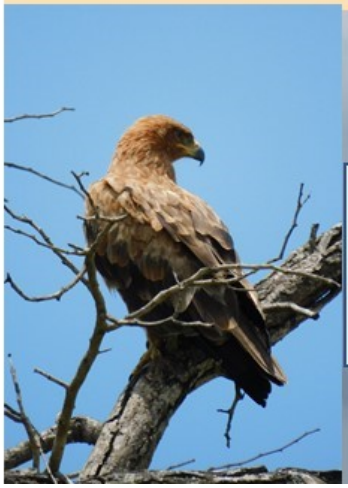
APPENDIX D: SPECIALIST REPORTS

ANNEXURE A:Terrestrial & Aquatic Ecology Report

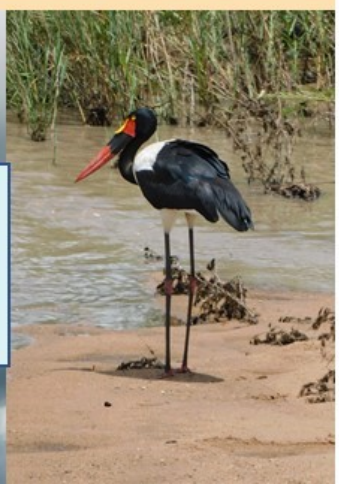
KATEKA LODGE: THE EXPANSION OF THE EXISTING CAMP FOOTPRINT

Specialist Study: An aquatic impact assessment for the proposed development.



Dr Andrew Deacon

February 2022



KATEKA LODGE: THE EXPANSION OF THE EXISTING CAMP FOOTPRINT

Kateka Lodge: An Ecological Assessment for the expansion of the existing camp footprint, Klaserie Private Nature Reserve, Mpumalanga.

Specialist Study: An aquatic impact assessment for the proposed development.

February 2022

Dr Andrew Deacon (PhD Zoology)

Registered with the South African Council for Natural Scientific Professions

(Registration number: 116951)

Executive Summary

The proposed development entails renovations of existing infrastructure, replacing redundant infrastructure and initiate new projects in the expanded project footprint. The proposed Kateka Lodge development includes the original, fenced-off Kateka Lodge project area (1.89 ha), as well as the proposed 2.45 ha extended area.

The ephemeral drainage line runs past the lodge and is a tributary of the Tsiri River. The drainage line comprises a sandy river bed, filled with alluvial sediment and will only be flowing during heavy rainfall events.

Due to the lack of flows and absence of surface water, no aquatic animal species (fish or macro-invertebrates) are able to inhabit the system. Even during the short-lived surface flows, the distance from permanent water and brief inundation of the system, rules out the presence of these groups. Since the ephemeral drainage line is part of a CBA landscape (Other Natural Areas) and situated in a Protected Area, the Aquatic Biodiversity Theme is rated as "Very High" sensitivity by the screening tool.

According to the initial buffer determination, a buffer of 10 m is required on both sides of the drainage line. This buffer will be initiated to protect the drainage line in its current condition from any degradation. The buffer will be implemented before construction and will be adhered to throughout lodge operation.

The following risks have been identified to potentially impact on the receiving environment:

Construction phase:

- Site clearing and manipulating topsoil. Cleared areas are prone to erosion which will cause siltation in the drainage line.
- Erosion of cleared, trampled or compacted surfaces will create erosion gulleys and silt will be washed into drainage lines.
- Pollution of the drainage line due to construction activities.
- Sewage effluent due to presence of construction personnel.
- Clearing fence lines and erecting new fences.
- Re-routing the road around the project area and creating a new stream crossing through the drainage line

Operational phase

- Increase of sewage effluent due to additional facilities for the staff housing and wellness centre.
- Storm water has the potential to increase soil erosion.
- Alien invasive vegetation - Competing with indigenous plant species and further transform the natural habitat.

All the expected impacts were assessed and all were confirmed to be "Low" or mitigated to attain a "Low" risk level. By implementing all the mitigation measures and managing the system on a continuous basis as prescribed by the Risk Assessment, all the impacts will be addressed to a satisfactory level. Therefore, it is proposed that the project should be authorised with the provision that the mitigation measures prescribed in this document, where applicable, are included in the EMPr

Table of Contents

2.7.2 A signed statement of independence by the specialist
2.7.3 A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment
2.7.4 Methodology
2.7.5 A description of the assumptions made and any uncertainties or gaps in knowledge or data
2.7.6 The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant.
2.7.7 Additional environmental impacts expected from the proposed development.
2.7.8 Any direct, indirect and cumulative impacts of the proposed development on site.
2.7.9 The degree to which impacts and risks can be mitigated.
2.7.10 The degree to which the impacts and risks can be reversed.
2.7.11 The degree to which the impacts and risks can cause loss of irreplaceable resources.
2.7.12 A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.
2.7.13 The proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).
2.7.14 A motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a “low” aquatic biodiversity sensitivity and that were not considered appropriate.
2.7.15 A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not.
2.7.16 Any conditions to which this statement is subjected.

Summary: A reasoned opinion

References

Abbreviations

BGIS	Biodiversity Geographic Information System
°C	Degrees Celsius
CBA	Critical Biodiversity Areas
Cell	Cell phone
Dr	Doctor
DWA	Department of Water Affairs (post-2010)
DWAF	Department of Water Affairs and Forestry (pre-2010)
DWS	Department of Water and Sanitation (since May 2014))
e.g.	For example
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FRAI	Fish Response Assessment Index
Ha	Hectares
KMZ	Keyhole Markup language Zipped
KNP	Kruger National Park
LUDS	Land-Use Decision Support Tool
m	Meter
m^2	Square meter
MBSP	Mpumalanga Biodiversity Sector Plan
MIRAI	Macro-invertebrate Response Assessment Index
mS/m	milliSiemens per metre
MTPA	Mpumalanga Tourism and Parks Agency
NP	National Park
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
ONA	Other Natural Areas
PES	Present Ecological State
PESEIS	Present Ecological State, Ecological Importance and Ecological Sensitivity
PhD	Doctor of Philosophy
PNR	Private Nature Reserve
Pr. Sci. Nat	Natural Scientific Professionals
Reg. no.	Registration number
RQO	Resource Quality Objectives
SACNASP	South African Council for Natural Scientific Professions
SANParks	South African National Parks
SASS5	South African Scoring System version 5
TOR	Terms of Reference
WMA	Water Management Area

1. Introduction

1.1 Background to the project

The brief of the project is to undertake an aquatic and terrestrial impact assessment for the expansion of the existing infrastructure in the Kateka Lodge project area, Klaserie Private Nature, Mpumalanga.

The proposed development entails renovations of existing infrastructure, replacing redundant infrastructure and initiate new projects in the expanded project footprint. The site plan of the Kateka Lodge as proposed for the new developments is illustrated below.

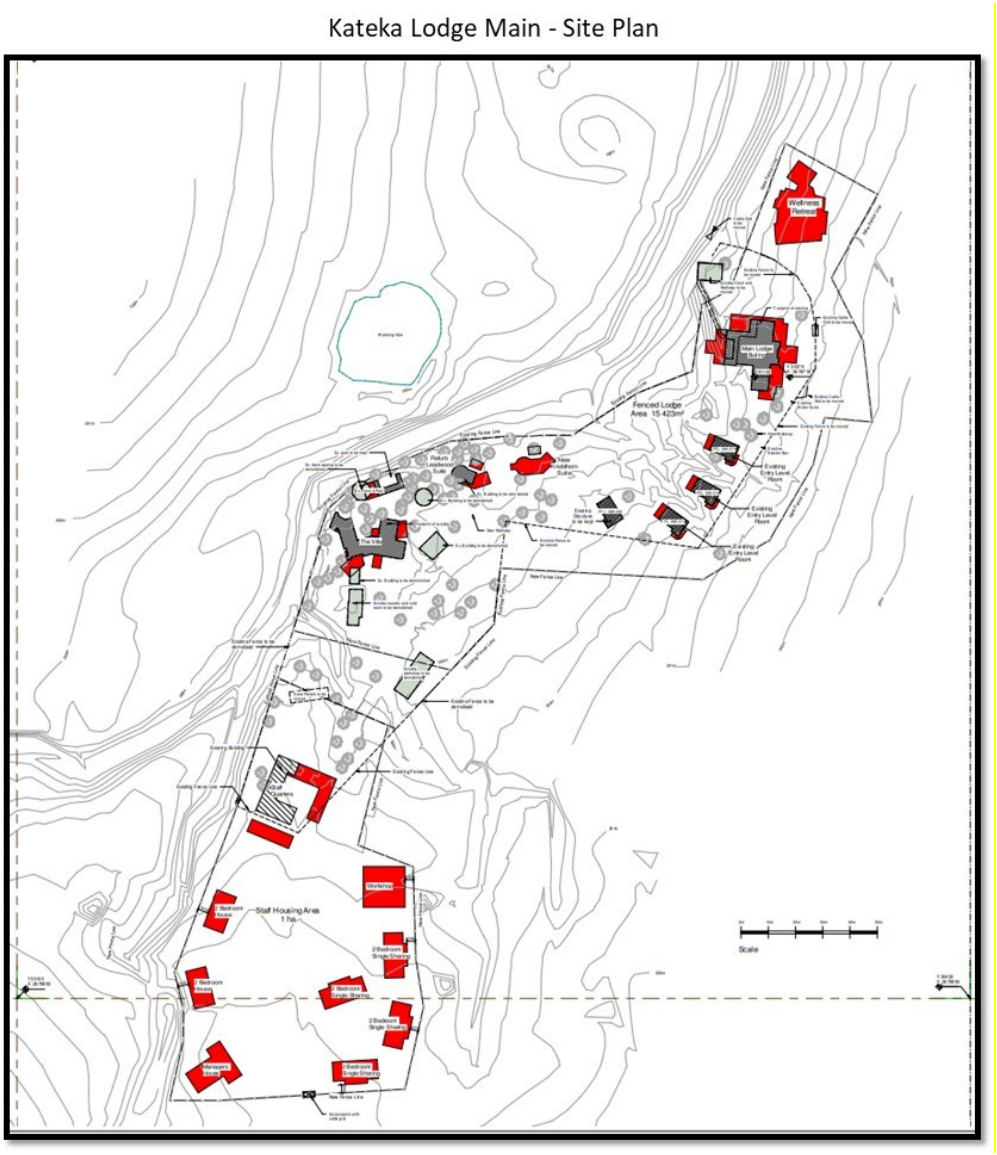


Figure 1: The site plan of the Kateka Lodge as proposed for the new developments.

1.2 Specialist Terms of Reference

This project proposal is prepared for a Specialist Study: An aquatic and terrestrial impact assessment for the expansion of the existing Kateka Lodge project area, Klaserie Private Nature, Mpumalanga. The Environmental Evaluation concerns the ecological aspects for the proposed expansion and the surrounding environment.

Screening Assessment

PHASE 1: Site Sensitivity Verification and Minimum Report Content Requirements

- Perform the **Site Sensitivity Verification** according to the criteria provided by the "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity" (Appendix D: Aquatic Biodiversity Protocol (GN No. 320 dated 20th March 2020)).
- Record the outcome of the Site Sensitivity Verification in the form of a report according to the minimum report content requirements in the same protocol.
- It is your responsibility to ensure your assessment and reporting meets all the requirements of the relevant protocol.

Aquatic Biodiversity Specialist Assessment

PHASE 2: Specialist Assessment and Minimum Report Content Requirements

- Perform the Specialist Assessment according to the criteria provided by the "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity" (Appendix D: Aquatic Biodiversity Protocol (GN No. 320 dated 20th March 2020)).
- Write up the findings of the specialist assessment in an Aquatic Biodiversity Specialist Assessment Report or Aquatic Biodiversity Compliance Statement that contains the minimum report content requirements prescribed in the same protocol.

Impact Assessment

- Assess the impacts for each of the proposed development alternatives including the no-go option, which will be identified throughout the process.
- The impacts must be assessed according to the Impact Assessment Criteria.
- Consider the potential negative and positive impacts that would result from the proposed alternatives and include mitigation measures to reduce those negative impacts that cannot be avoided, as well as measures to enhance the positive impacts.

1.3 Aquatic Biodiversity Protocol

This section concerns the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity (hereafter referred to as: Aquatic Biodiversity Protocol).

This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on aquatic biodiversity for activities requiring environmental authorisation (Government Gazette). In this Special Assessment Report, the corresponding numbering in the protocol will be added wherever it is relevant (Table 2).

The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (screening tool).

1.3.1 Screening Report for an Environmental Authorization as required by the 2014 EIA regulations – proposed site environmental sensitivity.

The National Web based Environmental Screening Tool allows for the generating of a Screening Report referred to in Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended whereby a Screening Report is required to accompany any application for Environmental Authorisation.

A Screening Assessment was undertaken, and the Screening Report was generated on 15th February 2022, using the application classification "Any activities within or close to a watercourse."

EIA Reference number: Environmental Authorisation
Project name: Kateka Lodge
Project title: Mafunyane Camp
Applicant: Mafunyane owner
Compiler: Dr AR Deacon

An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of "Very high sensitivity" for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment (Table 1).

Table 1: The Aquatic Biodiversity Impact Assessment identified in the Screening Report (Figure 2).

Theme	Sensitivity Rating	Reason for Sensitivity Rating		Type of Assessment	TOR
		Sensitivity	Features		
Aquatic Biodiversity	Very High	Very high	Wetlands and Estuaries	Aquatic Biodiversity Specialist Assessment	Gazetted Protocol (GN No.320)
			Aquatic CBAs		

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

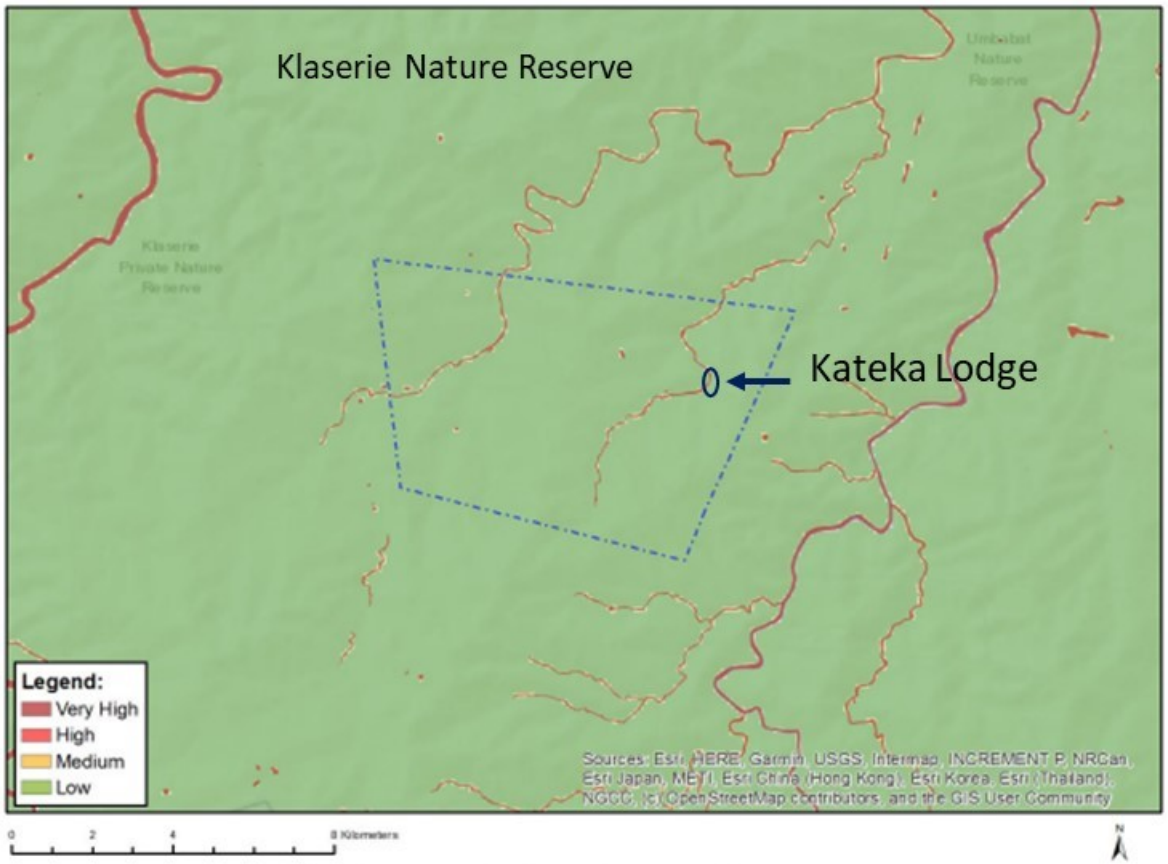


Figure 2: The project area is located within the Klaserie Private Nature Reserve and the Aquatic Biodiversity Theme is rated as “Very High” sensitivity (Environmental Screening Tool, 2021).

2. Specialist Assessment and minimum report content requirements

Assessment and reporting of impacts on aquatic biodiversity

An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of "Very high sensitivity" for aquatic biodiversity, must submit an **Aquatic Biodiversity Specialist Assessment** (Screening Report).

The "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity" (Appendix D: Aquatic Biodiversity Protocol (GN No. 320 dated 20th March 2020)) will be the proforma used throughout this report (see Table of Contents). Tables 2 and 16 summarises the main minimum report contents requirements.

Table 2:	Specialist assessment Checklist
	Requirements for Specialist Reports: Published in Government Notice No. 320; Government Gazette 43110**;** 20 March 2020
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP), with expertise in the field of aquatic sciences.
2.2	The preferred site within the proposed development footprint.
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:
2.3.1	A description of the aquatic biodiversity and ecosystems on the site, including; (a) aquatic ecosystem types; and
	(b) Presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns.
2.3.2	The threat status of the ecosystem and species as identified by the screening tool.
2.3.3	An indication of the national and provincial priority status of the aquatic ecosystem.
2.3.4	A description of the ecological importance and sensitivity of the aquatic ecosystem including: (a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site.
	(b) the historic ecological condition (reference) as well as present ecological state of rivers (in-stream, riparian and floodplain habitat).
2.4	Identify alternative development footprints.
2.5	Assessment of the potential impacts of the proposed development:
2.5.1	Maintaining the priority aquatic ecosystem.
2.5.2	Maintaining the resource quality objectives.
2.5.3	Impact on fixed and dynamic ecological processes.
	a. Impacts on hydrological functioning.
	b. Sediment regime.
	c. Modification in relation to the overall aquatic ecosystem.
	d. Risks associated with water uses.
2.5.4	Impact on the functioning of the aquatic feature:
	a. Base flows.
	b. Quantity of water.
	c. Change in the hydrogeomorphic typing.
	d. Quality of water.
	e. Ecological connectivity.
	f. Loss or degradation of all or part of any unique or important features.
2.5.5	Impact on key ecosystems regulating and supporting services especially:
	(a) flood attenuation;

Table 2:	Specialist assessment Checklist
	(b) streamflow regulation;
	(c) sediment trapping;
	(d) phosphate assimilation;
	(e) nitrate assimilation;
	(f) toxicant assimilation;
	(g) erosion control;
	(h) carbon storage.
2.5.6	How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator/prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?
2.6	In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered?

2.1 Registered Specialist

The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP), with expertise in the field of aquatic sciences.

Dr Andrew Deacon is registered with the South African Council for Natural Scientific Professions (SACNASP). Registration number: 116951.

2.2 The preferred site within the proposed development footprint.

The proposed Kateka Lodge development includes the original, fenced-off Kateka Lodge project area (1.89 ha), as well as the proposed 2.45 ha extended area (Figure 3).

Figure 3: A Google Earth aerial view of the original, fenced-off Kateka Lodge project area (1.89 ha).

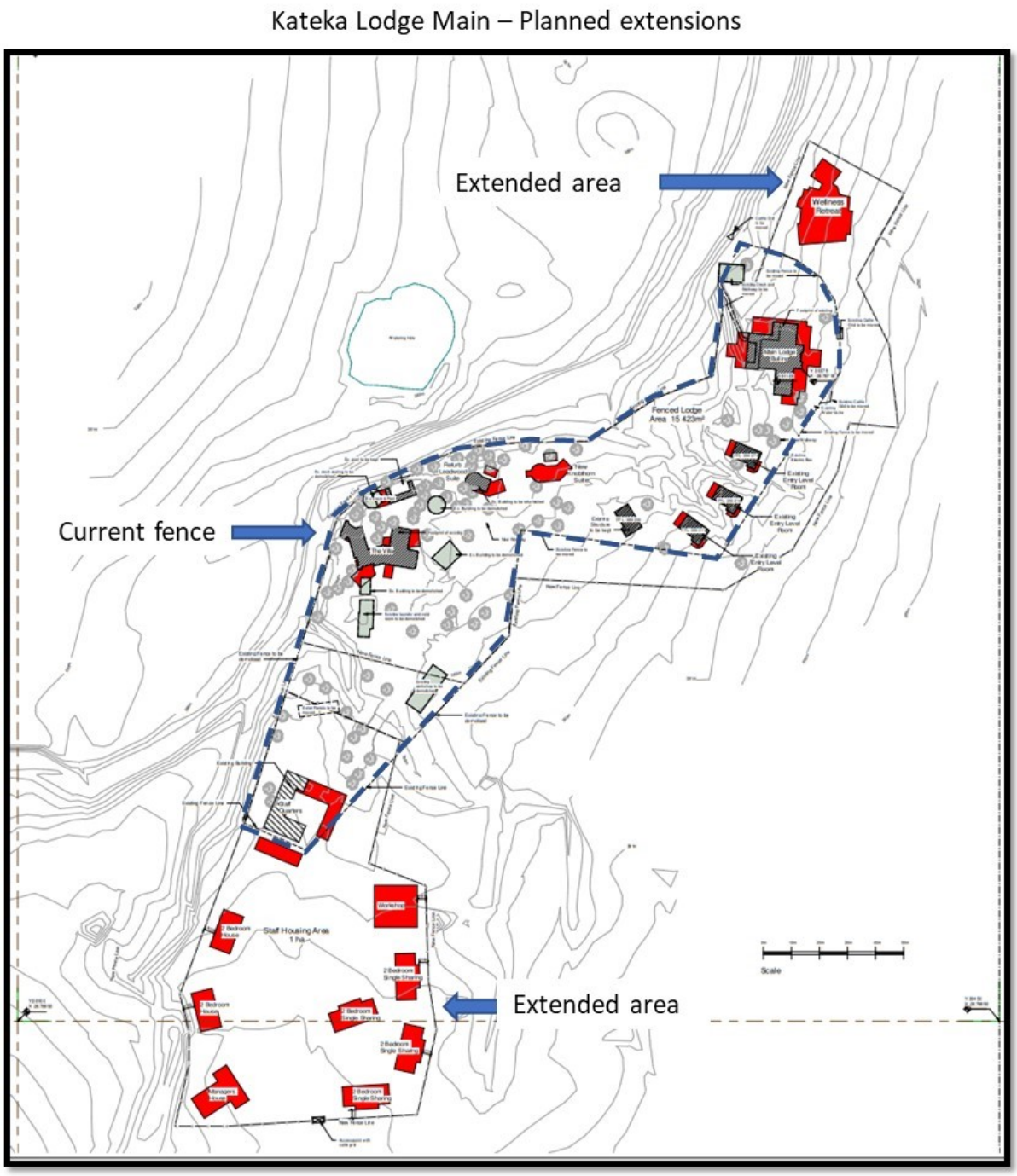


Figure 4: A diagram of the proposed Kateka Lodge development which includes the original, fenced-off Kateka Lodge project area (1.89 ha) (dotted line), as well as the proposed 2.45 ha extended area.

Planned infrastructure.

Area for new and refurbished suites

Two suites, the refurbished Leadwood Suite and the new Knobthorn suite, is planned for the central area next to the drainage line fence (Figure 5). The development is situated between existing large indigenous trees, facing towards the watering hole outside the fence.

Existing Entry Level Rooms

There are three existing Entry Level Rooms which will be upgraded with small improvements. The rooms are connected to the main lodge building to the north of the camp area with wooden walkways (Figure 6).

The existing Main Lodge building

The existing Main Lodge building will be upgraded and extended (Figure 7). The extension will not impact on any tall trees or sensitive habitats.

The Wellness Retreat

The Wellness Retreat is a new proposed addition to the camp infrastructure (Figure 8). It is planned on an area outside the existing footprint to the north of the camp. The Retreat will look out onto the drainage line and will cover an area of 401m^2 in the mopane woodland.

The Villa and other existing infrastructure

The Villa forms the centre of the existing infrastructure along the fence with the drainage line (Figure 9). Five of the existing buildings will be demolished and only the improved Villa, swimming pool and extended deck, will remain.

Existing staff quarters

The existing staff quarters will be extended and refurbished (Figure 10).

Staff housing area

The staff housing infrastructure will consist of 6 two-bedroom units, the manager's house and a workshop (Figure 11). It will be situated in a 1.0 ha fenced area outside the existing footprint and in the southern portion of the camp.

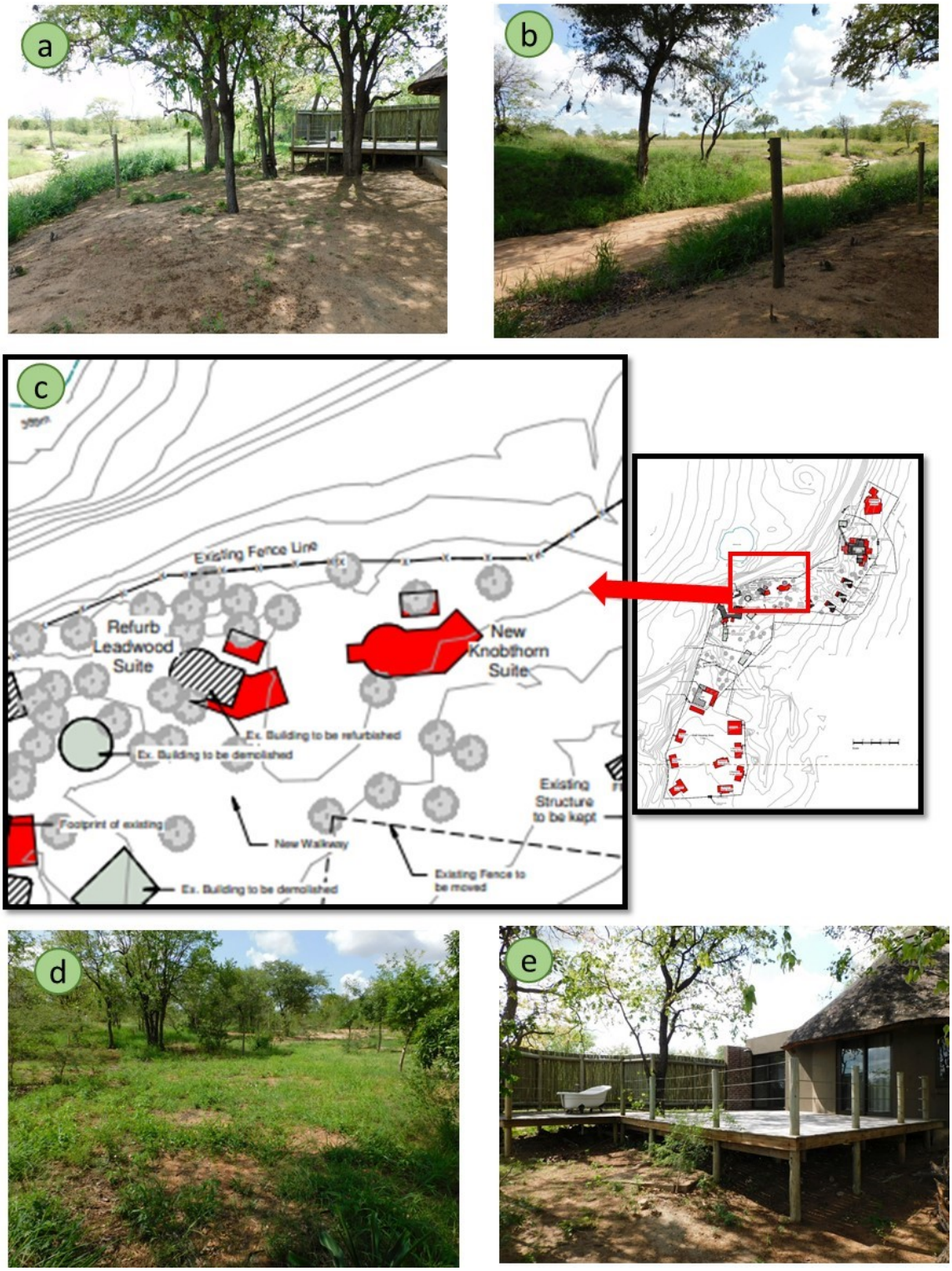


Figure 5: New and refurbished suites

5a and e. The Leadwood suite to be refurbished**.**

5b. The drainage line on the outside of the fence.

5c. The area for new and refurbished suites.

5d. Medium-sized trees and shrubs cover the area for the Knobthorn suite.

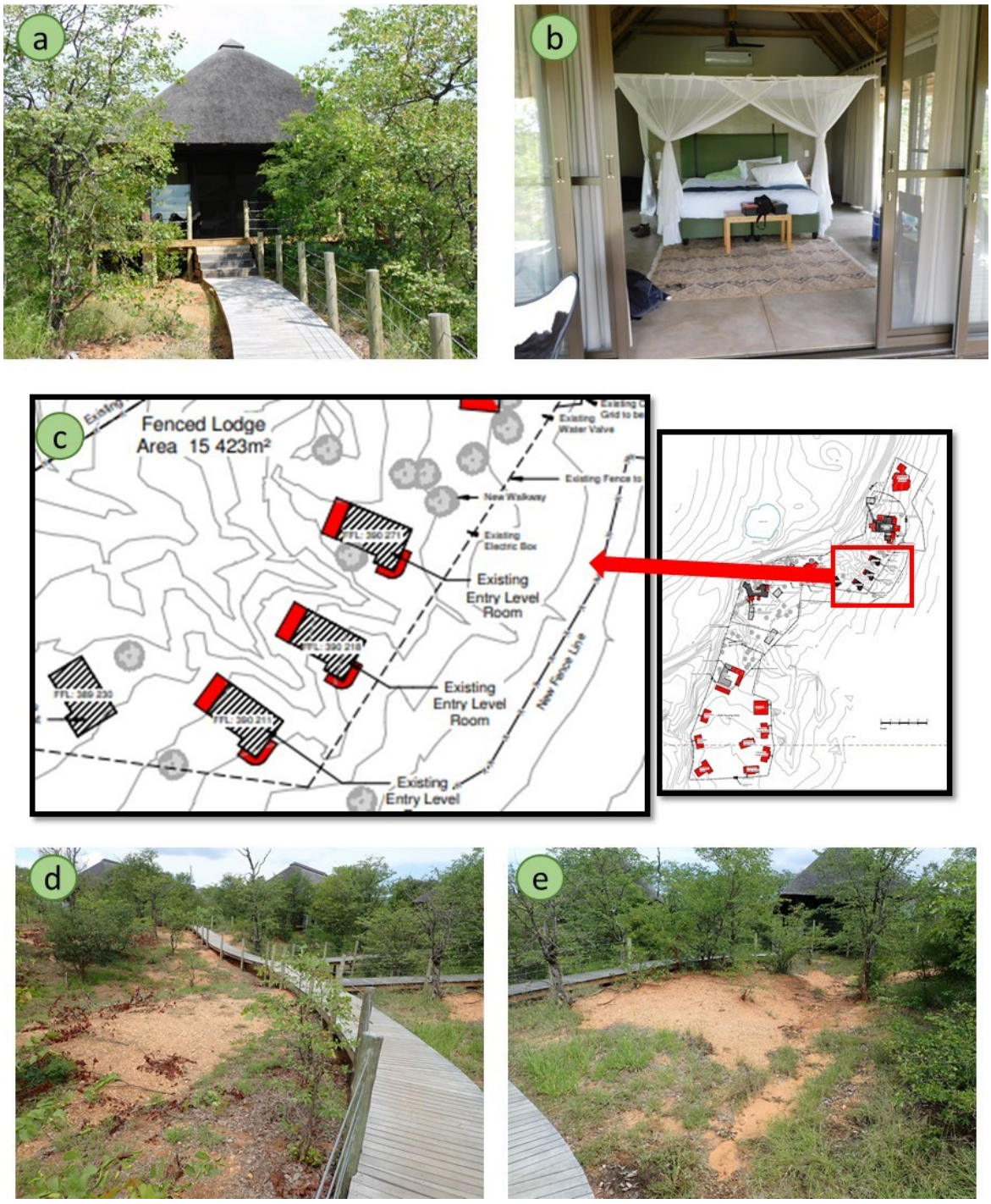


Figure 6: Existing Entry Level Rooms

6a and b. An existing Entry Level Room.

6c. The existing Entry Level Room plan.

6d and e. Walkways between the rooms and the main lodge building.

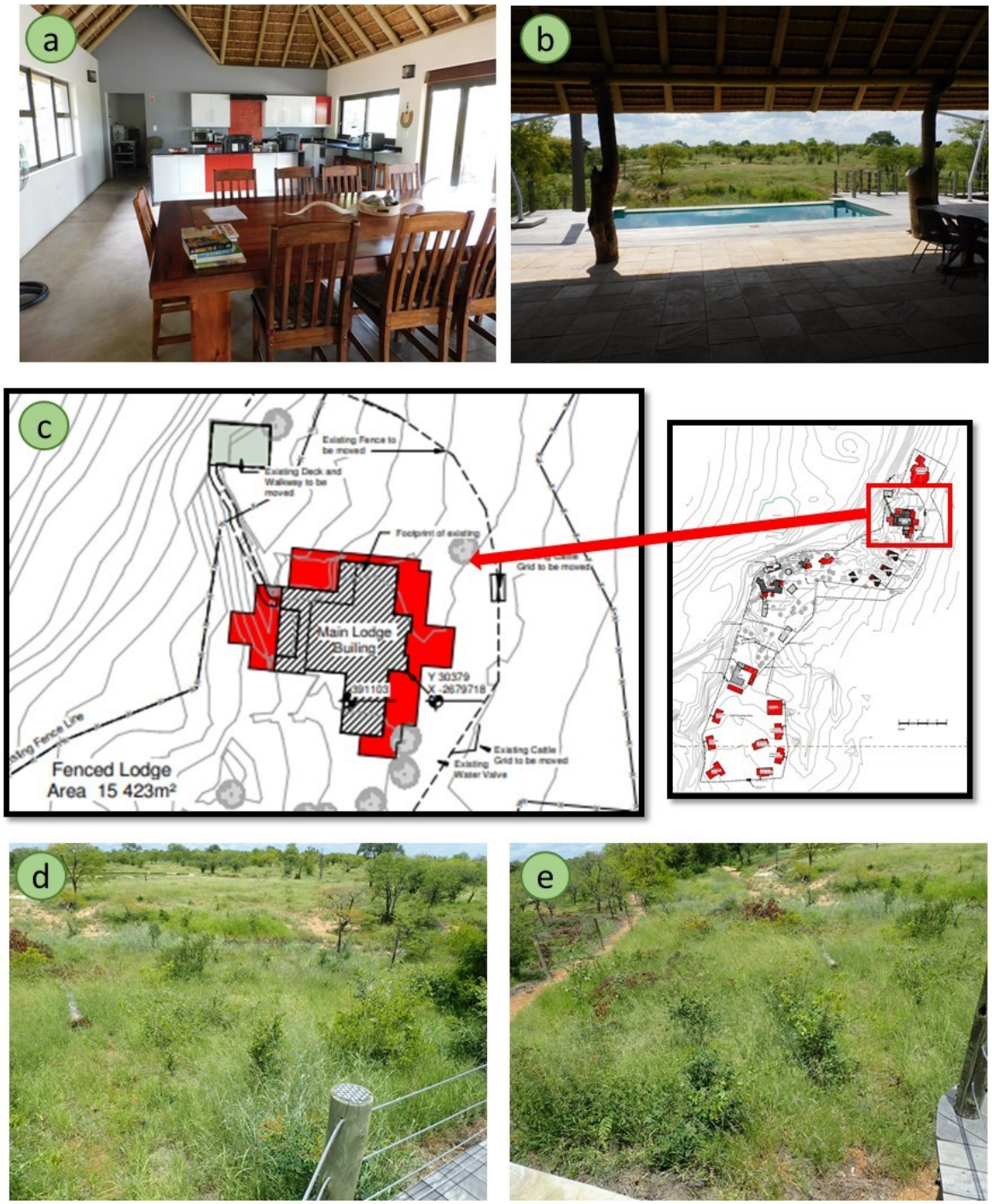


Figure 7: The existing Main Lodge building

7a and b. The existing Main Lodge building and pool.

