



SCIENTIFIC TERRESTRIAL SERVICES

Terrestrial Biodiversity Assessment

FOR THE PROPOSED MINING EXPANSION
ACTIVITIES AT THE THARISA MINE, NORTH WEST
PROVINCE

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Part of the SAS Environmental Group of Companies

EXECUTIVE SUMMARY

Scientific Terrestrial Services CC (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) phase in support of obtaining the Environmental Authorisation (EA) process for the proposed expansion of the Tharisa Mine, henceforth be referred to as the “**study area**”. The proposed activities associated with the Tharisa Mine expansion that will take place within the study area will include the following:

1. Extending a previously approved waste rock dump (WRD) – referred to as the “**West Above Ground WRD**”; and
2. Establishing a WRD above backfilled portions of the East and West pits – referred to as the “**East Above Ground WRD**”.

During the field assessment, one habitat unit was identified within the study area, namely Transformed Habitat.

Species diversity and habitat integrity:

The study area is located within two vegetation types, namely the Marikana Thornveld in the east and the Moot Plains Bushveld in the east, i.e., the reference vegetation types. Overall, the habitat within the study area was characterised by transformed areas (because of mining activities) in which vegetation cover ranged from almost absent to low. When vegetation was present, it was generally dominated by alien and invasive plant (AIP) species and/or native pioneer species that favour disturbed habitats. Given the level of transformation within the study area because of mining activities, the presence of indigenous vegetation¹ was confirmed to be absent.

The Transformed habitat (of low floral and faunal sensitivity) comprised of approximately 165 ha and was associated with areas of 1) historic mining activities (i.e., in which low vegetation cover was identified and AIP and native pioneer species were recorded), 2) current mining activities (i.e., in the existing pits in which vegetation cover was largely absent), and 3) associated road and building infrastructure.

Conservation Significance:

The Screening Tool indicated that the Terrestrial Biodiversity Theme for the study area was of very high sensitivity. Triggering features included Critical Biodiversity Areas (CBA2), Ecological Support Areas (ESA1 and ESA2), focus areas for land-based expansion and a Vulnerable ecosystem, namely the Marikana Thornveld. As the presence of representative, intact CBA and ESA habitat, as well as intact habitat of the threatened ecosystem was **not** confirmed during the site visit, together with the location of the study area within an active mining footprint area, the very High Sensitivity assigned to the Terrestrial Biodiversity Theme by the screening tool was not supported.

Species of Conservation Concern (SCC):

The Online Screening Tool indicated that the Plant Species was of low sensitivity for the study area. This sensitivity was confirmed during the field assessment as suitable habitat for Red Data Listed (RDL) species was not recorded within the study area, and suitable habitat to support such species is absent throughout the study area. The Screening Tool indicated that the Animal Species was of medium sensitivity for the study area and triggering species included *Chrysospalax villosus* (Rough-haired golden mole, VU), *Crocidura maquassiensis* (Maquassie Musk Shrew, VU), *Dasymys robertsii* (African marsh rat, VU), and *Sagittarius serpentarius* (Secretary bird, LC). Following the site assessment, the specialist study disputes the findings of the screening tool. The site has been significantly transformed resulting in no habitat being present for either of the faunal species as indicated in the screening tool.

No South African National Biodiversity Institute (SANBI) Red Data List (RDL) species or any other nationally (e.g., species under The National Forest Act, 1998 (Act No. 84 of 1998) (NFA) or the 2007

¹ The NEMA definition of indigenous vegetation: "Indigenous vegetation: refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding 10 years.



Threatened or Protected Species (TOPS) List) or provincially protected species (e.g., species listed under the Transvaal Nature Conservation Ordinance, 1983 (Ordinance No. 12 of 1983) (TNCO)) were observed during the field assessment. Furthermore, no suitable habitat to support populations thereof was identified within the study area. A lack of suitable habitat for such species of conservation concern (SCC) is attributed to the significantly degraded nature of the Transformed Habitat.

No faunal SCC were observed during the field assessment and no faunal SCC are expected to occur within or be associated with the study area due to the degraded nature of the available habitat.

Impacts associated with the proposed mining activities on Important Conservation Features within the study area:

The study area is located within areas of conservation significance, including a Critical Biodiversity Area (CBA2), Ecological Support Areas (ESA1 & ESA2) and the remaining extent of the vulnerable (VU) Marikana Thornveld threatened ecosystem (of national importance). The impact of the proposed mining activities on these areas within the study area (i.e., immediate local area) are not anticipated to be determinantal as the areas in which the proposed WRDs are located are within existing transformed habitat. Furthermore, no suitable habitat for protected species was recorded within the study area.

Concluding Remarks:

Following the biodiversity assessment within the study area, the impacts associated with the proposed mining activities were determined. The impacts arising from the proposed mining activities from a i) floral habitat and species diversity perspective, and ii) from a SCC perspective, both ranged from **medium to very low** prior to the implementation of mitigation measures. With mitigation measures fully implemented, it is the opinion of the specialist that all impacts can be effectively reduced to **very low and insignificant** levels. From a faunal perspective: the perceived impact significance of the proposed mining activities, prior to mitigation, ranges from **medium-high to very low** (based on habitat sensitivity). Following mitigation, impacts are anticipated to range from **very low and insignificant** levels.

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



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Part A: Background Information

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Website:

<http://www.sasenvironmental.co.za>

Image taken on site.

DOCUMENT GUIDE

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

Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
2	Terrestrial Biodiversity Specialist Assessment	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	Part A – C: Cover Page Part A: Appendix E
2.2	The assessment must be undertaken on the preferred site and within the proposed mining activities footprint.	Part A: Section 1
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed mining activities will impact these;	Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.3	The ecological corridors that the proposed mining activities would impede including migration and movement of flora and fauna;	Part A: Section 3 (desktop analysis) Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Area (FEPA) sub catchments;	Part A: Section 3 (desktop analysis) Part B: Section 3.2 – 3.4 (flora) Part C: Section 3.2 – 3.7 (fauna) <i>*Refer to the Freshwater Assessment (SAS 202238, 2022)</i>
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: <ul style="list-style-type: none"> a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified; 	Part A: Section 3 (desktop analysis) Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a “low” sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Not Applicable.
2.3.7	The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: <ul style="list-style-type: none"> a) <i>the reasons why an area has been identified as a CBA;</i> b) <i>an indication of whether or not the proposed mining activities is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;</i> 	Part A: Section 3 (desktop analysis) Part B: Section 3.1, 3.3, 5.3.3 Part C: Section 3

	<ul style="list-style-type: none"> c) <i>the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);</i> d) <i>the impact on ecosystem threat status;</i> e) <i>the impact on explicit subtypes in the vegetation;</i> f) <i>the impact on overall species and ecosystem diversity of the site; and</i> g) <i>the impact on any changes to threat status of populations of species of conservation concern in the CBA;</i> 	
2.3.7.2	<p>Terrestrial Ecological Support Areas (ESAs), including:</p> <ul style="list-style-type: none"> a) <i>the impact on the ecological processes that operate within or across the site;</i> b) <i>the extent the proposed mining activities will impact on the functionality of the ESA; and</i> c) <i>loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;</i> 	
2.3.7.3	<p>Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including-</p> <ul style="list-style-type: none"> a) <i>an opinion on whether the proposed mining activities aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;</i> 	Part A: Section 3 (desktop analysis)
2.3.7.4	<p>Priority areas for protected area expansion, including-</p> <ul style="list-style-type: none"> a) <i>the way in which in which the proposed mining activities will compromise or contribute to the expansion of the protected area network;</i> 	Part A: Section 3 (desktop analysis)
2.3.7.5	<p>SWSAs including:</p> <ul style="list-style-type: none"> a) <i>the impact(s) on the terrestrial habitat of a SWSA; and</i> b) <i>the impacts of the proposed mining activities on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);</i> 	Not Applicable
2.3.7.6	<p>FEPA sub catchments, including-</p> <ul style="list-style-type: none"> a) <i>the impacts of the proposed mining activities on habitat condition and species in the FEPA sub catchment;</i> 	<i>Refer to the Freshwater Assessment (SAS 202238, 2022)</i>
2.3.7.7	<p>Indigenous forests, including:</p> <ul style="list-style-type: none"> a) <i>impact on the ecological integrity of the forest; and</i> b) <i>percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.</i> 	Not Applicable
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.	
	Part B: Results of the Floral Assessment as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities.	
	Part C: Results of the Faunal Assessment as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities.	
3	Terrestrial Biodiversity Specialist Assessment Report	
3.1	The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Part A: Appendix E
3.1.2	A signed statement of independence by the specialist;	Part A: Appendix E
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Part B: Section 1.3 (flora) Part C: Section 1.3 (fauna)
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Part A: Appendix C Part B: Section 2 (flora) Part B: Appendix A (flora) Part C: Section 2 (fauna) Part C: Appendix A (fauna)
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Part B: Section 1.3 (flora) Part C: Section 1.3 (fauna)



3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Part B: Section 4 (flora) Part C: Section 4 (fauna)
	Impact Assessment Requirements 3.1.7 Additional environmental impacts expected from the proposed mining activities; 3.1.8 Any direct, indirect and cumulative impacts of the proposed mining activities; 3.1.9 The degree to which impacts and risks can be mitigated; 3.1.10 The degree to which the impacts and risks can be reversed; 3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources; 3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Part B: Section 5 (flora) Part C: Section 5 (fauna)
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a “low” terrestrial biodiversity sensitivity and that were not considered appropriate;	Not Applicable to this report
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed mining activities, if it should receive approval or not; and	Part A: Executive summary Part B: Section 6 (flora) Part C: Section 6 (fauna)
3.1.15	Any conditions to which this statement is subjected.	Part B: Section 5.4 (flora) Part C: Section 5.4 (fauna)
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	Not Applicable to this report
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	Not Applicable to this report



GLOSSARY OF TERMS

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

Alien species (syn. exotic species; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006); after Low and Rebelo (1998).	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act.
Critical Biodiversity Area (CBA)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.
Critically Endangered (CR) (IUCN² Red List category)	Applied to both species/taxa and ecosystems: A species is CR when the best available evidence indicates that it meets at least one of the five IUCN criteria for CR, indicating that the species is facing an extremely high risk of extinction. CR ecosystem types are at an extremely high risk of collapse. Most of the ecosystem type has been severely or moderately modified from its natural state. The ecosystem type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost. CR species are those considered to be at extremely high risk of extinction.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Development footprint (as per the NEMA definition)	“in respect of land, means any evidence of its physical transformation as a result of the undertaking of any activity”
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Ecoregion	An ecoregion is a “recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region”.
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.
Degradation	The many human-caused processes that drive the decline or loss in biodiversity, ecosystem functions or ecosystem services in any terrestrial and associated aquatic ecosystems.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Driver (ecological)	A driver is any natural or human-induced factor that directly or indirectly causes a change in ecosystem. A direct driver clearly influences ecosystem processes, where indirect driver influences ecosystem processes through altering one or more direct drivers.
Ecological Condition	“ecological condition” means the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a reference condition of “natural”.

