, and the perimeters should be regularly checked during the operational phase for alien vegetation proliferation to prevent spread into surrounding natural areas; and - Continue with and update the alien and invasive plant control plan accordingly. **Faunal / Floral SCC** - No collection of firewood (as this often provides microhabitats for small insect and arachnids) or floral and faunal SCC is allowed by mining personnel; - Edge effect control needs to be implemented to ensure no further degradation and potential loss of SCC outside of the footprint area occurs; and - It must be ensured that related operational activities are kept strictly within the footprint. **Fire** - No illicit fires must be allowed during the operational phase of the proposed mining development. - Fire breaks should be maintained during the operational phase. **Rehabilitation** - Rehabilitation of natural vegetation should proceed in accordance with a rehabilitation plan compiled by a suitable specialist. This rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during and once construction has been completed, ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken during the decommissioning phase; and - Rehabilitation must be implemented at all times, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and cost.
Project phase	*Decommissioning and Closure Phase*
Impact Summary	*Loss of floral, faunal habitat, species and SCC*
	Rehabilitation - All infrastructure and operation footprints should be rehabilitated in accordance with a rehabilitation plan compiled by a suitable specialist; - All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure objective; and - Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure. **Alien Vegetation** - Edge effects of decommissioning and closure activities, such as erosion and alien plant species proliferation, which may affect adjacent sensitive habitat, need to be strictly managed adjacent to the footprint; - Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase of the development, and the immediate surrounding area (30m from the perimeters) should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural area; and - An Alien and Invasive Plant Management and Control Plan must be designed and implemented in order to monitor and control alien faunal recruitment in disturbed

	areas. The alien floral control plan must be implemented for a period of at least 5 years after decommissioning and closure to ensure faunal habitat is not degraded further.

9. CONCLUSION

Scientific Aquatic Services (SAS) was appointed to conduct a faunal and floral ecological assessment as part of the Environmental Authorisation process for the proposed new Super Fines Storage Facility (SFSF) and associated infrastructure at the Gloria Mine Complex, and Underground Mine Complex of the Assmang (Pty) Ltd Black Rock Mine Operations (BRMO). During the field investigation, one habitat unit was identified, namely the Kathu Bushveld Habitat.

The assessment of the study area indicated that overall, the site is considered to be of intermediate sensitivity for floral and faunal species.

During the field assessment, a number of NFA and NCNCA protected floral species were observed throughout the study area, and include *Vachellia erioloba, V. haematoxylon, Boophone disticha, Harpagophytum procumbens,* and *Orbea sp.* Removal/ destruction of any of these will require permits from DAFF and NCDENC. Loss of individuals from the study area although considered a high impact, is not considered detrimental for the conservation of these species within the province. Loss of individuals should still be minimised by implementing a rescue and relocation plan for herbaceous species, as well as by limiting the development footprint to what is essential and actively managing edge effects on the surrounding natural area.

Faunal diversity and occupancy of the study area was lower than expected, but this is likely a result of the study area location, being located adjacent to the existing tailings facility, an active mining area and being bordered by 3 active roads, resulting in notable habitat fragmentation. This combined with edge effects and anthropogenic activities in the surrounding areas has likely resulted in many faunal species seeking habitat elsewhere, contributing to the decrease diversity and abundance observed. The study area the potential to provide habitat to several faunal SCC, of which one, *Ardeotis kori* (Kori Bastard), was observed foraging on site. It is imperative that cognisance of SCC be taken and that all required management and mitigation measures are undertake in order to limit impacts to these species.

The impacts associated with the proposed development range from low to medium-high for all phases of the development prior to mitigation taking place. With mitigation fully implemented, all impacts can be reduced, most notably the extent thereof.

The objective of this study was to provide sufficient information on the floral and faunal ecology of the area, together with other studies on the physical and socio-cultural environment for the EAP and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. The need for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to be compared and considered along with the need to ensure sustainable economic development of the country.

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

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APPENDIX A - Legislative Requirements and Indemnity

National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA)

The National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations (GN R326 as amended in 2017 and well as listing notices 1, 2 and 3 (GN R327, R325 and R324 of 2017), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the Environmental Impact Assessment process depending on the nature of the activity and scale of the impact

National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)

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

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

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

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

Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA)

The obtaining of a New Order Mining Right (NOMR) is governed by the MPRDA. The MPRDA requires the applicant to apply to the DMR for a NOMR which triggers a process of compliance with the various applicable sections of the MPRDA. The NOMR process requires environmental authorisation in terms of the MPRDA Regulations and specifically requires the preparation of a Scoping Report, an Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP), and a Public Participation Process (PPP).

Government Notice 864 Alien and Invasive Species Regulations as published in the Government Gazette 40166 of 2016 as it relates to the National Environmental Management Biodiversity Act, 1998 (Act 107 of 1998)

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

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

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

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

Categories according to NEMBA (Alien and Invasive Species Regulations, 2017):

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

Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)

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

The National Forest Act, 1998 (Act 84 of 1998, as amended in September 2011) (NFA).

Principles to guide decisions affecting forestry resources applicable to land development management are contained in the following principle:

Principle 3

3) The principles are that—
(a) natural forests must not be destroyed save in exceptional circumstances where, in the opinion of the Minister, a proposed new land use is preferable in terms of its economic, social or environmental benefits;
(b) a minimum area of each woodland type should be conserved, and forests must be developed and managed to -
(i) conserve biological diversity, ecosystems and habitats;
(ii) sustain the potential yield of their economic, social and environmental benefits.
This section of the Act alludes to the fact that the conservation status of all vegetation types needs to be considered when any development is taking place to ensure that the adequate conservation of all vegetation types is ensured.