7c. The existing Main Lodge building and pool plan.

7d and e. The area in front of the Main Lodge building behind the camp fence.

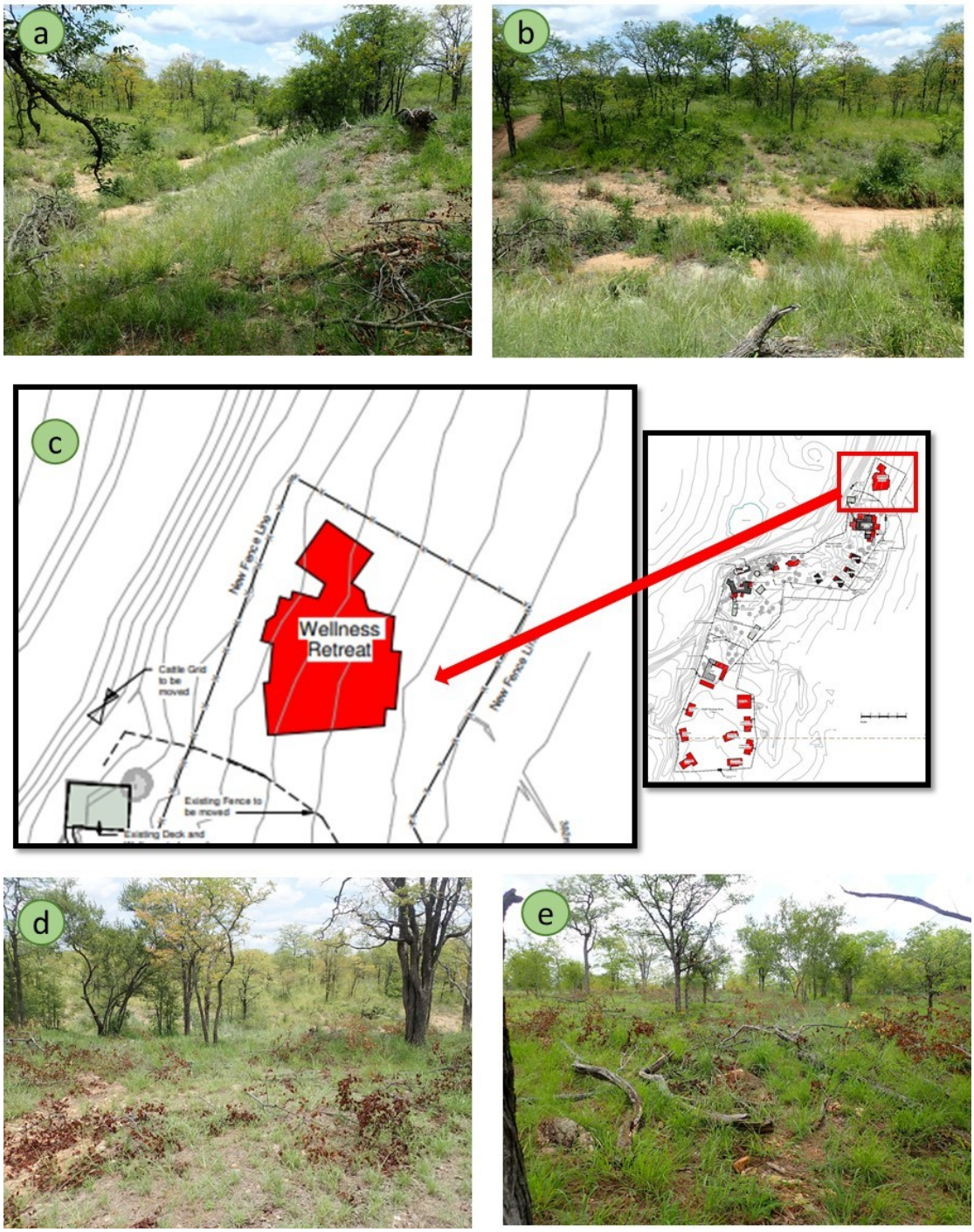


Figure 8: The Wellness Retreat

8a and b. The setting of the drainage line to be viewed from the front of the proposed building.

8c. The proposed Wellness Retreat on the northern boundary of the camp.

8d and e. The area for the building has been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape.

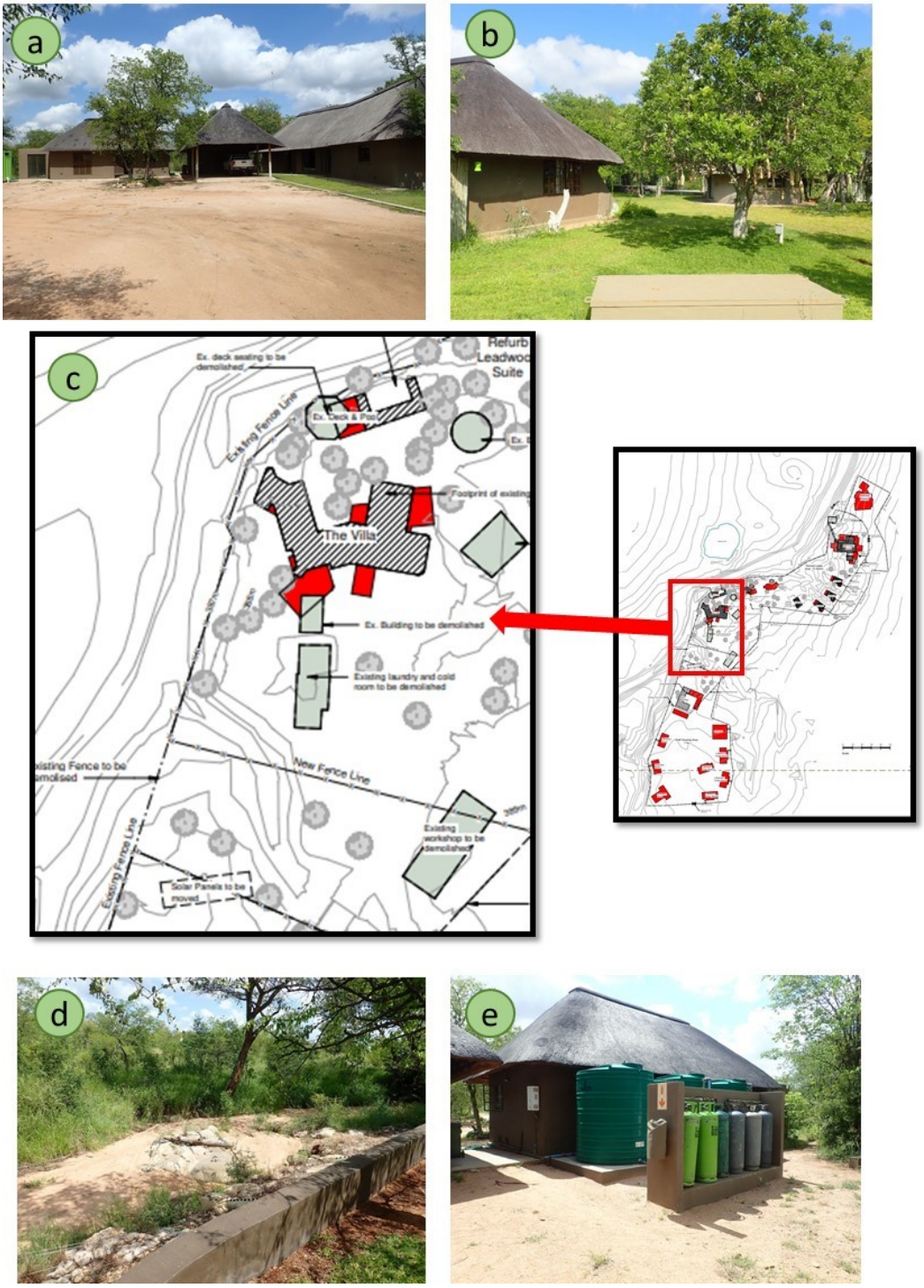


Figure 9: The Villa and other existing infrastructure

9a. The Villa will be improved.

9b. Certain buildings will be demolished.

9c. The Villa and other existing infrastructure.

9d. The local drainage line passes very close to the west of the Villa setting.

9e. Some of the existing infrastructure around the Villa will be upgraded

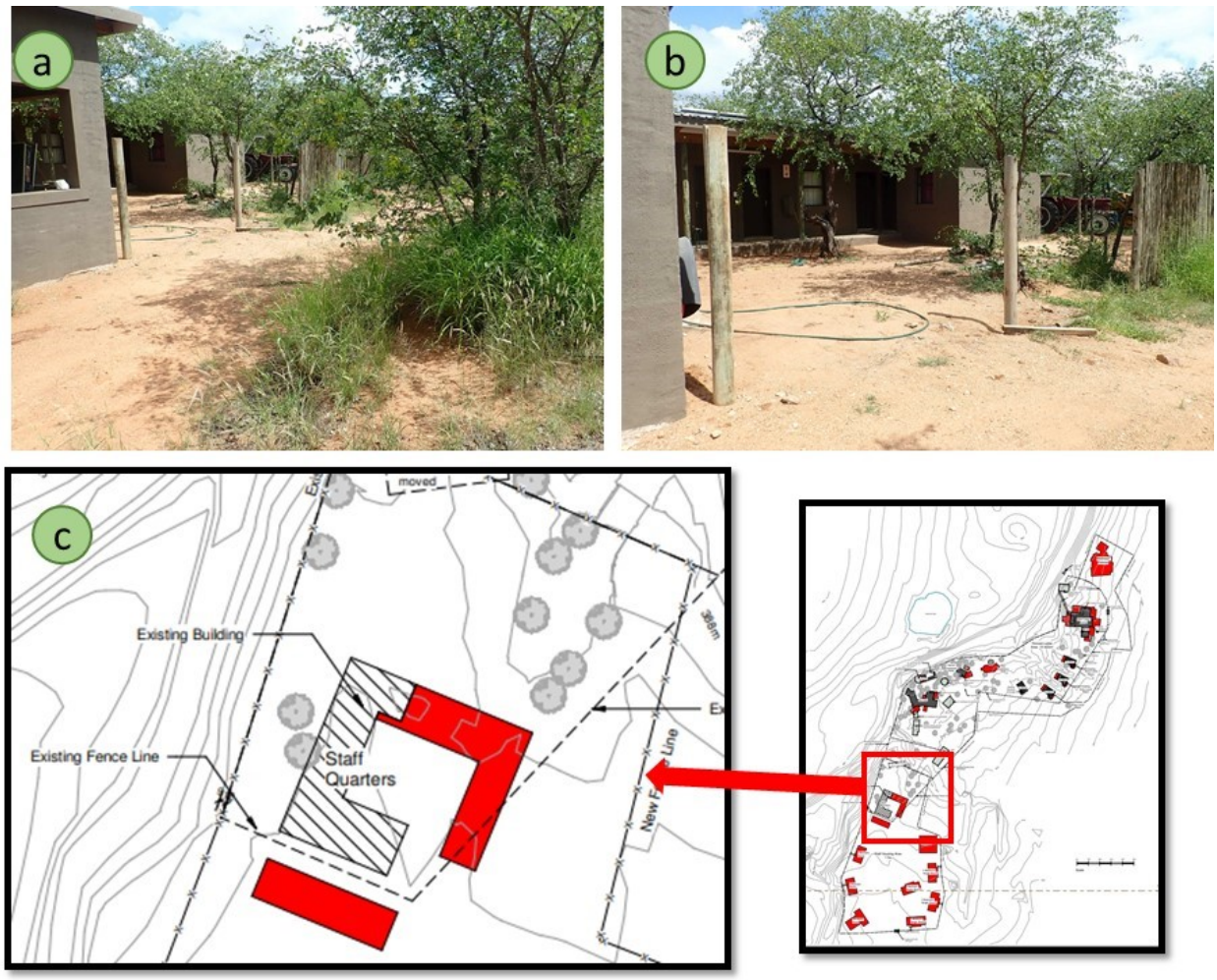


Figure 10: Existing staff quarters

10a and b. The existing staff quarters will be extended and refurbished.

10c. The existing staff quarters.

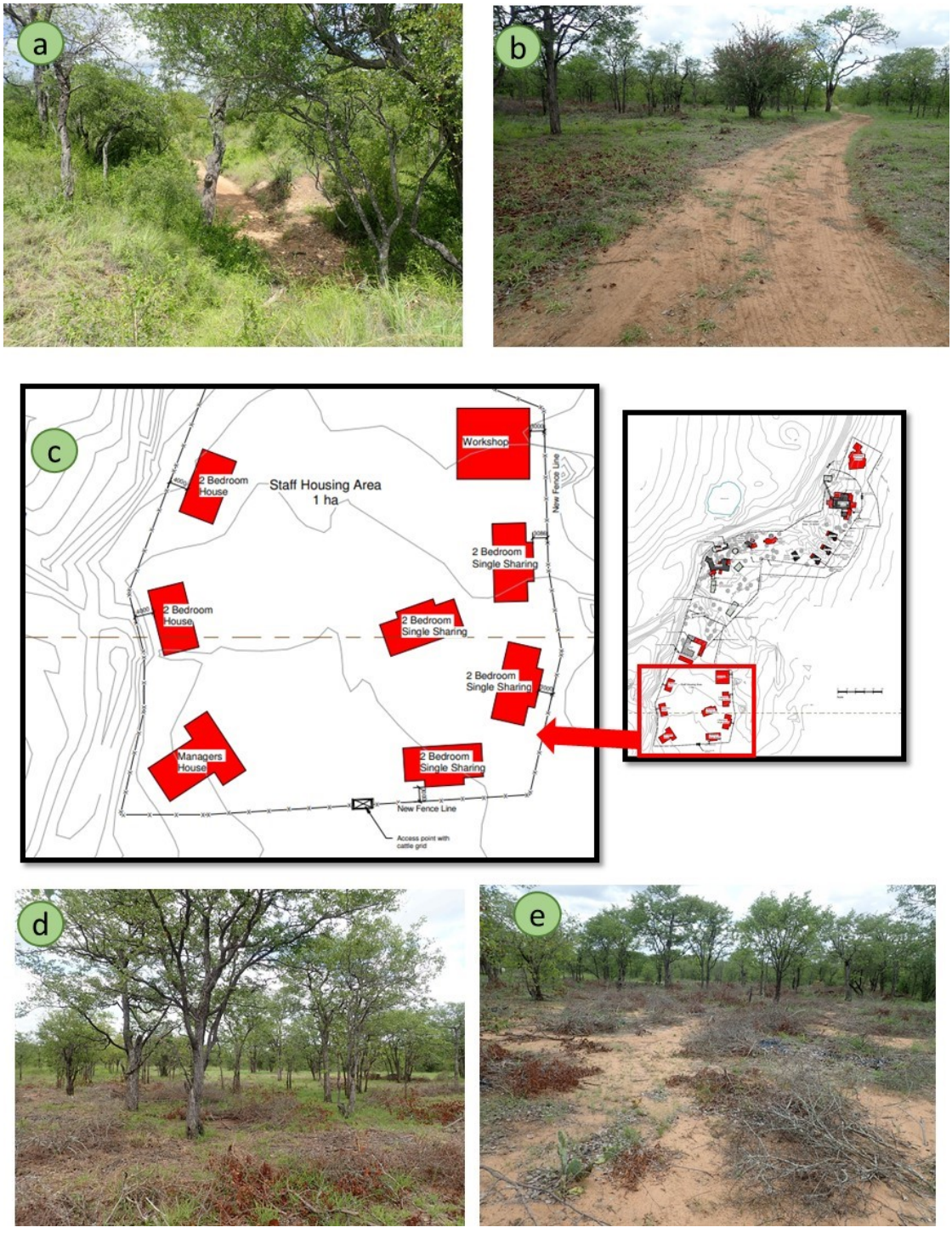


Figure 11: Staff housing area

11a. Some of the staff houses will be build close to the drainage line.

11b. A dirt road passes through the area to a planned gate in the fence.

11c. The Staff housing area.

11d and e. The area earmarked for the housing has been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape.

2.3 Aquatic baseline description

2.3.1a Aquatic ecosystem types

Aquatic habitat assessment

Aquatic surveys and biomonitoring are essential components of ecological risk assessment and aim to measure present biological conditions and trends in the aquatic ecosystem. It attempts to relate the observed variation to changes in available habitat, as dictated by physical system drivers of the system such as water quality, geomorphology, and hydrology (Kleynhans & Louw, 2008).

The Klaserie Private Nature Reserve has no permanent perennial water source. A number of large non-perennial rivers occur in the region, which include the Timbavati, Nhlaralumi, Klaserie, Tsiri and the Mohlabetsi.

The ephemeral drainage line running through the project area and past the lodge, is a tributary of the Tsiri River that flows into the Kruger Park, where it drains into the Olifants River. The drainage line comprises a sandy river bed, filled with alluvial sediment and will only be flowing during heavy rainfall events. Due to the lack of regular flow events, the riparian zone is not well defined, while terrestrial vegetation grows close to the edge of the streambed (Figure 12a). In areas larger trees occur due to shallow subsurface moisture.

During the monitoring survey in January 2022 the stream started to flow due to heavy rain in the area, but the flow only lasted hours.

Figure 12:

12a. An unnamed ephemeral drainage line runs past the project area.

12b. The drainage line on the outside of the fence.

2.3.1b Presence of aquatic species

Due to the lack of flows and absence of surface water, no aquatic animal species (fish or macro-invertebrates) are able to inhabit and survive in the system. Even during the short-lived surface flows, the distance from permanent water and brief inundation of the system, rules out the presence of these groups.

2.3.2 The threat status of the ecosystem and species as identified by the screening tool.

According to the screening tool, the Aquatic Biodiversity Theme is rated as "Very High" sensitivity (Figure 2 and Table 3). The sensitivity is ascribed to Aquatic CBAs and Wetlands of the area.

Proposed Development Area Environmental Sensitivity

The following summary of the development footprint environmental sensitivities or threat status of the ecosystem and species is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Table 3: The development footprint environmental sensitivities of the aquatic ecosystem identified by the screening tool (Figure 2).

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Animal species		**X**		
Aquatic Biodiversity Theme	**X**			
Plant Species Theme			**X**	

The following section with maps represents the results of the screening for environmental sensitivity in the proposed site for the aquatic ecosystem themes associated with the project classification.

Table 4: Sensitivity features of the project area.

Theme	Sensitivity	Feature
Aquatic biodiversity	Very High	Aquatic CBAs and Wetlands
Terrestrial Biodiversity Theme	Very High	Klaserie Private Nature Reserve

2.3.3 An indication of the national and provincial priority status of the aquatic ecosystem.

The use of CBA maps in Environmental Impact Assessments

Ideally, all land-users and people who make decisions about land and the use of natural resources should be aware of spatial biodiversity priorities and should know how to take these into consideration in their planning and decision-making processes. This is so that they can proactively identify the ecological opportunities and constraints within a landscape and use these to locate different land-uses appropriately (Cadman *et al.*, 2010).

Systematic biodiversity planning provides a powerful set of tools (maps and land-use guidelines) that facilitate this in a wide range of sectors, at both the policy-making and operational decision-making levels. The Mpumalanga Biodiversity Sector Plan represents the biodiversity sector's input to a wide range of planning and decision-making processes, frameworks and assessments in multiple land-use sectors (MBSP Handbook, Lötter *et al.* 2014).

The Kateka Lodge project area falls within the planning domain of the Mpumalanga Biodiversity Sector Plan, developed by the Mpumalanga Tourism and Parks Agency (MTPA). The potential impact of the development on Critical Biodiversity Areas should be considered

in detail as these areas have been identified through systematic conservation planning exercises and represent biodiversity priority areas which should be maintained in a natural to near natural state in order to safeguard biodiversity patterns and ecological processes. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives.

Table 5: The key results of the LUDS Report as extracted from the Mpumalanga Biodiversity Sector Plan national datasets available from BGIS.

National Data Set	Aspect
National terrestrial information: Mpumalanga Province	
South African district boundaries	Ehlanzeni
South African municipal boundaries	MPDMA32
Quater-degree grid squares	2431AB
Biome	Savanna
Terrestrial CBAs	
Protected areas	PA National Parks & Nature Reserves
Informal land-based protected areas (NSBA 2010)	Klaserie Private Nature Reserve
National aquatic information: Ntseri Catchment	
Water Management Area (WMA)	Limpopo
Sub-WMA name	Olifants
Freshwater CBAs and ESAs	Other natural areas
Critical Biodiversity Areas	
Freshwater CBAs and ESAs	Other natural areas (ONAs)

Critical Biodiversity Areas

Overlaying the BGIS Critical Biodiversity Areas map onto the Kateka Lodge project area, resulted in the compilation of Figures 13 and 14 and Table 5. According to these maps and LUDS Report (Table 5) the project area falls into the following sensitive areas:

- Terrestrial:
  - Protected areas
  - Other natural areas

- Freshwater
  - Other natural areas

The Kateka Lodge project area is situated in a CBA catchment (ONA = Other Natural Areas) which means it should be maintained in a natural state with no loss of ecosystem functionality or species (Figure 14). Other Natural Areas are natural areas that are potentially available to changes in land-use, subject to environmental authorisation processes. Although they are not identified to support freshwater CBAs or ESAs, they still provide important ecosystem services. Freshwater ONAs are particularly important in buffers around rivers and wetlands to reduce siltation and improve water quality.

Figure 13: The Critical Biodiversity areas for the Kateka Lodge project area as illustrated by the LUDS programme (BGIS, 2015) for Mpumalanga Province.

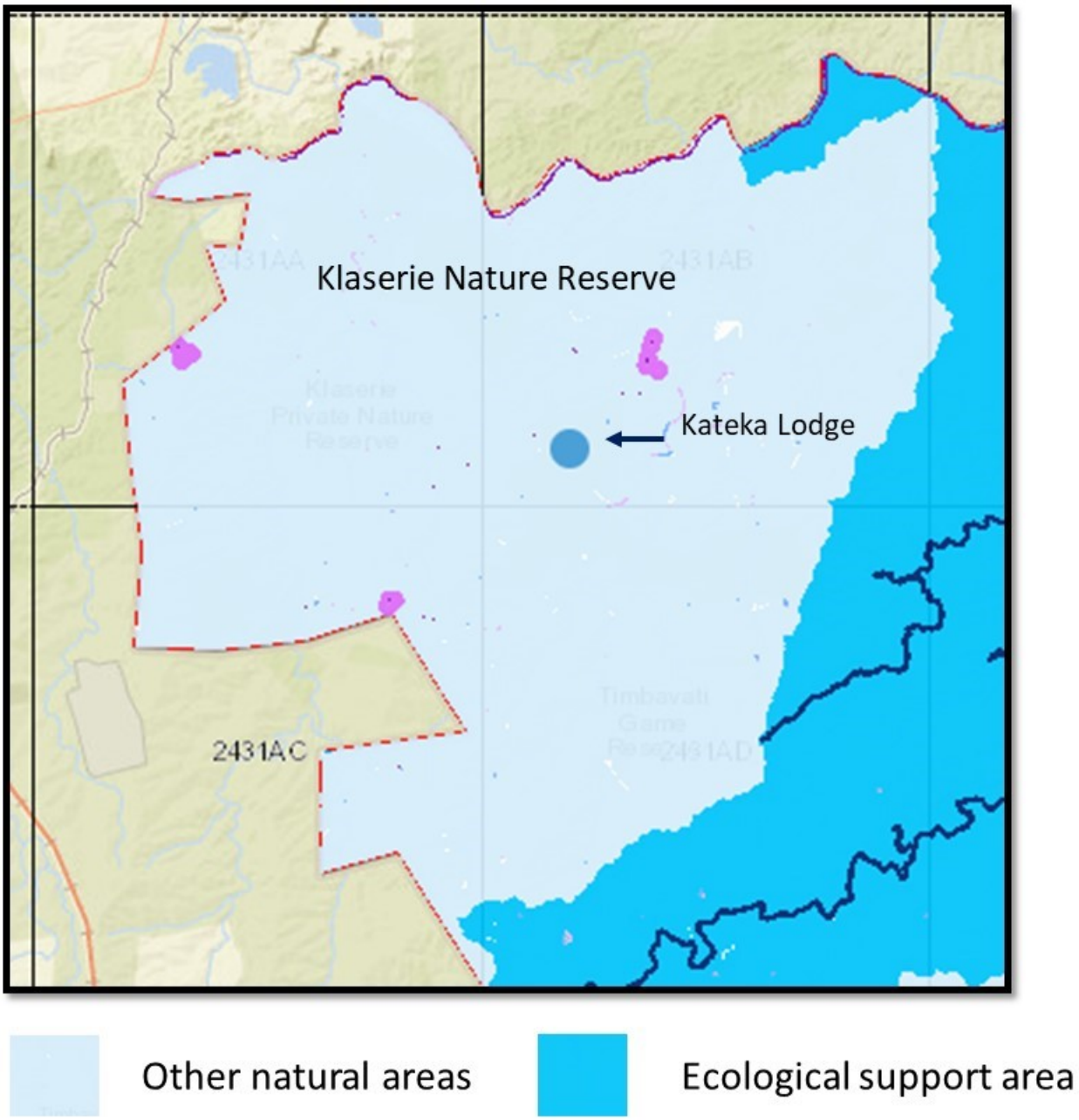


Figure 14: The conservation status of the aquatic system of the project area, as illustrated by the LUDS programme (BGIS, 2015) for Mpumalanga Province.

With these sensitive landscape properties, it is paramount to approach the construction and operation phases of the entire project with caution as the footprint of the entire project area is classified as a Protected Area.

Since the ephemeral drainage line is part of a CBA landscape (Other Natural Areas) and situated in a Protected Area, the Aquatic Biodiversity Theme is rated as “Very High” sensitivity for the project area.

CBA maps of the study area was compiled by using the Biodiversity Geographic Information System (BGIS) maps as illustrated in Figures 13 and 14. Every attempt should be made during all phases of the project development not to have an impact on these areas. While determining

the area and distribution of a core habitat is important, it is equally important that appropriate management measures be defined to ensure the core habitat continues to function effectively.

2.3.4 A description of the ecological importance and sensitivity of the aquatic ecosystem.

This section supplies a description of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site. These include. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.

Since the drainage line is not a large enough system to be rated through the DWS PESEIS evaluation, no official assessment for the system was done. Despite the fact that it is part of a CBA landscape (Other Natural Areas) and situated in a Protected Area, the ephemeral system that only flows intermittently when heavy rain downpours occur in its catchment.

The lack of surface water (the stream flows only for a few hours during downpours) means that the system does not support aquatic habitats, and the short-lived subsurface moisture in the system also does support a proper riparian zone (Figures 12 a and b). Therefore, the ecological importance and sensitivity of the aquatic ecosystem is considered to be “Low”.

2.3.4.1 Present Ecological State of the study area

This following section supplies a description of the historic ecological condition (reference) as well as present ecological state of rivers (in-stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).

The ephemeral system that consists mainly of a dry streambed, very scant riparian zone and some superficial floodplain habitat in places, has not been influenced in most of its catchment by human-related impacts. As part of a conservation area, it is conserved in its natural condition. Thus, apart from an off-stream watering hole created for game-viewing close to the drainage line, and the existing small camp adjacent to the drainage line, no adverse human impacts are expected to influence the drainage system.

2.3.4.2 Corridors for Connectivity

The guidelines for land-use practices or activities that impact on water quantity in freshwater CBAs includes the following: Generic buffers should be established around streams within these catchments. These buffers can be refined based on a site visit and applying the DWS’s wetland delineation tool.

Due to their positioning adjacent to water bodies, buffer zones associated with streams and rivers will typically incorporate riparian habitat. Riparian habitat, as defined by the NWA, includes the physical structure and associated vegetation of the areas associated with a watercourse (Macfarlane et al, 2015). However, the riparian zone is not the only habitat type that is present in the buffer as the zone may also incorporate stream banks and terrestrial habitat, depending on the width of the aquatic impact buffer zone applied. Therefore, the riparian zone must be delineated before the buffer zone is established.

2.3.4.3 Riparian delineation

The drainage adjacent to the project area is mostly devoid of riparian vegetation. Due to this, no recognisable riparian zone could be delineated. In the case where no clear riparian zone is present, buffers should be delineated from the edge of the macro channel bank (Figure 15).

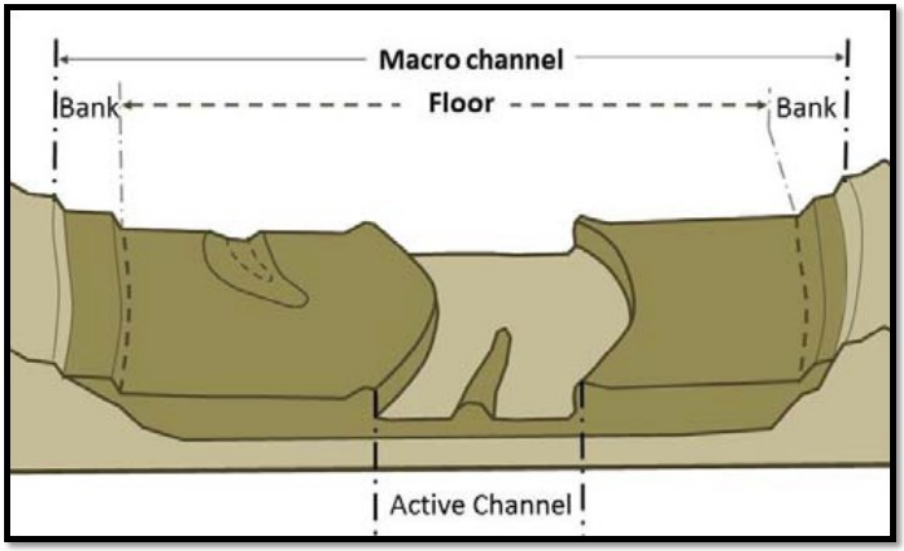


Figure 15: Guidance for Buffer Zone Delineation: Buffer delineated from edge of macro channel floor (Macfarlane and Bredin, 2017).

The active channel is the portion of a river that is inundated at intervals to maintain channel form (i.e., the presence of distinct bed and banks) and keep the channel free of established terrestrial vegetation. Active channels are typically filled to capacity during bank-full discharge (i.e., during periods of flow).

Stream delineation and habitat evaluation was undertaken according to the DWAF Guidelines (2005) and DWAF updated manual (2008) (see Methods Section 2.7.4). Figure 16 illustrates the Kateka Lodge project area with the riparian zone delineated. The delineation shapefiles are available as Appendix 1 (Appendix 1. Kateka delineation and buffer).

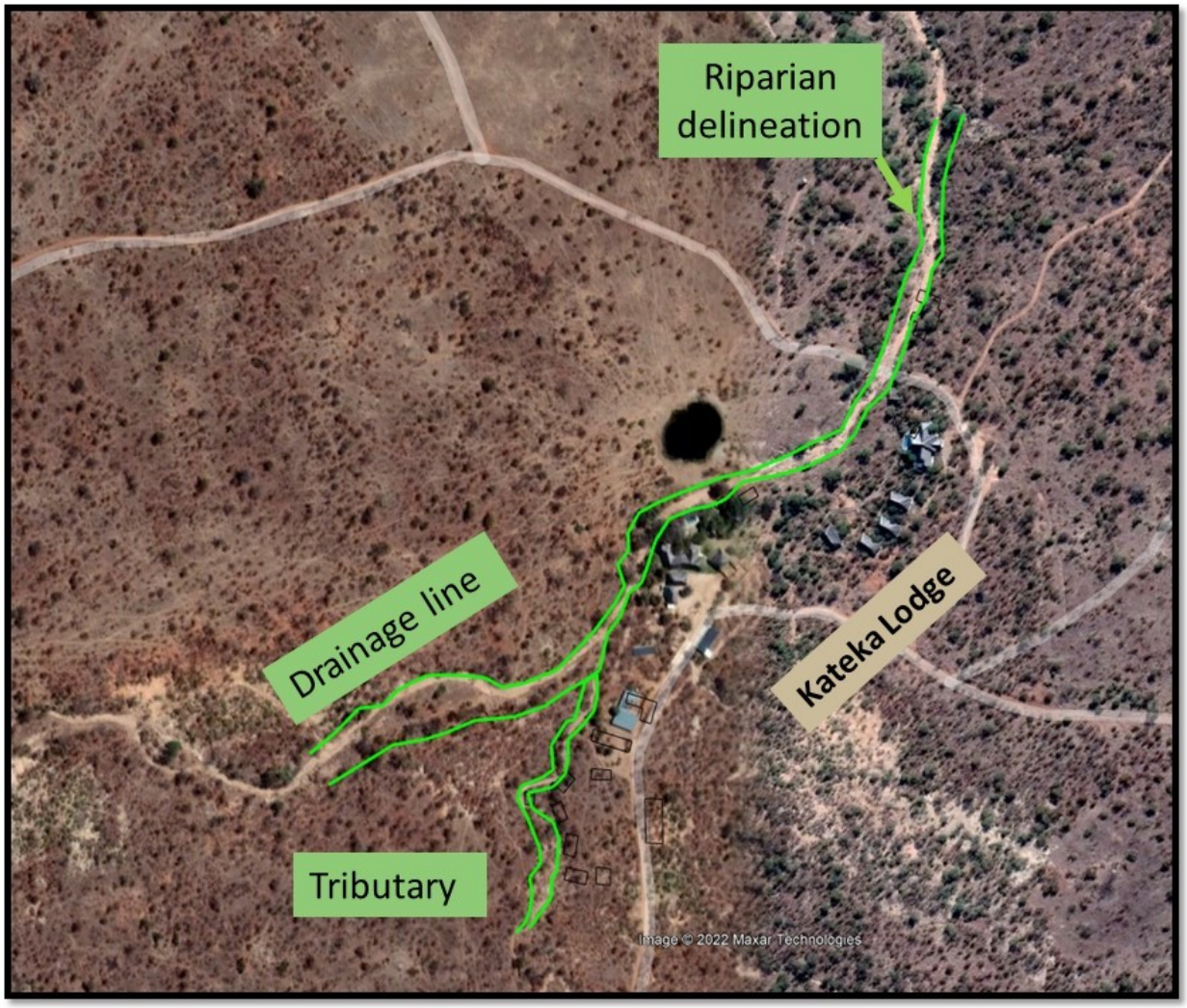


Figure 16: The delineated riparian zone (green lines) of the Kateka project drainage line and tributary.

2.3.4.4 Buffer zones

Buffer zones have been used in land-use planning to protect natural resources and limit the impact of one land-use on another. Buffer zones will serve as a mitigating measure for impacts created by the construction and operational phases of the Kateka project drainage line, and the implemetation will be recapitulated in the mitigation section (Impact 1.2).

Buffer zones associated with water resources have been shown to perform a wide range of functions, and on this basis, have been proposed as a standard measure to protect water resources and associated biodiversity. These functions include:

- Maintaining basic aquatic processes;
- Reducing impacts on water resources from upstream activities and adjoining land uses;
- Providing habitat for aquatic and semi-aquatic species;
- Providing habitat for terrestrial species; and
- A range of ancillary societal benefits.

Determining the required buffer width is largely an exercise of assessing the situation and linking it to an acceptable level of risk. Determining appropriate management measures for aquatic impact buffer zones is largely dependent on the threats associated with the proposed activity adjacent to the water resource. These threats include:

- Increases in sedimentation and turbidity;
- Increased nutrient inputs;
- Increased inputs of toxic organic and heavy metal contaminants; and
- Pathogen inputs.

Any potential risks must be managed and mitigated to ensure that no deterioration to the water resource takes place. Standard management measures should be implemented to ensure that any on-going activities do not result in a decline in water resource quality. The protected riparian zone will serve as a mitigating measure for impacts created by the construction and operational phases of the proposed project.

The aspects utilised to establish the Kateka project drainage line buffer zone, are listed in Table 6 and the buffers obtained from these features are displayed at the end of the table as: 10 m during the construction phase, and 10 m for the operational phase.

Table 6: Site-based tool: Determination of buffer zone requirements for drainage systems.

Site-based tool: Determination of buffer zone requirements for river systems.	
Name of Assessor	Dr AR Deacon
Project details	Kateka Lodge
Date of Assessment	2022/2/18
Level of Assessment	Site-based
Approach used to delineate the riparian zone & active channel?	Site-based delineation
River type	Lowland river
Present Ecological State	B (Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged).