² International Union for Conservation of Nature (IUCN)



	<p>Various terminology can be used for precision of language:</p> <ul style="list-style-type: none"> ➤ <u>Fair ecological condition</u>: Areas that are moderately modified, semi-natural. An ecological condition class in which ecological function is maintained even though composition and structure have been compromised. Can apply to a site or an ecosystem. ➤ <u>Good ecological condition</u>: Areas that are natural or near-natural. An ecological condition class in which composition, structure and function are still intact or largely intact. Can apply to a site or an ecosystem. <p><u>Poor ecological condition</u>: Areas that are severely or irreversibly modified. An ecological condition class in which ecological function has been compromised in addition to structure and composition. Can apply to a site or an ecosystem.</p>
Ecological processes	The functions and processes that operate to maintain and generate biodiversity. In order to include ecological processes in a biodiversity plan, their spatial components need to be identified and mapped.
Ecological Support Area (ESA)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Ground Truth	To check the accuracy of (remotely sensed data) by means of in-situ observations.
Habitat (as per the definition in NEMBA)	A place where a species or ecological community naturally occurs.
Habitat loss	Conversion of natural habitat in an ecosystem to a land use or land cover class that results in irreversible change in the composition, structure and functional characteristics of the ecosystem concerned.
Important Bird and Biodiversity Area (IBA)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Indigenous vegetation (as per the definition in NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed alien species	All alien species that are regulated in South Africa under the National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004), Alien and Invasive Species Regulations, 2020.
Least Threatened	Least threatened ecosystems are still largely intact.
Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g., species are still native if they increase their range as a result of watered gardens but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
Near Threatened (according to IUCN)	Close to being at high risk of extinction in the near future.
Red Data listed (RDL) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Species of Conservation Concern (SCC)	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.
Threatened ecosystem	An ecosystem that has been classified as CR, EN or VU, based on an analysis of ecosystem threat status. A threatened ecosystem has lost or is losing vital aspects of its structure, function, or composition. The NEMBA allows the Minister of Environmental Affairs or a provincial MEC for Environmental Affairs to publish a list of threatened ecosystems. To date, threatened ecosystems have been listed



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



LIST OF ACRONYMS

AIP	Alien Invasive Plant
Al	Aluminium
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resource Act
CBA	Critical Biodiversity Area
CR	Critically Endangered
Cr	Chromium
DFFE	Department of Forestry, Fisheries, and the Environment
DMRE	Department of Mineral Resources and Energy
E-GIS	Environmental Geographical Information Systems
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
EW	Extinct in the Wild
Fe	Iron
GIS	Geographic Information System
GN	Government Notice
Ha	Hectares
IBA	Important Bird Area
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
LC	Least Concern
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
masl	Meters Above Mean Sea Level
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
Mn	Manganese
MPRDA	Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NFA	The National Forest Act, 1998 (Act No. 84 of 1998)
NPAES	National Protected Areas Expansion Strategy
NWBSP	North West Biodiversity Sector Plan
Pb	Lead
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
READ	(Department of) Rural, Environmental and Agricultural Development
RDL	Red Data List
SABAP 2	Southern African Bird Atlas 2
SACAD	South Africa Conservation Areas Database
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SAPAD	South Africa Protected Area Database
SCC	Species of Conservation Concern



STS	Scientific Terrestrial Services CC
SWSA	Strategic Water Source Area
TNCO	Transvaal Nature Conservation Ordinance, 1983 (Ordinance No. 12 of 1983)
TOPS	Threatened or Protected Species
TSF	Tailings Storage Facility
VEGMAP	National Vegetation Map Project
VU	Vulnerable
WRD	Waste Rock Dump
WSAs	Water Source Areas



1 INTRODUCTION

1.1 Project Background

Scientific Terrestrial Services CC (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) phase in support of obtaining Environmental Authorisation (EA) for the proposed expansion of the Tharisa Mine, henceforth be referred to as the “**study area**”. Refer to Section 1.2 for a project description.

The study area is located in the North West province, within the Madibeng municipality, which is an administrative division of the Bojanala Platinum District Municipality. The study area is located approximately 20 km southeast of Rustenburg and approximately 2.5 km south of Marikana. The N4 is located approximately 1.4 km south of the study area and the R566 is located approximately 14 km west of the R556. The location and extent of the study area is indicated in Figures 1 and 2.

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

1.2 Project Description

Tharisa Minerals (Pty) Ltd (i.e., “Tharisa”) is an opencast mining operation that produces chrome and platinum group metal concentrates. The mine has been operational since 2008. The opencast mine is located on portions of farms 342 JQ and Elandsdrift 467 JQ, south of the Marikana Town, in the North West Province.

Mining is undertaken in two mining sections, namely the East Mine and West Mine, using conventional open pit truck and shovel methods. The two mining sections are separated by the perennial Sterkstroom River and the D1325 (Marikana Road). Waste rock from the open pit areas is stockpiled on Waste Rock Dumps (WRDs) and some in-pit dumping of waste rock has taken place at the East Mine. Key existing mine infrastructure includes haul roads, run-of-mine, a concentrator complex, various product stockpiles, topsoil stockpiles, WRDs, tailings storage facilities (TSFs) and supporting infrastructure such as offices, workshops, change house and access control facilities.



As part of its on-going mine planning, Tharisa has identified the need for additional waste rock storage on site. In this regard, Tharisa is making an application to the Department of Mineral Resources and Energy (DMRE) for an integrated EA and update of the mine's current Environmental Management Programme (EMPr). The following activities are proposed:

1. Expansion of the existing and approved Far West WRD 1 by a footprint of 109 hectares (ha) – this expanded area is hereafter referred to as the “**West Above Ground WRD.**” Portions of the West Above Ground WRD will be located on backfilled areas of the West Pit; and
2. Establishing a WRD above backfilled portions of the East pit – referred to as the “**East Above Ground WRD**”. The proposed East Above Ground WRD will cover an area of approximately 72 ha.

Design of proposed WRDs:

The management of residue stockpiles and deposits must be undertaken in accordance with Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits (Government Notice (GN) 632 of 2015, as amended). In this regard, the design features of the proposed WRDs are presented in Table 1. The detailed design report and drawings of the proposed WRDs will be provided as part of the EIA and EMPr phase.

Table 1: Design features of the WRDs as obtained from the proponent.

FEATURE	DETAIL
Physical dimensions	<p>Height: Approximately 70 m (applies to all proposed WRD's)</p> <p>Bench height: Approximately 15 m</p> <p>Footprint:</p> <p>West OG WRD: Approximately 109 ha; and</p> <p>East OG WRD: Approximately 72 ha.</p> <p>Maximum storage capacity:</p> <p>West OG WRD: Approximately 35.31 million m³; and</p> <p>East OG WRD: Approximately 26.26 million m³.</p>
Chemical properties	<p>The waste rock material comprises pyroxenite, anorthosite and norite. The geochemical work undertaken for waste rock samples at Tharisa indicate that the waste rock is non-acid generating and based on leachate tests chemicals of concern that are likely to leach from the WRD's when compared to water quality standards include: Elevated concentrations of Aluminium (Al), Chromium (Cr), Iron (Fe), Manganese (Mn), and Lead (Pb).</p>
Waste rock transport and deposition	<p>Excess open pit waste rock loaded onto mine dump trucks and transported to WRDs. Waste rock access ramps constructed with a maximum gradient of 1V:7H (8°) for mine dump trucks. Waste rock is then dumped and spread / flattened with a bulldozer.</p>
Control of seepage and dirty water run-off	<p>The control of seepage from the toe of the WRDs as well as run-off from the side slopes will be achieved by the construction of a series of toe paddocks and secondary toe paddock cross walls around the perimeter of the WRDs, from where it will seep into the unsaturated soil or evaporate.</p>



FEATURE		DETAIL
Diversion of clean water		Stormwater diversion trenches will be established to divert clean surface run-off from the surrounding area away from the WRD to prevent the contamination of clean water.
Topsoil stripping		Topsoil in WRD footprint areas will be stripped and stockpiled in accordance with the topsoil conservation guide. A stripping depth of 500 mm has been recommended by the soils study. Stripping and stockpiling of topsoil will be done in advance of dumping.
Side slopes		Average slope: 1V:3H
Access and access control		A 4 m wide waste rock road will be constructed around the perimeter of each dump for routine inspections and maintenance. A perimeter fence around each WRD is planned.
Monitoring		Monitoring of seepage water retained in the perimeter to paddocks and boreholes around the perimeter of each WRD.
Dust control		Operational Phase: Watering of roads for dust suppression. Post Operational Phase: No measures necessary due to the coarse particle size distribution.
Closure		The WRD should be shaped to ensure the area is free draining (i.e., no ponding of water on the top surface post closure). The WRD side slopes to be confirmed through on-going field trials. The WRD should be capped with a minimum of 300 mm soil/growth medium material. The capping thickness should be confirmed through on-going field trials. No active groundwater protection measures are envisaged during closure given the relatively low pollution potential of the residual waste rock material. If water quality monitoring around any WRD indicates that the WRDs are causing pollution, additional management measures will be investigated in consultation with a qualified specialist.
Rehabilitation	Revegetation	The WRD is to be revegetated using a mix of indigenous grasses (i.e., dry seeding) and trees/shrubs (i.e., hand planting of seedlings). The vegetation species will be confirmed through ongoing field trials.
	Erosion control	The erosion management measures and/or mitigation measures to be confirmed through ongoing field trials.
	Maintenance and aftercare	Maintenance and aftercare period to be confirmed through ongoing field trials.
	Rehabilitation success criteria	Rehabilitation success will be determined by monitoring trends in soil nutrient levels, soil microbial levels, vegetation cover and vegetation biodiversity levels and comparing data and temporal trends in the data to numerical targets.



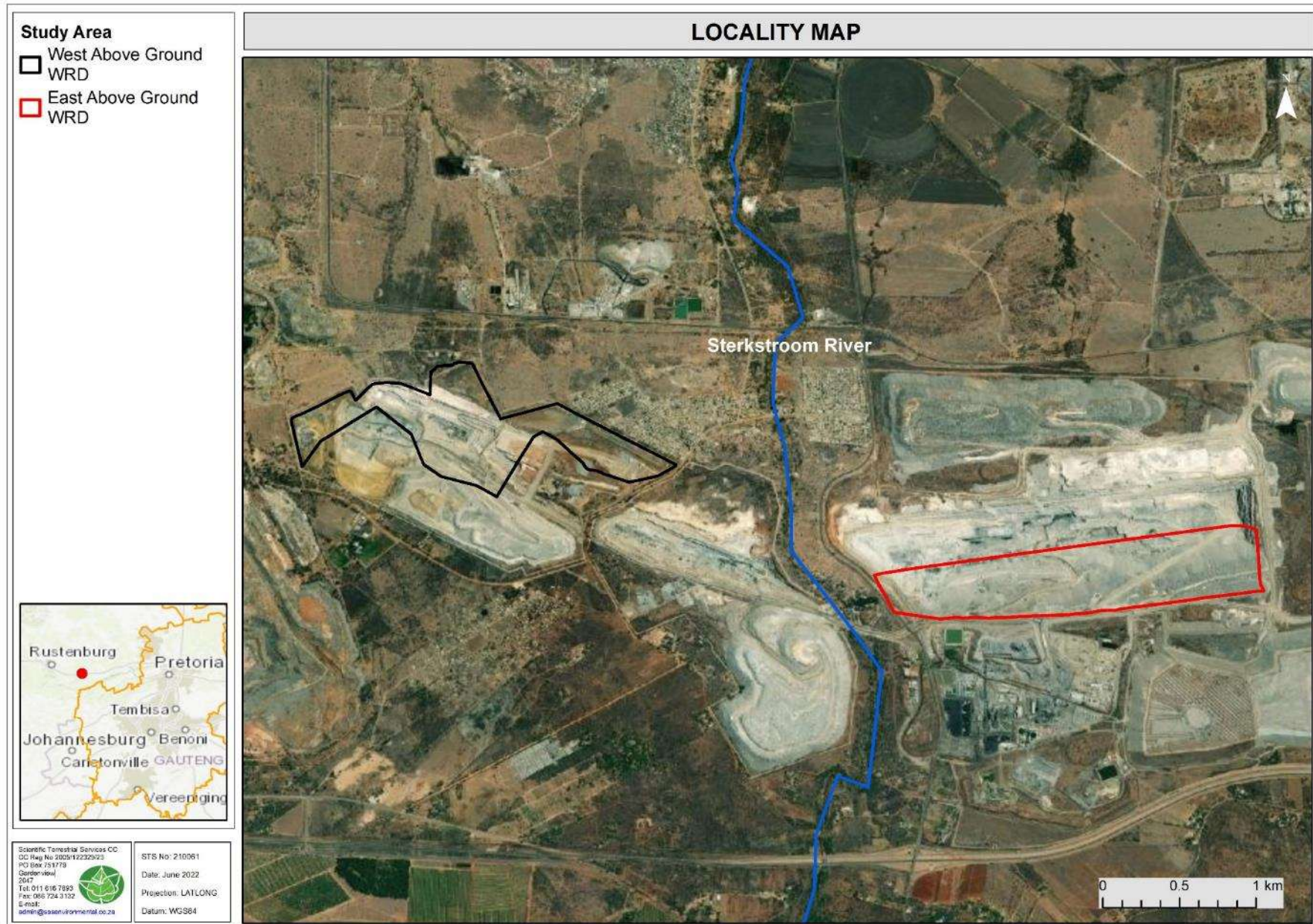


Figure 1: Digital satellite image depicting the study area in relation to surrounding area.