Principle 6

(6) Criteria and indicators may include but are not limited to, those for determining—
the level of maintenance and development of—
(i) forest resources:
(ii) biological diversity in forests:
(iii) the health and vitality of forests:
(iv) the productive functions of forests:
(v) the protective and environmental functions of forests; and
(vi) the social functions of forests.

The Northern Cape Nature Conservation Act, 2009 (Act No 9 of 2009) (NCNCA);

Restricted activities involving specially protected plants:

49 (1) No person may, without a permit-
(a) Pick;
(b) Import;
(c) Export;
(d) Transport;
(e) Possess;
(f) Cultivate; or
(g) Trade in, a specimen of a specially protected plant

Restricted activities involving protected plants

50 (1) Subject to the provision of section 52, no person may, without a permit-

(a) Pick;
(b) Import;
(c) Export;
(d) Transport;
(e) Cultivate; or
(f) Trade in, a specimen of a protected plant.

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APPENDIX B – Floral Method of Assessment

Floral Species of Conservation Concern Assessment

Prior to the field visit, a record of all potential floral SCC and their habitat requirements was acquired making use of relevant national and provincial list published in:

- the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009),
- Government Notice 256 Threatened or Protected Species (TOPS) as published in the Government Gazette 38600 of 2015 as it relates to the National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004); and
- Government Notice 908 List of Protected Tree Species as published in the Government Gazette 38215 as it relates to the National Forest Act, 1998, (Act 84 of 1998, amended in September 2011).

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 floral SCC was determined using the following calculations wherein the distribution range for the species, specific habitat requirements and level of habitat disturbance were considered. The accuracy of the calculation is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Each factor contributes an equal value to the calculation.

Distribution						
	Outside of known distribution range					**Inside known distribution range**
Site score						
EVC 1 score	0	1	2	3	4	5
Habitat availability						
	No habitat available					**Habitat available**
Site score						
EVC 1 score	0	1	2	3	4	5
Habitat disturbance						
	0	**Very low**	**Low**	**Moderate**	**High**	**Very high**
Site score						
EVC 1 score	5	4	3	2	1	0

[Distribution + Habitat availability + Habitat disturbance] / 15 x 100 = POC%

Vegetation Surveys

Vegetation surveys were undertaken by first identifying different habitat units and then analysing the floral species composition that was recorded during detailed floral assessments using the step point vegetation assessment methodology. Different transect lines were chosen throughout the entire study area within areas that were perceived to best represent the various plant communities. Floral species were recorded, and a species list was compiled for each habitat unit. These species lists were also compared with the vegetation expected to be found within the relevant vegetation types as described in Appendix E, which serves to provide an accurate indication of the ecological integrity and conservation value of each habitat unit (Evans & Love, 1957; Owensby, 1973).

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;
- **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 contributes 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 utilisation 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 B1: Floral habitat sensitivity rankings and associated land-use objectives.

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

APPENDIX C – Faunal Method of Assessment

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of human habitation in the area surrounding the study area and the associated anthropogenic activities may have an impact on faunal behaviour and in turn the rate of observations. In order to increase overall observation time within the study area, as well as increasing the likelihood of observing shy and hesitant species, camera traps were strategically placed within the study area.

Mammals

Motion sensitive infrared camera traps were used to capture medium to large mammal species (Figure D1). These cameras were placed along trails and near suitable habitat areas and left for the full duration of the field site visit.

Figure D1: Field cameras used to document medium to large mammal species.

Furthermore, mammal species were recorded during the field assessment with the use of visual identification, spoor, call and dung whilst Sherman traps were used in order to attain additional small mammal data. Specific attention was given to mammal SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Avifauna

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

Reptiles

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

Amphibians

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

Invertebrates

Whilst conducting transects through the study area, all insect species visually observed were identified, and where possible photographs taken. Due to the limitations on traveling equipment on airlines, pitfall traps were not used during this assessment.

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

Arachnids

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

Faunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC was determined using the following four parameters:

- Species distribution;
- Habitat availability;
- Food availability; and
- Habitat disturbance.

The accuracy of the calculation is based on the available knowledge about the species in question. Therefore, it is important that the literature available is also considered during the calculation.
Each factor contributes an equal value to the calculation.

Scoring Guideline				
Habitat availability				
No Habitat	**Very low**	**Low**	**Moderate**	**High**
1	2	3	4	5
Food availability				
No food available	**Very low**	**Low**	**Moderate**	**High**
1	2	3	4	5
Habitat disturbance				
Very High	**High**	**Moderate**	**Low**	**Very Low**
1	2	3	4	5
Distribution/Range				
Not Recorded		**Historically Recorded**		**Recently Recorded**
1		3		5

[Habitat availability + Food availability + Habitat disturbance + Distribution/Range] / 20 x 100 = POC%

Faunal Habitat Sensitivity

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

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

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

Table C1: Faunal habitat sensitivity rankings and associated land-use objectives.

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

APPENDIX D – Impact Assessment Methodology

Ecological Impact Assessment Method

In order for the Environmental Assessment Practitioner (EAP) to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation.
- An **environmental aspect** is an 'element of an organisations activities, products and services which can interact with the environment'[2]. The interaction of an aspect with the environment may result in an impact.
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the Table C2. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance-rating matrix and are used to determine whether mitigation is necessary[3].