Ecological importance & sensitivity (Current status)	Very low: Features are not ecologically important and sensitive at any scale. The biodiversity of these areas is typically ubiquitous with low sensitivity to anthropogenic disturbances and play an insignificant role in providing ecological services.
Management Objective	Maintain
Sector	Open space: Areas defined as open space include a range of land-uses with minimal infrastructural development, such as parks, gardens and off-road trails. Includes areas set aside for preservation and conservation because they provide ecosystem services, are unique natural landscapes, viewpoints, areas of ecological, historical and/or cultural importance, biodiversity, and/or have unique, rare of endangered habitats or species.
Sub-sector	Open space
MAP Class	1001 - 1200mm
Rainfall intensity	Zone 3
Stream order	1st order
Channel width	1-5m
Perenniality	Intermittent systems (<3 months)
Average slope of rivers catchment	<3%
Inherent runoff potential of the soil in the river's catchment	Moderate Low (B)
Longitudinal river zonation	Lowland river
Inherent erosion potential (K factor) of catchment soils	0.13 - 0.25
Retention time	Generally slow moving
Inherent level of nutrients in the landscape	Moderate base status
Inherent buffering capacity	Neutral pH
Natural salinity levels	Non-saline (<200mS/m)
River depth to width ratio	> 0.25
Mean annual temperature	Zone 5 (19.5 - 24.2 Deg C)
Level of domestic, livestock and contact recreational use	Low
Buffer attributes (Current status)	
Slope of the buffer	Gentle (2.1 - 10%)
Vegetation characteristics (Construction phase)	Good: Moderately robust vegetation with good interception potential (e.g., good condition tufted grass stands).
Vegetation characteristics (Rehabilitation phase)	Good: Moderately robust vegetation with good interception potential (e.g. good condition tufted grass stands).
Soil permeability	High: Deep well-drained soils (e.g., sand and loamy sand & sand).
Micro-topography of the buffer zone	Dominantly uniform topography: Dominantly smooth topography with few/minor concentrated flow paths to reduce interception.
Aquatic impact buffer requirement	
Construction Phase	**10m**
Operational Phase	**10m**

According to the initial buffer determination, a buffer of 10 m is required on both sides of the drainage line. This buffer will be initiated to protect the drainage line in its current condition from any degradation. The buffer will be implemented before construction and will be adhered to throughout lodge operation. This buffer width is obtained whenever the following mitigation measures are applied to the model (Table 7).

Table 7: Mitigation measures to apply to the model in order to protect the Kateka project drainage line.

Construction Phase

Threat Posed by the proposed land use / activity	**Justification for changes in threat ratings**
Increase in sediment inputs and turbidity	Strict measures must be taken to prevent erosion and prevent sediment-laden water from entering receiving watercourses.
Increased nutrient inputs	Ensure that the facility sewage system is maintained in a sanitary and operational state.

Operational Phase

Threat Posed by the proposed land use / activity	**Justification for changes in threat ratings**
Increased nutrient inputs	Ensure that the facility sewage system is maintained in a sanitary and operational state.

Final aquatic impact buffer requirements (including practical management considerations) for both sites and all the segments:

Final aquatic impact buffer requirement during the construction phase: 10 m

Final aquatic impact buffer requirement during the operational phase: 10 m

Once protection requirements for water resources and associated biodiversity have been established, the buffer zone requirements have to be finalised and delineated on a layout plan and in-field.

Once a final buffer zone area has been determined, appropriate management measures need to be documented to ensure that the water quality enhancement and other buffer zone functions, including biodiversity protection, are maintained or enhanced. These measures should ideally be integrated in the environmental management plan (EMP) for the proposed development, as it includes a requirement to assign clear responsibilities for buffer zone management at both the construction and operation phases. Although management measures will be specific to each site, some guidance is provided to ensure that management measures cater adequately for key buffer zone functions.

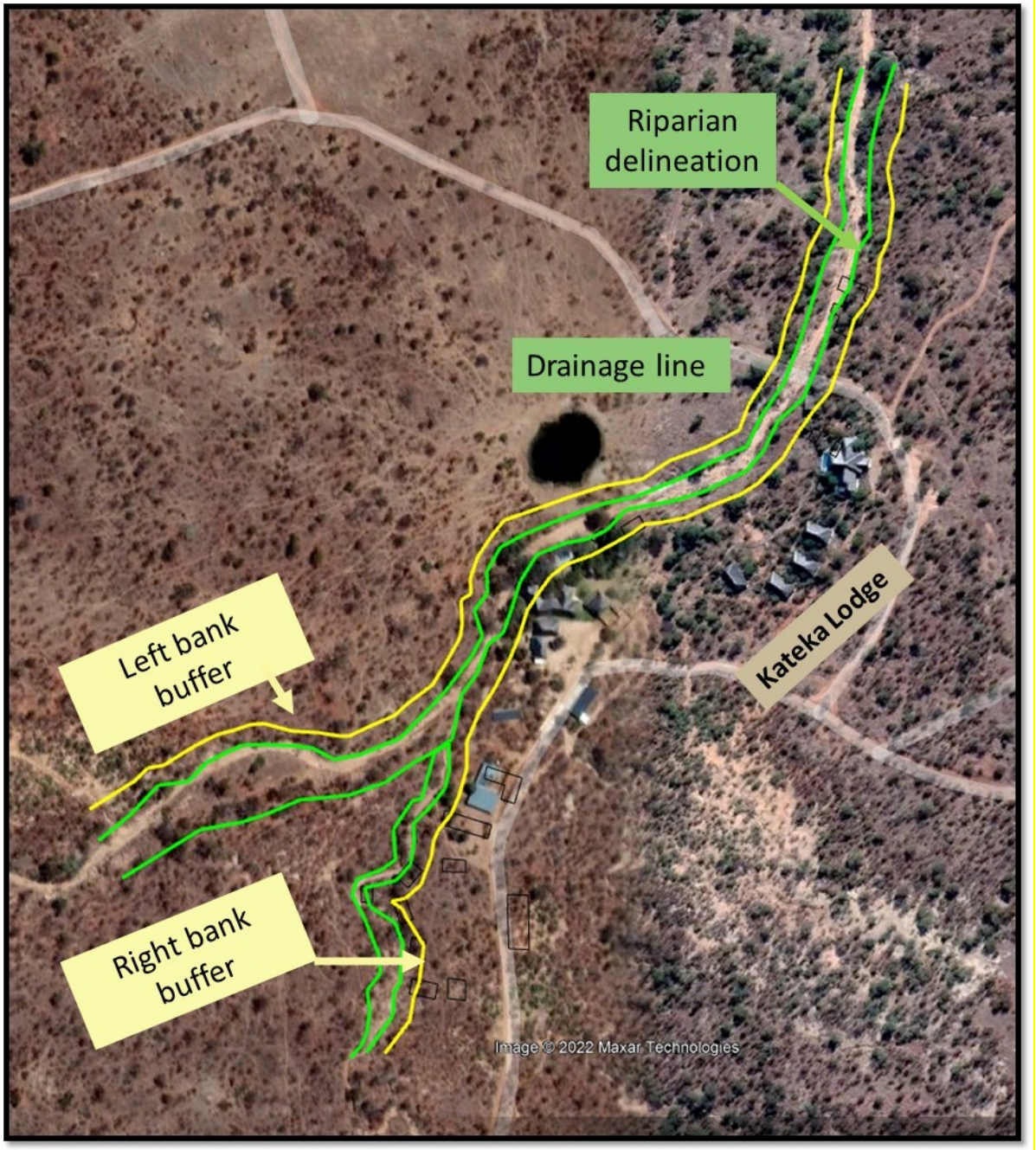


Figure 17: This figure outlines the proposed buffer of 10m (yellow line) in order to protect the riparian corridor (green line) and to protect the Kateka project drainage line (Shape file of buffer – Appendix 1. Kateka delineation and buffer).

2.4 Alternative development footprints

The Kateka Lodge project area is an established tourist destination which forms part of the Klaserie Private Nature Reserve tourism industry. The new owners wish to refurbish some of the older infrastructure and extend the 1.89 ha camp by fencing in an additional 2.45 ha, adding to the current development.

The existing footprint has a well-established garden with many large indigenous trees, and it is planned to extend the infrastructure to the north and south of the camp, creating one development and sharing facilities. It is believed that one medium-sized facility is less obtrusive than two smaller units apart. Therefore, no alternative has been proposed.

2.5 Assessment of the potential impacts of the proposed development.

The Risk Assessment was done in accordance with the Risk Matrix (Based on DWS 2015 publication: Section 21 (c) and (I) water use Risk Assessment Protocol and as contained in Appendix A in GN509 of 26 August 2016) and was carried out considering the risk rating of the project. Following is an abstract from the completed Risk Matrix to indicate the significance of the project activities on the Kateka Lodge project area:

Development aspects

The following proposed development activities will be assessed relating to their impacts on the local and surrounding environment.

Development 1. The refurbishment of infrastructure in the current fenced footprint (Figure 4).

Development 2. The construction of a wellness area to the north of the camp (greenfield area) (Figure 4).

Development 3. The development of a staff housing area and the construction of storerooms, workshop and bedrooms to the south of the camp (greenfield area) (Figure 4).

Development 4. Fencing of the new greenfield areas.

Development 5. Re-routing the road around the project area and creating a new stream crossing through the drainage line.

The risks associated with the water use/s and related activities.

Following is an abstract from the Risk Assessment Matrix (Appendix 2) for the Kateka Lodge project area relating to all current and expected impacts that the development will have on the drainage system, the significance of these impacts, and mitigation through control measures.

The potential impacts of the project on the aquatic biodiversity of the study area are assessed under the following categories, namely:

CONSTRUCTION PHASE

Activity 1. Construction of the planned infrastructure and activities impacting the drainage line.

Aspect 1.1 Presence of construction staff and construction activities.

Impact 1.1: Site clearing and manipulating topsoil. Cleared areas are prone to erosion which will cause siltation in the drainage line.

The clearance of vegetation for buildings, infrastructure and access roads will require clearing and earthworks to enable levelling and contouring of the site, which implies the movement or removal of topsoil and sub-surface material. This will alter the ground level and topography of the site. Changes to natural drainage patterns may be created by the construction.

Vegetation clearing (exposed soil surfaces) and compacted surfaces (access roads) may alter the hydrological nature of the area by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate into the soils (where vegetation is cleared, compaction takes place, and where hard surfaces are constructed), which escalates the potential for erosion and sedimentation to occur.

Should erosion occur, it will result in the loss of valuable soil. During the operational phase of the development, the potential for soil erosion also exists in areas where water may be concentrated such as during the rain periods.

Mitigation: Demarcate strict no-go areas around sensitive environments including, watercourses and large trees. Site layout must not impact the river bank, particularly bank stability.

Any construction required at the ephemeral drainage line should ensure surface water flows freely and that erosion is adequately managed long term. Prevent the infilling and sedimentation of local watercourses, jeopardising flow patterns when flow occur during the rainy seasons.

Strict measures must be taken to prevent erosion and sediment-laden water from entering the adjacent watercourses. These measures should include:

- minimising the clearing areas and the removal of topsoil, stockpiling, covering and reuse of topsoil where re-establishment of vegetation on cleared areas is possible,
- re-establishment of indigenous vegetation wherever possible (particularly where riparian zones have been disturbed for watercourse crossings by fence line, pipeline or roads),
- Control of stormwater run-off (in accordance with a stormwater management plan) and ongoing repair and stabilisation of any erosion.

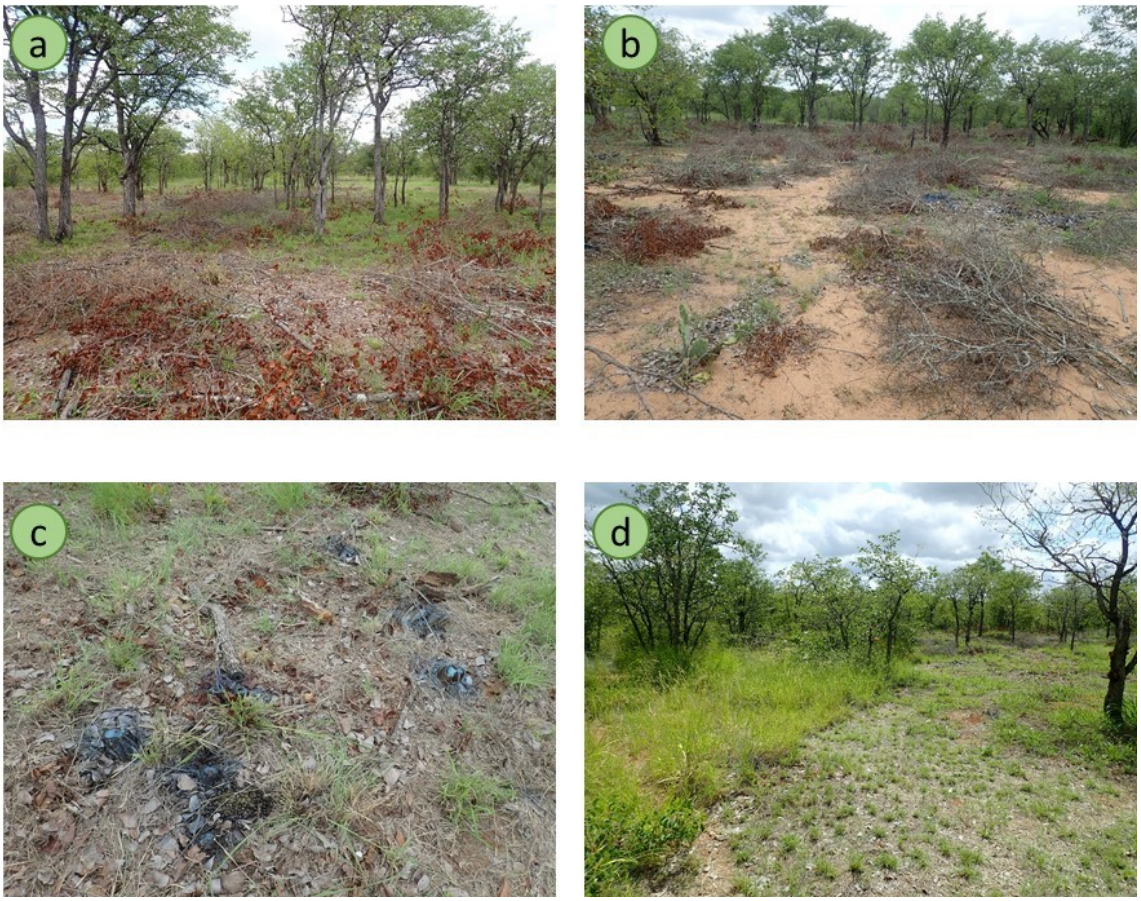


Figure 18: Vegetation clearing

18a. The areas earmarked for the housing and the wellness centre have been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape.

18b. Cleared brush are left on the ground to act as cover and slow down some of the flows during rain events and thus delay erosive forces.

18c. Poisoning of root stock and cut down stumps prevent coppicing.

18d. Slashing herbaceous vegetation leaves rootstock intact to bind the soil.

Table 8: Outcome of Impact 1.1 risk assessment according to the Risk Assessment Matrix.

Significance	Risk Rating	Confidence level
32	Low	4

Impact 1.2: Physical impact on the water course.

The following infrastructure are planned to be constructed close to the drainage line (Figure 4):

- Wellness retreat,
- some of the staff housing
- and 2 new suites.

Construction activities near the drainage line will have the following potential impacts on the drainage area:

- Removal of large trees will impact on the ecology of the area, specially around the drainage line.
- Clearing of vegetation will create open areas susceptible to erosion.
- Erosion of cleared, trampled or compacted surfaces will create erosion gulleys and silt will be washed into drainage lines.
- The collection and removal of rocks, stones, grit, sand or gravel from the riverine environment will impact on the habitat composition of the local ecosystem.

Mitigation: According to the Site-based Buffer tool (Section 2.3.4.4), a 10 m buffer should be implemented between these structures and the edge of the drainage line. The buffer should be demarcated and in place at the start of construction and adhere to throughout the operational phase.

Once a site plan (which will include the buffers) has been submitted and authorised by the ECO, the contractor will proceed with necessary vegetation clearing and/ pruning within the marked development footprint. Demarcation is to be maintained and left in place for the duration of works. No workers are to leave site or have access to the surrounding areas. The contractor is to take all efforts to minimise the amount of vegetation that is cleared. No large riparian or terrestrial trees should be damaged or removed.

All materials for building must be sourced off site from sustainable and appropriately licensed source (sand, stone etc.). Refrain from removing any natural material or structures from the riverine environment, such as rocks, stones, grit, sand, gravel, dead trees or tree trunks. These components act as natural habitat for the ecosystem after the completion of the project.

Table 9: Outcome of Impact 1.2 risk assessment according to the Risk Assessment Matrix.

Significance	Risk Rating	Confidence level
26	Low	5

Impact 1.3: Pollution of the drainage line due to construction activities.

During construction, hydrocarbons leaking from construction vehicles, refuelling depots and concrete mixing areas, may result in the contamination of soils, leaving the soil sterile or at risk of leaching contamination to surface or ground water.

Stockpile areas for construction material, generation and disposal of building waste and liquids and vehicle maintenance could have a negative impact on ground water, surface water and the environment as a whole.

Mitigation: A generic buffer should be implemented to protect the drainage line from pollution and siltation due to construction activities:

A buffer must be implemented between the development and surrounding environment. This buffer must include:

- Construction camps, storage areas, soil stockpile areas and laydown areas must be located at least 20m away from the riparian zone.
- Prohibit the dumping of excavated material within the riparian zone or within 20m of the riparian zone. Spoil material must be appropriately disposed of at a registered waste disposal facility.
- Portable toilets must be located at least 20m from surrounding watercourses.
- Strictly prohibit the movement of heavy vehicles, machinery and guests within the infiltration and evapotranspiration area.

Storage and construction material

The following must be adhered to:

- All stockpile sites to be approved by the ECO and/or landowner, prior to commencement of stockpiling.
- All stockpile sites to be properly demarcated with silt-fences and/or danger tape, where necessary.
- Silt protection measures around stockpile sites may be required.
- All construction material should be stored within the site camp / boundary (if space allows it).
- No construction material is to be stored outside of the site camp / boundary without written permission from the appropriate landowner.
- No hazardous materials to be stored on site like diesel, petrol etc. without approval by the ECO.

Table 10: Outcome of Impact 1.3 risk assessment according to the Risk Assessment Matrix.

Significance	Risk Rating	Confidence level
24	Low	4

Impact 1.4: Sewage effluent due to presence of construction personnel.

Temporary ablution facilities for the construction crew have the potential to impact on surface water in the form of chemicals, pathogens and nutrients. Additional sewage requirements of construction team may have impacts on the surrounding environment if not managed effectively.

Mitigation: Portable chemical toilets are acceptable where flushing toilets cannot be provided. Chemical toilets are most common on short-term or smaller construction sites.

Portable construction toilets take up very little space and are easy to transport around large building sites as needed. Chemical toilets are also entirely self-contained, with no need for a mains water system.

The number of toilets required depends on the number of workers on the site, and the ratio of males to females. If you are using chemical toilets, the standard is one plastic construction toilet to every seven individuals working a 40-hour week.

Toilets and washing facilities require routine cleaning. Using a portable toilet hire company is often the best way to ensure your construction site toilets are serviced regularly. Portable toilets for construction sites are usually only serviced once a week as part of a hire contract. Depending on the frequency of use, cleaning might be needed more often, or you may require more units on the site.

Impact 1.5: Clearing fence lines and erecting new fences.

Clearing fence lines will result in vegetation clearing.

Mitigation: Care should be taken to refrain from removing large trees. The fence should also adhere to the 10 m drainage line buffer.

Table 11: Outcome of Impact 1.5 risk assessment according to the Risk Assessment Matrix.

Significance	Risk Rating	Confidence level
24	Low	5

Activity 2: Re-routing the road around the project area and creating a new stream crossing through the drainage line.

Aspect 2.1 Constructing an access road and a drainage line crossing.

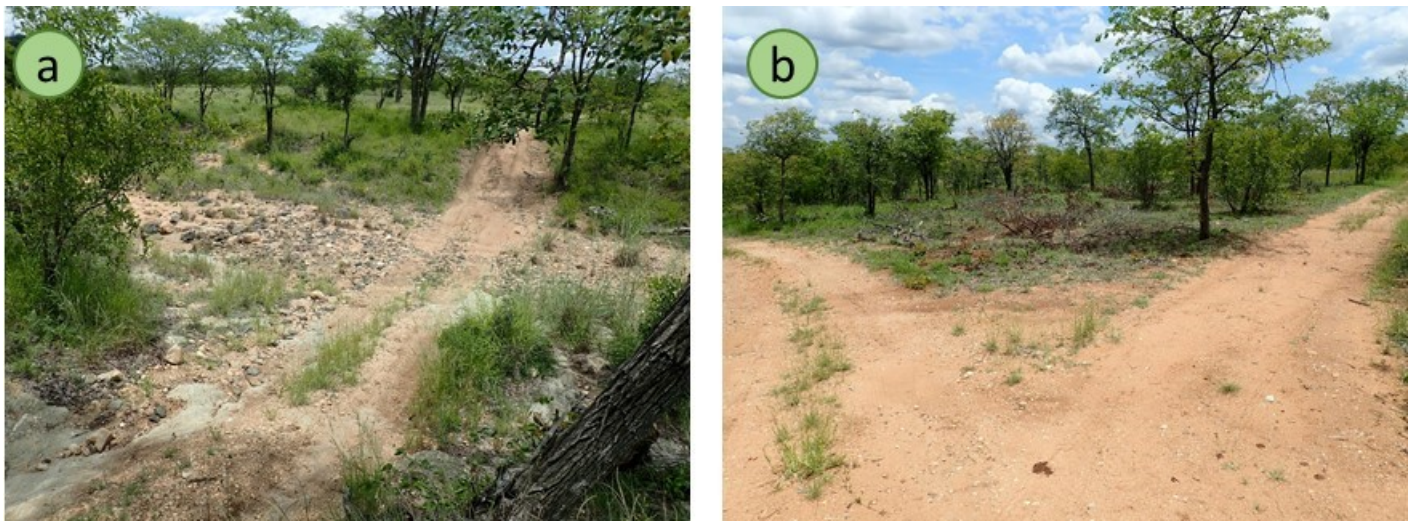


Figure 19: Current route to the drainage line crossing.

19a. The current drainage line crossing.

19b. The current route to the drainage line crossing (track to the left).

Impact 2.1: The current crossing forms part of the reserve's road network and a new crossing will be needed to replace this drainage line crossing. Figure 19b shows the current route to the left which leads to the drainage line crossing and which will be neutralised by the new development. The route to the right might become the alternative route, but this will be extended towards the drainage line and the creation of a new drainage line crossing further downstream.

Access routes and tracks can have a significant impact on ecosystems, particularly in terms of erosion and sedimentation of local watercourses, if not mitigated properly. Erosion of cleared and bare areas leads to sedimentation into the water course. Issues and areas of concern related to the siting and design of the road and crossing are:

- The presence and distribution of sensitive soils, notably clay / duplex soils.
- Drainage channels and river crossings.
- Areas of protected species.

Mitigation: Only the construction of two-spoor track type roads will be allowed. These proposed two-spoor tracks will be categorised as all-weather roads. The route should be clearly marked out on site by the ECO and Project manager prior to any vegetation clearing taking place in order to prevent unnecessary vegetation removal. Use existing roads whenever possible.

Road construction should not impact any large indigenous trees, especially protected species. Avoid sensitive areas. Areas may be sensitive because of conflicts with other resources or because of problems in construction or reclamation. Some examples of sensitive areas are:

- Highly erodible areas, that is, fine-textured soils, steep slopes (Table 1).
- Areas directly visible from recreational areas (camp sites).

The current drainage line crossing proof to be an acceptable and very stable crossing. Unvented fords are best suited for ephemeral or intermittent streams (streams that are dry most of the year). Therefore, it is proposed that a similar area be located downstream and the same procedures should be applied to create a similar crossing with the least impact on the drainage line morphology and minimum impact on the habitats present.

Table 12: Outcome of Impact 2.1 risk assessment according to the Risk Assessment Matrix.

Significance	Risk Rating	Confidence level
52.5	Low	4

OPERATIONAL PHASE

Activity 3: Operation of the extended and new infrastructure

Aspect 3.1 Increase of sewage effluent due to additional facilities for the staff housing and wellness centre.

Impact 3.1: When nutrients such as nitrogen and phosphorus are discharged from septic systems into the groundwater, they represent a potentially important nonpoint source of pollution to the drainage line.

The additional sewage facilities could negatively affect the associated watercourse due to inter alia inadequately treated effluent, a risk associated with the passive biological treatment process of septic tanks.

Poorly maintained septic tanks can result in nutrient-rich runoff being discharged. These wastes create unfavourable conditions for native vegetation and encourage growth of weeds.

Mitigation: In order to improve the level of wastewater treatment and minimize the ‘amount of disease organisms, nutrients, and chemicals that enter ground and surface waters, the

system must be in proper working order, follow simple maintenance procedures, and conserve water.

- Ensure that the facility sewage system is maintained in a sanitary and operational state.
- Ensure that the facility sewage system is not overloaded, and that it functions within its design capacity.
- Take action to reduce output or increase capacity if necessary.
- Ensure that measures are put in place to prevent all leaks and spills.
- Repairs to the sewage system must be done immediately.
- In the event of a failure or overflow situation at the waste water treatment plant, implement a back-up system which will ensure that no sewage is discharged into the environment.
- Regular removal of sludge from the septic tanks by a licenced contractor (if required).
- Ensure that all treated effluent meets or exceeds South African water quality regulations prior to discharge or reuse.

Table 13: Outcome of Impact 3.1 risk assessment according to the Risk Assessment Matrix.

Significance	Risk Rating	Confidence level
47.5	Low	3

Aspect 3.2: Storm water

Impact 3.2: Storm water has the potential to increase soil erosion.

Diversion of stormwater may result in large volumes of water being concentrated in certain areas, thereby increasing the risk of erosion. Erosion of the soil surface greatly increases the risk of losing topsoil to erosion, impairing the soils' ability to support vegetation growth.

Diversion of stormwater may result in large volumes of water being concentrated in certain areas, thereby increasing the risk of erosion. Concentrated stormwater deriving from the infrastructure hard surfaces will result in erosion and siltation of stream beds.

Mitigation: Storm water management should be undertaken in order to prevent erosion, to protect water sources from siltation and to preserve the ecosystems of watercourses. The introduction of efficient stormwater drainage systems to deal with the erosion and siltation problem implies that the runoff must be conveyed as efficiently as possible to the natural watercourses.

It is suggested that Best Practice Guidelines and Specifications relating to stormwater management should be used to implement measures to slow down flows channelled through the camp, right from where the fence start at the eastern boundary. Paving of areas should be kept to a minimum.

Figure 20: Current route to the drainage line crossing.

20a. An erosion furrow leading from the camp area towards the drainage line.

20b. Some bare areas created by surface flows and erosion.

20c. Areas in the current camp, illustrating the risk of erosion and gulley formation.

Table 14: Outcome of Impact 3.2 risk assessment according to the Risk Assessment Matrix.

Significance	Risk Rating	Confidence level
40.5	Low	4

Aspect 3.3: Alien invasive vegetation.

Impact 3.3: The control of weeds and invasive alien species on the development site is the responsibility of the developer.

The removal of indigenous plant species predisposes the disturbance footprint to alien plant invasion. Competing with indigenous plant species and further transform the natural habitat. This makes future rehabilitation/re-vegetation difficult and favours colonising species like invasive aliens.

Increased human activity may result in introduction of alien invasive species.

Mitigation: Maintain a long-term strategy of invasive alien plant eradication for the site linked to the Reserve management.

Control exotics and invasive plants to be eradicated. Following the completion of any works, the user must ensure that all disturbed areas are:

(i) cleared of alien invasive vegetation;

(ii) re-vegetated with indigenous and endemic vegetation suitable to the area.

Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Rehabilitate all identified areas as soon as practically possible, utilising specified methods and species. Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge.

Chemical eradication: Ensure that only properly trained people handle and make use of chemicals. Follow manufacturer's instruction when using chemical methods, especially in terms of quantities, time of application etc.

Table 15: Outcome of Impact 3.4 risk assessment according to the Risk Assessment Matrix.

Significance	Risk Rating	Confidence level
40.5	Low	4

2.5.1 to 2.5.6 Impact Assessment Aspects

Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions (2.5.1 to 2.5.6 below):

2.5.1 Maintaining the priority aquatic ecosystem.

Question: Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?

A: Yes, no significant adverse impact has been predicted during the study and impact assessment that could jeopardise the surrounding environment.

2.5.2 Maintaining the priority aquatic ecosystem.

Question: Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?

A: Yes. There are no RQOs established for the drainage line. The absence of aquatic biota means that no aquatic fauna will be influenced by the project. Should the mitigation proposed for the project is adhered to, riverine vegetation should also remain intact. Water quality and flows will also be unchanged by the construction and operational phases as supported by the Risk Assessment (Section 2.5).

2.5.3 Impact on fixed and dynamic ecological processes.

Question: How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:

a. Impacts on hydrological functioning.

Impact: Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g., suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes);

A: Since this is an ephemeral drainage line which only flows during high rainfall events, there will be no changes to flood regimes.

b. Sediment regime.

Impact: Will the proposed development change the sediment regime of the aquatic ecosystem and its sub-catchment (e.g., sand movement, meandering river mouth or estuary, flooding or sedimentation patterns);

A: Should the mitigation proposed for the project is adhered to, the sediment regime of the aquatic ecosystem and its sub-catchment will not be affected.

c. Modification in relation to the overall aquatic ecosystem.

Impact: What will the extent of the modification in relation to the overall aquatic ecosystem be (e.g., at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.)?

A: No modification is expected. The drainage line is an ephemeral system that only flows during high rainfall events and thus very rarely contains aquatic habitats.

d. Risks associated with water uses.

Impact: To what extent will the risks associated with water uses and related activities change?

A: None. The downstream reach of the drainage line runs through wilderness areas similar to the project area. Since there are no adverse impacts stemming from the Kateka project area, none of the camps along the drainage line in the lower reach of the system will be affected.

2.5.4 Impact on the functioning of the aquatic feature stated

Question: How will the proposed development impact on the functioning of the aquatic feature? This must include:

a. Base flows.

Impact: On base flows (e.g., too little or too much water in terms of characteristics and requirements of the system).

A: The drainage line is an ephemeral system that only flows during high rainfall events and thus very rarely contains surface flows. No infrastructure or interference is planned to be present in the drainage line apart of the river crossing that will consist of a natural rocky bottom.

b. Quantity of water.

Impact: The quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g., seasonal to temporary or permanent; impact of over-abstraction or instream or off-stream impoundment of a wetland or river).

A: The mitigation of any pollution, including hazardous substances and sewage effluent will all be mitigated to “Low” impact. The fact that the drainage line is an ephemeral system, treated

effluent that reaches the deep sandy alluvium of the drainage, will improve in quality with time. Thus, no surface water will be influenced by the camp activities.

c. Change in the hydrogeomorphic typing.

Impact: The change in the hydrogeomorphic typing of the aquatic ecosystem (e.g., change from an unchannelled valley-bottom wetland to a channelled valley-bottom wetland).

A: Camp activities will have very little influence on the drainage line, be it morphological or hydrological.

d. Quality of water.

Impact: The quality of water (e.g., due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);

A: Should the mitigation proposed for the project is adhered to, the sediment regime of the aquatic ecosystem will not be affected significantly, and the effluent input will be of "Low" risk.

e. Ecological connectivity.

Impact: The fragmentation (e.g., road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal).

A: The river crossing that will consist of a natural rocky bottom integrated into the river bed, will be the only physical structure in the drainage line and it will have no influence on the system to influence its connectivity.

f. Loss or degradation of all or part of any unique or important features.

Impact: The loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g., waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);

A: The drainage line is an ephemeral system that only flows during high rainfall events and thus very rarely contains surface flows. There is no indication that the system will change in any aspect, and at least not by the activities in the Kateka Lodge project area.

2.5.5 Impact on key ecosystems regulating and supporting services especially:

Question: How will the proposed development impact on key ecosystems regulating and supporting services especially:

(a) Flood attenuation: There is no indication that any activity in the project area will influence the drainage system in such a way that it will have an impact on flood attenuation or other flows.

(b) Streamflow regulation: There is no indication that any activity in the project area will influence the drainage system in such a way that it will have an impact on streamflow regulation or other flows.

(c) Sediment trapping: There is no indication that any activity in the project area will influence the drainage system in such a way that it will have an impact on sediment trapping. The river crossing that will consist of a natural rocky bottom which is integrated into the river bed, will be the only physical structure in the drainage line and it will have no influence on the throughflow in the system.

(d) Phosphate assimilation: There is no reason to believe that the construction or presence of the camp will have an impact on any water quality parameter in the river reach. Should run-off from the camp reach the drainage line, it will seep away into the alluvial deposits of the drainage line bed.

(e) Nitrate assimilation: There is no reason to believe that the construction or presence of the camp will have an impact on any water quality parameter in the river reach. Should run-off from the camp reach the drainage line, it will seep away into the alluvial deposits of the drainage line bed.

(f) Toxicant assimilation: There is no reason to believe that the construction or presence of the camp will have an impact on any water quality parameter in the river reach.

(g) Erosion control: According to the impact assessment, mitigation to erosion aspect will be mitigated to "Low".

(h) Carbon storage: There is no reason to believe that the construction or presence of the camp will have an adverse impact on carbon storage in the river reach.

2.5.6 How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?

A: Due to the lack of surface water or regular flows in this ephemeral system, no aquatic fauna is present. The riparian zone is naturally scant and mixed with terrestrial species due to the deeper subsurface water.

There is thus no reason to believe that the proposed development will impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the drainage line environment.

2.6. In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered.

A: Not applicable to this project.

2.7 Aquatic Biodiversity Specialist Assessment Report

The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the information summarised in Table 16.

Minimum Requirements for Specialist Assessments (see below)

The protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity.

This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on aquatic biodiversity for activities requiring environmental authorisation.

Table 16:	Specialist reports Checklist
	Requirements for Specialist Reports: Published in Government Notice No. 320; Government Gazette 43110**;** 20 March 2020
2.7	The findings of the specialist assessment must be written up in an **Aquatic Biodiversity Specialist Assessment Report** that contains, as a minimum, the following information:
2.7.1	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;
2.7.2.	a signed statement of independence by the specialist;
2.7.3.	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
2.7.4.	the methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;
2.7.5.	a description of the assumptions made any uncertainties or gaps in knowledge or data;
2.7.6.	the location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;
2.7.7.	additional environmental impacts expected from the proposed development;
2.7.8.	any direct, indirect and cumulative impacts of the proposed development on site;
2.7.9.	the degree to which impacts and risks can be mitigated;
2.7.10.	the degree to which the impacts and risks can be reversed;
2.7.11.	the degree to which the impacts and risks can cause loss of irreplaceable resources;
2.7.12.	a suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;
2.7.13	. proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);
2.7.14.	a motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a “low” aquatic biodiversity sensitivity and that were not considered appropriate;
2.7.15	. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and
2.7.16.	any conditions to which this statement is subjected.

The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP), with expertise in the field of aquatic sciences.

For detail of the Registered Specialist, see Section 2.1.

2.7.1 Details of the Specialist

2.7.1.1 Contact details of the specialist:

Dr Andrew Deacon
Cell: 082 325 5583
Email: andrew@nethog.co.za
PO Box 784, Malalane, 1320

Registered with the South African Council for Natural Scientific Professions (SACNASP). Registration number: 116951

2.7.1.2 Field of expertise: Freshwater Ecologist

2.7.1.3 Curriculum vitae

Dr Andrew Deacon (PhD Zoology) worked as a researcher at Scientific Services, South African National Parks (SANParks, 1989 - 2012). He was initially employed as an Aquatic ecologist to coordinate the multidisciplinary KNP Rivers Research Programme, but later was tasked to manage the monitoring and research programmes for small vertebrate ecology in 15 South African National Parks (including Addo-, Kalahari- and Kruger NP).