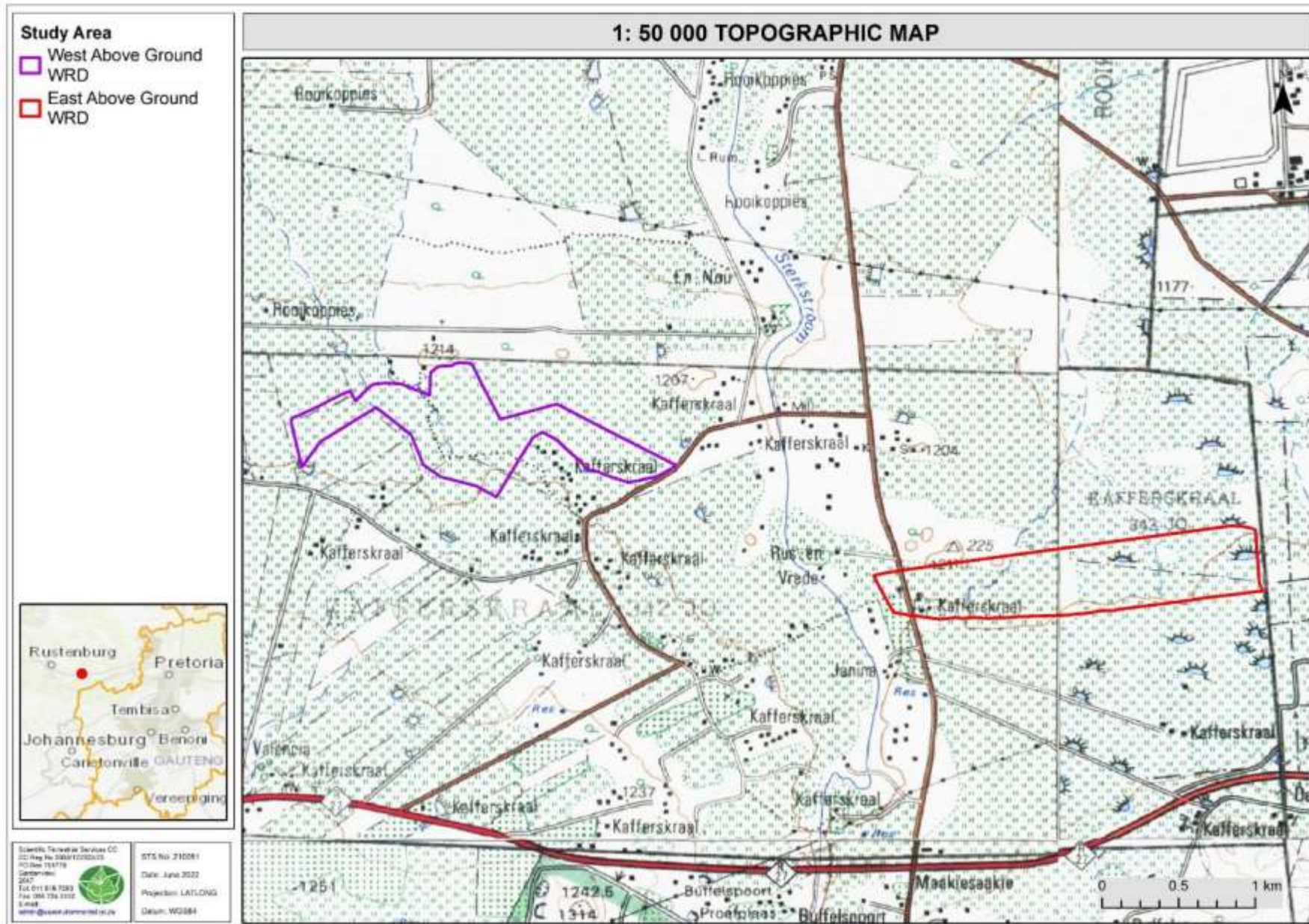


Figure 2: The study area depicted on a 1:50 000 topographical map in relation to the surrounding area.



1.3 Scope of Work

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

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

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

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



surrounds. Within the screening tool outcome, the names of some species are not provided, and these species are rather assigned a number keeping them unidentifiable (e.g., Sensitive species 1). This procedure is followed because of the vulnerability of the species to threats such as illegal harvesting and overexploitation. According to the best practise guidelines provided by SANBI, the name of sensitive species **may not appear** in the final EIA report **nor any of the specialist reports** released into the public domain. However, the conservation threat status of such species has been provided; and

- The field assessment was undertaken during autumn (26th April 2022). The field assessment aimed to determine the ecological status of the habitat associated with the study area, and to “ground-truth” the results of the desktop assessment. A more accurate assessment would require that assessments take place in all seasons of the year, especially in summer after the rainy season.

1.5 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996³;
- The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
 - GN number 1002: National List of Ecosystems that are Threatened and Need Protection dated 9 December 2011, as it relates to the NEMBA;
 - GN number R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated September 2020 as it relates to the NEMBA;
 - GN number 1003: Legislation to come into force on the 1st of June 2022: Government Notice number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020, as it relates to the NEMBA; and
 - GN number 30568: Threatened or Protected Species (TOPS) list dated 14 December 2007, as it relates to the NEMBA.
- The National Forest Act, 1998 (Act No. 84 of 1998, amended) (NFA);

³ Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the ‘Constitution of the Republic of South Africa, 1996’. It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.



- GN 1935: List of Protected Tree Species as published in the Government Gazette 46094 dated 25 March 2022, as it relates to the NFA;
- The National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEMPAA);
- Government Gazette 45421 dated 10 May 2019 as it relates to the DFFE’s national environmental screening report required with an application for environmental authorisation as identified in regulation 16(1)(v) of EIA Regulations:
 - For the Terrestrial Biodiversity Theme: GN 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity as published in Government Gazette 43110 dated 20 March 2020; and
 - For Animal and Plant Species Themes: GN 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant and Animal Species as published in Government Gazette 43855 dated 30 October 2020;
- The Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA); and
- The Transvaal Nature Conservation Ordinance, 1983 (Ordinance No. 12 of 1983) (TNCO).

2 ASSESSMENT APPROACH

Maps and digital satellite images were generated prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. The biodiversity desktop assessment is confined to the study area and does not include the neighbouring and adjacent properties, although the sensitivity of surrounding areas is included on the respective maps. Relevant databases and documentation that were considered during the assessment of the study area includes ⁴:

- 2010 National Protected Area Expansion Strategy (NPAES) (Government of South Africa, 2010; DEA & SANBI, 2009), including the below listed vector datasets:
 - NPAES Focus Areas 2010: National Protected Areas Expansion Strategy: Focus areas for protected area expansion (South African National Parks (SanParks), 2010);

⁴ Datasets obtained from:

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



- NPAES Formal: Polygons of formal protected national parks areas in South Africa (SANParks/SANBI, 2013); and
 - NPAES Protected Areas – Informal: Informal conservation areas in South Africa (SANParks/SANBI, 2012).
- The South African Conservation Areas Database, Quarter 4 (SACAD, 2021)⁵;
 - The South African Protected Areas Database, Quarter 4 (SAPAD, 2021)⁶;
 - The North West Biodiversity Sector Plan (NW BSP), 2015 (READ, 2015);
 - North West Terrestrial Critical Biodiversity Area (CBA) Map (2015);
 - The National Vegetation Map Project (VEGMAP), with the below vector dataset used for information on Biomes, Bioregions and Vegetation Type(s):
 - 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018a)
 - The National List of Threatened Ecosystems 2011 (SANBI 2011; South Africa, 2011);
 - From the National Biodiversity Assessment (NBA, 2018) Terrestrial Assessment project (Skowno et al, 2019):
 - 2018 Terrestrial ecosystem threat status and protection level - remaining extent (SANBI, 2018b); and
 - 2018 Terrestrial ecosystem threat status and protection level layer (SANBI, 2018c).
 - The Important Bird and Biodiversity Areas (IBA) Programme and vector dataset (BirdLife South Africa, 2015; Marnewick et al, 2015a and 2015b), in conjunction with the South African Bird Atlas Project 2 (SABAP 2);
 - The International Union for Conservation of Nature (IUCN);
 - The National Web-Based Environmental Screening Tool (accessed 2021); and
 - From the 2017 Strategic Water Source Areas (SWSA) project:
 - 2017 SWSA **Surface water** (Water Research Commission, 2017).

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

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



The field assessment took place on 26th April 2022 to “ground-truth” the results of the desktop assessment. Results of the field assessment are presented in Parts B and C.

3 RESULTS OF THE DESKTOP ANALYSIS

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

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



Table 2: Summary of the biodiversity characteristics associated with the study area [in the Quarter Degree Squares (QDS) 2527CB & 2527DA]

DETAILS OF THE AREA OF INTEREST IN TERMS OF MUCINA & RUTHERFORD (2018)						
BIOME	The study area is situated within the Savanna Biome .					
BIOREGION	The study area is located within the Central Bushveld Bioregion .					
VEGETATION TYPE	The study area is situated within the Marikana Thornveld and the Moot Plains Bushveld vegetation types (SVcb 6 & SVcb8) (Figure 3; Appendix D).					
CLIMATE	Marikana Thornveld: Summer rainfall with very dry winters. Moot Plains Bushveld: Summer rainfall with very dry winters.					
	Climate Characteristics	MAP* (mm)	MAT* (°C)	MFD* (Days)	MAPE* (mm)	MASMS* (%)
	Marikana Thornveld	654	17.6	23	2284	76
	Moot Plains Bushveld	632	17.9	19	2378	77
ALTITUDE	Marikana Thornveld: 1 050–1 450 Moot Plains Bushveld: 1 050 – 1 450		VEGETATION & LANDSCAPE FEATURES	Marikana Thornveld: Open <i>Vachellia karroo</i> woodland, occurring in valleys and slightly undulating plains, and some lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops or in other habitat protected from fire. Moot Plains Bushveld: Open to closed, low, often thorny savanna dominated by various species of <i>Vachellia</i> and <i>Senegalia</i> in the bottomlands and plains as well as woodlands of varying height and density on the lower hillsides. The herbaceous layer is dominated by grasses.		
DISTRIBUTION	Marikana Thornveld: North-West and Gauteng Provinces: Occurs on plains from the Rustenburg area in the west, through Marikana and Brits to the Pretoria area in the east. Altitude about 1 050–1 450 m. Moot Plains Bushveld: North-West and Gauteng Provinces: Main belt occurs immediately south of the Magaliesberg from the Selons River Valley in the west through Maanhaarrand, filling the valley bottom of the Magalies River, proceeding east of the Hartebeestpoort Dam between the Magaliesberg and Daspoort mountain ranges to Pretoria.					
GEOLOGY & SOILS	Marikana Thornveld: Most of the area is underlain by the mafic intrusive rocks of the Rustenburg Layered Suite of the Bushveld Igneous Complex. Rocks include gabbro, norite, pyroxenite and anorthosite. The shales and quartzites of the Pretoria Group (Transvaal Supergroup) also contribute. Mainly vertic melanic clays with some dystrophic or mesotrophic plinthic catenas and some freely drained, deep soils. Moot Plains Bushveld: Clastic sediments and minor carbonates and volcanics of the Pretoria Group (including the Silverton Formation) and some Malmani dolomites in the west, all the Transvaal Supergroup (Vaalian). There is also some contribution from mafic Bushveld intrusives. Soils often stony with colluvial clay-loam but varied, including red, yellow apedal freely drained, dystrophic and eutrophic plinthic catenas, vertic and melanic clays, and some less typical Glenrosa and Mispah forms.		CONSERVATION	Marikana Thornveld: Endangered (EN) . Target 19%. Less than 1% statutorily conserved in, for example, Magaliesberg Nature Area. More conserved in addition in other reserves, mainly in De Onderstepoort Nature Reserve. Considerably impacted, with 48% transformed, mainly cultivated and urban or built-up areas. Most agricultural development of this unit is in the western regions towards Rustenburg, while in the east (near Pretoria) industrial development is a greater threat of land transformation. Erosion is very low to moderate. Alien invasive plants occur localised in high densities, especially along the drainage lines. Moot Plains Bushveld: Vulnerable (VU) . Target 19%. Some 13% statutorily conserved mainly in the Magaliesberg Nature Area. About 28% transformed mainly by cultivation and urban and built-up areas. Very scattered occurrences to sometimes dense patches in places of various alien plants.		



CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)	
<p>NBA</p> <p>FIGURE 4</p>	<p>The study area is located within a small section of the remaining extent of the Marikana Thornveld. The study area is not located within the remaining extent of the Moot Plains Bushveld in the east. The Marikana Thornveld is EN and is poorly protected. The Moot Plains Bushveld is of Least Concern (LC) and is poorly protected.</p> <p>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 NEMPAA and compared with the biodiversity target for that ecosystem type.</p> <p>The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa. Two headline indicators that are applied to both ecosystems and species are used in the NBA:</p> <ol style="list-style-type: none"> 1) Ecosystem threat status 2) Ecosystem protection level
<p>NATIONAL THREATENED ECOSYSTEMS (2011)</p> <p>FIGURE 5</p>	<p>The study area is situated within the VU Marikana Thornveld ecosystem, according to the National Threatened Ecosystem Database (2011). According to the database, only small remnants of the threatened ecosystem are anticipated to be located within sections of the East Above Ground WRD.</p> <p>This ecosystem is listed under Criterion A1 of GN 1002 and occurs on plains from the Rustenburg area in the west, through Marikana and Brits to the Pretoria area in the east of South Africa. The A1 criterion and VU status of the Marikana Thornveld means that the ecosystem has experienced an irreversible loss of natural habitat with $\leq 60\%$ or original ecosystem remaining and $\geq 20\%$ of ecosystem being significantly degraded.</p> <p>The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011).</p> <p>Note: <i>The National List of Threatened Terrestrial Ecosystems published in terms of the NEMBA in 2011 remains in legal force. The data contained in NBA 2018 represents an update of the assessment of threat status for terrestrial ecosystems, but the National List of Threatened Terrestrial Ecosystems has not yet been revised.</i></p>
<p>IBA (2015)</p> <p>FIGURE 6</p>	<p>The study area (including both the West Above Ground WRD and the East Above Ground WRD) is located within the Magaliesberg IBA.</p> <p>IBA trigger species: The most important trigger species within the IBA are the globally threatened Cape Vulture (<i>Gyps coprotheres</i>) and the endangered Secretary bird (<i>Sagittarius serpentarius</i>). Regionally threatened species include the Lanner Falcon (<i>Falco biarmicus</i>), Half-collared Kingfisher (<i>Alcedo semitorquata</i>), African Grass Owl (<i>Tyto capensis</i>), African Finfoot (<i>Podica senegalensis</i>) and Verreaux's Eagle (<i>Aquila verreauxii</i>). Biome-restricted species include White-bellied Sunbird (<i>Cinnyris talatala</i>), Kurrichane Thrush (<i>Turdus libonyanus</i>), White-throated Robin-chat (<i>Cossypha humeralis</i>), Kalahari Scrub Robin (<i>Erythropygia paena</i>) and Barred Wren-Warbler (<i>Calamonastes fasciolatus</i>).</p>
<p>SAPAD (2021, Q4); SACAD (2021, Q4); NPAES (2010).</p> <p>FIGURE 7 & 8</p>	<p>The SAPAD (Q4_2021) indicated that the Magaliesberg Protected Natural Environment is located within 10 km of the study area. According to the SACAD (Q4, 2021), the study area is located within the Magaliesberg Biosphere Reserve (Figure 7); however, the study area is located in the transitional area of the Biosphere Reserve (Figure 8) according to the Magaliesberg Biosphere Management Plan. “Biosphere zones are an attempt to reduce conflicts arising between conservation and development. There are opportunities for conservation and sustainable development that may help mitigate the vulnerability of the biodiversity and marginalised communities within the biosphere. The zones demarcate areas where appropriate activities are permitted.” (https://magaliesbergbiosphere.org.za/biosphere-zones/). UNESCO describes the three zones as follows:</p>



	<ol style="list-style-type: none"> 1. Core Zone: It comprises a strictly protected zone that contributes to the conservation of landscapes, ecosystems, species and genetic variation. 2. Buffer Zones: It surrounds or adjoins the core area(s) and is used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training, and education. 3. Transitional Areas: The transition area is where communities foster socio-culturally and ecologically sustainable economic and human activities. <p>The recommended land use of the Transitional Area of the Magaliesberg Biosphere Reserve includes:</p> <ul style="list-style-type: none"> - The land use within the transition zone will allow for game ranching, cattle grazing, pastures, eco-tourism developments, higher level tourism developments, cultivated lands, irrigation, orchards, agro-industries, human settlements, support services and infrastructure, mining and industrial development. Emphasis will be placed on entering collaboration with communities and industries to wisely develop, cooperatively management and sustainably utilise the larger area to ensure the protection of the natural and heritage resources of the Magaliesberg. - This area will be the focus for collaborative effort for environmental education, public awareness and specialist training activities; with the aim to reduce impact on the Magaliesberg and to enhance the benefits to communities. <p>The NPAES (2010) dataset, indicated that the study area was within 10 km of a Focus Area, namely the NW/Gauteng Bushveld Focus Area, as well as within 10 km of a Formal Protected Area (of which the boundary is the same as identified by the SAPAD), namely the Magaliesberg Protected Natural Environment.</p>
NORTH WEST BIODIVERSITY SECTOR PLAN (NW BSP) (2015)	
<p>CBA2 FIGURE 9</p>	<p>Only a small section of the study area (encompassing a small central area within the West Above Ground WRD) is located within a CBA 2.</p> <p>DEFINITIONS: CBAs include natural or near-natural terrestrial and aquatic features that were selected based on an area’s biodiversity characteristics, spatial configuration, and requirement for meeting both <i>biodiversity pattern</i> and <i>ecological process targets</i>. CBAs include irreplaceable sites where no other options exist for meeting targets for biodiversity features, as well as best-design sites (i.e., CBA Important Areas) which represent an efficient configuration of sites to meet targets in an ecologically sustainable way that is least conflicting with other land uses and activities. These areas need be maintained in the appropriate condition for their category. Some CBAs are degraded or irreversibly modified but are still required for achieving specific targets, such as cultivated lands for threatened species.</p> <p>REASONS IDENTIFIED AS CBA2: According to NW BSP (READ, 2015) these areas are considered a CBA2 because they have been identified as i) part of an IBA, ii) they function as corridors in the landscape, and iii) because they function as critical corridor linkages for biodiversity.</p>
<p>Ecological Support Areas (ESA1) FIGURE 9</p>	<p>Most areas within the West Above Ground WRD and the entire area within the East Above Ground WRD are located within a ESA1.</p> <p>DEFINITIONS: ESA1s ecosystems that are still in a natural, near-natural state or semi-natural state, and have not been previously developed. These ecosystems are moderately to significantly disturbed but are still able to maintain basic functionality within the landscape. Individual species or other biodiversity indicators may be severely disturbed or reduced. These are areas with low irreplaceability with respect to biodiversity pattern targets only.</p> <p>REASONS IDENTIFIED AS ESA1: According to NW BSP (READ, 2015) these areas these areas are considered an ESA1 because they are still in a natural, near-natural state or semi-natural state, and have not been previously developed and have been identified as part of IBA, and ii) because they function as critical corridor linkages for biodiversity.</p>



<p>Ecological Support Areas (ESA2) FIGURE 9</p>	<p>Small, scattered sections of the West Above Ground WRD are located within ESA2.</p> <p>DEFINITIONS: ESA2s ecosystems are not in a natural or near-natural state, and has been previously developed (e.g., ploughed). These ecosystems are significantly disturbed but still able to maintain some ecological functionality within the landscape. Individual species or other biodiversity indicators are severely disturbed or reduced and these are areas that have low irreplaceability with respect to biodiversity pattern targets only. These are areas with low irreplaceability with respect to biodiversity pattern targets only. These areas are required to maintain ecological processes especially landscape connectivity.</p> <p>REASONS IDENTIFIED AS ESA2: According to NWBSP (READ, 2015) these areas are considered an ESA2 because they are not in a natural or near-natural state, and has been previously developed and have been identified as i) part of an IBA, and ii) because they function as critical corridor linkages for biodiversity.</p>
<p>NATIONAL WEB BASED ENVIRONMENTAL SCREENING TOOL (2020)</p>	
<p>The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed mining activities footprint to avoid sensitive areas. The different sensitivity ratings pertaining to the plant [and animal] protocols are described below:</p> <ul style="list-style-type: none"> ➤ <u>Very high</u>: habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km² are considered critical habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under critically endangered (CR), EN, or VU criteria of the IUCN or species listed as critically/ extremely rare under South Africa’s national red list criteria. For each species reliant on a critical habitat, all remaining suitable habitat has been manually mapped at a fine scale. ➤ <u>High</u>: recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. ➤ <u>Medium</u>: model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. ➤ <u>Low</u>: areas where no species of conservation concern (SCC) are known or expected to occur. 	
<p>TERRESTRIAL BIODIVERSITY THEME</p>	<p>For the terrestrial biodiversity theme, the study area is considered to have a very high sensitivity. The triggered sensitivity features include the presence of CBA’s, ESA’s, a protected areas expansion strategy, and a VU ecosystem, namely the Marikana Thornveld.</p>
<p>PLANT SPECIES THEME</p>	<p>For the plant species theme, the study area is considered to have a low sensitivity.</p>
<p>ANIMAL SPECIES THEME</p>	<p>For the animal species theme, the study area is considered to have a medium sensitivity. The species triggering the medium sensitivity outcome is <i>Chrysospalax villosus</i> (Rough-haired golden mole, VU), <i>Crocidura maquassiensis</i> (Maquassie Musk Shrew, VU), <i>Dasymys robertsii</i> (African march rat, VU), and <i>Sagittarius serpentarius</i> (Secretary bird, LC).</p>
<p>IMPORTANCE OF THE STUDY AREA TO THE MINING AND BIODIVERSITY GUIDELINES</p>	
<p>BIODIVERSITY IMPORTANCE FIGURE 10</p>	<p>Most of the study area is located within areas identified as High Biodiversity Importance and according to the Mining and Biodiversity Guidelines (2013). A small section of the study area (within the East Above Ground WRD) is located within an area considered to be of Moderate Biodiversity Importance.</p> <p>Areas of High Biodiversity Importance <u>Risk for mining:</u> High risk for mining. <u>Implications for mining:</u> These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, for maintaining important ecosystem services for communities or the country. An EIA should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on spatial biodiversity.</p> <p>Areas of Moderate Biodiversity Importance <u>Risk for mining:</u> Moderate risk for mining. <u>Implications for mining:</u> EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features (e.g., threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy.</p>



STRATEGIC WATER SOURCE AREAS FOR SURFACE WATER (2017)

Surface Water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national water source areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage.

NAME & CRITERIA	The study area is not within 10 km of a SWSA.
----------------------------	------------------------------------------------------

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



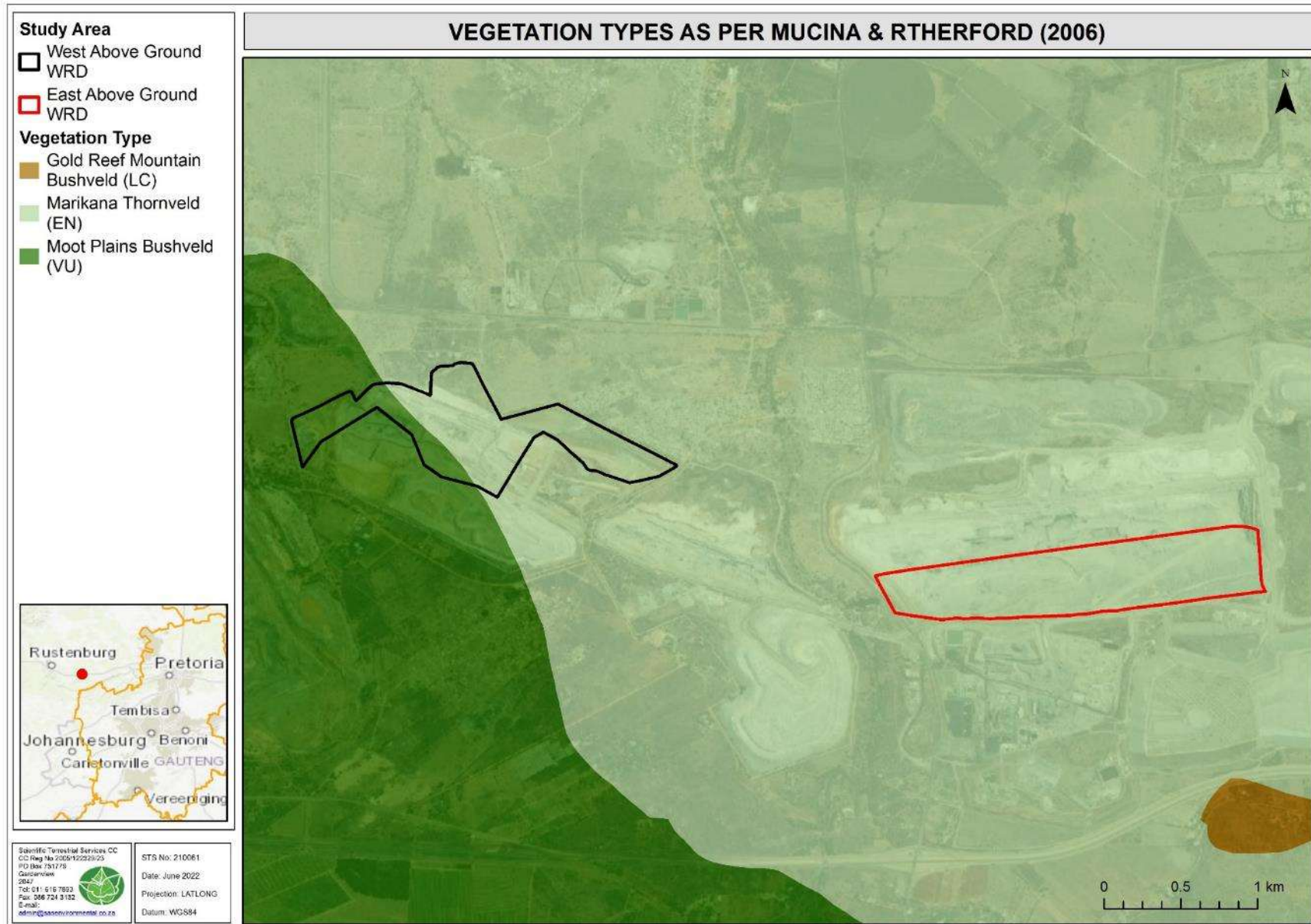


Figure 3: The vegetation type associated with the study area (original extent) according to the updated VEGMAP project (SANBI, 2018a).