The assessment of significance is undertaken twice. Initial, significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment takes into account the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act, 1998 (No. 108 of 1998) in instances of uncertainty or lack of

[2] The definition has been aligned with that used in the ISO 14001 Standard.

[3] Some risks/impacts that have low significance will however still require mitigation.

information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table D1: Criteria for assessing the significance of impacts

LIKELIHOOD DESCRIPTORS

Probability of impact	**RATING**
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	**RATING**
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

CONSEQUENCE DESCRIPTORS

Severity of impact	**RATING**
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	**RATING**
Activity specific/ < 5 ha impacted / Study areas affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Study areas affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Study areas affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Study areas affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Study areas affected > 3000m	5
Duration of impact	**RATING**
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5

Table D2: Significance Rating Matrix.

	CONSEQUENCE (Severity + Spatial Scope + Duration)														
LIKELIHOOD (Frequency of activity + Frequency of impact)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table D3: Positive/Negative Mitigation Ratings.

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very high	126-150	Critically consider the viability of proposed projects Improve current management of existing projects significantly and immediately	Maintain current management
High	101-125	Comprehensively consider the viability of proposed projects Improve current management of existing projects significantly	Maintain current management
Medium-high	76-100	Consider the viability of proposed projects Improve current management of existing projects	Maintain current management
Medium-low	51-75	Actively seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Low	26-50	Where deemed necessary seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Very low	1-25	Maintain current management and/or proposed project criteria and strive for continuous improvement	Maintain current management and/or proposed project criteria and strive for continuous improvement

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the client and its contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/Impacts were assessed for all stages of the project cycle including:
  - Pre-construction;
  - Construction; and
  - Operation.
- If applicable, transboundary or global effects were assessed.
- Individuals or groups who may be differentially or disproportionately affected by the project because of their *disadvantaged* or *vulnerable* status were assessed.

- Particular attention was paid to describing any residual impacts that will occur after rehabilitation.

Mitigation measure development

According to the DEA *et al.,* (2013) "Rich biodiversity underpins the diverse ecosystems that deliver ecosystem services that are of benefit to people, including the provision of basic services and goods such as clean air, water, food, medicine and fibre; as well as more complex services that regulate and mitigate our climate, protect people and other life forms from natural disaster and provide people with a rich heritage of nature-based cultural traditions. Intact ecological infrastructure contributes significant savings through, for example, the regulation of natural hazards such as storm surges and flooding by which is attenuated by wetlands".

According to the DEA *et al.,* (2013) Ecosystem services can be divided into 4 main categories:

- Provisioning services are the harvestable goods or products obtained from ecosystems such as food, timber, fibre, medicine, and fresh water;
- Cultural services are the non-material benefits such as heritage landscapes and seascapes, recreation, ecotourism, spiritual values and aesthetic enjoyment;
- Regulating services are the benefits obtained from an ecosystem's control of natural processes, such as climate, disease, erosion, water flows, and pollination, as well as protection from natural hazards; and
- Supporting services are the natural processes such as nutrient cycling, soil formation and primary production that maintain the other services.

Loss of biodiversity puts aspects of the economy, wellbeing and quality of life at risk, and reduces socio-economic options for future generations. This is of particular concern for the poor in rural areas who have limited assets and are more dependent on common property resources for their livelihoods. The importance of maintaining biodiversity and intact ecosystems for ensuring on-going provision of ecosystem services, and the consequences of ecosystem change for human well-being, were detailed in a global assessment entitled the Millennium Ecosystem Assessment (MEA, 2005), which established a scientific basis for the need for action to enhance management and conservation of biodiversity.

Sustainable development is enshrined in South Africa's Constitution and laws. The need to sustain biodiversity is directly or indirectly referred to in a number of Acts, not least the National Environmental Management: Biodiversity Act (No. 10 of 2004) (hereafter referred to as the Biodiversity Act), and is fundamental to the notion of sustainable development. In addition, International guidelines and commitments as well as national policies and strategies are important in creating a shared vision for sustainable development in South Africa (DEA et al., 2013).

The primary environmental objective of the Mineral and Petroleum Resources Development Act (MPRDA) is to give effect to the environmental right contained in the South African Constitution. Furthermore, Section 37(2) of the MPRDA states that "any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations".

Pressures on biodiversity are numerous and increasing. According to the DEA et al., (2013) Loss of natural habitat is the single biggest cause of biodiversity loss in South Africa and much of the world. The most severe transformation of habitat arises from the direct conversion of natural habitat for human requirements, including4:

- Cultivation and grazing activities;
- Rural and urban development;
- Industrial and mining activities, and
- Infrastructure development.

Impacts on biodiversity can largely take place in four ways (DEA *et al*., 2013):

- **Direct impacts:** are impacts directly related to the project including project aspects such as site clearing, water abstraction and discharge of water from riverine resources;

[4] Limpopo Province Environment Outlook. A Report on the State of the Environment, 2002. Chapter 4.

- **Indirect impacts:** are impacts associated with a project that may occur within the zone of influence in a project such as surrounding terrestrial areas and downstream areas on water courses;
- **Induced impacts:** are impacts directly attributable to the project but are expected to occur due to the activities of the project. Factors included here are urban sprawl and the development of associated industries; and
- **Cumulative impacts:** can be defined as the sum of the impact of a project as well as the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity resources. Examples include numerous mining operations within the same drainage catchment or numerous residential developments within the same habitat for faunal or floral species.

Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted the definition of a clear mitigation strategy for biodiversity impacts.

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect, the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered to be the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated (DEA *et al*., 2013):

- **Avoid/prevent impact:** can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels;
- **Minimise impact:** can be done through utilisation of alternatives that will ensure that impacts on biodiversity and ecoservices provision are reduced. Impact minimisation is considered an essential part of any development project;
- **Rehabilitate impact:** is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation tool as even with significant resources and effort rehabilitation that usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:
  - **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
  - **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources on the focus area supports the intended post closure land use. In this regard special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;
  - **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community of community suitable for supporting the intended post closure land use; and
  - **Species reinstatement** which focuses on the re-introduction of any ecologically important species which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.

- **Offset impact:** refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed to be unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered to be a last resort to compensate for residual negative impacts on biodiversity.

The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity the residual impacts should be considered to be of very high significance and when residual impacts are considered to be of very high significance, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have medium to high significance, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance no biodiversity offset is required.5

In light of the above discussion the following points present the key concepts considered in the development of mitigation measures for the proposed development.

- Mitigation and performance improvement measures and actions that address the risks and impacts[6] are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation.

Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, with estimates of the resources (including human resource and training requirements) and responsibilities for implementation wherever possible.

Recommendations

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

[5] Provincial Guideline on Biodaiversity Offsets, Western Cape, 2007.

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

APPENDIX E - Vegetation Type

Kathu Bushveld

Table F3: Dominant & typical floristic species of Kathu Bushveld (Mucina & Rutherford, 2012)

	Species
Tall Tree	*Vachellia erioloba* (d)
Small Trees	*Senegalia mellifera* subsp. *detinens* (d), *Vachellia. leudertzii* var. *leudertzii* (k), *Boscia albitrunca* (d), *Terminalia sericea,*
Tall Shrubs	*Diospyros lycioides* subsp. *lycioides* (d), *Dichrostachys cinereal, Grewia flava, Gymnosporia buxifolia, Rhigozum brevispinosum*
Low Shrubs	*Aptosimum decumbens, Grewia retinervis, Nolletia arenosa, Sida cordifolia, Tragia dioica,*
Graminoids	*Aristida meridionalis* (d), *Brachiaria nigropedata* (d), *Centropedia glauca* (d), *Eragrostis lehmanniana* (d), *Schmidtia pappophoroides* (d), *Stipagrostis uniplumis, Tragus berteronianus, Anthephora argentea* (k), *Megaloprotachne albescens* (k), *Panicum kalaharense* (k)
Herbs	*Acrotome inflate, Erlangea misera, Gisekia africana, Heliotropium cillatum, Hermbstaedtia fleckii, H. odorata, Limeum fenestratum, L. viscosum, Lotononis platycarpa, Senna italic* subsp. *arachoides, Tribulus* terrestris*, Neuradopsis bechuanensis* (k)

APPENDIX F – Northern Cape Provincial Spatial Development Framework (NC PSDF, 2012)

The study area falls within the Griqualand West Centre of Endemism (GWC). According to van Wyk and Smith (2001), the GWC coincides with the surface outcrops of the Ghaap Group (previously Griqualand West Sequence) and Olifantshoek Supergroup (previously Sequence). However, in floristic terms the outer boundaries of the centre are rather diffuse, as several of the GWC floristic elements spill over onto related substrates, especially alkaline substrates rich in calcium.

The Kalahari Mountain Bushveld covers the mountainous western parts of the GWC, while the Kalahari Plateau Bushveld Both bushveld types are endemic to the GWC, with *Tarchonanthus camphorates* is a particularly common woody species in these bushveld types. Typical mountain species include *Searsia tridactyla* (formally known as *Rhus tridactyla*), *Croton gratissimus* and *Buddleja saligna*. Pockets of Karoo-type vegetation increase towards the south and west, especially in heavily overgrazed areas.

The vegetation of the GWC is still intact, although extremely poorly conserved. Apparently, the Kalahari Plateau Bushveld is the only Savanna Biome vegetation type, which is not represented in any sizable nature reserve. Bush encroachment by e.g. the indigenous *Senegalia mellifera* (formally known as *Acacia mellifera*), which is due to inappropriate veld management practices (mainly overgrazing by domestic livestock), is a major problem in many parts of the region.

APPENDIX G - Species Lists

Commented [NC1]: Still need to finalise

Table G1: Dominant floral species encountered within the study area. Alien species are indicated with an asterisk (*). Protected species as indicated in Bold.