As a recognised scientist in the fields of Ichthyology and Terrestrial Ecology, he is currently engaged as a specialist consultant regarding ecological studies. He was involved in numerous research programmes and projects and produced EIA specialist reports (aquatic or terrestrial ecology) for 82 projects. Additionally, he also participated in Aquatic ecosystem projects, Environmental Water Requirement Studies and Faunal and ecosystems monitoring projects.

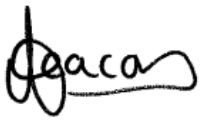
Apart from multiple environmental projects in South Africa, he has worked on assignments in the Democratic Republic of the Congo, Zambia, Mozambique, Zimbabwe, Namibia and Swaziland. He completed: Wetland Introduction and Delineation Course – Centre for Environmental Management: University of the Free State. He is a registered Professional Natural Scientist (Pr. Sci. Nat.) in the fields of Ecological Science (Reg. no. 116951).

2.7.2 A signed statement of independence by the specialist

DECLARATION

I, Andrew Richard Deacon, declare that I –

- act as an independent specialist consultant in the field of ecological science;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
- have and will not have any vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report; and
- will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.



ANDREW RICHARD DEACON

2.7.3 A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.

The field work has taken place over a period of three days from 10 to 12 January 2022 on an unnamed ephemeral drainage line next to the Kateka Lodge in the Klaserie Private Nature Reserve. The season corresponds with summer when the riparian zone vegetation is in full bloom, enabling identification during riparian surveys.

Since seasonal changes do not influence the presence of aquatic fauna (fish and macro-invertebrates) significantly, aquatic surveys are not directed by seasonality. The ability to survey rivers safely when the water levels are low, is paramount for instream surveys, especially where crocodiles and hippos are present.

However, due to the lack of surface water or regular flows in this ephemeral system, no aquatic fauna was present. The riparian zone is naturally scant and mixed with terrestrial species due to the deeper subsurface water.

During the site visit the area experienced a heavy rainfall event and the system started to flow. However, before any aquatic species could react to the flow, the stream disappeared into the alluvial bed.

2.7.4 Methodology

The methodology used to undertake the site inspection and the specialist assessment, (including equipment and modelling used, where relevant), are described in the following section.

2.7.4.1 Screening Report

The National Web based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an application for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity.

The Screening Tool also provides site specific EIA process and review information, for example, the Screening Tool may identify if an industrial development zone, minimum information requirement, Environmental Management Framework or bio-regional plan applies to a specific area.

Finally, the Screening Tool allows for the generating of a Screening Report referred to in Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended whereby a Screening Report is required to accompany any application for Environmental Authorisation and as such the tool has been developed in a manner that is user friendly and no specific software or specialised GIS skills are required to operate this system.

A screening report was done for an environmental authorization or for a part two amendment of an environmental authorisation as required by the 2014 EIA regulations, evaluating the proposed development footprint for environmental sensitivity.

2.7.4.2 Site Sensitivity Verification Report

2.7.4.2.1 The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist (Protocol 2.1).

2.7.4.2.2 The site sensitivity verification must be undertaken through the use of (Protocol 2.2):

(a) a desk top analysis, using satellite imagery;

(b) a preliminary on-site inspection; and
(c) any other available and relevant information.

2.7.4.2.3 The outcome of the site sensitivity verification must be recorded in the form of a report that (Protocol 2.3):

(a) confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;

(b) contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and

(c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

2.7.4.3 Aquatic biodiversity and ecosystems

Due to the lack of surface water or regular flows in this ephemeral system, no aquatic fauna was present. The riparian zone is naturally scant and mixed with terrestrial species due to the deeper subsurface water. Because of the natural absence of the aquatic and marginal ecosystems, the following acknowledged methodology could not be implemented.

2.7.4.3.1 Aquatic ecosystem types
Aquatic Ecosystem Classification
Aquatic Habitat Assessments
2.7.4.3.2 Aquatic biota surveys
Aquatic invertebrate assessment
Macro-invertebrate Response Assessment Index: MIRAI
Fish communities - Fish Response Assessment Index (FRAI)
Ecological State of the Water Course

Riparian delineation

It is important to differentiate between wetlands and riparian habitats. Riparian zones are not wetlands, however, depending on the ecosystem structure, wetlands can also be classified as riparian zones if they are located in this zone (e.g., valley bottom wetlands). Although these distinct ecosystems will be interactive where they occur in close proximity it is important not to confuse their hydrology and eco-functions.

Riparian delineations are performed according to *"A practical field procedure for identification and delineation of wetlands and riparian areas"* as amended and published by the Department of Water Affairs and Forestry (2005); (Henceforth referred to as DWAF Guidelines (2005).

Aerial photographs and land surveys were used to determine the different features and riparian areas of the study area. Vegetation diversity and assemblages were determined by completing survey transects along all the different vegetation communities identified in the riparian areas.

Riparian areas are protected by the National Water Act (Act 36 of 1998), which defines a riparian habitat as follows:

> *"Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas."*

Riparian areas include plant communities adjacent to and affected by surface and subsurface hydrologic features, such as rivers, streams, lakes, or drainage ways. Due to water availability and rich alluvial soils, riparian areas are usually very productive.

Tree growth rate is high and the vegetation is lush and includes a diverse assemblage of species. The delineation process requires that the following be taken into account:

- Topography associated with the watercourse;
- Vegetation;
- Alluvial soils and deposited material.

A typical riparian area according to the DWAF Guidelines (2005) is illustrated in Figure 21.

In addition to the DWAF Guidelines (2005) and DWAF updated manual (2008), the unpublished notes: *Draft riparian delineation methods prepared for the Department of Water Affairs and Forestry, Version 1* (Mackenzie & Rountree, 2007) were used for classifying riparian zones encountered on the property according to the occurrence of nominated riparian vegetation species.

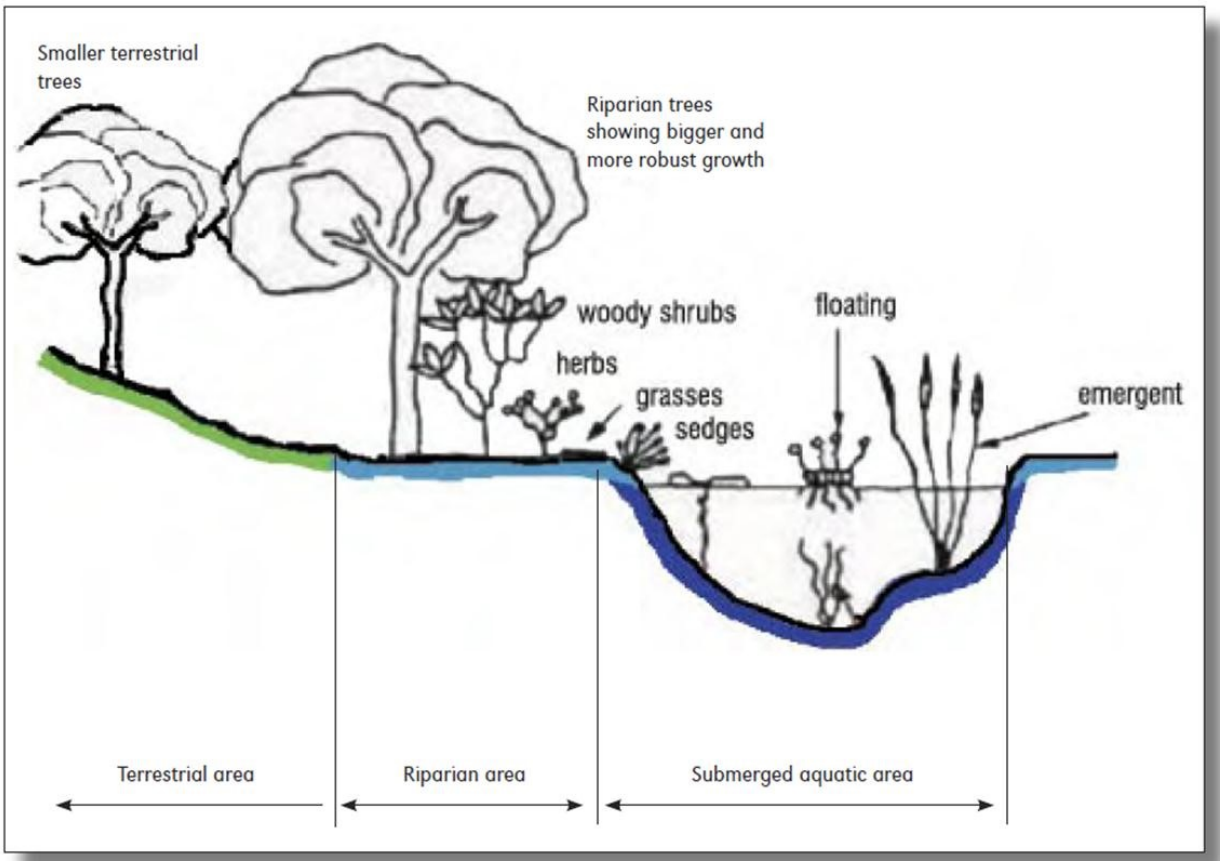


Figure 21: A cross section through a typical riparian area (DWAF Manual, 2008).

Buffers

Aquatic buffer zones are typically designed to act as a barrier between human activities and sensitive water resources thereby protecting them from adverse negative impacts. Buffer zones associated with water resources have been shown to perform a wide range of functions, and on this basis, have been proposed as a standard measure to protect water resources and associated biodiversity (Macfarlane et al, 2015). These functions include:

- Maintaining basic aquatic processes;
- Reducing impacts on water resources from upstream activities and adjoining land uses;
- Providing habitat for aquatic- and semi-aquatic species;
- Providing habitat for terrestrial species; and
- A range of ancillary societal benefits.

Due to their positioning adjacent to water bodies, buffer zones associated with streams and rivers will typically incorporate riparian habitat. Riparian habitat, as defined by the NWA, includes the physical structure and associated vegetation of the areas associated with a watercourse. These areas are commonly characterised by alluvial soils (deposited by the current river system) and 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 (Macfarlane et al, 2015).

However, the riparian zone is not the only vegetation type that lies in the buffer zone as the zone may also incorporate stream banks and terrestrial habitats depending on the width of the aquatic impact buffer zone applied. A diagram indicating how riparian habitat typically relates to aquatic buffer zones defined in this guideline is provided in Figure 22.

Once an aquatic impact buffer zone has been determined, management measures need to be tailored to ensure buffer zone functions are maintained for effective mitigation of relevant threat/s. Management measures must therefore be tailored to ensure that buffer zone functions are not undermined. Aspects to consider include:

- Aquatic impact buffer zone management requirements;
- Management objectives for the aquatic impact buffer zone; and
- Management actions required to maintain or enhance the aquatic impact buffer zone in line with the management objectives. Activities that should not be permitted in the aquatic impact buffer zone should also be stipulated.

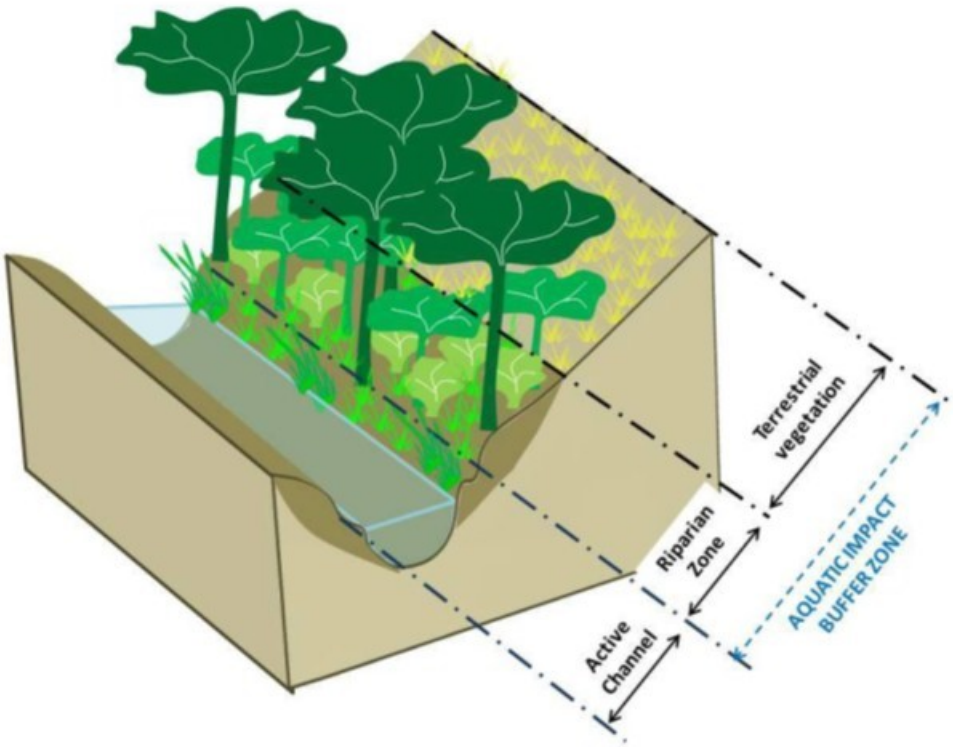


Figure 22: Schematic diagram indicating the boundary of the active channel and riparian habitat, and the areas potentially included in an aquatic impact buffer zone (Macfarlane et al, 2015).

Determining appropriate management and monitoring of buffer zones

A series of Excel based Buffer Zone Tools have been developed to help users determine suitable buffer zone requirements (Macfarlane and Bredin, 2017). These include a rapid desktop tool for determining potential aquatic impact buffer zone requirements together with three site-based tools for determining buffer zone requirements for rivers, wetlands and estuaries. Central to these tools is a buffer model, which is populated automatically from the data capture sheets provided. This is based on best available science and is used to generate buffer zone recommendations as part of the assessment process. The Overview of the stepwise assessment process for buffer zone determination (Macfarlane and Bredin, 2017) is illustrated if Figure 23.

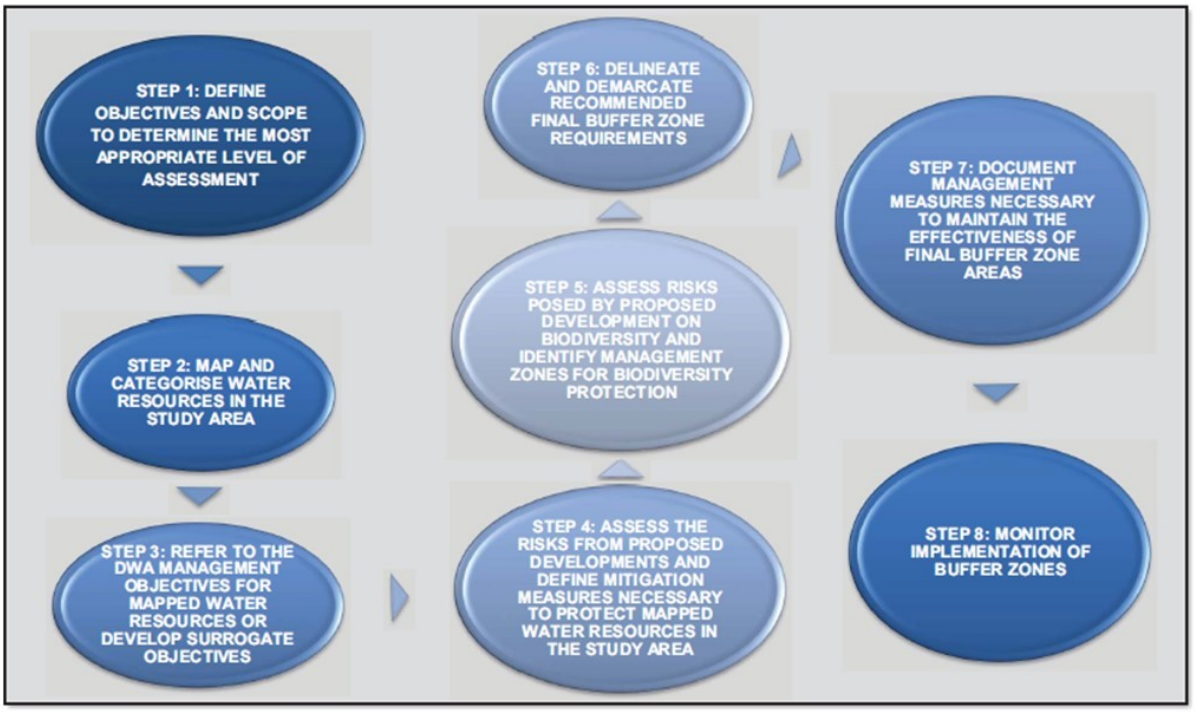


Figure 23: Overview of the stepwise assessment process for buffer zone determination (Macfarlane and Bredin, 2017).

Once a final buffer zone area has been determined, appropriate management measures should be documented to ensure that the water quality enhancement and other buffer zone functions, including biodiversity protection, are maintained or enhanced. Key aspects addressed include:

- Demarcating buffer zones.
- Defining suitable management measures to maintain buffer functions.
- Reviewing the need to integrate protection requirements with social and development imperatives.
  Monitoring to ensure that buffer zones are implemented and maintained effectively.

2.7.4.3 Spatial data sets that indicate Critical Biodiversity Areas

To establish how important the site is for meeting biodiversity targets, a number of resources and tools are used as prescribed by the Mpumalanga Biodiversity Sector Plan (MBSP Handbook, Lötter *et al.* 2014). Specifically, the Land-Use Decision Support Tool (LUDS) and the Limpopo Conservation Plan are extensively used to compile the LUDS Report (BGIS, 2016). LUDS was developed to facilitate and support biodiversity planning and land-use decision-making at a national and provincial level. Its primary objective is to serve as a guideline for biodiversity planning but should not replace specialist ecological assessments.

Critical Biodiversity Areas (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. If these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be

met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

Land-Use Decision Support Tool (LUDS)

To establish how important the site is for meeting biodiversity targets, it is necessary to answer the following three simple but fundamentally important questions:

- How important is the site for meeting biodiversity objectives (e.g., is it in a **Critical Biodiversity Areas** (CBA) or Ecological Support Area (ESA)?
- Is the proposed land-use consistent with these objectives or not (to be checked against the land-use guidelines)?
- Does the sensitivity of this area trigger the requirements for assessing and mitigating environmental impacts of developments, or in terms of the listed activities in the EIA regulations?

Risk Assessment using the Risk Matrix

In terms of the new Government Gazette Notice, GN 509 in GG 40229 of 26 August 2016 (*General Authorisations for impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse), Regulation 7*:

Assessment of risk and mitigation factors

It is required that the following documents and associated spread sheets be used during the assessment of risk and mitigation of risks:

(a) A Practical Field Procedure for Delineation of Wetlands and Riparian Area (2005) which is available on the Department's website http:/ /www.dws.gov.za, under water use authorization in terms of section 21 (c) or (i) of the Act;

(b) Appendix A (Excel Spreadsheet) and information regarding the method used in Appendix A is contained in the Department of Water and Sanitation 2015 publication: Section 21(c) and (i) water use Risk Assessment Protocol, which is available on the Department's website http: / /www.dws.gov.za, under section 21(c) and (i) water use authorization.

(c) Guideline: Assessment of activities /developments affecting wetlands, which is available on the Department's website http: / /www.dws.gov.za, under section 21 (c) and (i) water use authorization.

(d) Guideline for the determination of buffer zones for rivers, wetlands and estuaries, which is available on the Department's website http: / /www.dws.gov.za, under water use authorization in terms of section 21 (c) and (i) of the Act.

The DWS Risk assessment protocol was obtained from GN 509. Risk posed to "resource quality", as defined in the NWA, must be scored according to the Risk Rating Table for Severity (Table 17). A Severity score is then generated. Consequence, Likelihood and finally Significance scores are automatically calculated with the rest of parameters according to respective Risk Rating Tables (Tables 17-21).

Risk is determined after considering all listed control/mitigation measures. Borderline LOW /MODERATE risk scores can be manually adapted downwards up to a maximum of 25 points (from a score of 80) subject to a listing of additional mitigation measures considered and listed in RED font. ONLY LOW RISK ACTIVITIES located within the regulated area of the

watercourse will qualify for a General Authorisation (GA) according to GN 509. Medium and High risk activities will require a Section 21 (c) and (i) water use license. The risk rating is determined by combined scores from the following matrix components (Tables 17-21):

Consequence= Severity + Spatial Scale + Duration
Likelihood = Frequency of the Activity+ Frequency of the Impact + Legal Issues + Detection
Risk = Consequence x Likelihood

Table 17: Severity - How severe do the aspects impact on the resource quality (flow regime, water quality, geomorphology, biota, and habitat)? Derived from the DWS Risk Matrix Impact Assessment method (GN 509).

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland. The score of 5 is only compulsory for the significance rating.	

Table 18: Spatial scale - How large is the area that the aspect is impacting on? Derived from the DWS Risk Matrix Impact Assessment method (GN 509).

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional/neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5

Table 19: Duration -How long does the aspect impact on the resource quality? Derived from the DWS Risk Matrix Impact Assessment method (GN 509).

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5
PES and EIS (sensitivity) must be considered.	

Table 20: Frequency of the activity - How often do you do the specific activity? Derived from the DWS Risk Matrix Impact Assessment method (GN 509).

Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

Table 21: Frequency of the incident/impact - How often does the activity impact on the resource quality? Derived from the DWS Risk Matrix Impact Assessment method (GN 509).

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

2.7.5 A description of the assumptions made and any uncertainties or gaps in knowledge or data.

- Whilst the author has made every effort to verify that information provided in this report is reliable, accurate and relevant, this report is based on information that could reasonably have been sourced within the time period allocated to the report and is dependent on the information provided by management and/or its representatives.

- Project proponents will always strive to avoid and mitigate potentially negative project related impacts on the environment, with impact avoidance being considered the most successful approach, followed by mitigation. It further assumes that the project proponents will seek to enhance potential positive impacts on the environment.

- Due to the fact that detail mitigation procedures have been presented, it is trusted that the construction team management with the help of the ECO will ensure that these mitigatory measures be implemented where applicable.

2.7.6 to 2.7.16 Minimum information regarding:

2.7.6 The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant.

Synopsis: Two areas to the north and south of the current camp site, was earmarked for development. The Kateka Lodge will include the original, fenced-off Kateka Lodge project area (1.89 ha), with the proposed 2.45 ha extended area. The proposed extensions will be accommodated in areas dominated by mopane woodland, the dominant vegetation type in the area.

The new development will fit in with the current setup of the project area, all along the drainage line with its 10 m buffer between the drainage and the development. Apart from the river crossing downstream of the camp, no development will take place in the drainage line ecosystem.

2.7.7 Additional environmental impacts expected from the proposed development.

Synopsis: All identified impacts have been addressed in detail in the impact assessment section (Section 2.5), and no additional impacts is anticipated.

2.7.8 Any direct, indirect and cumulative impacts of the proposed development on site.

Synopsis: The drainage line will remain in its near pristine state with no future development envisaged. The 10 m buffer will remain in place for the future.

2.7.9 The degree to which impacts and risks can be mitigated.

Synopsis: During the risk assessment, 9 potential impacts were identified. All were successfully mitigated to a “Low” risk rating.

2.7.10 The degree to which the impacts and risks can be reversed.

Synopsis: For 9 potential impacts identified during the risk assessment, all were assigned mitigation measures that reversed potential impacts to “Low” risk rating posed to the resource quality of the watercourse.

2.7.11 The degree to which the impacts and risks can cause loss of irreplaceable resources.

Synopsis: No impact was identified to cause loss of irreplaceable resources during the risk assessment. All the risk assessed were mitigated to a “Low” risk rating.

2.7.12 A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.

Synopsis: By making use of the DWS Buffer Tool Kit, a final aquatic impact buffer of 10m on both sides of the drainage line was establish. The 10 m buffer is situated between the macro-channel bank and the camp fence .

2.7.13 The proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).

Synopsis: All the proposed impact management actions listed in the Risk Matrix in the Environmental Management Programme will be considered and, if applicable, they will be included in the EMPr.

2.7.14 A motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate.

Synopsis: If the mitigation to all the probable impacts (all classified as "Low" risk rating) is implemented and adhered to, both the project footprints will have very little impact on the drainage line. The drainage line itself has a "Low" aquatic biodiversity sensitivity due to its ephemeral nature.

2.7.15 A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not.

Synopsis: By implementing all the suggested mitigation measures and managing the system as prescribed, on a continuous basis, all the impacts will be addressed to a satisfactory level. It is the reasoned opinion that the overall project outcome mitigates all listed impacts satisfactory to a "Low" impact level.

2.7.16 Any conditions to which this statement is subjected.

Synopsis: It is proposed that the project should be authorised with the provision that the mitigation measures prescribed in this document are, where applicable, included in the EMPr.

Summary: A reasoned opinion

The proposed development entails renovations of existing infrastructure, replacing redundant infrastructure and initiate new projects in the expanded project footprint. The proposed Kateka Lodge development includes the original, fenced-off Kateka Lodge project area (1.89 ha), as well as the proposed 2.45 ha extended area.

The ephemeral drainage line runs past the lodge and is a tributary of the Tsiri River. The drainage line comprises a sandy river bed, filled with alluvial sediment and will only be flowing during heavy rainfall events.

Due to the lack of flows and absence of surface water, no aquatic animal species (fish or macro-invertebrates) are able to inhabit the system. Even during the short-lived surface flows, the distance from permanent water and brief inundation of the system, rules out the presence of these groups.

Since the ephemeral drainage line is part of a CBA landscape (Other Natural Areas) and situated in a Protected Area, the Aquatic Biodiversity Theme is rated as "Very High" sensitivity by the screening tool.

According to the initial buffer determination, a buffer of 10 m is required on both sides of the drainage line. This buffer will be initiated to protect the drainage line in its current condition from any degradation. The buffer will be implemented before construction and will be adhered to throughout lodge operation.

The following risks have been identified to potentially impact on the receiving environment:

Construction phase:

- Site clearing and manipulating topsoil. Cleared areas are prone to erosion which will cause siltation in the drainage line.
- Erosion of cleared, trampled or compacted surfaces will create erosion gulleys and silt will be washed into drainage lines.

- Pollution of the drainage line due to construction activities.
- Sewage effluent due to presence of construction personnel.
- Clearing fence lines and erecting new fences.
- Re-routing the road around the project area and creating a new stream crossing through the drainage line

Operational phase

- Increase of sewage effluent due to additional facilities for the staff housing and wellness centre.
- Storm water has the potential to increase soil erosion.
- Alien invasive vegetation - Competing with indigenous plant species and further transform the natural habitat.

All the expected impacts were assessed and all were confirmed to be “Low” or mitigated to attain a “Low” risk level. By implementing all the mitigation measures and managing the system on a continuous basis as prescribed by the Risk Assessment, all the impacts will be addressed to a satisfactory level. Therefore, it is proposed that the project should be authorised with the provision that the mitigation measures prescribed in this document, where applicable, are included in the EMPr

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KATEKA LODGE: THE EXPANSION OF THE EXISTING CAMP FOOTPRINT

Kateka Lodge: An Ecological Assessment for the expansion of the existing camp footprint, Klaserie Private Nature Reserve, Mpumalanga.

Specialist Study: A terrestrial impact assessment for the proposed development.

February 2022

Dr Andrew Deacon (PhD Zoology)

Registered with the South African Council for Natural Scientific Professions
(Registration number: 116951)

Executive summary

The proposed development entails renovations of existing infrastructure, replacing redundant infrastructure and initiate new projects in the expanded project footprint. The proposed Kateka Lodge development includes the original, fenced-off Kateka Lodge project area (1.89 ha), as well as the proposed 2.45 ha extended area.

The following risks have been identified to potentially impact on the receiving environment:

Construction phase:

Construction of the planned infrastructure and activities impacting the environment.

- Site clearing and manipulating topsoil - Cleared areas are prone to erosion.
- Removal of large or protected trees in the footprint.
- Noise, movement, lights and dust disturbing local fauna.
- Pollution of the soil due to construction activities.
- Clearing fence lines and erecting new fences.
- Rehabilitation of demolished infrastructure.

The new route to the drainage crossing.

- Construction a new road to the drainage crossing.

Operational phase

Operation of the extended and new infrastructure

- Storm water has the potential to increase soil erosion.
- Alien invasive vegetation.

After surveying the current footprint and the proposed greenfield areas, it was concluded that no special habitats will be influenced during the development of the proposed project, and that the species composition of plants and animals are similar to the area surrounding the Kateka Lodge.

During the survey of the area in January 2022 no Species of Conservation Concern (SCC) were observed in the camp footprint. This includes both fauna and flora. A number of SCC animal species might visit the immediate area and ever venture into the camp because of the lush tree growth, but none of the larger species are expected to remain in the camp due to the presence of people.

Due to the small size of the footprint, the fence around the camp and the presence of people in the camp area, few SCC animals will make this small tract of land their permanent dwelling. During the survey of the area in January 2022 no SSC faunal species were resident or expected to reside permanently in the camp footprint. It is thus reasoned that no SCC species will be impacted by the project activities.

All the expected impacts were assessed and all were confirmed to be “Low” or mitigated to attain a “Low” risk level. By implementing all the mitigation measures and managing the system on a continuous basis as prescribed by the Risk Assessment, all the impacts will be addressed to a satisfactory level. Therefore, it is proposed that the project should be authorised with the provision that the mitigation measures prescribed in this document, where applicable, are included in the EMPr

Table of Contents

Abbreviations

APNR	Associated Private Nature Reserves
BGIS	Biodiversity Geographic Information System
°C	Degrees Celsius
CBA	**Critical Biodiversity Areas**
Cell	Cell phone
Dr	Doctor
e.g.	For example
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMF	Environmental Management Frameworks
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
ESA	Ecological Support Area
Ha	Hectares
IUCN	International Union for Conservation of Nature
KNP	Kruger National Park
LUDS	Land-Use Decision Support Tool
m	Meter
m^2	Square meter
MBCP	Mpumalanga Biodiversity Conservation Plan
MBSP	Mpumalanga Biodiversity Sector Plan
MTPA	Mpumalanga Tourism and Parks Agency
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management & Biodiversity Act
NSBA	National Spatial Biodiversity Assessment
ONA	Other Natural Areas
PA	Protected Area
PhD	Doctor of Philosophy
Pr. Sci. Nat	Natural Scientific Professionals
Reg. no.	Registration number
SA	South Africa
SACNASP	South African Council for Natural Scientific Professions
SANParks	South African National Parks
SSC	Species of Special Concern
TOPS	Threatened or Protected Species
TOR	Terms of Reference
WMA	Water Management Area

1.3 Details of the Author

Dr Andrew Deacon (PhD Zoology) worked as a researcher at Scientific Services, South African National Parks (SANParks, 1989 - 2012). He was initially employed as an Aquatic ecologist to coordinate the multidisciplinary KNP Rivers Research Programme, but later was tasked to manage the monitoring and research programmes for small vertebrate ecology in 15 South African National Parks (including Addo-, Kalahari- and Kruger NP).

As a recognised scientist in the fields of Ichthyology and Terrestrial Ecology, he is currently engaged as a specialist consultant regarding ecological studies. He was involved in numerous research programmes and projects and produced EIA specialist reports (aquatic or terrestrial ecology) for 82 projects. Additionally, he also participated in Aquatic ecosystem projects, Environmental Water Requirement Studies and Faunal and ecosystems monitoring projects.

Apart from multiple environmental projects in South Africa, he has worked on assignments in the Democratic Republic of the Congo, Zambia, Mozambique, Zimbabwe, Namibia and Swaziland. He completed: Wetland Introduction and Delineation Course – Centre for Environmental Management: University of the Free State. He is a registered Professional Natural Scientist (Pr. Sci. Nat.) in the fields of Ecological Science (Reg. no. 116951).

1. Introduction

1.1 Specialist Terms of Reference

This project proposal is prepared for a Specialist Study: An aquatic and terrestrial impact assessment for the expansion of the existing Kateka Lodge project area, Klaserie Private Nature, Mpumalanga. The Environmental Evaluation concerns the ecological aspects for the proposed expansion and the surrounding environment.

1.2 Background to the project

The brief of the project is to undertake a terrestrial impact assessment for the expansion of the existing infrastructure in the Kateka Lodge project area, Klaserie Private Nature, Mpumalanga.

The proposed development entails renovations of existing infrastructure, replacing redundant infrastructure and initiate new projects in the expanded project footprint. The site plan of the Kateka Lodge as proposed for the new developments is illustrated below (Figure 1).

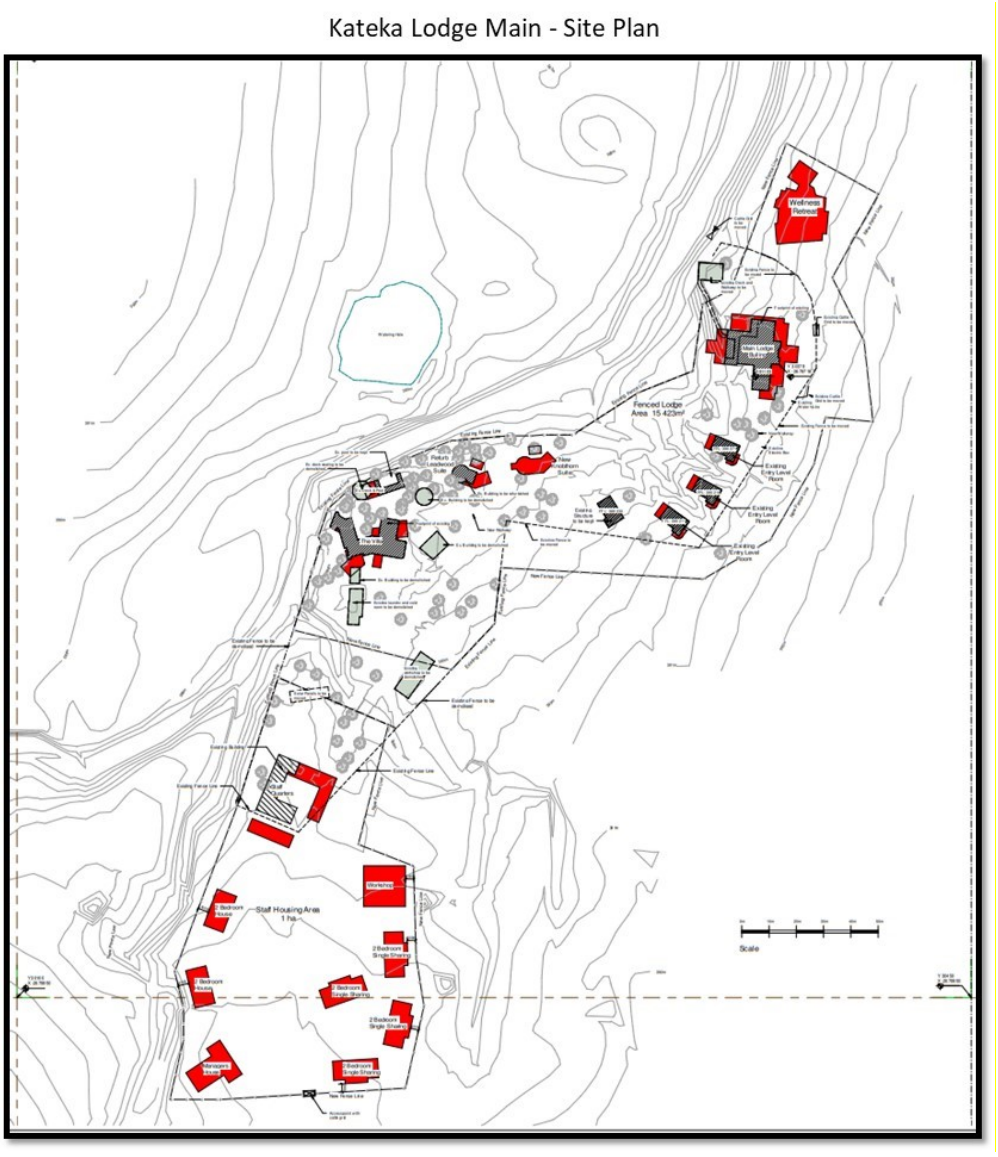

Figure 1: The site plan of the Kateka Lodge as proposed for the new developments.

The site proposed development footprint.

The proposed Kateka Lodge development includes the original, fenced-off Kateka Lodge project area (1.89 ha), as well as the proposed 2.45 ha extended area (Figure 2).