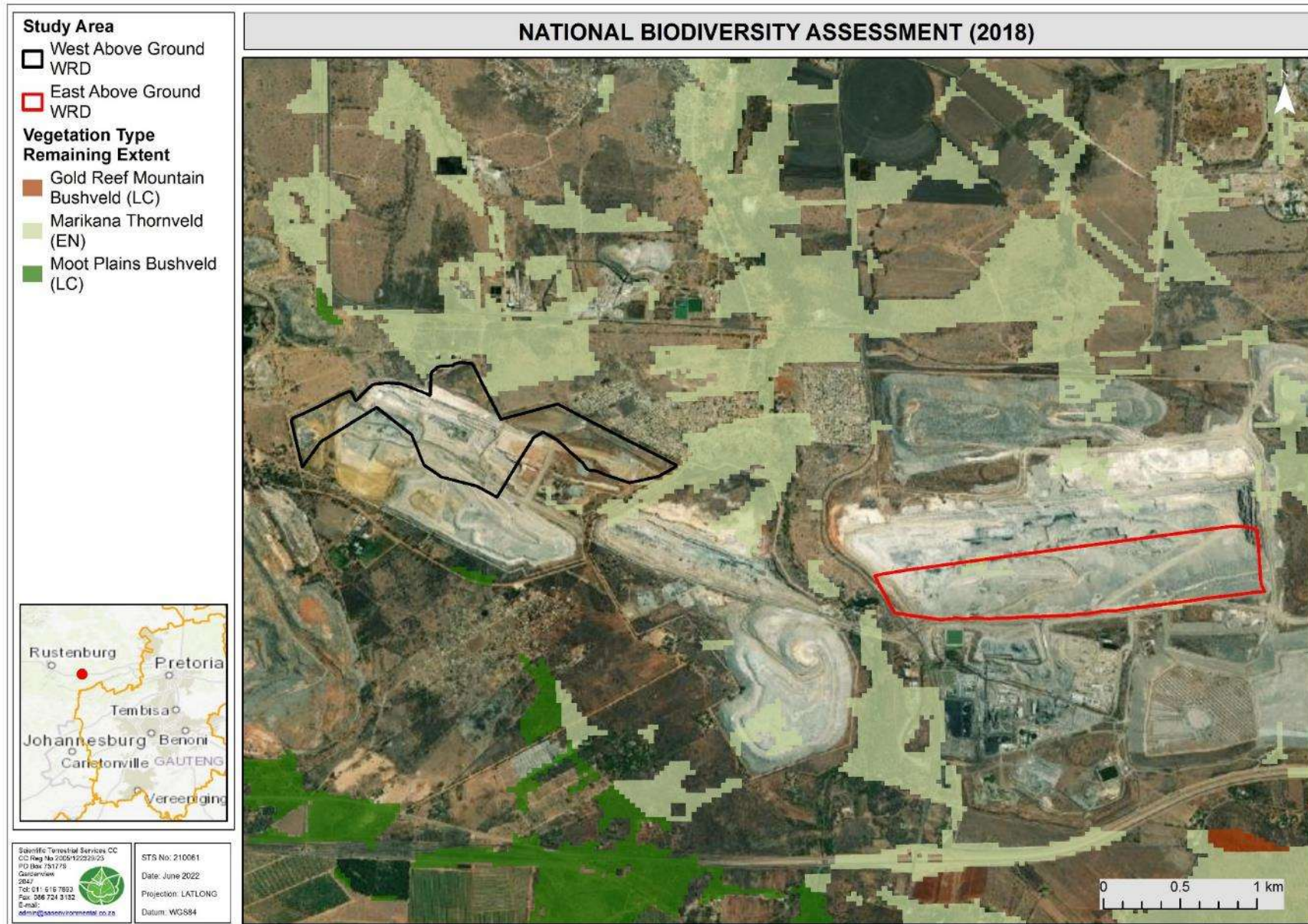


Figure 4: The remaining extent of the vegetation types associated with the study area according to the National Biodiversity Assessment (NBA, 2018).



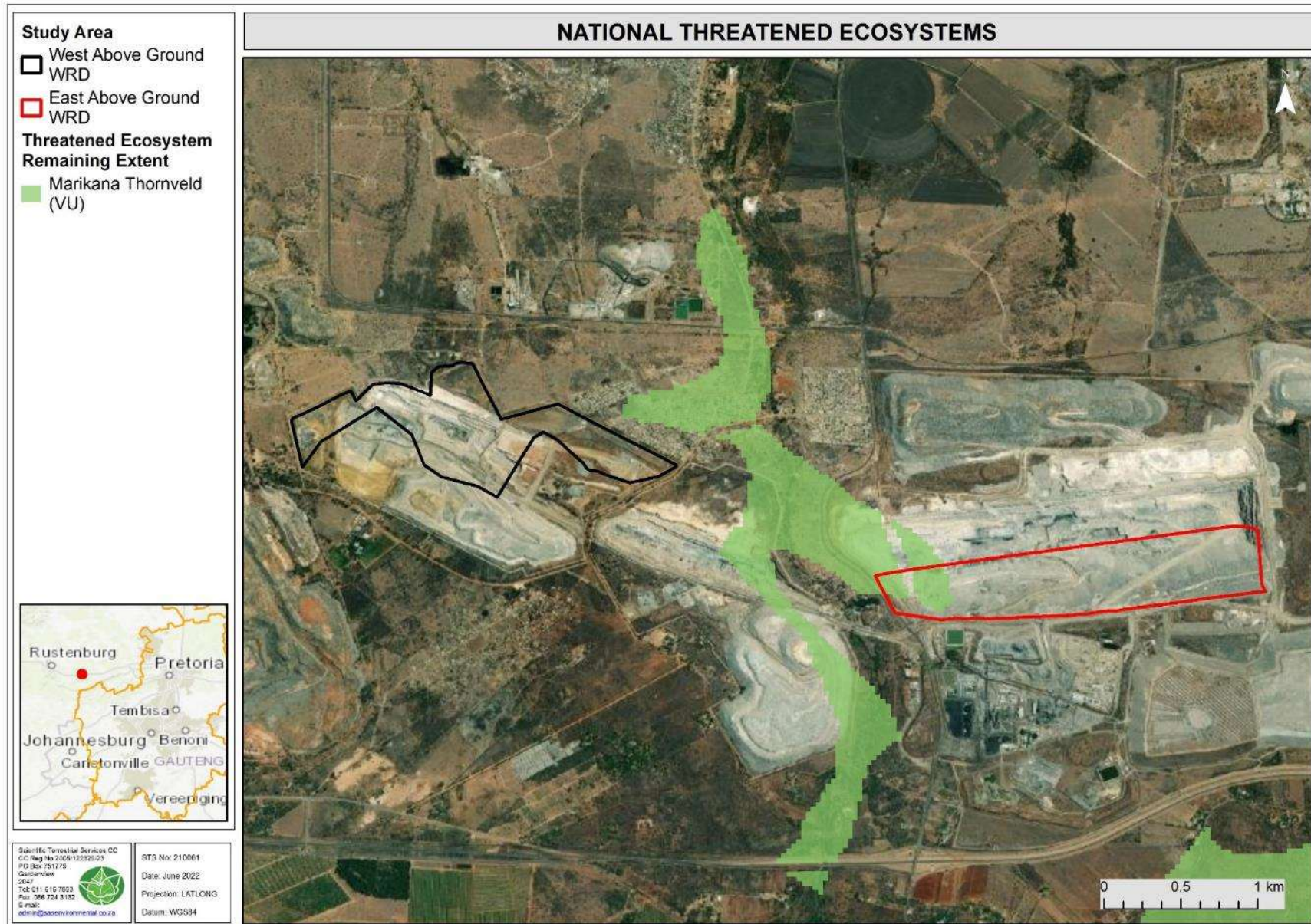


Figure 5: Remaining extent of the Vulnerable (VU) Marikana Thornveld within the study area, according to National Threatened Ecosystems Dataset (2011).



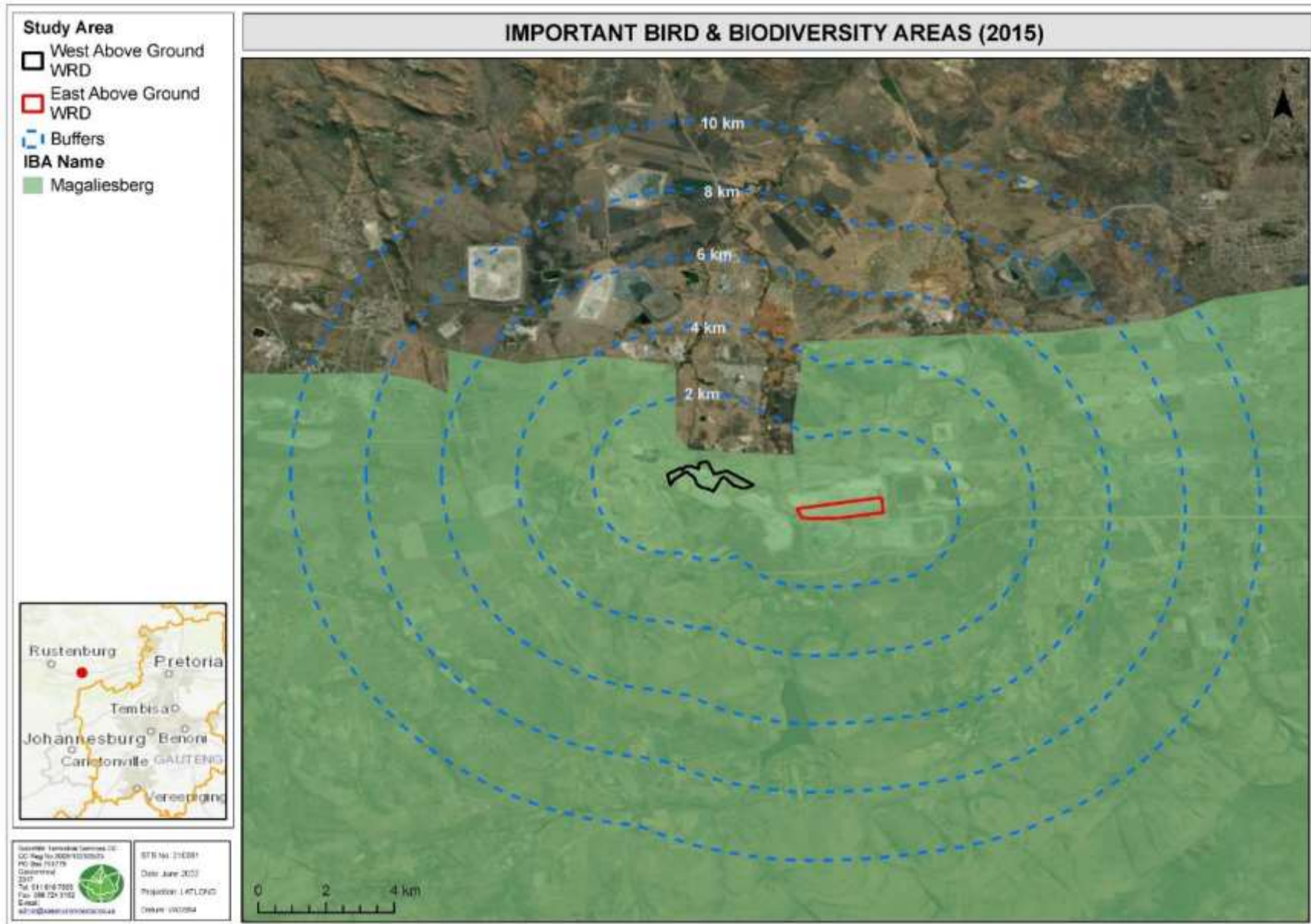


Figure 6: Important Bird and Biodiversity Areas (IBAs) in relation to the study area.