Species *Alien **Succulent	Habitat Unit		
	Eragrostis chloromelas grassland	Degraded Secondary Grassland	*Hyparrhenia hirta* Secondary Grassland
TREES AND SHRUBS			
**Acacia decurrens*		X	
**Acacia baileyana*		X	
**Agave sisalana*		X	
**Eucalyptus camaldulensis*	X	X	
**Allocasuarina torulosa*		X	
**Acacia longifolia*		X	
**Melia azederach*		X	
**Eucalyptus sideroxylon*		X	
**Acacia dealbata*		X	
**Acacia podalyriifolia*		X	
**Yucca sp.*		X	
**Leucaena leucocephala*		X	
**Solanum mauritianum*		X	
**Tipuana tipu*		X	
**Eucalyptus viminalis*		X	
Gomphocarpus fruticosus	X	X	
Searsia pyroides			X
Seriphium plumosum		X	
Vachellia karroo		X	
Pollichia campestris			X
FORBS AND GROUNDCOVERS			
** Bidens pilosa*	X		
**Mirabilis jalapa*		X	
**Conyza bonariensis*	X		
**Datura ferox*			X
**Solanum elaeagnifolium*	X		X
**Tagetes minuta*	X	X	X
**Verbena bonariensis*	X	X	
**Verbena brasilliensis*			X
**Hibiscus trionum*	X		
Aloe greatheadii			X
**Hypochaeris radicata*	X		
Eucomis autumnalis	X		
Cotula anthemoides			X
Felicia muricate	X		
Scabiosa columbaria			X
Helichrysum nudifolium	X		
Helichrysum rugulosum	X		X
Hermannia depressa		X	
Hilliardiella oligocephala			X
Hypoxis hemerocallidea		X	
Hypoxis iridifolia	X		
Lactuca inermis			X
Pollygala hottentotoica	X		
Senecio consanguineus			X
**Guilleminea densa*			X
**Gomphrena celosioides*	X	X	
Monsonia angustifolia	X	X	
Polydora poskeana		X	
Medicago laciniata		X	
Schkuria pinnata			X
CREEPERS AND CLIMBERS			
**Ipomoea purpurea*		X	
Cucumis zeyheri		X	X

Species *Alien **Succulent	Habitat Unit *Eragrostis chloromelas* grassland	Degraded Secondary Grassland	*Hyparrhenia hirta* Secondary Grassland
Ipomoea ommaneyi		X	X
FERNS			
Pellaea calomelanos		X	
GRASSES/ REEDS AND SEDGES			
**Chloris virgata*			X
Aristida congesta subsp. *congesta*	X	X	X
Cynodon dactylon	X	X	X
Cynodon nlemfuensis	X		
Cyperus esculentes		X	
Eragrostis chloromelas	X	X	X
Eragrostis curvula		X	
Eragrostis gummiflua	X		
Eragrostis plana	X		
Hyparrhenia hirta	X	X	X
Melinis repens	X	X	
Sporobolus africanus			X
Themeda triandra	X		X
Hyparrhenia tamba			X

Table G2: Mammal species likely to be associated with the study area.

Scientific Name	Common Name	IUCN Status	NCNCA (2009)
Canis mesomelas	Black-backed Jackal	LC	NA
Sylvicapra grimmia	Common duiker	LC	Protected
Lepus saxatilis	Scrub hare	LC	Protected
Lepus capensis	Cape hare	LC	Protected
Tragelaphus strepsiceros	Kudu	LC	Protected
Phacochoerus africanus	Warthog	LC	Protected
Raphicerus campestris	Steenbok	LC	Protected
Elephantulus intufi	Bushveld Sengi	LC	
Hystrix africaeaustralis	Porcupine	LC	Protected

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

CR= Critically Endangered, **EN=** Endangered, **EW =** Extinct in the Wild, **NT =** Near Threatened, **VU=** Vulnerable, **P=** Protected, DDD = Data Deficient - Insufficient Information; DDT = Data Deficient - Taxonomically Problematic; N/L = Not Listed; POC = Probability of Occurrence.

Tab le G3: Avifaunal species recorded during the field surveys as well as their 2015 IUCN status.

Scientific name	Common name	IUCN Status	NCNCA (2009)
Streptopelia capicola	Cape turtledove	LC	Protected species
Pycnonotus nigricans	Red-eyed Bulbul	LC	NA
Columba guinea	Speckled pigeon	LC	Protected
Falco rupicolus	Rock kestrel	LC	Specially protected
Uraeginthus granatinus	Violet eared waxbill	LC	Protected
Colies colius	White-backed mousebird	LC	NA
Tyto alba	Western barn owl	LC	Specially protected
Apus caffer	White-rumped Swift	LC	Protected
Ploceus velatus	Southern masked weaver	LC	NA
Laniarius astrococcineus	Crimson-breasted shrike	LC	Protected
Sylvietta rufescens	Long-billed crombec	LC	Protected
Upupa africana	African Hoopoe	LC	Protected
Sylvia subcaerulea	Chestnut-vented tit-babbler	LC	Protected
Prinia masulosa	Karoo Prinia	LC	Protected
Serinus flaviventris	Yellow Canary	LC	Protected
Passer melanurus	Cape Sparrow	LC	NA
Sporopipes squamifrons	Scaly-feathered Finch	LC	Protected
Spreo bicolor	Pied Starling	LC	Protected
Saxicola torquata	African Stonechat	LC	Protected
Anthus cinnamomeus	African Pipit	LC	Protected
Cisticola fulvicapillus	Neddicky	LC	Protected
Elanus caeruleus	Black-shouldered Kite	LC	Specially protected
Anthus crenatus (Previously observed)	African Rock Pipit	NT	Specially protected
Tockus nasutus	African Grey Hornbill	LC	Protected
Dicrurus adsimilis	Fork-tailed Drongo	LC	Protected
Hirundo fuligula	Rock Martin	LC	Protected
Parus cinerascens	Ashy Tit	LC	Protected
Batis pririt	Pririt Batis	LC	Protected
Sigelus silens	Fiscal Flycatcher	LC	Protected

Emberiza flaviventris	Golden-breasted Bunting	LC	Protected
Erythropygia paena	Kalahari scrub Robin	LC	Protected
Cinnyris talatala	White-bellied Sunbird	LC	Protected
Cinnyris fuscus	Dusky Sunbird	LC	Protected