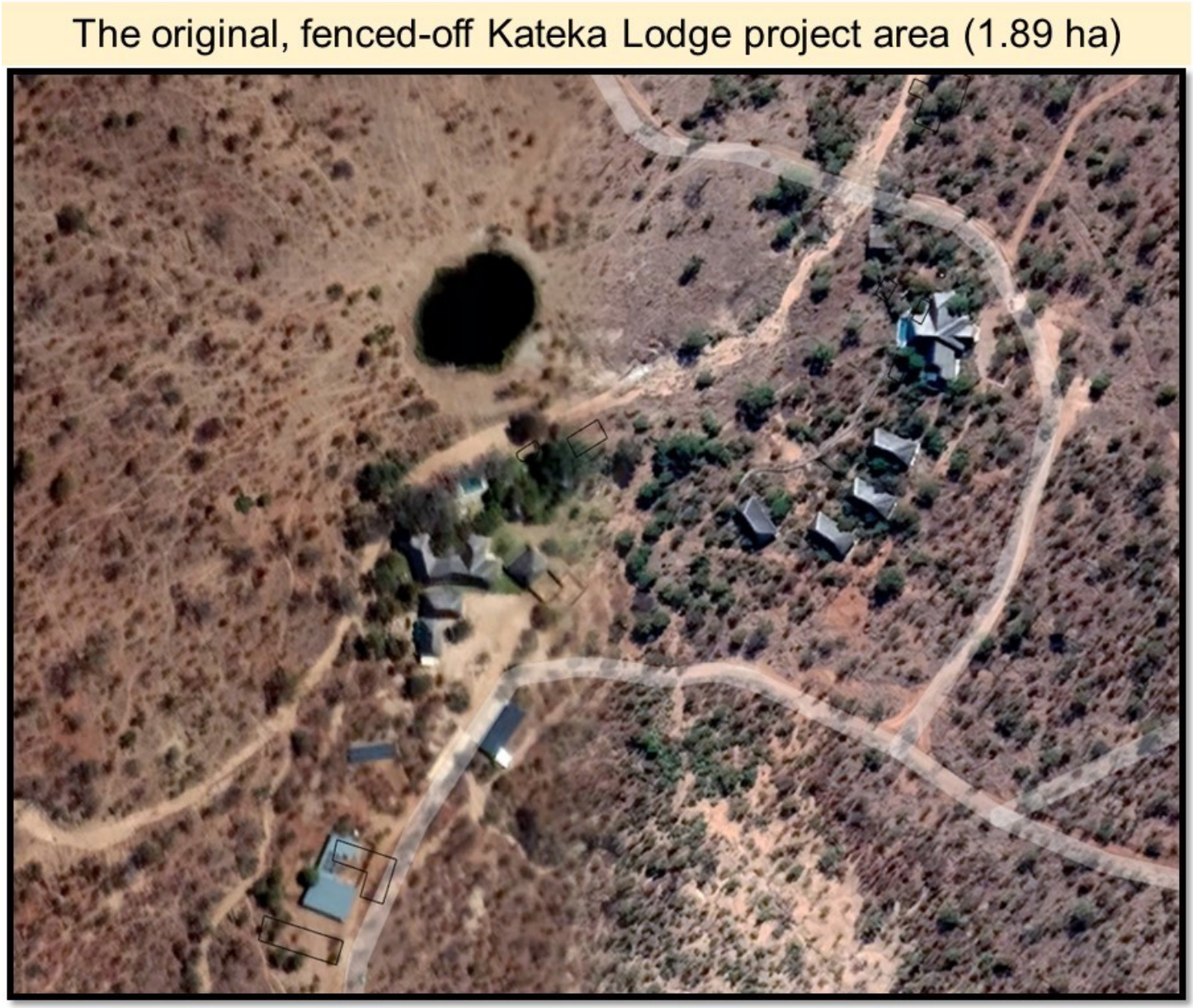

Figure 2: A Google Earth aerial view of the original, fenced-off Kateka Lodge project area (1.89 ha).

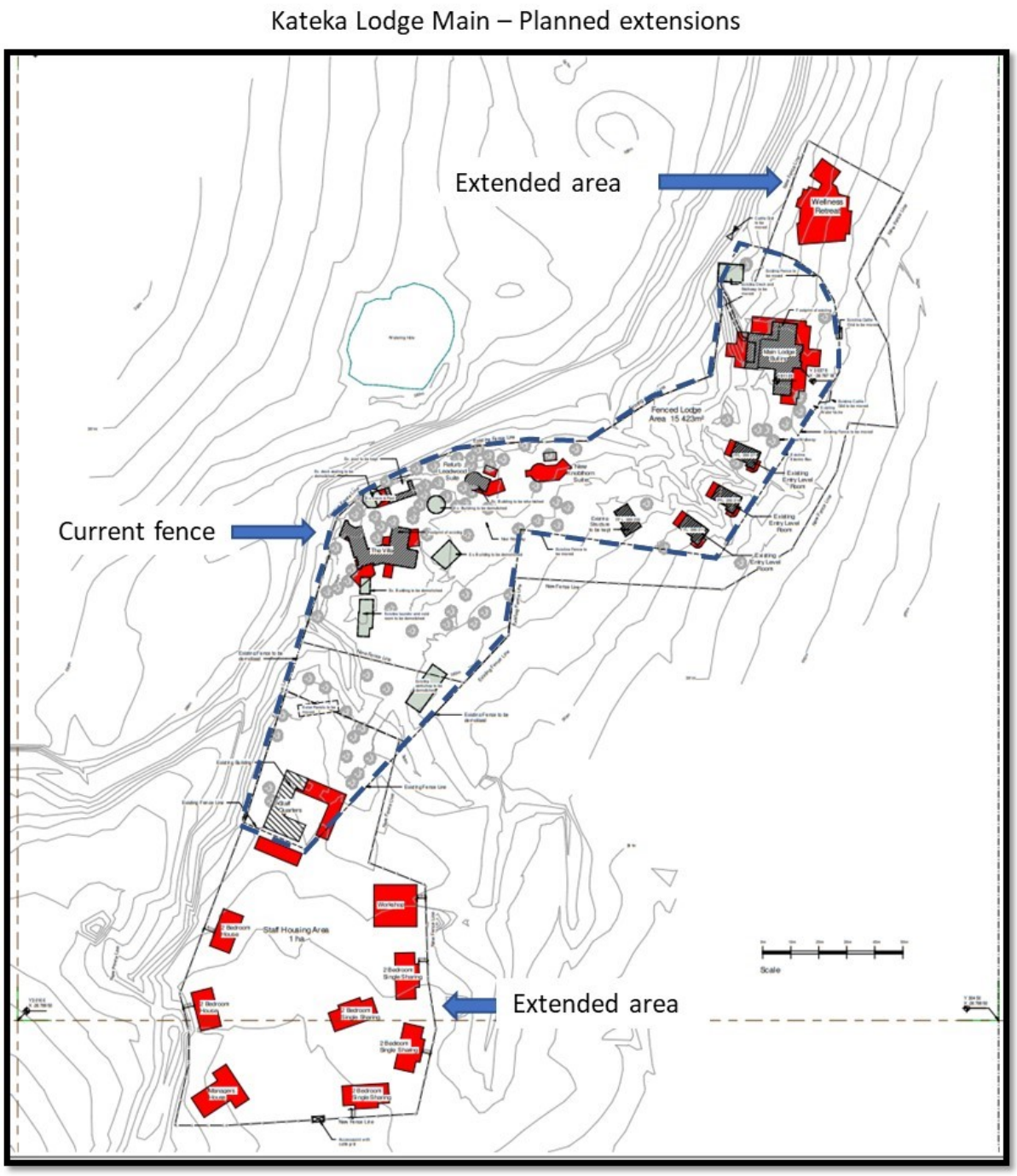

Figure 3: A diagram of the proposed Kateka Lodge development which includes the original, fenced-off Kateka Lodge project area (1.89 ha) (dotted line), as well as the proposed 2.45 ha extended area.

Planned infrastructure.

Area for new and refurbished suites

Two suites, the refurbished Leadwood Suite and the new Knobthorn suite, is planned for the central area next to the drainage line fence (Figure 4). The development is situated between existing large indigenous trees, facing towards the watering hole outside the fence.

Existing Entry Level Rooms

There are three existing Entry Level Rooms which will be upgraded with small improvements. The rooms are connected to the main lodge building to the north of the camp area with wooden walkways (Figure 5).

The existing Main Lodge building

The existing Main Lodge building will be upgraded and extended (Figure 6). The extension will not impact on any tall trees or sensitive habitats.

The Wellness Retreat

The Wellness Retreat is a new proposed addition to the camp infrastructure (Figure 7). It is planned on an area outside the existing footprint to the north of the camp. The Retreat will look out onto the drainage line and will cover an area of 401m^2 in the mopane woodland.

The Villa and other existing infrastructure

The Villa forms the centre of the existing infrastructure along the fence with the drainage line (Figure 8). Five of the existing buildings will be demolished and only the improved Villa, swimming pool and extended deck, will remain.

Existing staff quarters

The existing staff quarters will be extended and refurbished (Figure 9).

Staff housing area

The staff housing infrastructure will consist of 6 two-bedroom units, the manager's house and a workshop (Figure 10). It will be situated in a 1.0 ha fenced area outside the existing footprint and in the southern portion of the camp.

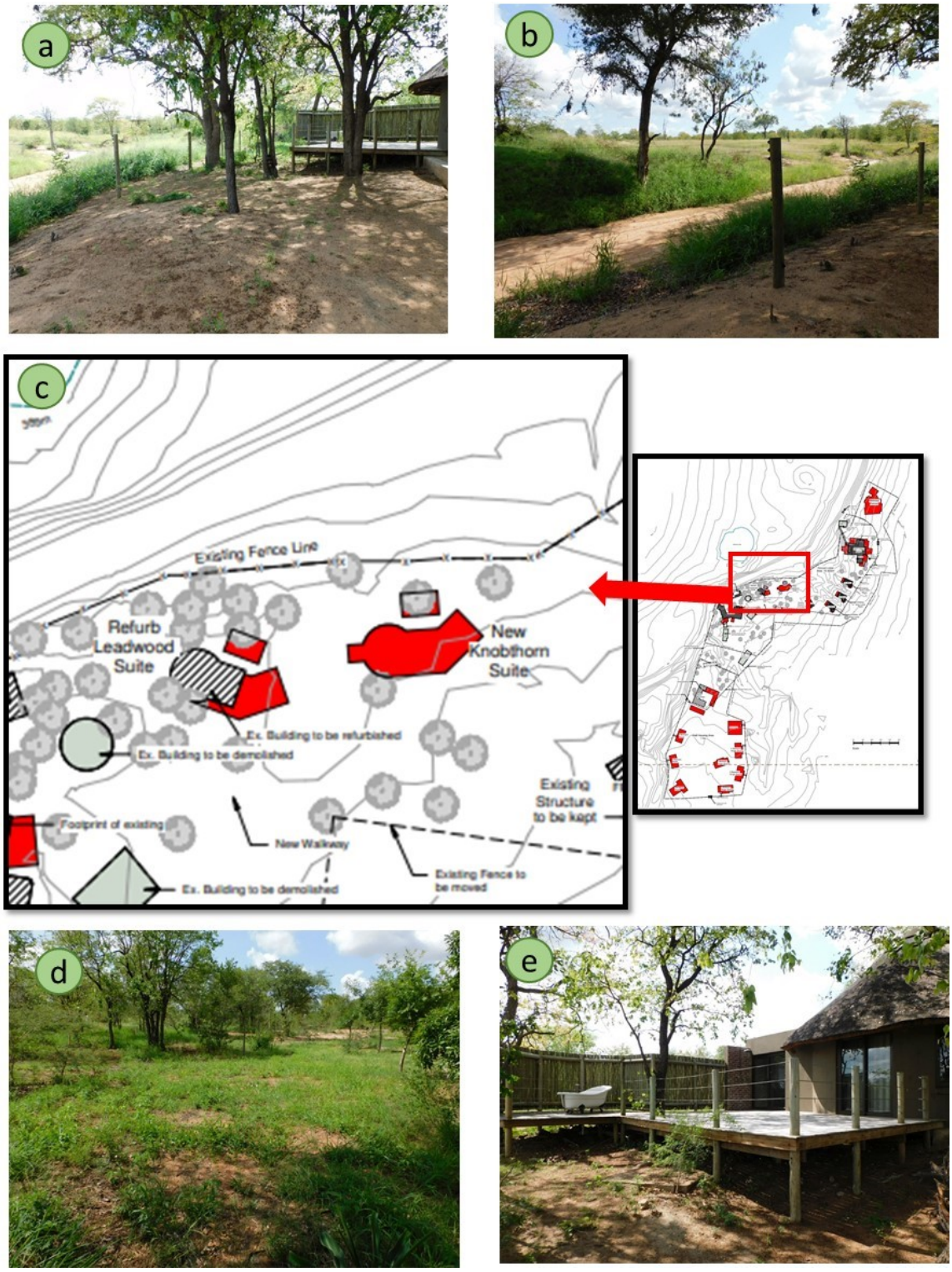

Figure 4: New and refurbished suites

4a and e. The Leadwood suite to be refurbished**.**
4b. The drainage line on the outside of the fence.
4c. The area for new and refurbished suites.

4d. Medium-sized trees and shrubs cover the area for the Knobthorn suite.

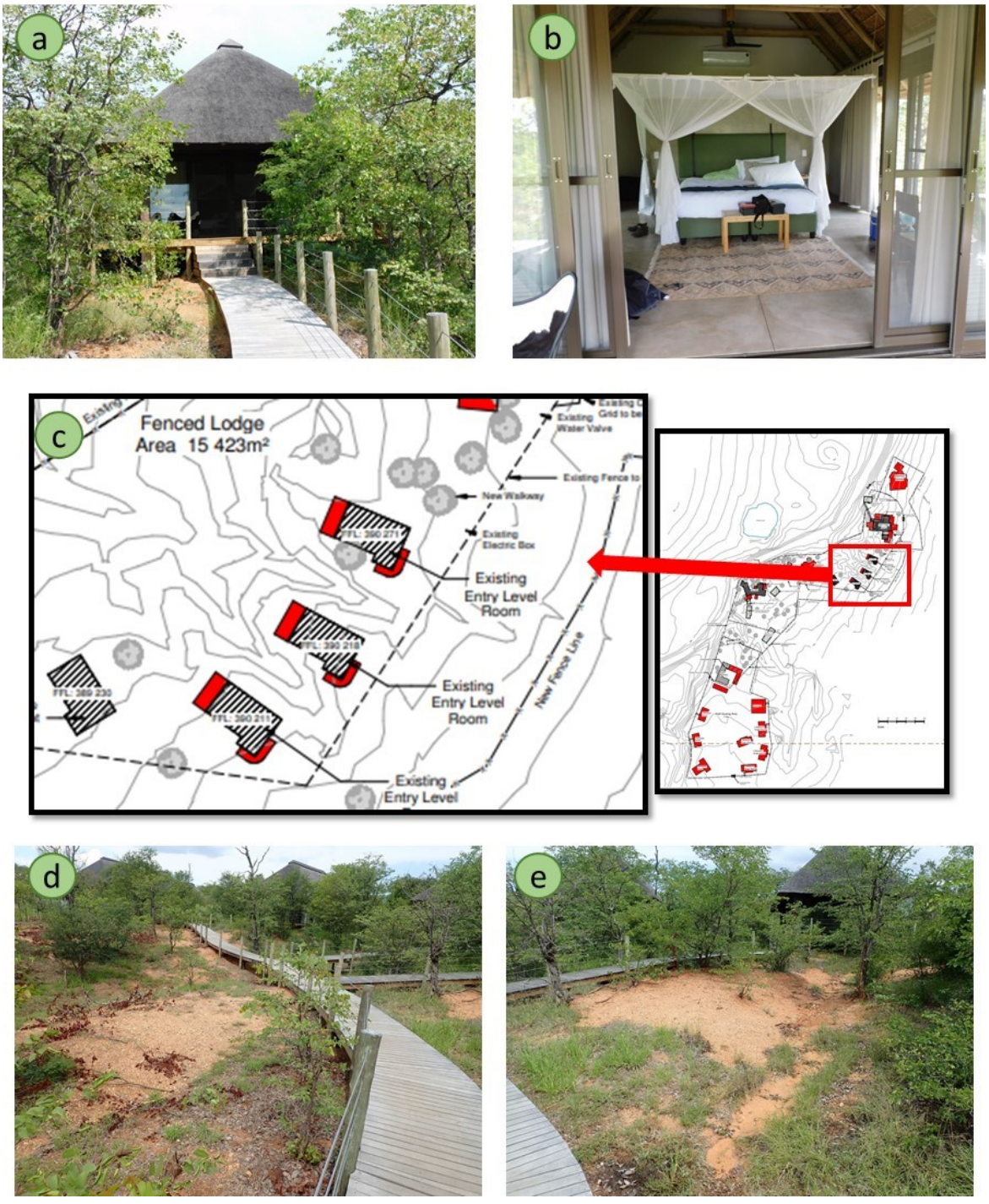

Figure 5: Existing Entry Level Rooms

5a and b. An existing Entry Level Room.
5c. The existing Entry Level Room plan.

5d and e. Walkways between the rooms and the main lodge building.

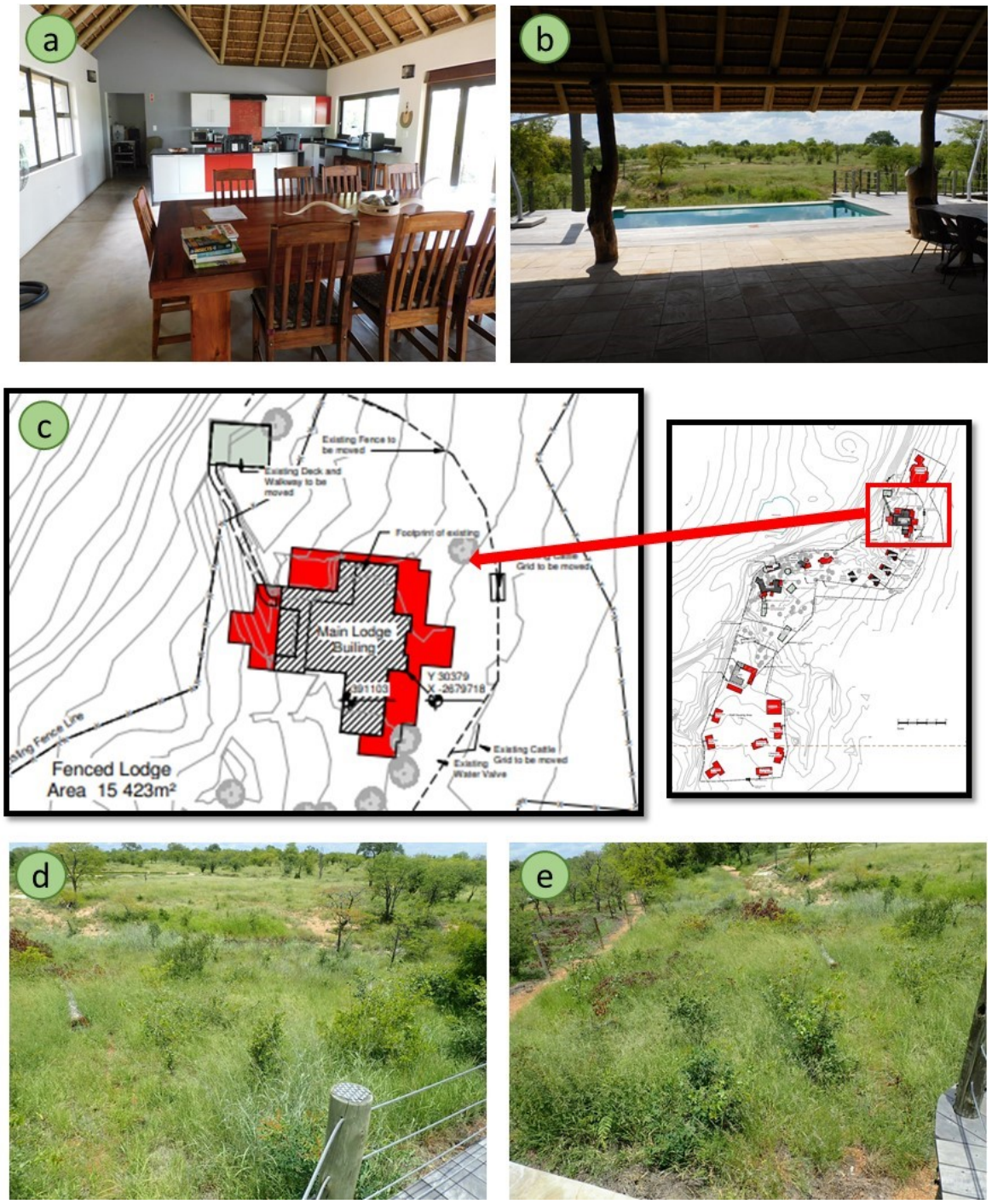

Figure 6: The existing Main Lodge building

6a and b. The existing Main Lodge building and pool.
6c. The existing Main Lodge building and pool plan.

5d and e. The area in front of the Main Lodge building behind the camp fence.

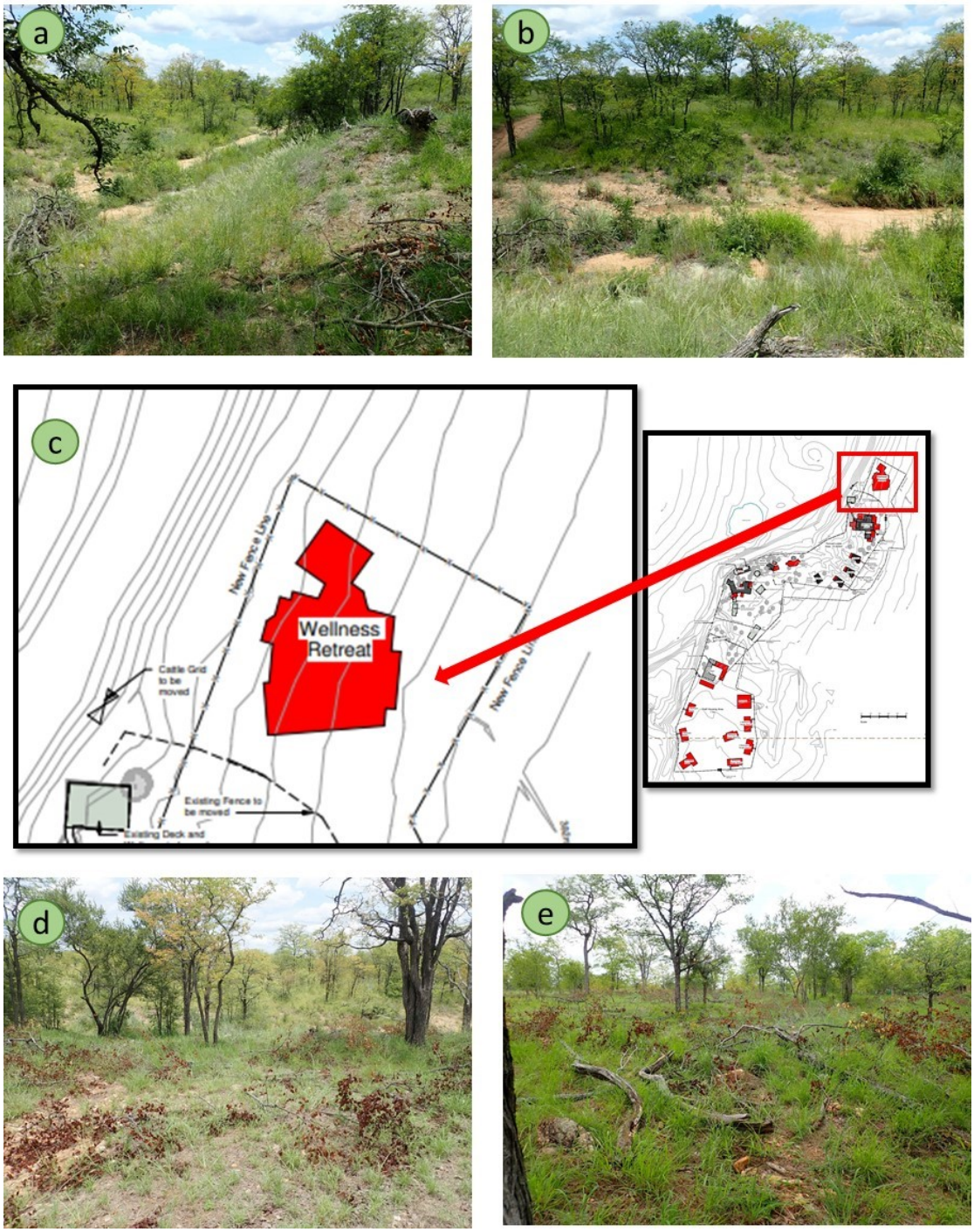

Figure 7: The Wellness Retreat

7a and b. The setting of the drainage line to be viewed from the front of the proposed building.
7c. The proposed Wellness Retreat on the northern boundary of the camp.

7d and e. The area for the building has been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape.

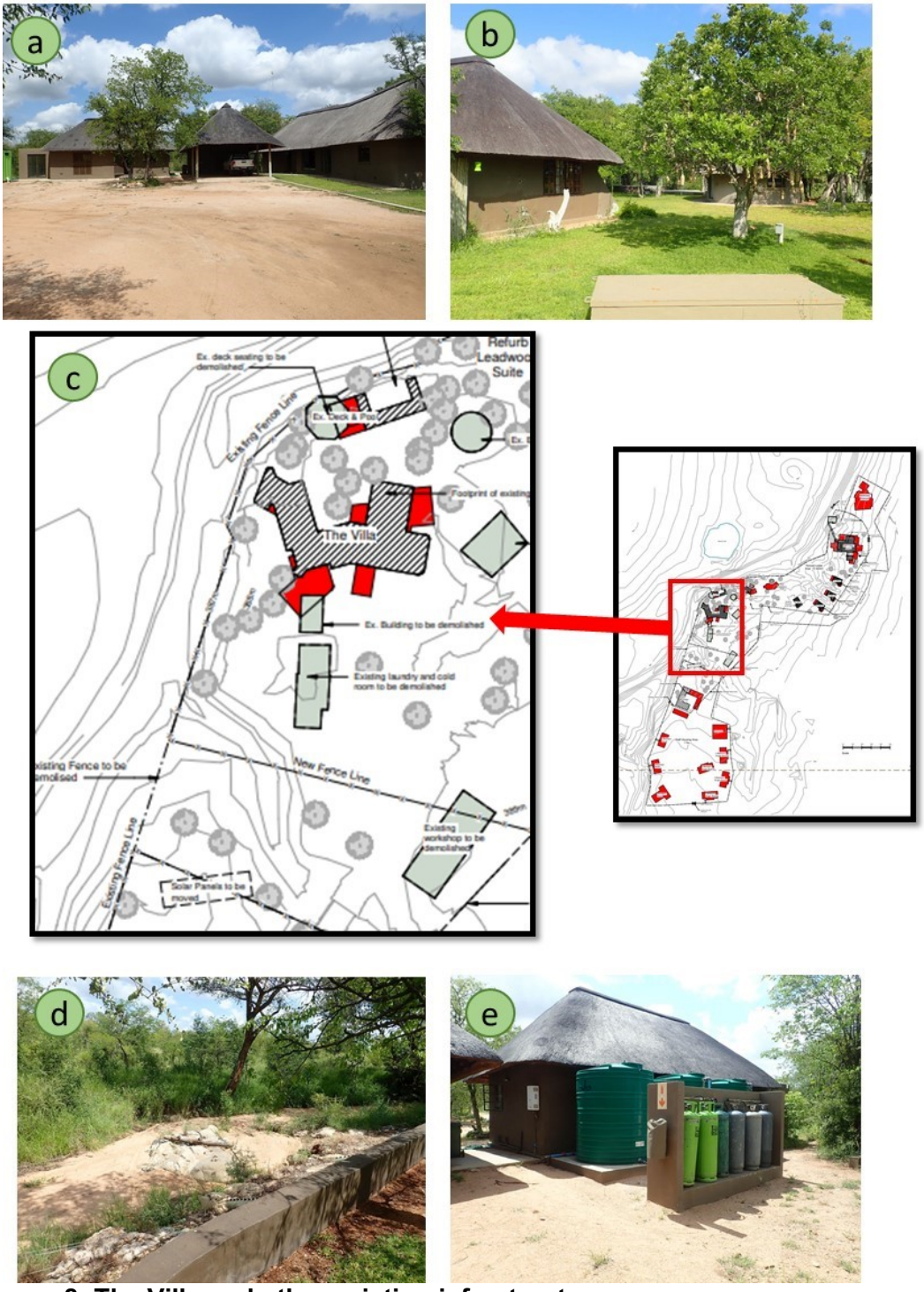

Figure 8: The Villa and other existing infrastructure

8a. The Villa will be improved.
8b. Certain buildings will be demolished.

8c. The Villa and other existing infrastructure.

8d. The local drainage line passes very close to the west of the Villa setting.

8e. Some of the existing infrastructure around the Villa will be upgraded

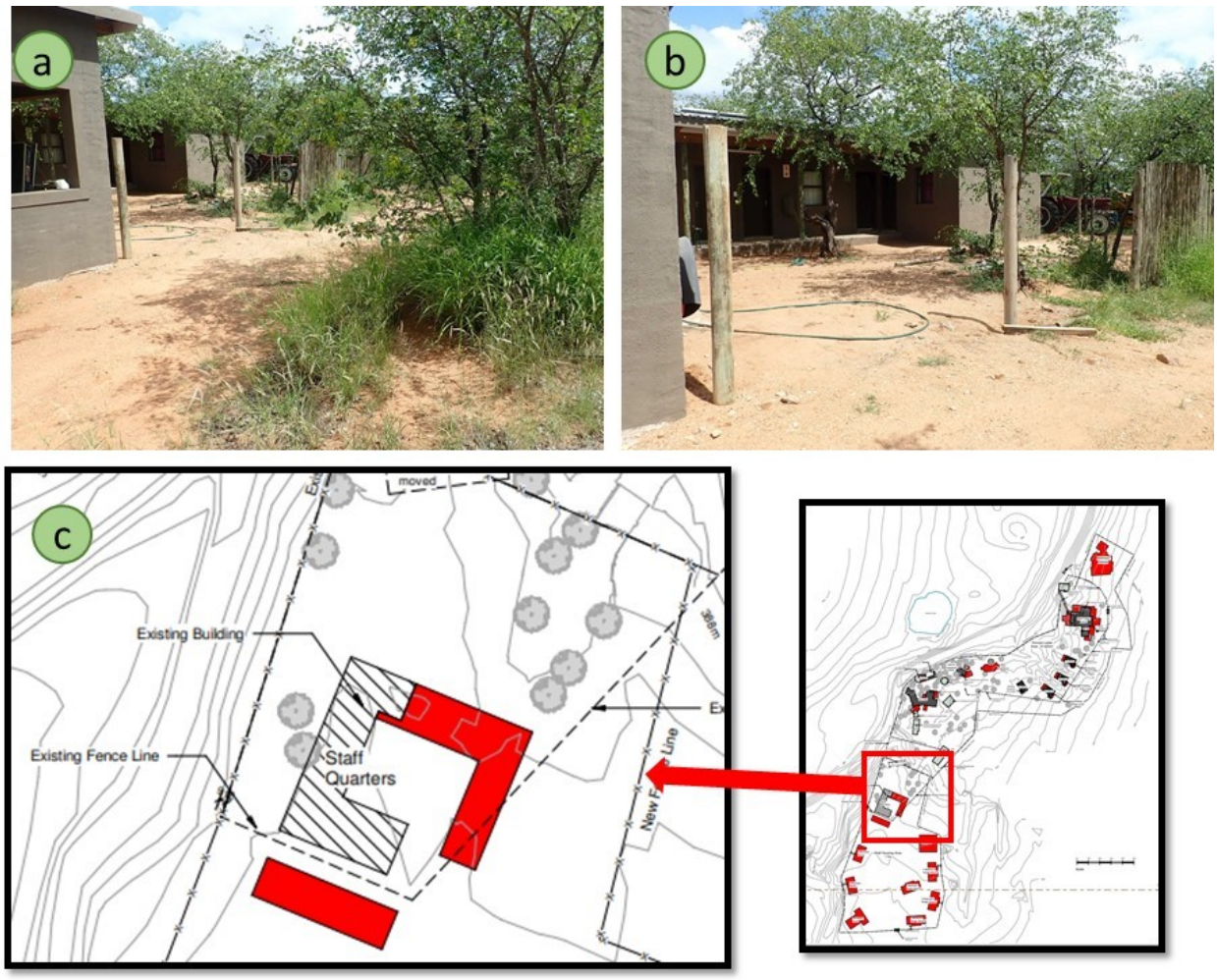

Figure 9: Existing staff quarters

9a and b. The existing staff quarters will be extended and refurbished.
9c. The existing staff quarters.

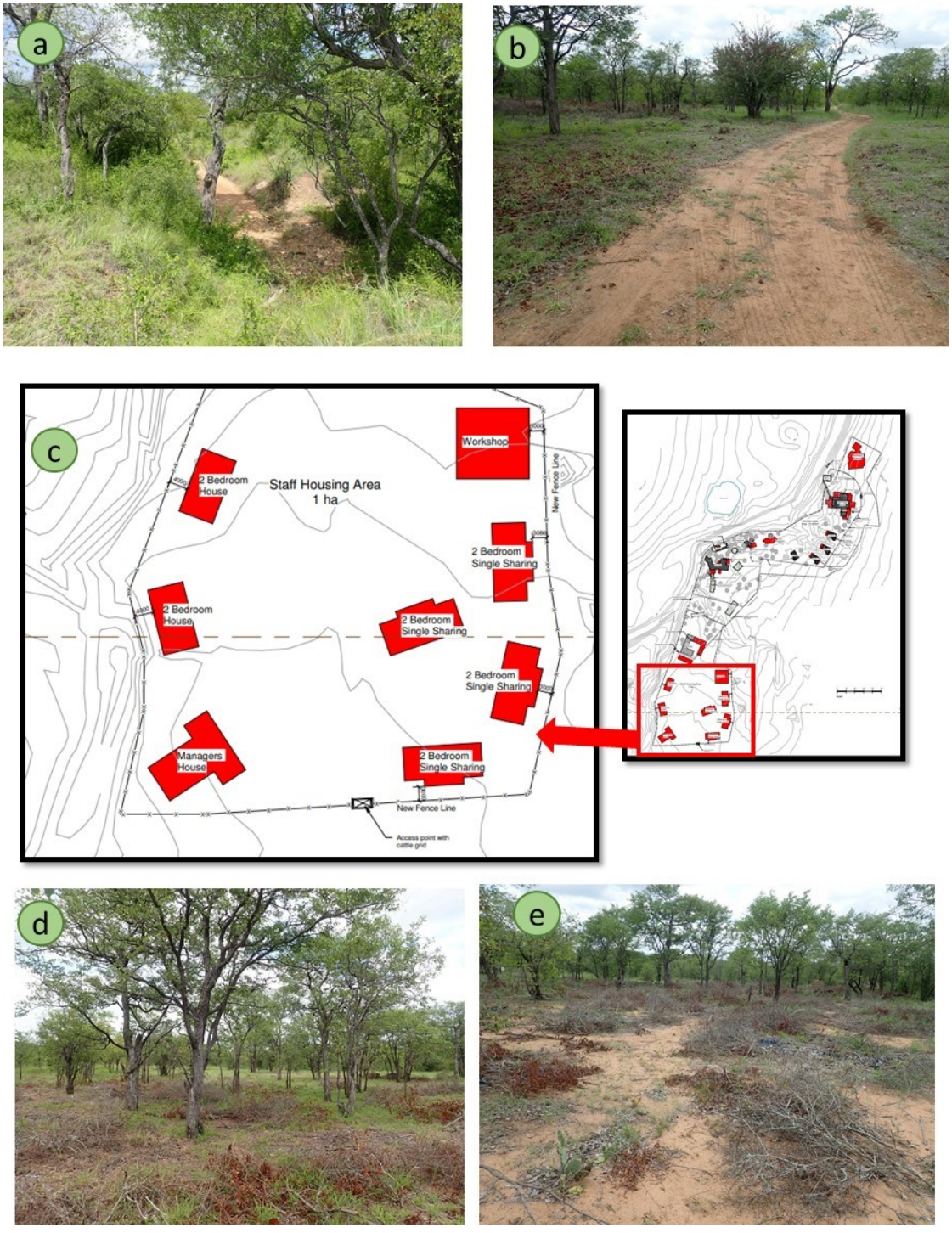

Figure 10: Staff housing area

10a. Some of the staff houses will be build close to the drainage line.
10b. A dirt road passes through the area to a planned gate in the fence.