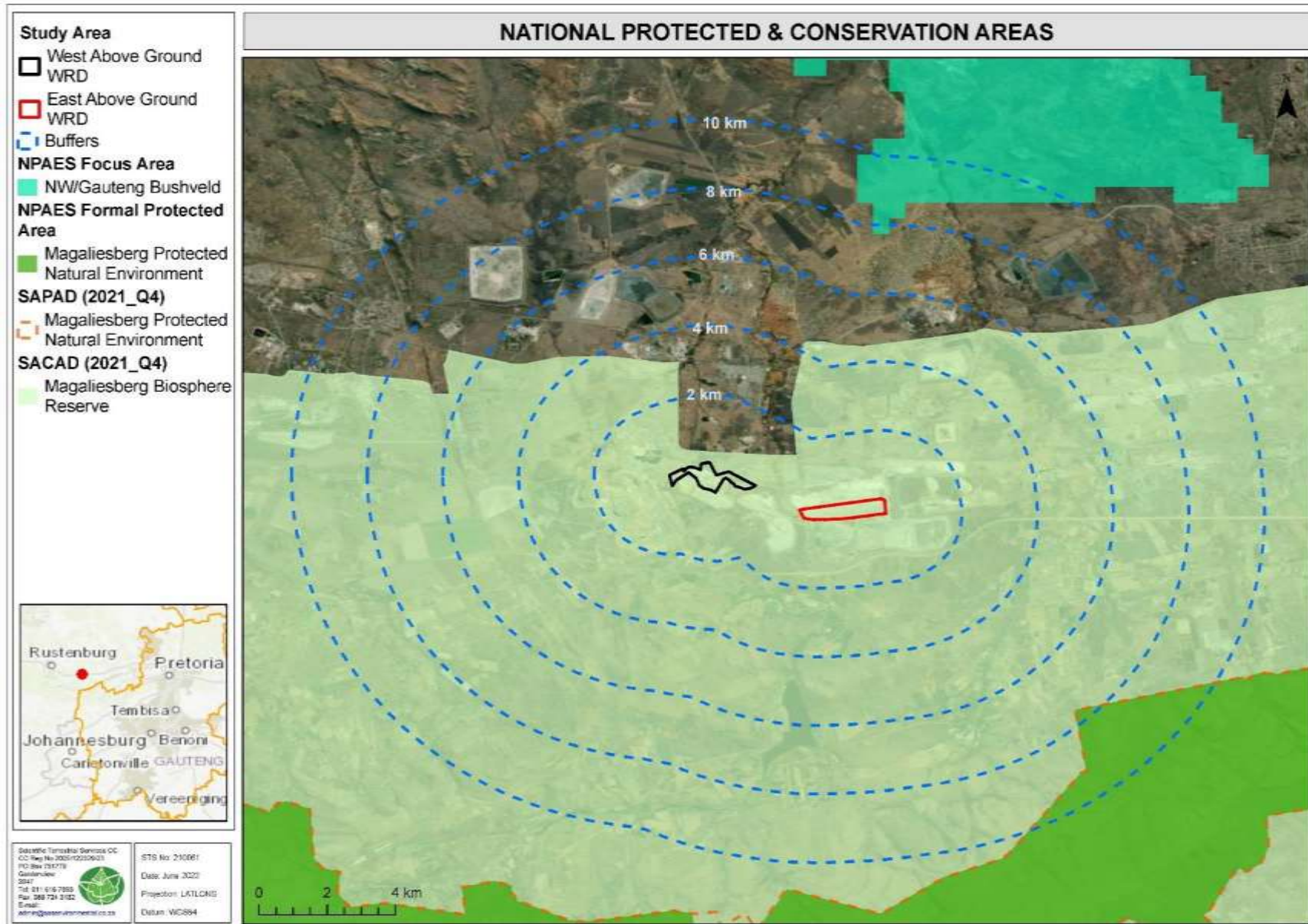


Figure 7: The study area in relation to the national protected and conservation areas as per the SACAD (Q4_2021), SAPAD (Q4_2021), and NPAES (2010).



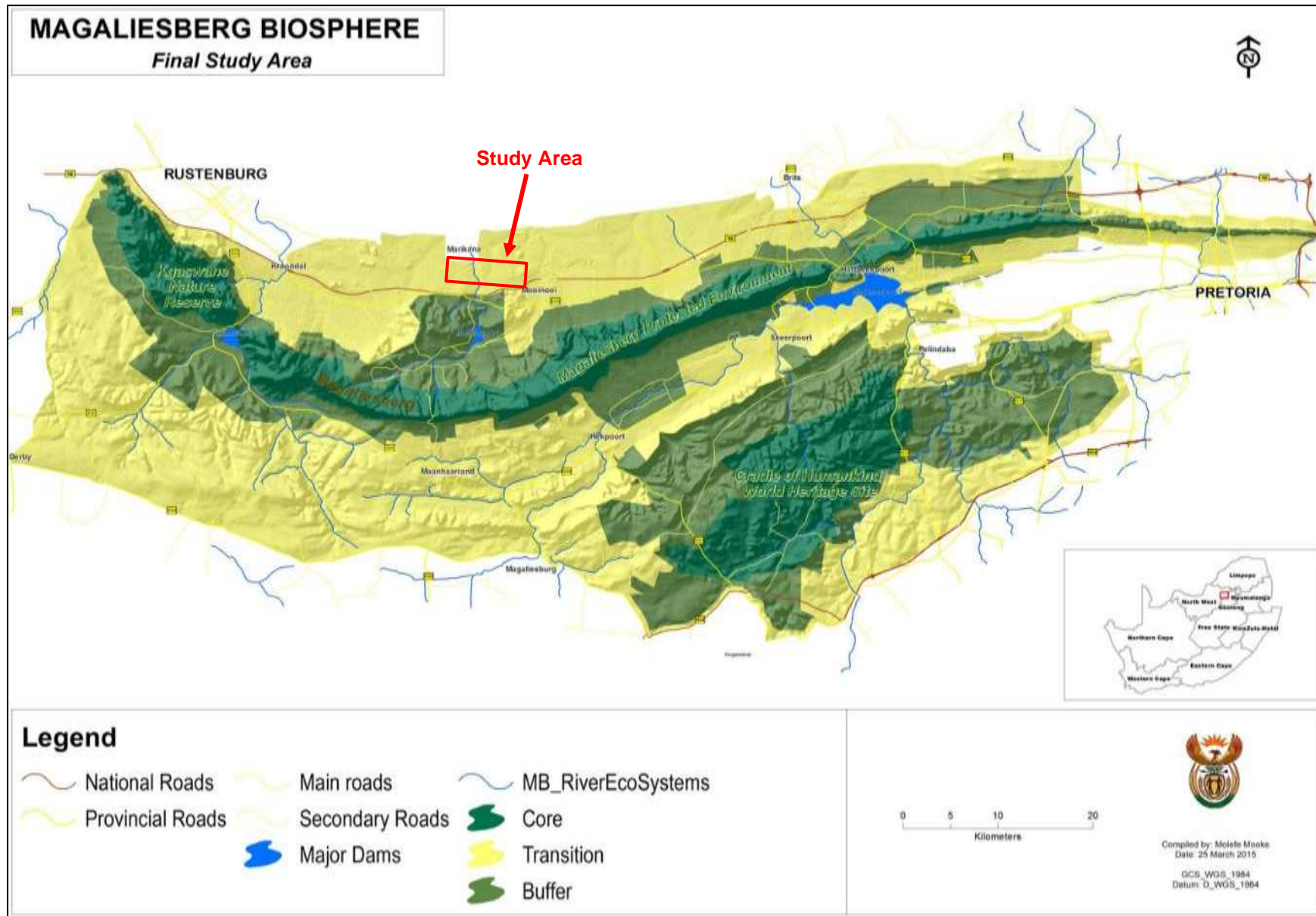


Figure 8: Core areas of the Magaliesberg Biosphere Reserve. The approximate locality of the study area is indicated by the red block.



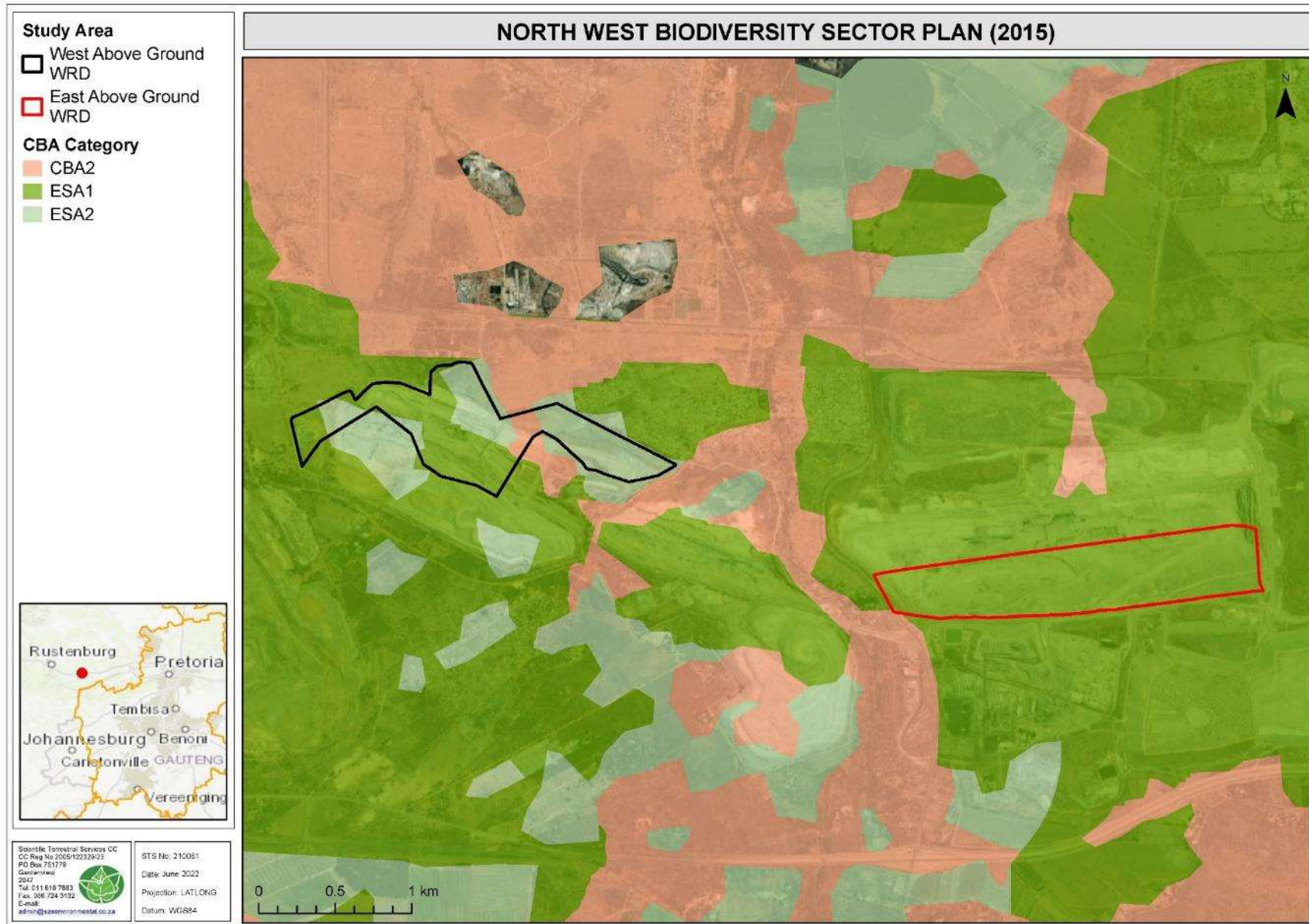


Figure 9: The study area in relation to the North West Biodiversity Sector Plan Version 2 (2015).