LC = Least Concern

Table G4: Insect species observed during the site visit

Scientific Name	Common Name	IUCN Status
Hodotermes mossambicus	Northern harvester termite	NYBA
Junonia hierta	Yellow Pansy	LC
Passalidius fortipes	Burrowing ground beetle	NYBA
Apterogyna sp.	Velvet ant	NA
Eremoides bicristatus	Crested Owlfly	NYBA
Stips sp.	Ridged seed beetle	NYBA
Gonometa postica	African silk moth	NYBA
Calidea dregii	Rainbow Shield Bug	NYBA
Catopsilia florella	African Migrant	NYBA
Belenois aurota	Brown-veined White	NYBA
Junonia orithya	Eyed Pansy	NYBA
Danaus chrysippus	African Monarch	NYBA
Colotis euippe	Smokey Orange Tip	NYBA
Eurema brigitta	Broad-bordered Grass Yellow	NYBA
Spalia sp	Sandman	NYBA
Loxostege frustalis	Karoo Moth	NYBA
Conistica saucia	Rock Grasshopper	NYBA
Sphingonotus scabriculus	Blue-wing	NYBA
Acanthacris ruficornis	Garden Locust	NYBA
Gastrimargus sp.	N/A	NYBA
Rhachitopis sp	N/A	NYBA
Systophlochius palochius	Orange wing	NYBA
Anterhynchium fallax	N/A	NYBA
Camponotus fulvopilosus	Bal-byter	NYBA
Crematogaster peringueyi	Cocktail Ant	NYBA
Pantala flavescens	Wandering Glider	LC
Mylabris oculata	CMR Bean Beetle	NYBA

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

Table G5: Arachnid species recorded during the site assessment.

Common Name	Scientific Name	IUCN 2016 Status
Community nest spiders	*Stegodyphus* sp.	NA
Grass funnel-web spiders	*Agelena* sp.	NA
Sun spider	Solifugae sp	NA

LC = Least Concern, NYBA = Not Yet Been Assessed, NA = Not applicable

Table G6: Reptile species observed during the site visit

Scientific name	Common Name	IUCN Red List Status
Boaedon capensis	Brown House Snake	NYBA

APPENDIX H - Floral SCC

The species listed below and protected within the various legislature have an increased probability of occurring within the study area. Species identified at the time of assessment are emboldened.

Table H1: NFA (1998) plant list for the tree species expected to occur within the study area area.

Family	Scientific Name	Habitat
Fabaceae	*Vachellia erioloba*	Savanna, semi-desert and desert areas with deep, sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops
Fabaceae	*Vachellia haematoxylon*	Bushveld, usually on deep Kalahari sand between dunes and dry watercourses.
Capparaceae	*Boscia albitrunca*	This species is found in the drier parts of southern Africa, in areas of low rainfall.

Table H2: NCNCA (2009) plant list for the floral species likely to occur within the study area area.

Family	Scientific Name	Habitat	Scedule
Apocynaceae	*Hoodia gordonii*	Occurs in a wide variety of arid habitats from coastal to mountainous, also on gentle to steep shale ridges, found from dry, rocky places to sandy spots in riverbeds.	Schedule 1
Fabaceae	*Lessertia frutescens* subsp. *frutescens*	Occurs naturally throughout the dry parts of southern Africa.	Schedule 1
Pedaliaceae	*Harpagophytum procumbens*	Well drained sandy habitats in open savanna and woodlands.	Schedule 1
Apocynaceae	*Orbea lutea subsp. lutea*	The plants grow in scrub, savanna (Acacia and mopane veld) and grassland at altitudes of 500-1500 m in full sun or semi-shade	Schedule 2
Capparaceae	*Boscia albitrunca*	This species is found in the drier parts of southern Africa, in areas of low rainfall.	Schedule 2
Asphodelaceae	*Aloe grandidentata*	Nama karoo shrubland, occurs on ironstone ridges, but in the eastern part of the range it is also found on calcrete.	Schedule 2
Amaryllidaceae	*Boophane disticha*	Dry grassland and rocky areas	Schedule 2
Amaryllidaceae	*Nerine laticoma*	Nerine laticoma occurs in a broad band stretching from the dry inland parts of Namibia eastwards and southwards through southern Botswana, Limpopo, Gauteng, the North-West, Northern Cape, Free State and Lesotho. It usually occurs in large colonies on deep, red, sandy soils.	Schedule 2
Iridaceae	*Babiana hypogaea*	Red sand plains. Usually in Kalahari Sand or stony laterite in open woodland or grassland	Schedule 2

Table H3: TOPS plant list for the floral species expected to occur within the Northern Cape.