10c. The Staff housing area.

10d and e. The area earmarked for the housing has been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape.

1.3 A description of the assumptions made and any uncertainties or gaps in knowledge or data.

- Whilst the author has made every effort to verify that information provided in this report is reliable, accurate and relevant, this report is based on information that could reasonably have been sourced within the time period allocated to the report and is dependent on the information provided by management and/or its representatives.

- Project proponents will always strive to avoid and mitigate potentially negative project related impacts on the environment, with impact avoidance being considered the most successful approach, followed by mitigation. It further assumes that the project proponents will seek to enhance potential positive impacts on the environment.

- Due to the fact that detail mitigation procedures have been presented, it is trusted that the construction team management with the help of the ECO will ensure that these mitigatory measures be implemented where applicable.

- It is assumed that the proposed extension and final footprint of the project area was approved by the APNR management.

- It is assumed that bush thinning and maintenance has occurred in accordance with APNR management strategies.

2. Methodology - Methods and approach

This project, and this report, is based on the guidelines provided in the Mpumalanga Biodiversity Sector Plan Handbook (MTPA, 2014). According to the MBSP, "it is important to note that all decisions regarding land-use applications in Mpumalanga are going to be evaluated by the authorities using the CBA maps and data, so it makes sense to consider these proactively, either prior to, or during, the EIA process."

2.1 Fieldwork

Vegetation communities identified in the desktop phase were ground-truthed during a field visit on 1-9 July 2020. The project area as well as the surrounding environment was surveyed on foot and dominant plant species were listed according to the vegetation communities.

Vegetation

Specialist assessment of terrestrial vegetation for the project

In accordance with the accepted proposal for this study, the botanical specialist study presented in the current report was to assess the footprint of the proposed Kateka Lodge development.

Terrestrial vertebrate surveys

Amphibians, reptiles, birds and mammals were surveyed in pre-selected units. Emphasis was placed on fauna with high conservation value and their probability of occurrence in the unit. These include meticulous searches on fixed transects in all the representative biotopes to assess the presence/absence of amphibians, reptiles, birds and mammal species. Where necessary, special methods were implemented to augment the chances of finding species, including traps, nocturnal spotlight searches and identifying tracks and scats. Special emphasis is placed on finding threatened species.

2.2 Establish Critical Biodiversity Areas

Maintaining biodiversity patterns and ecological processes and the ecosystem services derived from these, requires integrated management over large areas of land. The landscape approach to conservation is a system wide one where protected areas are embedded in a matrix of land-uses that strives for biodiversity compatibility. Herein biodiversity management objectives are integrated into the plans, decisions and practices of a wide range of land users. These land-use guidelines are designed to help achieve this (MTPA, 2014).

Critical Biodiversity Areas (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. If these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

To establish how important the site is for meeting biodiversity targets, a number of resources and tools are used. Specifically, the Land-Use Decision Support Tool (LUDS) and the MBCP are extensively used to compile the LUDS Report (BGIS, 2015). LUDS was developed to facilitate and support biodiversity planning and land-use decision-making at a national and

provincial level. Its primary objective is to serve as a guideline for biodiversity planning but should not replace specialist ecological assessments.

To establish how important the Kateka Camp site is for meeting biodiversity targets, it is necessary to answer the following three Lodge but fundamentally important questions:

- How important is the site for meeting biodiversity objectives (e.g., is it in a Critical Biodiversity Areas (CBA) or Ecological Support Area (ESA)?
- Is the proposed land-use consistent with these objectives or not (to be checked against the land-use guidelines)?
- Does the sensitivity of this area trigger the requirements for assessing and mitigating environmental impacts of developments, or in terms of the listed activities in the EIA regulations?

2.3 Impact Rating Methodology

It is the goal of the impact assessment process to determine the significance of potential environmental impacts associated with the proposed development. The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur. Each impact was evaluated individually, however the possibility of a cumulative impact was also considered and evaluated accordingly.

The potential impacts or risks associated with the proposed development were assessed based on the following criteria:

- **Applicable phase: Construction, Operational, (Decommissioning)**
- **Nature of impact:** Provides a description of the expected impacts (Negative, neutral or positive)

The criteria used to determine impact consequence are presented in the table below.

Table 1: Criteria used to determine the consequence of the impact

Rating	Definition of Rating	Score
A. Extent - the area over which the impact will be experienced		
Site	Confined to the site, or part thereof	1
Local	Effect limited to 3 to 5km of the site	2
Regional	Effect will have an impact on a regional scale.	3
B. Intensity - the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. Duration - the timeframe over which the impact will be experienced and its reversibility		
Short-term	Up to 2 years	1
Medium-term	2 - 15 years	2
Long-term	>15 years	3

The scores are then combined (A+B+C) to determine the Consequence Rating (Table 2).

Table 2: Calculation of the consequence score.

Combined Score (A+B+C)	3-4	5	6	7	8-9
Consequence Rating	Very low	Low	Medium	High	Very high

The probability of the impact occurring needs to be considered in order for the final significance rating to be informed by the specific context.

Table 3: Probability Classification.

Probability - the likelihood of the impact occurring	
Improbable	<40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	>70%- 90% chance of occurring
Definite	>90% chance of occurring

The significance of the impact is attained by cross-referencing probability against consequence, as is listed below.

- **Significance:**
  - Low: Where the impact will have a relatively small effect on the environment and will not have an influence on the decision
  - Medium: Where the impact can have an influence on the environment and the decision and should be mitigated
  - High: Where the impact definitely has an impact on the environment and decision regardless of any possible mitigation

Table 4: Status and Confidence classification.

Status of Impact	
Indication whether the impact is adverse (negative) or beneficial (positive)	+ ve
	- ve
Confidence of Assessment	
The degree of confidence in predictions based on available information, the EAP's judgement and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **INSIGNIFICANT**: the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity/development.
- **VERY LOW**: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.
- **LOW**: the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.
- **MEDIUM**: the potential impact **should** influence the decision regarding the proposed activity/development.
- **HIGH**: the potential impact **will** affect the decision regarding the proposed activity / development.
- **VERY HIGH**: The proposed activity should only be approved under special circumstances.

Significance post mitigation: Describes the significance after mitigation.
Mitigation: Provides recommendations for mitigation measures

3. Description of the study area

3.1 Physiography of the study area

Ecoregion

The project area is found in in Ecoregion 3: Lowveld. This hot and dry region is characterised by plains with a low to moderate relief and vegetation consisting mostly of Lowveld Bushveld types. Open hills with high relief and low mountains with high relief are present towards the west on the boundary with the North Eastern Highlands. In the north Mopane Bushveld and Mopane Shrubveld occur.

Climate:

Summer rainfall with dry winters. MAP from **about** 450 mm on the eastern flats to about 900 mm near the escarpment in the west. In a north-south direction, MAP of the unit appears to peak in Swaziland. Generally, a frost-free region. The APNR has hot summers and mild to cold winters. Summer temperatures range between 18°C and 45°C while winter temperatures range between 8°C and 23°C. Mean monthly maximum and minimum temperatures for Hoedspruit is 38.0°C and 3.7°C for January and July, respectively.

Precipitation in the survey area is low and erratic, characteristic of semi-arid savannas: a hot, wet season of 5-7 months (October to April) and the remainder of the year being dry. The vegetation is under moisture stress which is generally severe and of long duration (Peel *et al*, 2009).

Vegetation & Landscape Features:

The vegetation type of the project area consists of Granite Lowveld **(**SVI 3**;** Mucina & Rutherford, 2006), and it is on the boundary with the Phalaborwa-Timbavati Mopaneveld.

Distribution: A north-south belt on the plains east of the escarpment from Thohoyandou in the north, with an eastward extension to Mica and Hoedspruit to the area east of Bushbuckridge. Substantial parts are found in the Kruger National Park spanning areas east of Orpen Camp southwards through Skukuza and Mkuhlu, including undulating terrain west of Skukuza to the basin of the Mbyamiti River. Altitude 250-700 m.

The vegetation of the Granite Lowveld consists of tall shrubland with few trees to moderately dense low woodland on deep sandy uplands. Also include dense thicket to open savanna in the bottomlands and dense herbaceous layer on fine-textured soils.

Geology & Soils

Geologically, the study area is dominated by ancient granitoid rocks. From north to south, the Swazian Goudplaats Gneiss, Makhutswi Gneiss and Nelspruit Suite (granite gneiss and migmatite), and further south still, the younger Mpuluzi Granite (Randian) form the major basement geology of the area. Archaear granite and gneiss weather into sandy soils in the uplands arc clayey soils with high sodium content in the lowlands.

The soils of the APNR are dominated by Glenrosa and/or Mispah soil forms (other soils may occur). This group includes pedologically young landscapes that are not principally rock, alluvial or aeolian and where the dominant soil forming processes have been rock weathering, the formation of orthic topsoil horizons and clay illuviation giving rise to lithocutanic horizons. Lime is rare or absent in the upland soils but is widespread in the bottomland soils. Lime has

been used to indicate the extent to which the landscapes have been leached. Some landscapes have no lime, but soluble salt accumulations occur (Peel *et al*, 2009).

Conservation

Vulnerable. Target 19%. Some 17% statutorily conserved in the Kruger National Park. About the s**ame** amount conserved in private reserves, mainly the Selati, Klaserie, Timbavati, Mala Mala, Sabi Sand and Manyeleti Reserves. More than 20% already transformed, mainly by cultivation and by settlement development. Erosion is *low* to moderate.

4. Results

4.1 Ecological assessment of the planned project areas.

The proposed Kateka Lodge development consists of the original, fenced-off Kateka Lodge project area (1.89 ha), as well as the proposed 2.45 ha extended area (Figure 3). The extended area consists of the area proposed for the Wellness Retreat (approximately 0.43 ha), an extended area behind the existing Entry Level Rooms (approximately 0.55 ha) and the new Staff housing area (approximately 1.1 ha). These developments will all be enclosed as one large unit in the proposed newly fenced area, the Kateka Lodge development.

The planned development will fence off the existing drainage crossing as the road to the crossing will be fenced in with the Wellness Retreat. The current crossing forms part of the reserve's road network and a new crossing will be needed to replace this drainage line crossing.

Figure 11b shows the current route to the left which leads to the drainage line crossing and which will be neutralised by the new development. The route to the right might become the alternative route, but this will be extended towards the drainage line and the creation of a new drainage line crossing further downstream.

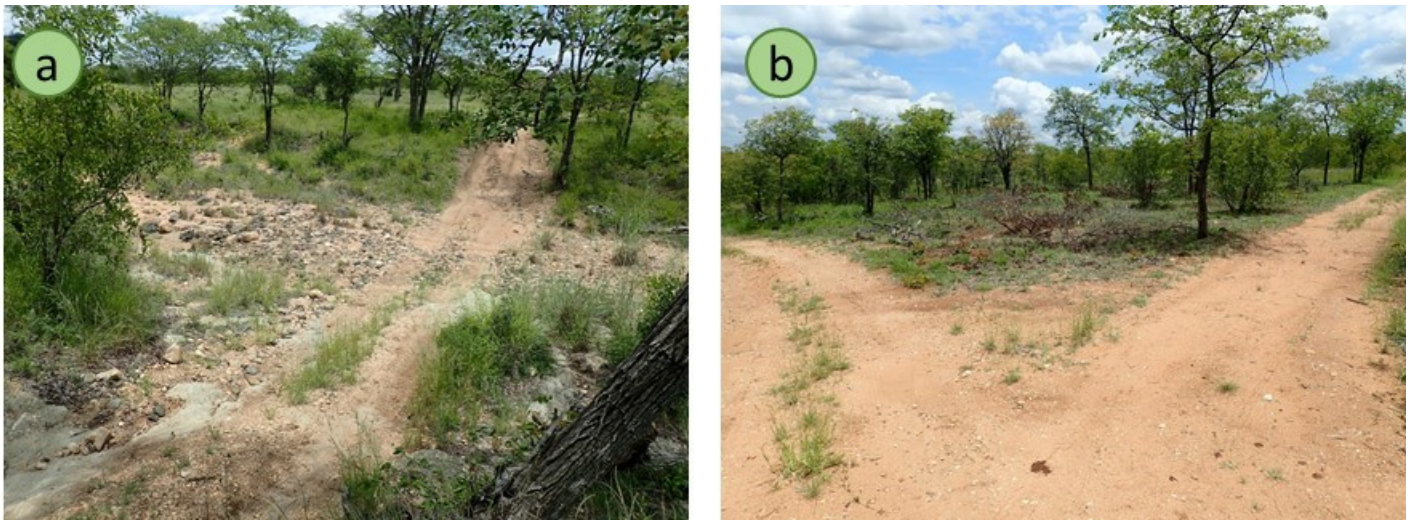

Figure 11: The existing drainage line crossing and the current route to the crossing.

11a. The current drainage line crossing.
11b. The current route to the drainage line crossing (track to the left).

Area for new and refurbished suites

The area proposed for the refurbished Leadwood Suite and the new Knobthorn suite (Figure 12), consist of the existing Leadwood Suite to be refurbished (Figure 13a), and an open woodland area proposed for the new Knobthorn suite (Figures 13b and 13c). The Knobthorn suite will be constructed in the open woodland with scattered indigenous shrubs and medium sized trees, including taller trees closer to the drainage line (Figure 13c). The indigenous tree layer consists of the following woody vegetation:

Mopane (*Colophospermum mopane*) – 90% of trees
Leadwood (*Combretum imberbe*)
Delagoa thorn (*Senegalia welwitschii*)
White-berry bush (*Flueggea virosa*)
Magic guarri (*Euclea divinorum*)
Common false-thorn (*Albizia harveyi*)

There is ample space for the development and no large tree should need be removed for the planned construction. All the construction activities should remain outside the 10m drainage buffer.

Some infrastructure close to the suite area will be demolished, but the development should refrain from removing any of the taller, indigenous tree species in the garden. Some of these trees were planted by the previous developers.

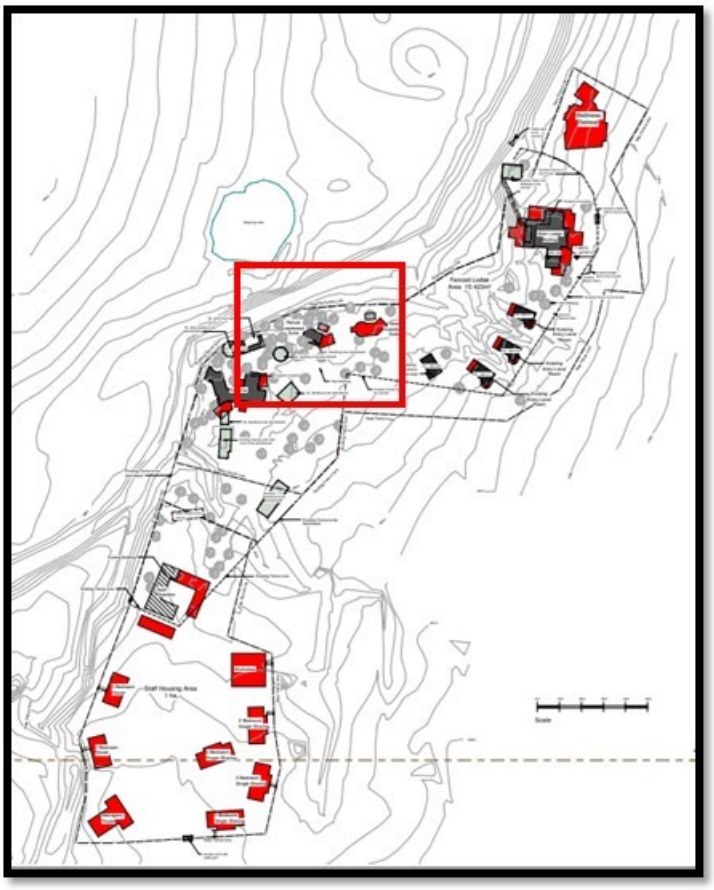

Figure 12: The area proposed for the refurbished Leadwood Suite and the new Knobthorn Suite

Figure 13: New and refurbished suites

13a. The Leadwood suite to be refurbished**.**
13b. The open woodland to house the Knobthorn suite.
13c. The Knobthorn suite area closer to the fence and drainage line.
13d. Some infrastructure close to the suite area will be demolished.

Existing Entry Level Rooms

There are three existing Entry Level Rooms will be upgraded with small improvements and none of the vegetation surrounding these premises (mostly mopane) should be removed. A new area of approximately 0.55 ha behind these rooms, will be fenced is with the new development. This portion will consist of the old road tot the lodge and some indigenous woodland.

These rooms are connected to the rest of the camp with wooden walkways (Figures 15a to d). The areas surrounding these walkways show signs of sheet and gulley erosion, caused by rain and concentrated flows from the infrastructure present.

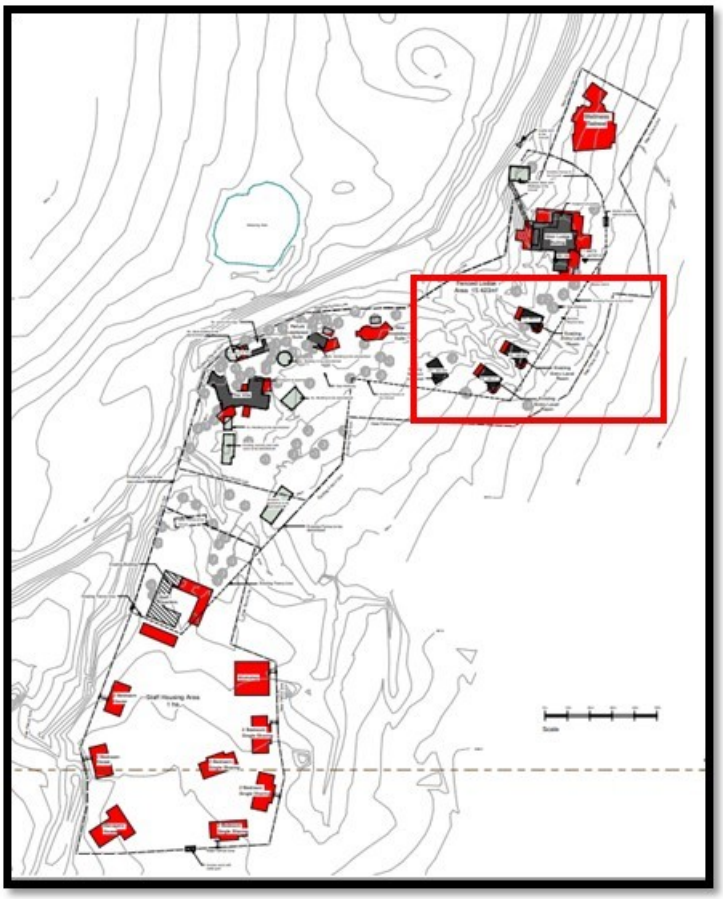

Figure 14: The existing Entry Level Rooms and extended area to the east of the camp.

Figure 15: Existing Entry Level Rooms

15a to d. Walkways between the existing Entry Level Room and the rest of the camp. Signs of sheet- and gulley erosion are present.

The existing Main Lodge building

The extension of the existing Main Lodge building will not have an impact on any tall trees or sensitive habitats. The 10 m buffer of the drainage line should be adhered to.

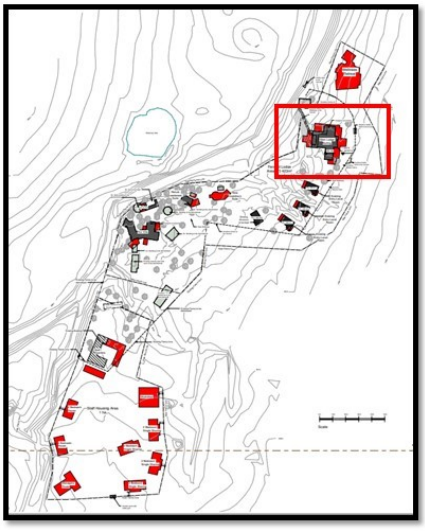

Figure 16: The existing Main Lodge building.

The Wellness Retreat

The extended area for the Wellness Retreat consists of 0.43 ha open mopane woodland. This is a new addition to the camp infrastructure and is located to the north of the project area.

The areas earmarked for the wellness centre have been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape (Figures 18 a and b). Poisoning of root stock and cut down stumps prevent coppicing. Cleared brush are left on the ground to act as cover and slow down some of the flows during rain events and thus delay erosive forces.

The indigenous tree layer of the area consists of the following woody vegetation:

Mopane (*Colophospermum mopane*) – 90% of trees
Red bushwillow (*Combretum apiculatum*) – 10% of trees
Magic guarri (*Euclea divinorum*)
Common false-thorn (*Albizia harveyi*)
African wattle (*Peltophorum africanum*)

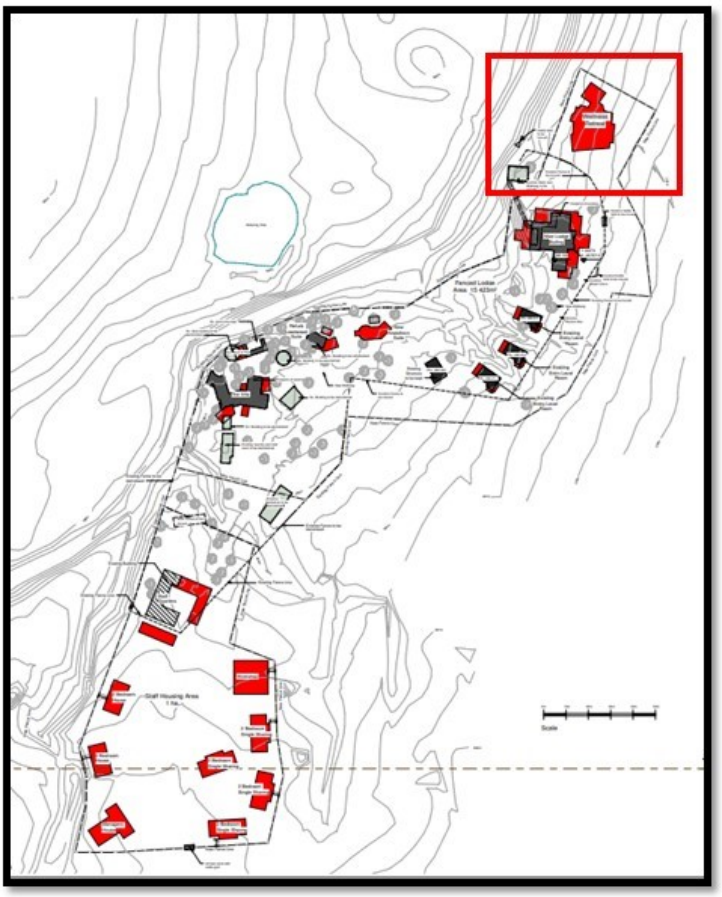

Figure 17: The proposed Wellness Retreat on the northern boundary of the camp.

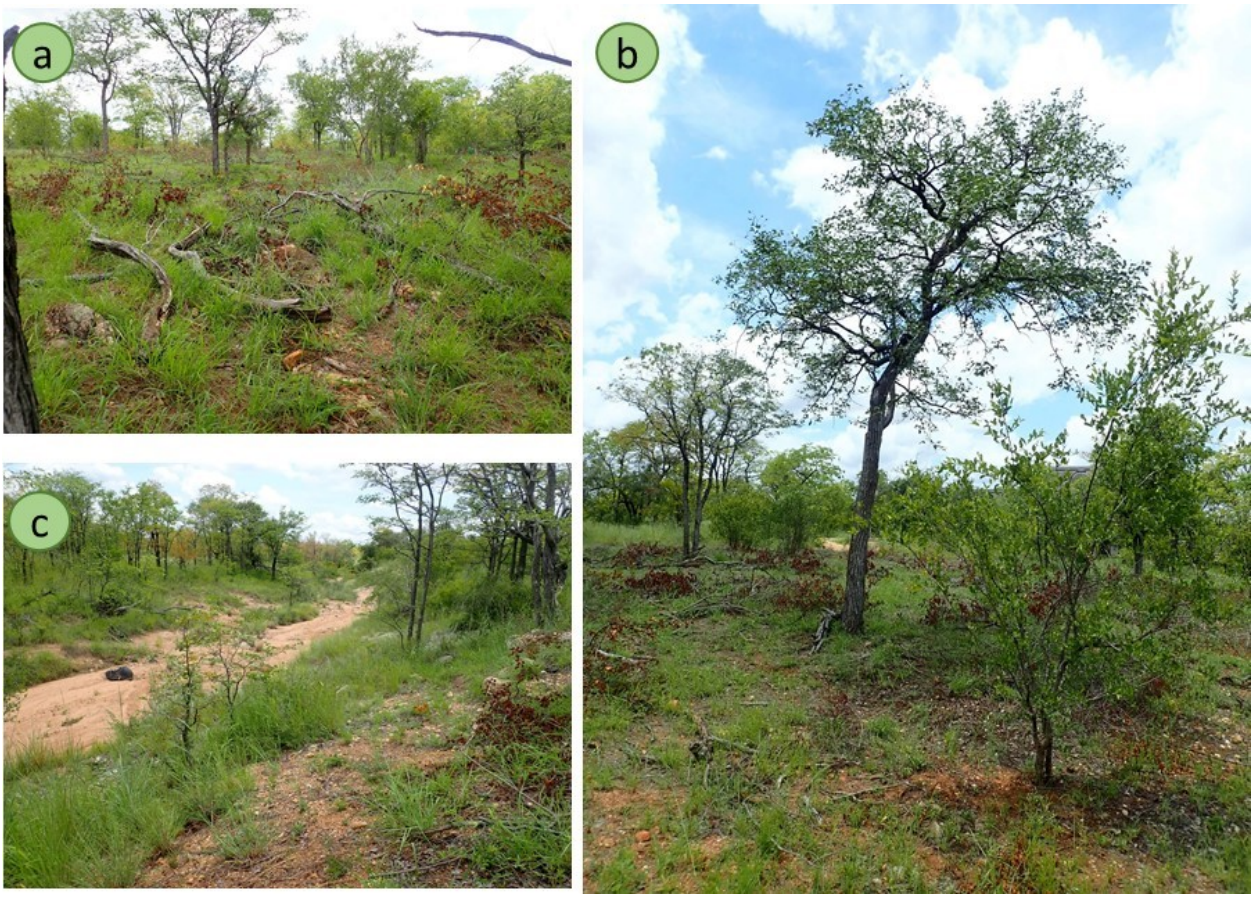

Figure 18: The Wellness Retreat

18a and b. The areas earmarked for the wellness centre have been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape.
18c. The setting of the drainage line to be viewed from the front of the proposed building.

The Villa and other existing infrastructure

The Villa forms the centre of the existing infrastructure which include the improved Villa, swimming pool and extended deck. Some infrastructure in this area, which include five of the existing buildings will be demolished. The development should refrain from removing any of the taller, indigenous tree species in the garden. Some of these trees were planted by the previous developers.

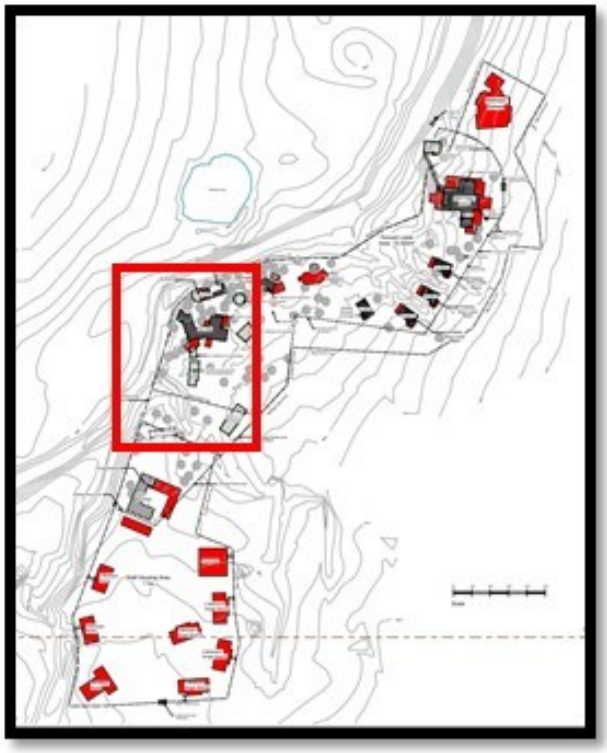

Figure 19: The Villa and other existing infrastructure.

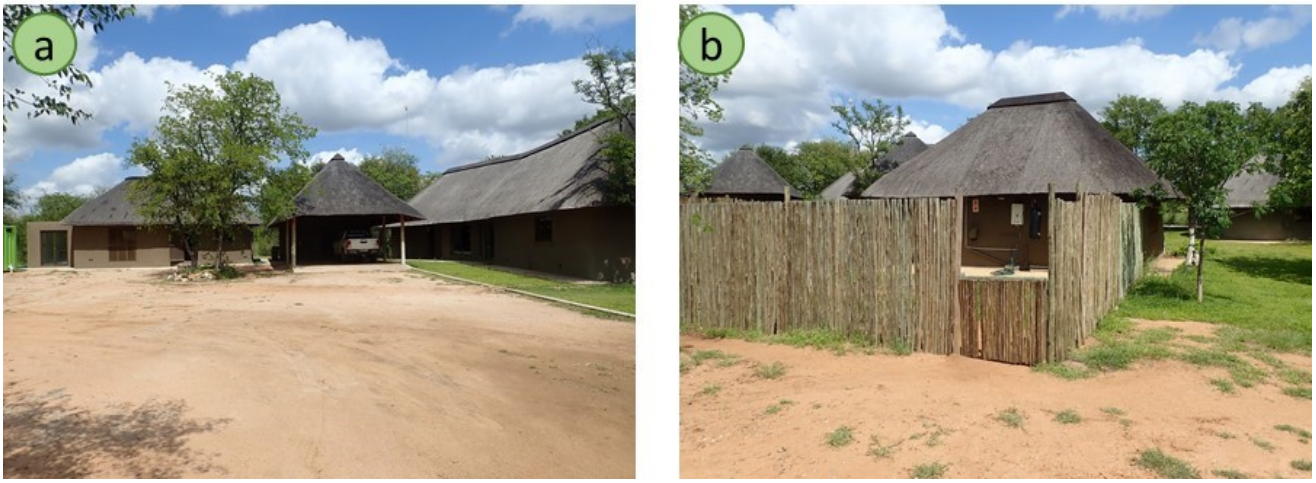

Figure 20: The Villa and other existing infrastructure.

20a. The Villa forms the centre of the existing infrastructure.
20b. Some infrastructure in this area, which include the laundry and cold room will be demolished.

Existing staff quarters

The existing staff quarters will be extended and refurbished.

Staff housing area

The staff housing infrastructure will be situated in a 1.0 ha fenced area outside the existing footprint and in the southern portion of the Kateka Lodge. The area earmarked for the housing has been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape. Poisoning of root stock and cut down stumps prevent coppicing. Cleared brush are left on the ground to act as cover and slow down some of the flows during rain events and thus delay erosive forces.

The indigenous tree layer of the area consists of the following woody vegetation:

Mopane (*Colophospermum mopane*) – 40% of trees
Purple-pod cluster-leaf (*Terminalia prunioides*) – 50% of trees
Weeping boer-bean (*Schotia brachypetala*)
Knob thorn (*Senegalia nigrescens*)
Russet bushwillow (*Combretum hereroense*)
Sneezewood (*Ptaeroxylon obliquum*)
Velvet-leaved corkwood (*Commiphora mollis*)

Smaller shrubs
Magic guarri (*Euclea divinorum*)
Common spike thorn (*Gymnosporia buxifolia*)
Raisin bush (*Grewia*)

The smaller shrubs were the main component that was cleared during the bush clearing process.

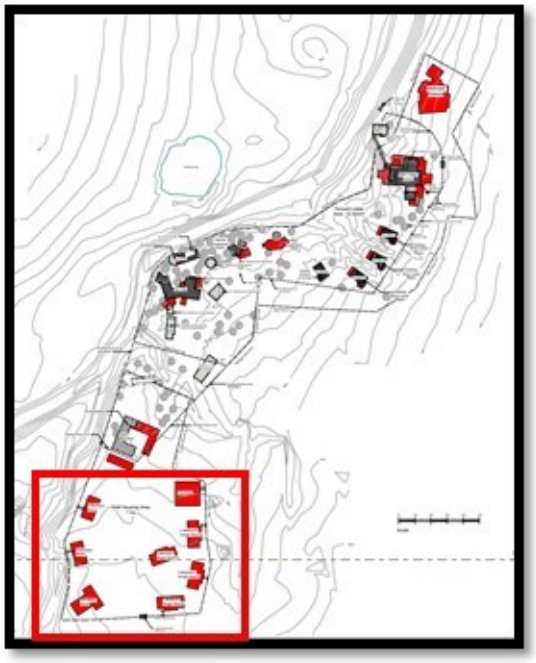

Figure 21: The staff housing infrastructure.

Figure 22: Staff housing area

22a to d. The area earmarked for the housing has been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape.

4.2 Terrestrial faunal assemblages of the project areas

During the biodiversity assessment (January 2022) of the landscape, different vegetation and land cover units were identified. By definition, ecosystem status reflects the ecosystem's ability to function naturally, at a landscape scale and in the long-term. Vegetation types provide a good representation of terrestrial biodiversity because most animals, birds, insects and other organisms are associated with specific vegetation types.

In order to establish a baseline of faunal occurrence, an assessment was made of the ecosystem template. The ecosystem template is a function of the geomorphology (abiotic) and the vegetation (biotic) structure of the area. By using species occurrence data from the current survey (2022) and expected occurrence records of known species distributions and preferred habitat type, the baseline integrity of the study is established.

Animal species observed in the project area and surroundings

Frogs:

- African common toad (*Sclerophrys gutturalis*)
- Painted reed frog (*Hyperolius marmoratus taeniatus*)
- Grey foam-net treefrog (*Chiromantis xerampelina)*

Reptiles:

- Common dwarf gecko *(Lygodactylus capensis capensis)*
- Common tropical house gecko (*Hemidactylus mabouia*)
- Striped skink (*Trachylepis striata*)
- Southern tree agama *(Acanthocercus atricollis)*

Birds:

- Natal spurfowl (*Francolinus natalensis*)
- Swainson's Spurfowl *(Pternistes swainsonii)*
- Helmeted Guineafowl (*Numida meleagris*)
- Bateleur *(Terathopius ecaudatus)*
- Egyptian goose (*Alopochen aegyptiaca*)
- White-faced whistling duck (*Dendrocygna viduata*)
- Laughing dove (Spilopelia *senegalensis*)
- Ring-necked Dove (*Streptopelia capicola*)
- Emerald-spotted Wood Dove (*Turtur chalcospilos*)
- Grey go-away-bird (*Corythaixoides concolor*)
- African Scops-Owl *(Otus senegalensis)*
- Blacksmith plover (*Vanellus armatus*)
- Woodland Kingfisher (*Halcyon senegalensis*)
- European Bee-eater (*Merops apiaster*)
- European Roller (*Coracias garrulus*)
- Lilac-breasted Roller *(Coracias caudatus)*
- African Grey Hornbill (*Lophoceros nasutus*)
- Southern Yellow-billed Hornbill *(Tockus leucomelas)*
- Cardinal Woodpecker (*Dendropicos fuscescens*)
- Fork-tailed Drongo (*Dicrurus adsimilis*)
- Black-headed Oriole (*Oriolus larvatus*)
- Dark-capped Bulbul (*Pycnonotus tricolor)*

- Arrow-marked Babbler (*Turdoides jardineii*)
- Southern Black Tit (*Parus niger*)
- Chinspot Batis *(Batis molitor)*
- Long-billed Crombec (*Sylvietta rufescens*)
- Rattling Cisticola (*Cisticola chiniana*)
- Black-backed puffback (*Dryoscopus cubla*)
- Magpie Shrike *(Urolestes melanoleucus)*
- Brown-crowned Tchagra *(Tchagra australis)*
- Black-crowned Tchagra (*Tchagra senegala*)
- Red-backed Shrike *(Lanius collurio)*
- Grey-headed Bushshrike *(Malaconotus blanchoti)*
- Burchell's Starling *(Lamprotornis australis)*
- Blue Waxbill (*Uraeginthus angolensis*)

Mammals:

- Spotted hyaena *(Crocuta crocuta*)
- Impala (*Aepyceros melampus*)
- African elephant (*Loxodonta africana*)
- Warthog (*Phacochoerus africanus)*
- Tree squirrel (*Paraxerus cepapi*)
- Slender mongoose (*Galerella sanguinea*)

Species of Conservation Concern

In the light of what have been discussed above relating to the size of the project area and the few animal species observed in the restricted area, it still be worthwhile to create a list of expected Species of Conservation Concern likely to occur or visit the immediate area.