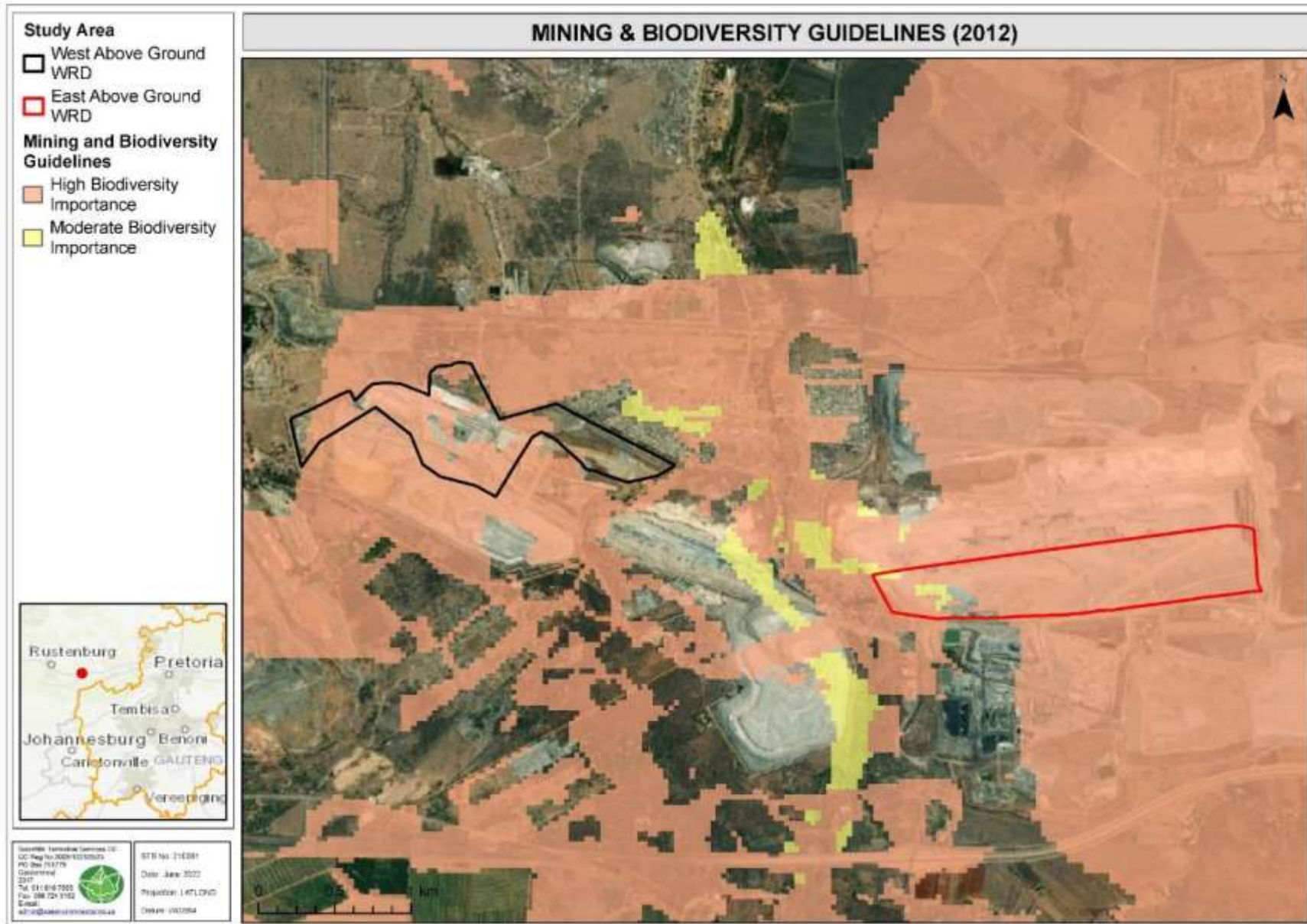


Figure 10: Importance of the study area according to the Mining and Biodiversity Guidelines.



4 STRUCTURE OF THE BIODIVERSITY REPORT

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

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

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



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APPENDIX A: Indemnity and Terms of Use of this Report

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

Although STS CC exercises due care and diligence in rendering services and preparing documents, STS CC accepts no liability and the client, by receiving this document, indemnifies STS CC and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from, or in connection with, services rendered, directly or indirectly by STS CC and by the use of the information contained in this document.

This report must not be altered or added to or used for any other purpose other than that for which it was produced without the prior written consent of the author(s). This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.



APPENDIX B: Legislative Requirements

THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996

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

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

Removal of the alien and weed species encountered in the application area must take place 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 ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) (NEMA)

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

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

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

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



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

Furthermore, a person may not carry out a restricted activity involving either:

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

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

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

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

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

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

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

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



NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT, 2003 (ACT NO. 57 OF 2003) AS AMENDED⁷ (NEMPAA)

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

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

According to the department of Department of Forestry, Fisheries and the Environment (DFFE) (previously the Department of Agriculture, Forestry and Fisheries (DAFF)) ©2019 website (<https://www.daff.gov.za/daffweb3/>):

“In terms of the National Forests Act of 1998 certain tree species (types of trees) can be identified and declared as protected. The Department of Water Affairs and Forestry followed an objective, scientific and participative process to arrive at the new list of protected tree species, enacted in 2004. All trees occurring in natural forests are also protected in terms of the Act. Protective actions take place within the framework of the Act as well as national policy and guidelines. Trees are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilisation.”

Applicable sections of the NFA pertaining to the proposed project include the below:

Section 12:

Declaration of trees as protected

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

Section 15(1):

No person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence granted by the Minister

⁷ Amendments to the NEMPAA:

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



or in terms of an exemption from the provisions of this subsection published by the Minister in the Gazette.

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

TRANSVAAL NATURE CONSERVATION ORDINANCE, 1983 (ORDINANCE NO. 12 OF 1983) (TNCO)

This Ordinance will be repealed in as far as it relates to the North West Province when the North West Biodiversity Management Act, 2017 comes into force.

Applicable Legislation and Guidelines used to Compile the Report

FAUNA AND FLORA SCHEDULES IN THE ORDINANCE

- Schedule 2: Protected game
- Schedule 2A: Specially protected game
- Schedule 4: Protected wild animals
- Schedule 7: Invertebrata
- Schedule 11: Protected plants
- Schedule 12: Specially protected plants

Subject to the provisions of this Ordinance, no person shall pick a protected plant. Unless he is the holder of a permit which authorises him to do so. Subject to the provisions of this Ordinance, no person shall hunt protected game: Provided that upon the written application of the owner of land a permit may be issued. Any person who contravenes or fails to comply with subsection (1) shall be guilty of an offence.

CHAPTER VIII - ENDANGERED AND RARE SPECIES OF FAUNA AND FLORA [Section 97(1)]

Every species of fauna and flora referred to in -

- a. Appendix I;
- b. Appendix II: to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington DC 1973), as amended up to 6 June 1981, and any readily recognisable part or derivative thereof, shall be an endangered species or a rare species of fauna and flora respectively.

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



APPENDIX C: Impact Assessment Methodology

Ecological Impact Assessment Method as provided by the proponent

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE	Significance = consequence x probability	
Definition of CONSEQUENCE	Consequence is a function of intensity, spatial extent and duration	
Criteria for ranking of the INTENSITY of environmental impacts	VH	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	VL	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	VH	Very long, permanent, +20 years (Irreversible. Beyond closure)
Criteria for ranking the EXTENT of impacts	VL	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours
	H	Local area, extending far beyond site boundary.
	VH	Regional/National



PART B: DETERMINING CONSEQUENCE							
INTENSITY = VL							
DURATION	Very long	VH	Low	Low	Medium	Medium	High
	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High

VL	L	M	H	VH
A part of the site/ property	Whole site	Beyond the site, affecting neighbours	Extending far beyond site but localised	Regional/ National
EXTENT				

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (Of exposure to impacts)	Definite/ Continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Low	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VH
CONSEQUENCE							



PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	Decision guideline
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Insignificant	Inconsequential, not requiring any consideration.

*VH = very high, H = high, M= medium, L= low and VL= very low and + denotes a positive impact.

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 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, 2004 (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 Minerals and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) (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, including⁸:

- 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;
- **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 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;

⁸ Limpopo Province Environment Outlook. A Report on the State of the Environment, 2002. Chapter 4.



- **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 or 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.⁹

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

- Mitigation and performance improvement measures and actions that address the risks and impacts¹⁰ 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 where possible.
- 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 projects. These recommendations also include general management measures which apply to the proposed projects as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the projects from planning, through to construction and operation.

⁹ Provincial Guideline on Biodiversity Offsets, Western Cape, 2007.

¹⁰ Mitigation measures should address both positive and negative impacts



APPENDIX D: Vegetation Type

Marikana Thornveld (SVcb6)



Figure D1: SVcb6 Marikana Thornveld: *Vachellia nilotica*-dominated clay thornveld north of Pretoria (near Ga-Rankuwa, Gauteng) after fire, image (L. Mucina) taken from Mucina & Rutherford 2006, page 464

Remarks: Vegetation patterns on norite koppies are primarily determined by the amount of rockiness and aspect, warmer north-facing slopes and cooler south-facing slopes bearing floristically distinct vegetation. Several woody species, e.g., species of *Ficus*, are typical chasmophytes, penetrating the rocks with their roots (Van der Meulen 1979). The vegetation unit is transitional between xeric lowland bushveld and mesophyllous woodland in cooler more moist upland areas associated with the Magaliesberg and may be a more xeric phase of these upland areas (Van der Meulen 1979).

Table D1: Floristic species of *The Marikana Thornveld* (Mucina & Rutherford, 2006).

Dominant and typical floristic species	
Woody Layer	
Trees	<p>Small Trees: <i>Combretum molle</i> (d), <i>Croton gratissimus</i> (d), <i>Ficus abutilifolia</i> (d), <i>Pappea capensis</i> (d), <i>Senegalia caffra</i>, <i>Bridelia mollis</i>, <i>Combretum apiculatum</i>, <i>Cussonia paniculata</i>, <i>Dombeya rotundifolia</i>, <i>Faurea saligna</i>, <i>Ficus glumosa</i>, <i>Lannea discolor</i>, <i>Obetia tenax</i>, <i>Peltophorum africanum</i>, <i>Searsia leptodictya</i>, <i>Vangueria infausta</i>, <i>Ziziphus mucronata</i>.</p> <p>Succulent Trees: <i>Euphorbia cooperi</i>.</p> <p>Tall Trees: <i>Sclerocarya birrea</i> subsp. <i>caffra</i></p>
Shrubs	<p>Tall Shrubs: <i>Triaspis glaucophylla</i> (d), <i>Canthium gilfillanii</i>, <i>Clerodendrum glabrum</i>, <i>Diplorhynchus condylocarpon</i>, <i>Euclea natalensis</i>, <i>Grewia flavescens</i>, <i>Grewia monticola</i>, <i>Gymnosporia nemorosa</i>, <i>Gymnosporia polyacantha</i>, <i>Pavetta eylesii</i>, <i>Pouzolzia mixta</i>, <i>Psydrax livida</i>, <i>Vitex zeyheri</i>.</p> <p>Low Shrubs: <i>Jatropha latifolia</i> var. <i>latifolia</i> (d), <i>Abutilon austro-africanum</i>, <i>Hermannia floribunda</i>, <i>Hibiscus subreniformis</i>, <i>Searsia zeyheri</i>.</p> <p>Succulent Shrub: <i>Tetradenia brevispicata</i>.</p> <p>Semiparasitic Shrub: <i>Osyris lanceolata</i></p>
Woody Climbers	<p><i>Helinus integrifolius</i>, <i>Rhoicissus tridentata</i>, <i>Turraea obtusifolia</i>.</p> <p>Succulent Woody Climbers: <i>Cynanchum viminale</i>.</p>



Forb layer	
Herbs	<i>Hibiscus sidiformis</i> .
Geophytic Herbs	<i>Pellaea calomelanos</i> , <i>P. viridis</i> , <i>Scadoxus puniceus</i> .
Herbaceous Climber	<i>Cyphostemma lanigerum</i> .
Graminoid layer	
Graminoids	<i>Chrysopogon serrulatus</i> (d), <i>Setaria lindenberiana</i> (d), <i>Aristida congesta</i> , <i>Bulbostylis humilis</i> , <i>Eustachys paspaloides</i> , <i>Heteropogon contortus</i> , <i>Loudetia simplex</i> , <i>Melinis nerviglumis</i> , <i>Panicum maximum</i> , <i>Themeda triandra</i> .

*(d) is for dominant

Moot Plains Bushveld (SVcb8)



Figure D2: SVcb8 Moot Plains Bushveld: *Searsia lancea* and *Vachellia nilotica* dominate on flats at an altitude of 1 325 m at Hekpoort, west of Pretoria. Image (M. C. Rutherford) taken from Mucina & Rutherford 2006, page 456.

Table D2: Floristic species of *The Moot Plains Bushveld* (Mucina & Rutherford, 2006).

