APPENDIX D: SPECIALIST REPORTS

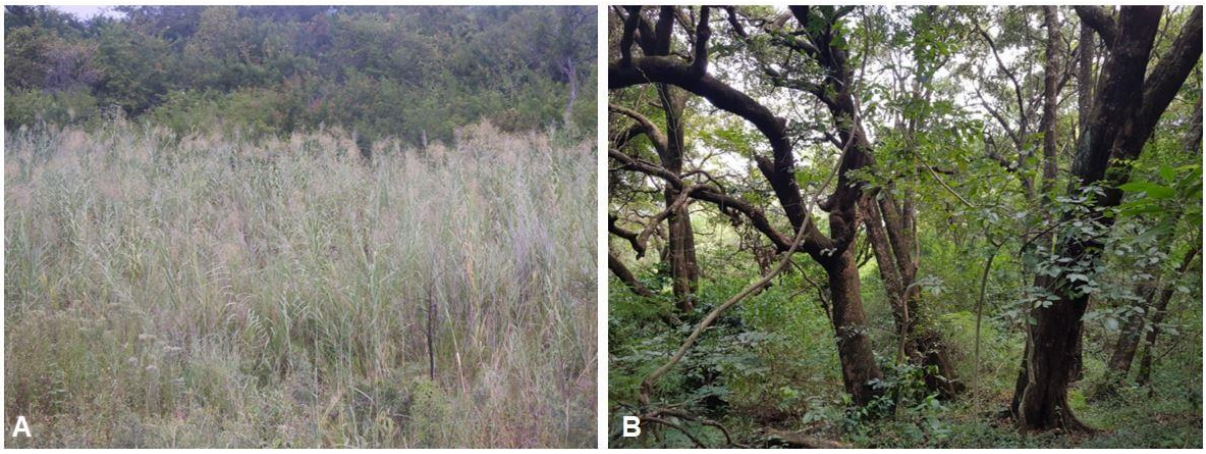
Annexure A: Wetland Delineation and Risk Assessment

BARBERTON VALLEY PLANTATIONS (PTY) LTD

PROPOSED AGRICULTURAL DEVELOPMENT AT UGUHLENI 698 JT

EIA Specialist Report: Aquatic Biodiversity Specialist Assessment

Field Survey: 14th March 2022
Draft Report V1.0: 27th April 2022



A) Valley Bottom Wetland without Channel on Uguhleni 698JT; B) Seepage Wetland on Uguhleni [14th March 2022].

Prepared for:

Steven Henwood
Henwood Environmental Solutions (Pty) Ltd
PO Box 12340
STEILTES
1213

Email: shenwood@mweb.co.za

Prepared by:

Rob Palmer
Nepid Consultants CC
P O Box 4349
WHITE RIVER
1240
SOUTH AFRICA

Cell: +27(0) 82 574 4486

Email: rob@nepid.co.za
Web: https//:nepid.co.za

Disclaimer

This report was based on the author's best scientific and professional knowledge and information available at the time of writing. Although Nepid Consultants has tried to ensure that all information contained within this report is accurate, Nepid does not warrant or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of the information presented in this report.

TERMS OF REFERENCE

Aquatic assessment for proposed clearance and related agriculture

[Email from Steven Henwood, 2021-10-25].

ACKNOWLEDGMENTS

The following are gratefully acknowledged for assisting with the information presented in this report:

- Duncan McKenzie, Ecorex Consulting Ecologists CC, Nelspruit.

DETAILS OF THE SPECIALIST

Name:	Rob Palmer
Qualifications:	PhD (Zoology)
Profession:	Biological Scientist (Pr. Sci. Nat. 400108/95) (Appendix A)
Speciality:	African rivers and wetlands. Accredited biomonitoring practitioner (Appendix B)
Experience:	30 years as an independent consulting ecologist (Appendix C)
Contact Details:	Cell: +27(0)82 574 4486; Email: rob@nepid.co.za

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ABBREVIATIONS

EIA	Environmental Impact Assessment
CBA	Critical Biodiversity Area
MTPA	Mpumalanga Tourism & Parks Agency
MNCA	Mpumalanga Nature Conservation Act
NFA	National Forest Act
PES	Present Ecological State
SANBI	South African National Botanical Institute

GLOSSARY OF TERMS

Buffer	*A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted to reduce the impact of adjacent land use on the wetland or riparian area. [DWAF 2008].*
Riparian Habitat	*the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.* [National Water Act (Act No. 36 of 1998)].
Watercourse	*a) a river or spring;* *b) a natural channel or depression in which water flows regularly or intermittently;* *c) a wetland, lake or dam into which, or from which, water flows; and* *d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse.* [National Water Act (Act No. 36 of 1998)].

1. INTRODUCTION

1.1 Background

Barberton Valley Plantations (Pty) Ltd is investigating the feasibility of clearing land for agricultural development on the farm Uguhleni 698 JT, near Barberton, Mpumalanga Province. The proposed development could impact negatively on aquatic ecosystems. This specialist report forms part of the environmental authorisation process for the proposed development. The report based on a review of available information and a field survey conducted by Nepid Consultants CC.

1.2 Project Description

The proposed development area concerns the production of macadamias on the farm Uguhleni 698 JT, which covers an area of 39.5 ha (Figure 1-1).

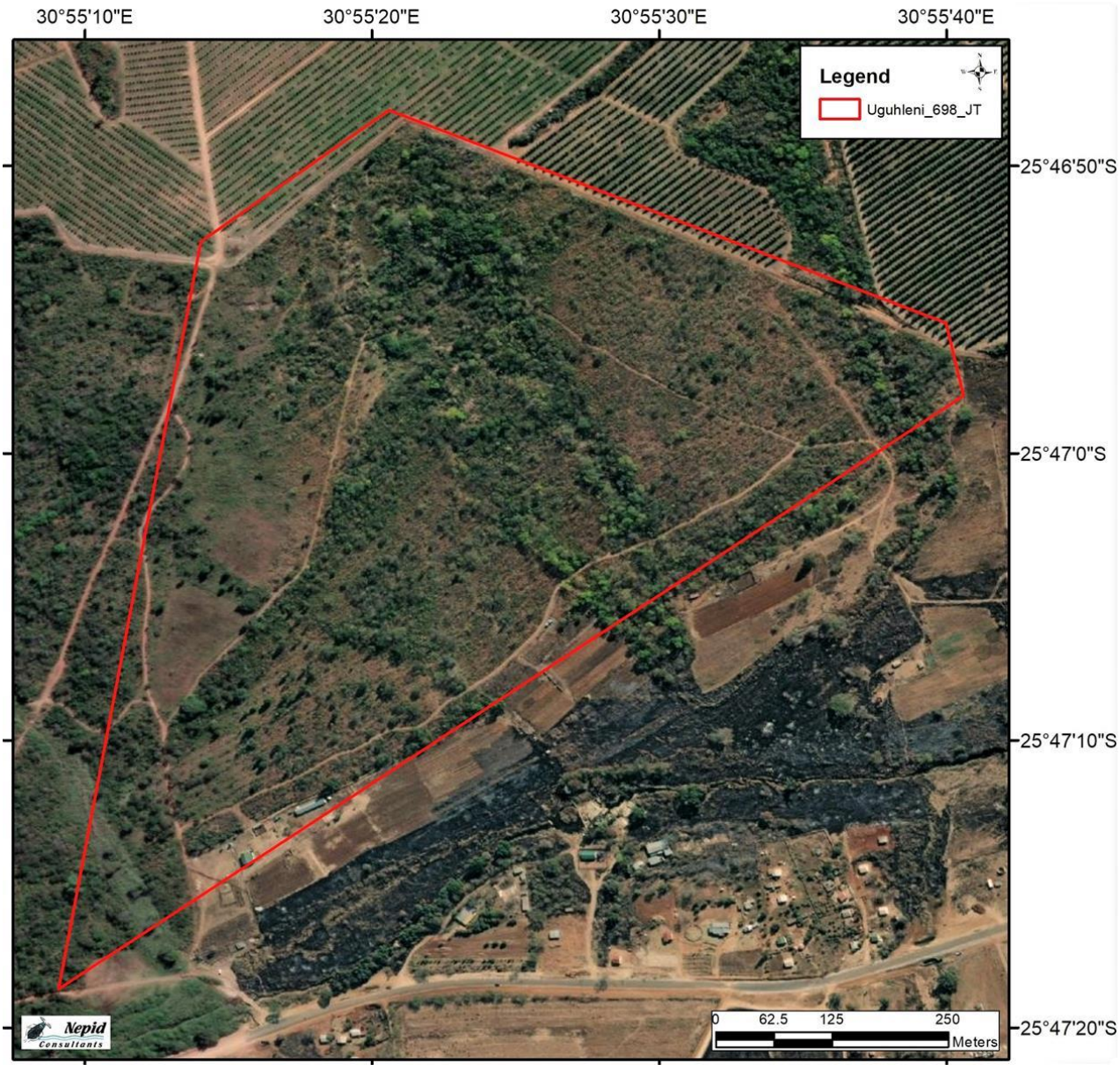


Figure 1-1. Proposed Development Area

[Source: Maxar Vivid Imagery 2020-07-19].

1.3 Legal Context

The proposed development triggers the following legislation with respect to potential impacts on aquatic ecosystems:

- **National Water Act, 1998 (Act No. 36 of 1998)**
  - Section 21c – impeding or diverting flow in a watercourse; and
  - Section 21i - altering the bed, banks, course or characteristics of a watercourse.

- **National Environmental Management Act, 1998 (Act No. 107 of 1998)**
  - Environmental Impact Assessment regulations of 2014, as amended; and
  - Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), when applying for Environmental Authorisation" ("the Protocols") (Government Notice No. 320 as published in Government Gazette No. 43110 on 20 March 2020).

1.4 Aims of This Report

The aims of this report were:

- **Baseline:** to describe the aquatic ecosystems that could be affected by the proposed development, against which the likely impacts can be evaluated, and future changes compared (i.e., to collect baseline data);

- **Risks:** assess the potential risks of the proposed development to aquatic ecosystems; and

- **Recommendations**: provide a reasoned opinion as to whether the proposed development should be authorised in terms of potential impacts on aquatic ecosystems; and to recommend appropriate mitigation, management and monitoring measures to minimise the detrimental impacts of the proposed development on aquatic ecosystems, and enhance positive impacts, where appropriate.

2. STUDY AREA

2.1 General

The proposed development is ~15 km west of Barberton, within the Mjindi Local Municipality, Ehlanzeni District, Mpumalanga Province (Figure 2-1). The Study Area for this report considered all aquatic ecosystems within 500 m of the proposed development, as required in terms of Government Notice 509 (26th August 2016). The Study Area for this report covered an area of ~240 hectares.

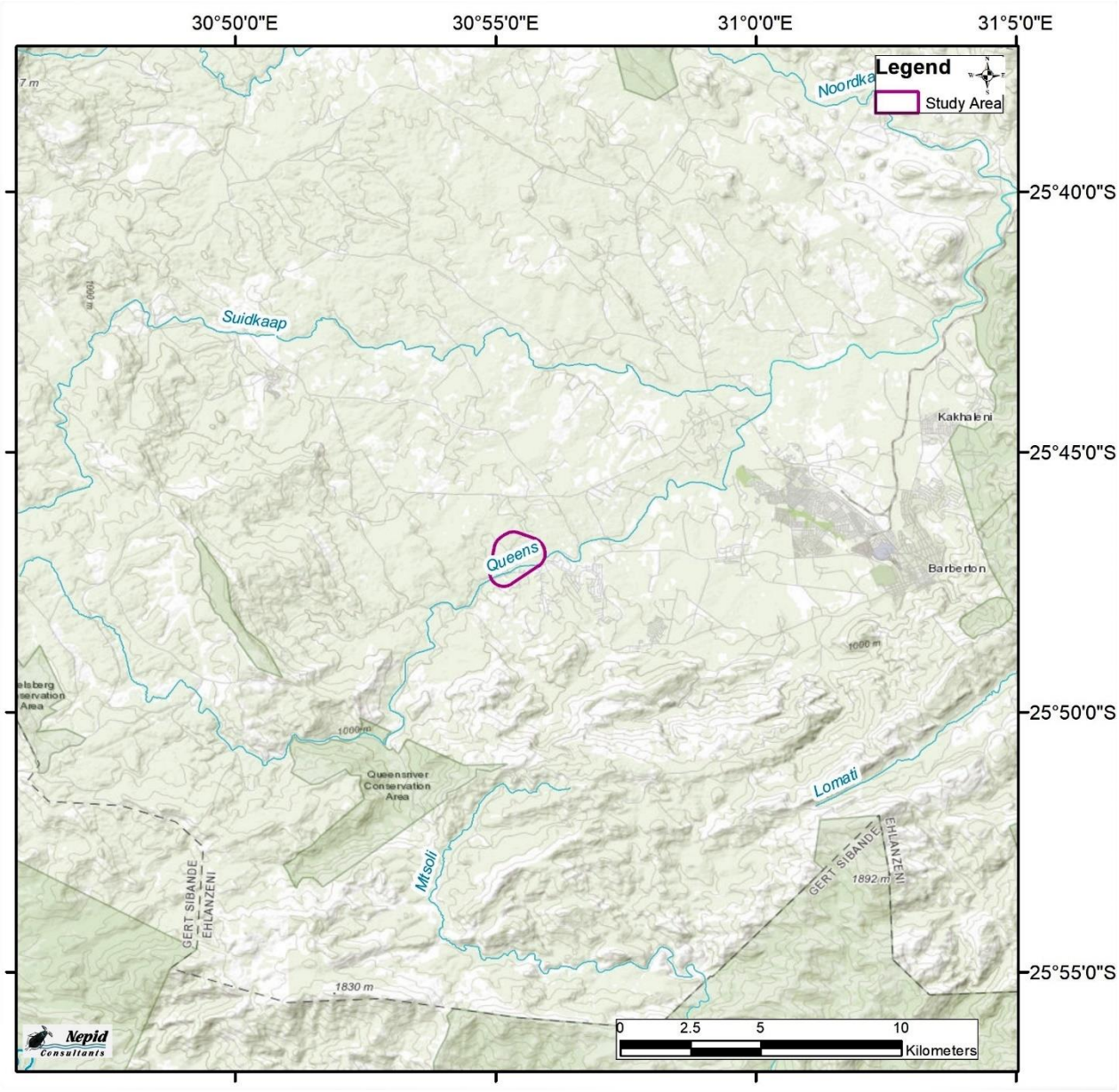


Figure 2-1. General Locality Map

2.2 Areas of Influence

The proposed development could impact on aquatic ecosystems in the following areas:

- **Direct Areas of Influence.** The proposed developments could impact directly on four watercourses, two of which start within Uguhleni 698 JT, and two of which run through Uguhleni 698 JT (Figure 2-2);
- **Indirect Areas of Influence.** The proposed development is ~100 m north of the Queens River at its nearest point, and as such could have indirect impacts on ~600 m of the Queens River, as well as three tributaries on the left bank, as shown in Figure 2-2. The Queens River within the Study Area falls within Reach X23E-0115.

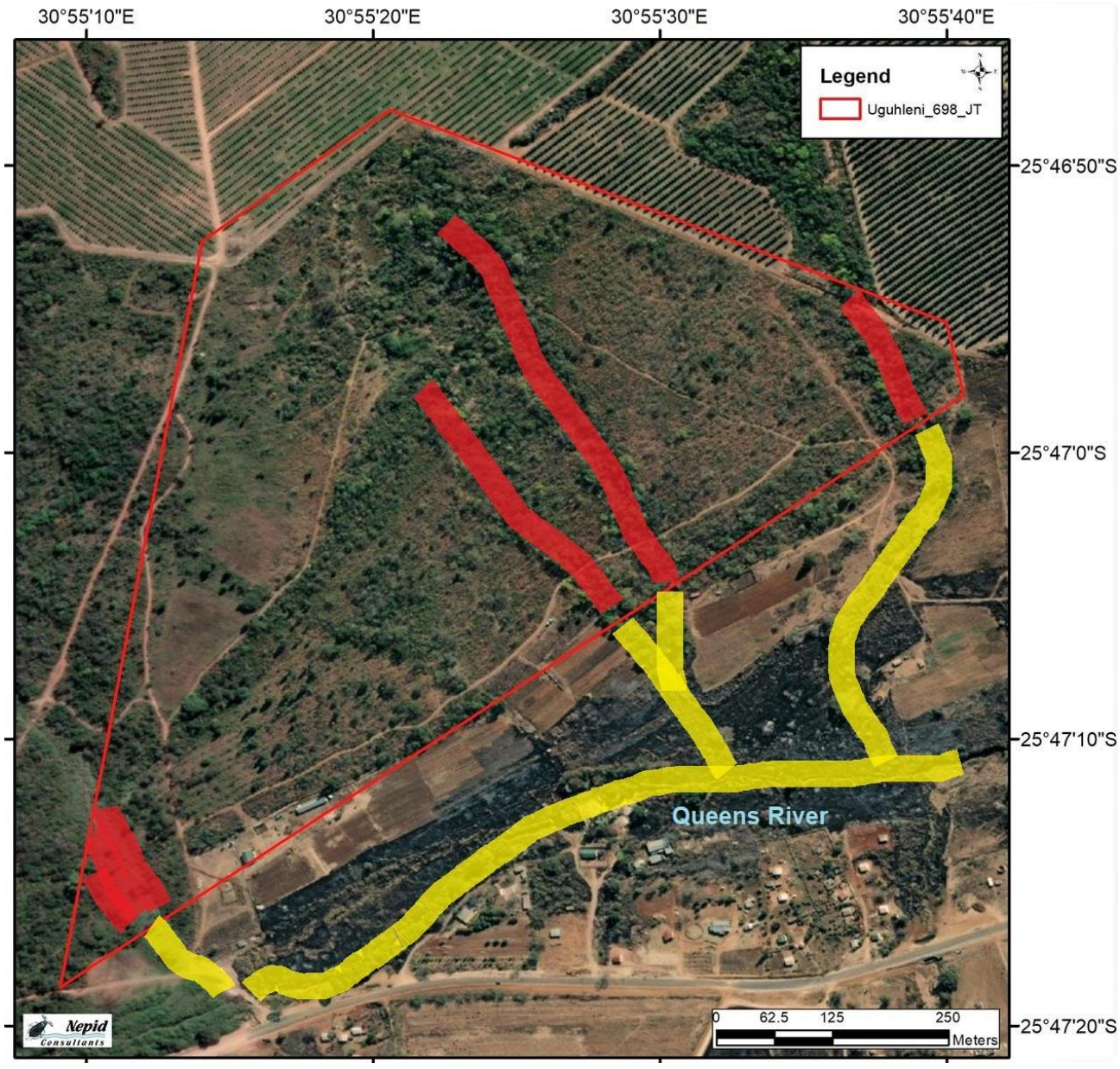


Figure 2-2. Areas of Potential Direct Influence (Red Highlights) and Indirect Influence (Yellow Highlights) on Aquatic Ecosystems

3. METHODS

3.1 Review

A review of available ecological data pertaining to the proposed development area revealed the following important sources of information:

- Terrestrial Biodiversity Specialist Assessment (Digital Earth 2022);
- Mpumalanga Biodiversity Sector Plan: Freshwater Assessment (MTPA 2011),
- Maxar Vivid imagery, dated 26th August 2020;
- Google Earth™ images (various dates); and
- Environmental Screening Tool (https://screening.environment.gov.za).

3.2 Field Survey

Date: 14rd March 2022
Duration: 4 hrs
Season: Autumn (wet)
Timing: The field survey was conducted following good summer rains, and many plants were in flower.
Data Quality: The quality of data presented in this report is considered to be appropriate for the purposes of this report.

3.3 Aquatic Ecosystem Classification

Aquatic ecosystems were classified according to hydrogeomorphic units, as described by Ollis *et al*. (2013).

3.4 Aquatic Ecosystem Delineation

Wetlands were delineated according to the method detailed by the Department of Water Affairs and Forestry (DWAF 2008). The method is based on a combination of plant species composition and soil features within 50 cm of the soil surface. A soil auger was used to locate the outer boundaries of the wetlands

3.5 Present Ecological State

3.5.1 Present Ecological State

The Present Ecological State of wetlands was assessed using the method developed by DWAF (1999). The method involves rating the extent to which various parameters appear to have changed from likely reference (natural) conditions on a numerical scale between 0 (*Critically Modified*) and 5 (*Natural*). The results were classified into one of six Present Ecological State categories, ranging from *Natural* (Category A), to *Critically Modified* (Category F) (Table 3-1).

Table 3-1. Classification of Present Ecological State.

Category	Ecological Condition	Impact	Average Score
A	*Natural*	None	>4
B	*Largely Natural*	Small	3-4
C	*Moderately Modified*	Moderate	2-3
D	*Largely Modified*	Large	1.5-2
E	*Seriously Modified*	Serious	0.9-1.5

F	*Critically Modified*	Critical	<0.9

3.6 Ecological, Functional and Social Importance

Ecological, Functional and Social Importance of aquatic ecosystems was assessed using a rapid method described by Rountree *et al.* (2012). The method involves rating various parameters on a numerical scale between 0 (*Zero)* and 4 (*Very High*).

3.7 Risk Assessment

Risks of the proposed development on aquatic ecosystems were assessed using the Department of Water Affairs and Sanitation Risk Assessment Matrix, dated September 2016. The method complies with General Authorisations for impeding or diverting the flow of water in a watercourse (National Water Act Section 21c), and/or altering the bed, banks, course or characteristics of a watercourse (National Water Act Section 21i) (DWA 2016).

3.8 Wetland Buffer Zones

Wetland buffer zones were based on assessment of various considerations including Present Ecological State, Ecological Importance and Sensitivity, potential risks, slope, vegetation cover, and soil permeability, *inter alia*, as detailed by Macfarlane *et al*. (2015).

3.9 Assumptions and Limitations

3.9.1 Report Focus

This report focusses on aquatic ecosystem classification, delineation, functional assessment and present ecological state, but does not address various aspects related to aquatic ecosystems, such as hydrology, water abstraction, hydraulics, aquatic macroinvertebrates, amphibians, reptiles, waterbirds or fish. The focus of the report is considered appropriate for the purposes of this report.

3.9.2 Level of Detail

This report was based on the following levels of detail:

- primary data were collected within the potential Direct Areas of Influence (i.e. within the proposed development area); and
- secondary data were used to describe ecological conditions within the Study Area, but beyond the potential Areas of Direct Impact. The level of detail presented is considered appropriate for the purposes of this report.

3.9.3 Spatial Resolution

The riparian and wetland boundaries are considered accurate to 5 m, as they were based on available Google Earth imagery and a standard, hand-held GPS. Higher resolution delineation would need more detailed assessment of soils, differential GPS and boundaries pegged in the field, but this is not considered necessary for the purposes of this report.

3.9.4 Temporal Resolution

The baseline data for this report was based on a once-off survey, so no information was available on temporal changes. However, a once-off field survey is considered adequate for the purposes of this report.

4. ECOLOGICAL CONTEXT

4.1 Aquatic Biodiversity Sensitivity

The National Environmental Screening Tool indicated that the aquatic biodiversity sensitivity within the potential Area of Influence on aquatic ecosystems was *Very High* (Figure 4-1). The very high sensitivity is attributed to the area falling within a **Strategic Water Source Area**.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Figure 4-1. Aquatic Biodiversity Theme Sensitivity.

[Source: Environmental Screening Tool (https://screening.environment.gov.za).]

4.2 Aquatic Species Identified by the Screening Tool

The Screening Tool did not list any sensitive aquatic species as potentially occurring in the Study Area. However, two sensitive terrestrial plant species were listed as potentially occurring in the Study Area:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Macledium zeyheri subsp. thyrsiflorum
Medium	Sensitive species 575

4.3 Geology

Geology within the Study Area comprises **Kaap Valley Granite** of the Swazian Era, with acidic and intermediate dolerite intrusions.

4.4 Soils

Soils within the Study Area are classified as **Chromic Cambisols** according to the World Reference Base (Jones *et al.* 2013). Chromic Cambisols are described as "*moderately developed soil with a redish hue*" (Jones *et al.* 2012). Soils in the Study Area are considered to have a moderate risk of erosion (Schulze and Horan 2006).

4.5 Aquatic Ecoregion

The Study Area is located within the **North Eastern Highlands** Level I Aquatic Ecoregion (*sensu* Kleynhans *et al.* 2005). This ecoregion is described as a hot and dry region characterised by plains with a low to moderate relief, and vegetation consisting mostly of Lowveld Bushveld types.

4.6 Aquatic Ecosystem Threat Status

The Queens River within the Study Area is classified as a National Freshwater Fish Support Area and Fish Sanctuary (Nel *et al.* 2011). The threatened fish species expected within the Study Area is *Labeobarbus nelspruitensis*. This species is classified regionally and globally as **Near Threatened** (http://speciesstatus.sanbi.org/assessment/).

4.7 Aquatic Ecosystem National Priority Status

The National Aquatic Ecosystem Priority status of the Queens River within Reach X23E-0115 was rated at a desktop level by the Department of Water Affairs and Sanitation as follows (DWS 2014):

- Ecological Importance: **High**
- Ecological Sensitivity: **Very High**

4.8 Present Ecological State

The Present Ecological State of the Queens River within the Study Area was rated based on desktop information by the Department of Water Affairs and Sanitation in 2012 as *Moderately Modified* (Category C) (DWS 2014). A survey of the Crocodile River Catchment in 2013 came to the same conclusion but based in limited information as the survey was conducted when the river was in flood such that macroinvertebrates could not be sampled, and only two species of fish was collected out of 22 species expected for the reach (Roux *et al*. 2013). A subsequent survey was conducted at Hilversum in September 2018, and seven species of fish was recorded (Gerhard Diedericks pers. comm.).

4.9 Strategic Water Source Areas

The Study Area is located within a **Strategic Water Source Area** (*sensu* Proserve 2011). These are areas that contribute at least 50% of Mpumalanga's runoff in only 10.2% of surface area (www.bgis.sanbi.org). These areas are recognised as ecologically important.

4.10 Terrestrial Vegetation

The Study Area is located in a terrestrial vegetation type classified as **Legogote Sour Bushveld** (SVI 9). This vegetation type had a conservation status of *Endangered* (Mucina and Rutherford 2006), but this was later changed to *Vulnerable* (Notice 1002 of Government Gazette 34809, 9 December 2011).

4.11 Drainage

The proposed development straddles Quaternary Catchments X23E and X23F, in the middle reaches of the Queens River Catchment, Nkomati Water Management Area (Figure 4-2). The proposed development area slopes in a south-eastern direction towards the Queens River at an average gradient of ~0.100, which is classified as **Strongly Sloping**.

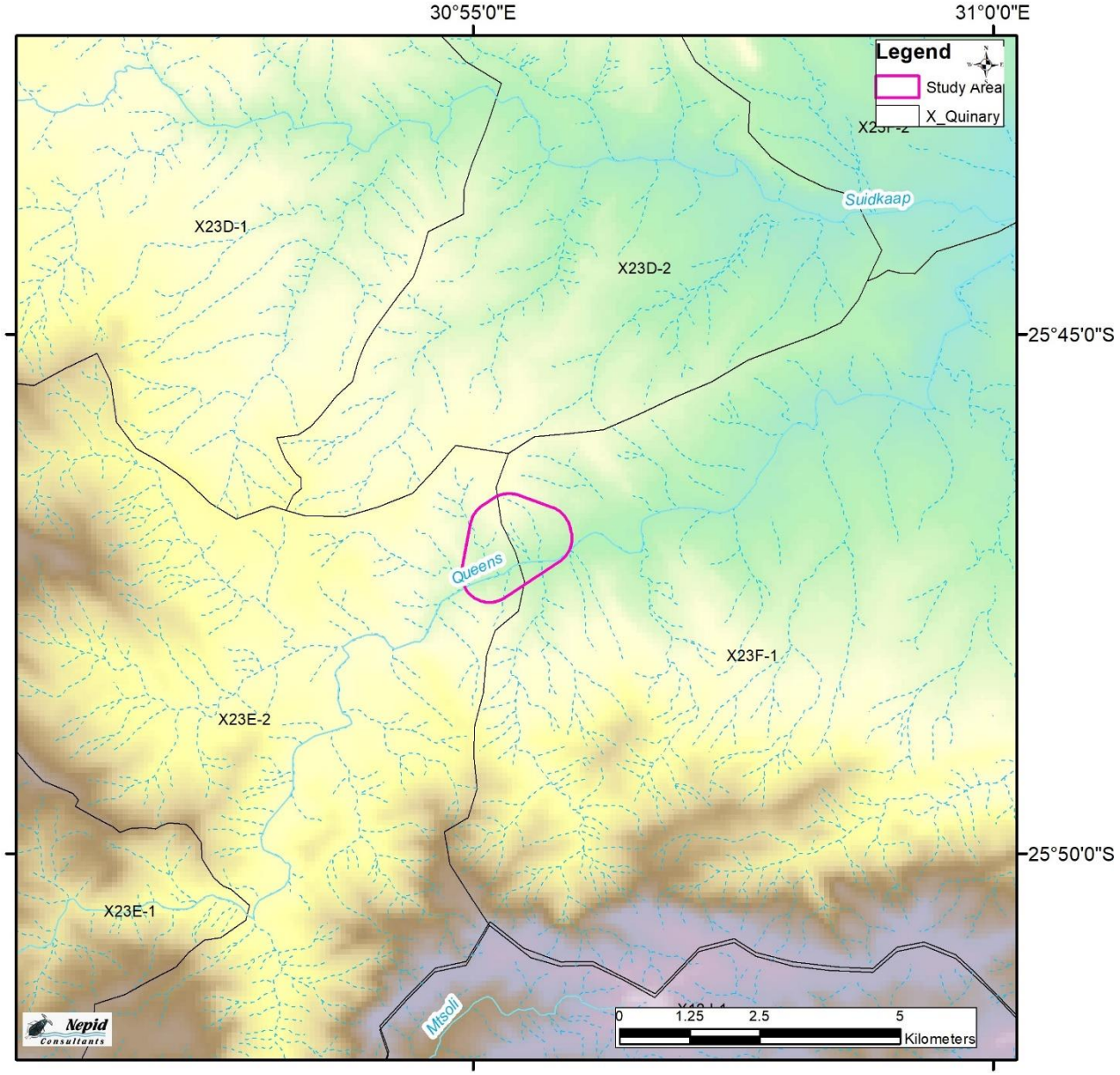


Figure 4-2. Quaternary Catchments

4.12 Aquatic Ecosystem Provincial Priority Status

The Mpumalanga Biodiversity Sector Plan classifies the proposed development area as mostly "*Ecological Support Area: Important Subcatchments*" (Figure 4-3). Ecological Support Areas are defined as "*Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services. In the terrestrial assessment they support landscape connectivity and strengthen resilience to climate change. ESAs need to be maintained in at least a functional and often natural state, supporting the purpose for which they were identified*." (MTPA, 2011).

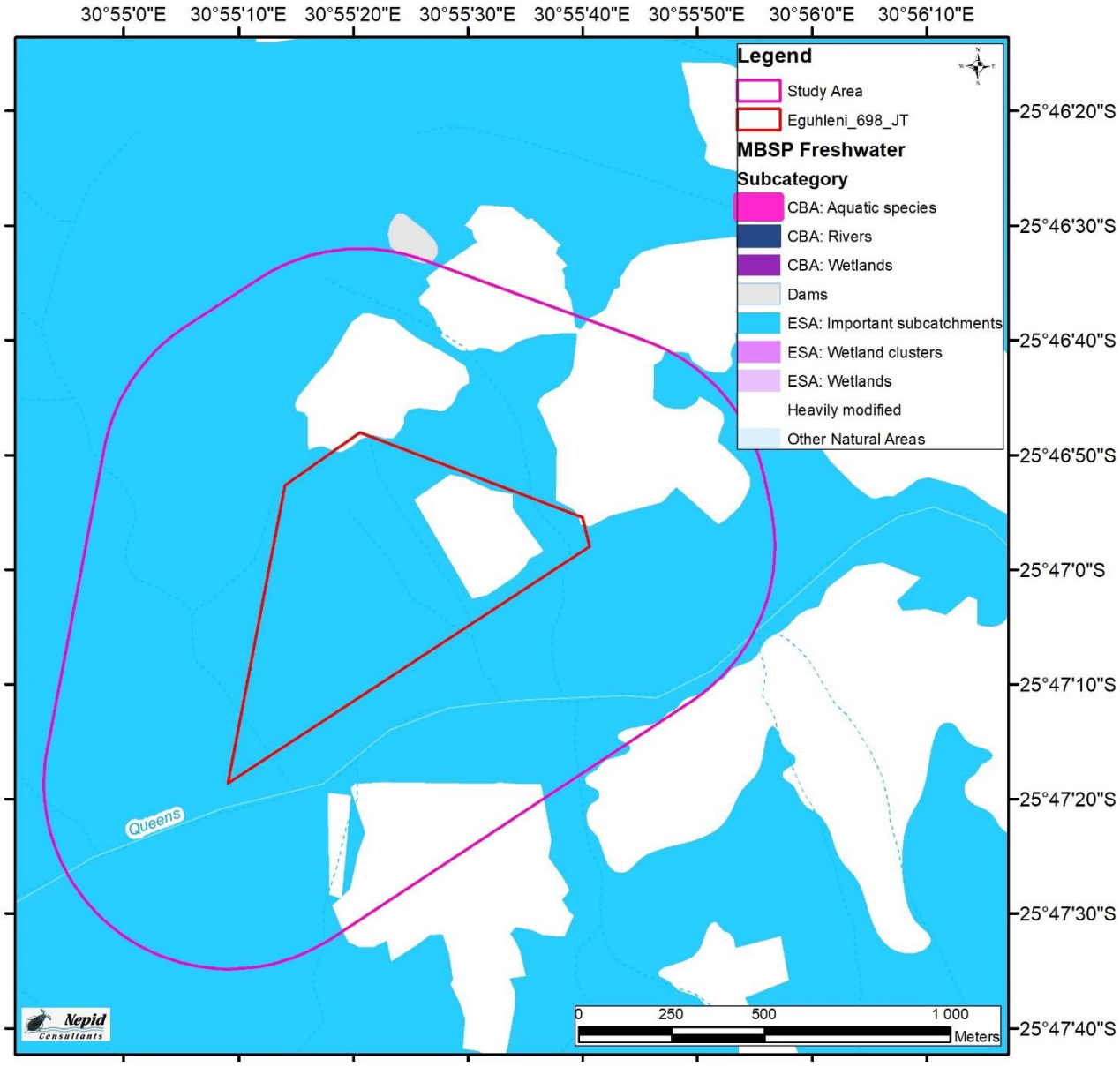


Figure 4-3. Mpumalanga Biodiversity Sector Plan

[Source: MTPA 2011].

4.13 Land Use

Examination of historical aerial images shows that most of the proposed development area had been cultivated in the past. In March 2022 the area was fallow and land use appeared to be restricted to cattle grazing. Infrastructure on the property at this time comprised farm tracks and an abandoned farm homestead. The surrounding land use comprised mostly orchards, and rural homesteads to the south.

5. BASELINE ASSESSMENT

5.1 Aquatic Ecosystems Delineation

The delineation of aquatic ecosystems within the Study Area is shown in Figure 5-1.

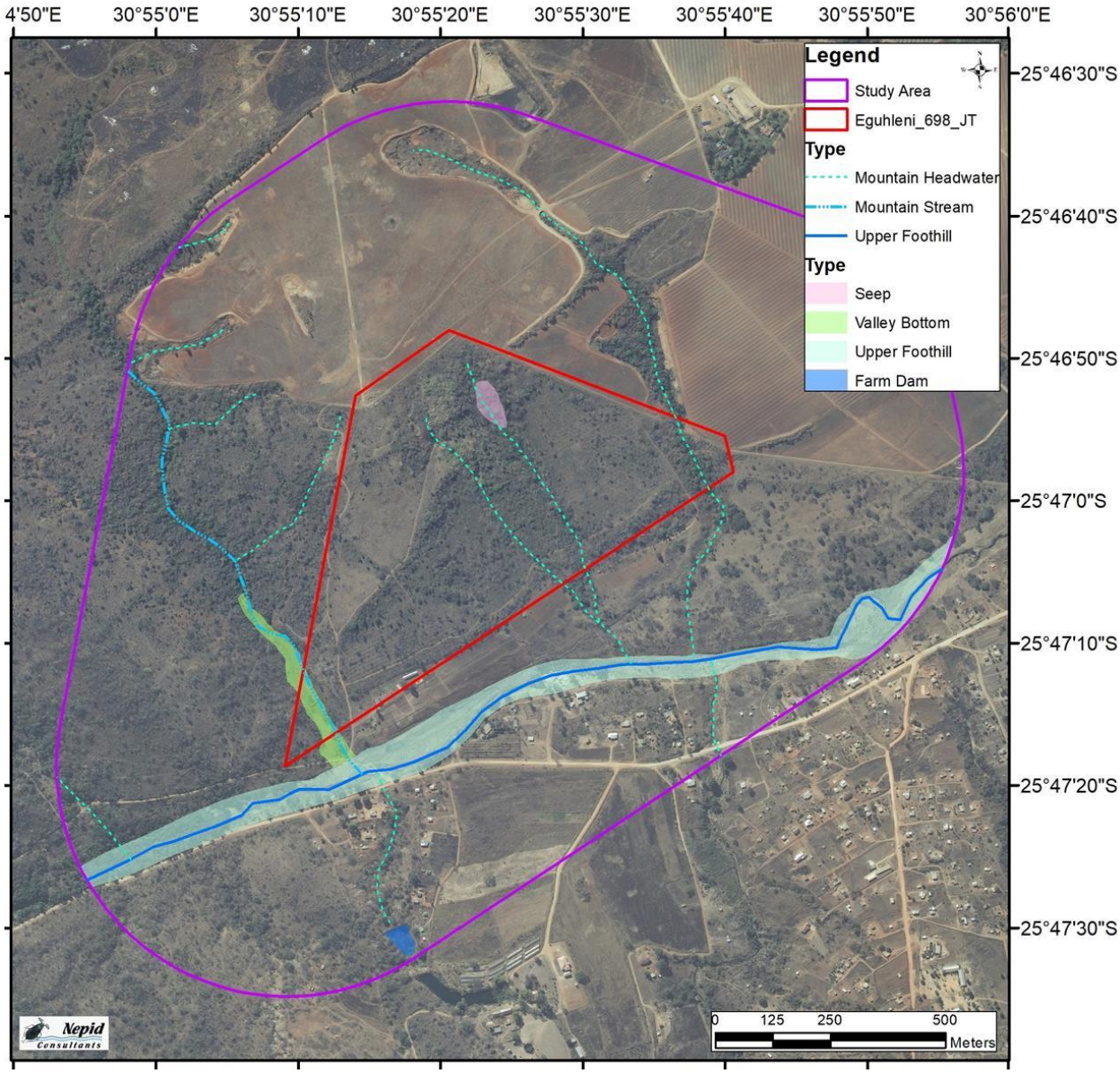


Figure 5-1. Delineation of Aquatic Ecosystems within the Study Area

5.2 Aquatic Ecosystem Types

Five hydro-geomorphic aquatic ecosystem types were identified within the Study Area as follows:

Type: **"Mountain Headwater" Drainage Lines**

Description: Three drainage lines with gradients equivalent to "Mountain Headwaters" were identified within the Study Area (Figure 5-2). These drainage lines flowed in a south-easterly direction to join the Queens River. Their combined length within the potential Area of Influence was ~1.5 km, of which ~900 m was within the potential Direct Area of Influence (i.e. within the proposed development area), and ~600 m was within the potential Indirect Area of Influence (i.e. between the proposed development area and the Queens River) (Figure 2-2).

Hydrology: Ephemeral.

Soils: Soils along the drainage lines comprised coarse sands, but these were not assessed in further detail for the purposes of this report.

Flora: Vegetation along these drainage lines was classified as ***Jaracanda mimosifolia – Hippobromus pauciflorus*** **Riparian Thicket** (Digital Earth 2022). A list of plant species recorded during the field survey in March 2022 is included in Appendix E.

Figure 5-2. Photographs of "Mountain Headwater" Drainage Lines

Type: **"Mountain Stream" Drainage Line**

Description: One drainage line with a gradient equivalent to a "Mountain Stream" was identified within the Study Area (Figure 5-1). This drainage line was upstream of the proposed development area and outside of the potential Area of Direct or Indirect Influence, and so it was not considered further for the purposes of this report.

Type: **Upper Foothills**

Description: The Queens River within the Study Area is classified as an Upper Foothill. The river here comprises a single channel ~3 m wide and a riparian zone of between ~20 and 60 m width on either side of the channel. The river will not be impacted directly by the prosed development, but about 600 m of the river could be indirectly impacted by the proposed development. The river was not considered in further detail for the purposes of this report.

Type: **Unchannelled Valley Bottom Wetland**

Description: The south-western corner of the proposed development area contained one Unchannelled Valley Bottom Wetland (Figure 5-3). The portion of this wetland that could be impacted by the proposed development covered an area of ~0.8 ha, of which ~0,5 ha was within the potential Direct Area of Influence (i.e. within the proposed development area), and ~0.3 ha was within the potential Indirect Area of Influence (i.e. between the proposed development area and the Queens River) (Figure 2-2).

Hydrology: Seasonal flow but with permanent saturation of soils.

Soils: The upper portion of this wetland was covered in recent deposits of course sand (Figure 5-3). However, below this layer of sand, as well as further downstream within the wetland, the soils comprised **Katspruit Soil Formation**, indicative of permanent saturation (Figure 5-4).

Flora This wetland was characterised by the reed ***Phragmites mauritianus*.** A list of plant species recorded in this wetland during the field survey in March 2022 is included in Appendix E.

Figure 5-3. Photographs of Unchannelled Valley Bottom Wetland

a) **b)**

Figure 5-4. Photographs of Wetland Soils

[Katspruit Soil Formation: a) black topsoil indicating high organic content, and dark reddish brown subsoil (5YR 2/5/2); b) greenish black gley within high clay content without mottling (b), indicative of permanent saturation].

Type: **Seepage Wetland**

Description: One Seepage Wetland was located in the northern portion of the proposed development area (Figure 5-4). This wetland within was ~100 m long and ~40 m wide and covered an area of 0.4 ha. This wetland flowed into a steep ephemeral "Mountain Headwater" drainage line.

Hydrology: Seasonal flow but with permanent saturation of soils.

Soils: Soils in this wetland were not sampled but are presumed to be similar to the those in the Valley Bottom Wetland, described above.

Flora Vegetation in this wetland was classified as ***Bridelia micrantha – Syzygium cordatum*** **Riparian Forest** (Digital Earth 2022). This wetland was characterised by large trees and herbaceous understory. Tree species included *Celtis africana*, *Ficus sur, F. sycomorus* and *Syzygium guineense*. Shrubs included *Coffea arabica, Diospyros whyteana* and *Halleria lucida.* Ferns included *Christella dentata* and *Pteris catoptera.* A list of plant species recorded during the field survey in March 2022 is included in Appendix E.

Figure 5-5. Photographs of Seepage Wetland

5.3 Aquatic Habitats

"Mountain Headwater" Drainage Lines

There were no aquatic habitats in "Mountain Headwater" Drainage Lines as flows were too ephemeral to support obligate aquatic species.

Upper Foothills

Instream habitats in the Queens River comprised pools, including artificial pools created by weirs, interspersed by rapids. The channel was bordered by dense stands of *Phragmites* reeds. Riparian habitats were largely degraded, but there were scattered trees remaining in what is likely to have been a former riparian forest.

Unchannelled Valley Bottom Wetland

Aquatic habitats in the Unchannelled Valley Bottom Wetland comprised seasonally inundated shallow wetland on permanently saturated clays with a moderate diversity of wetland plants, comprising mostly reeds, grasses and sedges.

Seepage Wetland

Aquatic habitats in the Seepage Wetland comprised what appeared to be permanent shallow pools and seepage zones. The vegetation comprised large trees with a high diversity of obligate wetland plants.

5.4 Migration Patterns

The drainage lines are potentially of local importance as an ecological corridors. The Queens River is an important corridor for migration of fish, but there were no fish recorded or expected within the proposed development area.

5.5 Reference Ecological State

Reference conditions of aquatic ecosystems investigated for this report are unknown, but an aerial image taken in 1961 gives some idea of likely reference conditions (Figure 5-6). The photograph shows the drainage lines that run through the proposed development. The most notable feature of the area and associated drainage lines is that woody vegetation was largely absent. Cultivation was present on either side of the Queens River, and again, woody vegetation appears to have been largely absent.