Family	Scientific Name	Habitat	Growth Form	Threat Status
Aizoaceae	*Cheiridopsis peculiaris*	Gravels and shale derived from metamorphic rocks of the Namaqualand Complex	Succulent	CR
Aizoaceae	*Conophytum herreanthus subsp. Herreanthus*	Quartz patches	Succulent	CR
Asphodelaceae	*Aloidendron pillansii*	Succulent Karoo shrubland on dry, rocky dolomite and gneiss hillsides.	Succulent, Tree	EN
Amaryllidaceae	*Haemanthus granitcus*	Namaqualand Klipkoppe Shrubland or Namaqualand Granite Renosterveld.	Geophyte	EN
Aizoaceae	*Lithops dorotheae*	Fine-grained, sheared, feldspathic quartzite	Succulent	EN
Asphodelaceae	*Aloidendron dichotomum*	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.	Succulent, Tree	VU
Amaryllidaceae	*Brunsvigia herrei*	Succulent Karoo Shrubland, granitic soils on flats and sometimes in deposits of fairly large stones.	Geophyte	VU
Aizoaceae	*Conophytum bachelorum*	Rocky outcrops	Succulent	VU
Aizoaceae	*Conophytum ratum*	Spongy quartz soil.	Succulent	VU
Amaryllidaceae	*Gethyllis grandiflora*	Sandy and or stony soils in arid karroid shrubland.	Geophyte	VU
Amaryllidaceae	*Gethyllis namaquensis*	Coastal dunes and gravelly mountain slopes in succulent karoo shrubland.	Geophyte	VU
Amaryllidaceae	*Brunsvigia josephinae*	Heavy clay soils.	Geophyte	VU
Asphodelaceae	*Aloe krapohliana*	Occurs in the extremely arid northern regions of the Succulent Karoo, on clay, stony (mostly quarzitic) and sandy soils on flats and slopes.	Herb, Succulent	P
Amaryllidaceae	*Cyrtanthus herrei*	Deeply shaded rock ledges on south-facing rocky slopes.	Bulb	P
Aizoaceae	*Sceletium tortuosum*	Quartz patches and is usually found growing under shrubs in partial shade.	Succulent	P
Pedaliaceae	*Harpagophytum procumbens*	Well drained sandy habitats in open savanna and woodlands.	Herb	P

CR= Critically Endangered, EN= Endangered, VU= Vulnerable, P= Protected

APPENDIX I - Faunal SCC

Table B1: TOPS list of faunal species (2015) expected to occur within the Northern Cape.

Scientific Name	Common Name	Threat Status
Homopus signatus	Speckled tortoise	VU
Pachydactylus goodi	Good's Gecko	VU
Cordylus macropholis	Large-scaled Lizard	P
Cordylus imkeae	Rooiberg Girdled Lizard	P
Opistophthalmus ater	Steinkopf Burrowing Scorpion	CR
Acinonyx jubatus	Cheetah	VU
Manis temminckii	Pangolin	VU
Ceratotherium simum	Southern White Rhinoceros	P
Crocuta crocuta	Spotted Hyaena	P
Felis nigripes	Black-footed Cat	P
Hyaena brunnea	Brown Hyaena	NT
Neophron percnopterus	Egyptian Vulture	CR
Aquila rapax	Tawny Eagle	EN
Torgos tracheliotos	Lappet-faced Vulture	EN
Gyps africanus	White-backed Vulture	CR
Gyps coprotheres	Cape Vulture	EN
Neotis ludwigii	Ludwig's Bustard	EN
Polemaetus bellicosus	Martial Eagle	EN
Terathopius ecaudatus	Bateleur	EN
Anthropoides paradiseus	Blue Crane	P
Ardeotis kori	Kori Bustard	P
Orycteropus afer	Aardvark	P
Python natalensis (*sebae*)	Southern African Python	P

CR= Critically Endangered, EN=Endangered, NT=Near Threatened, VU=Vulnerable, P=Protected

Faunal Species of Conservation Concern

Threatened species not yet listed above that may occur in the study area.

Scientific Name	Common Name	NCCA 2009 Status	IUCN 2015 Status	POC (%)
Mellivora capensis	Honey badger	Specially Protected	LC	20
Felis silvestris	African wild cat	Specially protected	LC	15
Ictonyx striatus	Striped polecat	Specially protected	LC	15
Poecilogale albinucha	African striped weasel	Specially protected	LC	5
Proteles cristata	Aardwolf	Specially protected	LC	20
Vulpes chama	Cape fox	Specially protected	LC	40
Atelerix frontalis	Southern African hedgehog	Specially protected	LC	25
Panthera pardus	Leopard	Specially protected	VU	10
Aquila verreauxii	Black eagle	Specially Protected	VU	40
Gyps africanus	White-backed Vulture	Specially Protected	CR	10
Neotis ludwigii	Ludwig's Bustard	Specially protected	EN	60
Polemeatus bellicosus	Martial Eagle	Specially Protected	EN	20
Aquila rapax	Tawny Eagle	Specially Protected	EN	8
Gyps coprotheres	Cape Vulture	Specially Protected	EN	7
Torgos tracheliotos	Lappet-faced Vulture	Specially Protected	EN	5
Cursorius rufus	Burchell's courses	Protected	VU	15
Falco biarmicus	Lanner Falcon	Specially Protected	VU	10
Sagittarius serpentarius	Secretarybird	Specially Protected	VU	5
Ardeotis kori	Kori Bustard	NA	NT	8
Opistophthalmus carinatus	Burrowing scorpion	Specially Protected	NYBA	80
Opistophthalmus wahlbergii	Burrowing scorpion	Specially Protected	NYBA	60
Chamaeleo dilepis	Common flap-neck chameleon	Specially Protected	LC	60
Python sebae	African rock python	Specially Protected	LC	60

EN = Endangered, CR = Critically Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, NYBA = Not yet been assessed, NE = Not Evaluated, NA = Not applicable

South African Bird Atlas Project 2 list for quadrant 2722BB

Avifaunal Species for the pentad 2710_2250, within the QDS 2722BB

http://sabap2.adu.org.za/coverage/pentad/2710_2250

APPENDIX J - Impact Assessment Tables

The tables below present the impact assessment according to the method described in Appendix D. All impacts are considered without mitigation taking place as well as with mitigation fully implemented.