For this report, the category “Species of Special Concern” is considered to include all threatened taxa listed by South African Red Data lists (Species of Conservation Concern), Threatened or Protected Species (NEMBA) and all South African endemic taxa.

The desk-top study concerning SCC species for the project area can be summarised as follows:

> **Frogs**: Currently no threatened frog species is expected to occur in the area.
>
> **Reptiles**: There are two threatened reptile species expected to occur in the area (including MTPA conservation status):
>
> - Southern African python (*Python natalensis*) - NEMA TOPS 2007: Protected;
> - Giant legless skink (*Acontias plumbeus*) - Mpumalanga: Near-threatened;

Comparing the habitat requirements of the Species of Concern with the habitat availability in the biotopes, both the Southern African python and Giant legless skink might venture into the camp footprint.

Birds: The following threatened bird species are expected to occur in the area (IUCN, 2014; NEMBA, 2014; Red Data Book, 2015):

> - Yellow-billed stork (*Mycteria ibis*) - SA Red Data (Taylor 2015): Endangered. IUCN 2016 Status: Least concern.

- Black stork (*Ciconia nigra*) - SA Red Data (Taylor 2015): Vulnerable, TOPS (2007): Vulnerable. IUCN 2016 Status: Least concern. Mpumalanga: Vulnerable.
- Abdim's stork (*Ciconia abdimii*) - SA Red Data (Taylor 2015): Near-threatened. Mpumalanga: Near threatened. IUCN 2016 Status: Least concern.
- Saddle-billed stork (*Ephippiorhynchus senegalensis*) - SA Red Data (Taylor 2015): Endangered. NEMBA (TOPS): Endangered. IUCN 2014 Status: Least concern.
- Marabou Stork *(Leptoptilos crumeniferus)* - SA Red Data (Taylor 2015): Near threatened. IUCN 2014 Status: Least concern.
- African White-backed Vulture *(Gyps africanus)* - IUCN 2015: Critically Endangered; SA Red Data (Taylor 2015): Critically Endangered. NEMBA TOPS (2015 - Endangered species).
- Cape Vulture *(Gyps coprotheres)* - IUCN 2015: EN Endangered; SA Red Data (Taylor 2015): Endangered. NEMBA TOPS (2015): Endangered species.
- White-headed Vulture *(Trigonoceps occipitalis)* - IUCN 2015: Critically Endangered; Endangered species; SA Red Data (Taylor 2015): Critically Endangered.
- Secretary bird (*Sagittarius serpentarius*) - IUCN 2015 VU Vulnerable; SA Red Data (Taylor 2015): Vulnerable. NEMBA (TOPS 2007): Vulnerable species.
- Bateleur *(Terathopius ecaudatus)* - IUCN 2015 NT: Near-threatened. SA Red Data (Taylor 2015): Endangered. NEMBA TOPS (2015): Endangered species.
- Tawny Eagle *(Aquila rapax)* - SA Red Data (Taylor 2015): Endangered; NEMBA TOPS (2015): Endangered species; IUCN 2015 Status: Least concern.
- Martial Eagle *(Polemaetus bellicosus)* - IUCN 2015 Status: Near-threatened; SA Red Data (Taylor 2015): Endangered; NEMBA TOPS (2015): Endangered species.
- African Crowned Eagle *(Stephanoaetus coronatus)* - IUCN 2015 Status: Near-threatened. SA Red Data (Taylor 2015): Vulnerable. NEMBA (TOPS 2007): Vulnerable species. Mpumalanga: Vulnerable.
- Lanner Falcon *(Falco biarmicus)* - SA Red Data (Taylor 2015): Vulnerable. IUCN 2015 Status: Least concern.
- Kori Bustard *(Ardeotis kori)* - IUCN 2015 Status: Near-threatened. SA Red Data (Taylor 2015): Near threatened. NEMBA TOPS (2015): Protected species.
- European Roller (*Coracias garrulus*) - SA Red Data (Taylor 2015): Near-threatened; IUCN 2018 Least concern.
- Southern Ground-Hornbill *(Bucorvus leadbeateri)* - IUCN (2014) VU Vulnerable. SA Red Data (Taylor 2015): Endangered; NEMBA TOPS (2015): Endangered species.

Most of these species might visit the immediate area and even venture into the camp because of the lush tree growth, but none of these species are expected to remain in the camp due to the presence of people. During the survey of the area in January 2022 no SSC bird species were nesting in the trees around the camp footprint.

Sixteen (16) mammal species which have distribution ranges overlapping with the project area, and suitable habitat available, are listed as Species of Special Concern, most of which are considered threatened:

1. Percival's short-eared trident bat *(Cloeotis percivali)* - SA Red Data (2016): Endangered. IUCN (2016): Least concern. Anchieta's pipistrelle *(Hypsugo anchietae)* - SA Red Data (2004): Near-threatened. IUCN (2010): Least concern
2. Spotted hyaena *(Crocuta crocuta*) - NEMBA (TOPS 2015): Protected species.
3. Cheetah (*Acinonyx jubatus*) - IUCN 2015: Vulnerable; NEMBA (TOPS 2015): Vulnerable species
4. Leopard (*Panthera pardus*) - IUCN (2016): Vulnerable. SA Red Data (Child 2016) Vulnerable. NEMBA (TOPS 2015): Protected species.

5. Lion (*Panthera leo*) - IUCN (2012): VU Vulnerable. NEMBA (TOPS 2015): Vulnerable species
6. Serval *(Leptailurus serval*) - SA Red Data (Child 2016): Near threatened; NEMBA (TOPS 2015): Protected species. IUCN (2016) Least concern.
7. Wild dog (*Lycaon pictus*) - IUCN 2012: EN Endangered; NEMBA (TOPS 2015): Endangered species.
8. African striped weasel (*Poecilogale albinucha*) - SA Red Data 2016: Near threatened
9. Honey badger (*Mellivora capensis*) - NEMBA (TOPS) 2007: Protected species. IUCN (2014) Least concern. SA Red Data (Child 2016): Least concern.
10. African elephant (*Loxodonta africana*) - IUCN (2010): Vulnerable. NEMBA (TOPS 2015): Protected species; SA Red Data: Least concern.
11. South central black rhinoceros (*Diceros bicornis minor*) - NEMBA (TOPS 2015): Vulnerable species
12. Southern white rhinoceros (*Ceratotherium simum*) - IUCN (2014): NT Near-threatened. NEMBA (TOPS 2015): Protected species.
13. Tsessebe (*Damaliscus lunatus*) - NEMBA (TOPS 2015): Protected species. IUCN (2014): Least concern
14. Sharpe's grysbok (*Raphicerus sharpei)* - NEMBA (TOPS 2015): Protected species; IUCN Least Concern.
15. Sable antelope (*Hippotragus niger niger*) - NEMBA (TOPS 2015): Vulnerable species.
16. Temminck's ground Pangolin (*Smutsia temminckii*) - IUCN (2016) Vulnerable. SA Red Data (Child 2016): Vulnerable. NEMBA (TOPS 2015): Vulnerable species.

A number of these species might visit the immediate area and ever venture into the camp because of the lush tree growth, but none of the larger species are expected to remain in the camp due to the presence of people. During the survey of the area in January 2022 no SSC mammal species were found in the camp footprint.

Due to the small size of the footprint, the fence around the camp and the presence of people in the camp area, few SCC animals will make this small spot their permanent dwelling. During the survey of the area in January 2022 no SSC faunal species were resident or expected to reside permanently in the camp footprint. It is thus reasoned that no SCC species will be impacted by the project activities.

5. Impact Assessment

5.1 Present Ecological State of the Project Area

Screening Report

The National Web based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an application for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity. The Screening Tool also provides site specific EIA process and review information, for example, the Screening Tool may identify if an industrial development zone, minimum information requirement, Environmental Management Framework or bio-regional plan applies to a specific area.

A screening report was done for an environmental authorization or for a part two amendment of an environmental authorisation as required by the 2014 EIA regulations, evaluating the proposed development footprint for environmental sensitivity. Following is an abstract from the original Screening Tool application:

Environmental screening results and assessment outcomes

The following summary of the development footprint environmental sensitivities or threat status of the ecosystem and species is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Table 5: A summary of the environmental screening results and assessment outcomes.

Application category	Any activities within or close to a watercourse
Wind or solar developments	No nearby wind or solar developments found.
Environmental Management Frameworks	Olifants EMF
Development zone	South African Conservation Area

Proposed Development Area Environmental Sensitivity

The following summary of the development footprint environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Table 6: The development footprint environmental sensitivities (Figure 23).

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme		**X**		
Animal species		**X**		
Aquatic Biodiversity Theme	**X**			
Archaeological and Cultural Heritage Theme				**X**

Civil Aviation Theme		**X**		
Plant Species Theme			**X**	
Defence Theme			**X**	
Terrestrial Biodiversity Theme	**X**			

The maps in Figure 23 represents the results of the screening for environmental sensitivity of the proposed footprint for the relative agriculture theme sensitivity associated with the project classification.

Table 7: Sensitivity features of the project area.

Theme	Sensitivity	Feature
Agriculture Theme	High	Medium
Animal species theme	High	Aves-*Necrosyrtes monachus* Aves-*Ephippiorhynchus senegalensis* Aves-*Terathopius ecaudatus* Mammalia-*Loxodonta africana* Mammalia-*Hippopotamus amphibius*
	Medium	Mammalia-*Acinonyx jubatus* Mammalia-*Crocidura maquassiensis* Mammalia-*Lycaon pictus*
Aquatic biodiversity	Very High	Aquatic CBAs Wetlands and Estuaries
Archaeological and Cultural Heritage Theme	Low	Low sensitivity
Plant Species Theme	Low - Medium	Sensitive species 1252 Sensitive species 1204
Terrestrial Biodiversity Theme	Very High	Klaserie Private Nature Reserve

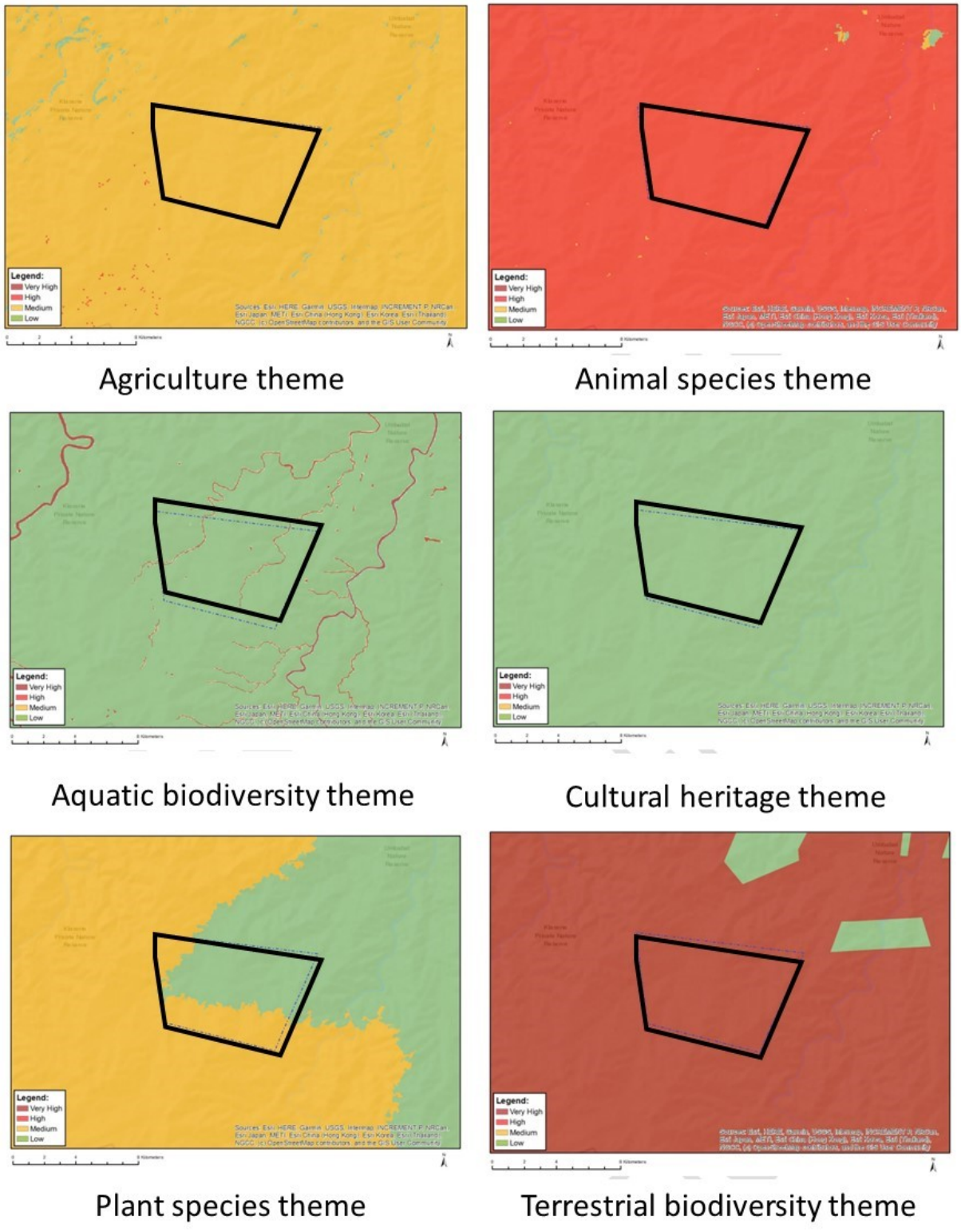

Figure 23: Maps of relative theme sensitivity for important for selected themes (Table 6).

5.2 The use of CBA maps in Environmental Impact Assessments

The Project Area is located in the APNR which is situated in the eastern Lowveld of South Africa to the east of the Drakensberg escarpment on the western boundary of the Kruger National Park (Figure 24).

To establish how important the site is for meeting biodiversity targets, the Land-Use Decision Support Tool (LUDS) was used to compile the LUDS Report (BGIS, 2016). LUDS was developed to facilitate and support biodiversity planning and land-use decision-making at a national and provincial level. Its primary objective is to serve as a guide for biodiversity planning but should not replace specialist ecological assessments.

Critical Biodiversity Areas (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. If these areas are not maintained in a natural or near-natural state, then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

Before the field study, the team will establish how important the site is for meeting biodiversity targets. To do this, it is necessary to answer the following three simple but fundamentally important questions:

- How important is the site for meeting biodiversity objectives (e.g., is it in a CBA or Ecological Support Area (ESA)?
- Is the proposed land-use consistent with these objectives or not (to be checked against the land-use guidelines)?
- Does the sensitivity of this area trigger the MTPA's requirements for assessing and mitigating environmental impacts of developments, or in terms of the listed activities in the EIA regulations?

The key results of the LUDS Report are summarized in Table 8. The information is extracted for the area from national datasets available on the Biodiversity Geographic Information System (BGIS).

Table 8: The key results of the LUDS Report as extracted from the Mpumalanga Biodiversity Sector Plan national datasets available from BGIS.

National Data Set	Aspect
National terrestrial information: Mpumalanga Province	
South African district boundaries	Ehlanzeni
South African municipal boundaries	MPDMA32
Quater-degree grid squares	2431AB
Biome	Savanna
Terrestrial CBAs	
Protected areas	PA National Parks & Nature Reserves
Informal land-based protected areas (NSBA 2010)	Klaserie Private Nature Reserve
National aquatic information: Ntseri Catchment	
Water Management Area (WMA)	Limpopo
Sub-WMA name	Olifants
Freshwater CBAs and ESAs	Other natural areas
Critical Biodiversity Areas	
Freshwater CBAs and ESAs	Other natural areas (ONAs)

Critical Biodiversity Areas

The Klaserie Private Nature is a Provincial Nature Reserve and is classified as a CBA (Figure 24) in the Protected Area Category as “Private Protected Area” (2985 of 1962 Notice 229) (Ferrar. & Lötter, 2007). Protected areas that are proclaimed as protected areas under national or provincial legislation, including gazetted Protected Environments, are areas that are meeting biodiversity targets and therefore must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.

Figure 24: A map of the Mpumalanga and Limpopo Lowveld area, indicating the project location (red circle) to illustrate the large area being covered by National Protected Areas (green shaded area) (Mpumalanga Biodiversity Sector Plan, 2014).

Protected areas are broadly grouped into four types, based on ownership and management status. A little over 73% of the protected areas in the province are state-owned and managed (either National Parks or provincial or municipal Nature Reserves), with the balance falling into one or other category of privately-owned protected area (contract Nature reserves or Protected Environments).

All operational aspects of managing protected areas are subject to their main purpose, which is to protect and maintain biodiversity and ecological integrity. In terms of the Protected Areas Act (Act 57 of 2003), a formally approved management plan is required for each protected area. Such plans identify allowable activities, uses and developments and allocate them to appropriate zones within the protected area. The plans are not purely spatial, but also deal with policy and implementation issues, time frames, staffing, performance criteria and budgets. These plans are also required to consider public participation, capacity building, resource use and other social and economic opportunities, including contractual and co-management arrangements with communities, where appropriate. Where there is an

approved protected area management plan with zonation in place, this will determine the allowable and prohibited activities in each zone within the protected area (Ferrar. & Lötter, 2007).

The desired management objective of Protected Areas is “Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. A benchmark for biodiversity.” The general guidelines are as follows:

- All operational aspects of managing these areas must be subject to their main purpose, which is to protect and maintain biodiversity and ecological integrity and should be governed by a formally approved management plan and land-use activities that support the primary function of these areas as primary sites for biodiversity conservation.
- The management plan must identify allowable activities, which should be consistent at least with the CBA Irreplaceable category; the location of these allowable activities should be captured in a zonation plan in the management plan.
- Activities relating to the construction of roads, administrative or tourism infrastructure and services (such as water reticulation systems, power lines and the likes) that are required to support the primary function of the protected area and its allowable activities, must be subject to at least a basic scoping report, or a full EIA, as specified by NEMA, and the protected area management plan.
- In the case of Protected Environments**,** a variety of agricultural land uses may be allowed, such as livestock grazing, plantation forestry and some cultivation. The location of these land-use activities must be informed by the CBA maps and should be specified in the zonation plan of the management plan for the protected environment. All areas of natural habitat that are zoned for conservation use, should be subject to implementation of the land-use guidelines for protected areas, CBAs, and ESAs.

Ecological Support Areas (ESAs): Those areas that play a significant role in supporting ecological functioning of Critical Biodiversity Areas (CBAs) and/or delivering ecosystem services, as determined in a systematic biodiversity plan. A *Critical Biodiversity Area map* is a map of Critical Biodiversity Areas and Ecological Support Areas based on a systematic biodiversity plan. Critical Biodiversity Areas and Ecological Support Areas are areas that require safeguarding to ensure the continued existence of biodiversity, ecological processes and ecosystem services. A Critical Biodiversity Area map, often developed at provincial level, provides the basis for a biodiversity sector plan.

The Kateka Lodge project area is situated in a CBA catchment (ONA = Other Natural Areas) which means it should be maintained in a natural state with no loss of ecosystem functionality or species (Figure 26). Other Natural Areas are natural areas that are potentially available to changes in land-use, subject to environmental authorisation processes. Although they are not identified to support freshwater CBAs or ESAs, they still provide important ecosystem services. Freshwater ONAs are particularly important in buffers around rivers and wetlands to reduce siltation and improve water quality.

Figure 25: The Critical Biodiversity areas for the Kateka Lodge project area as illustrated by the LUDS programme (BGIS, 2015) for Mpumalanga Province.

Overlaying the BGIS Critical Biodiversity Areas map onto the Kateka Lodge project area, resulted in the compilation of Figures 25 and 26 and Table 8. According to these maps and LUDS Report (Table 8) the project area falls into the following sensitive areas:

- Terrestrial:
  - Protected areas
  - Other natural areas

- Freshwater
  - Other natural areas

With these sensitive landscape properties, it is paramount to approach the construction and operation phases of the entire project with caution as the footprint of the entire project area is classified as a Protected Area.

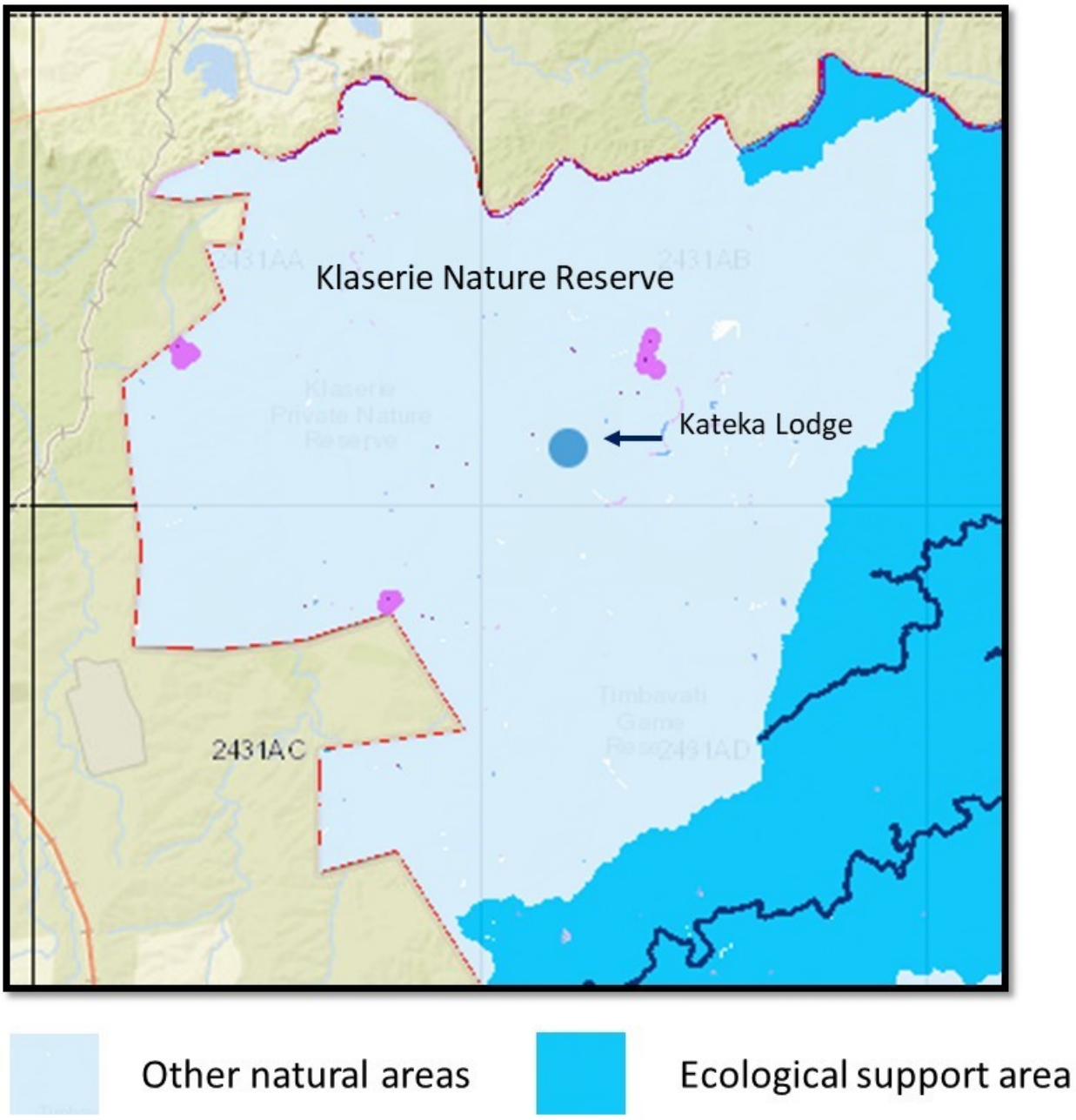

Figure 26: The conservation status of the aquatic system of the project area, as illustrated by the LUDS programme (BGIS, 2015) for Mpumalanga Province.

5.3 Sensitivity mapping

Sensitivity assessments identify those sections of the study area that have high conservation value or that may be sensitive to disturbance. Sensitivities could be determined based on:

- Areas containing untransformed natural vegetation and associated faunal habitat;
- irreplaceability of the vegetation type and associated faunal habitat;
- ecological importance of vegetation and faunal habitat;
- high diversity or complexity of faunal habitat;
- observations of the abundance and diversity of floral and faunal species present at the time of the assessment;
- occurrence of Species of Conservation Concern (SCC);
- systems vital to sustaining ecological functions;
- presence or absence of CBAs and ESAs;
- degree of disturbance encountered as a result of historical activities.

In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to have a low sensitivity.

An ecological sensitivity map of the project area was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various relevant reports. This includes delineating the different vegetation and habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties. Additionally, values and potential presence of vegetation and fauna species diversity, as well as species of conservation concern, were evaluated.

Five, broad-scale botanical biodiversity ‘sensitivity’ categories were identified and were developed for practical mapping purposes. They are intended as a summary of the perceived botanical biodiversity value and sensitivity, of mapped broad-scale vegetation and land-cover type units. Based on the assessment, the sensitivity of the project footprint can be divided into five categories of sensitivity: Very high, High, Moderate, Low and Negligible. These categories are listed as biodiversity sensitivity categories in Table 9.

Note: The ephemeral drainage line was also evaluated but addressed in the Aquatic Report.

Table 9: Important parameters relating to faunal diversity and landscape sensitivity listed in the different vegetation and land cover types in order to establish the biodiversity sensitivity and value of the project area.

Vegetation/ Land cover type unit	**Status and sensitivity of vegetation type**	**CBA Category**	**Biota:** Species of special concern (**SSC**)	**Biodiversity value and sensitivity**	**Overall ecological value and sensitivity**
1.Mopane woodland	Granite Lowveld (Least concern)	CBA Protected Area	**SSC:** 2 reptiles; 17 birds; 16 mammals	Very High	**High**
2. Infrastructure, tracks and fencing	Moderately modified	CBA Protected Area	Moderate	Moderate	**Moderate**

1. Mopane woodland

These untransformed areas contain open woodland which is not impacted by the presence of the Kateka Lodge and associated activities. The 2.45 ha of natural mopane woodland constitutes a typical open savanna woodland with widely spaced tall trees and expanses covered with a dense cover of herbaceous vegetation. The mix of grassland and tall trees constitutes an important Lowveld habitat and is considered to have a "**High"** sensitivity in terms of biodiversity conservation.

2. Infrastructure, tracks and fencing

The areas of woodland that have been modified by human activities in the past (4.34 ha) are moderately modified and areas of erosion is visible towards the drainage line. Most of the original indigenous plant species were incorporated in the lodge landscape and small animal species utilise some of the natural habitats. Therefore, it is currently considerate Moderate in indigenous biodiversity. The overall ecological value and sensitivity of this unit has been assessed as "**Moderate"** in terms of biodiversity conservation.

5.4 Desired management Objective

7.5 Land-use guidelines

Different categories of CBA have specific management objectives, according to their biodiversity priority. In broad terms, the biodiversity priority areas need to be maintained in a healthy and functioning condition, whilst those that are less important for biodiversity can be used for a variety of other land-use types (Lötter et al, 2014).

Protected Areas

Protected Areas are those areas that are proclaimed as protected areas under national or provincial legislation, including gazetted Protected Environments. The desired management objectives for these areas are to meet biodiversity targets and therefore must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.

Table 10: Subcategory - PA: Protected Environment - Natural - Gazetted Protected Environments, in terms of PA Act. Objective: Meeting biodiversity targets in largely production focused landscapes. Biodiversity management plans in place to improve state of biodiversity.

Permissible land-uses that are unlikely to compromise the biodiversity objective.	Land-uses that may compromise the biodiversity objective and that are only permissible under certain conditions.	Land-uses that will compromise the biodiversity objective and are not permissible.
Livestock & Game Ranching	Open Space	Arable Lands
Conservation / Stewardship	High Impact Tourism	Agricultural Infrastructure
Low Impact Tourism	Eco-estates	Forestry
	Roads & Rail	Municipal Commonage
	Water Works, Sewerage Works, Catchment Transfers	Rural Residential
	Linear Structures: Pipelines, Canals, Power lines	Residential
		Urban Influence
		Low Impact & General Industry
		High Impact Industry
		Quarrying / Opencast Mining
		Prospecting / Underground Mining
		Transport Services
		Other Utilities

Land use: The Mpumalanga zonation scheme defines 25 zones, many of which provide for the distinctions needed for urban planning, and the zonation most relevant for the Wessels Camp project is:

Zone: Tourism and Accommodation - Low Impact Tourism

The Tourism and Accommodation zone provides opportunities for the development of a broad range of tourist and recreational facilities, inclusive of tourism, recreation and accommodation facilities. The degree of impact on biodiversity depends on the nature of the tourism facility.

- Low impact facilities include things such as outdoor recreation (e.g., hiking trails, 4 x 4 tracks), camping sites, gift shops, restrooms and non-place-bound tourist and recreation facilities such as paint-ball parks.

Eco-and adventure-tourism make a significant and growing contribution to the economy of this region, providing stable and sustainable employment for large numbers of people. Although the Kruger National Park has over the years been the cornerstone of this sector, and will likely always remain so, Mpumalanga has a wide variety and abundance of scenic natural areas and a growing international tourist market. The growth in game farming and the establishment of numerous private conservation areas and other nature-based tourism activities has expanded the economic opportunities that well-managed biodiversity and natural landscapes can provide (Lötter et al, 2014).

Low Impact tourism and accommodation facilities that are in support of sustainable rural tourism, rural businesses and communities and that provide for the rural recreational and leisure needs of urban dwellers, could be allowed in protected areas, CBAs and ESAs subject to the appropriate biodiversity related controls being in place. In all cases, permission would

be required to ensure that these land-uses do not compromise the specific biodiversity objectives of the area (Lötter et al, 2014).

5.5 Impact Assessment and Mitigation

Development aspects

The following proposed development activities will be assessed relating to their impacts on the local and surrounding environment.

Development 1. The refurbishment of infrastructure in the current fenced footprint (Figure 3).

Development 2. The construction of a wellness area to the north of the camp (greenfield area) (Figure 3).

Development 3. The development of a staff housing area and the construction of storerooms, workshop and bedrooms to the south of the camp (greenfield area) (Figure 3).

Development 4. Fencing of the new greenfield areas.

Development 5. Re-routing the road around the project area and creating a new stream crossing through the drainage line.

The potential impacts of the project on the biodiversity of the study area are assessed under the following broad categories, namely:

CONSTRUCTION PHASE

Activity 1. Construction of the planned infrastructure and activities impacting the environment.

Impact 1.1 Site clearing and manipulating topsoil - Cleared areas are prone to erosion.
Impact 1.2: Removal of large or protected trees in the footprint
Impact 1.3: Noise, movement, lights and dust disturbing local fauna.
Impact 1.4: Pollution of the soil due to construction activities.
Impact 1.5: Clearing fence lines and erecting new fences.
Impact 1.6: Rehabilitation of demolished infrastructure.

Activity 2. The new route to the drainage crossing.

Impact 2.1: Construction a new road to the drainage crossing.

OPERATIONAL PHASE

Activity 3: Operation of the extended and new infrastructure

Impact 3.1: Storm water has the potential to increase soil erosion.
Impact 3.2: Alien invasive vegetation.

The impact assessment of all the perceived impacts provided below, describes each broad impact, determines the significance of the impact and lists summarised mitigation and monitoring measures for each impact.

Activity 1. Construction of the planned infrastructure and activities impacting the environment.

Impact 1.1 Site clearing and manipulating topsoil - Cleared areas are prone to erosion.

Applicable Phase: Construction phase
Applicable activity: Site clearing and manipulating topsoil.

Nature of impact:

The clearance of vegetation for buildings, infrastructure and access roads will require clearing and earthworks to enable levelling and contouring of the site, which implies the movement or removal of topsoil and sub-surface material. Cleared areas are prone to erosion, which will alter the ground level and topography of the site.

Vegetation clearing (exposed soil surfaces) and compacted surfaces (access roads) may alter the hydrological nature of the area by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate into the soils (where vegetation is cleared, compaction takes place, and where hard surfaces are constructed), which escalates the potential for erosion to occur.

Should erosion occur, it will result in the loss of valuable soil. During the operational phase of the development, the potential for soil erosion also exists in areas where water may be concentrated such as during the rain periods.

Mitigation of Impact 1.1: Demarcate strict no-go areas around sensitive environments including, watercourses and large trees.

Strict measures must be taken to prevent erosion and loss of valuable soil. These measures should include:

- minimising the clearing areas and the removal of topsoil, stockpiling, covering and reuse of topsoil where re-establishment of vegetation on cleared areas is possible,
- re-establishment of indigenous vegetation wherever possible,
- Control of stormwater run-off (in accordance with a stormwater management plan) and ongoing repair and stabilisation of any erosion.

Table 11: Site clearing and manipulating topsoil.

ISSUE:	Site clearing and manipulating topsoil.
Project Phase	Construction
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Short-term (1)
Consequence	Very low (3)
Probability	Possible
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Medium
Preferred Alternative	None.

- **Significance Post Mitigation: LOW -** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

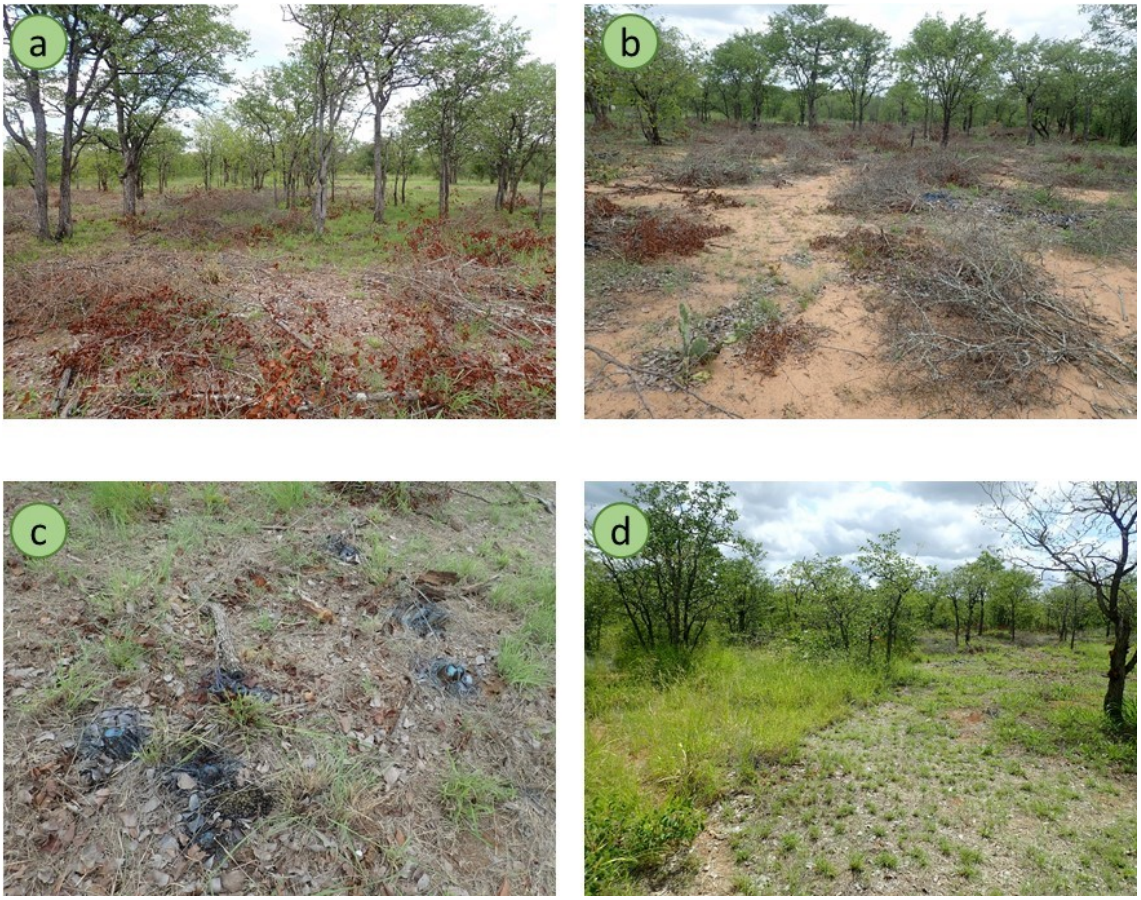

Figure 27: Vegetation clearing

27a. The areas earmarked for the housing and the wellness centre have been cleared of shrubs and small trees, all the larger trees remained as part of the camp landscape.
27b. Cleared brush are left on the ground to act as cover and slow down some of the flows during rain events and thus delay erosive forces.