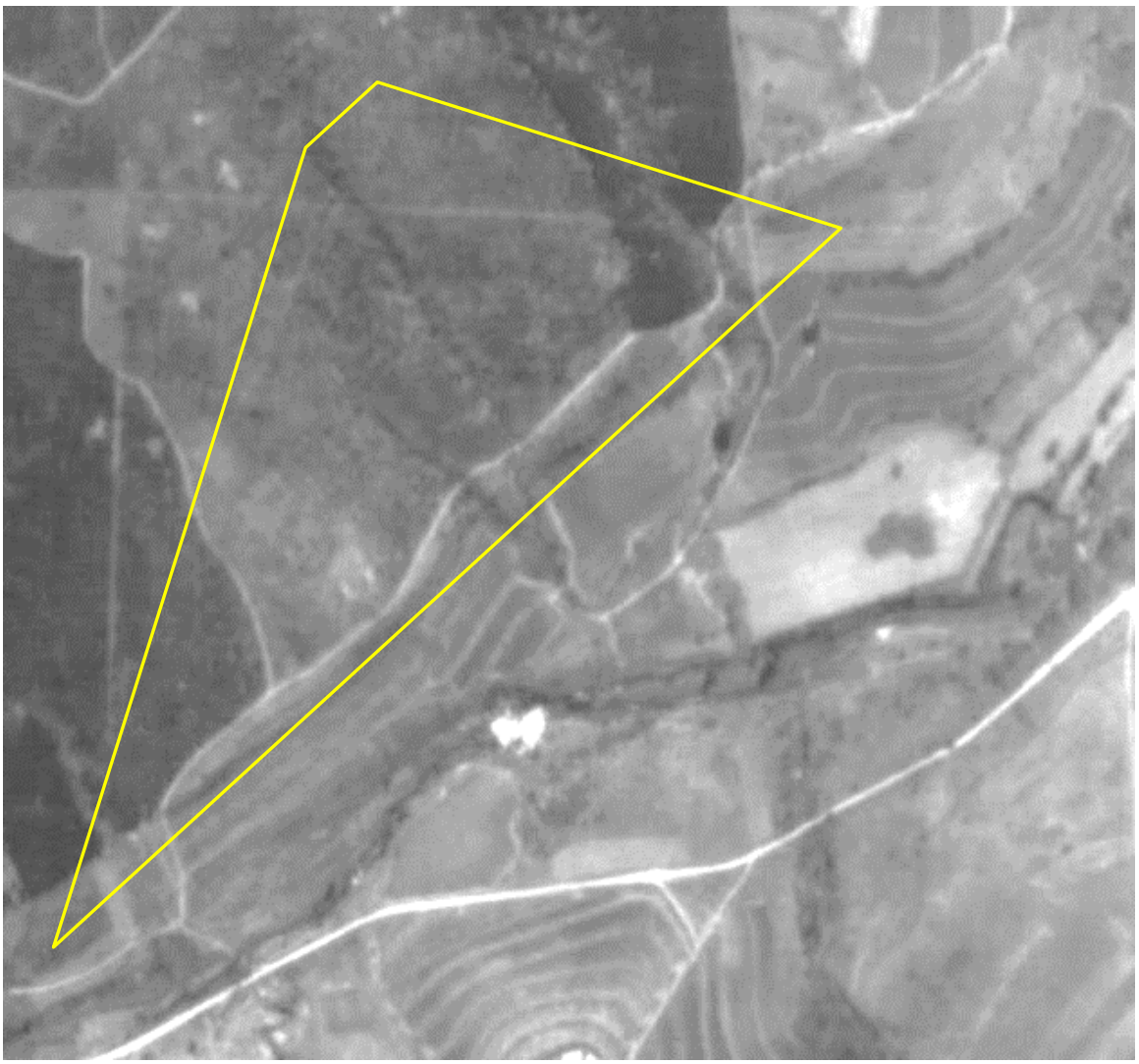


Figure 5-6. Aerial Photograph of the Proposed Development Area in 1961

[Source: Chief Surveyor-General].

5.6 Present Ecological State

"Mountain Headwater" Drainage Line

The Present Ecological State of the "Mountain Headwater" Drainage Lines within the Study Area in March 2022 was rated as **Category D** (Table 5-1). The main cause of ecological degradation was attributed to vegetation removal and encroachment of alien woody vegetation associated with historical cultivation. A total of 17 species of alien plants was recorded, equivalent to 24% of the total number of plant species recorded in the drainage line. Alien species included *Bidens pilosa, Catharanthus roseus, Chromolaena odorata, Desmodium uncinatum, Duranta erecta, Euphorba heterophylla, Lantana camara, Melia azedarach, Morus alba, Pinus sp., Psidium guajava, Solanum aculeatissima, S. delagoense, Solanum mauritianum* and *Tagetes minuta.* The magnitude of high flows is likely to have increased compared to natural conditions because of clearing of natural vegetation, while low flows are likely to have decreased because of the increase in alien vegetation, particularly the Bamboo *Bambusa glaucescens*, which was abundant in the catchment.

Upper Foothill

The Present Ecological State of the Queens River was not assessed for this study, but a previous survey conducted in 2013 concluded that this section of the Queens River was in a **Category C** (Roux *et al.* 2013). The main issues of concern at the time were forestry, subsistence farming and mining (Roux *et al.* 2013). In February 2019 the gravel road running on the southern bank of the

Queens River was under construction, and construction activities encroached into the riparian zone, with permanent negative local impacts on the Queens River (pers. obs.).

Unchannelled Valley Bottom Wetland

The Present Ecological State of the Unchannelled Valley Bottom Wetland in March 2022 was rated as **Category D** (Table 5-1). The main cause of ecological degradation was attributed to deposition of sediments associated with cultivation in the catchment. The wetland was also impacted by road crossings and cattle grazing. The diversity and abundance of alien plant species was high. A total of 32 species of alien plants was recorded, equivalent to 35% of the total number of plant species recorded in the wetland. Alien plant species included *Bianceae decapetala, Desmodium incanum, D. uncinatum, Lantana camara, Cyperus cyperoides, Lactuca serriola, Parthenium hysterophus, Ricinus communis, Paspalum urvillei, Paspalum distichum* and *Verbena bonariensis.*

Seepage Wetland

The Present Ecological State of the Seepage Wetland d Valley Bottom Wetland in March 2022 was rated as **Category C** (Table 5-1). The main cause of ecological degradation was attributed to alien vegetation and a notable increase in woody vegetation compared to 1961. The reason for the increase in woody vegetation is not known for certain but could be associated with reduced frequency of fires. The diversity and abundance of alien plant species was high. A total of 18 species of alien plants was recorded, equivalent to 29% of the total number of plant species recorded in the wetland. Alien plant species included *Alpina zerumbet, Achyranthes aspera aspera, Aristochlia littolaris, Bidens pilosa, Chromolaena odorata* and *Jacaranda mimosifolia.*

.

Table 5-1. Habitat Integrity Assessment: March 2022.

	Criteria	"Mountain Headwater" Drainage Lines	Unchannelled Valley Bottom Wetland	Seepage Wedtland
1	Flow Modification	2	2	4
2	Inundation	5	5	5
3	Water Quality Modification	3	3	4
4	Sediment Load Modification	3	1	4
5	Channel Modification	3	2	3
6	Topographical Alteration	4	3	4
7	Terrestrial Encroachment	2	3	3
8	Vegetation Removal	1	3	4
9	Alien Vegetation	2	1	2
10	Alien Fauna	5	5	5
	Mean	**3.0**	**2.8**	**3.8**
	%	**60%**	**56%**	**76%**
	Present Ecological State	**D**	**D**	**C**

Reference: (Duthie 1999)

5.7 Ecological and Functional Importance

Ecological Importance

Ecological Importance of aquatic ecosystems within the Study Area was rated as ***Moderate*** for all three types of aquatic ecosystem that were assessed. Details of the assessment are presented in Appendix F and summarised in Figure 5-7. The Seepage Wetland was rated as the most important of the three, mainly because of the habitat provided by large trees and the confirmed presence of four species of conservation concern. Two species of tree recorded in the Seepage Wetland are protected in terms of the National Forest Act, namely *Breonadia salicina* and *Pterocarpus angolensis.* Two species of plant recorded in the Seepage Wetland are protected in terms of Mpumalanga Nature Conservation Act, namely: *Adenia gummifera and Scadoxus puniceus.* Regional context was rated as *Very High* for all three types because the Study Area is located within a Strategic Water Source Area, which are considered highly sensitive. The Incomati chiselmouth *Labeobarbus nelspruitensis,* which is classified by the IUCN as *Near-Threatened*, occurs in the in the Queens River within the Study Area, but there are no known red data aquatic species within the likely project footprint.

Functional Importance

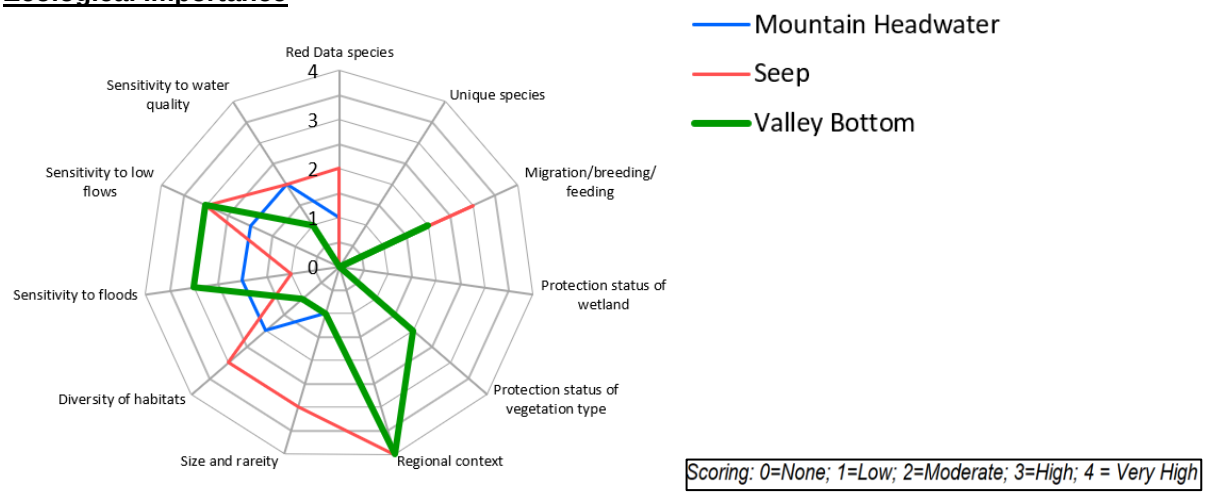
Functional Importance of the "Mountain Headwater" Drailane Lines was rated as ***Low***, while that of the Seepage Wetland and the Unchanneled Valley Bottom Wetland was rated as **Moderate** (Appendix F). The most important ecological functions of the "Mountain Headwater" Drainage Lines is erosion control and carbon storage, while that of the Unchannelled Valley Bottom Wetland is sediment trapping, followed by flood attenuation. Nutrient and toxin assimilation by the valley bottom wetland is likely to be limited because of seasonal flows and small size of this wetland.

Direct Human benefits

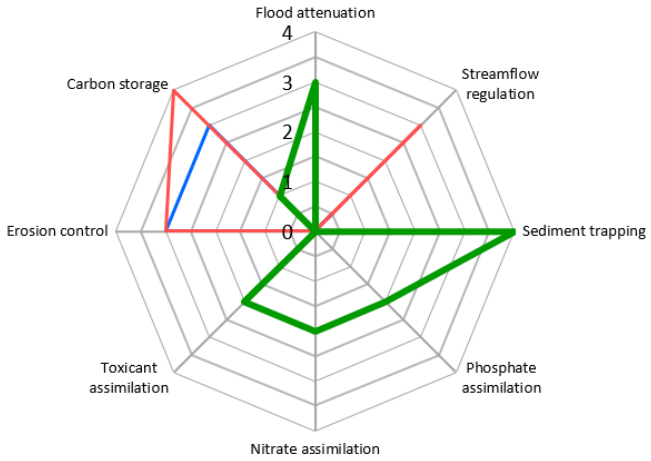
Direct Human Benefits were rated as ***Very Low*** for all three types of aquatic ecosystem that were assessed. There was no evidence of subsistence cultivation. The wetlands provide grazing for cattle, and the Seepage Wetland may also provide harvestable resources in the form of medicinal plants. The importance of cultural heritage, tourism, recreation, education and research are unknown, but unlikely to be important.

(Figure 5-7).

Ecological Importance



Functional Importance



Direct Human Benefits (Subsistence)

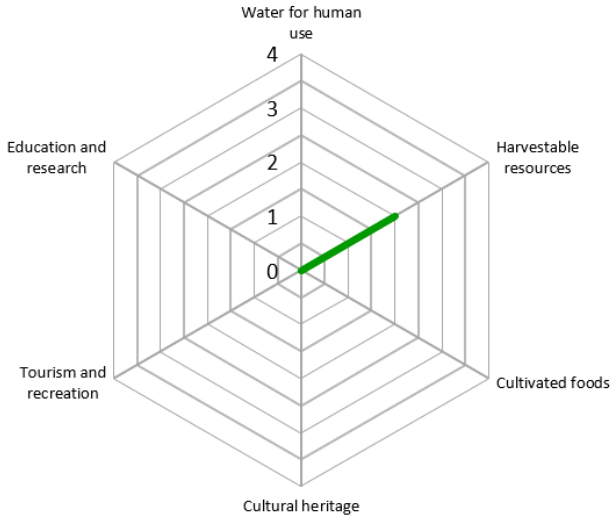


Figure 5-7. Ecological and Functional Importance.

6. IMPACTS

This section summarises the key risks of the proposed development to aquatic ecosystems. Detailed scoring of the risk assessment is included in Appendix G.

Construction Phase

6.1 Impact of Bulk Earthworks on Aquatic Habitats

In the absence of mitigation, bulk earthworks during construction would impact directly on 0.5 ha of Unchannelled Valley Bottom Wetland; 0.4 ha of Seepage Wetland; and 900 m of episodically active "Mountain Headwater" Drainage Lines. These direct impacts can be avoided, and potential indirect impacts can be minimised, by ensuring that no development takes place within 30 m from the two wetlands within the proposed development area, and within 15 m of the episodic "Mountain Headwater" Drainage Line, as shown in Figure 7-1. The severity of the potential residual impacts on the flow regime, water quality, aquatic habitats and aquatic biota are expected to be minimal, so these aspects were rated as "1". The spatial scale of the residual direct impacts will be avoided, while the spatial scale of residual indirect impacts are likely to be localised, so spatial scale was rated as "1". Potential residual impacts of bulk earthworks on aquatic ecosystem are likely continue for the duration of operation, so duration was rated as "4". The frequency of activity is once-off, so this was rated as "1". The probability that the proposed development will impact negatively on aquatic habitats is unknown but unlikely, so frequency was rated as "2". The extent of potential impacts on aquatic habitats will be easily observed, and so detection was rated as "1". The overall significance score is 54, which is marginally within the "Moderate" risk category, but the method allows for a score of 54 to be classified as "Low" if the specialist considers the risks to be low. The overall risk of the re-aligned development on wetland and riparian habitat is rated with high confidence, as **Low.**

6.2 Impact of Bulk Earthworks on Sediment Runoff and Deposition

Bulk earthworks during construction is likely to have indirect impacts on surface water quality and aquatic habitats because of runoff and deposition sediments from the development areas into the receiving watercourses. The proposed development is therefore expected to increase turbidity and bed load in the receiving watercourses during storm events. The severity of this impact on water quality and aquatic habitats was rated as "2". Elevated sediments are unlikely to affect the flow regime, and no taxa that are sensitive to elevated turbidity were recorded or expected in the Area of Influence, so the severity the flow regime and biota were rated as "1". The spatial scale of this impact could extend beyond the proposed site but not beyond the boundary of the Study Area, so spatial scale was rated "2". Sediment transport is expected to decline once the orchards become established, but deposition of sediments observed in the stream and Valley Bottom Wetland in February 2019 show that bulk earthworks associated with bush clearing and agricultural development can have long-term ecological consequences. The duration of this impact was therefore rated as "2". Bulk earthworks is a once-ff event, so the frequency of activity was rated as "1". The probability that sediment deposition will impact negatively on aquatic ecosystems is unknown but unlikely, so frequency was rated as "2". The extent of direct impacts will be moderately easy to observe, so detection was rated as "2". The overall risk of the re-aligned development on sediment runoff and deposition is rated with high confidence, as **Low.**

6.3 Impact of Bulk Earthworks on Alien Invasive Vegetation

Disturbance of soil caused by bulk earthworks during construction is likely to create conditions suitable for further proliferation of alien invasive vegetation. The proposed development site and surrounding aquatic ecosystems are heavily infested with alien vegetation because of historical agricultural development. Further proliferation can be managed by implementing a programme to control the spread of alien invasive vegetation. The severity of this potential impact on the flow regime, water quality, habitat and biota were therefore rated as "1". The spatial scale of this impact could extend beyond the proposed site but not beyond the boundary of the Study Area, so spatial scale was rated "2". Potential impacts of bulk earthworks on the spread of alien vegetation are likely to be long-term, so duration was rated as "4". Bulk earthworks is a once-off activity, so frequency of activity was rated as "1". The probability that further spread of alien vegetation will impact measurably on aquatic ecosystems is unknown but unlikely, so frequency was rated as "2". Alien vegetation is easily observed, so detection was rated as "1". The overall risk of the re-aligned development on further spread of alien invasive vegetation is rated with high confidence, as **Low.**

Operational Phase

6.4 Impact of Agricultural Production on Surface Water Quality

Agricultural return flows and drift of foliar application of fertilizer and pesticides during operation could impact negatively on surface water quality in receiving watercourses, and this increases the risks of eutrophication and associated algal blooms. Aquatic biota inhabiting nearby aquatic ecosystems are likely to be tolerant of water quality deterioration, so the risks to aquatic biota are likely to be low. The severity of the potential impact on water quality is unknown but potentially harmful, so this aspect was rated as "2". The severity of the potential impacts on the flow regime, aquatic habitats and biota are likely to be insignificant or unmeasurable, so these were rated as "1". The spatial extent of water quality deterioration may extend to neighbouring properties, so this aspect was rated as "2". Potential impacts on water quality will continue for as long as the development is operational, and for this reason duration was rated as "4". The probability that the proposed re-aligned fields will impact negatively on surface water quality is unknown but highly unlikely, so frequency was rated as "2". Potential impacts on surface water quality will be easily observed, and so detection was rated as "1". The overall significance score is 65, which is marginally within the "Moderate" risk category, but the method allows for a score of 65 to be classified as "Low" if the specialist considers the risks to be low. The overall risk of the re-aligned development on surface water quality is rated with low confidence, as **Low.**

6.5 Impact of Erosion

The magnitude of stormwater runoff is likely to increase because of increased hardened surfaces and increased road network associated with access roads. Increased stormwater runoff increases the risks of erosion, particularly along "Mountain Headwater" Drainage Lines, so the severity of elevated stormwater runoff on the flow regime and aquatic habitats were rated as "2". Elevated stormwater runoff is unlikely to impact measurably on surface water quality or biota, so these aspects were rated as "2". The spatial extent of erosion risks is expected to be localised, so this aspect was rated as "1". Potential impacts of stormwater runoff will continue for as long as the development is operational, so duration was rated as "4". The probability that the proposed re-aligned fields will impact negatively on stormwater runoff is low, so frequency was rated as "1". Erosion is easily observed, and so detection was rated as "1". The overall significance score is 52, which is marginally within the "Moderate" risk category, but the method allows for a score of 52 to be classified as "Low" if the specialist considers the risks to be low. The overall risk of the re-aligned development on erosion is rated with low confidence, as **Low.**

6.6 Cumulative Impacts on Aquatic Ecosystems

The most likely developments in the vicinity of Uguhleni in the near future is further clearing of vegetation for cultivation. This is certain to increase water demands and also likely to increase

sediment runoff into receiving watercourses. The road network is likely to increase with future development in the area and this is likely to increase conveyance and drainage rates, and this is likely to increase the magnitude of stormwater peaks and flood peaks, and this could have detrimental impacts on stream bank stability and infrastructure such as stream crossings (i.e. culverts, causeways and bridges). The severity of the cumulative impacts on the flow regime and water quality were therefore rated as "2". The severity of cumulative impacts on aquatic habitats and biota are low, so these were rated as "1". The spatial scale of cumulative impacts extends could extend to surrounding properties, so this aspect was rated as "2". Sediment runoff is expected to decline once orchards are established, and then the biggest threat to the watercourse is likely to be associated with runoff and aerial drift of pesticides, herbicides and fertilisers. The cumulative impacts on water quality may therefore be significant, and this highlights the need for terrestrial vegetation buffer zones to protect seepage wetlands from runoff from surrounding orchards. Cumulative impacts are likely to continue for the duration of operation, so duration was rated as "4". The proposed development is a once-off activity, so frequency was rated as "1". The probability that the proposed re-aligned fields will have measurable cumulative impacts is low, so frequency was rated as "1". Cumulative impacts are hard to measure, so detection was rated as "3". The overall significance score is 75, which is well within the "Moderate" risk category, but the method allows for a score of 75 to be classified as "Low" if the specialist considers the risks to be low. The cumulative impacts of the proposed re-aligned development on aquatic ecosystems is rated with low confidence, as **Low.**

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7. RECOMMENDATIONS

7.1 Authorisation

Authorisation of the proposed agricultural development in relation to potential impacts on aquatic ecosystems is recommended provided that the mitigation measures recommended in this report are followed. This recommendation is based on the following considerations:

- **Aquatic Habitats.** The proposed development could impact directly and negatively on aquatic habitats in three types of aquatic ecosystem, but these impacts can be avoided entirely by implementing buffer zones;
- **Present Ecological State.** The Present Ecological State of aquatic ecosystems within the potential Area of Influence in March 2022 was mostly degraded because of historical cultivation. The proposed upgrade is not expected to alter the Present Ecological State of aquatic ecosystems;
- **Ecological Importance and Sensitivity.** The proposed development is located in an area where the Ecological Importance and Sensitivity of aquatic ecosystems is low. Furthermore, the proposed development is not expected to impact measurably on any threatened aquatic species;
- **Unique or Important Ecological Features**. The proposed development will not impact any unique or important aquatic ecological features;
- **Ecological Connectivity.** The proposed development could impact local migration corridors, but this impact can be avoided by implementing buffer zones;
- **Hydrological Functions.** The proposed development will impact local hydraulic conditions, and this may impact on hydrological functions in terms of elevated magnitude of stormwater, but any such impacts are likely to be localised and can be managed by developing and implementing a Stormwater Management Plan;
- **Sediment Transport.** The proposed development is expected to alter sediment transport, particularly during initial bush clearing and bulk earthworks. However, the potential impacts on sediment transport are likely to be localised and can be managed by developing and implementing a Stormwater Management Plan;
- **Water Quality.** Water quality deterioration associated with the proposed development is the main potential issue of concern with respect to potential impacts on aquatic ecosystems during operation. While of concern, these can be monitored and managed;
- **Water Users and Uses**. The proposed development could impact other water users because of abstraction, but use is expected to be within the legal water use allocations. The proposed development is not expected to impact on other water uses;
- **Key Ecosystem Services.** The proposed development is not expected to impact negatively on ecosystem services.

7.2 Mitigation

Mitigation measures proposed to avoid or reduce potential impacts on biodiversity and aquatic ecosystems are the following:

Planning Phase

- **Aquatic Buffer Zones.** Aquatic buffer zones of no development apart from access roads that cross drainage lines are recommended. Access roads must be routed to minimise crossings of drainage lines. The following aquatic buffer zones are recommended (Figure 7-1):

    - **15 m** on either side of all episodic "Mountain Headwater" Drainage Lines. The aim of this buffer zone is to minimise the risks of erosion.

    - **30 m** from the outer edge of the Unchanneled Valley Bottom Wetland and Seepage Wetland (forest patch). The aim of the buffer zone is to maintain the ecological integrity and functioning of these wetlands by avoiding direct impacts and minimizing indirect impacts that could be associated with the proposed development. A buffer zone of 30 m is recommended for these wetlands because:

        - the slope of the surrounding topography is steep and sufficient to generate significant surface runoff during storm events, so a wide buffer zone around these areas is appropriate;
        - the Seepage Wetland constitutes what appears to be a permanent spring, and as such, a wide buffer zone is appropriate;
        - both of these wetlands remain functionally intact and provide important ecological goods and services, including biodiversity support, grazing for cattle, and nutrient assimilation, so a wide buffer is appropriate so as to protect these services; and
        - vegetation cover in and around the wetlands is generally sparse, and this is likely to be more so after fire, so a wide buffer zone is appropriate.

- **Stormwater Management Plan.** A Stormwater Management Plan must be developed for the proposed development and the associated access roads. The design of the stormwater system must aim to reduce risks of sediment transport and water quality deterioration by:

    - stormwater runoff must be managed to avoid elevated peak flows from impacting on watercourses. High water velocity greatly increases the erosion risk so drains that convey such water should contain energy brakes, such as lining with stones, concrete, grass or gabions to reduce the water velocity and therefore erosion;
    - use of multiple smaller discharges rather than a few large discharges;
    - appropriate diversion of stormwater runoff from existing and proposed access to avoid siltation of watercourses; and
    - retention ponds, where appropriate, to reduce the magnitude of stormwater flows;

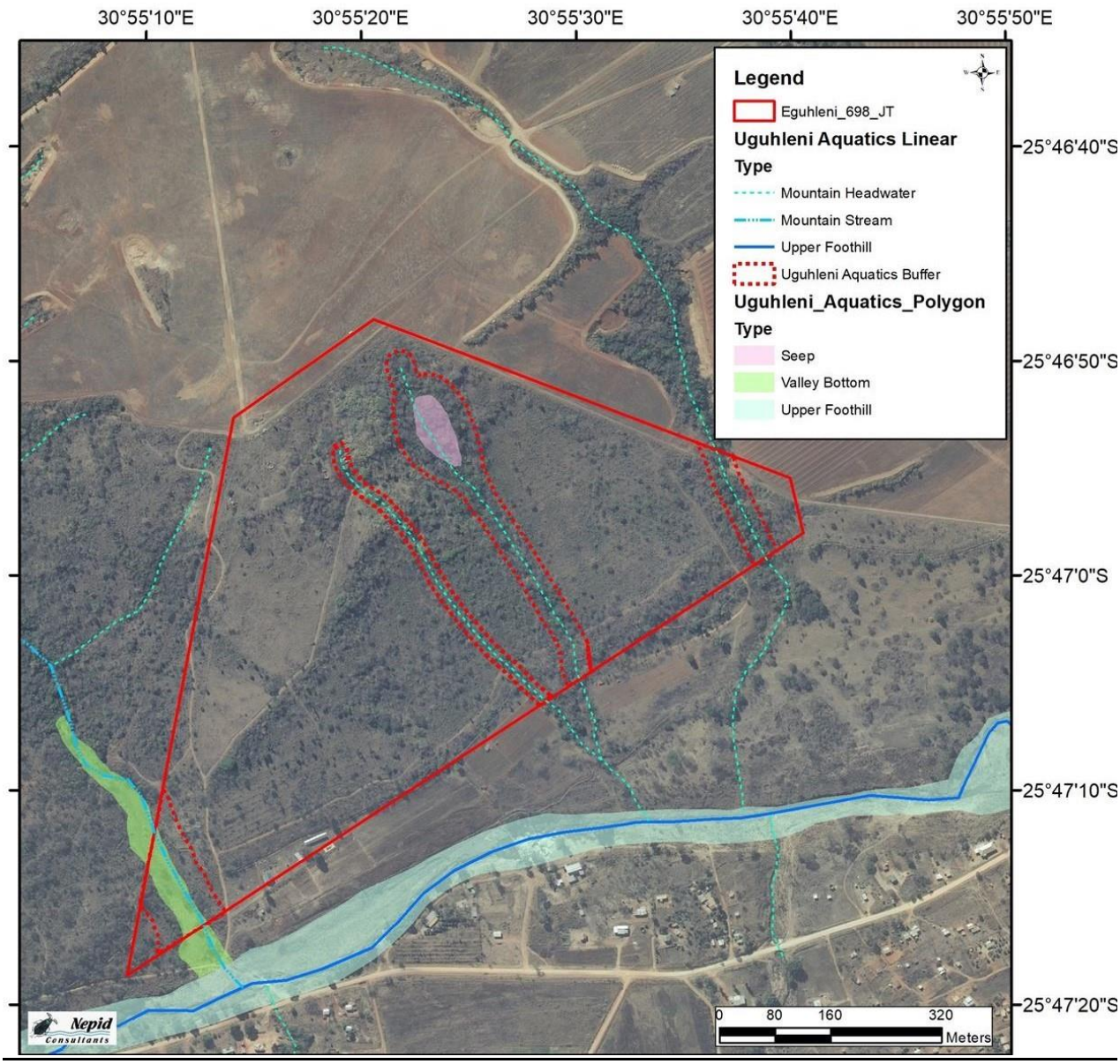

Figure 7-1. Aquatic Buffer Zones

Construction and Operation Phase

- **Control Alien Invasive Vegetation.** Declared alien invasive vegetation within all areas disturbed by site preparation and construction should be controlled at the end of construction, and at annual intervals during operation. Personnel tasked to control alien vegetation should receive appropriate training in the following: methods and control measures; equipment and techniques; types of herbicides and dosages applied; mixing techniques; storage of chemicals and equipment; health and safety issues; plant identification; procedures for equipment washing; equipment maintenance; record keeping, *inter alia.*

7.3 Monitoring

Monitoring of aquatic ecosystems is not considered necessary because the low potential impacts that the proposed development is expected to have if the recommended mitigation measures are adhered to.

8. REFERENCES

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9. APPENDICES

Appendix A: SACNASP Certificate

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Robert William Palmer

Registration Number: 400108/95

is a registered scientist

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

Biological Science (Professional Natural Scientist)

Effective 25 October 1995 Expires 31 March 2023

Chairperson

Chief Executive Officer

To verify this certificate scan this code

Appendix B: SASS5 Certificate

NATIONAL AQUATIC ECOSYSTEM HEALTH MONITORING PROGRAMME

Water and Sanitation

Environment Affairs

Water Research Commission

CERTIFICATE OF ACCREDITATION

This is to certify that

Rob Palmer

has met the requirements of the
River Health Programme as a SASS5 Practitioner

COMPETENCY IN THE FOLLOWING AREAS HAVE BEEN DEMONSTRATED:

UNDERSTANDING OF THE SCOPE AND APPLICATION OF THE SASS5 METHOD.

DEMONSTRATION OF THE CORRECT SAMPLING PROTOCOLS

DEMONSTRATION OF THE CORRECT SAMPLE PREPARATION PROTOCOLS

IDENTIFICATION OF AQUATIC MACROINVERTEBRATES

COMPETENCY IS VALID FOR 3 YEARS FROM CERTIFICATE DATE

NATIONAL SASS5 AUDITOR

13 April 2019
DATE

Appendix C: Curriculum Vitae

Curriculm Vitae: One Page **Robert William Palmer**

Profession	:	**Aquatic Ecologist**
Date of Birth	:	15 Dec 1961
Name of Firm	:	Nepid Consultants CC
Position in Firm	:	Director
Years with Firm	:	16
Years' Experience	:	30
Nationality	:	South African
Place of birth	:	Grahamstown, South Africa
Marital Status	:	Married

Summary

Rob is an aquatic ecologist with a PhD in Zoology from Rhodes University, South Africa. He has over 30 years' experience as an independent consultant. He has specialist knowledge of the biodiversity of African rivers and wetlands, including aquatic flora, invertebrates and fish. He has participated in numerous ESIAs throughout Africa, many to environmental standards required by the IFC or World Bank. He has been a team leader for various mining and water resource development projects and environmental impact assessments involving coordination of multi-disciplinary teams. He is a member of the SA Council for Natural Scientific Professions and an accredited SASS5 biomonitoring practitioner.

Qualifications:

• PhD [Zoology]	Rhodes University, Grahamstown, RSA	1992
• BSc (Hons) [Mammalogy]	Pretoria University, RSA	1985
• BSc [Zoology]	University of Cape Town, RSA	1984

Professional Registrations:

- SA Council for Natural Scientific Professions (Biological Science): No 400108/95
- SASS5 Accreditation (Dept. Water Affairs & Sanitation)

Professional Societies

- International Association for Impact Assessment (South Africa)
- Southern African Society of Aquatic Scientists

Languages:

	Speaking	Reading	Writing
English (home):	Excellent	Excellent	Excellent
Afrikaans:	Good	Good	Poor
Xhosa:	Fair	Poor	Poor
Portuguese:	Poor	Fair	Poor

Countries of Work Experience (short-term consultancies):

Southern Africa:	Angola, Lesotho, Malawi, Namibia, South Africa, Swaziland, Zambia
East Africa:	Eritrea, Ethiopia, Mozambique, Tanzania, Uganda
West Africa:	Burkina Faso, Guinea, Mali, Sierra Leone
Central Africa:	Cameroon, DRC
North Africa:	Morocco
Asia:	Afghanistan (virtual)

Key Qualifications: Freshwater Biodiversity - Rivers & Wetlands

Employment Record:

2005 – present	Nepid Consultants CC	Founder Director
2021 – present	World Bank	Short-Term Consultant (S Asia)
1997 – 2004	AfriDev Consultants Pty Ltd	Associate from 1997; Director from 2000
1991 – 1997	Onderstepoort Veterinary Institute	Research Fellow
1986 – 1991	Rhodes University	PhD Student

Contact Details: email: rob@nepid.co.za; Tel: +27(0)82 574 4486; PO Box 4349, White River, 1240, RSA
website: https://nepid.co.za/ ; Linkedin: www.linkedin.com/in/palmer-rob

Dated: 3rd January 2022

Page 1

Appendix D: Declaration of Independence

The Specialist Appointed in terms of the Regulations

I, **Robert William Palmer**, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

✓	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- 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 application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties 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 or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist

Nepid Consultants CC

Name of company

2022-01-03

Date

Signature of the Commissioner of Oaths for project/application:

2022/01/03

Date:

Designation:

Official stamp (below):

2022 -01- 03

COMM... WI... ...NTRE ...ER

SOUTH AFRICAN POLICE SERVICE

Appendix E: Plant Species List

Plant species recorded in wetlands and riparian zones at Uguhleni in March 2022.

Family	Species	Protected	Seep	Drainage Line	VB Wetland
Gymnosperms					
Pinaceae	*Pinus sp.*		*1*	*2*	
Ferns					
Pteridaceae	*Pteris catoptera*		*3*		
Sinopteridaceae	*Cheilanthes viridis*		*2*	*2*	*3*
Thelypteridaceae	*Christella dentata*		*3*		
Thelypteridaceae	*Cyclosorus interruptus*				*3*
Monocots					
Amaryllidaceae	*Scadoxus puniceus*	MNCA	*1*		
Arecaceae	*Phoenix reclinata*				*1*
Asparagaceae	*Asparagus setaceus*		*2*		
Asparagaceae	*Asparagus virgatus*			*1*	
Commelinaceae	*Commelina erecta*				*2*
Cyperaceae	*Carex spicato-paniculata*		*3*	*2*	
Cyperaceae	*Cyperus cyperoides* *		*1*		
Cyperaceae	*Cyperus dives*				*2*
Cyperaceae	*Cyperus distans*				*2*
Cyperaceae	*Cyperus esculentus*				*3*
Cyperaceae	*Cyperus flavescens*				*1*
Cyperaceae	*Cyperus melanospermus*				*2*
Cyperaceae	*Cyperus polystachyos polystachyos*				*3*
Cyperaceae	*Cyperus dives*				
Cyperaceae	*Fimbristylis dichotoma*				*3*
Cyperaceae	*Fuirena pubescens*				*2*
Cyperaceae	*Schoenoplectus brachyceras*				*3*
Dennstaedtiaceae	*Pterodium aquilinum capense*			*3*	
Iridaceae	*Gladiolus vinosomaculatus*	MNCA			*1*
Poaceae	*Bambusa glaucescens*			*4*	
Poaceae	*Bothriochloa bladhii*				*2*
Poaceae	*Cynodon dactylon*		*2*		*2*
Poaceae	*Cynodon nlemfuensis* *		*2*		*3*
Poaceae	*Digitaria eriantha*		*2*		*1*
Poaceae	*Eulisine africana*		*2*		*1*
Poaceae	*Eragrostis curvula*			*3*	*1*
Poaceae	*Hyparrhenia tamba*				*1*
Poaceae	*Hyperthelia dissoluta*			*1*	
Poaceae	*Imperata cylindrica*			*1*	*1*
Poaceae	*Leersia hexandra*		*3*		*3*
Poaceae	*Melinis repens repens*			*1*	
Poaceae	*Oplismenus hirtellus*		*3*	*2*	*1*
Poaceae	*Panicum schinzii*				*1*
Poaceae	*Pennisetum clandestinum*				*1*
Poaceae	*Paspalum dilatatum* *				*2*
Poaceae	*Paspalum distichum*				*2*
Poaceae	*Paspalum urvillei* *				*2*
Poaceae	*Phragmites mauritianus*				*5*
Poaceae	*Setaria megaphylla*		*2*	*5*	*2*
Poaceae	*Setaria sphacelata*				*2*
Poaceae	*Sorghum arundinaceum*				*1*
Poaceae	*Sporobolus africanus*				*2*
Poaceae	*Sporobolus pyramidalis*			*1*	*1*
Poaceae	*Themeda triandra*			*1*	
Poaceae	*Megathyrsus maximus*			*2*	
Poaceae	*Urochloa trichopus*			*3*	
Smilacaceae	*Smilax anceps*		*1*	*3*	

Family	Species	Protected	Seep	Drainage Line	VB Wetland
Zingiberaceae	*Alpinia zerumbet* *3		1		
Dicots					
Acanthaceae	*Thunbergia neglecta*				1
Amaranthus	*Alternanthera pungens* *				1
Amaranthaceae	*Achyranthes aspera aspera* *		2		1
Amaranthaceae	*Amaranthus hybridus* *				2
Amaranthaceae	*Gomphrena celosioides* *				1
Anacardiaceae	*Searsia dentata*			2	
Anacardiaceae	*Searsia pentheri*			2	
Anacardiaceae	*Searsia transvaalensis*			2	
Apocynaceae	*Catharanthus roseus*			1	
Aristolochiaceae	*Aristolochia littoralis* *1b		2		
Asteraceae	*Ageratum conyzoides* *1b		1	2	2
Asteraceae	*Bidens pilosa* *1b		2	4	2
Asteraceae	*Crassocephalum picridifolium*				1
Asteraceae	*Chromolaena odorata* *1b		1	1	
Asteraceae	*Erigeron bonariensis* *				1
Asteraceae	*Gymnanthemum myrianthum*				1
Asteraceae	*Lactuca serriola*				1
Asteraceae	*Laggera crispata*				1
Asteraceae	*Nidorella auriculata*				1
Asteraceae	*Parthenium hysterophorus* *1b				1
Asteraceae	*Senecio madagascariensis*				1
Asteraceae	*Sonchus oleraceus* *				1
Asteraceae	*Tagetes minuta* *		2	2	1
Asteraceae	*Tithonia rotundifolia* *1b				1
Asteraceae	*Xanthium strumarium* *1b			1	
Bignoniaceae	*Jacaranda mimosifolia* *		2	5	
Celastraceae	*Gymnosporia buxifola*			1	
Celastraceae	*Gymnosporia heterophylla*			1	
Celastraceae	*Gymnosporia senegalensis*			3	
Celtidaceae	*Celtis africana*		3	2	
Combretaceae	*Combretum molle*		2		
Combretaceae	*Combretum zeyheri*			2	
Ebenaceae	*Diospyros lycioides subp. sericea*				1
Ebenaceae	*Diospyros whyteana*		2	3	
Ebenaceae	*Euclea crispa*			3	1
Ebenaceae	*Euclea natalensis subsp natalensis*				2
Euphorbiaceae	*Acalypha brachiata*			1	
Euphorbiaceae	*Acalypha sonderiana*		1		
Euphorbiaceae	*Acalypha villicaulis*			1	
Ephorbiaceae	*Euphorbia heterophylla*			1	
Euphorbiaceae	*Euphorbia hirta**				1
Euphorbiaceae	*Ricinus communis* *2				1
Fabaceae	*Abrus laevigatus*			1	
Fabaceae	*Bauhinia galpinii*			2	
Fabaceae	*Biancaea decapetala* * 1b				1
Fabaceae	*Crotalaria recta*				1
Fabaceae	*Crotalaria lanceolata*				1
Fabaceae	*Dalbergia armata*		3		
Fabaceae	*Desmodium incanum* *				2
Fabaceae	*Desmodium uncinatum* *		2	4	2
Fabaceae	*Dichrostachys cinerea subsp nyassana*			3	
Fabaceae	*Eriosema psoraleoides*			3	
Fabaceae	*Flemingia grahamiana*				1
Fabaceae	*Indigofera sp.*				1
Fabaceae	*Mucuna coriacea*			1	
Fabaceae	*Neonotonia wightii*		2	2	
Fabaceae	*Pseudarthria hookeri*			2	2

Family	Species	Protected	Seep	Drainage Line	VB Wetland
Fabaceae	*Pterocarpus angolensis*	NFA	*1*		
Fabaceae	*Senegalia ataxacantha*				*1*
Fabaceae	*Senegalia caffra*				*1*
Fabaceae	*Senna septemtrionalis *1b*				*1*
Fabaceae	*Sesbania bispinosa **				*2*
Fabaceae	*Vachellia karroo*			*1*	
Fabaceae	*Vachellia sieberiana var woodii*			*1*	
Lamiaceae	*Volkameria glabra*		*2*	*2*	
Malvaceae	*Dombeya pulchra*				*2*
Malvaceae	*Dombeya rotundifolia*		*1*	*2*	*1*
Malvaceae	*Malvastrum coromandelianum *1b*				*2*
Malvaceae	*Pavonia burchellii*				*1*
Malvaceae	*Pavonia columella*		*1*		
Malvaceae	*Sida alba*			*1*	
Malvaceae	*Sida dregei*				*1*
Malvaceae	*Triumfetta pilosa*		*2*		
Malvaceae	*Waltheria indica*			*1*	
Meliaceae	*Melia azedarach *1b*		*1*	*3*	
Makastomataceae	*Argyrella canescens*				*1*
Meliaceae	*Ekebergia capensis*		*2*		
Menispermaceae	*Cissampelos mucronata*		*1*		
Moraceae	*Ficus petersii*		*2*	*2*	
Moraceae	*Ficus sur*		*3*		
Moraceae	*Ficus sycomorus ssp. sycomorus*		*3*		
Moraceae	*Morus alba var. alba *3*		*1*	*3*	
Myrtaceae	*Eucalyptus sp.*		*1*	*1*	
Myrtaceae	*Psidium guajava *2 or 0*		*1*	*2*	*1*
Myrtaceae	*Syzygium cordatum cordatum*		*5*	*2*	
Myrtaceae	*Syzygium guineense guineense*		*3*		
Passifloraceae	*Adenia gummifera gummifera*	MNCA	*1*		
Passifloraceae	*Passiflora subpeltata *1b*				*1*
Pedaliaceae	*Ceratotheca triloba*			*1*	
Phyllanthaceae	*Antidesma venosum*				
Phyllanthaceae	*Bridelia micrantha*		*5*	*1*	*1*
Phyllanthaceae	*Flueggea virosa virosa*		*1*	*3*	
Polygonaceae	*Persicaria decipiens*				*3*
Polygonaceae	*Persicaria lapathifolia **				*1*
Ranunculaceae	*Clematis 42ucronate*				*1*
Ranunculaceae	*Ranunculus multifidus **				*2*
Rhamnaceae	*Berchemia discolor*			*1*	
Rhamnaceae	*Ziziphus 42ucronate mucronata*			*1*	
Rosaceae	*Rubus rigidus **				*1*
Rubiaceae	*Breonadia salicina*	MNCA	*1*		
Rubiaceae	*Coffea arabica **		*3*		
Rubiaceae	*Epogona lanceolata*		*1*		
Rubiaceae	*Richardia brasiliensis **				*1*
Rubiaceae	*Tricalysia capensis transvaalensis*		*3*		
Rubiaceae	*Vangueria infausta ssp. infausta*		*1*		
Rutaceae	*Ptaeroxylon obliquum*		*2*		
Sapindaceae	*Cardiospermum halicacabum*				*1*
Sapindaceae	*Cardiospermum grandiflorum *1b*			*1*	
Sapindaceae	*Hippobromus pauciflorus*		*2*	*5*	
Solanaceae	*Solanum aculeatissum *1b*			*3*	
Solanaceae	*Solanum delagoense **			*2*	
Solanaceae	*Solanum mauritianum * 1b*		*2*	*3*	*2*
Solanaceae	*Solanum seaforthianum * 1b*		*2*		
Solanaceae	*Solanum sisymbriifolium * 1b*				*2*
Stilbacaeae	*Halleria lucida*		*1*		
Verbenaceae	*Durante erecta **			*1*	

Family	Species	Protected	Seep	Drainage Line	VB Wetland
Verbenaceae	*Lantana camara complex *1b*			*3*	*2*
Verbenaceae	*Lantana rugosa*		*2*	*3*	*3*
Verbenaceae	*Lippia javanica*			*3*	
Verbenaceae	*Priva cordifolia*			*1*	
Verbenaceae	*Verbena bonariensis *1b*				*2*
Vitaceae	*Rhoicissus tridentata*			*1*	
	Number of Species		**62**	**70**	**91**
	Alien Species		**18 (29%)**	**17 (24%)**	**32 (35%)**

MNCA = Mpumalanga Nature Conservation Act
NFA = National Forest Act

Rating (0-6):
- = absent
1 = rare (<5%)
2 = sparse (>5-25%)
3 = common (>25-50%)
4 = abundant (>50-75%)
5 = predominant (>75-95%)
6 = near entire (>95%)

Appendix F: Ecological Importance and Sensitivity

Ecological Importance

Parameter	Mountain Headwater	Seep	Valley Bottom
Biodiversity support	**0.7**	**2.0**	**0.7**
Red Data species	0.0	3.0	0.0
Unique species	0.0	0.0	0.0
Migration/breeding/feeding	2.0	3.0	2.0
Landscape scale	**1.8**	**2.4**	**1.6**
Protection status of wetland	0.0	0.0	0.0
Protection status of vegetation type	2.0	2.0	2.0
Regional context	4.0	4.0	4.0
Size and rareity	1.0	3.0	1.0
Diversity of habitats	2.0	3.0	1.0
Sensitivity of the wetland	**2.0**	**2.3**	**2.3**
Sensitivity to floods	2.0	1.0	3.0
Sensitivity to low flows	2.0	3.0	3.0
Sensitivity to water quality	2.0	3.0	1.0
	2.0	**2.4**	**2.3**

Scoring: 0=None; 1=Low; 2=Moderate; 3=High; 4 = Very High

Functional Importance

Parameter	Mountain Headwater	Seep	Valley Bottom
Flood attenuation	0.0	0.0	3.0
Streamflow regulation	0.5	3.0	0.0
Sediment trapping	0.0	1.0	4.0
Phosphate assimilation	0.0	1.0	2.0
Nitrate assimilation	0.0	1.0	2.0
Toxicant assimilation	0.0	1.0	2.0
Erosion control	3.0	3.0	0.0
Carbon storage	3.0	4.0	1.0
	0.8	**1.8**	**1.8**

Scoring: 0=None; 1=Low; 2=Moderate; 3=High; 4 = Very High

Direct Human Benefits

Parameter	Mountain Headwater	Seep	Valley Bottom
Water for human use	0.0	0.0	0.0
Harvestable resources	1.0	2.0	2.0
Cultivated foods	0.0	0.0	0.0
Cultural heritage	0.0	0.0	0.0
Tourism and recreation	0.0	0.0	0.0
Education and research	0.0	0.0	0.0
	0.2	**0.3**	**0.3**

Scoring: 0=None; 1=Low; 2=Moderate; 3=High; 4 = Very High

Summary

Parameter	Mountain Headwater	Seep	Valley Bottom
Ecological Importance	2.0	2.4	2.3
Hydro-Functional Importance	0.8	1.8	1.8
Direct Human Benefits	0.2	0.3	0.3
Average	**1.0**	**1.5**	**1.5**

Scoring: 0=None; 1=Low; 2=Moderate; 3=High; 4 = Very High

Appendix G: Risk Matrix

RISK MATRIX (Based on DWS 2015 publication: Section 21 c and I water use Risk Assessment Protocol)
NAME and REGISTRATION No of SACNASP Professional member: RW Palmer Reg no. 400108/95

27 April 2022

Risk to be scored for construction and operational phases of the project. MUST BE COMPLETED BY SACNASP PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE.