Floral Impacts

J1. Impact on Habitat and Diversity of Floral Species

The following tables highlight the perceived impacts on the habitat and diversity of floral species pertaining to the relevant habitat units affected by the proposed development,

Table J1: Impact on the Floral Habitat Integrity and Species Diversity of the *Kathu Bushveld.*

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	4	3	3	3	9	9	81 (Medium-High)
Operational phase	4	3	3	3	4	7	10	70 (Medium- Low)
Decommissioning and Closure	3	3	3	3	5	6	11	66 (Medium-Low)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	3	3	2	3	7	8	56 (Medium-Low)
Operational phase	2	3	2	2	4	5	8	40 (Low)
Decommissioning and Closure	1	3	1	2	5	4	8	28 (Low)

Table J2: Impact on the Floral Habitat Integrity and Species Diversity of the Transformed Habitat.

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	2	2	2	2	6	6	36 (Low)
Operational phase	4	2	2	3	4	6	9	54 (Medium- Low)
Decommissioning and Closure	3	2	2	3	5	5	10	50 (Low)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	2	2	2	3	6	7	42 (Low)
Operational phase	2	2	1	2	4	4	7	28 (Low)
Decommissioning and Closure	1	2	1	2	5	3	8	24 (Very-Low)

J2. Impact on Habitat for Floral SCC

The following tables highlight the perceived impacts on the habitat for floral SCC pertaining to the relevant habitat units affected by the proposed development activities.

Table J3: Impact on the Floral Species of Conservation Concern within the *Kathu Bushveld.*

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	4	3	3	3	9	9	81 (Medium-High)
Operational phase	3	3	2	3	4	6	9	54 (Medium- Low)
Decommissioning and Closure	3	3	2	3	3	6	8	48 (Low)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	4	2	2	3	8	7	56 (Medium-Low)
Operational phase	2	3	1	1	4	5	6	30 (Low)
Decommissioning and Closure	1	3	1	1	3	4	5	20 (Very Low)

Table J4: Impact on the Floral Species of Conservation Concern within the Transformed Habitat.

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	2	2	2	2	3	4	7	28 (Low)
Operational phase	2	2	1	2	4	4	7	28 (Low)
Decommissioning and Closure	2	2	2	2	3	4	7	28 (Low)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	1	2	1	1	3	3	5	15 (Very Low)
Operational phase	1	2	1	1	4	3	6	18 (Very Low)
Decommissioning and Closure	1	2	1	1	3	3	5	15 (Very-Low)

Faunal Impacts

J3. Impact on faunal species, habitat and SCC

The following tables highlight the perceived impacts on the habitat, ecological structure, diversity and SCC pertaining to the proposed development.

Table J5: Loss of faunal habitat and ecological integrity.

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	3	3	2	3	8	8	64 (Medium Low)
Operational phase	4	3	3	2	4	7	9	63 (Medium Low)
Decommissioning and Closure	4	3	2	2	5	7	9	63 (Medium Low)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	3	2	2	3	8	7	56 (Medium Low)
Operational phase	2	3	1	1	4	5	6	30 (Low)
Decommissioning and Closure	2	3	2	1	4	5	7	35 (Low)

Table J6: Loss of faunal diversity.

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	3	3	2	3	7	8	56 (Medium Low)
Operational phase	3	3	2	2	4	6	8	48 (Low)
Decommissioning and Closure	3	3	2	2	5	6	9	54 (Medium Low)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	3	3	2	2	3	6	7	42 (Low)
Operational phase	2	3	1	1	4	5	6	30 (Low)
Decommissioning and Closure	1	3	2	1	4	4	7	28 (Low)

Table J7: Impact on important faunal species of conservation concern.

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	3	3	2	3	7	8	56 (Medium Low)
Operational phase	4	3	2	2	4	7	8	56 (Medium Low)
Decommissioning and Closure	3	3	2	2	5	6	9	54 (Medium Low)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	3	2	2	3	7	7	42 (Low)
Operational phase	3	3	1	1	4	6	6	36 (Low)
Decommissioning and Closure	1	3	2	1	4	4	7	28 (Low)

APPENDIX K – Specialist information

DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

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

N. Cloete MSc (Environmental Management) (University of Johannesburg)

C. Hooton BTech Nature Conservation (Tshwane University of Technology)

S. van Staden MSc Environmental Management (University of Johannesburg)

K. Marais BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)

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

vitae

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Nelanie Cloete		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	084 311 4878
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	nelanie@sasenvgroup.co.za		
Qualifications	MSc Environmental Management (University of Johannesburg) MSc Botany (University of Johannesburg) BSc (Hons) Botany (University of Johannesburg) BSc (Botany and Zoology) (Rand Afrikaans University)		
Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP) Member of the South African Association of Botanists (SAAB) Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group Member of the Grassland Society of South Africa (GSSA) Member of the Botanical Society of South Africa (BotSoc)		

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Kim Marais		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	084 311 4878
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	kim@sasenvgroup.co.za		
Qualifications			
Registration / Associations			

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

I, Nelanie Cloete, declare that -

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

Signature of the Specialist

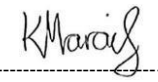
I, Christopher Hooton, declare that -

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

Signature of the Specialist

I, Kim Marais, declare that -

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



Signature of the Specialist