Dominant and typical floristic species	
Woody Layer	
Trees	Small Trees: <i>Vachellia nilotica</i> (d), <i>Vachellia tortilis</i> subsp. <i>heteracantha</i> (d), <i>Searsia lancea</i> (d).
Shrubs	Tall Shrubs: <i>Buddleja saligna</i> (d), <i>Euclea undulata</i> (d), <i>Olea europaea</i> subsp. <i>africana</i> (d), <i>Grewia occidentalis</i> , <i>Gymnosporia polyacantha</i> , <i>Mystroxyton aethiopicum</i> subsp. <i>burkeanum</i> .
	Low Shrubs: <i>Aptosimum elongatum</i> , <i>Felicia fascicularis</i> , <i>Lantana rugosa</i> , <i>Teucrium trifidum</i> .
	Succulent Shrub: <i>Kalanchoe paniculata</i> .
Woody Climbers	<i>Jasminum breviflorum</i>
Forb layer	
Herbs	<i>Achyroopsis avicularis</i> , <i>Corchorus asplenifolius</i> , <i>Evolvulus alsinoides</i> , <i>Helichrysum nudifolium</i> , <i>H. undulatum</i> , <i>Hermannia depressa</i> , <i>Osteospermum muricatum</i> , <i>Phyllanthus maderaspatensis</i>
Herbaceous Climber	<i>Lotononis bainesii</i> .
Graminoid layer	
Graminoids	<i>Heteropogon contortus</i> (d), <i>Setaria sphacelata</i> (d), <i>Themeda triandra</i> (d), <i>Aristida congesta</i> , <i>Chloris virgata</i> , <i>Cynodon dactylon</i> , <i>Sporobolus nitens</i> , <i>Tragus racemosus</i> .

*(d) is for dominant



APPENDIX E: Details, Expertise And Curriculum Vitae of Specialists

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

Samantha-Leigh Daniels	PhD Candidate Plant Science (University of Pretoria)
Christopher Hooton	BTech Nature Conservation (Tshwane University of Technology)
Christien Steyn	MSc Plant Science (University of Pretoria)
Nelanie Cloete	MSc Botany and Environmental Management (University of Johannesburg)
Stephen van Staden	MSc Environmental Management (University of Johannesburg)

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

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Nelanie Cloete		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	Nelanie@sasenvgroup.co.za		
Qualifications	MSc Environmental Management (University of Johannesburg) MSc Botany (University of Johannesburg) BSc (Hons) Botany (University of Johannesburg) BSc (Botany and Zoology) (Rand Afrikaans University)		
Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP) Member of the South African Association of Botanists (SAAB) Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group Member of the Grassland Society of South Africa (GSSA)		

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Christien Steyn		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Fax:	086 724 3132
Telephone:	011 616 7893		
E-mail:	christien@sasenvgroup.co.za		
Qualifications	MSc Plant Science (University of Pretoria) BSc (Hons) Plant Science (University of Pretoria) BSc (Environmental Science) (University of Pretoria)		
Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP) Member of the South African Association of Botanists (SAAB) Member of the Botanical Society of South Africa (BotSoc)		



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

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

I, Samantha-Leigh Daniels, declare that -

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



Signature of the Specialist

I, 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.



Specialist Signature



I, Christien Steyn, declare that -

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



Signature of the Specialist

I, Nelanie Cloete, declare that -

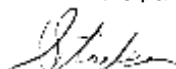
- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise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



Signature of the Specialist

I, Stephen van Staden, declare that -

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



Signature of the Specialist





**SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION**

CURRICULUM VITAE OF SAMANTHA-LEIGH DANIELS

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

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

EDUCATION

Qualifications

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

AREAS OF WORK EXPERIENCE

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

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Training

- Plant species identification
- Herbarium usage and protocols





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTOPHER HOOTON

PERSONAL DETAILS

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

EDUCATION

Qualifications

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

AREAS OF WORK EXPERIENCE

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

Africa - Zimbabwe, Sierra Leone

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Freshwater Assessments

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





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTIEN STEYN

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 127823/21)

Member of the Botanical Society of South Africa (BotSoc)

Member of the Grassland Society of South Africa (GSSA)

Member of the Land Rehabilitation Society of Southern Africa (LARSSA)

Member of the South African Association of Botanists (SAAB)

EDUCATION

Qualifications

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

Short courses and Training

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

AREAS OF WORK EXPERIENCE

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

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF NELANIE CLOETE

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

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

EDUCATION

Qualifications

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

Short Courses

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

AREAS OF WORK EXPERIENCE

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

Africa - Democratic Republic of the Congo (DRC)

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Freshwater Assessments

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

Legislative Requirements, Processes and Assessments

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





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF **STEPHEN VAN STADEN**

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

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

EDUCATION

Qualifications

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

Short Courses

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

AREAS OF WORK EXPERIENCE

South Africa – All Provinces

Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia

Eastern Africa – Tanzania Mauritius

West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona

Central Africa – Democratic Republic of the Congo

DEVELOPMENT SECTORS OF EXPERIENCE

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

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

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



Freshwater Assessments

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

Aquatic Ecological Assessment and Water Quality Studies

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

Biodiversity Assessments

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

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Hydropedological Assessment

Visual Impact Assessment

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



APPENDIX F: Interested & Affected Parties (I&AP’S) Comments & Responses

Stakeholder	Date & method of communication	Comments	Response	
<p>Kelebogile Mekgoe Rustenburg Local Municipality</p>	<p>Via email on the 17th of June 2022</p>	<p>With regard to the aforementioned, the Unit: Integrated Environmental Management acknowledges receipt of Scoping Report for the proposed additional waste rock storage project. Tharisa Minerals (Pty) Ltd is an opencast mining operation that produces chrome and platinum group metal (PGMs) concentrates. Mining is undertaken in two mining sections, namely the East Mine and West Mining, using the conventional open pit truck and shovel methods. The mine has been operational since 2008. The opencast mine is located on farms 342 JQ.</p> <p>This nature of the pits at Tharisa is such that there is continually more waste rock generated than capacity available in the worked-out areas of the pits and the balance must be dumped on surface WRDs. Additional waste rock handling and storage capacity is therefore required to accommodate the waste rock from the open pit operations. As part of its on-going mine planning, Tharisa has identified the need for additional WRD storage on site.</p> <p>The following activities are proposed:</p> <ul style="list-style-type: none"> • The expansion of the existing and approved Far West WRD 1 by footprint of 109 ha. The expanded area will be referred to as the West Above Ground (OG) WRD. Portions of the West OG WRD will be located on backfilled areas of the West Pit; and • The establishment of a waste rock dump (referred to as the East OG WRD) on backfilled portions of the East Pit. The proposed East OG WRD will cover an area of approximately 71 ha. <p>The proposed activities will occur within the approved mining rights area of Tharisa Minerals. The Mining right area</p>	<p>The soil, land use and land capability specialist confirmed that this project is regarded as being of low impact significance due to the inherent soil constraints of the area and the severe disturbance of the majority of the soils on site. However, mitigation measures and recommendations outlined in specialist study must be implemented in efforts to conserve soil resources in the post mining landscape.</p> <p>The recommendations provided in your letter with specialist inputs will be included in the EMP of the draft EIR.</p> <p>It is noted that the background datasets indicate that the proposed activities do fall within areas indicated as Zone F (areas of high and significant biodiversity including critical CBAs and ESAs). However, upon assessment of the site it was evident that the current land use activities (i.e. mining) do not align with these desktop database outputs. As such, the impact of the proposed activities in the study area (i.e., immediate local area) are not anticipated to be detrimental as the areas in which the proposed WRDs are located are within existing transformed habitat. Only the Sterkstroom River, located outside of the proposed study area may be considered representative of a CBA, however as no mining activities as part of this application are planned within this locality.</p>	<p>Part B (Floral report), Section 3.3 and 5.3.3.</p>



		<p>has been extensively disturbed as a result of existing mining, community and private farming activities.</p> <p>The proposed project is listed in terms of National Environmental Management Act, NEMA, Act 107 of 1998), 07 April 2017, as amended. The prospecting right triggers listed activity, Listing Notice 1 (GNR 983 of 2014), Activity 12, 30, 34 and 48, Listing Notice 2 (GNR 984), Activity 6 and 15 and Listing Notice 3 (GNR 985 of 2014), Activity 12 as amended.</p> <p>The proposed activity is a waste management activity of which the Waste Management License (WML) is required in terms of the National Environmental Management: Waste Act, 59 of 2008 (NEM: WA) for waste activities in Category B (GNR 985 of 2014), Activity 12 as amended.</p> <p>The proposed activity is a waste management activity of which the Waste Management License (WML) is required in terms of the National Environmental Management: Waste Act, 59 of 2008 (NEM: WA) for waste activities in Category B (GNR 921 of 2013), Activity 7, 10, 11, as amended.</p> <p>According to the Bojanala Platinum District Municipality's Environmental Management Framework (BPDM EMF, June 2020), the site is situated in Zone A: Development Zone I, Zone C: Development Zone III, Zone D: Agriculture Zone, Zone E: Agriculture Zone II, Zone F: Biodiversity Zone and Zone G: Sensitive Topography.</p> <ul style="list-style-type: none"> i. Zone A: Development Zone I: 'Development Zone I' is a refinement of areas identified for future urban development in local municipal SDFs. These development uses include, amongst others, residential land uses, commercial land uses and land uses related to government functions, but specifically excludes industrial land uses and mining related land uses 		
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		<ul style="list-style-type: none"> ii. Zone C: Development Zone III: ‘Development Zone II (Industrial)’ is a refinement of areas identified for future industrial development in local municipal SDFs. iii. Zone D: Agriculture Zone I. The ‘Agriculture Zone’ represents existing high potential agricultural land in the area (i.e. cultivated fields) that should be preserved for crop production and other agricultural purposes. iv. Zone E: Agricultural Zone II. The “Agriculture Zone” represents areas deemed suitable for further agricultural development for both grazing and cultivation purposes. The land may also be utilised for other types of development. v. Zone F: The “Biodiversity Zone” represents areas of high and significant biodiversity in the Bojanala District Municipality. Areas of high biodiversity was identified from the North West Province Biodiversity Sector Plan and includes, among others, critical biodiversity areas (CBAs) and Ecological Support Areas (ESAs). vi. Zone G: “Sensitive Topography Zone” represents the sensitive topographical features, such as hills and ridges, which are deemed sensitive to development. <p>According to Zone A: Development Zone I, Zone C: Development Zone III, Zone D: Agriculture Zone I, Zone E: Agriculture Zone II, Zone F: Biodiversity Zone and Zone G: Sensitive Topography Zone, the land use listed above is compatible partially compatible and incompatible, as per the above-mentioned Zone, however, the proposed project will occur within the mining rights area of Tharisa Mine. The Unit: IEM will support the proposed development, however, the following recommendations must be taken into consideration.</p>		
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		<ol style="list-style-type: none"> 1. The mitigation measures and the recommendations contained in the Scoping Report compiled by SLR Consulting (Pty) Ltd for this activity must be implemented. 2. There is possibility of seepage from the waste rock dump (WRD) into surface and groundwater, which may contain elevated levels of chromium and other elements; therefore continuous water monitoring should be done on the existing and proposed waste rock dump (WRD). 3. Waste rock dump is susceptible to wind entrainment and can lead to some environmental impacts especially if there are sensitive receptors down wind (i.e. The school, Lapologang and Mmadithokwa community and the neighbouring farm owners). It is therefore recommended that proper rehabilitation measures be put in place (i.e. slopes well managed and the dust be minimised). 4. The stripped and stockpiled topsoil may be chemically altered due to storage, this can potentially alter nutrient levels in the soil and result in a loss of fertility, therefore proper management of topsoil must be ensured. 5. For the proposed Waste rock dump expansion, mitigation measures must be implemented to minimise health hazard and risk to Lapologang and Madithowa Village, and nearby landowners (i.e. noise, dust and ground vibration). 6. All plant species of conservation importance (i.e. <i>Sclerocarya birrea</i> subsp. <i>africana</i>) must be removed from demarcation area prior to construction commencing and must either be relocated outside of the construction area. 7. Any complaint from the public during the construction and operation of this project must be attended to by the person involved 		
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		<p>as soon as possible to the satisfaction of the parties concerned. A complaint register must be kept up to date and shall be produced upon request.</p> <p>8. As far as possible, employment opportunities should be given to the local skilled, semi-skilled and unskilled labour force during the construction and operation phases to stimulate the local and regional economy as per Social and Labour Plan.</p> <p>The applicant must be responsible for compliance with the provisions for duty of care and remediation of environmental damage in accordance with Section 28 of National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.</p>		
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