					Severity																
No.	Phases	Activity	Aspect	Impact	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	PES AND EIS OF WATERCOURSE
1	Construction	Clearing of vegetation and associated bulk earthworks	Vegetation removal; Land preparation; Soil disturbance; Compaction	Impact of Bulk Earthworks on Wetland and Riparian Habitat	1	1	1	1	**1.0**	1	4	**6.0**	1	2	5	1	**9.0**	**54**	**Low**	80	**See Text**	Drainage Lines EIS = Low PES = D Seep EIS = Mod PES = C VB Wetland EIS = Mod PES = D
2	Construction	As above	As above	Impact of Bulk Earthworks on Sediment Runoff and Deposition	1	2	2	1	**1.3**	2	2	**4.3**	1	2	5	2	**10.0**	**43**	**Low**	70	**See Text**	As above
3	Construction	As above	As above	Impact of Bulk Earthworkd on Alien Invasive Vegetation	1	1	1	1	**1.3**	2	4	**5.3**	1	2	5	1	**9.0**	**47**	**Low**	70	**See Text**	As above
4	Operation	Agricultural return flows; Foliar application of fertilizer and pesticides	Runoff and drift of nutrients, herbicides, pesticides, fertilizers and salts into watercourse	Impact of Agricultural Production on Surface Water Quality	1	2	1	1	**1.3**	2	4	**7.3**	1	2	5	1	**9.0**	**65**	**Low**	40	**See Text**	As Aboce
3	Operation	Stormwater; Road Network	Runoff of stormwater into watercourse	Impact of Erosion	2	1	2	1	**1.5**	1	4	**6.5**	1	1	5	1	**8.0**	**52**	**Low**	40	**See Text**	As Above
5	Operation	-	Cumulative Impacts	Cumulative Impacts on Aquatic Ecosystems	2	2	1	1	**1.5**	2	4	**7.5**	1	1	5	3	**10.0**	**75**	**Low**	40	**See Text**	As Above

Annexure B: Ecological Sensitivity Assessment

Uguhleni Agricultural Development

Ehlanzeni District, Mpumalanga Province

EIA Specialist Report:
Terrestrial Biodiversity Impact Assessment

Field Survey: 17th March 2022
Draft Report V1.0: 18th April 2022

Prepared for:

Steven Henwood
Henwood Environmental Solutions (Pty) Ltd
PO Box 12340
Steiltes
Nelspruit
1213

Tel: 078 672 3645
Email: shenwood@mweb.co.za

Prepared by:

Duncan McKenzie (SACNASP Reg. No. 122647)
Digital Earth (Pty) Ltd
P.O. Box 19787
The Village
MBOMBELA, 1218

e-mail: duncan@digitalearth.co.za

and:

Graeme Wolfaard (SACNASP Reg. No. 117179)
Sustineri Ecological Consulting (Pty) Ltd

e-mail: graeme.wolfaard@outlook.com

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Abbreviations

BES	Biodiversity and Ecosystem Services
BODATSA	Botanical Database of Southern Africa
CBA	Critical Biodiversity Area
BI	Biodiversity Importance
CI	Conservation Importance
CPE	Centre of Plant Endemism
DEA	Department of Environmental Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ESIA	Environmental and Social Impact Assessment
EST	Environmental Screening Tool
FEPA	Freshwater Ecosystem Priority Area
FI	Functional Integrity
GBIF	Global Biodiversity Information Facility
ha	Hectare
IBA	Important Bird & Biodiversity Area
IUCN	International Union for Conservation of Nature
mamsl	Metres above mean sea level
MH	Mitigation Hierarchy
MNCA	Mpumalanga Nature Conservation Act (No. 10 of 1998)
NEMA	National Environmental: Management Act (No. 107 of 1998)
NEMBA ToPS	National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004)
NFA	National Forest Act (No. 30 of 1998)
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System
QDGS	Quarter-Degree Grid Square, for example 2531 AB
RR	Receptor Resilience
SABAP2	Southern African Bird Atlas Project 2
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SEI	Site Ecological Importance

Terminology

Alien	Introduced from elsewhere: neither endemic nor indigenous.
Biodiversity	The diversity of living organisms, including the terrestrial and aquatic ecosystems they inhabit; this can be measured at gene, species or ecosystem level.
Disturbed	An ecosystem that is in a sub-climax ecological state, usually through impacts such as low levels of invasion by alien or indigenous pioneer plants, moderate overgrazing, poor burning regimes, etc. These systems still contain a large proportion of indigenous flora.
Degraded	An ecosystem that is in a poor ecological state, usually through impacts such as invasion by alien plants, severe overgrazing, poor burning regimes, etc. These systems contain a low proportion of indigenous flora.
Geophyte	Plants that produce their growth points from organs stored below the ground, an adaption to survive frost, drought and / or fire.
Transformed	Transformed ecosystems are no longer natural and contain little or no indigenous flora. Examples include agricultural lands, plantations, urban areas, etc.
Ungulate	Hoofed animal, such as a cow or antelope.

DIGITAL EARTH (Pty) Ltd. P.O. Box 19787 The Village Mbombela 1218
Cell: 079 530 7873 E-mail: duncan@digitalearth.co.za

1. INTRODUCTION

1.1 Background

Barberton Valley Plantations (Pty) Ltd is applying for authorisation to clear untransformed vegetation for agricultural purposes. This report forms part of the environmental authorisation process and concerns the potential implications of the activities listed above on terrestrial ecosystems. This report is based on a review of available information and a field survey conducted in March 2022. Henwood Environmental Solutions contracted Digital Earth (Pty) Ltd. to perform an ecological assessment for terrestrial ecosystems (flora, mammals, birds, reptiles and frogs) for the proposed development. This study will provide a basis for the assessment of the potential impacts of the development on the terrestrial ecology of the study area as well as providing a baseline of surrounding untransformed vegetation. The key deliverables for this study were a report on the potentially impacted terrestrial ecosystems and an integrated ecological importance assessment, including an Impact Assessment on the receiving environment.

The contents of this report comply with the requirements for specialist reports as detailed in Appendix 6 of the National Environmental Management Act (No 107 of 1998; NEMA) Regulations of 2014 (updated in 2017) (GN R. 326 of 2017).

1.2 Study Team

The study team for this report was as follows:

Duncan McKenzie (Director - Digital Earth, Terrestrial Ecologist). Duncan has been involved in biodiversity assessments for various developments for 15 years. Countries of work experience include Lesotho, Swaziland, Mali, Mozambique, Sierra Leone, Morocco, Guinea, South Africa, Tanzania and the Democratic Republic of the Congo. Duncan previously worked as a Regional Coordinator for the Mondi Wetlands Project and has lectured on many aspects of conservation across South Africa. He is currently the Mpumalanga Regional Co-ordinator for the South African Bird Atlas Project, the Mpumalanga Regional Reviewer for eBird, formerly served on the KZN Bird Rarities Committee, is lead author of The Birds of Mbombela and is lead author on the Wildflowers of the Kruger National Park and the Roberts Birds of the Kruger National Park projects. Duncan is a Certificated Natural Scientist (SACNASP Reg. No.122647). His CV is presented in Appendix 5.

Linda McKenzie (Director - Digital Earth, GIS Specialist). Linda is a GIS Specialist/GIS Analyst with over 21 years' experience in the industry. She has extensive experience in both the private and public sector and has worked on a wide variety of projects and GIS applications. These include, most recently, vegetation and sensitivity mapping, landcover data capture, municipal roads master planning, hydroelectric scheme and wind farm feasibility mapping as well as town planning, land surveyor and engineering support services. Linda formerly served as Vice Chairperson and Treasurer for GISSA Mpumalanga and is a registered Professional GISc Practitioner (GPr. GISc 0170).

Graeme Wolfaard (Sustineri Ecological Consulting, Ecologist)

Graeme is a Professional Natural Scientist in Ecological Science (SACNASP No. 117179) with an MSc (Veterinary Science) degree and over 8 years' experience as a rangeland ecologist and habitat specialist. Graeme has experience undertaking veld condition assessments, terrestrial ecological assessments for EIAs, developing management plans for wildlife reserves and communal rangelands, facilitating Biodiversity Stewardship applications and framework/ policy development for various socio-ecological projects. He has undertaken research and work for various public institutions/ organizations and private companies in the field of conservation, ecology and environmental impact studies extending across South Africa, Botswana, Zimbabwe, Mozambique, Kenya and Liberia.

1.3 Report Objectives

The objectives of this report were to:

- provide an objective ecological assessment of the baseline state of the receiving environment;
- assess the ecological importance of all habitats / vegetation communities identified as comprising the receiving environment; and
- assess the significance of potential project-related impacts on the receiving environment.

1.4 Acknowledgements

- Rob Palmer of Nepid Consultants is thanked for providing the wetland delineation for this report.

1.5 Declaration of Independence

We declare that we have been appointed as independent consulting ecologists with no affiliation with or vested financial interests in the proponent, other than for work performed under the 2014 Environmental Impact Assessment Regulations (as amended in 2017). We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. Remuneration for our services by the proponent is not linked to approval by any decision-making authority responsible for authorising this development.

D.R. McKenzie 18 April 2022

L. McKenzie 18 April 2022

2. STUDY AREA

The proposed agricultural development is situated the farm Uguhleni 698 JT, approximately 15 km west of Barberton in the Ehlanzeni District, Mpumalanga Province, South Africa (Figure 1). The total area surveyed measured 37 ha. The study area formed the direct Project Area Of Influence (PAOI), with a 1 km buffer around the farm being considered as the indirect PAOI. This buffer was chosen due to the high levels of transformation present surrounding the study area. Most of the area to the north, east and south of the direct PAOI is agriculturalised, with some remaining natural vegetation occurring to the west of the direct PAOI. The perennial Queens River lies 100 m from the southern boundary at its closest point. The large Selapi Village is situated immediately to the south of the study area.

An investigation of historical aerial imagery indicates that 62% of the study area was formerly agriculturalised (Figure 2). Untransformed vegetation is mostly restricted to drainage lines and much of the formerly developed areas have been colonised by pioneer indigenous and alien plant species. Therefore, most of the study area contains secondary vegetation. The study area is currently used for informal cattle grazing.

The study area falls within the summer rainfall zone with a mean annual precipitation of between 600 and 1,100 mm per annum with frost infrequent to occasional at higher altitudes[1]. It is situated within the quarter-degree grid square (QDGS) 2530 DD at an elevation of ~790 mamsl at the northern sections and ~730 in the south. The general topography of the area is gently to moderately undulating, with shallow drainage lines. The study area falls within the summer rainfall, dry winter zone with a mean annual precipitation of between 600 and 1100 mm per annum, with frost infrequent to occasional at higher altitudes[2].

[1] Mucina & Rutherford, 2006
[2] Mucina & Rutherford, 2006

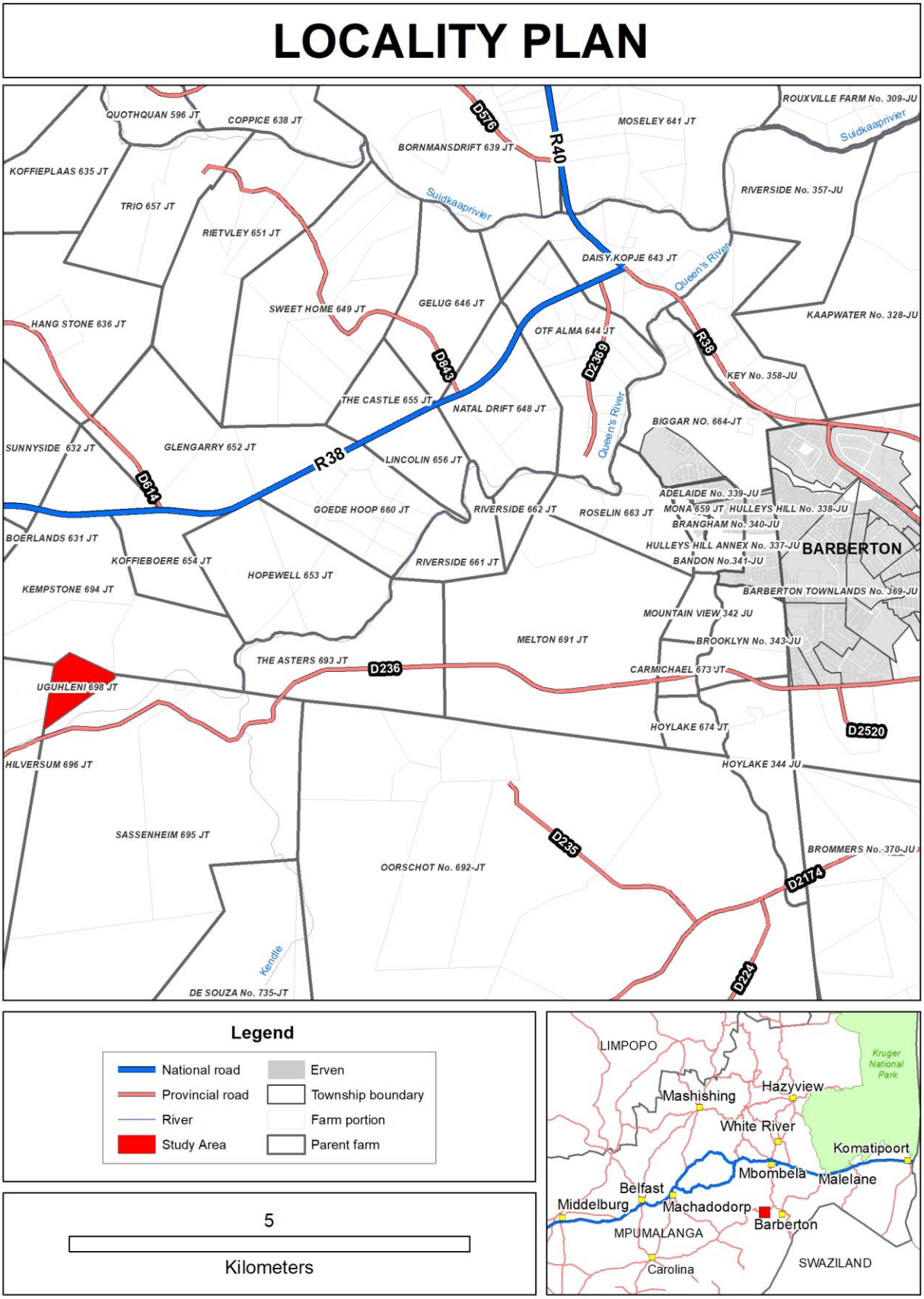

Figure 1. Location of Study Area

DIGITAL EARTH (Pty) Ltd. P.O. Box 19787 The Village Mbombela 1218
Cell: 079 530 7873 E-mail: duncan@digitalearth.co.za

Figure 2. Map Reflecting Former Agricultural Activities on Uguhleni (Source: Google Earth, 06/09/2004)

DIGITAL EARTH (Pty) Ltd. P.O. Box 19787 The Village Mbombela 1218
Cell: 079 530 7873 E-mail: duncan@digitalearth.co.za

3. SCOPE OF WORK

The results of the specific site query performed by the online Environmental Screening Tool of the Department of Environmental Affairs (DEA) determined the Scope of Work of the Terrestrial Ecology Assessment. Three Themes were relevant to this study, namely Animal, Plant and Terrestrial Biodiversity. The specific level of site sensitivity for the Animal Theme and Plant Themes is **Medium.** However, the Terrestrial Biodiversity Theme is **Very High**, which triggered a required specialist assessment and a set of reporting requirements according to the following Government Notices:

- **Terrestrial Biodiversity Theme** – "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on Terrestrial Biodiversity" (Government Notice No. 320, published in Government Gazette 43110, 20 March 2020)
- **Plant & Animal Themes** – "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on Terrestrial Plant and Animal Species" (Government Notice No. 1150, published in Government Gazette 43855, 30 October 2020)

These requirements provided guidelines for establishing the Objectives and Scope to ensure protocol compliance within the report. Additionally, the 2020 guidelines provided by the South African "Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa" (SANBI, 2020) provided guidance regarding the method in which specialist studies should be undertaken to meet these minimum requirements.

The Objectives and Scope for this project were therefore as follows:

- Provide a baseline ecological description of the terrestrial ecosystems within the Project Area of Influence (PAOI) that are likely to be impacted by the proposed developments, including of the following:
    - descriptions of the terrestrial ecosystem present, including threatened ecosystems, habitat fragmentation, main vegetation types, presence of indigenous forests, ecological connectivity, Species of Conservation Concern and important habitats;
    - ecological drivers or processes and how these functioning within the PAOI;
    - any ecological corridors that are present in the project area;

  - the presence of any Strategic Water Source Areas or Freshwater Ecosystem Priority Areas;
  - any significant terrestrial landscape features;
  - any potential alternatives of low sensitivity; and
  - the presence of and impact on any Critical Biodiversity Area, Ecological Support Areas or Protected Areas, as well as designated Priority Areas for Protected Area Expansion;

- Provide a site-based Ecological Importance Assessment of all habitats or vegetation communities present within the PAOI;
- Assess the significance of direct, indirect and cumulative impacts of the project on terrestrial biodiversity, including:
  - a description of each impact;
  - the significance of each impact; and
  - description of mitigation measures for each impact
- Provide management measures that should be included in the Environmental Management Program (EMP), including on infrastructure layout; and
- Provide a substantiated statement regarding the acceptability / approval or not of the project.

A compliance checklist providing an indication of report compliance to the above protocols has been compiled and is included in Appendix 4.

4. APPROACH AND METHODOLOGY

The approach and methods applied in this study in both the desktop and fieldwork phases conform with the Species Environmental Assessment Guidelines: Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa (SANBI, 2020).

4.1 Environmental Screening Tool

An initial screening of the study area was undertaken using the Environmental Screening Tool of the DEA. Some of the modelled or confirmed species have been identified as sensitive species by the South African National Biodiversity Institute (SANBI) and have been assigned a unique number in the screening report produced by the EST. These names have been withheld as the species may be prone to illegal harvesting and must be protected.

4.2 Site-specific Desktop Assessment

4.2.1 Flora

Descriptions of national vegetation types were compiled using Mucina & Rutherford (2006). Various sources then were referenced to obtain a list of plant species potentially occurring within the general area, from which a list of the most likely Species of Conservation Concern (SCC)[3] were searched for during fieldwork:

1. The Botanical Database of Southern Africa (formerly BODATSA, now NEWPOSA)[4], which is curated by the South African National Biodiversity Institute (SANBI), was queried for a list of plant species that have been recorded from a 20 km radius of the study area. The BODATSA contains records from the National Herbarium in Pretoria, the Compton Herbarium in Cape Town and the KwaZulu-Natal Herbarium in Durban.
2. All Research Grade (confirmed) plant records from within a 20 km radius of the study area from the iNaturalist website were investigated for the presence of SCC. This is a peer-reviewed photographic database containing a large dataset of biodiversity records.

[3] Raimondo *et al.* (2009), includes those with a status of Critically Rare, Rare, Near Threatened and Data Deficient as well as threatened species (Vulnerable, Endangered and Critically Endangered)
[4] http://newposa.sanbi.org/

3. Data from previous surveys performed by the author within the general area were also referred to for any additional flora SCC. Most specifically, a terrestrial ecology report was produced for the property Hilversum 696 JT which is situated immediately to the west of Uguhleni 698 JT[5].

4.2.2 Fauna

Lists of mammal, bird, reptile and frog SCC potentially occurring within the study area were prepared using data from SANBI's Red List of South African Species website, Child *et al*. (2016), the Virtual Museum and Southern African Bird Atlas Project 2 projects of the Fitzpatrick Institute of African Ornithology, Taylor *et al.* (2016), Minter *et al*. (2004), Bates *et al*. (2014), the IUCN Red List of Threatened Species, the iNaturalist website as well as from the previous surveys conducted by the author in the general area.

The above data were captured mostly at a quarter-degree spatial resolution but were refined by excluding species unlikely to occur within the study area due to unsuitable habitat characteristics (e.g., altitude and land-use). Potential occurrence of fauna within the general area around the study area was predicted based on the specialist's knowledge of habitat requirements of local fauna species.

4.3 Fieldwork

The vegetation communities identified in the desktop phase were ground-truthed during a site visit on the 28th of March 2022. This coincided with the end of the wet season and the data quality are acceptable for this report. The boundary of the proposed agricultural development was supplied by HES and pre-loaded onto a Samsung S21 phone using LocusMap Pro™ software. This area was then surveyed on foot using meandering transects.

4.3.1 Flora

Meandering transects covering as much of the natural habitat within the study area were selected to sample the flora. All plant species located within each vegetation community encountered were recorded, with cover abundance assessed according to four categories, namely dominant, frequent, uncommon or rare. Specific attention in each locality was given to habitats that potentially host SCC.

[5] ECOREX, 2019.

These include species listed under SANBI's Red List of South African Plants, as well as the website of the International Union for the Conservation of Nature (IUCN). Within the context of this study, SCC also include range-restricted and endemic species as well as those protected under the following legislation:

- Mpumalanga Nature Conservation Act (No. 10 of 1998) (MNCA)
- National Forests Act (No. 30 of 1998) (NFA)
- National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015) (NEMBA ToPS)

Photographs of all restricted endemics and SCC were taken as evidence of occurrence and these have been submitted to the online sightings database iNaturalist, which links all research grade observations to the Global Biodiversity Information Facility (GBIF).

4.3.2 Fauna

Birds were identified audially and visually using Nikon 10x42 binoculars. Observations were made incidentally during the time that the vegetation survey was conducted and limited to birds seen and heard within the application site and immediate surrounds. Mammals, reptiles and frogs were recorded incidentally as they were encountered during the survey through direct evidence (sightings) and indirect evidence (spoor, dung etc.). Specific attention was given to habitats that potentially host SCC[6]. These include species listed under SANBI's Red List of South African Species, as well as the website of the IUCN. Within the context of this study, SCC also include range-restricted and endemic species as well as those protected under the following legislation:

- Mpumalanga Nature Conservation Act (No. 10 of 1998) (MNCA)
- National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015) (NEMBA ToPS)

4.4 Method for the determination of Site Ecological Importance (SEI)

[6] The same approach as Raimondo *et al*. (2009) has been followed here regarding species of conservation concern (i.e., those with a status of Declining, Near Threatened and Data Deficient) and threatened species (Vulnerable, Endangered and Critically Endangered)

A standardised method for assessing site-specific ecological importance in relation to a proposed project (including the project footprint and project activities), providing guidelines for biodiversity specialists in Environmental and Social Impact Assessments (ESIA's), has been followed in this report (SANBI, 2020). This assessment does not replace the output of the National Web-based Environmental Screening Tool but is complementary to it, providing a more site-specific assessment that is linked to the proposed project footprint / activities.

SEI is one of the most important outcomes of a specialist ecological study and provides a basis for assessing the significance of impacts that a project may have on the receiving environment. SEI is a function of the Biodiversity Importance (BI) of the receptor (e.g. the species of conservation concern, vegetation/fauna community or habitat type) and its resilience to impacts (Receptor Resilience) as follows:

SEI = BI + RR

BI in turn is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows:

BI = CI + FI

Conservation Importance is defined as "the importance of a site for supporting biodiversity features of conservation concern present e.g., populations of IUCN Threatened and Near-Threatened species (CR, EN, VU & NT), Rare, Range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes" (SANBI, 2020). The fulfilling criteria for CI are presented in Table 1.

Table 1. Criteria for Determining Conservation Importance of a Receptor

Conservation Importance	Fulfilling Criteria
VERY HIGH	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
HIGH	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
MEDIUM	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
LOW	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
VERY LOW	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Functional Integrity (FI) of the receptor (e.g., the vegetation/fauna community or habitat type) is defined here as "a measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts". Fulfilling criteria for determining FI are given in Table 2.

Table 2. Criteria for Determining Functional Integrity of a Receptor

Functional Integrity	Fulfilling Criteria
VERY HIGH	Very large (>100 ha) intact area for any conservation status of regional vegetation type or >5 ha for CR regional vegetation types High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches No or minimal current ecological impacts with no signs of major past disturbance (e.g. ploughing)
HIGH	Large (>20 ha but <100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches Only minor current ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential
MEDIUM	Medium (>5 ha but <20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches Mostly minor current ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance; moderate rehabilitation potential
LOW	Small (>1 ha but <5 ha) area Almost no habitat connectivity but migrations still possible across some transformed or degraded natural habitat; a very busy used road network surrounds the area. Low rehabilitation potential Several minor and major current ecological impacts
VERY LOW	Very small (<1 ha) area No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current ecological impacts

BI can be derived from a simple matrix of CI and FI as indicated in Table 3.

Table 3. Biodiversity Importance Two-way Matrix

Biodiversity Importance		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

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Cell: 079 530 7873 E-mail: duncan@digitalearth.co.za

Receptor Resilience (RR) is defined as "*the intrinsic capacity of the receptor to resist major damage from disturbance and / or to recover to its original state with limited or no human intervention".* The fulfilling criteria for RR are presented in Table 4.

Table 4. Criteria for Determining Receptor Resilience

Receptor Resilience	Fulfilling Criteria
VERY HIGH	Habitat that can recover rapidly (~ less than 5 years) to restore > 70 % of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed
HIGH	Habitat that can recover relatively quickly (~ 5-10 years) to restore > 70 % of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed
MEDIUM	Will recover slowly (~more than 10 years) to restore > 70 % of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed
LOW	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~less than 50 % of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed
VERY LOW	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed

Once BI and RR have been calculated using the above two matrices, SEI can be determined using the matrix in Table 5.

Table 5. Site Ecological Importance Two-way Matrix

SEI		Biodiversity Importance				
		Very High	High	Medium	Low	Very Low
Receptor Resilience	Very Low	Very High	Very High	High	Medium	Low
	Low	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	High	High	Medium	Low	Very Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

Guidelines for how to interpret SEI of a project in terms of impact mitigation are given in Table 6, and SEI values for each vegetation community / proposed development site are indicated spatially in Figure 7.

Table 6. Guidelines for interpreting Site Ecological Importance of Receptors in terms of project impacts

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation - No destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages. Destructive impacts for species/ecosystems where <persistence target remains.
High	Avoidance mitigation wherever possible. Minimization mitigation – Changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimization & restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities
Low	Minimization & restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities
Very Low	Minimization mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required

4.5 Assessment of Impacts

The first phase of the Impact Assessment is the identification of the various project activities which may impact upon the identified environmental receptors and resources. These receptors and resources allow for an understanding of the impact pathways and assessment of the sensitivity of that receiving environment to change. The significance of the impact is then assessed by rating each variable numerically, according to defined criteria as provided in Table 7. The purpose of the significance rating of the identified impacts is to develop a clear understanding of the influences and processes associated with each impact. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact and can obtain a maximum value of 10. The severity, spatial scope and duration of the impact together comprise the consequence of the impact; and when summed can obtain a maximum value of 15.

Table 7. Criteria for Assessing the Significance of Impacts

Frequency of Activity	**Rating**
Duration of aspect	
Annually or less / low	1
6 monthly / temporary	2
Monthly / infrequent	3
Weekly / life of operation / regularly / likely	4
Daily / permanent / high	5
Frequency of Impact	**Rating**
Almost never / almost impossible	1
Very seldom / highly unlikely	2
Infrequent / unlikely / seldom	3
Often / regularly / likely / possible	4
Daily / highly likely / definitely	5
Severity of Impact	**Rating**
Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful	5
Spatial Scope of Impact	**Rating**
Activity specific	1
Area specific	2
Whole project site / local area	3
Regional	4
National/International	5
Duration of Impact	**Rating**

One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure / permanent	5

Activity: a distinct process or task undertaken by an organisation for which a responsibility can be assigned.

Environmental aspect: an element of an organisation's activities, products or services which can interact with the environment.

Environmental impacts: consequences of these aspects on environmental resources or receptors.

Receptors: comprise but are not limited to people or man-made structures.

Resources: include components of the biophysical environment.

Frequency of activity: refers to how often the proposed activity will take place.

Frequency of impact: refers to the frequency with which a stressor will impact on the receptor.

Severity: refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.

Spatial scope: refers to the geographical scale of the impact.

Duration: refers to the length of time over which the stressor will cause a change in the resource or receptor

The score for each impact, pre and post mitigation, is calculated as follows:

Likelihood	**X**	**Consequence**
(Frequency of Activity + Frequency of Impact)		(Severity + Spatial Scope + Duration)

The values for likelihood and consequence of the impact are then read from a significance rating matrix as shown in Table 8.

The Precautionary Principle is applied in instances of uncertainty or lack of information by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations the model outcomes are adjusted. Arguments and descriptions for such adjustments, as well as arguments for each specific impact assessments are presented in the text and encapsulated in the assessment summary table linked to each impact

discussion. Included in the discussion under each specific impact is a cumulative assessment of the impact on terrestrial environments represented in the study area.

The Mitigation Hierarchy (MH) as proposed by The Biodiversity Company (2015) is applied to all impacts. The mitigation hierarchy is a tool designed to help decision makers limit, as far as possible, the negative impacts of development projects on Biodiversity and Ecosystem Services (BES). It involves the application of four key actions - 'avoid', 'minimize', 'restore' and 'offset'—and provides a "best practice approach to aid in the sustainable management of living, natural resources by establishing a mechanism to balance conservation needs with development priorities. While all components of the mitigation hierarchy are important, rigorous efforts to avoid and minimize as far as feasible are likely to achieve significant reductions in potential impacts."[7]

Table 8. Significance Rating Matrix and Score Classification

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

	Very Low
	Low
	Low-Medium
	Medium
	High
	Very High

[7] The Biodiversity Company, 2015

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Cell: 079 530 7873 E-mail: duncan@digitalearth.co.za

4.6 Assumptions, Limitations and Knowledge Gaps

4.6.1 Seasonality

The fieldwork component of this assessment was based on a site visit covering one day in the wet season. It is likely that plants which flower at other times of the year are underrepresented although this is not seen as a limitation that could affect the Record of Decision as the specialist has extensive experience of local flora and has assessed habitat suitability for potentially occurring threatened plant species.

4.6.2 Overlooked Species

Certain plant species, particularly geophytes, will only flower in seasons when conditions are optimal and may thus remain undetected, even over a survey that encompasses several seasons. Other plant species may be overlooked because of very small size and / or extreme rarity. A sampling strategy will always represent merely a subset of the true diversity of the study area. However, the level of sampling effort for this study was appropriate for the objectives of the study.

4.6.2 Chiroptera

Bat species thought to only forage over the study area (i.e., mostly cave-roosting species) were not included in the assessment due to the lack of suitable caves within the study area. However, due to the small size of the study area the level of detail collected and presented is considered appropriate for the purposes of this report.

5. BIODIVERSITY BASELINE DESCRIPTION

5.1 Flora

5.1.1 Regional Context

The study area is situated within the Lowveld Bioregion of the Savanna Biome. This is the largest biome in South Africa, occupying 32.8% of the surface area (Mucina & Rutherford 2006). White (1983) considers the moister eastern savannas of South Africa to fall within the Zambezian Regional Centre of Endemism. This Region stretches from the north-eastern portion of South Africa northwards to Tanzania and westwards to Angola. More specifically, this work categorises the area south of the Limpopo River as South Zambezian Undifferentiated Woodland and Scrub Woodland.

5.1.1.1 National Vegetation Types

According to the current National Vegetation Map (SANBI, 2018), the vegetation type present within the study area is Legogote Sour Bushveld. This vegetation type was assessed as Endangered by Mucina & Rutherford (2006). More recently, Legogote Sour Bushveld was assessed as **Vulnerable** (VU) in the Mpumalanga Biodiversity Sector Plan (MBSP) (Lötter *et al.*, 2014). This vegetation type has also been assessed as **VU** in the National List of Threatened Ecosystems (Notice 1002 of Government Gazette 34809, 9 December 2011). Legogote Sour Bushveld is virtually endemic to Mpumalanga Province, marginally extending into the Limpopo Province. It occurs on the granite and quartzite foothills of Mpumalanga and Limpopo Provinces below the escarpment west of the Kruger National Park, extending from Mariepskop in the north through Mbombela to Barberton in the south. The vegetation type originally covered about 352 314 ha, of which 57.5% has been transformed, mostly through cultivation and urbanisation[8].

Typical Legogote Sour Bushveld is characterised by open to dense woodland on gently to moderately undulating terrain with a high diversity of trees and shrubs. Typical canopy species include *Parinari curatellifolia, Pterocarpus angolensis, Sclerocarya birrea, Vachellia sieberiana, Combretum molle* and *C. zeyheri*. The shrub layer contains amongst others *Bauhinia galpinii, Senegalia ataxacantha, Diospyros lycioides, Searsia pentheri, Erythroxylon emarginatum* and *Dichrostachys cinerea*. Common herbs include *Agathisanthemum bojeri, Gerbera ambigua, Waltheria indica* and *Hibiscus sidiformis*. Grasses are strongly dominated by *Hyperthelia dissoluta,* but other commonly recorded species

[8] Lötter *et al.*, 2014

include *Panicum maximum* and *Schizachyrium sanguineum*. Succulents are represented by *Aloe petricola, Euphorbia vandermerwei* and *Stapelia gigantea*[9]. Due to the former agricultural developments within the study area, very little representative Legogote Sour Bushveld is present.

5.1.1.2 Centres of Plant Endemism

Three Centres of Plant Endemism (CPE) are present in Mpumalanga, namely the Barberton, Sekukhuneland and Wolkberg CPE's (Van Wyk & Smith, 2001). These centres are areas that have an unusually high number of plants unique to that area. The study area is situated just within the Barberton Centre of Plant Endemism (BCPE). The BCPE is shared with nearby Swaziland and is largely a result of the surface-outcrops of volcanic sedimentary rocks belonging to the Barberton Supergroup. Outcrops of serpentinite occur throughout the BCPE, and these rocks give rise to soils with unusually high magnesium: calcium ratios. These soils, together with those derived from ultramafic rocks, are also associated with high concentrations of heavy metals, which are potentially toxic to plants. At least 30 plant species of the BCPE are edaphic (influenced by soil) specialists, adapted to the serpentine soils[10]. However, no serpentine soils were located within the study area and no edaphic specialists are expected.

5.1.1.3 Threatened Ecosystems

Legogote Sour Bushveld has been listed as a Threatened Ecosystem (Notice 1002 of Government Gazette 34809, 9 December 2011), and classified as **Vulnerable**. However, very little natural vegetation exists within the study area and only small portions contain representative Legogote Sour Bushveld.

5.1.2 Local Context – Plant Species Richness and Vegetation Assemblages

The results of a query on SANBI's Botanical Database of Southern Africa (BODATSA) lists 1321 plant species from 169 families for a 20 km radius of the project area. However, many of these species are found in the surrounding Escarpments (Barberton / MaKhonjwa and Nelshoogte areas) outside of Legogote Sour Bushveld. March 2022 fieldwork yielded 195 plants species from 58 families from within the project area representing 15% of the BODATSA total. The true plant species diversity of the study area is likely to be slightly higher, with spring and winter flowering herbaceous plants under-represented due to the timing of the survey. The full list of plant species confirmed to occur in the

[9] Mucina & Rutherford, 2006
[10] Van Wyk & Smith, 2001

study area during fieldwork is provided in Appendix 1. The dominant plant families are the Poaceae (29 spp.), Fabaceae (24 spp.) and Asteraceae (17 spp.).

An assessment of retrogressive satellite imagery reveals much of the area has experienced varying degrees of modification due to agricultural practices over time. This has resulted in differences in species composition, abundance, and vegetation structure, particularly across the terrestrial habitats.

Five vegetation communities are represented within the study area, based on distinctive vegetation structure (grassland, woodland, thicket, etc.), floristic composition (dominant and diagnostic species) and position in the landscape (mid-slopes, terrace, crest, etc.). Representative photographs of these communities are presented in Figure 3, are spatially presented in Figure 4 and are described in detail below. Alien plant species are indicated by an asterisk.

5.1.2.1 Dichrostachys cinerea – Sporobolus pyramidalis Secondary Woodland

This community makes up the largest extent of the study area (Figure 4) and varies in species composition, abundance and vegetation structure (Figure 3), largely due to varying intensities and frequencies of modification for agricultural practices over time.

Vegetation structure varies but can mostly be characterised as Low Bushland to Low Thicket (Edwards 1983), which is dominated by herbs and shrubs (1 – 5 m), many of which are aliens or pioneer/ sub-climax species. Emergent trees (2 – 5 m) are scattered throughout.

Dominant indigenous tree species include *Dichrostachys cinerea* subsp*. nyassana*; while *Cussonia spicata*, *Vachellia karroo*, *V. sieberiana*, *Dombeya rotundifolia, Searsia pentheri, Annona senegalensis, Senegalia caffra, Antidesma venosum, Hippobromus pauciflorus* and *Ziziphus mucronata* occur frequently. Alien trees are represented by * *Jacaranda mimosifolia, * Melia azedarach* and * *Pinus* spp.

The shrub layer is dominated by *Pseudarthria hookeri*, * *Psidium guajava*, * *Lantana rugosa,* * *Bidens pilosa* and *Lippia javanica*, while *Gymnanthemum crataegifolium* occurs frequently. *Sporobolus pyramidalis* is the dominant grass species. Other common species include *Hyparrhenia hirta*, *Aristida congesta* subsp. *barbicollis*, *Eragrostis curvula*, *Heteropogon contortus*, *Hyperthelia dissoluta*, *Melinis repens* and *Themeda triandra*.

A total of 117 species (60% of the entire list) was recorded from the Secondary Woodland community, the highest species richness of the five vegetation communities in the study area (Appendix 1).

5.1.2.2 Bridelia micrantha – Syzygium cordatum Riparian Forest

This community can be classified as Short to Tall Forest (Edwards 1983, Figure 3) and occurs at the northern extent of the central drainage line (Figure 4).

Trees that dominate the upper canopy include *Syzygium cordatum* and *Bridelia micrantha*; while frequently occurring species include *Celtis africana*, *Ficus sur* and *Syzygium guineense*. Additional woody species in the canopy include * *Coffea arabica*, *Tricalysia capensis* and *Dalbergia armata*. Common understory forbs include *Thelypteris dentata*, *Carex spicato-paniculata*, *Oplismenus hirtellus* and *Pteris catoptera*.

A total of 54 species (28% of the entire list) was recorded from the Riparian Forest community, the second lowest species richness of the five vegetation communities in the study area (Appendix 1).

5.1.2.3 Jacaranda mimosifolia – Hippobromus pauciflorus Riparian Thicket

This community can be classified as Short Thicket (Edwards 1983, Figure 3) and occurs along the drainage lines, which slope in a southerly direction towards the Queen's River (Figure 4). It has been historically heavily disturbed by agricultural activities.

This community is dominated by the tree * *Jacaranda mimosifolia*, while the indigenous tree *Hippobromus pauciflorus* dominates the understory. Other frequently occurring alien trees include * *Melia azedarach, * Morus alba* and * *Pinus* sp. Frequently occurring indigenous trees include *Gymnosporia senegalensis* and *Euclea crispa*, while less common trees include *Celtis africana*, *Combretum zeyheri*, *Volkameria glabra*, *Ficus petersii*, *F. sycamorus* and *Syzygium cordatum*. Frequently occurring indigenous shrubs include *Diospyros whyteana* and *Flueggea virosa*, while the alien species * *Solanum mauritianum* and * *Lantana camara* occur frequently. The vigorous herbaceous layer is dominated by the alien herbs * *Bidens pilosa* and * *Desmodium uncinatum*, while the dominant grass species is *Setaria megaphylla*.

A total of 43 species (22% of the entire list) was recorded from Riparian Thicket, the lowest species richness for the five vegetation communities present within the study area (Appendix 1).

5.1.2.4 Dombeya rotundifolia – Jacaranda mimosifolia Short Thicket

This vegetation community contains of an abundance of shrubs (2 – 5 m) and trees (3 – 10 m) (Figure 3) and exists along bands where previous earth-moving works for agricultural practices occurred (Figure 4).

Frequently occurring trees include a mix of indigenous and alien species from the surrounding landscape i.e., *Searsia pentheri, Cussonia spicata, * Jacaranda mimosifolia, Dichrostachys cinerea* subsp*. nyassana, Vachellia karroo, V. sieberiana, Dombeya rotundifolia* and *Hippobromus pauciflorus*. Frequently occurring shrubs include *Pseudarthria hookeri*, *Euclea crispa* and * *Psidium guajava*, while frequently occurring herbaceous species include * *Tagetes minuta* and * *Desmodium uncinatum*. The most regularly occurring grass species are *Hyparrhenia hirta, Sporobolus pyramidalis* and *Themeda triandra*.

A total of 56 species (29% of the entire list) was recorded from Short Thicket, the third highest species richness of the five vegetation communities present within the study area (Appendix 1).

5.1.2.5 Phragmites mauritianus Wetland

The Wetland community occurs in the extreme south-western portion of the study (Figure 4). Vegetation structure is Tall Grassland (Edwards, 1983, Figure 3).

The instream and channel edge dominated by the reed *Phragmites mauritianus*, while frequently occurring sedges include *Thelypteris interrupta*, *Cyperus esculentus*, *Fimbristylis dichotoma* and *Schoenoplectus corymbosus.* The herbs *Persicaria decipiens* and * *Ranunculus multifidus* occur throughout. The alien shrub * *Lantana camara* occurs frequently along wetland edge. Obligate wetland grasses include * *Cynodon nlemfuensis*, *Bothriochloa bladhii*, *Leersia hexandra*, * *Paspalum dilatatum*, *P. distichum* and * *P. urvillei*.

A total of 78 species (40% of the entire list) was recorded from Wetland, the second highest species richness for the five vegetation communities present within the study area (Appendix 1).

Figure 3. Photographs of Vegetation Communities present within the Study Area

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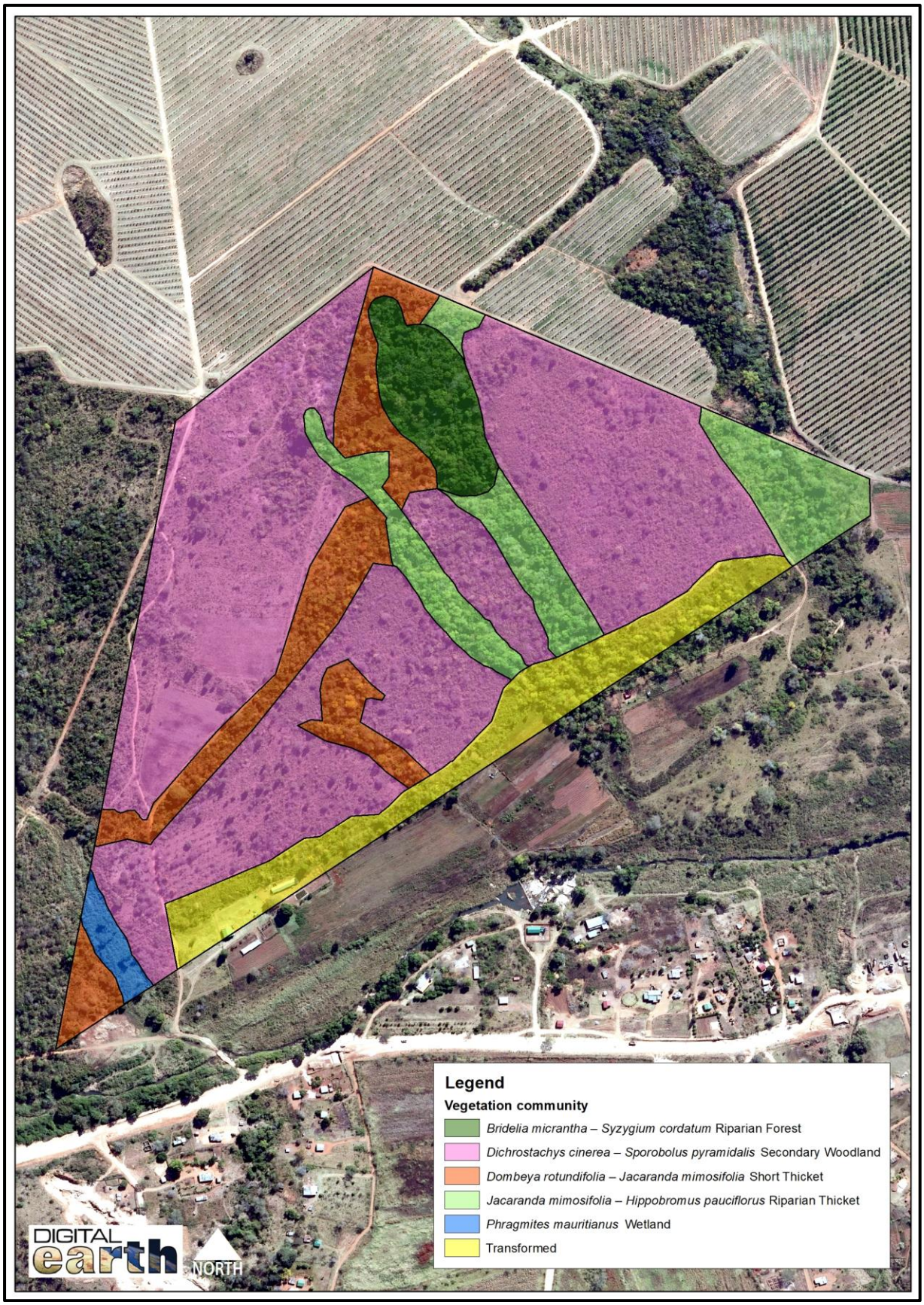

Figure 4. Spatial Presentation of Vegetation Communities located within the Study Area

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5.1.3 Species of Conservation Concern

The study area is situated within a region that has a low to moderate concentration of SCC, with an estimated nine species potentially occurring within a 20km radius but still within Legogote Sour Bushveld (Table 10). A total of 195 species from 58 families was recorded during fieldwork, none of which are listed as threatened or Near Threatened (NT) by SANBI (Appendix 1).

All but one the species listed in Table 9 have a low or very low likelihood of occurrence due to either a lack of suitable habitat, being highly conspicuous species that are unlikely to be overlooked during fieldwork, adequate coverage of suitable habitat during fieldwork or because they are regionally rare or very little is known about them. The epiphytic orchid *Ansellia africana* has a moderate likelihood of occurrence and is described below:

***Ansellia africana* Lindl. Leopard Orchid**

This familiar orchid is listed as VU by the IUCN due to harvesting for traditional medicinal uses and orchid collectors as well as wide scale bush clearing for agriculture[11]. Raimondo *et al.* do not consider this a SCC in South Africa, where it is fairly common and widespread in the savanna biome (*pers. obs*.). While no mature plants were located during fieldwork, young plants are inconspicuous, and some may be present within the study area.

5.1.4 Endemic Species

No plants located during fieldwork are endemic to Mpumalanga.

5.1.5 Protected Species

Three trees recorded during fieldwork are protected under the NFA, namely *Sclerocarya birrea, Breonadia salicina* and *Pterocarpus angolensis.* Both are found in very low numbers. Four additional plants are protected under the MNCA, namely *Scadoxus puniceus, Gladiolus vinosomaculatus, Aloe barbertoniae, Scadoxus puniceus* and *Adenia gummifera*. Most were recorded in the Riparian Forest and Short Thicket Communities and all in low numbers (Table 9).

[11] Crook, 2013

5.1.6 Alien Species

Forty-six alien plant species were recorded from within the study area during fieldwork, 21 of which are listed as being invasive under the National Environmental Management: Biodiversity Act (Act No. 10 of 2004, NEMBA) Alien and Invasive Species Lists, 2016 (Appendix 1). This highlights the severity of infestation within the study area.

Table 9. Confirmed Plant Species of Conservation Concern

Taxa	Growth Form	Protected	Vegetation Communities				
			Riparian Forest	Riparian Thicket	Short Thicket	Secondary Woodland	Wetland
Family Anacardiaceae *Sclerocarya birrea* (A.Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro	tree	NFA			r		
Family Amaryllidaceae *Scadoxus puniceus* (L.) Friis & Nordal	geophyte	MNCA			r		
Family Asphodelaceae *Aloe barbertoniae* Pole-Evans	succulent	MNCA				u	
Family Fabaceae *Pterocarpus angolensis* DC.	tree	NFA	r		r		
Family Iridaceae *Gladiolus vinosomaculatus* Kies	geophyte	MNCA					r
Family Passifloraceae *Adenia gummifera* (Harv.) Harms var. *gummifera*	climber	MNCA	r				
Family Protaceae *Faurea rochetiana* (A.Rich.) Chiov. ex Pic.Serm.	tree	MNCA				r	
Family Rubiaceae *Breonadia salicina* (Vahl) Hepper & J.R.I.Wood	tree	NFA	r				
TOTAL	**8**	**8**	**3**	**0**	**3**	**2**	**1**

NFA = National Forests Act MNCA = Mpumalanga Nature Conservation Act	u = uncommon r = rare

Table 10. Potentially occurring Plant Species of Conservation Concern

Species	Red Data Status	Habitat Preference	Optimal Survey Time	Likelihood of Occurrence	Justification
Family Anacardiaceae *Ozoroa barbertonensis*	VU	Grassland, on rocky hillsides between rocks on white-green band of serpentine soil	Throughout the year (even when sterile)	Very Low	No suitable habitat present, none located despite intensive searching
Family Asteraceae *Macledium zeyheri* subsp. *thyrsiflorum*	VU	Serpentine outcrops in montane grassland and dry woodland	Oct-April, deciduous species	Very Low	No serpentine outcrops present
Family Celastraceae *Elaeodendron transvaalense*	NT	Dry woodland	Throughout the year (even when sterile)	Very Low	Very rare in the general area, prefers heavier soils to the north-east
Family Dioscoreaceae Listed Sensitive Species No. 1252	VU	Wooded and relatively mesic places, such as the moister bushveld areas, coastal bush and wooded mountain kloofs	Usually throughout the year (even when sterile) although deciduous in dry environments	Low	Degraded habitats present, not located during fieldwork
Family Hyacinthaceae *Bowiea volubilis* subsp. *volubilis*	VU	Scree slopes, rocky thickets	Oct-April (deciduous species)	Very Low	No suitable habitat present
Merwilla plumbea	NT	Open grassland, wetlands, rocky ridges	Oct-April (deciduous species)	Low	No suitable habitat present, none located during fieldwork
Family Iridaceae	Rare		Oct - Feb (deciduous species)	Low	

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Gladiolus serpenticola		Serpentine soils in grassland and savanna			No suitable habitat present, none located despite intensive searching
Family Orchidaceae *Ansellia africana*	VU‡	Riverine forest, tall woodland	Throughout the year (even when sterile)	Moderate	Suitable habitat present, none located despite intensive searching but a species that is easily overlooked when young
Family Zingiberaceae Sensitive Species No. 575	CR	Wide variety of habitat types	Oct-April, deciduous species	Very Low	Very rare in Mpumalanga, only known from a few localities further north within the Crocodile Gorge and KNP

NT - Near Threatened
VU - Vulnerable
EN - Endangered
CR - Critically Endangered
‡ - IUCN assessment

5.2 Terrestrial Fauna

5.2.1 Mammals

5.2.1.1 Regional Overview

The study area is situated in the savanna biome in the low, gently undulating hills of the southwestern Foothills of eastern Mpumalanga. Most of the study area was formerly cultivated and disturbance levels are high. Most of the surrounding area is inhabited or modified through urbanisation or agricultural developments, with natural vegetation existing only to the west of the study area. Although not directly observed during fieldwork, bushmeat hunting with dogs and snaring probably takes place occasionally. The property is mostly unfenced, and access appears to be uncontrolled. The provincial Songimvelo Nature Reserve lies approximately 13 km to the south of the study area. However, most of the area in between is afforested.

A total of 25 mammals have been recorded in the QDGS 2530 DD in the Animal Demography Unit's Virtual Museum's database[12]. The actual number of species present is likely to be higher as many mammals are small, cryptic or nocturnal in habit and therefore difficult to photograph. However, the grid is seldom visited by the public and few records have been submitted. Only one of the confirmed Virtual Museum mammals have conservation status, namely Natal Red Duiker *Cephalophus natalensis* which is assessed as NT. Endemism is very low, with none of the potentially occurring mammals being endemic to South Africa, Lesotho and Eswatini. The 2019 ecological survey performed on the adjacent property yielded ten mammal species, one of which is assessed as NT (Natal Red Duiker)[13].

5.2.2.2 Confirmed Species

Only four native mammals were recorded during fieldwork, namely Vervet Monkey *Chlorocebus pygerythrus*, Cape Porcupine *Hystrix africaeaustralis,* Natal Red Duiker *Cephalophus natalensis* and Southern Bushbuck *Tragelaphus sylvaticus* (Appendix 2). All are locally common species in the general area (*pers. obs*). Additional fieldwork, including small mammal trapping and camera traps, would result in a low number of additions and it is unlikely that this would have produced data that would have changed the ecological importance analysis of this report.

[12] http://vmus.adu.org.za/vm_sp_list.php accessed 31/03/2022
[13] ECOREX 2019

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5.2.2.3 Species of Conservation Concern

An estimated 17 conservation-important mammals potentially occur within the study area (Appendix 3). Several cave-roosting bat species of conservation concern are likely to occur overhead, but these species are only likely to feed over the site because of the shortage of suitable roosting sites and have been excluded from this assessment. Of the 17 potentially occurring species, 12 are considered to be SCC[14] with eight considered threatened (Appendix 3). One of these was located during fieldwork and is discussed below.

Natal Red Duiker *Cephalophus natalensis*

This small antelope is listed as NT due to ongoing habitat loss due to agriculture and bush-clearing as well as losses through bushmeat hunting[15]. It is still fairly common in the general area (*pers. obs*.) and tracks were located in thicket / forest habitat within the study area.

One species has a moderate likelihood of utilising the study area on a regular basis and is described below:

Serval *Leptailurus serval*

This medium-sized cat species is fairly common in suitable habitat in Mpumalanga (*pers. obs*.). Although not located during fieldwork, this species has a Moderate likelihood of occurring within the study area. It is listed as NT due to habitat loss and fragmentation, as well as demand for their coats[16].

The remaining potentially occurring SCC all have low or very low likelihood of occurring due to a lack of suitable habitat, high disturbance levels or regional scarcity.

5.2.2.4 Protected Species

Several potentially occurring species are protected under either the MNCA or the NEMBA ToPS (Appendix 3). However, only one was confirmed during fieldwork, namely Natal Red Duiker which is protected under the MNCA.

[14] The same approach as Raimondo *et al*. (2009) has been followed here regarding species of conservation concern (i.e. those with a status of Declining, Near Threatened and Data Deficient) and threatened species (Vulnerable, Endangered and Critically Endangered)
[15] Child *et al*. 2016
[16] Child *et al*., 2016

5.2.2.5 Alien Species

No naturalised alien mammal species were located during fieldwork, and very few are expected.

5.2.2 Avifauna

5.2.2.1 Regional Overview

The savanna biome, within which the study area is situated, supports the highest diversity of bird species within the Southern African sub-region[17]. Although no formal publications regarding avifauna have been published for the Barberton area, a paper published by BirdLife Lowveld in 2019 listed 376 bird species from 81 families having been confirmed from within the adjacent Barberton/ Makhonjwa World Heritage Site[18]. Of these, 24 are assessed as threatened or NT in the BirdLife South Africa Red Data List (Taylor *et al.,* 2015).

The Barberton area is avifaunally well sampled and diverse with a total of 384 species recorded from 1258 lists submitted for the nine pentads (mapping units) surrounding Uguhleni 698 JT from Full Protocol cards[19] in the second Southern African Bird Atlas Project (SABAP2)[20]. At a finer scale, data from SABAP2 indicate that 212 bird species from 17 full protocol cards have already been recorded from the pentad in which the study area is situated (2545_3055)[21]. A pentad covers an area of approximately 77 km^2, which is considerably smaller than a QDGS (approximately 694 km^2) and thus a better indication of which species occur in the study area. Several of the potentially occurring birds are endemic to South Africa, Lesotho and Eswatini, but none were recorded during fieldwork (Appendix 2).

The study area is situated approximately 13 km north of the Songimvelo Nature Reserve, an area designated as an Important Bird and Biodiversity Area by Birdlife South Africa[22]. Due to the amount of disturbance in the area surrounding the study area, including agriculture and large settlements, as well as being at a much lower elevation and supporting very different habitats, very few of the conservation-important bird species found in Songimvelo are expected to regularly utilise the area. The study area is not situated within close proximity to any Wetlands of International Importance (Ramsar Sites)[23].

[17] Taylor *et al*., 2015
[18] McKenzie & McKenzie, 2019
[19] Full Protocol lists reflect an observer effort of between two hours and five days of data collection while Ad Hoc lists reflect an effort of less than two hours
[20] https://sabap2.birdmap.africa/coverage/group/459_Ughln created on 31/03/2022
[21] Data accessed from http://sabap2.adu.org.za/pentad_info.php?pentad=2545_3055#menu_top on 31/03/2022
[22] Marnewick *et al*., 2015
[23] https://www.ramsar.org/wetland/south-africa

5.2.2.2 Local Avifaunal Assemblages

A total of 57 bird species, or 22% of the pentad list, was confirmed from within or immediately adjacent to the actual habitats represented in the study area during fieldwork and are listed in Appendix 2. Sufficient sampling was undertaken for assessing habitat suitability for potentially occurring threatened species and to describe broad bird assemblages. Three broad assemblages or species-habitat associations were identified, and are briefly described below:

I. Woodland Assemblage

The degraded woodlands that dominate the study area provide refuge for a moderate diversity of widespread savanna species such as Brown-hooded Kingfisher *Halcyon albiventris*, Yellow-fronted Canary *Crithagra mozambica*, Long-billed Crombec *Sylvietta rufescens*, Scarlet-chested Sunbird *Chalcomitra senegalensis* and Blue Waxbill *Uraeginthus angolensis*. Thirty-nine species (68% of the entire species list) were recorded from the Woodland assemblage, the highest of the three assemblages.

II. Thicket Assemblage

Thicket and dense, closed woodland habitat occur on the drainage lines within the study area. Common species include Natal Spurfowl *Pternistis natalensis*, Purple-crested Turaco *Tauraco porphyreolophus*, Golden-tailed Woodpecker *Campethera abingoni*, Dark-capped Bulbul *Pycnonotus tricolor* and African Firefinch *Lagonosticta rubricata*. Twenty-two species (39% of the entire list) were recorded from the Thicket assemblage; the second highest of the three assemblages present.

III. Wetland Assemblage

Wetland habitat, dominated by grasses, reeds and sedges, occurs in the far western portion of the study area. Typical species recorded are Tawny-flanked Prinia *Prinia subflava,* Red-collared Widowbird *Euplectes ardens,* Yellow-throated Longclaw *Macronyx croceus* and Red-faced Cisticola *Cisticola erythrops*. Sixteen species (34% of the entire species recorded during fieldwork) were recorded from the Grassland assemblage, the lowest of the three assemblages.

5.2.2.3 Species of Conservation Concern

An estimated ten bird SCC have been recorded from or potentially occur within the general area around the study area (Appendix 3). Seven of these are threatened, with the remaining three are assessed as NT. No threatened or NT species were recorded during fieldwork, and only one of the potentially occurring threatened species potentially occurs. This species is described below.

Crowned Eagle *Stephanoaetus coronatus*

The Crowned Eagle is the largest avian predator of Africa's forests, feeding primarily on monkeys, small antelope and hyraxes[24]. The greater Barberton area supports at least three pairs of birds (G. Batchelor *pers. comm*.) and it has a reporting rate of 11.8% for the pentads within the study area (Appendix 3). One nest site is situated 4 km west of the study area on the Queens River on SAPPI property and these birds are highly likely to occasionally forage woodland habitats within the study area. However, no potential nesting sites are present. Crowned Eagle is listed as VU due to ongoing habitat destruction, direct persecution from small-stock farmers and due to having a low total population in South Africa[25].

The remaining potentially occurring SCC all have a low or very low likelihood of regularly occurring within the study area, primarily due to very high disturbance levels, a lack of suitable habitat, regional rarity or shortage of suitable nesting sites such as tall trees or cliffs (Appendix 3). No raptor nests were located within the study area.

5.2.2.4 Endemic Species

No bird species recorded during fieldwork are endemic to South Africa, Lesotho and Swaziland.

5.2.2.5 Protected Species

With the exception of most gamebirds, waterfowl and problem birds, most bird species are protected in Mpumalanga under the MNCA. No potentially occurring species are protected under NEMBA ToPS.

5.2.2.5 Alien Species

No alien bird species were recorded during fieldwork (Appendix 2). It is likely that at least some are present within adjacent transformed / degraded habitat.

[24] Hocket *et al*., 2005
[25] Taylor *et. al*., 2015

5.2.3 Herpetofauna

5.2.3.1 Regional Overview

The Lowveld and Foothills of eastern Mpumalanga supports a very high diversity of reptile species, with diversity levels ranking in the top 10% of all areas in South Africa[26]. The two reptile groups showing the highest diversity include the lizards (20-41 species recorded) and snakes (20-44 species recorded) (Bates *et al.*, 2014). Reptile endemicity is low with only two species recorded in the QDGS 2530 DD being endemic to South Africa. This is to be expected as the area lies in close proximity to Mozambique in the widespread savanna biome (Bates *et al.,* 2014, Tolley *et al.*, 2019). One hundred and eight reptile species have been recorded from 2530[27] but, at a finer scale, only 26 species have been recorded from the QDGS 2530 DD, in which the study area is situated, as listed on the Reptile Atlas of Southern Africa website (http://vmus.adu.org.za/) and in Bates *et al*. (2014).

The Uguhleni area supports a moderately high diversity of frog species, with levels of 11-20 species per QDGS in the greater Barberton area[28]. However, no potentially occurring frogs are endemic to South Africa (Minter *et al.,* 2004). Forty-one frog species have been recorded from the degree grid 2530[29] and, on a finer scale, 19 have been recorded from the QDGS 2530 DD [30], within which the study area is situated.

5.2.3.2 Confirmed Species

Only one reptile was recorded during fieldwork, namely Common Dwarf Gecko *Lygodactylus capensis* (Appendix 2). This is a common and widespread species in the general area (*pers. obs*.). Two frogs were recorded from Wetland habitat, namely Plain Grass Frog *Ptychadena anchietae* and Snoring Puddle Frog *Phrynobatrachus natalensis*. Both are very common in the Foothills and Lowveld of Mpumalanga (*pers. obs*.). Four reptile and five frog species, none of which are SCC, were recorded from the adjacent property during the ecological study performed in 2019[31]. Dedicated herpetofaunal surveys in the wet season, including trapping, would no doubt have produced additional species but are unlikely to have produced data that would change the recommendations in this report.

[26] Bates *et al*., 2014
[27] http://vmus.adu.org.za/vm_sp_list.php accessed 31/03/2022
[28] Minter *et al*., 2004
[29] http://vmus.adu.org.za/vm_sp_list.php accessed 31/03/2022
[30] http://vmus.adu.org.za/vm_sp_list.php accessed 31/03/2022
[31] ECOREX, 2019

5.2.3.3 Species of Conservation Concern, Protected and Alien Species

Two nationally threatened reptiles potentially occur in in the general proximity of the study area, namely Listed Sensitive Species No. 2 and Natal Hinged Tortoise *Kinixys natalensis* (both VU), but both with a Very Low likelihood due to lack of suitable habitat, high disturbance levels or regional rarity. Southern African Python *Python natalensis* is protected under the NEMBA ToPS and is likely to regularly occur within the study area (Appendix 3). No potentially occurring frog species are considered SCC. No alien herpetofauna species were recoded or are expected in the study area.

5.3 Important Ecological Processes / Drivers and Ecological Connectivity

The focus on threatened species and ecosystems are often the primary approach taken with conservation actions (for example, biodiversity assessments). While this is still important, the protection of biodiversity assets will not be effective unless the ecological processes or drivers that sustain them are maintained (Bennett *et al*., 2009).

Ecological processes are those processes which maintain the structure and species composition of habitats and allow these to evolve over time (Driver *et al.* 2003). Many kinds of ecological processes sustain biodiversity, including the following:

- climatic processes;
- primary productivity;
- hydrological processes;
- formation of biophysical habitats;
- interactions between species;
- movements of organisms; and
- natural disturbance regimes[32].

The study area is situated within the savanna biome (Mucina & Rutherford, 2006). Savannas consist of an "open tree layer with a continuous grassy ground layer, typically dominated by shade-intolerant species" (Ratnam *et al.* 2011). Savannas are also complex in nature. They occur where trees and grasses interact to create a biome that is neither grassland nor forest. Trees and grasses interact by many mechanisms, some negative (competition) and some positive (facilitation). The strength and sign of the interaction varies in both time and space, allowing a rich array of possible outcomes but no universal predictive model (Scholes & Archer, 1997).

The following major ecological drivers were identified for the Savanna biome by Sankaran *et al*. (2005):

- The availability of resources (water, nutrients); and
- Disturbance regimes (fire, herbivory).

[32] Bennett *et al*., (2009)

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No important local or landscape corridors have been identified within the study area[33]. Of moderate local importance is the riparian vegetation along the Queens River, situated just to the south of the study area. Although this area is moderately impacted by alien plant infestation, it does support several protected plant species and is probably functioning as an important migration corridor for biota.

The very high levels of urbanisation and agriculturalisation surrounding the study area means that many of the primary ecological drivers are either absent or reduced. Most of the larger ungulates have been removed from the ecosystem and burning is probably an annual occurrence. Habitat transformation has been relatively rapid as informal dwellings have been constructed to the south of the study area.

The total amount of nutrients and mean annual precipitation entering the ecosystem has probably not been altered much despite the presence of vast swathes of urbanisation to the south and agricultural developments to the north of the study area. The position of the proposed agricultural development in the mid-altitude savanna means that it is unlikely that any climate-change refugia, which are mostly located in higher-altitude areas to the west, would be impacted by the project.

The disturbed or degraded state of the five vegetation communities within the study area makes it unlikely it provides important connectivity to other surrounding savanna habitats. However, the rocky hills and grassy wetlands to the west of the study are not as degraded and are linked to other similar habitat and most likely provide important ecological connectivity.

[33] Lötter *et al*., 2014

5.4 Environmental Screening Tool

According to regulation 16(1)(b)(v) of the EIA Regulations (2014), applicants requiring Environmental Authorisation must comply with the protocols within the report generated by the DEA's online EST. The result of the site-specific EST query indicated that the study area, including a 1km buffer, has **Medium** Sensitivity for the Animal and Plant Themes and **Very High** Sensitivity for the Terrestrial Biodiversity Theme (Figure 5) due to the potential or confirmed occurrence of the following:

Animal Theme (Medium)

- Mammalia - *Ourebia ourebi* - EN

The study area does not support grasslands, habitat of Oribi.

- Mammalia – *Cercopithecus albogularis schwarzi* – VU

The inland subspecies of Samango Monkey has a low likelihood of occurring within the study area due to a lack of suitable forest habitat present.

- Mammalia – *Acinonyx jubatus* – VU

Cheetah has a very low likelihood of occurring within the study area due to the high transformation levels present, high human disturbance levels and lack of prey.

- Mammalia – *Dasymys robertsii* – VU

Robert's Marsh Rat is dependent on pristine and undisturbed aquatic habitats, such as marshes, with high connectivity. The study area is situated on the eastern edge of its distribution range, and the wetland system present is small and with only moderate connectivity. It therefore has a Low likelihood of occurring within the study area.

- Mammalia – *Crocidura maquassiensis* – VU

The Maquassie Musk Shrew is unrecorded from eastern Mpumalanga. It therefore has a Very Low likelihood of occurrence.

- Invertebrates – *Clonia lalandei* – VU

Lalande's Black-winged Clonia has a Very Low likelihood of occurrence due to a lack of suitable temperate grassland habitat present.

Insecta-*Lepidochrysops irvingi* – VU

This small butterfly has a Very Low likelihood of occurrence due to a lack of suitable montane grassland habitat present.

Plant Theme (Medium)

- Listed Sensitive Species No. 575 – CR

This deciduous, herbaceous plant has a very low likelihood of occurrence due to regional rarity and popularity within the medicinal plant trade. The closest known population is situated *c.* 40 km to the north within the Crocodile Gorge.

- *Macledium zeyheri* subsp. *thyrsiflorum* – VU

This herbaceous plant has a Very Low likelihood of occurrence due to no suitable habitat (serpentine outcrops in grassland and woodland) being present.

Terrestrial Biodiversity Theme (Very High)

- Critical Biodiveristy Area 2 (CBA Optimal)
- Vulnerable Ecosystem (Legogote Sour Bushveld
- Protected Areas Expansion Strategy

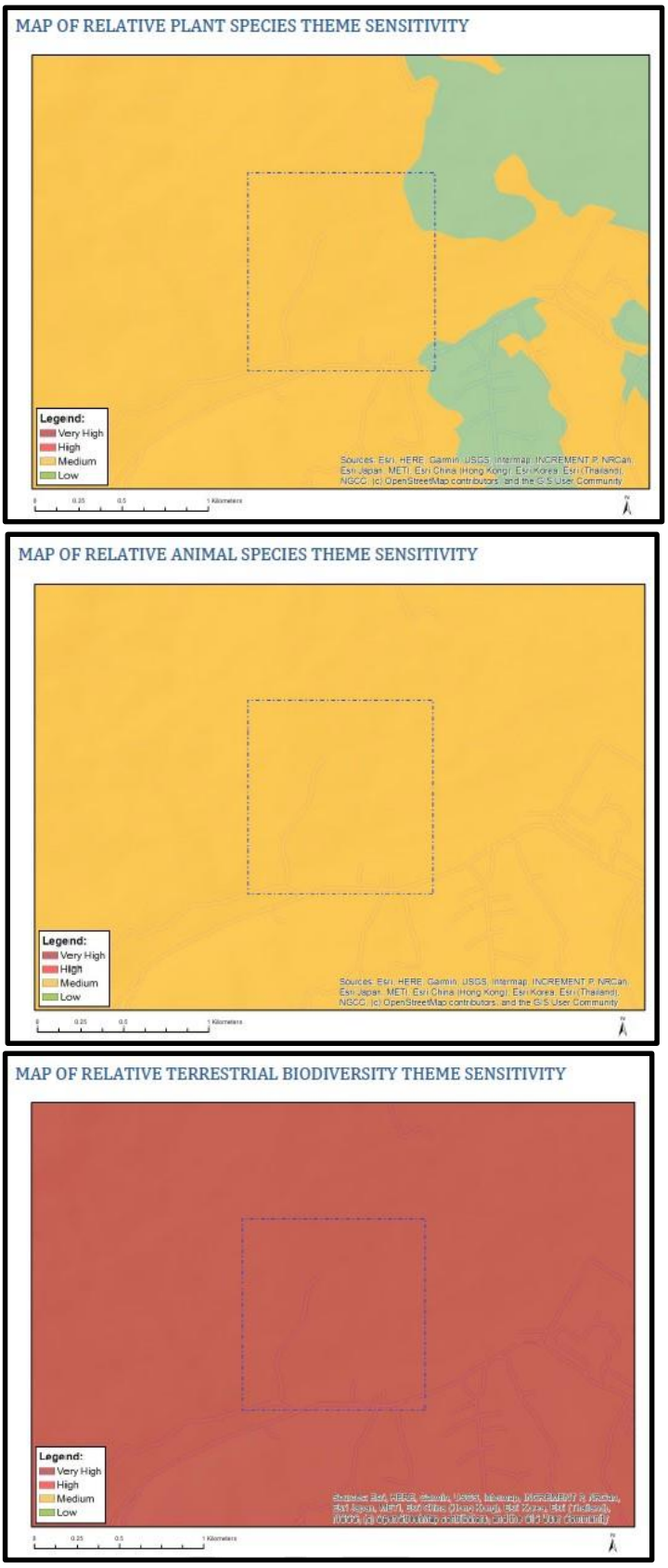

Figure 5. Environmental Screening Tool Themes relevant to Terrestrial Ecology

5.5 Mpumalanga Biodiversity Sector Plan Assessment

The central portions of the study area are classified as **Heavily** or **Moderately Modified** by the the MBSP (Lötter *et al.*, 2014) (Figure 6). These areas show the greatest flexibility in terms of management objectives and permissible land-uses[34]. Most of the Secondary Woodland vegetation type occurs in this category.

The western, northern and eastern portions of the study area have been assessed as **Critical Biodiversity Area (CBA) Optimal** by the the MBSP (Lötter *et al.*, 2014, Figure 6). These are areas that are the most important in Mpumalanga for meeting biodiversity targets outside of formally protected areas and for conserving critical biodiversity ecosystems. CBA areas should be maintained in a natural state with no further loss of natural habitat. The desired management objective in these areas is conservation management which includes, for example, low-intensity livestock or game farming[35]. Any development should be carried out under the provisions of the National Environmental Management Act (NEMA, Act 107 of 1998). However, most of these portions of the study area are ecologically compromised by various anthropogenic factors, including historical agricultural lands and alien plant infestation and should probably be excluded from the macro-scale CBA assessment. A revision of the MBSP will most likely re-classify many of these areas as **Heavily** or **Moderately Modified** and **Other Natural Areas**.

[34] Lötter *et al*., 2014
[35] Lötter *et al*., 2014

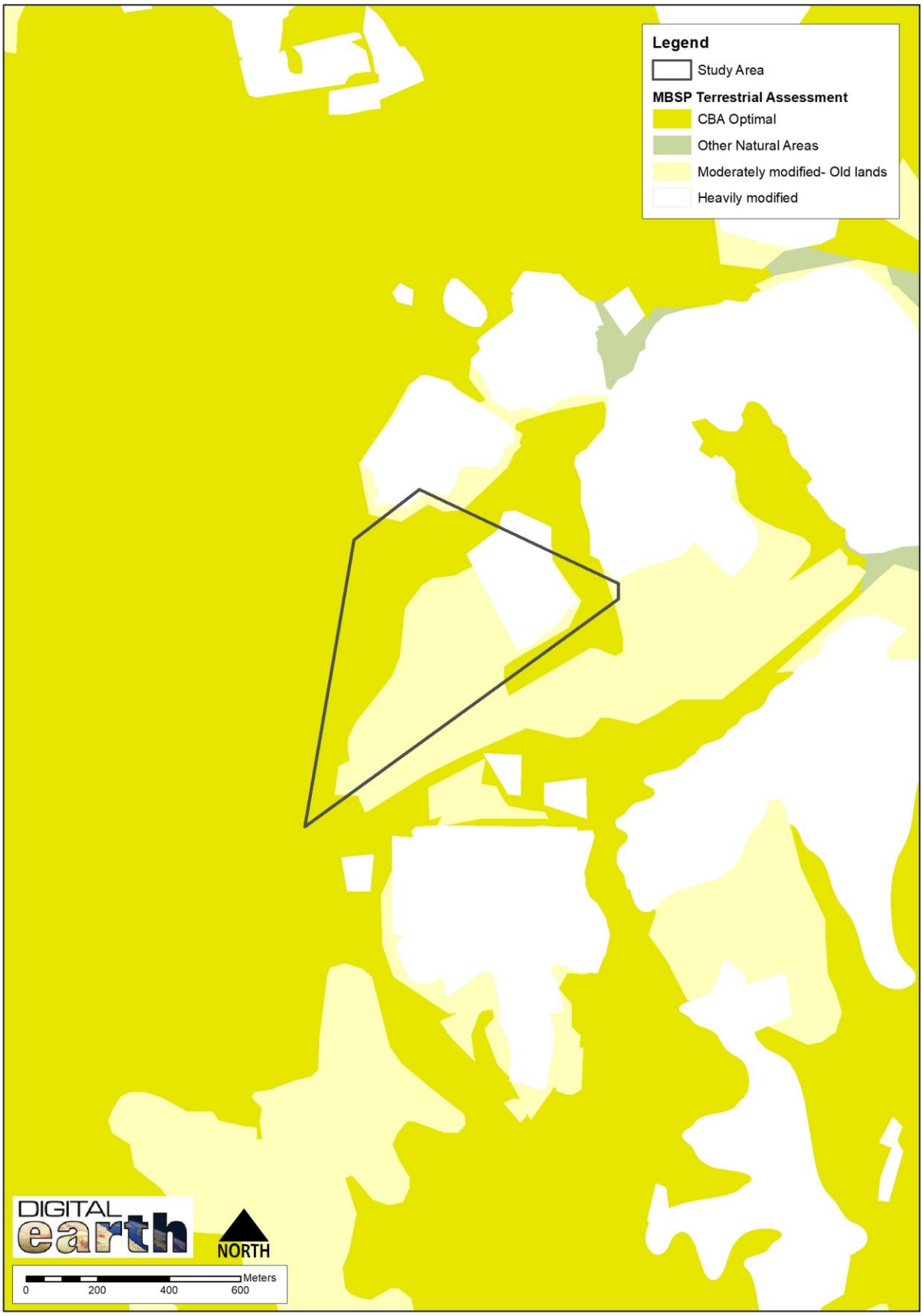

Figure 6. Mpumalanga Biodiversity Sector Plan Assessment of the Study Area

5.6 Site-specific Ecological Importance Analysis

An Ecological Importance analysis of the five vegetation communities represented in the study area was undertaken using the methodology described in Section 4.4. Table 11 shows the calculation of Ecological Importance of the study area, which is displayed in Figure 7 below.

The Secondary Woodland community has Low Conservation Importance (CI) as only a few protected plants were confirmed, and disturbance levels are very high. Few potentially occurring SCC are possible. This leads to a Functional Integrity (FI) assessment of Low and a Biodiversity Importance (BI) of **Low**. Receptor Resilience (RR) is Medium as Legogote Sour Bushveld is a vegetation type that is slow to recover fully after disturbances or impacts and contains species that only have a moderate likelihood of returning to a site once the disturbance or impact has been removed. The integration of Low BI and Medium RR results in a SEI of **Low**.

The Riparian Forest has a High CI due to the confirmed presence of nationally and provincially protected plants, due to the national protection status of riparian areas, due to the confirmed presence of a NT-listed mammal and due to potentially having a local importance as an ecological corridor. FI is only Medium due to the presence of several alien invasive plant species. This leads to a BI value of **Medium**. RR is **Low** as riparian areas contain habitat that is unlikely to be able to recover fully after a relatively long period. When the Medium BI is combined with a Low RR the resulting SEI is **High**.

The Riparian Thicket has a High CI due to the confirmed presence of nationally and provincially protected plants, due to the national protection status of riparian areas and due to potentially having a local importance as an ecological corridor. Functional Integrity (FI) is Low due to the dominance of many alien invasive plant species and high disturbance levels. This leads to a BI value of **Medium**. Receptor Resilience (RR) is **Medium** as degraded riparian areas contain habitat that is slow to recover fully after disturbances or impacts and contain species that only have a moderate likelihood of returning to a site once the disturbance or impact has been removed. When the Medium BI is combined with a Medium RR the resulting SEI is **Medium**.

The Short Thicket community has Medium CI as only a few protected plants were confirmed, and disturbance levels are very high. No potentially occurring SCC are possible. This leads to a FI assessment of Low and a BI of **Low**. RR is Medium as Legogote Sour Bushveld is a vegetation type that

is slow to recover fully after disturbances or impacts and contains species that only have a moderate likelihood of returning to a site once the disturbance or impact has been removed. The integration of Low BI and Medium RR results in a SEI of **Low**.

The Wetland vegetation community has a High CI due to the national protection status of wetlands, due to being intact and therefore performing important wetland functions such as water attenuation, water storage and filtering and due to potentially having a local importance as an ecological corridor. FI is High. This leads to a BI value of **High**. RR is **Medium** as wetland areas contain habitat that is slow to recover fully after disturbances or impacts and contain species that only have a moderate likelihood of returning to a site once the disturbance or impact has been removed. When the High BI is combined with a Medium RR the resulting SEI is **High**.

According to SANBI's 2020 guidelines for biodiversity specialists in ESIAs (Table 6), areas with High SEI have the following land use guidelines:

- Avoidance mitigation wherever possible. Minimization mitigation – Changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.

Areas with Medium SEI have the following land use guidelines:

- Minimization & restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities.

Areas with Low SEI have the following land use guidelines:

- Minimization & restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities

Table 11. Ecological Sensitivity of Vegetation Communities in the Study Area

Assessment Criteria	Secondary Woodland	Riparian Forest	Riparian Thicket	Short Thicket	Wetland
Conservation Importance	Medium	High	High	Medium	High
Functional Integrity	Low	Medium	Low	Low	High
Biodiversity Importance	Low	Medium	Medium	Low	High
Receptor Resilience	Medium	Low	Medium	Medium	Medium
SITE ECOLOGICAL IMPORTANCE	**Low**	**High**	**Medium**	**Low**	**High**

Figure 7. Site Ecological Importance of the Vegetation Communities in the Study Area

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6. KEY CURRENT AND POTENTIAL IMPACTS

This section details the environmental impacts of the proposed development within the study area on terrestrial ecosystems. Impacts are not arranged in any order of overall significance.

6.1 Loss of Habitat with a Very High Terrestrial Biodiversity Theme (EST), CBA: Optimal Conservation Status and Vegetation Communities with High SEI

The study area is situated within an area assessed as having Very High Terrestrial Biodiversity Theme within the Environmental Screening Tool of the DEA. Additionally, portions of the study area are situated within an area assessed as CBA: Optimal in the MBSP, and two vegetation communities are assessed as having High SEI (Riparian Forest and Wetland). According to SANBI's 2020 guidelines, impacts in these areas should be avoided. Destruction of sensitive natural vegetation will therefore result in a **High** significance, but with mitigation, this can be lowered to **Low-Medium.**

Likelihood		**Consequence**			
Frequency of Activity	*Frequency of Impact*	*Severity*	*Spatial Scope*	*Duration*	*Significance Rating*
Significance Pre-Mitigation					
5	5	4	2	5	110
Significance Post-Mitigation					
4	4	2	2	4	64

Cumulative Impact

The loss of habitat from agricultural activities may result in a localised cumulative impact. The post-mitigation significance of the cumulative impact is however considered to be **Low-Medium**.

Description of Mitigation Measures and Application of Mitigation Hierarchy

- It is suggested that all new agricultural developments be restricted to the areas formerly cultivated (see Figure 2) and that a 30 m conservation buffer be implemented around the edge of all riparian areas and drainage lines.
- An independent Environmental Compliance Officer must be appointed to monitor compliance with the RoD during all phases of construction; and
- Bulk clearing of vegetation should be restricted to the dry months between April and September to reduce erosion and subsequent sedimentation.

Application of these measures are likely to reduce the impact significance to **Low-Medium**, which would require no further application of the Mitigation Hierarchy.

6.2 Invasion of Natural Habitat by Alien Plants

A very high total of 46 alien plant species were located within the study area during fieldwork, 21 of which are declared alien invasives. Many of these species are dominants or co-dominants in some of the vegetation communities. Additional invasion is highly likely as construction activities could introduce seeds which may thrive in bare soil resulting from construction activities. The significance of this impact is therefore **High** but, with the implementation of appropriate mitigation, the significance could be reduced to **Low**.

Likelihood		**Consequence**			
Frequency of Activity	*Frequency of Impact*	*Severity*	*Spatial Scope*	*Duration*	*Significance Rating*
Significance Pre-Mitigation					
4	4	5	3	5	104
Significance Post-Mitigation					
3	3	1	2	4	42

Cumulative Impact

The loss of habitat from invasion from alien plant species, which is already evident, may result in a regional cumulative impact and should therefore be regarded as having **Medium** significant. The post-mitigation significance of the cumulative impact is however considered to be **Low**. However, this will depend on strict implementation of the mitigation measures described below.

Description of Mitigation Measures and Application of Mitigation Hierarchy

- In order to comply with the National Environmental Management: Biodiversity Act (Act No. 10 OF 2004), all listed invasive exotic plants as indicated in Appendix 1 should be targeted and controlled.
- An alien plant control plan should be compiled to address the inevitable invasion that will follow the resultant bare soil after construction work. Once clearing commences, regular monitoring of the study area and adjacent natural habitat should take place to ensure that no woody alien species are establishing. If located, all plants should be destroyed. This is not applicable to annual “weeds” which are significantly harder to control and will also assist with the binding of loose soil within the construction site.

- It is important that weed control, if involving herbicides, be managed correctly to reduce the impact on the adjacent natural vegetation.
- Regular inspections should be made to determine if any additional alien plants have established.

Application of these measure are likely to reduce the impact significance to **Low**, which would require no further application of the Mitigation Hierarchy.

6.3 Potential of Soil Erosion

Rain and sediment runoff from loose and bare soil around the cleared land parcels are likely to result in some erosion and downstream sedimentation. Although the pre-mitigation impact of this is **Low-Medium**, consideration must be given to the timing of clearing activities. Clearing during the dry season and the careful and correct implementation of a re-vegetation and soil erosion plan will reduce this impact to **Low**.

Likelihood		**Consequence**			
Frequency of Activity	*Frequency of Impact*	*Severity*	*Spatial Scope*	*Duration*	*Significance Rating*
Significance Pre-Mitigation					
3	4	3	2	4	63
Significance Post-Mitigation					
3	3	1	1	4	36

Cumulative Impact

The loss of topsoil and sedimentation of natural habitat may result in a local cumulative impact and will likely only happen after heavy rain events. However, due to the small spatial extent and nature of the proposed development, this should be regarded as only having **Low-Medium** significant. The post-mitigation significance of the cumulative impact is however considered to be **Low**. However, this too will depend on strict implementation of the mitigation measures described below.

Description of Mitigation Measures and Application of Mitigation Hierarchy

It is recommended that clearing be conducted in the dry months between April and September, prior to the onset of the rains. The seasonal arrival of the rain season subsequent to construction will then allow for the natural re-vegetation of bare areas, from the seedbank within the soil. Suitable drains and other stormwater infrastructure should be constructed in areas where run-off is likely. Application of these measure are likely to reduce the impact significance to **Low**, which would require no further application of the Mitigation Hierarchy.

6.4 Increase in Poaching Activities

Unsupervised construction workers may participate in small-scale poaching through setting snares or traps for bushmeat. This may affect the confirmed NT-listed Natal Red Duiker. Medicinal plants may also be harvested for muthi. Due to the current lack of access controls, mitigation measures are redundant. The impact is likely to be **Low-Medium**.

Likelihood		**Consequence**			
Frequency of Activity	*Frequency of Impact*	*Severity*	*Spatial Scope*	*Duration*	*Significance Rating*
Significance Pre-Mitigation					
3	3	3	3	3	54
Significance Post-Mitigation					
3	3	3	2	3	48

Cumulative Impact

Due to the small spatial extent and high degree of disturbance within the study area, the cumulative effect of this impact is Low.

Description of Mitigation Measures and Application of Mitigation Hierarchy

Due to the area surrounding the proposed development site appearing to be accessible to the general public, no appropriate mitigation measures can be made. The erection of a boundary fence and implementation of strict access controls may reduce the impact rating to Low, which would require no further application of the Mitigation Hierarchy.

6.5 Destruction of Protected Plants

Three nationally and five provincially protected plant species were confirmed during fieldwork. Some of these species may be destroyed during clearing. However, very few plants were located within the Secondary Woodland community which was formerly cultivated, and the severity of this impact is rated as Small. The overall significance of this impact pre-mitigation is **Medium**. With the implementation of potential mitigation measures, the post-mitigation significance is **Low-Medium**.

Likelihood		Consequence			
Frequency of Activity	*Frequency of Impact*	*Severity*	*Spatial Scope*	*Duration*	*Significance Rating*
Significance Pre-Mitigation					
5	5	3	1	4	80
Significance Post-Mitigation					
4	4	1	1	4	48

Cumulative Impact

Due to the high disturbance levels currently in place, and the relatively few plants present within areas suitable for agriculture, this impact will not have a detrimental effect on the ecology of the area. The cumulative impact is therefore Low.

Description of Mitigation Measures and Application of Mitigation Hierarchy

- The placing of all proposed agricultural lands within the Secondary Woodland and exclusion of all other vegetation communities from development will reduce the overall impact to Low.
- Avoid the destruction of all protected plants, wherever possible.
- If plants are located within the area to be cleared, then a destruction permit from the relevant authority should be applied for.

Implementation of these measures will reduce the overall significance of the impact to Low and would not require further application of the Mitigation Hierarchy.

6.6 Destruction of Habitat for Faunal SCC

One mammal listed as NT was confirmed from Riparian Forest / Thicket during fieldwork (Natal Red Duiker). In addition, one mammal listed as NT (Serval) and one bird listed as VU (Crowned Eagle) may occasionally forage within the study area. The overall significance of this impact pre-mitigation is **Medium**. With the implementation of potential mitigation measures, the post-mitigation significance can be reduced to **Low**.

Likelihood		Consequence			
Frequency of Activity	*Frequency of Impact*	*Severity*	*Spatial Scope*	*Duration*	*Significance Rating*
Significance Pre-Mitigation					
5	5	3	3	4	100
Significance Post-Mitigation					
3	3	3	3	3	54

Cumulative Impact

The ongoing destruction of riparian vegetation and infestation from alien plants in the general area is cause for concern. However, long-term protection of riparian habitat will reduce the cumulative Impact to Low-Medium.

Description of Mitigation Measures and Application of Mitigation Hierarchy

- No development is to take place within 30 m of the edge of all riparian zones, including wetlands.
- Alien plant control should take place within all riparian and wetland areas, as well as within the buffers.
- Buffer zones should be managed according to sound ecological principles. These include rotational burning and grazing.

Implementation of these measures will reduce the overall significance of the impact to Low-Medium and would not require further application of the Mitigation Hierarchy.

7. CONCLUSION

The terrestrial ecology of a portion of land was surveyed for a proposed agricultural development west of Barberton, in the Ehlanzeni District Municipality, Mpumalanga Province, South Africa. Most of the study area was historically farmed and now contains secondary vegetation dominated by pioneer indigenous and alien plant species.

The EST of the DEA indicates that the study area has a Medium Animal and Plant Themes, and Very High Terrestrial Biodiversity Theme. The main drivers of these assessments are several potentially occurring threatened and NT plant and animal species as well as the area being assessed as CBA: Optimal in the MBSP and being situated within a VU Ecosystem (Legogote Sour Bushveld). However, due to the high disturbance levels and degraded habitats only one SCC was confirmed, namely Natal Red Duiker. This is still a fairly common species in the Barberton area. Very few additional SCC are likely to occur. Additionally, very little representative Legogote Sour Bushveld is present, and the CBA status is not justified. The macro-scale assessment of the conservation importance of natural vegetation in Mpumalanga does not allow for small discrepancies where vegetation is disturbed or degraded, such as is present within the study area. A re-assessment, using a finer scale, may well result in a revision of the CBA assessment to Heavily or Moderately Modified or Other Natural Areas.

Five vegetation communities were identified within the study area. The SEI of the Secondary Woodland and Short Thicket is Low. Riparian Forest and Wetland have High SEI, while that of Riparian Thicket is Medium.

The cumulative impact of the proposed development will not result in a significant loss of biodiversity. If, as recommended, all development remains within the Secondary Woodland and currently cleared areas, it will result in the destruction of 27 ha of secondary habitat and no loss of natural vegetation. These areas are already ecologically compromised.

Provided the recommendations suggested in this report are followed, and the developer complies with all relevant legislation pertaining to the development activities (such as the NEMA and NEMBA), there is no objection to the proposed development in terms of the terrestrial ecosystems of the study area. However, if the development were to proceed without the implementation of the recommendations given above then we would object to the development application, due to the

potential negative impact on the remaining areas containing natural vegetation, such as the various drainage lines and wetlands present.

8. CONSULTATION PROCESS

Henwood Environmental Services, as the EAP, is assumed to have initiated the stakeholder engagement process with the I&AP's including with the information contained in this report and the formal Issues and Comments Register contained in the EIA documentation, fully documenting the responses to all terrestrial ecology related issues and concerns.

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10. APPENDICES

Appendix 1. Checklist of Flora Recorded During Fieldwork

Taxa	Growth Form	Protected	NEMBA Alien Invasive Species Category	Vegetation Communities				
				Secondary Woodland	Riparian Forest	Riparian Thicket	Short Thicket	Wetland
Family Acanthaceae								
Ruellia cordata Thunb.	herb			r				
Thunbergia alata Bojer ex Sims	climber			u				
Thunbergia neglecta Sond.	climber			u				r
Family Amaranthaceae								
* *Achyranthes aspera* L. var. *aspera*	herb				u			r
* *Alternanthera pungens* Kunth	herb			u				r
* *Amaranthus hybridus* L.	herb							u
* *Gomphrena celosioides* Mart.	herb			u				r
Family Amaryllidaceae								
Scadoxus puniceus (L.) Friis & Nordal	geophyte	MNCA			r			
Family Anacardiaceae								
Lannea discolor (Sond.) Engl.	tree						u	
Sclerocarya birrea (A.Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro	tree	NFA					r	
Searsia dentata (Thunb.) F.A.Barkley	tree			u				
Searsia pentheri (Zahlbr.) Moffett	tree			f		u	f	
Searsia pyroides var. *gracilis* (Engl.) Moffett	shrub			u				
Searsia transvaalensis (Engl.) Moffett	shrub			f				
Family Annonaceae								
Annona senegalensis Pers. subsp. *senegalensis*	tree			u			u	
Family Apocynaceae								

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Secamone sp.	climber						r	
Family Araceae								
Stylochaeton natalense Schott	herb			r				
Family Araliaceae								
Cussonia spicata Thunb.	tree			f			f	
Family Arecaceae								
Phoenix reclinata Jacq.	shrub							r
Family Aristolochiaceae								
* *Aristolochia littoralis* Parodi	climber		1b		u			
Family Asparagaceae								
* *Agave americana* L.	succulent			r				
Asparagus setaceus (Kunth) Jessop	dwarf shrub				u			
Asparagus virgatus Baker	dwarf shrub					r		
Family Asphodelaceae								
Aloe barbertoniae Pole-Evans	succulent	MNCA		u				
Family Aspleniaceae								
Thelypteris dentata (Forssk.) E.P.St.John	fern				f			
Thelypteris interrupta (Willd.) K.Iwats.	fern							f
Family Asteraceae								
* *Ageratum conyzoides* L.	herb		1b		r	u		u
* *Bidens pilosa* L.	herb			f	u	d	u	u
Crassocephalum picridifolium (DC.) S.Moore	climber			u				r
* *Erigeron bonariensis* L.	herb							r
* *Erigeron sumatrensis* Retz.	herb			u				
* *Flaveria bidentis* (L.) Kuntze	herb			r				
Gymnanthemum crataegifolium (Hutch.) H.Rob.	dwarf shrub			f			u	
Gymnanthemum myrianthum (Hook.f.) H.Rob.	shrub			u				r
Laggera crispata (Vahl) Hepper & J.R.I.Wood	herb			u				
Nidorella auriculata DC.	herb			u				
* *Parthenium hysterophorus* L.	herb		1b					r
* *Sigesbeckia orientalis* L.	herb			r				
Senecio madagascariensis Poir.	herb							r
Sonchus oleraceus L.	herb							r
* *Tagetes minuta* L.	herb			f	u	u	f	r

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* *Tithonia rotundifolia* (Mill.) S.F.Blake	herb							r
* *Xanthium strumarium* L.	herb		1b	u				
Family Bignoniaceae								
* *Jacaranda mimosifolia* D.Don	tree		1b	f	u	d	d	
Kigelia africana (Lam.) Benth.	tree			r			u	
Family Campanulaceae								
Cyphia elata Harv.	herb			r				
Wahlenbergia undulata (L.f.) A.DC.	herb			u				
Family Cannabaceae								
Celtis africana Burm. f.	tree				f	u		
Family Celastraceae								
Gymnosporia buxifolia (L.) Szyszyl.	tree			r		r		
Gymnosporia heterophylla (Eckl. & Zeyh.) Loes.	tree					r	u	
Gymnosporia senegalensis (Lam.) Loes.	tree			u		f	u	
Family Combretaceae								
Combretum collinum Fresen.	tree						u	
Combretum molle R.Br. ex G.Don	tree				u		r	
Combretum zeyheri Sond.	tree					u	u	
Family Commelinaceae								
Commelina cf. *erecta*	herb							u
Family Convolvulaceae								
Ipomoea cairica (L.) Sweet	creeper			r				
Family Cyperaceae								
Carex spicato-paniculata C.B.Clarke	sedge				f	u		
Cyperus cyperoides (L.) Kuntze	sedge				r			
Cyperus dives Delile	sedge							u
Cyperus esculentus L.	sedge							f
Cyperus melanospermus (Nees) Valck.Sur.	sedge							u
Cyperus polystachyos Rottb. var. *polystachyos*	sedge							f
Fimbristylis dichotoma (L.) Vahl	sedge							f
Fuirena pubescens (Poir.) Kunth	sedge							u
Schoenoplectus brachyceras (Hochst. ex A.Rich.) Lye	sedge							f
Family Dennstaedtiaceae								
Pteridium aquilinum (L.) Kuhn subsp. *aquilinum*	fern					f		

Family Ebenaceae								
Diospyros galpinii (Hiern) De Winter	dwarf shrub			r				
Diospyros lycioides Desf. subsp. *sericea* (Bernh.) De Winter	shrub			f			u	r
Diospyros whyteana (Hiern) F.White	shrub			r	u	f		
Euclea crispa (Thunb.) Gürke	shrub			f		f	f	r
Euclea natalensis A.DC. subsp. *natalensis*	shrub							u
Family Euphorbiaceae								
Acalypha petiolaris Hochst.	herb			u	r			
* *Euphorbia hirta* L.	herb			u				r
* *Ricinus communis* L. var. *communis*	dwarf shrub		2					r
Family Fabaceae								
Abrus laevigatus E.Mey.	climber					r		
Bauhinia galpinii N.E.Br.	shrub		1b			u	u	
* *Biancaea decapetala* (Roth) O.Deg.	shrub							r
Crotalaria recta Steud. ex A.Rich.	herb			r				
Dalbergia armata E.Mey.	climber			r	f			
* *Desmodium incanum* (Sw.) DC.	herb							u
* *Desmodium tortuosum* (Sw.) DC.	herb			r				
* *Desmodium uncinatum* (Jacq.) DC.	climber			f	u	d	f	u
Dichrostachys cinerea (L.) Wight & Arn. subsp. *nyassana* (Taub.) Brenan	tree			d			f	
Eriosema psoraleoides (Lam.) G.Don	dwarf shrub			u				
Flemingia grahamiana Wight & Arn.	dwarf shrub			u				r
Indigofera sp.a	herb							r
Indigofera cf. *tristoides*	dwarf shrub			u			u	
Mucuna coriacea Baker	climber			u				
Neonotonia wightii (Wight. ex Arn.) J.A.Lackey	climber			u	u	u	u	
*Pseudarthria hooker*i Wight & Arn. var. *hookeri*	dwarf shrub			d		u	f	u
Pterocarpus angolensis DC.	tree	NFA			r		r	
Rhynchosia minima (L.) DC. var. *prostrata* (Harv.) Meikle	climber			u				
Senegalia ataxacantha (DC.) Kyal. & Boatwr.	climber			f			f	r
Senegalia caffra (Thunb.) P.J.H.Hurter & Mabb.	tree			u				r
* *Senna septemtrionalis* (Viv.) H.S.Irwin & Barneby	shrub		1b	r				r
* *Sesbania bispinosa* (Jacq.) W.Wight	shrub							u
Vachellia karroo (Hayne) Banfi & Gallaso	tree			f			f	r
Vachellia sieberiana var. *woodii* (Burtt Davy) Kyal. & Boatwr.	tree			f			f	

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Family Heteropyxidaceae								
Heteropyxis natalensis Harv.	tree			u			u	
Family Hypoxidaceae								
Hypoxis rigidula Baker var. *rigidula*	geophyte			u				
Family Iridaceae								
Gladiolus vinosomaculatus Kies	geophyte	MNCA						r
Family Lamiaceae								
Leonotis ocymifolia var. *raineriana* (Vis.) Iwarsson	herb			u				
Volkameria glabra (E.Mey.) Mabb. & Y.W.Yuan	tree			r	u	u		
Family Malpighiaceae								
Sphedamnocarpus pruriens (A.Juss.) Szyszyl. subsp. *pruriens*	climber			u				
Family Malvaceae								
Dombeya pulchra N.E.Br.	tree							u
Dombeya rotundifolia (Hochst.) Planch. var. *rotundifolia*	tree			f	r	u	d	r
* *Malvastrum coromandelianum* (L.) Garcke	herb			u				u
Melhania acuminata Mast. var. *acuminata*	herb						u	
Pavonia burchellii (DC.) R.A.Dyer	dwarf shrub			u				r
Pavonia columella Cav.	herb				r			
Sida cordifolia L. subsp. *cordifolia*	dwarf shrub			u				
Sida lancifolia Burtt Davy	herb							r
Triumfetta pentandra A.Rich. *var. pentandra*	herb			u				
Triumfetta pilosa Roth	herb			u	u			
Family Melastomataceae								
Argyrella canescens (Graham) Harv.	herb							r
Family Meliaceae								
Ekebergia capensis Sparrm.	tree			r	u		u	
* *Melia azedarach* L.	tree		1b	u	r	f		
Family Menispermaceae								
Cissampelos mucronata A.Rich.	climber				r		u	
Family Moraceae								
Ficus ingens (Miq.) Miq.	tree			u			u	
Ficus petersii Warb.	tree				u	u		
Ficus sur Forssk.	tree				f			
Ficus sycomorus L. subsp. *sycomorus*	tree				u	u		

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* *Morus alba* L. var. *alba*	tree		3	r	r	f		
Family Myrtaceae								
* *Eucalyptus* L'Hér. sp.	tree		2		r			
* *Psidium guajava* L.	shrub		2/3	d	r	r	f	
Syzygium cordatum Hochst. ex C.Krauss subsp. *cordatum*	tree				d	u		f
Syzygium guineense (Willd.) DC. subsp. *guineense*	tree				f			
Family Olacaceae								
Ximenia caffra Sond. var. *caffra*	shrub						u	
Family Passifloraceae								
Adenia gummifera (Harv.) Harms var. *gummifera*	climber	MNCA			r			
* *Passiflora subpeltata* Ortega	climber		1b	r				
Family Pedaliaceae								
Ceratotheca triloba (Bernh.) Hook.f.	herb			u				
Family Phyllanthaceae								
Antidesma venosum E.Mey. ex Tul.	tree			u				
Bridelia micrantha (Hochst.) Baill.	tree				d	r		r
Flueggea virosa (Roxb. ex Willd.) Voigt subsp. *virosa*	shrub			u	r	f		
Family Pinaceae								
* *Pinus* sp.	tree		2	f	r	f	u	
Family Poaceae								
Aristida congesta Roem. & Schult. subsp. *barbicollis* (Trin. & Rupr.) De Winter	grass			f			r	
Bothriochloa bladhii (Retz.) S.T.Blake	grass							u
Bothriochloa insculpta (Hochst. ex A.Rich.) A.Camus	grass			u			u	
Cenchrus clandestinus (Hochst. ex Chiov.)	grass							r
Cynodon dactylon (L.) Pers.	grass			u				u
* *Cynodon nlemfuensis* Vanderyst	grass			u				f
Digitaria eriantha Steud.	grass			u				r
Eleusine africana Kenn.-O'Byrne	grass			u				r
Eragrostis curvula (Schrad.) Nees	grass			f				r
Heteropogon contortus (L.) Roem. & Schult.	grass			f				
Hyparrhenia hirta (L.) Stapf	grass			f			f	
Hyparrhenia tamba (Hochst. ex Steud.)	grass							r
Hyperthelia dissoluta (Nees ex Steud.) Clayton	grass			f				
Leersia hexandra Sw.	grass							u
Melinis repens (Willd.) Zizka subsp. *repens*	grass			f				

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Oplismenus hirtellus (L.) P.Beauv.	grass				f	u		r
Panicum deustum Thunb.	grass			u				
Panicum maximum Jacq.	grass			f		u	u	
* *Paspalum dilatatum* Poir.	grass							u
Paspalum distichum L.	grass							u
* *Paspalum urvillei* Steud.	grass							u
Phragmites mauritianus Kunth	reed							d
Pogonarthria squarrosa (Licht.) Pilg.	grass			u				
Setaria megaphylla (Steud.) T.Durand & Schinz	grass			u	u	d		u
Setaria pumila (Poir.) Roem. & Schult.	grass			r				
Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. *sphacelata*	grass			u			u	
Sporobolus africanus (Poir.) Robyns & Tournay	grass			f			u	u
Sporobolus pyramidalis P.Beauv.	grass			d		r	f	r
Themeda triandra Forssk.	grass			f			f	
Family Polygonaceae								
Persicaria decipiens (R.Br.) K.L.Wilson	herb							f
Family Protaceae								
Faurea rochetiana (A.Rich.) Chiov. ex Pic.Serm.	tree	MNCA		r				
Family Pteridaceae								
Hemionitis viridis (Forssk.) Christenh.	fern			u	u	u	r	f
Pteris catoptera Kunze	fern				f			
Family Ranunculaceae								
Clematis brachiata Thunb.	climber			f				r
* *Ranunculus multifidus* Forssk.	herb							u
Family Rhamnaceae								
Berchemia discolor (Klotzsch) Hemsl.	tree			u		r	r	
Ziziphus mucronata Willd. subsp. *mucronata*	tree			f			u	
Family Rubiaceae								
Breonadia salicina (Vahl) Hepper & J.R.I.Wood	tree	NFA			r			
* *Coffea arabica* L.	shrub				f			
* *Richardia brasiliensis* Gomes	herb			u				r
Tricalysia capensis var. *transvaalensis* Robbr.	shrub				f			
Vangueria infausta Burch. subsp. *infausta*	tree			u	r		u	
Family Rutaceae								
Ptaeroxylon obliquum (Thunb.) Radlk.	tree				u			

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Zanthoxylum capense (Thunb.) Harv.	tree			u			u	
Family Sapindaceae								
Cardiospermum halicacabum L.	climber			u				r
Hippobromus pauciflorus (L.f.) Radlk.	tree			u	u	d	f	
Family Simaroubaceae								
* *Ailanthus altissima* (Mill.) Swingle	tree		1b	u				
Family Smilacaceae								
Smilax anceps Willd.	climber			u	r	f	u	
Family Solanaceae								
Solanum campylacanthum A. Rich.subsp. *panduriforme*	dwarf shrub			u				
* *Solanum mauritianum* Scop.	shrub		1b	u	u	f		u
* *Solanum seaforthianum* Andrews	climber		1b		u			
* *Solanum sisymbriifolium* Lam.	dwarf shrub		1b	u				u
Family Stilbaceae								
Halleria lucida L.	tree				r			
Family Verbenaceae								
* *Lantana camara* L.	dwarf shrub		1b	u			u	u
Lantana rugosa Thunb.	dwarf shrub			d	u	f	u	f
Lippia javanica (Burm.f.) Spreng.	dwarf shrub			d		f	u	
* *Priva cordifolia* (L.f.) Druce	herb			r				
* *Verbena bonariensis* L.	herb		1b	f				u
Family Vitaceae								
Rhoicissus tridentata (L.f.) Wild & R.B.Drumm. subsp. *tridentata*	climber			u		r	u	
Family Zingiberaceae								
* *Hedychium* sp.	herb		1b		u			
TOTAL	**195**	**8**	**21**	**117**	**54**	**43**	**56**	**78**

NFA = National Forests Act

MNCA = Mpumalanga Nature Conservation Act

* = exotic species

d = dominant

f = frequent

u = uncommon

r = rare

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Appendix 2. Checklist of Fauna Recorded in the Study Area

Species	Taxonomic name	Red Data	Protected	Assemblages		
				Woodland	Riparian Forest /Thicket	Wetland
Mammals						
ORDER: PRIMATES						
Family Cercopithecidae (Old World monkeys)						
Vervet Monkey	*Chlorocebus pygerythrus*			x		
ORDER: RODENTIA						
Family Hystricidae (Old World porcupines)						
Cape Porcupine	*Hystrix africaeaustralis*				x	
ORDER: ARTIODACTYLA						
Family Bovidae (cattle & antelopes)						
Southern Bushbuck	*Tragelaphus sylvaticus*				x	
Natal Red Duiker	*Cephalophus natalensis*	NT	MNCA		x	
Subtotal	4	1	1	1	3	0
Birds						
ORDER: GALLIFORMES						
Family Numididae (guineafowl)						
Helmeted Guineafowl	*Numida meleagris*			x		
Family Phasianidae (pheasants, fowl and allies)						
Natal Spurfowl	*Pternistis natalensis*			x	x	
ORDER: PELECANIFORMES						
Family Threskiornithidae (ibises and spoonbills)						
Hadeda Ibis	*Bostrychia hagedash*					x
Family Scopidae (hamerkops)						
Hamerkop	*Scopus umbretta*					x
ORDER: CHARADRIIFORMES						

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Family Charadriidae (plovers, lapwings)						
Crowned Lapwing	*Vanellus coronatus*			x		
ORDER: ACCIPITRIFORMES						
Family Accipitridae (kites, hawks and eagles)						
African Goshawk	*Accipiter tachiro*				x	
ORDER: COLUMBIFORMES						
Family Columbidae (pigeons, doves)						
Cape Turtle Dove	*Streptopelia capicola*			x		
ORDER: MUSOPHAGIFORMES						
Family Musophagidae (turacos)						
Purple-crested Turaco	*Gallirex porphyreolophus*			x	x	
ORDER: CUCULIFORMES						
Family Cuculidae (cuckoos)						
Burchell's Coucal	*Centropus burchelli*			x		
Levaillant's Cuckoo	*Clamator levaillantii*			x		
ORDER: APODIFORMES						
Family Apodidae (swifts)						
Little Swift	*Apus affinis*			over	over	
ORDER: CORACIIFORMES						
Family Alcedinidae (kingfishers)						
Brown-hooded Kingfisher	*Halcyon albiventris*			x		
Family Meropidae (bee-eaters)						
White-fronted Bee-eater	*Merops bullockoides*			x		
ORDER: PICIFORMES						
Family Lybiidae (African barbets)						
Black-collared Barbet	*Lybius torquatus*				x	
Crested Barbet	*Trachyphonus vaillantii*			x		
Family Indicatoridae (honeyguides)						
Greater Honeyguide	*Indicator indicator*			x		
Family Picidae (woodpeckers)						
Golden-tailed Woodpecker	*Campethera abingoni*			x		
ORDER: PASSERIFORMES						
Family Malaconotidae (bushshrikes)						
Black-backed Puffback	*Dryoscopus cubla*			x	x	

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Southern Boubou	*Laniarius ferrugineus*				x		
Orange-breasted Bushshrike	*Chlorophoneus sulfureopectus*			x			
Gorgeous Bushshrike	*Telophorus viridis*				x		
Black-crowned Tchagra	*Tchagra senegalus*			x			
Family Laniidae (shrikes)							
Southern Fiscal	*Lanius collaris*			x			
Family Oriolidae (figbirds and orioles)							
Black-headed Oriole	*Oriolus larvatus*			x	x		
Family Dicruridae (drongos)							
Fork-tailed Drongo	*Dicrurus adsimilis*				x		
Family Nicatoridae (nicators)							
Eastern Nicator	*Nicator gularis*				x		
Family Pycnonotidae (bulbuls)							
Dark-capped Bulbul	*Pycnonotus tricolor*			x	x		
Family Hirundinidae (swallows & martins)							
Lesser Striped Swallow	*Cecropis abyssinica*			x			
Family Macrosphenidae (crombecs & African warblers)							
Long-billed Crombec	*Sylvietta rufescens*			x			
Family Cisticolidae (cisticolas & allies)							
Lazy Cisticola	*Cisticola aberrans*			x			
Red-faced Cisticola	*Cisticola erythrops*					x	
Yellow-breasted Apalis	*Apalis flavida*			x	x		
Green-backed Camaroptera	*Camaroptera brachyura*				x		
Tawny-flanked Prinia	*Prinia subflava*			x	x	x	
Family Leiothrichidae (laughingthrushes)							
Arrow-marked Babbler	*Turdoides jardineii*			x			
Family Zosteropidae (white-eyes)							
Cape White-eye	*Zosterops virens*			x	x		
Family Turdidae (thrushes)							
Kurrichane Thrush	*Turdus libonyanus*			x	x		
Groundscraper Thrush	*Turdus litsitsirupa*			x			
Family Muscicapidae (chats & Old World flycatchers)							
White-browed Robin-Chat	*Cossypha heuglini*				x		
White-throated Robin-Chat	*Cossypha humeralis*				x		

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White-browed Scrub Robin	*Cercotrichas leucophrys*			x		
Family Nectariniidae (sunbirds)						
Collared Sunbird	*Hedydipna collaris*				x	
Amethyst Sunbird	*Chalcomitra amethystina*			x		
Scarlet-chested Sunbird	*Chalcomitra senegalensis*			x		
Family Passeridae						
House Sparrow	*Passer domesticus*			x		
Family Ploceidae (weavers & widowbirds)						
Thick-billed Weaver	*Amblyospiza albifrons*					x
Village Weaver	*Ploceus cucullatus*			x		
Spectacled Weaver	*Ploceus ocularis*				x	
Red-collared Widowbird	*Euplectes ardens*			x		x
Southern Red Bishop	*Euplectes orix*					x
Family Estrildidae (waxbills, mannikins)						
African Firefinch	*Lagonosticta rubricata*				x	
Blue Waxbill	*Uraeginthus angolensis*			x		
Bronze Mannikin	*Lonchura cucullata*			x		
Family Motacillidae (wagtails and pipits)						
African Pipit	*Anthus cinnamomeus*			x		
Yellow-throated Longclaw	*Macronyx croceus*			x		
African Pied Wagtail	*Motacilla aguimp*					x
Family Fringillidae (finches, canaries & allies)						
Yellow-fronted Canary	*Crithagra mozambica*			x		
Subtotal	57	0	0	39	22	8
Reptiles						
ORDER: SQUAMATA						
Family Gekkonidae (geckos)						
Common Dwarf Gecko	*Lygodactylus capensis capensis*			x		
Subtotal	1	0	0	1	0	0
Frogs						
ORDER: ANURA						
Family Phrynobatrachidae						
Snoring Puddle Frog	*Phrynobatrachus natalensis*				x	x
Family Ptychadenidae (grass frogs)						

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Plain Grass Frog	*Ptychadena anchietae*			x		
Subtotal	2	0	0	1	1	1
TOTAL	**64**	**1**	**1**	**42**	**26**	**9**

MNCA = Mpumalanga Nature Conservation Act
NT = Near Threatened

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Appendix 3. Potentially Occurring Fauna of Conservation Concern

Common Name	Scientific Name	Red Data	Protected	Habitat	SABAP2 Reporting Rate for 2525_3055	Likelihood	Justification
Mammals							
Cheetah	*Acinonyx jubatus*	VU	NEMBA (VU)	Savanna, semi desert		Very Low	Included here solely due to being listed by the EST. A species not likely to venture this far from the KNP
African Clawless Otter	*Aonyx capensis*	NT	MNCA	Rivers and streams		Very Low	No suitable habitat present within the study area, but certainly resident along the nearby Queens River
Natal Red Duiker	*Cephalophus natalensis*	NT	MNCA	Forest and thicket		Confirmed	
Samango Monkey	*Cercopithecus albogularis schwarzi*	EN	NEMBA (VU)	Afromontane forest		Low	No suitable habitat present
Maquassie Musk Shrew	*Crocidura maquassiensis*	VU		Grassland and rocky grassland		Very Low	Included here solely due to being listed by the EST. Unrecorded from far E Mpumalanga

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Robert's Marsh Rat	*Dasymys robertsii*	VU		Marshes, wetlands		Low	Edge of range, rare species, requires more pristine habitat than what is present within the study area
Hippopotamus	*Hippopotamus amphibius*	VU‡	MNCA	Wetlands		Low	No suitable habitat present, may very occasionally occur within the nearby Queens River
Serval	*Leptailurus serval*	NT	NEMBA (PR)	Grassland, wetlands		Moderate	Suitable habitat present but high hunting pressure from adjacent urban area
Honey Badger	*Mellivora capensis*		MNCA	Wide variety of habitats		Moderate	Suitable habitat present
Aardvark	*Orycteropus afer*		NEMBA (PR)	Wide variety of habitats		Low	Very rare in the Barberton area
Thick-tailed Greater Galago	*Otolemur crassicaudatus*		MNCA	Moist woodland and forest		High	Suitable habitat present
Oribi	*Ourebia ourebi*	EN	MNCA	Upland plains grassland		Very Low	No suitable habitat present
Leopard	*Panthera pardus*	VU	NEMBA (PR)	Wide variety of habitats		Low	High human disturbance levels present, limited prey base
African Weasel	*Poecilogale albinucha*	NT		Wide variety of habitats		Very Low	Very rare in Eastern Mpumalanga
Aardwolf	*Proteles cristatus*		MNCA	Wide variety of habitats		Very Low	Very rare in the Barberton area

Steenbok	*Raphicerus campestris*		MNCA	Wide variety of habitats		Low	Limited suitable habitat present, rare in the general area
Mountain Reedbuck	*Redunca fulvorufula*	EN	MNCA	Hilly grassland and open woodland		Low	No suitable habitat present, occurs in the higher, grassy mountains to the south of the study area
Subtotal	17	12	14				
Birds							
Half-collared Kingfisher	*Alcedo semitorquata*	NT		Streams with overhanging vegetation	5.9%	Low	No suitable aquatic habitat present
Tawny Eagle	*Aquila rapax*	EN	NEMBA (EN)	Savanna	-	Very Low	Very rare in the area, high disturbance levels present
Abdim's Stork	*Ciconia abdimii*	NT		Short-grass savanna and semi desert	5.8%	Low	No suitable habitat present, very rare in the area
Black Stork	*Ciconia nigra*	VU			11.8%	Low	No suitable habitat present, high disturbance levels present
European Roller	*Coracias garrulus*	NT		Open, grassy savanna	-	Low	Very rare in the area, high disturbance levels present
Lanner Falcon	*Falco biarmicus*	VU		Wide variety of habitats but nests on cliffs	-	Low	Unrecorded from the area. No cliff-nesting sites present

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White-backed Night-Heron	*Gorsachius leuconotus*	VU		Streams with overhanging vegetation	-	Very Low	No suitable aquatic habitat present
Bat Hawk	*Macheiramphus alcinus*	EN		Tall woodland along rivers	-	Very Low	Limited suitable habitat present, high disturbance levels present, unrecorded from the area
African Finfoot	*Podica senegalensis*	VU		Rivers and streams with overhanging vegetation	-	Very Low	Limited suitable habitat present, high disturbance levels present, unrecorded from the area
Crowned Eagle	*Stephanoaetus coronatus*	VU		Forest	11.8%	Moderate	Limited suitable nesting habitat present, but may occasionally forage over the area
Subtotal	10	10	1				
Reptiles							
Listed Sensitive Species No. 2		VU	NEMBA (VU)	Wetlands		Very Low	No suitable aquatic habitat present, high disturbance levels
Natal Hinged Tortoise	*Kinixys natalensis*	VU		Dry rocky habitat in thornveld, valley bushveld, dry thicket or bushveld savanna		Low	Limited suitable habitat present, very rare in the area

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Southern African Python	*Python natalensis*		NEMBA (PR)	Wide variety of habitats, but usually near water or rocky outcrops		Moderate	Suitable habitat present
Subtotal	3	2	2				
TOTAL	**30**	**24**	**17**				

EN - Endangered
VU - Vulnerable
NT - Near Threatened
PR - Protected
NEMBA - National Environmental Management: Biodiversity Act
MNCA - Mpumalanga Nature Conservation Act
‡ - IUCN assessment

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Appendix 4. Specialist Report Checklist and Information Requested by The Competent Authorities

A Specialist Report Checklist Table has been compiled in accordance with the Appendix 6 of the EIA Regulations (GNR 982 of 04 December 2014). The section which relays the specific information required as per the guideline is given in the second column of the Table.

Any additional information requested by the Competent Authorities will be included in this section.

Specialist Report Guideline: Appendix 6 GNR 982 EIA Regulations 4 December 2014 as amended	
Details to be Included in the Report	**Section in Report**
Details of	
Specialist who prepared the report	1
Expertise of the specialist	1
CV of the specialist	Appendix 5
Declaration that the Specialist is Independent in a form as may be specified by the CA	Appendix 7
An indication of the Scope of and the Purpose for which the report was prepared	3
An indication of the Quality and Age of base data used for the specialist report	4.3
A Description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	5, 6
The Duration, Date and Season of the site investigation and the relevance of the season to the outcome of the assessment	4.3
A Description of the Methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	4.2, 4.3, 4.4, 4.5
Details of an Assessment of the specific identified Sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	5.6
An identification of any areas to be avoided including buffers	6
A Map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided including buffers	Fig 7
A Description of any Assumptions made and any Uncertainties or Gaps in Knowledge	4.6
A Description of the Findings and Potential implications of such findings on the Impact of the proposed activity, including identified Alternatives on the environment, or activities	5
Any Mitigation Measures for inclusion in the EMPr	6
Any Conditions for inclusion in the Environmental Authorisation	6
Any Monitoring Requirements for inclusion in the EMPr or Environmental Authorisation	6
Reasoned Opinion	
As to whether the proposed activity/ activities or portions thereof should be authorised	7
Regarding the acceptability of the proposed activity or activities	7
If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr and where applicable the closure plan	7

A Description of any Consultation Process that was undertaken during the course of preparing the specialist report	8
A Summary and copies of any comments received during any consultation process and where applicable all responses thereto	App 4
Any other Information requested by the CA	App 4

Appendix 5. Curriculum Vitae of Duncan McKenzie

Profession	Terrestrial Ecologist
Date of Birth	9 November 1977
Name of Firm	Digital Earth (Pty) Ltd.
Position in Firm	Director / Ecologist
Years with firm	3
Nationality	South African

Qualifications

- National Diploma: Nature Conservation (UNISA, 2007)
- National Certificate: Nature Guiding (Drumbeat Academy, 2004)

Membership in Professional Societies

- BirdLife South Africa
- South African Council for Natural Scientific Professions (Reg.No.122647)

Language Proficiency

- English (home language) - excellent
- Afrikaans - good
- isiZulu / isiSwati – fair to good

Countries of Work Experience

Botswana, Democratic Republic of the Congo, Lesotho, Mali, Morocco, Mozambique, Namibia, Republic of Guinea, Sierra Leone, South Africa, Swaziland, Tanzania, Zimbabwe.

EXPERIENCE & ACHIEVEMENTS

- 15 years' experience in specialist species identification, conducting baseline surveys, data analysis and report writing in various biomes in southern Africa, particularly savanna, forest and grassland biomes.
- 2 years' experience game reserve management (KwaZulu-Natal).
- 5 years' experience (part time) of wetland delineation and management.
- 2 years' experience of plant propagation and use for rehabilitation.
- Co-author of the new Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa (SANBI, 2020).
- Lead-author of the Birds of Mbombela book, published in 2019 by BirdLife Lowveld.
- 2017 recipient of BirdLife South Africa's Owl Award.
- SABAP2 Regional Co-ordinator for Mpumalanga.
- eBird Regional Reviewer for Mpumalanga.
- Scientific Advisor for BirdLife Lowveld.

EMPLOYMENT RECORD

2007 - present	ECOREX Consulting Ecologists CC / Digital Earth	Ecologist / Director
2005 - 2006	Iglu (London, UK)	Specialist Travel Agent
1997 - 2005	Duncan McKenzie Bird Tours	Owner, Specialist Guide
2001	KZN Wildlife	District Conservation Officer, Reserve Manager
1999 - 2001	Institute of Natural Resources	Part-time Horticulturalist and Rehabilitation Officer
1997-2001	Mondi Wetlands Project	Part-time Field Assistant and Regional Co-ordinator
1996-1997	Natal Parks Board	Ranger

RELEVANT PROJECTS & EXPERIENCE

COUNTRY	YEAR	PROJECT	CONTACT
Mozambique			
Mozambique	2018 - 2019	Mozambique LNG Crab Plover Population Study	ERM - Jessica Hughes (jessica.hughes@erm.com)
	2015	Biodiversity Baseline Study for a SASOL Gas Pipeline, Inhassoro	ERM - Jessica Hughes (jessica.hughes@erm.com)
	2014	Terrestrial Fauna Survey of the Quirimbas Palma-Pemba Coastal Road	ERM - Jessica Hughes (jessica.hughes@erm.com)
	2013	Biodiversity Baseline Study and Impact Assessment for Benga Coal Mine, Tete	Nepid Consultants - Dr Rob Palmer rob@nepid.co.za)
	2008	Terrestrial Ecology Study for Chinhanguanine Sugar Expansion Project, Maputo Province	ACER (Africa) Environmental Management Consultants
Tanzania			
Tanzania	2011	Biodiversity Baseline Study and Impact Assessment for Mkuju River Uranium Project, Selous Game Reserve, Songea	Epoch Resources - Fanie Coetzee (fanie@epochresources.co.za)
	2020	Terrestrial Ecology Survey of Kakono Hydropower Scheme, Kagera Region	SLR - Jessica Hughes (jessica.hughes@slrconsulting.com)
Southern and South-central Africa			
Democratic Republic of Congo	2016	Survey Of The Cupriferous Plant Translocation Programme For Kinsevere Mine, Katanga Province, DRC	Knight Piesold - Amelia Briel (abriel@knightpiesold.com)
	2014	Biodiversity Baseline Study and Impact Assessment for Pumpi Copper Mine, Kolwezi	Epoch Resources - Fanie Coetzee (fanie@epochresources.co.za)
	2011	Biodiversity Baseline Study and Impact Assessment for Kinsevere Copper Mine, Lubumbashi	Knight Piesold - Amelia Briel (abriel@knightpiesold.com)
South Africa	2021	Biodiversity Baseline Study and Impact Assessment for the Instream Construction on Little Gowrie	Henwood Environmental Services - Steven Henwood (shenwood@mweb.co.za)
	2019	Baseline Terrestrial Ecology Study & Biodiversity Value Assessment for the proposed Ilima Coal Mine	Epoch Resources - Fanie Coetzee (fanie@epochresources.co.za)

	2018	Baseline Terrestrial Ecology Study & Biodiversity Value Assessment for the proposed Olienhout Dam	Enpact Environmental Consultants CC - Heinrich Kammeyer (heinrich@enpact.co.za)
	2018	Baseline Terrestrial Ecology Study & Biodiversity Value Assessment for the proposed Strathmore Dam	Henwood Environmental Services - Steven Henwood (shenwood@mweb.co.za)
	2017	Baseline Terrestrial Ecology Study & Biodiversity Value Assessment for the proposed Croc River Sub-station and Powerline Routes	Enpact Environmental Consultants CC - Heinrich Kammeyer (heinrich@enpact.co.za)
	2016	Baseline Terrestrial Ecology Study And Biodiversity Sensitivity Assessment of the proposed developments on Lapalala Wilderness	NuLeaf - Peter Velcich (peter@nuleafsa.co.za)
	2014	Botanical Survey for the Kumba Mine Powerline Re-Routing	Synergistics - Chiara Kotze (ckotze@slrconsulting.com)
	2007	Terrestrial Ecology Study for the Groot Letaba Water Resource Development Scheme, Tzaneen	Iliso Consulting - Terry Baker (terry@iliso.com)
Swaziland	2017	Strengthening National Protected Areas Systems in Swaziland (SNPAS)	Linda Loffler (lindad@realnet.co.sz)
	2009	Biodiversity Baseline Study for Siphofaneni Road Developments	Aurecon Nelspruit (mbombela@aurecongroup.com)

BOOKS

- McKenzie, D. & Lawson, P. 2019. *Birds of Mbombela A Comparative Study*. Birdlife Lowveld, Nelspruit.
- Scientific Advisor on van den Berg, P. *Game Drive Birds of Southern Africa*. HPH, Cascades.
- Contributor on Chittenden, H. & Whyte, I. 2008. *Roberts Bird Guide Kruger National Park and Adjacent Lowveld*. John Voelcker Bird Book Fund, Cape Town.
- Contributor on Tarbotan, W. & Ryan, P. 2016. *Guide to Birds of the Kruger National Park*. Struik Nature, Cape Town.

PAPERS

- McKenzie, D.R., Underhill, L.G., López Gómez, M. and Brooks, M. Bird distribution dynamics - Pale-crowned Cisticola *Cisticola cinnamomeus* in South Africa. Biodiversity Observations 2017 8.15:1-9.
- McKenzie, D.R. Reporting rate comparisons for birds in the Nelspruit area – SABAP1 vs SABAP2. Biodiversity Observations, 2 (), 22 – 31.
- Guest editor on Underhill, L.G., Lawson, P. R. da Cruz, P. and Glasson, A. The impact of political history on birds: A case study in north-eastern Mpumalanga, South Africa. Biodiversity Observations7.68: 1–56.
- McKenzie, D. & McKenzie, L. 2019. The Avifaunal Importance of the Barberton-Makhonjwa World Heritage Site. BirdLife Lowveld, Mbombela.
- Sieben, E., Nyambeni, T., Mtshali, H., Corry, F.T.J., Venter, C.E., McKenzie, D.R., Matela, T.E., Pretorius, L. & Kotze, D. 2016. The herbaceous vegetation of subtropical freshwater wetlands in South Africa: Classification, description and explanatory environmental factors. South African Journal of Botany. 104. 158-166. 10.1016/j.sajb.2015.11.005.

RED-LIST ASSESSMENTS

- McKenzie, D., von Staden, L. & Mtshali, H. 2018. *Aloe simii* Pole-Evans. National Assessment: Red List of South African Plants version 2020.1.
- von Staden, L. & McKenzie, D. 2019. *Aloe komatiensis* Reynolds. National Assessment: Red List of South African Plants version 2020.1.

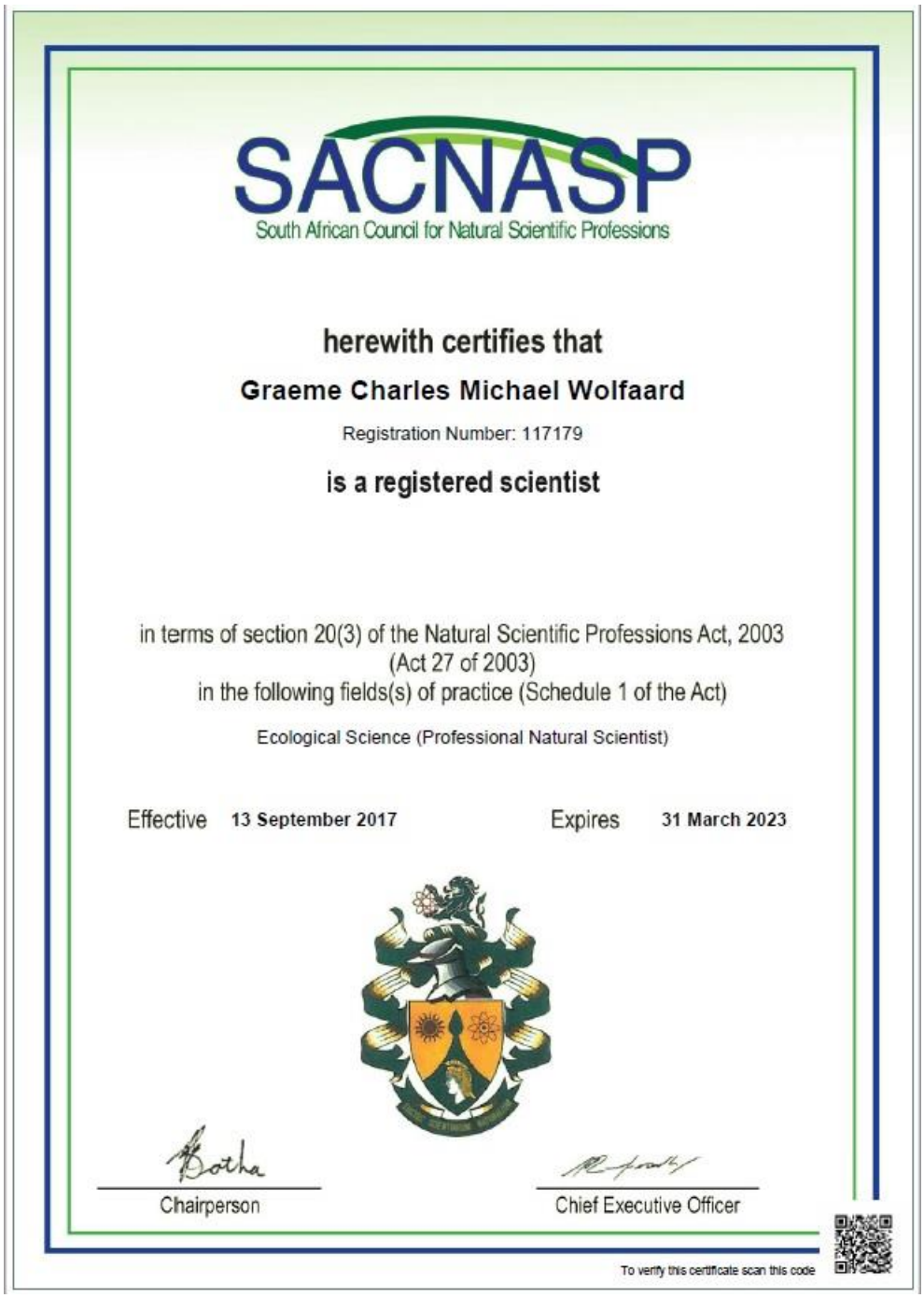
- von Staden, L., Lötter, M. & McKenzie, D. 2019. *Aloe modesta* Reynolds. National Assessment: Red List of South African Plants version 2020.1.

DECLARATION

I declare that the particulars above are accurate and true to the best of my knowledge and belief.

SIGNATURE DATE 18 April 2022

Appendix 6. Professions Certificates of the Study and Review Team



SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Graeme Charles Michael Wolfaard

Registration Number: 117179

is a registered scientist

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

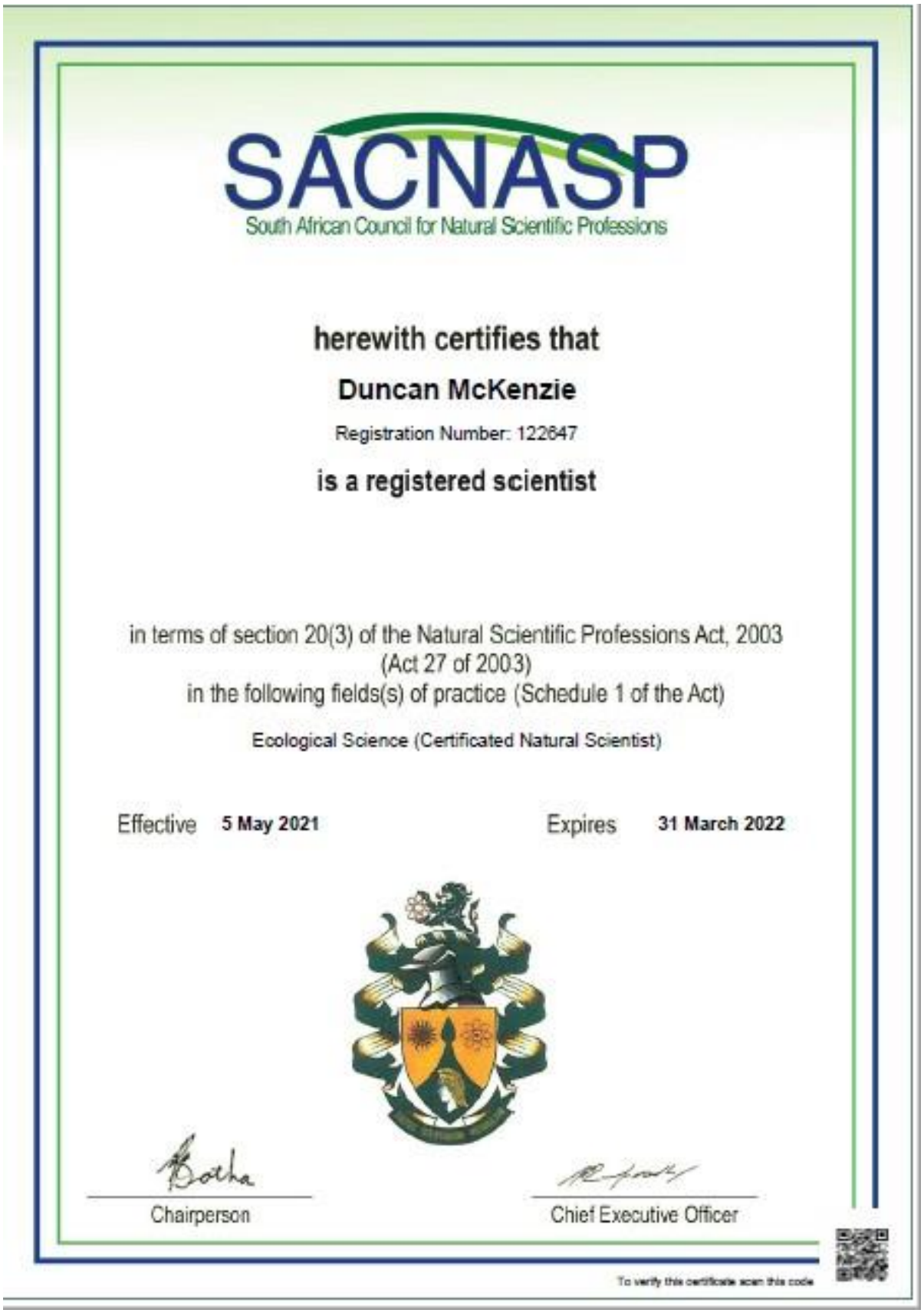
Ecological Science (Professional Natural Scientist)

Effective **13 September 2017** Expires **31 March 2023**

Chairperson

Chief Executive Officer

To verify this certificate scan this code



SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Duncan McKenzie

Registration Number: 122647

is a registered scientist

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

Ecological Science (Certificated Natural Scientist)

Effective **5 May 2021** Expires **31 March 2022**

Chairperson

Chief Executive Officer

To verify this certificate scan this code

DIGITAL EARTH (Pty) Ltd. P.O. Box 19787 The Village Mbombela 1218
Cell: 079 530 7873 E-mail: duncan@digitalearth.co.za

THE SOUTH AFRICAN COUNCIL FOR
PROFESSIONAL AND
TECHNICAL SURVEYORS

DIE SUID AFRIKAANSE RAAD VIR
PROFESSIONELE EN
TEGNIESE OPMETERS

CERTIFICATE OF REGISTRATION
SERTIFIKAAT VAN REGISTRASIE

This is to certify that — Hiermee word gesertifiseer dat

Linda Mc Kenzie

was registered as a — geregistreer is as 'n

PROFESSIONAL GISc PRACTITIONER

on the 13th day of March 2012 — op die 13de dag van Maart 2012

in accordance with the provisions of the Professional and Technical Surveyors' Act, 1984 (Act No 40 0f 1984) and is entitled to carry on his/her profession or calling in any part of the Republic of South Africa in terms of the said Act and rules framed thereunder.

ingevolge die bepalings van die Wet op Professionele en Tegniese Opmeters, 1984 (Wet nr 40 van 1984) en geregtig is om sy/haar beroep of nering in enige deel van die Republiek van Suid-Afrika te beoefen ingevolge die genoemde Wet en reëls daarvolgens uitgevaardig.

President

Issued under the Seal of the Council
Uitgereik onder die Seël van die Raad

Registration Number
Registrasienommer PGP 0170

Registrar
Registrateur

Goldfields Press

Appendix 7. Specialists Declaration

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I …Duncan McKenzie…, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or

	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014 (as amended in 2017);
- 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 application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties 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 or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist

Digital Earth (Pty) Ltd.

Name of company

18/04/2022

Date

Annexure D: Historical Impact Assessment

Phase 1 Archaeological and Heritage Impact Assessment on the farm Uguhleni 689 JT in respect of proposed agricultural development, Barberton, Umjindi Local Municipality, Mpumalanga Province.

Compiled for:

For **Henwood Environmental Solutions**

16 June, 2022

I, Jean-Pierre Celliers as authorized representative of Kudzala Antiquity CC , hereby confirm my independence as a specialist and declare that neither I or the Kudzala Antiquity CC have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which I was appointed as Heritage Consultant, other than fair remuneration for work performed on this project.

SIGNATURE: 

Table of Contents

Executive summary

Site name and location: An area of approximately 39,5 ha of previously cultivated land on the farm Uguhleni 689 JT, Barberton, Umjindi Local Municipality, Mpumalanga, in respect of proposed agricultural development.
Purpose of the study: An archaeological and heritage study in order to identify cultural heritage resources in respect of the proposed development.

Topographical Maps: 1:50 000 2530 DD (1943, 1968, 1984, 2010).

EIA Consultant: Henwood Environmental Solutions

Client:

Heritage Consultant: Kudzala Antiquity CC.
Contact person: JP Celliers Tel: +27 72 583 1622
E-mail: kudzala@lantic.net

Report date: 16 June 2022

Description and findings:

An Archaeological and Heritage Impact Assessment was undertaken by Kudzala Antiquity CC in respect of proposed agricultural development on an area of approximately 39,5 hectares on the farm Uguhleni 689 JT located near the town of Barberton in Mpumalanga Province. The study was done with the aim of identifying sites which are of heritage significance on the identified project areas and assess their current preservation condition, significance and possible impact of the proposed action. This forms part of legislative requirements as appears in section 38 of the National Heritage Resources Act (Act No. 25 of 1999). This report can be submitted in support of the National Environmental Management Act (Act 25 of 1998).
The survey was conducted on foot and with the aid of a motor vehicle in an effort to locate archaeological remains and historic sites, structures and features. Archival information obtained from the National Archives in Pretoria, including scrutiny of previous heritage surveys of the area formed the baseline information against which the survey was conducted.
Two sites, UG 1 and UG 2, were recorded during the physical survey but they are of low heritage significance and no mitigation is needed. They consist of a concrete irrigation dam and the ruined remains of a farmstead.
A total of nine survey orientation locations were documented (SO 1-9) which includes a GPS location and photographs of the landscape at that particular location.
In terms of section 34 of the National Heritage Resources Act (NHRA, 25 of 1999), no significant buildings or structures were located.

In terms of section 35 of the NHRA, no archaeological sites were located.
In terms of section 36 of the NHRA, no graves or gravesites and burial grounds were located. Due to the study area being densely overgrown with vegetation it is possible that some unmarked graves may have been overlooked during the survey. It is also possible that graves may occur nearby residential ruins (sites UG 1 and UG 2) but were not located during the physical survey due to the exceptionally dense vegetation cover. Bush clearing at sites UG 1 and UG 2 should be done with care in the event that unmarked graves may be present. When earth-moving activities are planned here it is recommended that the EMP or a qualified archaeologist be present to monitor the proceedings in the event that graves are encountered. When graves are encountered a qualified archaeologist should be contacted in order to assess and recommend further action.

It is not within the expertise of this report or the surveyor to comment on possible paleontological remains which may be located in the study area.

Disclaimer: *Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. Kudzala Antiquity CC will not be held liable for such oversights or for costs incurred as a result of such oversights.*

Introduction

1.1. Terms of reference

Kudzala Antiquity CC was commissioned to conduct an archaeological and heritage resources survey in respect of proposed agricultural development located on previously cultivated land on the farm Uguhleni 689 JT, located near the town of Barberton, Umjindi Local Municipality in Mpumalanga Province. The survey was conducted in order to assess the potential impact that the proposed activity may have on archaeological and heritage resources. The survey was conducted for Henwood Environmental Solutions.

1.1.1 Project overview

The client is in the process of obtaining environmental authorization to commence with agricultural activities on an area of approximately 39,5 hectares of the aforementioned farm. Suitable areas within the identified area are earmarked for this activity pending environmental authorization.

1.1.2. Constraints and limitations

The archaeological survey consisted of non-intrusive methods which exclusively rely on surface observations. The largest part of the project area was very difficult to access due to dense vegetation growth which resulted in archaeological visibility being low. Certain areas were not accessible at all due to dense Lantana (*Lantana camara*) growth probably as a result of previous agricultural activity.

1.2. Legislative Framework

The National Heritage Resources Act (NHRA) (Act No. 25, 1999) require that individuals or institutions have specialist heritage impact assessment studies undertaken whenever development activities are planned and such activities trigger activities listed in the legislation. This report is the result of an archaeological and heritage study in accordance with the requirements as set out in Section 38 (3) of the NHRA in an effort to ensure that heritage features or sites that qualify as part of the national estate are properly managed and not damaged or destroyed.

The study aims to address the following objectives:

- Analysis of heritage issues;
- Assess the cultural significance of identified places including archaeological sites and features, buildings and structures, graves and burial grounds within a specific historic context;
- Identifying the need for more research;
- Surveying and mapping of identified places including archaeological sites and features, buildings and structures, graves and burial grounds;
- A preliminary assessment of the feasibility of the proposed development or construction from a heritage perspective;
- Identifying the need for alternatives when necessary; and
- Recommending mitigation measures to address any negative impacts on archaeological and heritage resources.

Heritage resources considered to be part of the national estate include those that are of archaeological, cultural or historical significance or have other special value to the present community or future generations.

The national estate may include:

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living
- heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and paleontological sites;
- graves and burial grounds including:
    - (i) ancestral graves;
    - (ii) royal graves and graves of traditional leaders;
    - *(iii)* graves of victims of conflict;
    - (iv) graves of individuals designated by the Minister by notice in the *Gazette;*
    - (v) historical graves and cemeteries; and other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
- sites of significance relating to slavery in South Africa;
- movable objects including:

(i) objects recovered from the soil or waters of South Africa, including archaeological and paleontological objects and material, meteorites and rare geological specimens;

(ii) objects to which oral traditions are attached or which are associated with living heritage

(iii) ethnographic art and objects;
(iv) military objects
(v) objects of decorative or fine art;
(vi) objects of scientific or technological interest; and
(vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1 of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

Cultural resources are unique and non-renewable physical phenomena (of natural occurrence or made by humans) that can be associated with human (cultural) activities (Van Vollenhoven 1995:3). These would be any man-made structure, tool, object of art or waste that was left behind on or beneath the soil surface by historic or pre-historic communities. These remains, when studied in their original context by archaeologists, are interpreted in an attempt to understand, identify and reconstruct the activities and lifestyles of past communities. When these items are removed from their original context, any meaningful information they possess is lost, therefore it is important to locate and identify such remains before construction or development activities commence.

1.3. Approach and statutory requirements

The SAHRA Minimum standards of 2007 and 2016 guideline documents, forms the background against which the survey was planned and the report compiled. An Archaeological Impact Assessment (AIA) consists of three phases. This document deals with the first phase. This (phase 1) investigation is aimed at getting an overview of cultural resources in the project area, assigning significance to these resources, assessing the possible impact that the proposed activity may have on these resources, making recommendations pertaining to the management of heritage resources and putting forward mitigation measures where applicable.

When the archaeologist or heritage specialist encounters a situation where the planned project will lead to the destruction or alteration of an archaeological/ heritage site or feature, a second phase investigation is normally recommended. During a phase two investigation mitigation measures are put in place and detailed investigation into the nature of the cultural material is undertaken. Often at this stage, archaeological excavation and detailed mapping of a site is carried out in order to document and preserve the cultural heritage.

Phase three consists of the compiling of a management plan for the safeguarding, conservation, interpretation and utilization of cultural resources (Van Vollenhoven, 2002).

Continuous communication between the developer and heritage specialist after the initial assessment has been carried out may result in the modification of a planned route or development to incorporate or protect existing or newly found archaeological and heritage sites.

2. Description of surveyed area

The study area is located near Barberton on the farm Uguhleni 689 JT and was previously cultivated with orchards and crop fields.
The survey was conducted on foot and with the use of a motor vehicle in an effort to locate cultural remains.

Landscape: Natural and wetland vegetation surrounded by Legogote Sour Bushveld and landscaped agricultural use including orchards and cultivated fields.

Visibility: Poor in most areas due to dense vegetation cover.

Veld type: The vegetation forms part of the Savanna Biome and classed as Legogote Sour Bushveld. This veld type occurs in Mpumalanga and Limpopo Provinces on the lower eastern slopes and hills or the northeastern escarpment from Mariepskop in the north through White River to the Nelspruit area and extending westwards up valleys of the Crocodile, Elands and Houtbosloop Rivers and terminating in the south in the Barberton area. Altitude is 600-1000 m and sometimes higher. The landscape is characterised by gently to moderately upper pediment slopes with dense woodland including many medium to large shrubs, short thicket occurs on less rocky sites (Mucina and Rutherford, 2009).

Geology and soils: The larger part of the area is underlain by gneiss and migmatite of the Nelspruit Suite but the southern part occurs on the potassium-poor rocks of the Kaap Valley Tonalite. Pretoria Group shale and quartzite occur in the westernmost areas. Archaean granite plains with granite inselbergs and large granite boulders also occur (Mucina and Rutherford, 2009).

3. Methodology

This study consists of a detailed archival study in order to understand the study area in a historical timeframe, an archaeological background study which include scrutiny of previous archaeological reports of the area, obtained through the SAHRIS database, and published as well

as unpublished written sources on the archaeology of the area, social consultation with people who live nearby and a lastly a physical survey of the affected and immediate area.

The South African Heritage Resources Agency (SAHRA) and the relevant legislation (NHRA) require that the following components be included in an archaeological impact assessment:

- Archaeology;
- Shipwrecks;
- Battlefields;
- Graves;
- Structures older than 60 years;
- Living heritage;
- Historical settlements;
- Landscapes;
- Geological sites; and
- Paleontological sites and objects.

All the above-mentioned heritage components are addressed in this report, except shipwrecks, geological sites and paleontological sites and objects.

The ***purpose*** of the archaeological, archival and heritage study is to establish the whereabouts and nature of cultural heritage sites should they occur on project area. This includes settlements, structures and artefacts which have value for an individual or group of people in terms of historical, archaeological, architectural and human (cultural) development.

The ***aim*** of this study is to locate and identify such objects or places in order to assess and rate their significance and establish if further investigation is needed. Mitigation measures can then be suggested and put in place when necessary.

3.1. Archaeological and Archival background studies

The purpose of the desktop study is to compile as much information as possible on the heritage resources of the area. This helps to provide an historical context for located sites. Sources used for this study include published and unpublished documents, archival material and maps. Information obtained from the following institutions or individuals were consulted:

- Published and unpublished archaeological reports and articles;
- Published and unpublished historical reports and articles;
- Archival documents from the National Archives in Pretoria;

- Historical maps; and
- South African Heritage Resource Information System (SAHRIS) database.

3.1.1. Previous archaeological studies in the area

Some archaeological impact assessments (AIA's) and heritage impact assessments have been done in the greater area of the proposed development area.

In 2008 Dr Julius Pistorius conducted a Phase One Heritage Impact Assessment for the upgrading of an Eskom Substation on the farm Hilltop 458 which is located a number of kilometres north-east of Uguhleni 689 JT. The only significant feature he documented was the location of a single grave.

In 2018 Mr JP Celliers conducted a "Phase 1 Archaeological and Heritage Impact Assessment on the farm Waterfall 461 JT in respect of the proposed construction of an irrigation dam, Barberton, Mpumalanga Province". No sites of archaeological or heritage significance was documented.

3.1.2. Historic maps

Historical maps were scrutinized and features that were regarded as important in terms of heritage value were identified and if they were located within the boundaries of the project area they were physically visited in an effort to determine:

(i) whether they still exist;
(ii) their current condition; and
(iii) significance.

3.1.3. Physical survey

- The survey of the proposed project area was conducted on 16 June 2022
- The survey took one day to complete.
- The documented sites were numbered sequentially.
- Sites were recorded by using a handheld Garmin Etrex 22x GPS unit and the unit was given time to reach an accuracy of at least 5 metres.
- Sites were plotted on 1:50 000 topographical maps which are geo-referenced (WGS 84) and also on Google Earth.

- Two sites were recorded but they are of low heritage significance and no mitigation is needed. Some survey orientation sites were mapped for survey purposes.

3.2. Heritage site significance

The South African Heritage Resources Agency (SAHRA) formulated guidelines for the conservation of all cultural resources (sections 6 and 7 of the NHRA, 1999) and therefore also divided such sites into three main categories. These categories might be seen as guidelines that suggest the extent of protection a given site might receive. They include sites or features of local (Grade 3) provincial (Grade 2) national (Grade 1) significance, grades of *local significance* and *generally protected* sites with a variety of degrees of significance.

For practical purposes the surveyor uses his own classification for sites or features and divides them into three groups, those of low or no significance, those of medium significance and those of high significance **(*Also see table 5.2.Significance rating guidelines for sites*).**

Values used to assign significance and impact characteristics to a site include:

- **Types of significance**

The site's scientific, aesthetic and historic significance or a combination of these is established.

- **Degrees of significance**

The archaeological or historic site's rarity and representative value is considered. The condition of the site is also an important consideration.

- **Spheres of significance**

Sites are categorized as being significant in the international, national, provincial, regional or local context. Significance of a site for a specific community is also taken into consideration.

To arrive at the specific allocation of significance of a site or feature, the specialist considers the following:

- Historic context;
- Archaeological context or scientific value;
- Social value;
- Aesthetic value; and
- Research value.

More specific criteria used by the specialist in order to allocate value or significance to a site include:

- The unique nature of a site;
- The integrity of the archaeological deposit;
- The wider historic, archaeological and geographic context of the site;
- The location of the site in relation to other similar sites or features;
- The depth of the archaeological deposit (when it can be determined or is known);
- The preservation condition of the site;
- Quality of the archaeological or historic material of the site; and
- Quantity of sites and site features.

Archaeological and historic sites containing data, which may significantly enhance the knowledge that archaeologists currently have about our cultural heritage, should be considered highly valuable. In all instances these sites should be preserved and not damaged during construction activities. However, when development activities jeopardize the future of such a site, a second and third phase in the Cultural Resource Management (CRM) process is normally advised. This entails the excavation or rescue excavation of cultural material, along with a management plan to be drafted for the preservation of the site or sites.

Graves are considered very sensitive sites and should never under any circumstances be jeopardized by development activities. Graves and burial grounds are incorporated in the NHRA under section 36 and in all instances where graves are found by the surveyor, the recommendation would be to steer clear of these areas. If this is not possible or if construction activities have for some reason damaged graves, specialized consultants are normally contacted to aid in the process of exhumation and re-interment of the human remains.

4. History and Archaeology

4.1. Historic period

4.1.1. Early History

In Southern Africa the domestication of the environment began only a couple of thousands of years ago, when agriculture and herding were introduced. At some time during the last half of the first millennium BC, people living in the region where Botswana, Zambia and Angola are today, started moving southward, until they reached the Highveld and the Cape in the area of modern South Africa. As time passed and the sub-continent became fully settled, these agro-pastoralists, who spoke Bantu languages, started dominating all those areas which were ecologically suitable for their way of life. This included roughly the eastern half of modern South Africa, the eastern fringe of Botswana and the north of Namibia.

Up until the 1930s, malaria would have occurred sporadically in the study area during the rainy season. During the first half of the nineteenth century, Tsetse flies also thrived in this area. Pastoralists would have avoided the moist low-lying valleys and thickly wooded regions where these insects preferred to congregate. It is unlikely that populations would be dense in areas where malaria and the “sleeping sickness” transferred by Tsetse flies was a constant threat to humans and their stock (Bergh 1999: 3; Shillington 1995: 32).

In a few decades, the course of history in the old Transvaal province would change forever. The Difaqane (Sotho), or Mfekane (“the crushing” in Nguni) was a time of bloody upheavals in Natal and on the Highveld, which occurred around the early 1820s until the late 1830s. It came about in response to heightened competition for land and trade, and caused population groups like gun-carrying Griquas and Shaka’s Zulus to attack other tribes.

During the time of the Difaqane, a northwards migration of white settlers from the Cape was also taking place. Some travellers, missionaries and adventurers had gone on expeditions to the northern areas in South Africa – some as early as the 1720’s. One such an adventurer was Robert Schoon, who formed part of a group of Scottish travellers and traders who had travelled the northern provinces of South Africa in the late 1820s and early 1830s. Schoon had gone on two long expeditions in the late 1820’s and once again ventured eastward and northward of Pretoria in 1836 (Bergh, 1999: 13, 116-121).

By the late 1820s, a mass-movement of Dutch speaking people in the Cape Colony started advancing into the northern areas. This was due to feelings of mounting dissatisfaction caused by economical and other circumstances in the Cape. This movement later became known as the Great Trek. This migration resulted in a massive increase in the numbers of people of European

descent. As can be expected, the movement of whites into the Northern provinces would have a significant impact on the local farmer – herders who populated the land.

By 1860, the population of Europeans in the central Transvaal was already very dense and the administrative machinery of their leaders was firmly in place. Many of the policies that would later be entrenched as legislation during the period of apartheid had already been developed (Ross 2002: 39; Bergh, 1999: 170).

However, relations were at times also interdependent in nature. After the Great Trek, when European farmers had settled at various areas in the northern provinces, wealthier individuals were often willing to lodge needy white families on their property in exchange for odd jobs and commando service. These “bywoners” often arrived with a family and a few cows. He would till the soil and pay a minimal rent to the farmer from the crops he grew. The farmer did not consider him a labourer, but mostly kept workers for hard labour on the farm.

The discovery of gold in South Africa had a major impact in the region. In 1873 gold was discovered in Pilgrims Rest, 80 kilometres north of Nelspruit. This drew scores of prospectors into the region. The establishment of Barberton in 1884, after the discovery of the Sheba gold reef, also brought about greater activity in the area.

In 1884 gold was found on Moodie’s concession near the present town of Barberton. George Pigott Moodie was an important figure in the Transvaal in the late 19th century. In exchange for services to the Volksraad of the Transvaal in the 1870s, Moodie was rewarded with the title to a block of thirteen farms lying to the west of where Barberton now stands. These included the farm Hilversum, as well as Ameida, Brommers, De Bult, Emmenes, Heemstede, Josefsdal, Loenen, Oorschot, Oosterbeek, Sassenheim, Schoonoord and Welgelegen. The block became known as Moodie’s Estate (South African History Online, 2013; Curror 2002: 38).

Following Moodie’s discovery, the Barber brothers, accompanied by their cousin Graham H. Barber, as well as Edward White and Holden Bowker, proceeded to this locality to try their luck. Hal Barber made the first discovery, albeit of a low-grade reef, three miles east of Moodie’s camp. Not long thereafter, Fred Barber found a good reef, which he pegged at the foot of a hillside. The spot where the Barbers’ base camp was pitched in the valley ultimately became the town of Barberton. Not long thereafter prospectors swarmed into the area in search of gold. Canteens, shops, restaurants and a post office sprang up in the area that was known as Barber’s Camp. The Transvaal Mining Commissioner and Landdrost of Duivels Kantoor, one Wilson, came to establish a sort of government control and to collect licenses in the camp. In 1884 a meeting of the inhabitants was called, and a diggers’ committee was elected, of whom Fred and Hal Barber formed part. At this meeting, the camp was christened Barberton. By October 1885 this

settlement already had a population of about 500 (South African History Online, 2013; Myburgh 1949: 7-8).

By 1949 the Nkosi of Mhola was the predominant tribe in the district west of Sheba Siding, consisting of government ground, privately white-owned farms, the Barberton town lands, mine properties and company-owned land. The farm Sassenheim 86 formed part of Moodies Estates, which was mine land and a headman by the name of Mphungandlu Nkosi resided on this farm. The tribe consisted mostly of Swazi-speakers, and Mhola Mvulo Nkosi was its chief. Nkosi was born ca. 1898, and assumed his duties as chief in ca. 1923. Myburgh notes that, "though recognized for administrative purposes only", Nkosi was the most important chief in the district. He was an educated man. By 1949 the strength of the tribe was estimated at nearly 11 000. The ruling family of the tribe were the descendants of the Swazi king Mswati II, and they had their headquarters at eMjindini Village, Moodies (Myburgh, 1949: 31-32).

A large Homeland was located a small distance to the east of Barberton, and later became known as Kangwane. This area was proclaimed by the Land Act of 1936. In the Surplus People Project Report, the forced removal of people to the Kangwane area, or homeland, is discussed. According to this source the area could be regarded as a "dumping ground" allocated to South Africa's Swazis, consisting of two blocks of land. The first of these, the Nsikazi reserve, was a finger of land stretching along the western boundary of the Kruger National Park, and had been under black occupation for over 50 years. The second block was adjacent to the western and northern boundaries of Swaziland, and consisted of the Nkomazi and Mswati/Mlondozi reserves released under the 1935 Land Act (Bergh 1999: 42; Surplus people project 1983: 59).

4.1.2. Colonial period history

The Groot Trek of the Voortrekkers started with the Tregardt- van Rensburg trek in 1835. The two men met where Tregardt and his followers crossed the Orange River at Buffelsvlei (Aliwal North). Here van Rensburg joined the trek northwards. On August 23, 1837 the Tregardt trek left for Delagoabay from the Soutpansberg. They travelled eastwards alongside the Olifants River to the eastern foothills of the Drakensberg. From here they travelled through the Lowveld and the current Kruger National Park where they eventually crossed the Lebombo mountains in March 1838. They reached the Fortification at Lourenço Marques on 13 April 1838 (Bergh, 1998:124-125).

Permanent European (Voortrekker) settlement of the eastern areas of Mpumalanga can be traced back to a commission under the leadership of A.H. (Hendrik) Potgieter who negotiated with the Portuguese Governor at Delagoabaai in 1844 for land. It was agreed that these settlers could settle in an area that was four days journey from the east coast of Africa between the 10˚ and 26˚ south latitudes. Voortrekkers started migrating into the area in 1845. Andries-Ohrigstad was the first town established in this area in July 1845 after the Voortrekkers successfully negotiated for

land with the Pedi Chief Sekwati. Farms were given out as far west as the Olifants River. The western boundary was not officially defined but at a Volksraad meeting in 1849 it was decided that the Elands River would be the boundary between the districts of Potchefstroom and Lydenburg as this eastern portion of the Transvaal was then known (Bergh, 1998).

Due to internal strife and differences between the various Voortrekker groups that settled in the broader Transvaal region, the settlers in the Ohrigstad area now governed from the town of Lydenburg decided to secede from the Transvaal Republic in 1856. The Republic of Lydenburg laid claim to a large area that included not only the land originally obtained from the Pedi Chief Sekwati in 1849 but also other areas of land negotiated for from the Swazis. The Republic of Lydenburg was a vast area and stretched from the northern Strydpoort mountains to Wakkerstroom in the south and Bronkhortsspruit in the west to the Swazi border and the Lebombo mountains east.

As can be expected, the migration of Europeans into the north would have a significant impact on the indigenous people who populated the land. This was also the case in Mpumalanga. In 1839 Mswati succeeded Sobhuza (also known as Somhlomo) as king of the Swazi. Threatened by the ambitions of his half-brothers, including Malambule, who had support from the Zulu king Mpande, he turned to the Ohrigstad Boers for protection. He claimed that the land that the Boers had settled on was Swazi property. The Commandant General of the Ohrigstad settlement, Andries Hendrik Potgieter, responded that the land was ceded to him by the Pedi leader Sekwati, in return for protection of the Pedi from Swazi attacks (Giliomee, 2003).

However, in reaction to the increasingly authoritarian way in which Potgieter conducted affairs at Ohrigstad, the Volksraad of Ohrigstad saw Mswati's offer as a means to obtain more respectable title deeds for the property (Bonner, 1978). According to a sales contract set up between the Afrikaners and the Swazi people on 25 July 1846, the whites were the rightful owners of the land that had its southern border at the Crocodile River, which stretched out in a westerly direction up to Elandspruit; of which the eastern border was where the Crocodile and Komati rivers joined and then extended up to Delagoa bay in the north (Van Rooyen, 1951). The Europeans bought the land for a 100 heads of cattle (Huyser).

4.1.3. History of the Anglo Boer War (1899-1902) in the area

The discovery of diamonds and gold in the Northern provinces had very important consequences for South Africa. After the discovery of these resources, the British, who at the time had colonized the Cape and Natal, had intensions of expanding their territory into the northern Boer republics. This eventually led to the Anglo-Boer War, which took place between 1899 and 1902 in South Africa, and which was one of the most turbulent times in South Africa's history.

Even before the outbreak of war in October 1899 British politicians, including Sir Alfred Milner and Mr. Chamberlain, had declared that should Britain's differences with the Z.A.R. result in violence, it would mean the end of republican independence. This decision was not immediately publicised, and as a consequence republican leaders based their assessment of British intentions on the more moderate public utterances of British leaders. Consequently, in March 1900, they asked Lord Salisbury to agree to peace on the basis of the status quo ante bellum. Salisbury's reply was, however, a clear statement of British war aims (Du Preez, 1977).

During the British advance between February to September 1900, Lord Roberts replaced Genl. Buller as the supreme commander and applied a different tactic in confronting the Boer forces instead of a frontal attack approach he opted to encircle the enemy. This proved successful and resulted for instance in the surrender of Genl. Piet Cronje and 4000 burghers at Paardeberg on 27 February 1900.

This was the start of a number of victories for the British and shortly after they occupied Pretoria on 5 June 1900, a skirmish at Diamond Hill resulted in the Boer forces under command of Louis Botha, retreated alongside the Delagoa Bay railway to the east. Between the 21-27 August, Botha and 5000 burghers defended their line at Bergendal but were overwhelmed by superior numbers and artillery. This resulted in the Boer forces retreating even further east and three weeks later the British reached Komatipoort and thus the whole of the Eastern Transvaal south of the Delagoa Bay railway line was now occupied by British Forces.

General Louis Botha, with his Boer forces, marched through Nelspruit on 11 September 1900. A week later, on 18 September 1900, the British battalion of Lieutenant General F. Roberts arrived in Nelspruit. No major skirmishes in the war took place near Nelspruit, but a concentration camp for black people was established a small distance to the north of the town and a white concentration camp to the west of Barberton (Bergh, 1999: 54). Another event of import in the area was the arrival of the President of the Transvaal, Paul Kruger, in Nelspruit on 29 May 1900, where he received a message saying Lord Roberts had annexed the Transvaal. Kruger declared the annexation illegitimate on 3 September 1900, the same day that Nelspruit was proclaimed as the administrative capital of the Transvaal Republic. Kruger left Nelspruit in June of that year in order to board a ship to Swaziland (Bergh, 1999: 51; 54).

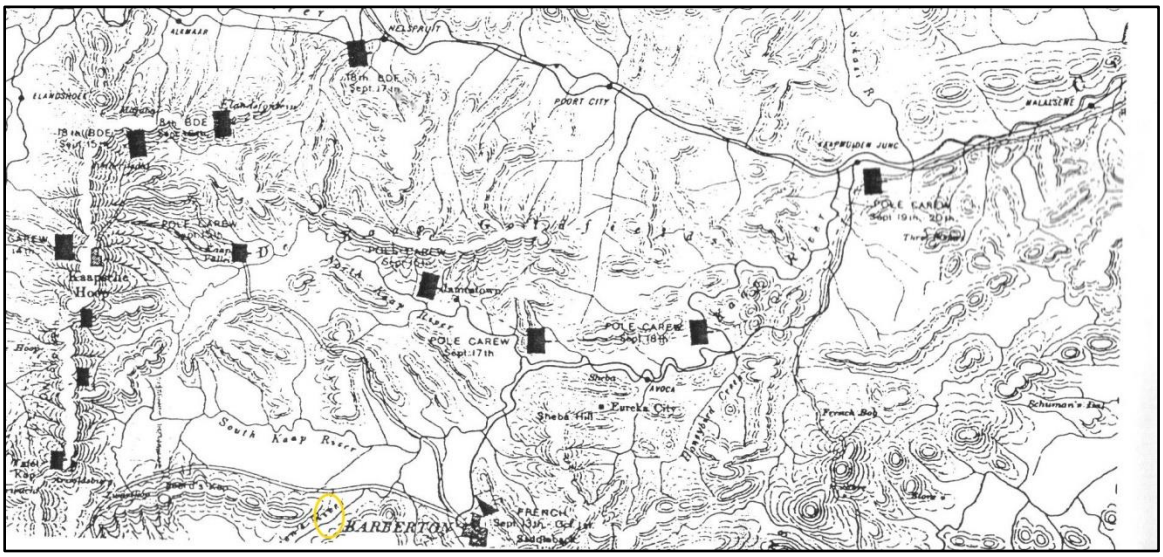


Figure. 4.1. Anglo Boer War map showing "The second stage of the combined advance on Komati Poort, Sept. 3rd -24th 1900. The approximate location of the study area is encircled in yellow (Major Jackson series, 1902).

During the Battle of Helvetia, ZAR forces succeeded in capturing "The Lady Roberts" British naval gun after an attack on enemy fortifications located at Helvetia between Lydenburg and Machadodorp on 28 December 1900. It was the only gun captured during the War and later destroyed by the ZAR forces to prevent the British claiming it back. The largest portions of the gun are at the National Museum in Pretoria but an inscribed piece which comes from the breech of the gun is part of the Lydenburg Museum collection.

No major skirmishes in the war took place near Barberton, but a concentration camp was established a small distance to the west of the town (Bergh, 1999: 54).

4.1.4. Railway history in the Eastern Lowveld

By June 1892, the new railway constructed from Lourenco Marques to Pretoria, reached Nelspruit. In November 1891 the Hall family opened a new hotel, mainly to accommodate railway construction workers. This hotel was moved to the centre of the town in June 1892 and was named the Fig Tree Hotel.

Railway expansion continued up until the Anglo-Boer War (1899-1902) and thereafter (Bergh, 1999). After the establishment of the Union of South Africa on 31 May 1910 the Transvaal had the most railway track in terms of distance. Some 2 730km of railway connected the economic centres of this province. Railways made a huge contribution towards economic development especially in the Witwatersrand area where it served as important platform for mining and industrial development (Bergh, 1999).

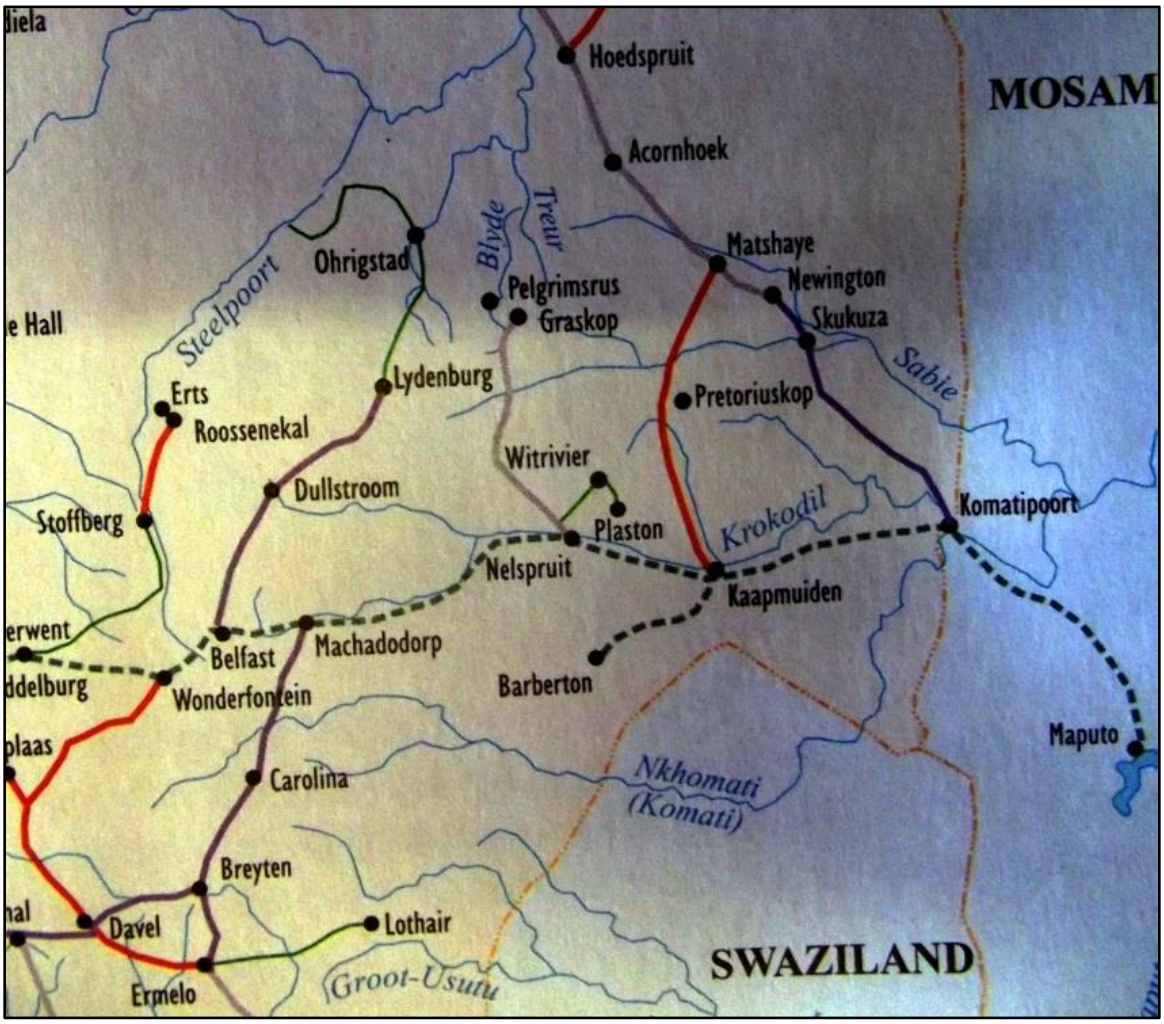


Figure. 4.2. Railway development in the Transvaal, 1889-1980 (Bergh, 1999: 79)

The decade after establishment of the Union is characterised by a sharp increase in railway development especially between 1911-1916, after which a period of inactivity followed due to the First World War (Bergh, 1999). Most of the development took place in the Eastern Transvaal and five railway lines were constructed in order to promote the growing agricultural industry.

Ermelo was linked with Piet Retief and further to the south with Commondale and Vryheid in Natal. The Komatipoort – Newington line was extended and passed over Acornhoek, Hoedspruit, Letsitele, Tzaneen and Soekmekaar (Fig. 4.1.) where it connects with the northern line from Pietersburg towards Louis Trichardt and Schoemansdal (Bergh, 1999).

4.1.5. Historic maps of the study area

Since the mid-1800s up until the present, South Africa has been divided and re-divided into various districts. Since 1845, Barberton and the farms to the west thereof, including the property under investigation, formed part of the Lydenburg district. This remained the case up until 1902, when the Barberton district was proclaimed. By 1994, Uguhleni was still located in the Barberton district (Bergh, 1999: 17, 20-27).

In 1979, the farm Uguhleni 698 JT was created by joining a portion of the southernmost portion of Kempstone 694 JT to the northwestern portion of Sassenheim 695 JT. (Windeed Search Engine 2022)

Before the Baberton District was proclaimed in 1845, only the farm Sassenheim 1001, Lydenburg District existed. After the proclamation, the farms were respectively known as Sassenheim 86 and Kempstone 164, Baberton District. By 1968, the farms were known as Sassenheim 695 JT and Kempstone 694 JT and they continue to exist under these names. (Major Jackson, 1902; Surveyor-General, 1917; Topographical Map, 1968).

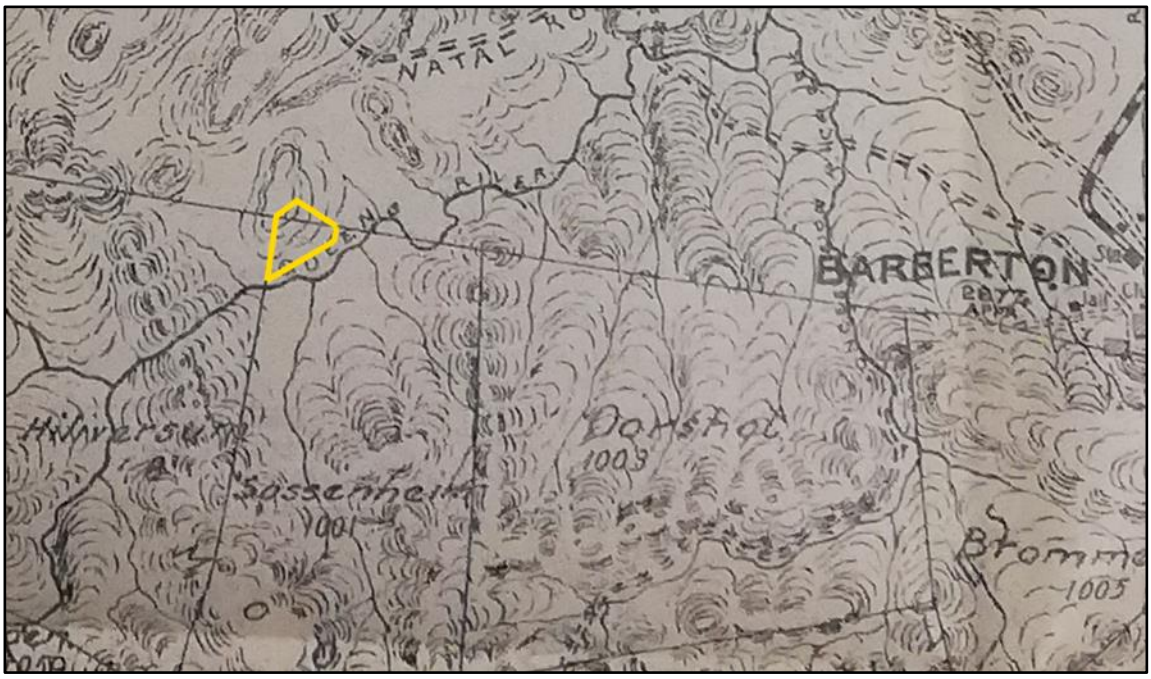


Figure. 4.3. Major Jackson Map of the Barberton district in 1902. The approximate location of the study area is indicated with a yellow border. At the time, only the farm Sassenheim 1001 existed. The Queens River can be seen south of the study area. No buildings or developments can be seen on the property. (Major Jackson, 1902).

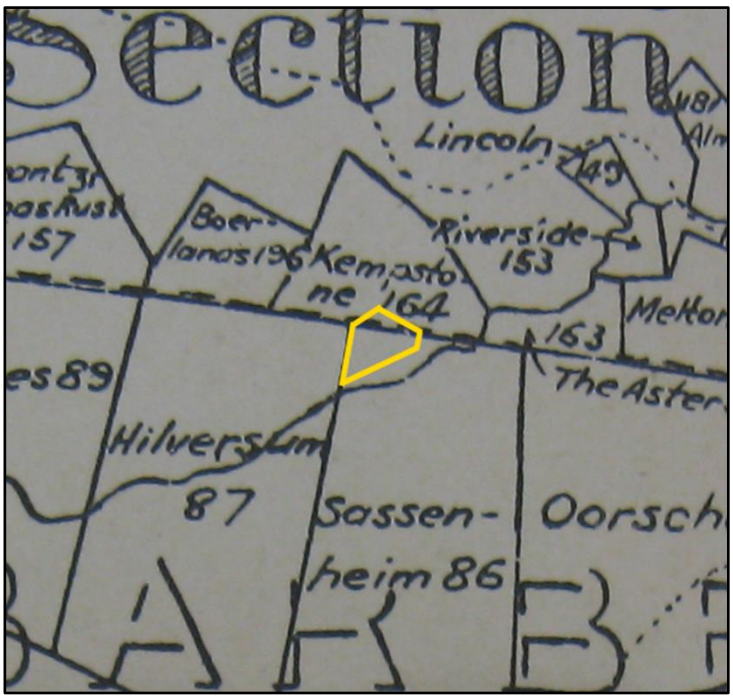


Figure. 4.4. Map of the Barberton district in the year 1917. The approximate location of the study area is indicated with a yellow border. At the time, Uguhleni 698 JT did not exist, and it fell partially within the farms Sassenheim 86 and Kempstone 164 (Surveyor-General, 1917).

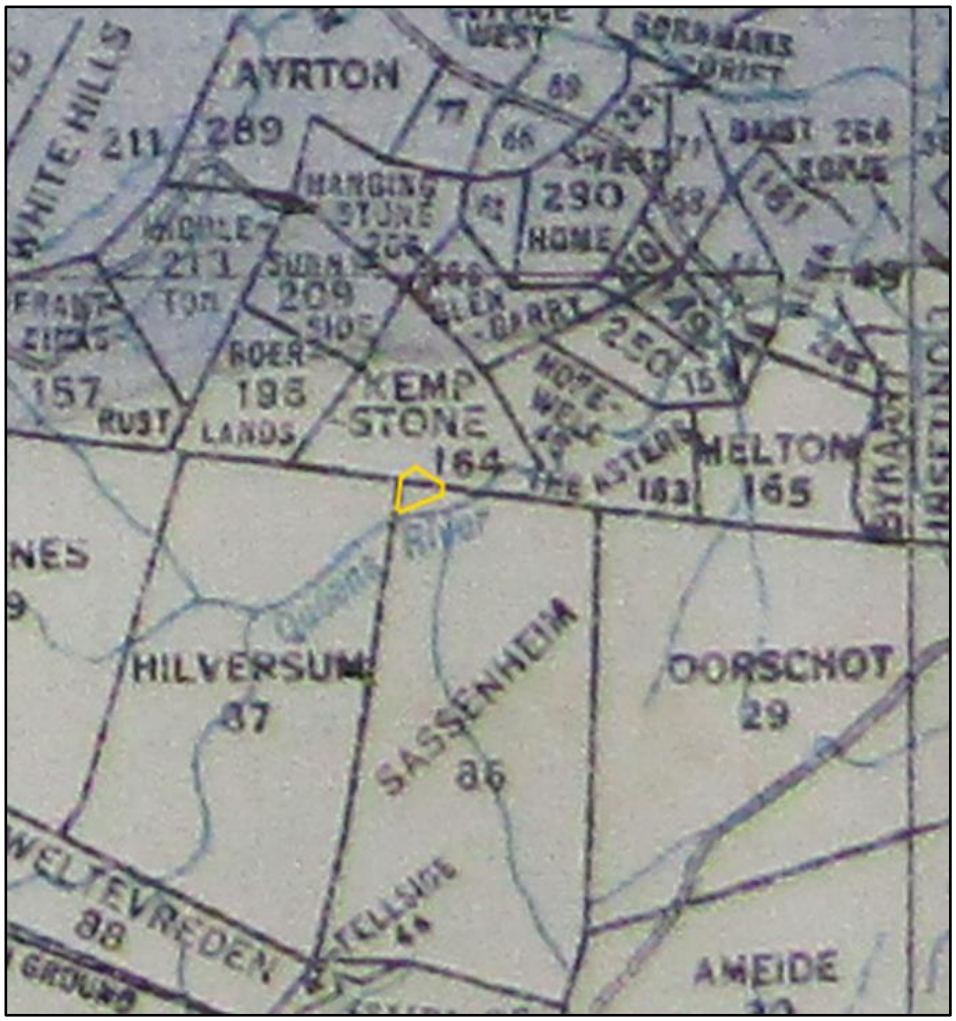


Figure. 4.5. Map of the Kruger National Park, dating approximately to the 1930s. The approximate location of the study area is indicated with a yellow border. At the time, Uguhleni 698 JT did not exist, and it fell partially within the farms Sassenheim 86 and Kempstone 164. The Queen's River can be seen to the south of the study area (NASA Maps: 3/1254).

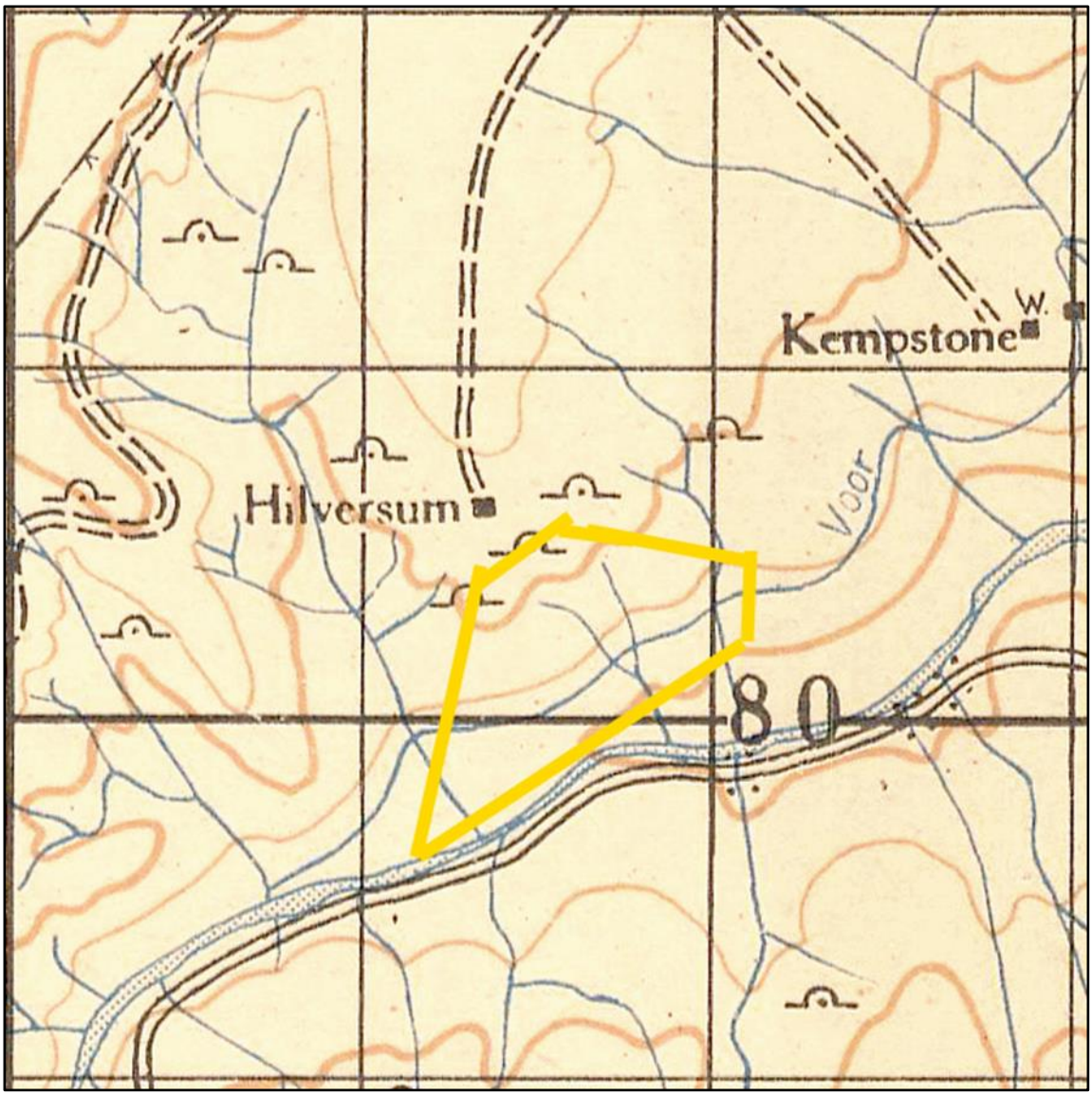


Figure. 4.6. Topographical map of the study area in 1943. The approximate location of the study area is indicated with a yellow border. A main road and the Queens River can be seen to the south of the study area. Several trials can be seen to the north of the study area, as well as a couple of buildings and huts. Several huts appear to be located within the study area (Topographical Map, 1943).

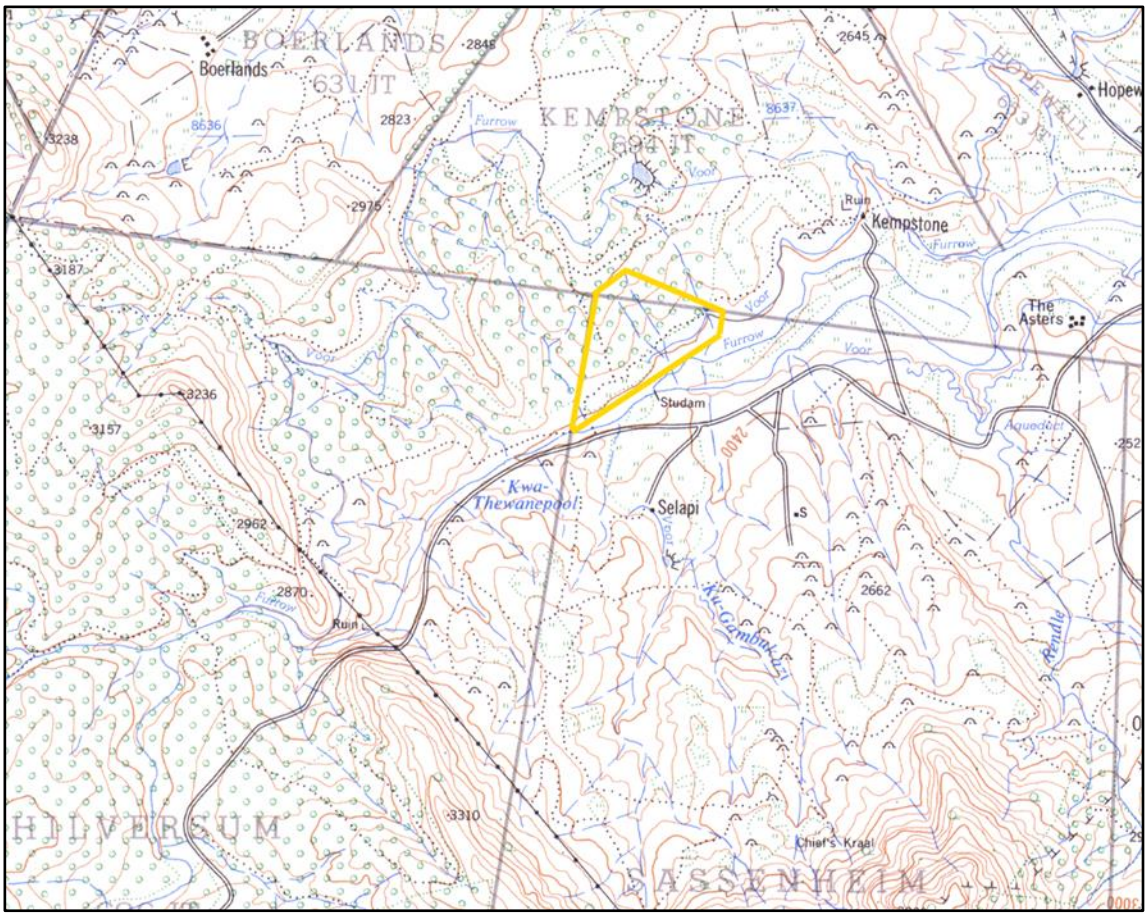


Figure. 4.7. Topographical map of the study area in the year 1968. The approximate location of the study area is indicated with a yellow border. The farms from which Uguhleni 698 JT was eventually formed were then known as Sassenheim 695 JT and Kempstone 694 JT. The study area consists of undeveloped land and only two perpendicular footpaths can be seen within the study area.

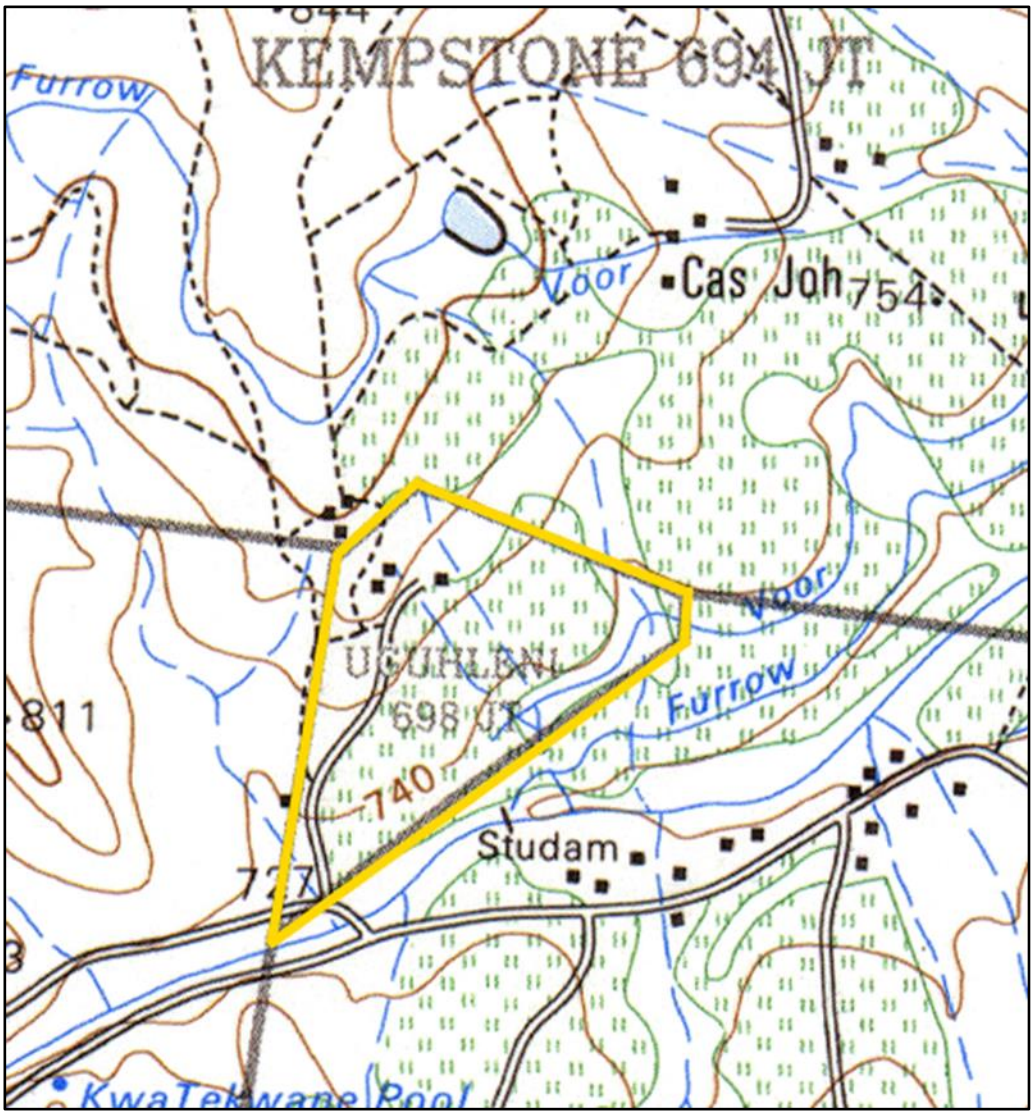


Figure. 4.8. Topographical map of the study area in the year 1984. The location of the farm Uguhleni 698 JT is indicated with a yellow border. At the time, the area consisted largely of cultivated land. A road and several footpaths leading to a few buildings to the north is visible (Topographical Map, 1984).

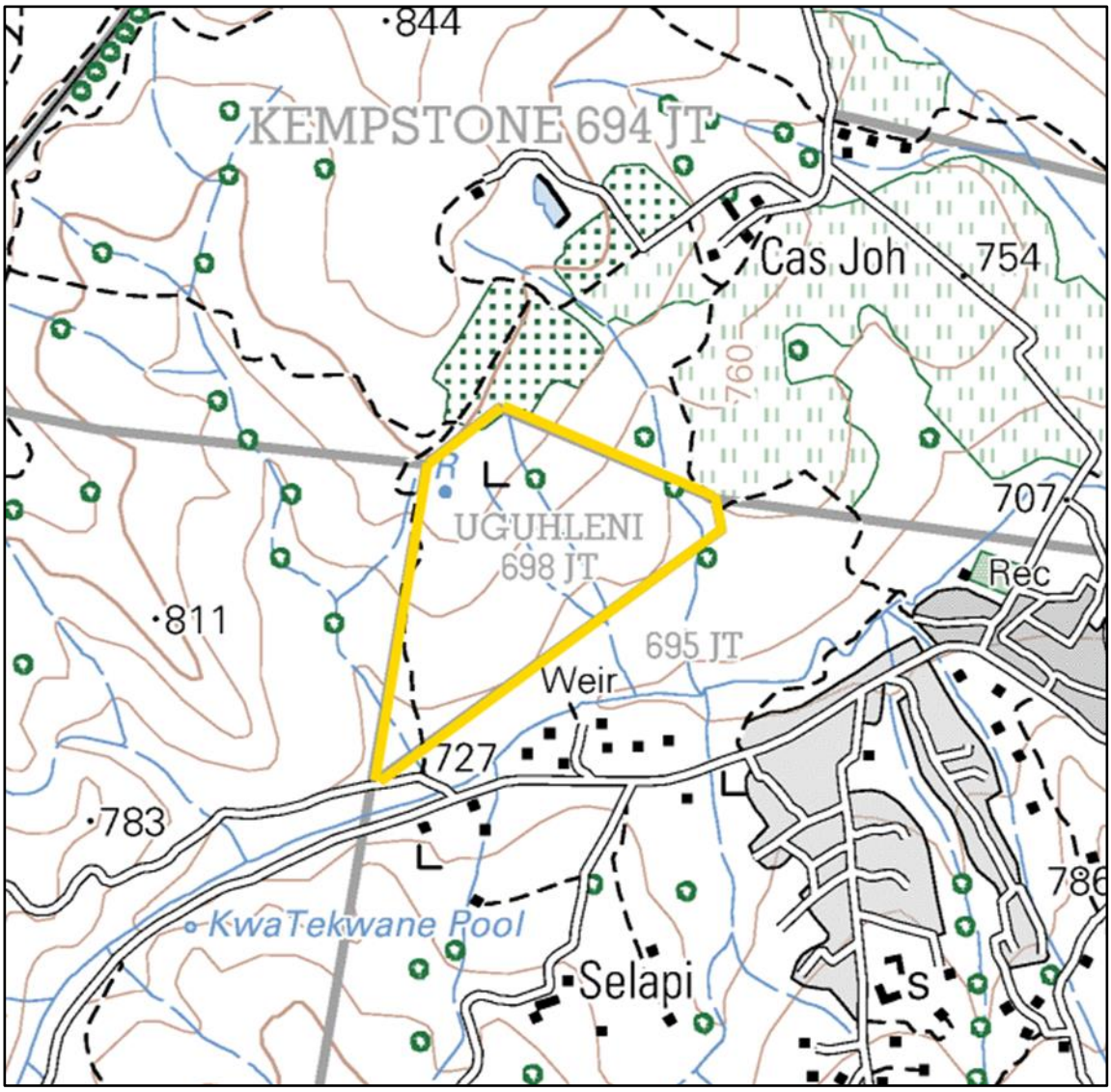


Figure. 4.9. Topographical map of the study area in the year 2010. The location of the farm Uguhleni 698 JT is indicated with a yellow border. At the time, the land was uncultivated and the only developments within the study area is a reservoir located in the north and a footpath on the western boundary (Topographical Map, 2010).

4.1.6. Historical overview of the ownership and development of the farm Uguhleni 689 JT.

A number of sources were consulted in the National Archives of South Africa. A record of historical landowners on the concerned properties will be provided. Thereafter follows a discussion of who lived in the study area and for what purpose the land was historically used.

Record of historical landowners

Uguhleni 698 JT was created in 1979 from portions of the farms of Sassenheim 695 JT and Kempstone 694 JT. Therefore, the historical ownership of these two farms is relevant to the history of Uguhleni 698 JT (Windeed Search Engine, 2022).

The only information regarding the historical landowners that could be traced in archival sources was that on or about 8 May 1913, title to the farm Kempstone 164, District Baberton, measuring 765 morgen and 476 square roods was granted in favour of Sophia Anna Fisher for a purchase sum of £635. (NARSSA *SAB, URU: 140 1289*)

The following information could be obtained regarding more recent landowners of Uguhleni 698 JT:

Purchase date:	**Transferred from:**	**Transferred to:**
1979	-	Christiaan Hattingh
2001	Christiaan Hattingh	Uguhleni Communal Prop Assoc
2021	Uguhleni Communal Prop Assoc	Baberton Valley Plantations (Pty) Ltd

(Windeed Search Engine, 2022).

History of land use

As with the record of historical landowners, the history of land use of the farms Sassenheim 695 JT and Kempstone 694 JT is relevant to the history of land use of Uguhleni 698 JT, since it is from these two farms that that latter was created.

On 8 December 1886, Mynpacht-brief No. 140 in extent of 1021 morgen 251 square roods of the farm Sassenheim 86, Baberton, was granted to Moodies Gold Mining and Exploration Company Limited (hereinafter referred to as “Moodies”) for a period of 10 years. On 3 September 1896, it was renewed for a further 10 years and again, on 28 February 1907 (NARSSA *SAB, JUS: 39 3/1132/10*).

The original Mynpacht-brief was held on an un-proclaimed farm and after protracted negotiations, the owners of the farm and government agreed that the original brief would be cancelled in exchange for a Mynpacht in extent of 454 morgen 417 square roods. This meant that the area subject to the Mynpacht would be less than one-fifth of the 3261 morgen 578 square roods farm (NARSSA *SAB, JUS: 39 3/1132/10*).

In 1909, Moodie wrote to the Mining Commissioner for Baberton requesting that a prospecting permit over the farm Sassenheim 86 (later known as Sassenheim 695 JT) be issued to A. Falcke. In that same year, a permit was issued for six months (NARSSA *TAB, MKB: 98 MCD1992/09*).

However, on or about August 1922, a certain portion of Sassenheim 86, District Baberton was de-proclaimed as a public digging. The public digging consisted of 879 morgen 534 square roods and was held in the name of Moodies (NARSSA *SAB, URU: 586 2710;* NARSSA *SAB, URU: 858 3096*).

In May 1907, there was evidence of "East Coast Fever" infected cattle at Maguba Kraal, situated on the boundary of Hilversum 87 and Sassenheim 86, south of Queens River. Seven heads of cattle had died and two more were possibly infected. People lived and grazed their cattle on the farm at the time. The Barberton office of the Department of Agriculture monitored the situation, as well as the spread of other contagious diseases in the region (NARSSA *TAB, TAD: 356 AW115*; NARSSA *SAB, VWR: 64 B645/128/31*). No further information regarding the history of land use could be found.

4.2. Archaeology

4.2.1. Stone Age

In Mpumalanga Province the Drakensberg separates the interior plateau also known as the Highveld from the low-lying subtropical Lowveld, which stretches to the Indian Ocean. A number of rivers amalgamate into two main river systems, the Olifants River and the Komati River. This fertile landscape has provided resources for humans and their predecessors for more than 1.7 million years (Esterhuizen & Smith in Delius, 2007).

The initial attraction of abundant foods in the form of animals and plants eventually also led to the discovery of and utilisation of various minerals including ochre, iron and copper. People also obtained foreign resources by means of trade from the coast. From 900 AD this included objects brought across the ocean from foreign shores.

The Early Stone Age (ESA)

In South Africa the ESA dates from about 2 million to 250 000 years ago, in other words from the early to middle Pleistocene. The archaeological record shows that as the early ancestors progressed physically, mentally and socially, bone and stone tools were developed. One of the most influential advances was their control of fire and diversifying their diet by exploitation of the natural environment (Esterhuizen & Smith in Delius, 2007).

The earliest tools date to around 2.5 million years ago from the site of Gona in Ethiopia. Stone tools from this site shows that early hominids had to cognitive ability to select raw material and shape it for a specific application. Many bones found in association with stone tools like these have cut marks which lead scientists to believe that early hominids purposefully chipped cobblestones to produce flakes with a sharp edge capable of cutting and butchering animal carcasses. This supplementary diet of higher protein quantities ensured that brain development of hominids took place more rapidly.

Mary Leaky discovered stone tools like these in the Olduwai Gorge in Tanzania during the 1960s. The stone tools are named after this gorge and are known as relics from the Oldowan industry. These tools, only found in Africa, are mainly simple flakes, which were struck from cobbles. This method of manufacture remained for about 1.5 million years. Although there is continuing debate about who made these tools, two hominids may have been responsible. The first of these was an early form of *Homo* and the second was *Paranthropus robustus*, which became extinct about 1 million years ago (Esterhuizen & Smith in Delius, 2007).

Around 1.7 million years ago, more specialised tools known as Acheulean tools, appeared. These are named after tools from a site in France by the name of Saint Acheul, where they were first discovered in

the 1800s. It is argued that these tools had their origin in Africa and then spread towards Europe and Asia with the movement of hominids out of Africa. These tools had longer and sharper edges and shapes, which suggest that they could be used for a larger range of activities, including the butchering of animals, chopping of wood, digging roots and cracking bone. *Homo ergaster* was probably responsible for the manufacture of Acheulean tools in South Africa. This physical type was arguably physically similar to modern humans, had a larger brain and modern face, body height and proportion very similar to modern humans. *Homo ergaster* was able to flourish in a variety of habitats in part because they were dependent on tools. They adapted to drier, more open grassland settings. Because these early people were often associated with water sources such as rivers and lakes, sites where they left evidence of their occupation are very rare. Most tools of these people have been washed into caves, eroded out of riverbanks and washed downriver. An example in Mpumalanga is Maleoskop on the farm Rietkloof where Early Stone Age (ESA) tools have been found. This is one of only a handful such sites in Mpumalanga.

Middle Stone Age (MSA)

A greater variety of tools with diverse sizes and shapes appeared by 250 000 before present (BP). These replaced the large hand axes and cleavers of the ESA. This technological advancement introduces the Middle Stone Age (MSA). This period is characterised by tools that are smaller in size but different in manufacturing technique (Esterhuizen & Smith in Delius, 2007).

In contrast to the ESA technology of removing flakes from a core, MSA tools were flakes to start with. They were of a predetermined size and shape and were made by preparing a core of suitable material and striking off the flake so that it was flaked according to a shape which the toolmaker desired. Elongated, parallel-sided blades, as well as triangular flakes are common finds in these assemblages. Mounting of stone tools onto wood or bone to produce spears, knives and axes became popular during the MSA. These early humans not only settled close to water sources but also occupied caves and shelters. The MSA represents the transition of more archaic physical type (*Homo)* to anatomically modern humans, *Homo sapiens.*

The MSA has not been extensively studied in Mpumalanga but evidence of this period has been excavated at Bushman Rock Shelter, a well-known site on the farm Klipfonteinhoek in the Ohrigstad district. This cave was excavated twice in the 1960s by Louw and later by Eloff. The MSA layers show that the cave was repeatedly visited over a long period. Lower layers have been dated to over 40 000 BP while the top layers date to approximately 27 000 BP (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

Later Stone Age (LSA)

Early hunter gatherer societies were responsible for a number of technological innovations and social transformations during this period starting at around 20 000 years BP. Hunting of animals proved more successful with the innovation of the bow and link-shaft arrow. These arrows were made up of a bone tip which was poisoned and loosely linked to the main shaft of the arrow. Upon impact, the tip and shaft separated leaving the poisoned arrow-tip imbedded in the prey animal. Additional innovations include bored stones used as digging stick weights to uproot tubers and roots; small stone tools, mostly less than 25mm long, used for cutting of meat and scraping of hides; polished bone tools such as needles; twine made from plant fibres and leather; tortoiseshell bowls; ostrich eggshell beads; as well as other ornaments and artwork (Esterhuizen & Smith in Delius, 2007).

At Bushman Rock Shelter the MSA is also represented and starts at around 12 000 BP but only lasted for some 3 000 years. The LSA is of importance in geological terms as it marks the transition from the Pleistocene to the Holocene, which was accompanied by a gradual shift from cooler to warmer temperatures. This change had its greatest influence on the higher-lying areas of South Africa. Both Bushman Rock Shelter and a nearby site, Heuningneskrans, have revealed a greater use in plant foods and fruit during this period (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

Faunal evidence suggests that LSA hunter-gatherers trapped and hunted zebra, warthog and bovids of various sizes. They also diversified their protein diet by gathering tortoises and land snails *(Achatina*) in large quantities.

Ostrich eggshell beads were found in most of the levels at these two sites. It appears that there is a gap of approximately 4 000 years in the Mpumalanga LSA record between 9 000 BP and 5 000 BP. This may be a result of generally little Stone Age research being conducted in the province. It is, however, also a period known for rapid warming and major climate fluctuation, which may have led people to seek out protected environments in this area. The Mpumalanga Stone Age sequence is visible again during the mid-Holocene at the farm Honingklip near Badplaas in the Carolina district (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

At this location, two LSA sites were located on opposite sides of the Nhlazatshe River, about one kilometre west of its confluence with the Teespruit. These two sites are located on the foothills of the Drakensberg, where the climate is warmer than the Highveld but also cooler than the Lowveld (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

Nearby the sites, dated to between 4 870 BP and 200 BP are four panels, which contain rock art. Colouring material is present in all the excavated layers of the site, which makes it difficult to determine whether the rock art was painted during the mid- or later Holocene. Stone walls at both sites date from the last 250 years of hunter gatherer occupation and they may have served as protection from predators and intruders (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

4.2.2. Early Iron Age

The period referred to as the Early Iron Age (AD 200-1500 approx.) started when presumably Karanga (north-east African) herder groups moved into the north eastern parts of South Africa. It is believed that these people may have been responsible for making of the famous Lydenburg Heads, ceramic masks dating to approximately 600AD.

Ludwig von Bezing was a boy of more or less 10 years of age when he first saw pieces of the now famous Lydenburg heads in 1957 while playing in the veld on his father's farm near Lydenburg. Five years later von Bezing developed an interest in archaeology and went back to where he first saw the shards. Between 1962 and 1966 he frequently visited the Sterkspruit valley to collect pieces of the seven clay heads. Von Bezing joined the archaeological club of the University of Cape Town when he studied medicine at this institution.

He took his finds to the university at the insistence of the club. He had not only found the heads, but potsherds, iron beads, copper beads, ostrich eggshell beads, pieces of bones and millstones. Archaeologists of the University of Cape Town and WITS Prof. Ray Innskeep and Dr Mike Evers excavated the site where von Bezing found the remains. This site and in particular its unique finds (heads, clay masks) instantly became internationally famous and was henceforth known as the Lydenburg Heads site.

Two of the clay masks are large enough to probably fit over the head of a child, the other five are approximately half that size. The masks have both human and animal features, a characteristic that may explain that they had symbolic use during initiation- and other religious ceremonies. Carbon dating proved that the heads date to approximately 600 AD and was made by Early Iron Age people. These people were Bantu herders and agriculturists and probably populated Southern Africa from areas north-east of the Limpopo river. Similar ceramics were later found in the Gustav Klingbiel Nature Reserve and researchers believe that they are related to the ceramic wares (pottery) of the Lydenburg Heads site in form, function and decorative motive. This sequence of pottery is formally known as the Klingbiel type pottery. No clay masks were found in a context similar to this pottery sequence.

Two larger heads and five smaller ones make up the Lydenburg find. The Lydenburg heads are made of the same clay used in making household pottery. It is also made with the same technique used in the manufacture of household pottery. The smaller heads display the 30odelling of a curved forehead and the back neck as it curves into the skull. Around the neck of each of the heads, two or three rings are engraved horizontally and are filled in with hatching marks to form a pattern. A ridge of clay over the forehead and above the ears indicates the hairline. On the two larger heads a few rows of small clay balls indicate hair decorations. The mouth consists of lips – the smaller heads also have teeth. The seventh head has the snout of an animal and is the only head that represents an animal.

Some archaeological research was done during the 1970's at sites belonging to the Early Iron Age (EIA), location Plaston, a settlement close to White River (Evers, 1977). This site is located on a spur between the White River and a small tributary. It is situated on holding 119 at Plaston.

The site was discovered during house building operations when a collection of pottery sherds was excavated. The finds consisted of pottery shards both on the surface and excavated.

Some of the pottery vessels were decorated with a red ochre wash. Two major decoration motifs occurred on the pots:

- Punctuation, using a single stylus; and
- Broad line incision, the more common motif.

A number of EIA pottery collections from Mpumalanga and Limpopo may be compared to the Plaston sample. They include Silver Leaves, Eiland, Matola, Klingbiel and the Lydenburg Heads site. The Plaston sample is distinguished from samples of these sites in terms of rim morphology, the majority of rims from Plaston are rounded and very few bevelled. Rims from the other sites show more bevelled rims (Evers, 1977:176).

Early Iron Age pottery was also excavated by archaeologist, Prof. Tom Huffman during 1997 on location where the Riverside Government complex is currently situated (Huffman, 1998). This site is situated a few km north of Nelspruit next to the confluence of the Nelspruit and Crocodile River. It was discovered during the course of an environmental impact assessment for the new Mpumalanga Government complex offices. A bulldozer cutting exposed storage pits, cattle byres, a burial and midden on the crest of a gentle slope. Salvage excavations conducted during December 1997 and March 1998 recovered the burial and contents of several pits.

One of the pits contained, among other items, pottery dating to the eleventh century (AD 1070 ± 40 BP). This relates the pottery to the Mzonjani and Broederstroom phases. The early assemblage belongs to the Kwale branch of the Urewe tradition.

During the early 1970s Dr Mike Evers of the University of the Witwatersrand conducted fieldwork and excavations in the Eastern Transvaal. Two areas were studied: the first area was the Letaba area south of the Groot Letaba River, west of the Lebombo Mountains, east of the great escarpment and north of the Olifants River. The second area was the Eastern Transvaal escarpment area between Lydenburg and Machadodorp.

These two areas are referred to as the Lowveld and escarpment respectively. The earliest work on Iron Age archaeology was conducted by Trevor and Hall in 1912. This revealed prehistoric copper-, gold- and iron mines. Schwelinus (1937) reported smelting furnaces, a salt factory and terraces near

Phalaborwa. In the same year D.S. van der Merwe located ruins, graves, furnaces, terraces and soapstone objects in the Letaba area.

Mason (1964, 1965, 1967, 1968) started the first scientific excavation in the Lowveld, followed by N.J. van der Merwe and Scully. M. Klapwijk (1973, 1974) also excavated an EIA site at Silverleaves and Evers and van den Berg (1974) excavated at Harmony and Eiland, both EIA sites.

Research by the National Cultural History Museum resulted in the excavation of an EIA site in Sekhukuneland, known as Mototolong (Van Schalkwyk, 2007). The site is characterized by four large cattle kraals containing ceramics, which may be attributed to the Mzonjani and Doornkop occupational phases.

4.2.3. Late Iron Age

The later phases of the Iron Age (AD 1600-1800's) are represented by various tribes including Ndebele, Swazi, BaKoni, and Pedi, marked by extensive stonewalled settlements found throughout the escarpment and particularly around Machadodorp, Lydenburg, Badfontein, Sekhukuneland, Roossenekal and Steelpoort. The BaKoni were the architects of a unique archaeological stone building complex who by the 19th century spoke seKoni which was similar to Sepedi. The core elements of this tradition are stone-walled enclosures, roads and terraces. These settlement complexes may be divided into three basic features: homesteads, terraces and cattle tracks. Researchers such as Mike Evers (1975) and David Collett (1982) identified three basic settlement layouts in this area. Basically these sites can be divided into simple and complex ruins. Simple ruins are normally small in relation to more complex sites and have smaller central cattle byres and fewer huts. Complex ruins consist of a central cattle byre, which has two opposing entrances and a number of semi-circular enclosures surrounding it. The perimeter wall of these sites is sometimes poorly visible. Huts are built between the central enclosure and the perimeter wall. These are all connected by track-ways referred to as cattle tracks. These tracks are made by building stone walls, which forms a walkway for cattle to the centrally located cattle byres.

5. Site descriptions, locations and impact significance assessment

Two sites, UG 1 and UG 2, were recorded but they are of low heritage significance and no mitigation is needed. They consist of a concrete irrigation dam and the ruined remains of a farmstead.

A total of nine survey orientation locations were documented (SO 1-9) which includes a GPS location and photographs of the landscape at that particular location.

The documented sites and survey orientations are tabled in Appendix B and their photos in Appendix D. A map of their location is also provided in Appendix C.

Tables indicate the ***site significance rating scales and status*** in terms of possible impacts of the proposed actions on any located or identified heritage sites (**Table 5.5 & 5.6).**

Table 5.1. Summary of located sites and their heritage significance

Type of site	**Identified sites**	**Significance**
Graves and graveyards	None	N/A
Late Iron Age	None	N/A
Early Iron Age	None	N/A
Historical buildings or structures	None	N/A
Historical features and ruins	Two UG1 & UG2	Low GP C
Stone Age sites	None	N/A

Table 5.2. Significance rating guidelines for sites

Field Rating	**Grade**	**Significance**	**Recommended Mitigation**
National Significance (NS)	Grade 1	High Significance	Conservation, nomination as national site
Provincial Significance (PS)	Grade 2	High Significance	Conservation; Provincial site nomination
Local significance (LS 3A)	Grade 3A	High Significance	Conservation, No mitigation advised
Local Significance (LS 3B)	Grade 3B	High Significance	Mitigation but at least part of site should be retained
Generally Protected A (GPA)	GPA	High/ Medium Significance	Mitigation before destruction
Generally Protected B (GPB)	GPB	Medium Significance	Recording before destruction
Generally Protected C (GPC)	GPC	Low Significance	Destruction

5.1. Description of located sites

Site Locations

5.1.1. Site UG 1.

Location: See Appendix B and D (fig. 1).

Description: Ruin of a previous dwelling.

Impact of the proposed development/ activity: The planned agricultural activity will probably impact on the site.

Recommendation: The site or feature is of low significance no mitigation is required. Care should be taken during bush clearing activities as it is possible that unmarked graves located nearby. Monitoring by an archaeologist or the EMP is recommended during such activities.


Photo view west.

5.1.2. Site UG 2.

Location: See Appendix B and D (fig. 2).

Description: Ruin of a previous dwelling.

Impact of the proposed development/ activity: The planned agricultural activity will probably impact on the site.

Recommendation: The site or feature is of low significance no mitigation is required. Care should be taken during bush clearing activities as it is possible that unmarked graves located nearby. Monitoring by an archaeologist or the EMP is recommended during such activities.


Photo view south

Survey orientation locations:

5.1.3. Site SO 1.

Location: See Appendix B and D (fig. 3).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view south

5.1.4. Site SO 2.

Location: See Appendix B and D (fig. 4).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view east

5.1.5. Site SO 3.

Location: See Appendix B and D (fig. 5).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view south

5.1.6. Site SO 4.

Location: See Appendix B and D (fig. 6).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A

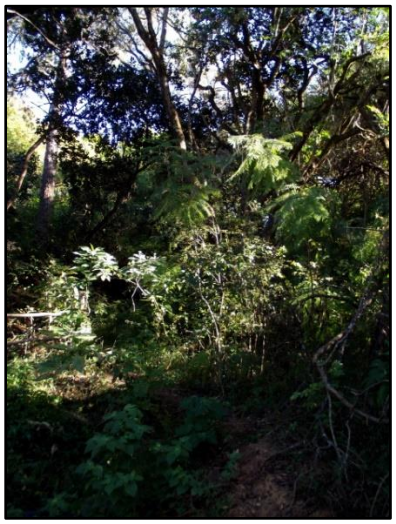


Photo view north

5.1.7. Site SO 5.

Location: See Appendix B and D (fig. 7).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view south

5.1.8. Site SO 6.

Location: See Appendix B and D (fig. 8).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view west

5.1.9. Site SO 7.

Location: See Appendix B and D (fig. 9).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view south-west

5.1.10. Site SO 8.

Location: See Appendix B and D (fig. 10).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo west

5.1.11. Site SO 9.

Location: See Appendix B and D (fig. 11).

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A

 Photo south east

TABLE 5.3. General description of located sites and field rating.

Site No.	Description	Type of significance	Degree of significance	NHRA heritage resource & rating
UG1	Dwelling Ruin	Structures (Section 34)	Archaeological: N/A Historic: N/A	Low. **GP C**. Destruction
UG2	Dwelling Ruin	Structures (Section 34)	Archaeological: N/A Historic: N/A	Low. **GP C**. Destruction
SO1	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None
SO2	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None
SO3	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None
SO4	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None
SO5	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None
SO6	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None
SO7	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None
SO8	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None
SO9	Survey orientation location	N/A	Archaeological: N/A Historic: N/A	None

TABLE 5.4. Site condition assessment and management recommendations.

Site no.	Type of Heritage resource	Integrity of cultural material	Preservation condition of site	Relative location	Quality of archaeological/ historic material	Quantity of site features	Recommended conservation management
UG1	Ruined dwelling	Poor	Poor	Uguhleni 689 JT	Poor	1	None
UG2	Ruined dwelling	Poor	Poor	Uguhleni 689 JT	Poor	1	None
SO 1	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A
SO 2	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A
SO 3	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A
SO 4	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A
SO 5	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A
SO6	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A
SO7	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A
SO8	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A
SO9	N/A	N/A	N/A	Uguhleni 689 JT	Archaeology: N/A Historically: N/A	-	N/A

TABLE 5.5. Significance Rating Scales of Impact

Site No.	Nature of impact	Type of site	Extent	Duration	Intensity	Probability	Score total
UG 1	Agricultural development	Ruin	Site as recorded	Short term	High	Highly probable	6
UG 2	Agricultural development	Ruin	Site as recorded	Short term	High	Highly probable	6
SO 1	Agricultural development	N/A	N/A	Short term	High	Highly probable	6
SO 2	Agricultural development	N/A	N/A	Short term	High	Highly probable	6
SO 3	Agricultural development	N/A	N/A	Short term	High	Highly probable	6
SO 4	Agricultural development	N/A	N/A	Short term	High	Highly probable	6
SO 5	Agricultural development	N/A	N/A	Short term	High	Highly probable	6
SO6	Agricultural development	N/A	N/A	Short term	High	Highly probable	6
SO7	Agricultural development	N/A	N/A	Short term	High	Highly probable	6
SO8	Agricultural development	N/A	N/A	Short term	High	Highly probable	6
SO9	Agricultural development	N/A	N/A	Short term	High	Highly probable	6

***Notes:** Short term ≥ 5 years, Medium term 5-15 years, Long term 15-30 years, Permanent 30+ years

Intensity: Very High (4), High (3), Moderate (2), Low (1)

Probability: Improbable (1), Probable (2), Highly probable (3), Definite (4)

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TABLE 5.6. Site current status and future impact scores

Site No.	Current Status	Low impact (4-6 points)	Medium impact (7-9 points)	High impact (10-12 points)	Very high impact (13-16 points)	Score Total
UG 1	Neutral	-	-	10 (proposed agricultural impact)	-	10
UG 2	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 1	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 2	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 3	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 4	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 5	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 6	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 7	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 8	Neutral	-	-	10 (proposed agricultural impact)	-	10
SO 9	Neutral	-	-	10 (proposed agricultural impact)	-	10

5.2. Cumulative impacts on the heritage landscape

Cumulative impacts can occur when a range of impacts which result from several concurrent processes have impact on heritage resources. The importance of addressing cumulative impacts is that the total impact of several factors together is often greater than one single process or activity that may impact on heritage resources.

There are no other impacts than those described in the project overview, therefore no additional developments which will have additional impacts. Also see section 6.1. Recommended management measures.

6. Summary of findings and recommendations

Two sites, UG 1 and UG 2, were recorded during the physical survey but they are of low heritage significance and no mitigation is needed. They consist of a concrete irrigation dam and the ruined remains of a farmstead.

A total of nine survey orientation locations were documented (SO 1-9) which includes a GPS location and photographs of the landscape at that particular location.

The archaeological survey consisted of non-intrusive methods which rely on surface observations. Most of the project footprint was difficult to access due to dense vegetation growth which resulted in archaeological visibility being very low. It is therefore possible that unmarked graves or poorly visible archaeological deposit may have been overlooked.

In terms of the archaeological component of the Act (25 of 1999, section 35) no sites were located or recorded in the study area.

In terms of the built environment in the project area (section 34 of the Act) no sites were identified in the study area.

In terms of burial grounds and graves (section 36 of the Act) no graves or gravesites were identified in the study area. Despite efforts being made during the physical survey, and due to the study area being densely overgrown with vegetation it is still possible that some unmarked graves may have been overlooked during the survey. It is also possible that graves may occur nearby residential ruins (sites UG 1 and UG 2) but were not located during the physical survey due to the exceptionally dense vegetation cover. Bush clearing at sites UG 1 and UG 2 should be done with care in the event that unmarked graves may be present. It is recommended that during the Environmental public participation process, the Environmental Practitioner engage with local residents about the known presence of any marked or unmarked graves in or near the project area. If there are any, the heritage practitioner will mark and map them and add to this report.

It is not within the expertise of this report or the surveyor to comment on possible paleontological remains which may be located in the study area.

The bulk of archaeological remains are normally located beneath the soil surface. It is therefore possible that some significant cultural material or remains were not located during this survey and will only be revealed when the soil is disturbed. Should excavation or large scale earth moving activities reveal any human skeletal remains, broken pieces of ceramic pottery, large quantities of sub-surface charcoal or any material that can be associated with previous occupation, a qualified archaeologist should be notified immediately. This will also temporarily halt such activities until an archaeologist has assessed the situation. It should be noted that if such a situation occurs it may have further financial implications.

6.1. Recommended management measures

Although the surveyor physically surveyed the area as thoroughly as possible, it is incumbent upon the developer to follow a chance find protocol in the instance when cultural remains be unearthed or laid bare during the process of development, as this study does not claim to have recorded every site on the landscape. The contractors and workers should be notified that archaeological sites might be exposed during the construction work.

- Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible;
- All discoveries shall be reported immediately to a museum, preferably one at which an archaeologist is available, so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Control Officer will advise the necessary actions to be taken;
- Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and
- Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or paleontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999).

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Appendix A

Terminology

"Alter" means any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or other decoration or any other means.

"Archaeological" means –

- Material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artifacts, human and hominid remains and artificial features or structures;
- Rock Art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artifacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; and
- Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found;

"Conservation", in relation to heritage resources, includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance;

"Cultural significance" means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance;

"Development" means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including –

- construction, alteration, demolition, removal or change of use of a place or a structure at a place;
- carrying out any works on or over or under a place;

- subdivision or consolidation of land comprising, a place, including the structures or airspace of a place;
- constructing or putting up for display signs or hoardings;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil;

"Expropriate" means the process as determined by the terms of and according to procedures described in the Expropriation Act, 1975 (Act No. 63 of 1975);

"Foreign cultural property", in relation to a reciprocating state, means any object that is specifically designated by that state as being of importance for archaeology, history, literature, art or science;

"Grave" means a place of internment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place;

"Heritage resource" means any place or object of cultural significance;

"Heritage register" means a list of heritage resources in a province;

"Heritage resources authority" means the South African Heritage Resources Agency, established in terms of section 11, or, insofar as this Act (25 of 1999) is applicable in or in respect of a province, a provincial heritage resources authority (PHRA);

"Heritage site" means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority;

"Improvement" in relation to heritage resources, includes the repair, restoration and rehabilitation of a place protected in terms of this Act (25 of 1999);

"Land" includes land covered by water and the air space above the land;

"Living heritage" means the intangible aspects of inherited culture, and may include –

- cultural tradition;
- oral history;
- performance;
- ritual;
- popular memory;
- skills and techniques;
- indigenous knowledge systems; and
- the holistic approach to nature, society and social relationships;

“Management” in relation to heritage resources, includes the conservation, presentation and improvement of a place protected in terms of the Act;

“Object” means any moveable property of cultural significance which may be protected in terms of any provisions of the Act, including –

- any archaeological artifact;
- palaeontological and rare geological specimens;
- meteorites;
- other objects referred to in section 3 of the Act;

“Owner” includes the owner’s authorized agent and any person with a real interest in the property and –

- in the case of a place owned by the State or State-aided institutions, the Minister or any other person or body of persons responsible for the care, management or control of that place;
- in the case of tribal trust land, the recognized traditional authority;

“Place” includes –

- a site, area or region;
- a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;
- a group of buildings or other structures which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures;
- an open space, including a public square, street or park; and
- in relation to the management of a place, includes the immediate surroundings of a place;

“Site” means any area of land, including land covered by water, and including any structures or objects thereon;

“**Structure”** means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.

Appendix B

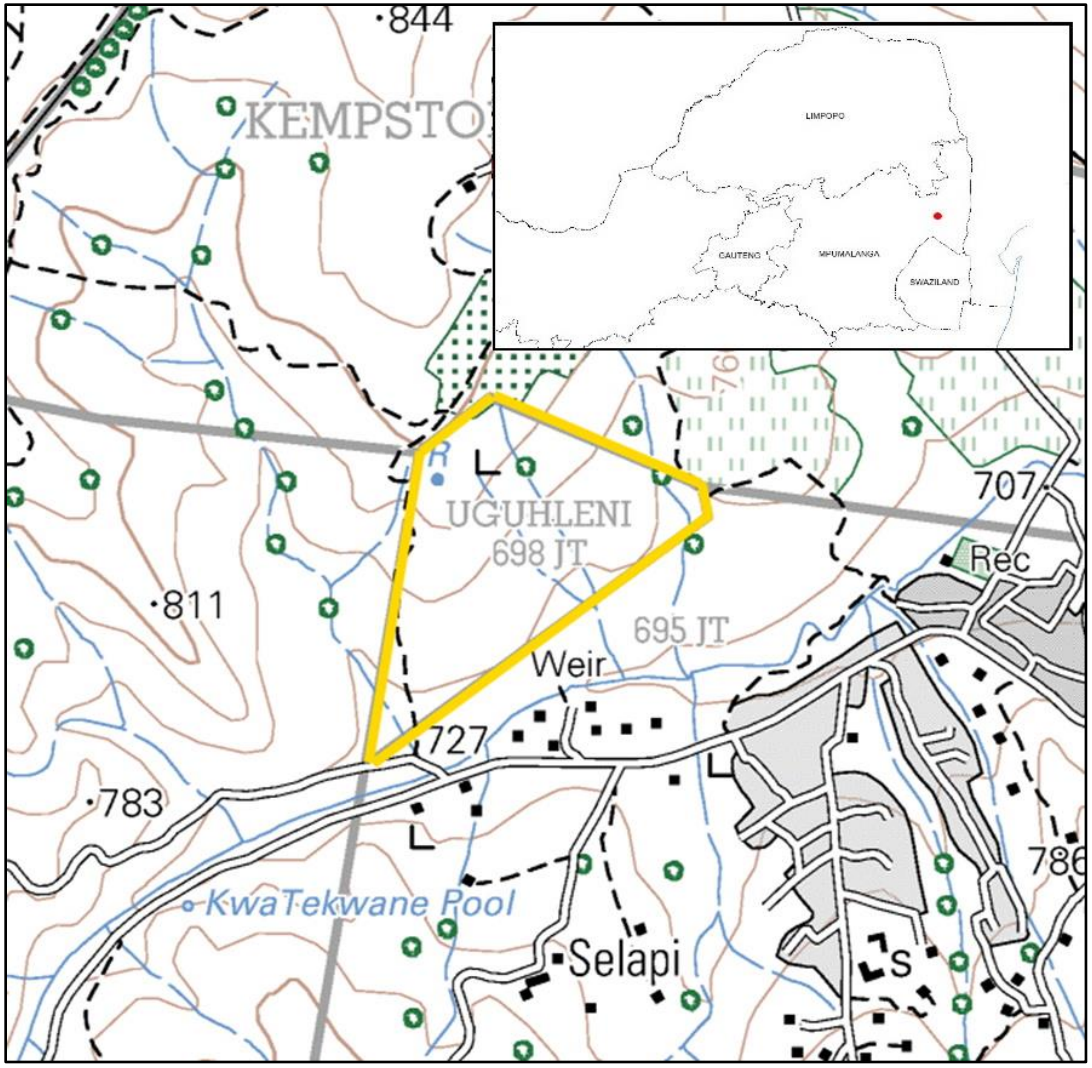
List of sites

Two sites UG 1 and UG 2 were recorded and nine survey orientation locations were documented for survey purposes. The survey orientation sites were named SO 1-9.

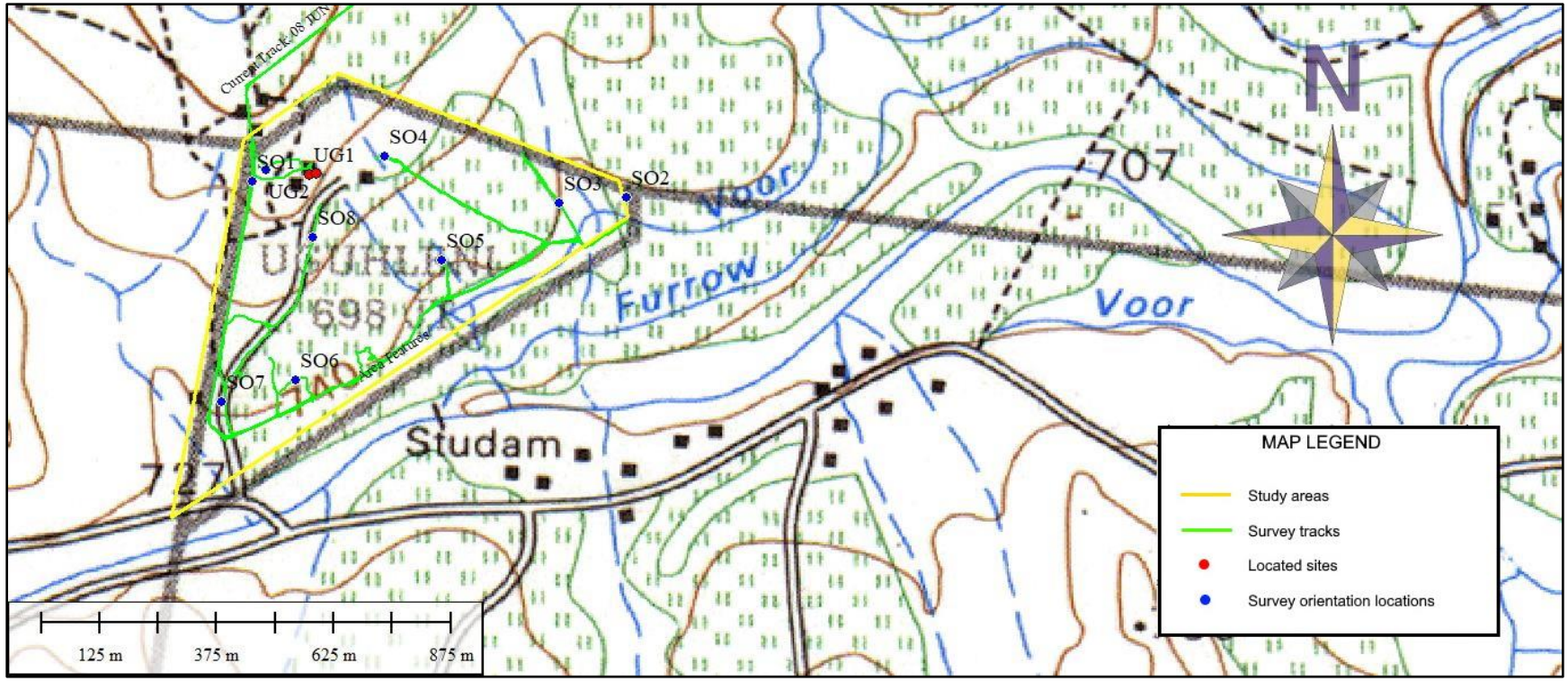
Table A. Site and Survey Orientation Locations.

Site Name	Date of compilation	GPS Coordinates		Photo figure No.
UG 1	16/06/2022	S25°46,9180'	E030°55,3097'	1
UG 2	16/06/2022	S25°46,9163'	E030°55,3184'	2
SO 1	16/06/2022	S25°46,9259'	E030°55,2440'	3
SO 2	16/06/2022	S25°46,9438'	E030°55,6749'	4
SO 3	16/06/2022	S25°46,9504'	E030°55,5979'	5
SO 4	16/06/2022	S25°46,8966'	E030°55,3970'	6
SO 5	16/06/2022	S25°47,0164'	E030°55,4619'	7
SO 6	16/06/2022	S25°47,1534'	E030°55,2946'	8
SO 7	16/06/2022	S25°47,1784'	E030°55,2086'	9
SO 8	16/06/2022	S25°46,9901'	E030°55,3142'	10
SO 9	16/06/2022	S25°46,9126'	E030°55,2606'	11

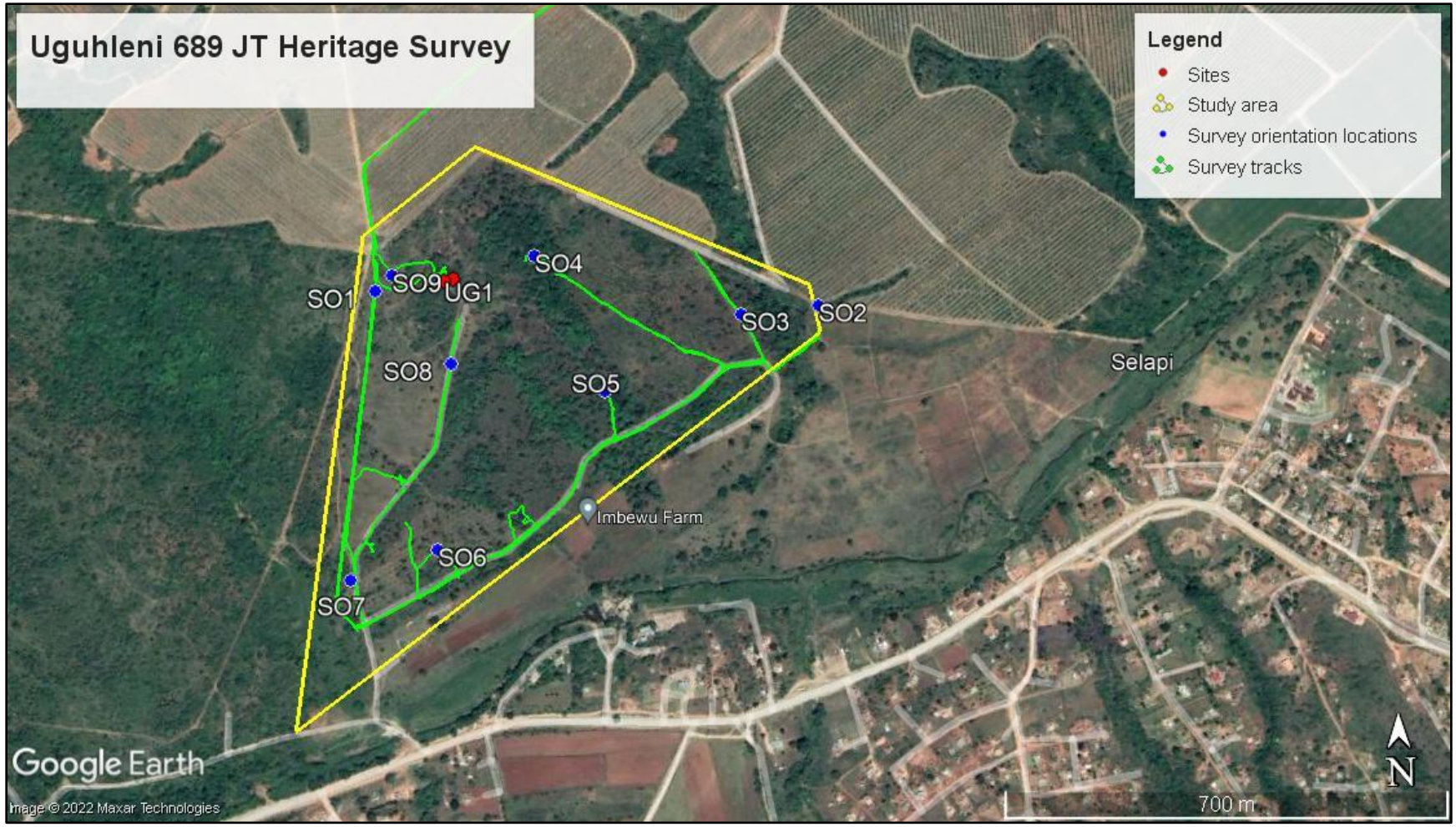
Appendix C



Regional Map, 1:50 000 Topographical Map 2530 DD (2010). The study area is indicated with a yellow border.



Study area, survey tracks and survey orientation locations, 1:50 000 Topographical Map 2530 DD (1984).



Google Earth Aerial view 2022.

Appendix D

Site Photos

Fig. 1. Site UG 1. Photos taken in a northern and southern direction.

Fig. 2. Site UG 2. Photo taken in a southern direction.

Survey Orientation Photos

Fig. 3. Site SO1. Photos taken in an eastern and south-eastern direction.

Fig. 4. Site SO2. Photos taken in a northern and north-eastern direction.

Fig. 5. Site SO3. Photos taken in a northern and western direction.

Fig. 6. Site SO4. Photos taken in a southern and western direction.

Fig. 7. Site SO 5. Photos taken in a northern and south-eastern direction.

Fig. 8. Site SO 6. Photo taken in a northern and southern direction.

Fig. 9. Site SO 7. Photos taken in a southern and south-western direction

Fig. 10. Site SO 8. Photos taken in a southern and eastern direction.

Fig. 11. Site SO 9. Photo taken in a south-eastern direction.

Annexure E: Palaeontological Report

Palaeosciences Centre, East Campus, 1 Jan Smuts Avenue, Braamfontein, Johannesburg
Private Bag 3, WITS 2050, Johannesburg, SOUTH AFRICA Tel: 011 717 6682

Marion.bamford@wits.ac.za
03 March 2022

Dr Ragna Redelstorff
Heritage Officer Archaeology, Palaeontology & Meteorites Unit
South African Heritage Resources Agency
111 Harrington Street
Cape Town 8001

Dear Dr Redelstorff

RE: Request for Exemption of any Palaeontological Impact Assessment for the proposed clearing of indigenous vegetation for agriculture on Farm Uguhleni 698 JT, west of Barberton, Mpumalanga Province

In my capacity as a professional palaeontologist, I am requesting exemption for palaeontological impact assessment in terms of the National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998) which requires that the proposed development must be preceded by the relevant impact assessment, in this case for palaeontology.

The farm (Fig. 1) lies on ancient, igneous rocks of the Kaap Valley Granite (hornblende-biotite granite) and undifferentiated granite that are too old of the incorrect type to preserve any fossils at all (Fig. 2). This is confirmed by the grey colouration in the SAHRIS palaeosensitivity map (Fig. 3). Since there is no chance of any fossils occurring in the area to be cleared or environs, we request exemption from any further palaeontological studies, as far as the palaeontology is concerned, that the project may be authorised.

Figure 1: Google Earth site map for the proposed clearing for agriculture on Uguhleni 698 JT indicated by the thin black outline. Coordinates: 25° 47' 02.36"S and 30° 55' 20.47"E.

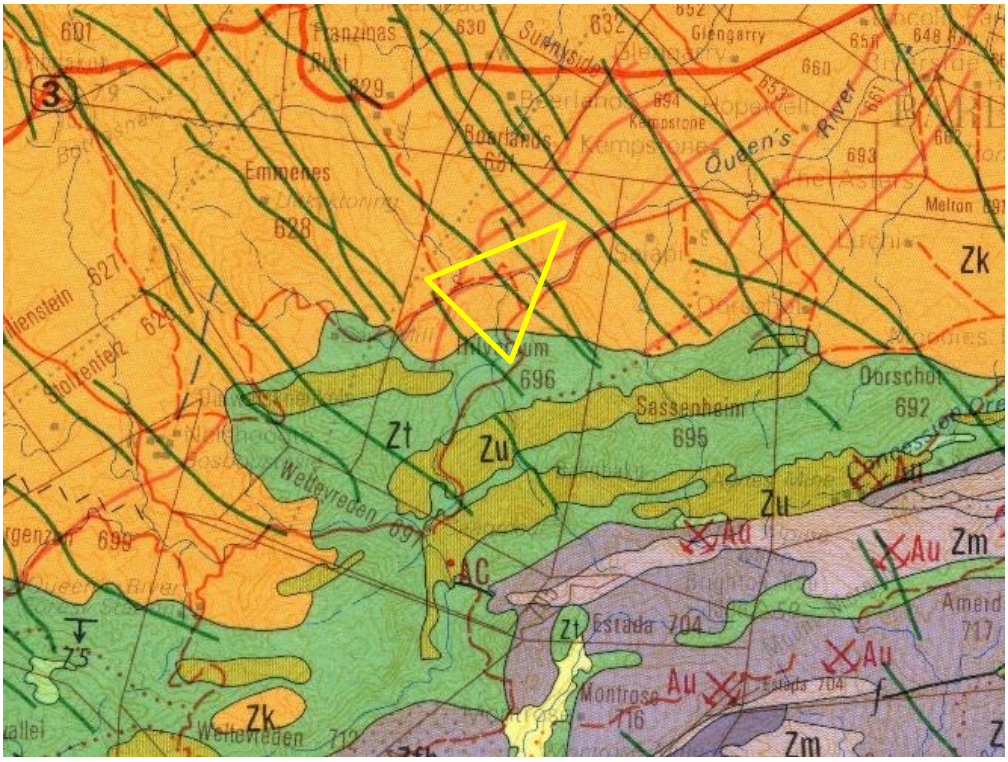


Figure 2: Geological map of the area around the farm Uguhleni 698 JT. The location of the proposed project is indicated within the yellow triangle. Abbreviations of the rock types are: Zk = Kaap Valley Granite; Zt = undifferentiated granites. Map enlarged from the Geological Survey 1: 250 000 map 2530 Barberton.

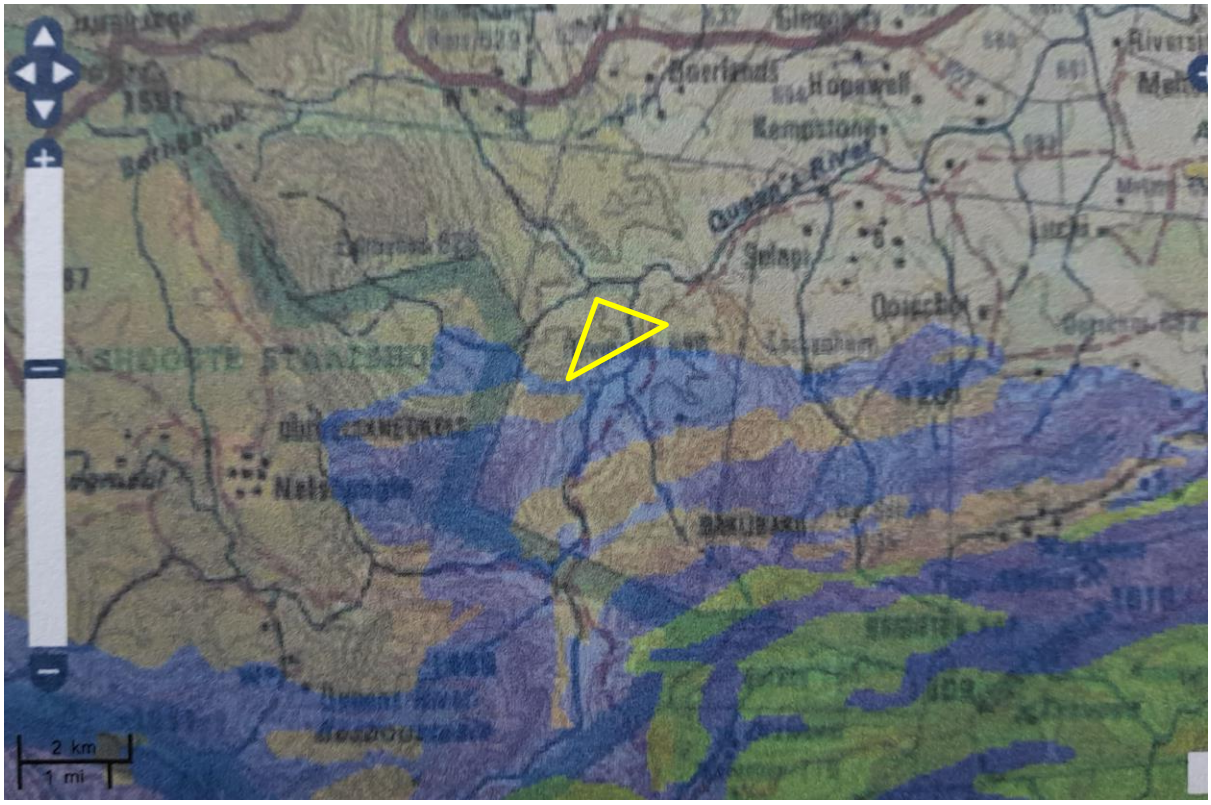


Figure 3: SAHRIS palaeosensitivity map for the site for the proposed Uguhleni 698 JT clearing for agriculture shown within the yellow triangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

Yours faithfully

Prof Marion Bamford
Palaeobotanist; PhD (Wits 1990)

Declaration of Independence

This letter has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Henwood Environmental Services, Mbombela, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Annexure F: Soil Assessment

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Specialized to succeed

Groenfontein Farm
c/o R44 & Anysworterlrug Road
Klapmuts 7625

+27 21 300 0543
info@agritechnovation.co.za
www.agritechnovation.co.za

30/03/2022

Barberton Valley Plantations Report

Kempston-New Establishment

On the 2nd of March, 4 soil samples were taken on the farm Kempston, on the new piece of land where they plan to establish Macadamias. With the results that was received, it can clearly be stated that the soil will be perfect for successful Macadamia farming.

Here are the ideal norms for different elements in the soil so that Macadamia farming will be successful

- pH(KCl)=4.5-5.5
- P(Bray1)= 25-30mg/kg
- Ca%= 60-65%
- Mg%=20-25%
- K%=7-10%
- Na%=0-3%

The 4 samples that were taken represented the North, South, East and West parts of the land to get a good idea if there might be variation in this piece of land. The results concluded that minimal variation consists in the 4 different parts of the field.

pH(KCl)

The pH of the soil is one of the most important aspects for farming Macadamias successfully. Macadamias are very sensitive to soils with a pH higher than 5.5 and all 4 of these samples were measured in the ideal range of between 4.5 and 5.5. Iron deficiency is a common symptom of soils with a pH that is too high

P(Bray1)

The Phosphate level is also a very important factor for Macadamia farming. Macadamia trees do not like a soil with a high level of Phosphate. Iron deficiency is a common symptom of trees that are planted in soils with a Phosphate level that is too high. All 4 samples tested on a very low level for Phosphate, but when it comes to Macadamia farming, this is much more ideal than a Phosphate level that is too high. It is much easier to pick up the level of Phosphate in the soil to where it should be, rather than to try and decrease the level of Phosphate in the soil.

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Groenfontein Farm
c/o R44 & Anyswortelrug Road
Klapmuts 7625

+27 21 300 0543
info@agritechnovation.co.za
www.agritechnovation.co.za

Calsium Percentage

All 4 of the samples were exactly in the norm for Macadamia farming or very close to the norm. The Calsium is very important when it comes to soil quality and nut quality

Magnesium Percentage

The 4 samples that were taken is a little bit higher in the Magnesium Percentage than what we would want it to be, but this is a common occurrence of virgin soils. The reason for the magnesium being a little bit to high is because the Potassium levels are on the lower side compared to what it should be.

Potassium Percentage

Like mentioned above, the Potassium levels are lower than what we would want it to be. This is very easily fixed. By applying Potassium to the trees after they have been planted, the lack of Potassium in the soil will start to decrease and the Magnesium levels will then decline and fall into the ideal levels for Magnesium

Sodium

All 4 samples that were taken were in the ideal range for Sodium levels, this is a very good sign of soils that do not consist of high levels of salts in the soil. Ideal for Macadamia Farming

Agriculturist

CP van Aardt

Verslag / Report
Grond / Soil

Nviro Business Hub unit 6, Ou Wapad road, Ifafi, Hartbeespoort, 0260 | Tel: 012 252 7588 | www.nviroteklabs.co.za

Datum Ontvang/Date Received:	2022-03-04	**Verslag nr./Report no.:**	WO 104365:129167
Datum Begin/Date Commenced:	2022-03-04	**Datum Gerapporteer/Date Reported:**	2022-03-11

To/Aan:

AGRI TECHNOVATION (PTY) LTD

27219757438

P.O. BOX 5435 MEYERSDAL 1447

Representative/Verteenwoordiger: ERIK DE VRIES
Farm Name/Plaas Naam:
Order/Bestel#: AT-VTPK00603-606, Denys Snyman
Email: labresults@agritechnovation.co.za

Lab Nommer	Sample Reference	pH KCl *	P Bray1	K AmAc *	Na AmAc	Ca AmAc	Mg AmAc *	EXCH ACID KCl	Ca% AmAc	Mg% AmAc	K% AmAc	Na% AmAc	ACID SAT. AmAc	Ca:Mg AmAc	(Ca+Mg)/K AmAc	Mg:K AmAc	S-VALUE AmAc	Na:K AmAc	T-VALUE AmAc *	Dens. *	S AmAc
Lab Number	Monsterverwysing	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	cmol(+)/kg	%	%	%	%	%				cmol(+)/kg	cmol(+)/kg	cmol(+)/kg	g/ml	mg/kg
G28-65829	AT-VTPK00603 North	5.16	4	58	23	1157	259	0.00	70.92	26.03	1.81	1.24	0.00	2.73	53.49	14.36	8.15	0.68	8.15	0.98	9.92
G28-65830	AT-VTPK00604 East	5.35	2	56	19	1212	303	0.00	69.11	28.30	1.64	0.95	0.00	2.44	59.32	17.24	8.77	0.58	8.77	1.03	5.65
G28-65831	AT-VTPK00605 South	5.02	2	70	19	1137	319	0.00	66.38	30.54	2.10	0.98	0.00	2.17	46.09	14.52	8.56	0.47	8.56	1.09	7.62
G28-65833	AT-VTPK00606 West	4.76	4	76	26	1068	392	0.00	60.29	36.23	2.20	1.28	0.00	1.66	43.97	16.51	8.86	0.58	8.86	1.03	12.06

Lab Nommer	Sample Reference	Zn DTPA	Cu DTPA	Mn DTPA	Fe DTPA
Lab Number	Monsterverwysing	mg/kg	mg/kg	mg/kg	mg/kg
G28-65829	AT-VTPK00603 North	0.75	0.78	11.88	14.21
G28-65830	AT-VTPK00604 East	1.28	0.77	14.22	13.25
G28-65831	AT-VTPK00605 South	0.99	1.09	13.61	31.70
G28-65833	AT-VTPK00606 West	0.42	0.58	7.52	11.75

NOTAS / NOTES:

Verslag goedgekeur deur / Report approved by:

Leoni Erasmus
leoni.e@nvirotek.co.za
Data Administrator

Erizt Schoeman
erizt.s@nvirotek.co.za
TS: WIN 021 & 031

Verslag / Report

Grond / Soil

Nviro Business Hub unit 6, Ou Wapad road, Ifafi, Hartbeespoort, 0260 | Tel: 012 252 7588 | www.nviroteklabs.co.za

BELANGRIK / IMPORTANT

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5. Any opinions and interpretations expressed herein are outside the scope of accreditation for the laboratory.

Test	Method	Test	Method
pH(KCl)*	WIN 031	Ca:Mg(AmAc)	CALC
P(Bray1)	WIN 073	(Ca+Mg)/K (AmAc)	CALC
K*(AmAc)	WIN 072	Mg:K(AmAc)	CALC
Na(AmAc)	WIN 072	S-VALUE(AmAc)	CALC
Ca(AmAc)	WIN 072	Na:K	CALC
Mg(AmAc)	WIN 072	T-VALUE(AmAc)*	CALC
EXCH ACID KCl	WIN 031	Dens. - Density*	WIN 076
Ca%(AmAc)	CALC	S (AmAc)	WIN 072
Mg%(AmAc)	CALC	Zn(DTPA)	WIN 050
K%(AmAc)	CALC	Cu(DTPA)	WIN 050
Na%(AmAc)	CALC	Mn(DTPA)	WIN 050
ACID SATURATION(AmAc)	CALC	Fe(DTPA)	WIN 050

End of Report

Agri Technovation

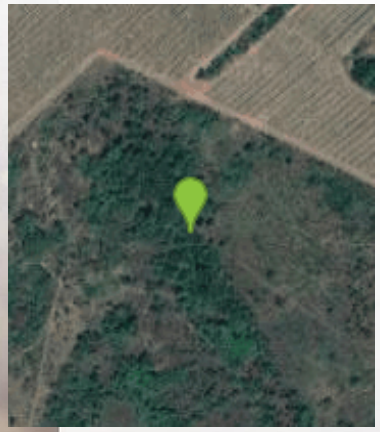
ITEST SOIL

Client: BARBERTON VALLEY PLANTATIONS
Farm: Kempston - North
Date of Sampling: 2022-3-2
Sample number: AT-VTPK00603
Agriculturist: CP van Aardt
Agent: Charl Carey
Crop: Macadamias

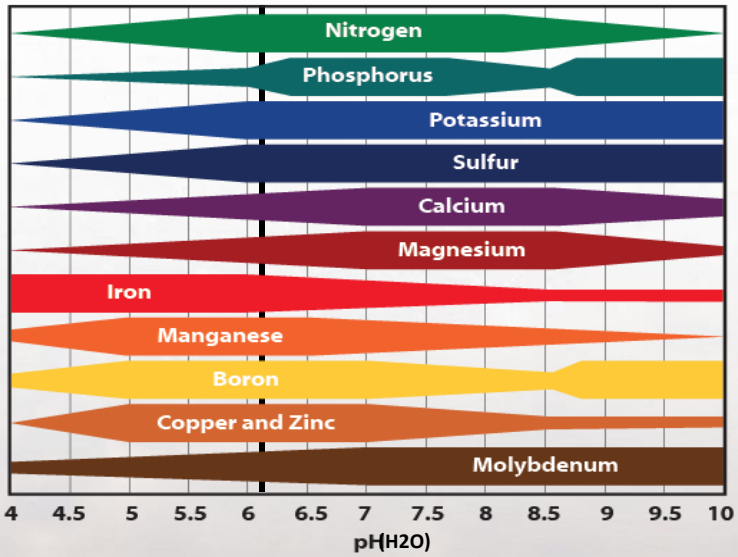
T cmol(+)/kg = 8.15

Lab No G28-65829

Farmer Sample



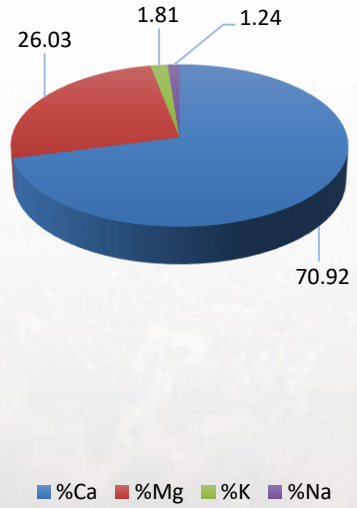
pH (KCL) 5.16



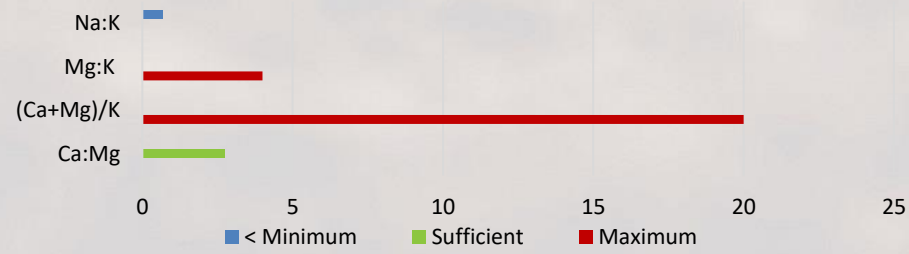
* pH (KCL) is approximately pH unit lower than pH (H2O)

Sample number:		AT-VTPK00603
Cations mg/kg	pH (KCL)	5.16
	PBray1	4.00
	K	58.00
	Na	23.00
	Ca	1157.00
	Mg	259.00
g/cm3	Density	0.98
	S AmAC	9.92
Base saturation	%Ca	70.92
	%Mg	26.03
	%K	1.81
	%Na	1.24
Base saturation ratios	Ca:Mg	2.73
	(Ca+Mg)/K	53.49
	Mg:K	14.36
	Na:K	0.68
Micro elements mg/kg DTPA	Zn	0.75
	Mn	11.88
	Cu	0.78
	Fe	14.21

Percentage base saturation



Base saturation ratios



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E: admin@agritechnovation.co.za
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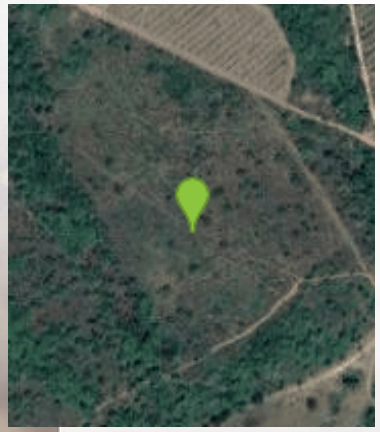
ITEST SOIL

Client: BARBERTON VALLEY PLANTATIONS
Farm: Kempston - East
Date of Sampling: 2022-3-2
Sample number: AT-VTPK00604
Agriculturist: CP van Aardt
Agent: Charl Carey
Crop: Macadamias

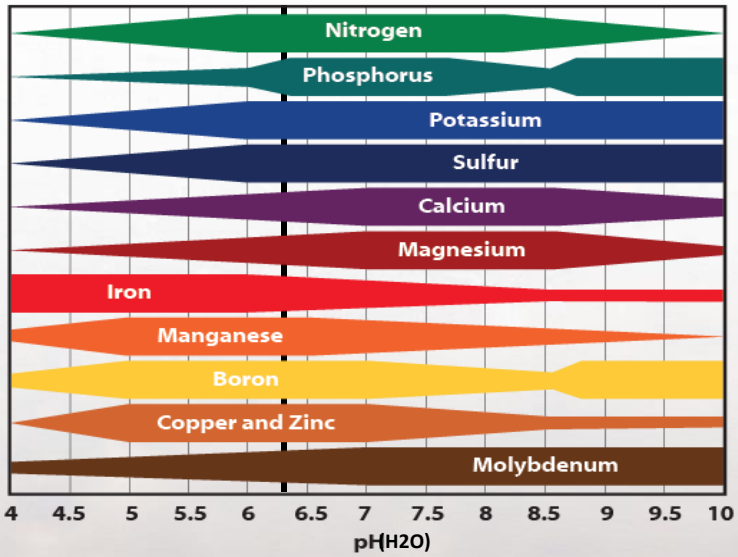
T cmol(+)/kg = 8.77

Lab No G28-65830

Farmer Sample



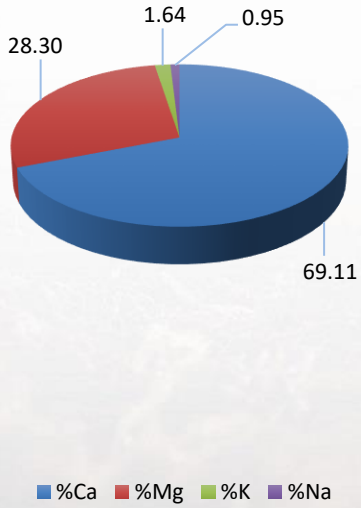
pH (KCL) 5.35



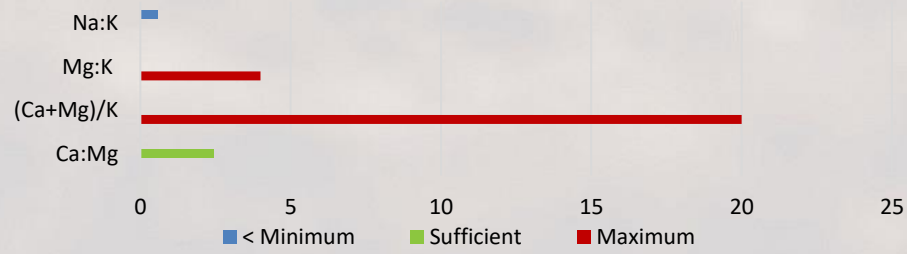
* pH (KCL) is approximately pH unit lower than pH (H2O)

Sample number:		AT-VTPK00604
Cations mg/kg	pH (KCL)	5.35
	PBray1	2.00
	K	56.00
	Na	19.00
	Ca	1212.00
	Mg	303.00
g/cm3	Density	1.03
	S AmAC	5.65
Base saturation	%Ca	69.11
	%Mg	28.30
	%K	1.64
	%Na	0.95
Base saturation ratios	Ca:Mg	2.44
	(Ca+Mg)/K	59.32
	Mg:K	17.24
	Na:K	0.58
Micro elements mg/kg DTPA	Zn	1.28
	Mn	14.22
	Cu	0.77
	Fe	13.25

Percentage base saturation



Base saturation ratios



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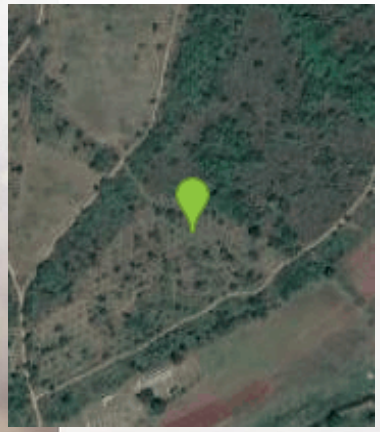
ITEST SOIL

Client: BARBERTON VALLEY PLANTATIONS
Farm: Kempston - South
Date of Sampling: 2022-3-2
Sample number: AT-VTPK00605
Agriculturist: CP van Aardt
Agent: Charl Carey
Crop: Macadamias

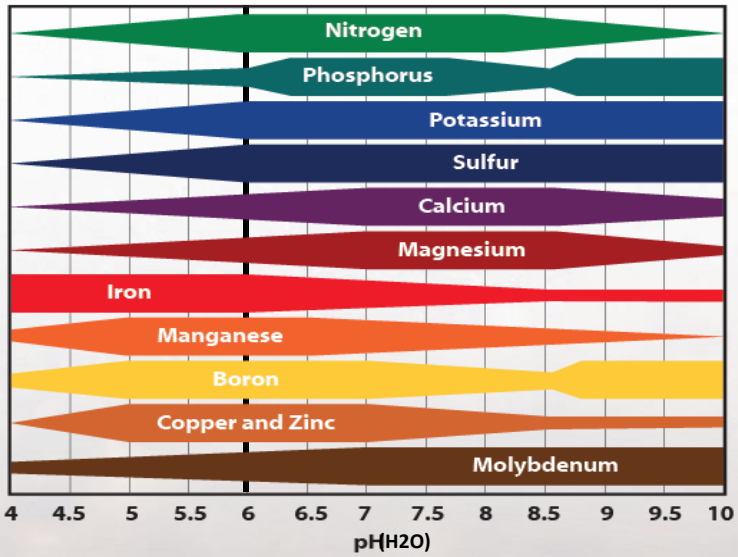
T cmol(+)/kg = 8.56

Lab No G28-65831

Farmer Sample



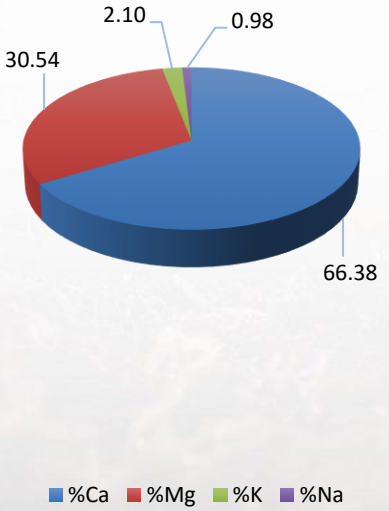
pH (KCL) 5.02



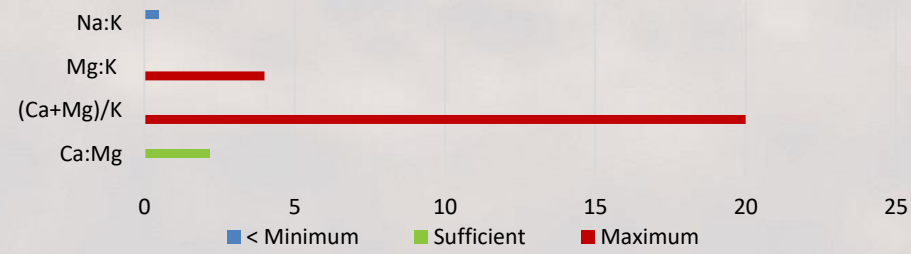
* pH (KCL) is approximately pH unit lower than pH (H2O)

Sample number:		AT-VTPK00605
Cations mg/kg	pH (KCL)	5.02
	PBray1	2.00
	K	70.00
	Na	19.00
	Ca	1137.00
	Mg	319.00
g/cm3	Density	1.09
	S AmAC	7.62
Base saturation	%Ca	66.38
	%Mg	30.54
	%K	2.10
	%Na	0.98
Base saturation ratios	Ca:Mg	2.17
	(Ca+Mg)/K	46.09
	Mg:K	14.52
	Na:K	0.47
Micro elements mg/kg DTPA	Zn	0.99
	Mn	13.61
	Cu	1.09
	Fe	31.70

Percentage base saturation



Base saturation ratios



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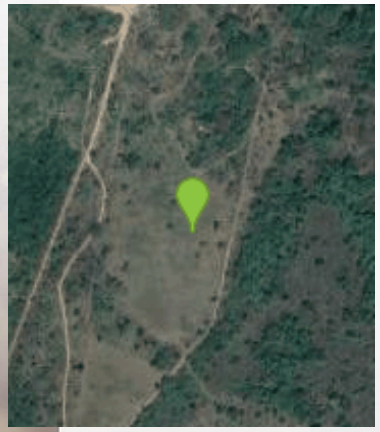
ITEST SOIL

Client: BARBERTON VALLEY PLANTATIONS
Farm: Kempston - West
Date of Sampling: 2022-3-2
Sample number: AT-VTPK00606
Agriculturist: CP van Aardt
Agent: Charl Carey
Crop: Macadamias

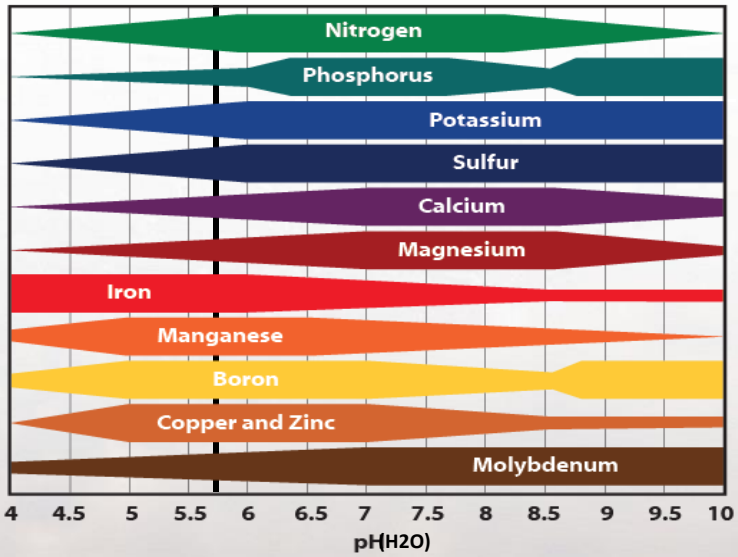
T cmol(+)/kg = 8.86

Lab No G28-65833

Farmer Sample



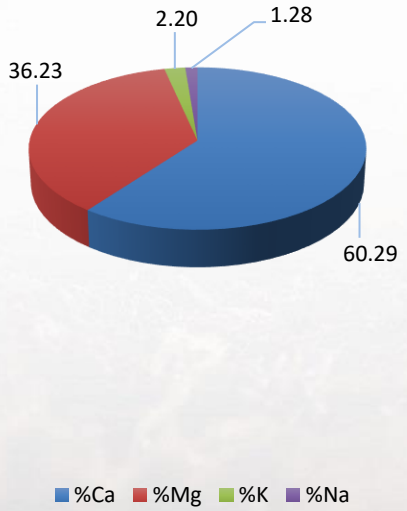
pH (KCL) 4.76



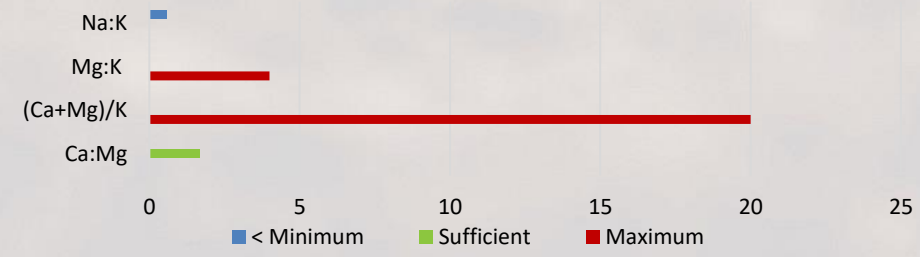
* pH (KCL) is approximately pH unit lower than pH (H2O)

Sample number:		AT-VTPK00606
Cations mg/kg	pH (KCL)	4.76
	PBray1	4.00
	K	76.00
	Na	26.00
	Ca	1068.00
	Mg	392.00
g/cm3	Density	1.03
	S AmAC	12.06
Base saturation	%Ca	60.29
	%Mg	36.23
	%K	2.20
	%Na	1.28
Base saturation ratios	Ca:Mg	1.66
	(Ca+Mg)/K	43.97
	Mg:K	16.51
	Na:K	0.58
Micro elements mg/kg DTPA	Zn	0.42
	Mn	7.52
	Cu	0.58
	Fe	11.75

Percentage base saturation



Base saturation ratios



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