27c. Poisoning of root stock and cut down stumps prevent coppicing.

27d. Slashing herbaceous vegetation leaves rootstock intact to bind the soil.

Impact 1.2: Removal of large or protected trees in the footprint

Applicable Phase: Construction phase
Applicable activity: Site clearing.

Nature of impact:

The clearance of vegetation for buildings, infrastructure and access roads will require clearing and earthworks to enable levelling and contouring of the site, which implies the cutting of large trees. Removal of tall trees alters the structure and function of the remaining woodland in the camp.

Mitigation of Impact 1.2: The site layout, service distribution lines and access areas should be clearly marked out on site by the ECO and Project manager prior to any vegetation clearing taking place in order to prevent unnecessary vegetation clearing.

Once a site plan has been submitted and authorised by the ECO, the contractor will proceed with necessary vegetation clearing and/ pruning within the marked development footprint. Demarcation is to be maintained and left in place for the duration of works. The contractor is to take all efforts to minimise the amount of vegetation that is cleared. No workers will collect wood on the construction site.

Do not remove any large tree without the permission of the ECO. In all areas mark trees earmarked for removal prior to felling for approval by the ECO.

The areas earmarked for the housing and the wellness centre have already been cleared of shrubs and small trees (Figure 27), all the larger trees remained as part of the camp landscape.

Table 12: Removal of large or protected trees in the footprint.

ISSUE:	Removal of large or protected trees in the footprint.
Project Phase	Construction
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Short-term (1)
Consequence	Very low (3)
Probability	Possible
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Medium
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Medium
Preferred Alternative	None.

- **Significance Post Mitigation: VERY LOW** - the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact 1.3: Noise, movement, lights and dust disturbing local fauna.

Applicable Phase: Construction phase
Applicable activity: Construction of camp infrastructure.

Nature of impact:

The noise, dust and movement during the construction phase will drive out most of the more mobile faunal species (birds and larger mammals).

Construction activities may result in noise pollution, mainly from traffic from vehicles and machinery, but also from the construction crew. The noise and movement will stress nearby animals and drive them away.

Light pollution may be created if construction takes place outside of daylight hours. Changes in lighting in an area, for example, can significantly affect some species' behavioural and biological rhythms, which are guided by natural cycles of light and dark. Nocturnal species, particularly birds, can become disoriented by night-time lighting.

Dust is created during the construction of gravel roads and unbound aggregate layers. Dust is an almost inevitable consequence of roadwork. The resulting dust can disturb both the faunal population and the local environment.

Mitigation of Impact 1.3: The project planners should address environmental opportunities and constraints of the site, visual impacts, materials used, access points, lighting, noise, dust, etc.

Noise: Vehicles, diesel generators and factory machines need to be maintained properly and checked from time to time. Lack of maintenance will not only increase noise levels, but also decrease the efficiency of these machines.

Lighting: In order to preserve the rural/wilderness atmosphere of developments in such areas, light spillage at night should be kept to a minimum and all external lighting should be low-mast (preferably bollard-type), down-cast lighting of a low intensity.

Dust: Dust incidences can be treated by either watering, alternative material choices or using dust binders. Alternatives include re-vegetation of temporarily exposed surfaces on which infrastructure will not be constructed.

Table 13: Noise, movement, lights and dust disturbing local fauna.

ISSUE:	Noise, movement, lights and dust disturbing local fauna.
Project Phase	Construction
Nature	Negative
Extent	Site (1)
Intensity	Medium (2)
Duration	Short-term (1)
Consequence	Very low (4)
Probability	Probable
Degree to which impact cannot be reversed	Medium
Degree to which Impact may cause	Low

irreplaceable loss of resources	
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Medium
Preferred Alternative	None.

- **Significance Post Mitigation: LOW -** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact 1.4: Pollution of the soil due to construction activities.

Applicable Phase: Construction phase
Applicable activity: Pollution of the soil due to construction activities.

Nature of impact:

During construction, hydrocarbons leaking from construction vehicles, refuelling depots and concrete mixing areas, may result in the contamination of soils, leaving the soil sterile or at risk of leaching contamination to surface or ground water.

Stockpile areas for construction material, generation and disposal of building waste and liquids and vehicle maintenance could have a negative impact on ground water, surface water and the environment as a whole.

Mitigation of Impact 1.4: Storage and construction material.

The following must be adhered to:

- All stockpile sites to be approved by the ECO and/or landowner, prior to commencement of stockpiling.
- All stockpile sites to be properly demarcated with silt-fences and/or danger tape, where necessary.
- Silt protection measures around stockpile sites may be required.
- All construction material should be stored within the site camp / boundary (if space allows it).
- No construction material is to be stored outside of the site camp / boundary without written permission from the appropriate landowner.
- No hazardous materials to be stored on site like diesel, petrol etc. without approval by the ECO.

Table 14: Pollution of the soil due to construction activities.

ISSUE:	Pollution of the soil due to construction activities.
Project Phase	Construction
Nature	Negative
Extent	Site (1)
Intensity	Medium (2)
Duration	Short-term (1)
Consequence	Very low (4)
Probability	Possible
Degree to which impact cannot be	Low

reversed	
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Low
Preferred Alternative	None.

Significance Post Mitigation: LOW - the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact 1.5: Clearing fence lines and erecting new fences.

Applicable Phase: Construction phase
Applicable activity: Erecting new fences.

Nature of impact:

Clearing fence lines will result in vegetation clearing.

Mitigation of Impact 1.5: Care should be taken to refrain from removing large trees. The fence should also adhere to the 10 m drainage line buffer (see aquatic report).

Table 15: Clearing fence lines and erecting new fences.

ISSUE:	Clearing fence lines and erecting new fences.
Project Phase	Construction
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Short-term (1)
Consequence	Very low (3)
Probability	Improbable
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	High
Significance Pre- Mitigation	**Low (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Low
Preferred Alternative	None.

Significance Post Mitigation: VERY LOW: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact 1.6: Rehabilitation of demolished infrastructure.

Applicable Phase: Construction phase
Applicable activity: Rehabilitation of demolished infrastructure.

Nature of impact:

The planned demolition of five the existing buildings will result in damaged and bare surfaces in the camp area, as well as rubble left by the demolition. The area laid bare by the demolition will be prone to erosion and the rubble will be aesthetically unacceptable.

Mitigation of Impact 1.6: Identify areas that must be rehabilitated to their natural state and areas that can be rehabilitated to a functional state (e.g., lawns and gardens).

The general aim of a rehabilitation programme is to recreate a natural ecosystem. The rehabilitation will therefore be outlined in three phases, which are required, namely:

- Take measures to stabilise the soil and remedy the soil;
- Re-vegetate disturbed areas using appropriate natural successional species;
- Monitor and manage the success of the rehabilitation by controlling aggressive indigenous plants, removing alien invasive plant species as soon as they are observed, and maintaining the re-vegetated areas to ensure the successful establishment of these re-vegetated areas.

The selection of species to be used for re-vegetation should be based on the ability of the species to successfully grow from the indigenous seeds, sods and/or plants which have been collected from the site.

The ECO should monitor the rehabilitation process and record the progress in the regular audit reports using photographic evidence. This should include monitoring the establishment success (presence, percentage cover or absence) of plant cover and species composition per plot.

Rubble resulting from the demolition must be disposed of at a registered and approved waste disposal site.

Table 16: Rehabilitation of demolished infrastructure.

ISSUE:	Rehabilitation of demolished infrastructure.
Project Phase	Construction
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Short-term (1)
Consequence	Very low (3)
Probability	Improbable
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Low

Preferred Alternative	None.

Significance Post Mitigation: VERY LOW: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.

Activity 2. The new route to the drainage crossing.

Impact 2.1: Construction a new road to the drainage crossing**.**

Applicable Phase: Construction phase
Applicable activity: Rehabilitation of demolished infrastructure.

Nature of impact:

The current road forms part of the reserve's road network and a new crossing will be needed to replace the current drainage line crossing. Figure 28b shows the current route to the left which leads to the drainage line crossing and which will be neutralised by the new development. The route to the right might become the alternative route, but this will be extended towards the drainage line and the creation of a new drainage line crossing further downstream.

Access routes and tracks can have a significant impact on ecosystems, particularly in terms of erosion and sedimentation of local watercourses, if not mitigated properly. Erosion of cleared and bare areas leads to sedimentation into the water course. Issues and areas of concern related to the siting and design of the road and crossing are:

- The presence and distribution of sensitive soils, notably clay / duplex soils.
- Drainage channels and river crossings.
- Areas of sensitive habitats and protected species.

Mitigation of Impact 2.1: Only the construction of two-spoor track type roads will be allowed. These proposed two-spoor tracks will be categorised as all-weather roads. The route should be clearly marked out on site by the ECO and Project manager prior to any vegetation clearing taking place in order to prevent unnecessary vegetation removal. Use existing roads whenever possible.

Road construction should not impact any large indigenous trees, especially protected species. Avoid sensitive areas. Areas may be sensitive because of conflicts with other resources or because of problems in construction or reclamation. Some examples of sensitive areas are:

• Highly erodible areas, that is, fine-textured soils, steep slopes.
• Areas directly visible from recreational areas (camp sites).

Table 17: Construction a new road to the drainage crossing**.**

ISSUE:	Construction a new road to the drainage crossing**.**
Project Phase	Construction
Nature	Negative
Extent	Local (2)
Intensity	Medium (2)
Duration	Medium-term (2)
Consequence	Medium (6)

Probability	Possible
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Low
Preferred Alternative	None.

Significance Post Mitigation: LOW - the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

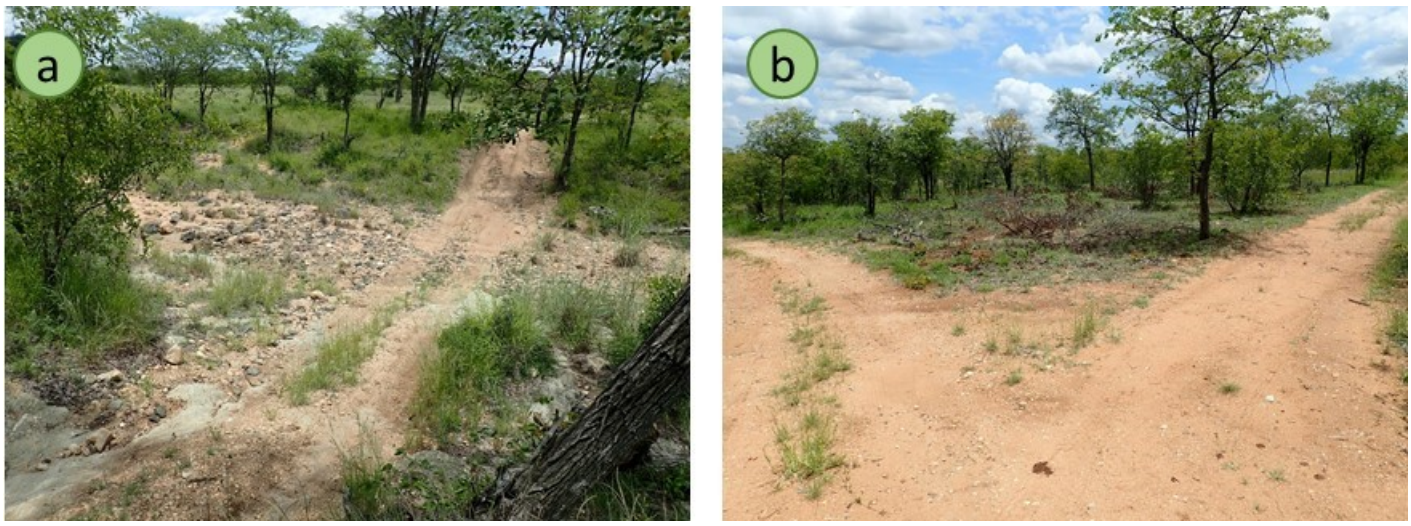

Figure 28: The existing drainage line crossing and the current route to the crossing.

28a. The current drainage line crossing.
28b. The current route to the drainage line crossing (track to the left).

OPERATIONAL PHASE

Activity 3: Operation of the extended and new infrastructure

Impact 3.1: Storm water has the potential to increase soil erosion.

Applicable Phase: Operational phase
Applicable activity: Storm water.

Nature of impact:

Diversion of stormwater may result in large volumes of water being concentrated in certain areas, thereby increasing the risk of erosion. Erosion of the soil surface greatly increases the risk of losing topsoil to erosion, impairing the soils' ability to support vegetation growth.

Diversion of stormwater may result in large volumes of water being concentrated in certain areas, thereby increasing the risk of erosion. Concentrated stormwater deriving from the infrastructure hard surfaces will result in erosion and siltation of stream beds.

Mitigation of Impact 2.1: Storm water management should be undertaken in order to prevent erosion, to protect water sources from siltation and to preserve the ecosystems of watercourses. The introduction of efficient stormwater drainage systems to deal with the erosion and siltation problem implies that the runoff must be conveyed as efficiently as possible to the natural watercourses.

It is suggested that Best Practice Guidelines and Specifications relating to stormwater management should be used to implement measures to slow down flows channelled through the camp, right from where the fence start at the eastern boundary. Paving of areas should be kept to a minimum.

Table 18: Storm water has the potential to increase soil erosion.

ISSUE:	Storm water**.**
Project Phase	Operation
Nature	Negative
Extent	Site (1)
Intensity	Medium (2)
Duration	Short-term (1)
Consequence	Very low (4)
Probability	Possible
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Medium
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Low
Preferred Alternative	None.

Significance Post Mitigation: LOW - the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Figure 29: Current route to the drainage line crossing.

29a. An erosion furrow leading from the camp area towards the drainage line.
29b. Some bare areas created by surface flows and erosion.
29c. Areas in the current camp, illustrating the risk of erosion and gulley formation.

Impact 3.2: Alien invasive vegetation.

Applicable Phase: Operational phase
Applicable activity: Influx of alien invasive vegetation.

Nature of impact:

The control of weeds and invasive alien species on the development site is the responsibility of the developer.

The removal of indigenous plant species predisposes the disturbance footprint to alien plant invasion. Competing with indigenous plant species and further transform the natural habitat. This makes future rehabilitation/re-vegetation difficult and favours colonising species like invasive aliens.

Increased human activity may result in introduction of alien invasive species.

Mitigation of Impact 3.2: Maintain a long-term strategy of invasive alien plant eradication for the site linked to the Reserve management.

Control exotics and invasive plants to be eradicated. Following the completion of any works, the user must ensure that all disturbed areas are:

(i) cleared of alien invasive vegetation;
(ii) re-vegetated with indigenous and endemic vegetation suitable to the area.

Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Rehabilitate all identified areas as soon as practically possible, utilising specified methods and species.

Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge.

Chemical eradication: Ensure that only properly trained people handle and make use of chemicals. Follow manufacturer's instruction when using chemical methods, especially in terms of quantities, time of application etc.

Table 19: Alien invasive vegetation.

ISSUE:	Alien invasive vegetation**.**
Project Phase	Operation
Nature	Negative
Extent	Local (2)
Intensity	Low (1)
Duration	Short-term (1)
Consequence	Very low (4)
Probability	Possible
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Low
Preferred Alternative	None.

Significance Post Mitigation: LOW - the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact 3.3: The transformed camp footprint act as a migration obstacle.

Applicable Phase: Operational phase
Applicable activity: Presence of camp prevent animals from passing through.

Nature of impact:

The fieldwork component of this study was conducted during January 2022. During the survey it was realised that the extent of the proposed development footprint and the nature of the final product must be evaluated at a local scale to assess the probable impact it might have on the local ecology.

- The 450m fenced property along the banks of the unnamed ephemeral drainage line will act as a barrier to most of the medium and larger mammal species that currently pass through the area.
- Preventing larger mammal species to access the drainage line.
- Some shrubs will be replaced by infrastructure (approximately 20% of the ground cover).

The initial footprint (1.89 ha) and management of the current lodge, Mafunyane Camp, seemingly had very little adverse impacts on the local ecology or biodiversity. The extension of the camp by adding 2.45 ha to the northern and southern perimeters of the project area (now referred to as Kateka Lodge), will increase the footprint of the project area from 300m to 450m along the banks of the unnamed ephemeral drainage line. The influence of the added 2.45 ha of greenfield mopane woodland (still unfenced), as well as the final 4.34 ha covered by the proposed development, will be the main components to evaluate during the impact assessment.

Mitigation of Impact 3.3: At an early stage of the survey, it became clear that the added 2.45 ha of mopane woodland to the northern and southern perimeters of the development will have very little impact on the environment if considered in the context of the larger Klaserie Private Nature Reserve.

The 2.45 ha of mopane woodland will be converted into fenced woodland with scattered infrastructure in between. Mopane woodland is a very common biotope in the northern portion of the Reserve. In this footprint only shrubs will be removed, mostly mopane shrubs, and this alteration will not have a significant impact on the regional biodiversity of the area considered.

A synopsis of main impacts envisaged are the following:

- The 450m fenced property along the banks of the unnamed ephemeral drainage line will act as a barrier to most of the medium and larger mammal species that currently pass through the area. However, as in the past, they will move around the flanks of the proposed fenced area with ease and the barrier will not impact on local mammal movement.
- Preventing larger mammal species to access the drainage line: The drainage line is ephemeral and rarely holds water, and the riparian zone does not offer different feeding areas than the surrounding mopane woodland. The only point of importance to the game in the area is the artificial drinking hole on the other side of the drainage line. However, observing game tracks on the aerial photos (Google Earth; Figure 2), most of the local game access the water from the west of the camp.
- Although some shrubs will be replaced by infrastructure (approximately 20% of the ground cover), most of the larger trees will form part of the camp environment and still available to birds and other small animal species.

After surveying the current footprint and the proposed greenfield areas, it was concluded that no special habitats will be influenced during the development of the proposed project, and that the species composition of plants and animals are similar to the area surrounding the Kateka Lodge.

Fencing the project area and the presence of people in the lodge area will deter the more sensitive or retiring species to steer clear of the lodge establishment. On the other hand, as been experienced at the current lodge, many species are not deterred from utilising any of the natural aspects of the project area. These species are an asset to the venture and therefore they will not be discouraged to visit the lodge area. It will only be problem animals, such as monkeys and baboons that will be discouraged from perceiving the Lodge as a place to find easy food.

Table 19: The transformed camp footprint act as a migration obstacle..

ISSUE:	The transformed camp footprint act as a migration obstacle.
Project Phase	Operation
Nature	Negative
Extent	Local (2)
Intensity	Low (1)
Duration	Short-term (1)
Consequence	Very low (4)
Probability	Possible
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	High
Significance Pre- Mitigation	**Medium (-ve)**
Significance Post Mitigation	**Low (-ve)**
Degree of Mitigation	Low
Preferred Alternative	None.

Significance Post Mitigation: LOW - the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact Assessment Summary

Table 20: A summary of the impact assessment post mitigation.

Impact No	Issue and aspect	Phases	Significance without mitigation	Significance with mitigation
1.1	Site clearing and manipulating topsoil	Construction	**Medium (-ve)**	**Low (-ve)**
1.2	Removal of large or protected trees in the footprint	Construction	**Medium (-ve)**	**Low (-ve)**
1.3	Noise, movement, lights and dust disturbing local fauna	Construction	**Medium (-ve)**	**Low (-ve)**
1.4	Pollution of the soil due to construction activities.	Construction	**Medium (-ve)**	**Low (-ve)**
1.5	Clearing fence lines and erecting new fences	Construction	**Low (-ve)**	**Low (-ve)**
1.6	Rehabilitation of demolished infrastructure	Construction	**Medium (-ve)**	**Low (-ve)**
2.1	Construction a new road to the drainage crossing.	Construction	**Medium (-ve)**	**Low (-ve)**
3.1	Storm water	Operational	**Medium (-ve)**	**Low (-ve)**
3.2	Alien invasive vegetation.	Operational	**Medium (-ve)**	**Low (-ve)**
3.3	The footprint act as a migration obstacle.	Operational	**Medium (-ve)**	**Low (-ve)**

5.6 Reasoned opinion

The proposed development entails renovations of existing infrastructure, replacing redundant infrastructure and initiate new projects in the expanded project footprint. The proposed Kateka Lodge development includes the original, fenced-off Kateka Lodge project area (1.89 ha), as well as the proposed 2.45 ha extended area.

The following risks have been identified to potentially impact on the receiving environment:

Construction phase:

Construction of the planned infrastructure and activities impacting the environment.

- Site clearing and manipulating topsoil - Cleared areas are prone to erosion.
- Removal of large or protected trees in the footprint
- Noise, movement, lights and dust disturbing local fauna.
- Pollution of the soil due to construction activities.
- Clearing fence lines and erecting new fences.
- Rehabilitation of demolished infrastructure.

The new route to the drainage crossing.

- Construction a new road to the drainage crossing.

Operational phase

Operation of the extended and new infrastructure

- Storm water has the potential to increase soil erosion.
- Alien invasive vegetation.
- The footprint act as a migration obstacle.

After surveying the current footprint and the proposed greenfield areas, it was concluded that no special habitats will be influenced during the development of the proposed project, and that the species composition of plants and animals are similar to the area surrounding the Kateka Lodge.

During the survey of the area in January 2022 no Species of Conservation Concern (SCC) were observed in the camp footprint. This includes both fauna and flora. A number of SCC animal species might visit the immediate area and ever venture into the camp because of the lush tree growth, but none of the larger species are expected to remain in the camp due to the presence of people.

Due to the small size of the footprint, the fence around the camp and the presence of people in the camp area, few SCC animals will make this small tract of land their permanent dwelling. During the survey of the area in January 2022 no SSC faunal species were resident or expected to reside permanently in the camp footprint. It is thus reasoned that no SCC species will be impacted by the project activities.

All the expected impacts were assessed and all were confirmed to be “Low” or mitigated to attain a “Low” risk level. By implementing all the mitigation measures and managing the system on a continuous basis as prescribed by the Risk Assessment, all the impacts will be addressed to a satisfactory level. Therefore, it is proposed that the project should be authorised with the provision that the mitigation measures prescribed in this document, where applicable, are included in the EMPr

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ANNEXURE B: Paeleontological.

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

EVOLUTIONARY STUDIES INSTITUTE

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Marion.bamford@wits.ac.za
29 October 2021

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 extension of Mafunyane Camp, Farm Fife 44, Klaserie Game Reserve, Mpumalanga

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.

Mafunyane Camp has been established on Farm Fife 44, part of the Klaseie Private Nature Reserve. The site is northeast of Hoedspruit. The owners of the property are proposing to construct about seven new chalets and other buildings to the southwest of the existing buildings (Fig. 1).

The entire farm lies on non-fossiliferous biotite gneiss of the ancient Makhutswi Gneiss (Fig. 2). Volcanic rocks do not preserve fossils and these ones are older than the origin of any life forms on earth. There is no chance of finding fossils in the project footprint, confirmed by the grey colour on the SAHRIS palaeosensitivity map (Fig. 3). We request exemption, therefore, for any further palaeontological impact assessment. As far as the palaeontological heritage is concerned, I recommend that the project be authorised.

Figure 1: Google Earth site map of the Mafunyane Camp site (thin black lines).

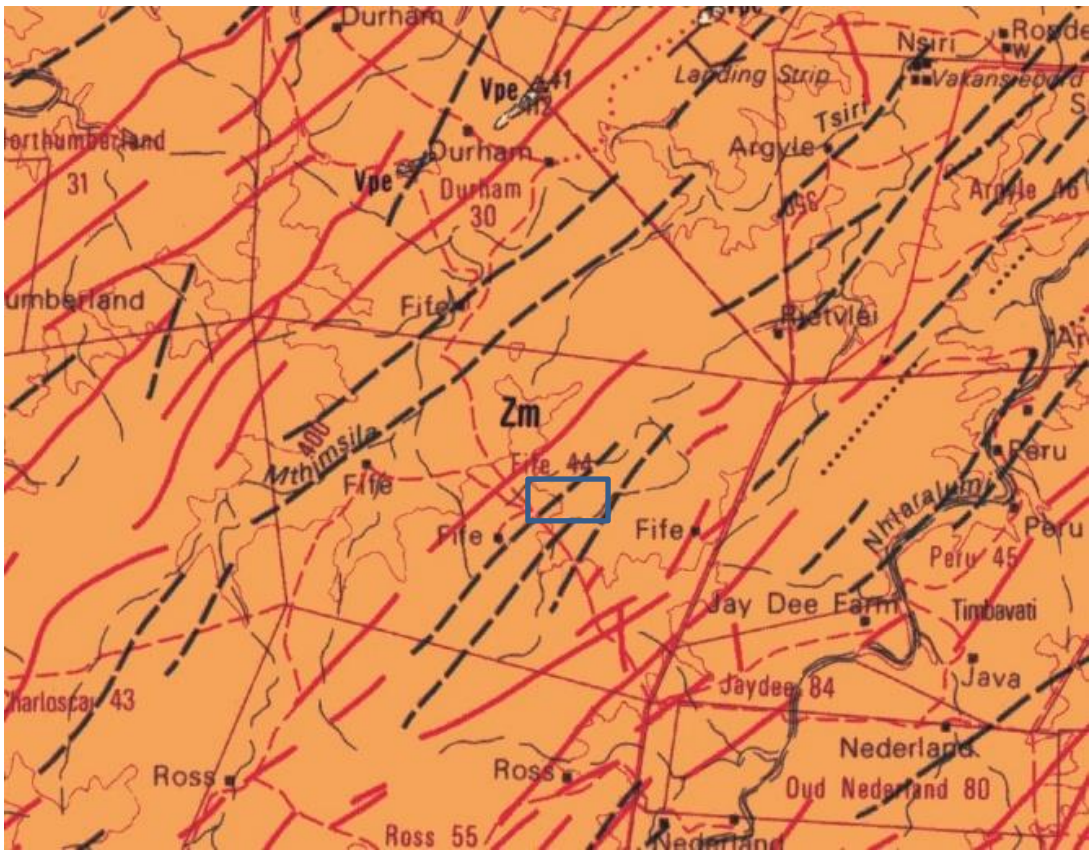

Figure 2: Geological map of the area around the Mafunyane Camp site. The location of the proposed project is indicated within the blue rectangle. Abbreviations of the rock types are: Zm = Makhutswi Gneiss (biotite gneiss). Map enlarged from the Geological Survey 1: 250 000 map 2430 Pilgrims Rest

Figure 3: SAHRIS palaeosensitivity map for the site for the proposed extension of Mafunyane Camp shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

Yours faithfully

MKBamford

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: MKBamford

ANNEXURE C: Historical Impact Assessment.

Phase 1 Archaeological and Heritage Impact Assessment on the farm Fife 44 KU in respect of the proposed expansion and construction of accommodation facilities in the Klaserie Private Nature Reserve, Mpumalanga Province.

Compiled by:

KUDZALA antiquity cc

For **Henwood Environmental Solutions**

Surveyor: Mr JP Celliers

10 January , 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 6 ha on the farm Fife 44 KU in respect of the expansion of an existing camp.
Purpose of the study: An archaeological and heritage study in order to identify cultural heritage resources in respect of the establishment of a camp for tourism purposes.

Topographical Maps: 1:50 000 2431 AB (1970, 1986); 1:250 000 2430 (1998).

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: 10 January 2022

Description and findings:

An Archaeological and Heritage Impact Assessment was undertaken by Kudzala Antiquity CC in respect of the proposed expansion of an existing camp, known as Mafunyane Camp, and associated facilities within an area of approximately 6 hectares on the farm Fife 44 KU in the Klaserie Private Nature Reserve near Hoedspruit, 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 including scrutiny of previous heritage surveys of the area formed the baseline information against which the survey was conducted. No sites or features of heritage significance was recorded or located during the physical survey.
A total of eight survey orientation locations were documented, sites SO 1-8 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 significant archaeological sites or features were located.
In terms of section 36 of the NHRA, no graves or gravesites and burial grounds were located.

It is not within the expertise of this report or the surveyor to comment on possible palaeontological 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 the proposed construction of new accommodation facilities at the existing Mafunyane camp on an area of approximately 6 hectares on the farm Fife 44 KU located within the Klaserie Private Nature Reserve 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 expand on an existing Bush Lodge and camp known as Mafunyane in the Klaserie Private Nature Reserve. Suitable areas within this 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. Most of the project footprint area was relatively easy of access but certain areas were difficult to access due to dense vegetation growth which resulted in archaeological visibility being low.

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.

1.2.1. Heritage in Protected areas

In February 2016 Government Gazette no. 40593 the Department of Environmental Affairs published Cultural Heritage Survey Guidelines and Assessment tools for protected areas in South Africa, under the National Environmental Management: Protected Areas Act, 2003 (Act 57, 2003).

In protected areas a basic inventory of the property facilitates confirmation of national heritage resources; conducting of heritage audits; site condition monitoring; prioritising sites by ranking their significance; evaluation of a protected area's heritage; assistance in planning for heritage resources and allocating resources.

Process in compiling the cultural resources inventory for the Klaserie Private Nature Reserve entails significance assessment of the heritage resources, condition assessment and evaluation for grading of the resources. This has not yet been done for the Klaserie and may be a valuable future consideration. A concise history of the establishment and history of the Klaserie Private Nature Reserve is discussed in section 4.1.6. of this report.

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 archaeological and heritage sites.

2. Description of surveyed area

The study area falls within the Klaserie Private Nature Reserve, Mpumalanga Province.
The survey was carried out on a project footprint consisting of approximately 6 hectares of Granite Lowveld vegetation.

Landscape: Natural and wetland vegetation previously Granite Lowveld vegetation and soils.

Visibility: Good-Poor in certain areas due to dense vegetation cover.

Veld type: The vegetation is classed as Granite Lowveld comprising tall shrubland with few trees to moderately dense woodland on the deep sandy uplands with *Terminala sericea, Combretum zeyheri and C. Tricholaena Eragrostis rigidior*. Dense thicket to open savanna in the bottomlands. The dense herbacius layer contains the dominant *Digitaria eriantha, Panicum maximum* and

Astrida congesta on fine-textured soils. The brackish bottomlands support *Sporobolus nitens, Urochloa mosambicensus* and *Chloris virgata* (Mucina and Rutherford, 2009).

Geology and soils: Swazian Goudplaats Gneiss, Makhutswi Gneiss and Nelspruit Suite occur from north to south. Further south, the younger Mpuluzi Granite form the major base geology of the area. Archaian gneiss and granite weather into sandy soils in the uplands and clayey soils with high sodium content in the lowlands (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 vicinity of the proposed development area.

In 2002 Mr FP Coetzee conducted an Archaeological Investigation on Antwerpen Game Farm in the Hoedspruit District. He did find some Middle Stone Age and early Iron Age remains in an erosion donga on the farm which is approximately 6000 hectares in extent.

In 2003 Mr F Roodt compiled a report in respect of a lodge development on the farm Avoca 88 for R&R Cultural Resources Consultants. He found some pottery fragments which were eroded from a nearby anthill. He did not ascribe any significance to the fragments.

In 2005 Dr Udo Kűsel conducted a "*Cultural Heritage Resources Impact Assessment of a Portion of Kapama Hoedspruit (Guernsey 81 KU Portions 6, 34, 98, 109, 56, 204 and 210)".* He stated that "except for a few isolated Stone Age flakes no important cultural heritage resources could be found".

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 17 December 2021
- The survey took one day to complete.
- The documented sites were numbered sequentially.
- Sites were recorded by using a handheld Garmin Oregon 450 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.
- No sites of archaeological or heritage significance were located. A number of survey orientation locations 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. Historians agree that the earliest Africans to inhabit in the Lowveld in Mpumalanga were of Nguni origin.

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. The Nelspruit settlement first received official recognition in August 1884 (South African History Online 2013).

4.1.2. Colonial settlement

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. 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).

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).

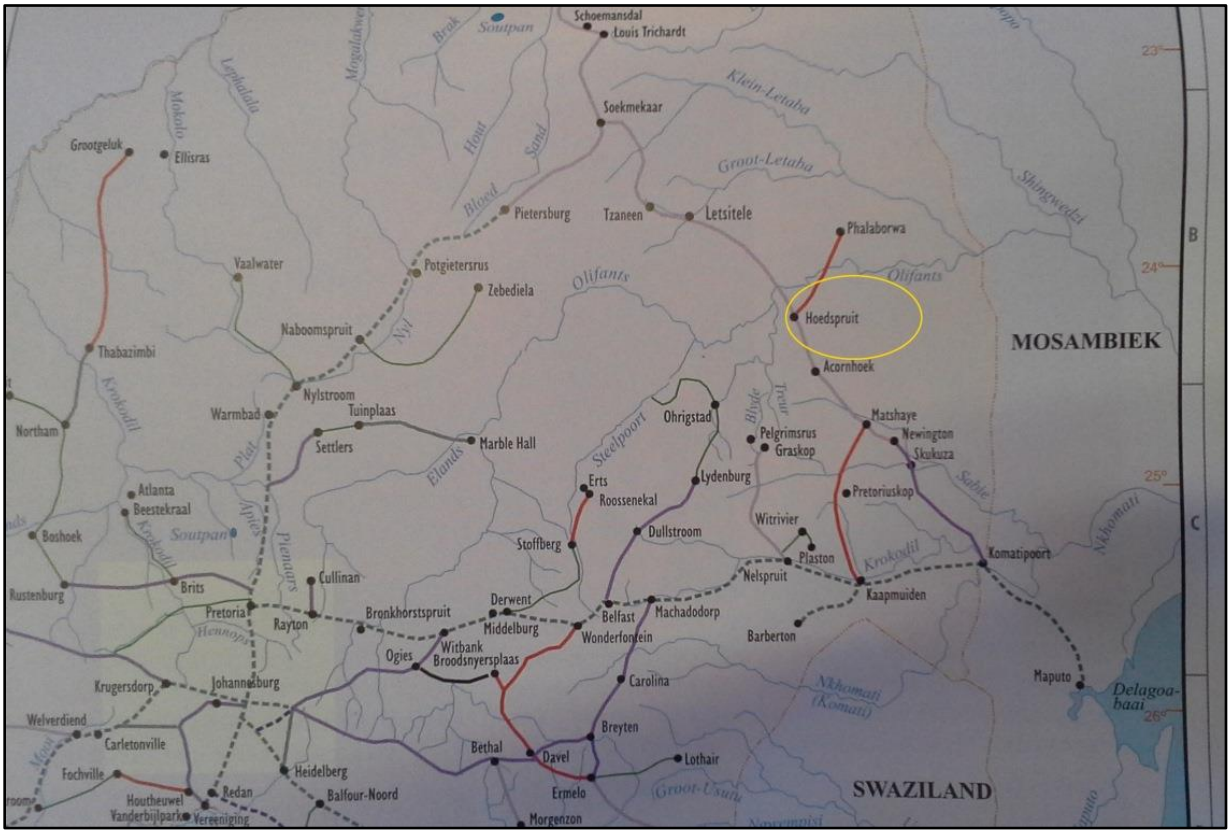

Figure 4.1. Railway development in the Transvaal, 1889-1980 (Bergh, 1999: 79)

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 (Fig. 4.1.). The Komatipoort – Newington line was extended and passed over Acornhoek, Hoedspruit, Letsitele, Tzaneen and Soekmekaar 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 until the present, South Africa has been divided and re-divided into various districts. Since 1845, the farms under investigation formed part of the Lydenburg district. By 1902 the farms were under the jurisdiction of the Ohrigstad ward of the Lydenburg district. As of 1924, the study area formed part of the Pilgrim's Rest district, and this was still the case by 1994, when the new Mpumalanga province was proclaimed (Bergh, 1999: 17, 20-27).

From the 1869 to 1923, the study area formed part of the farm Fife 1319, Lydenburg District. From 1924 to 1950 the farm was known as Fife 31, Pilgrims Rest District and from 1950, the farm has been known as Fife 44 KU.

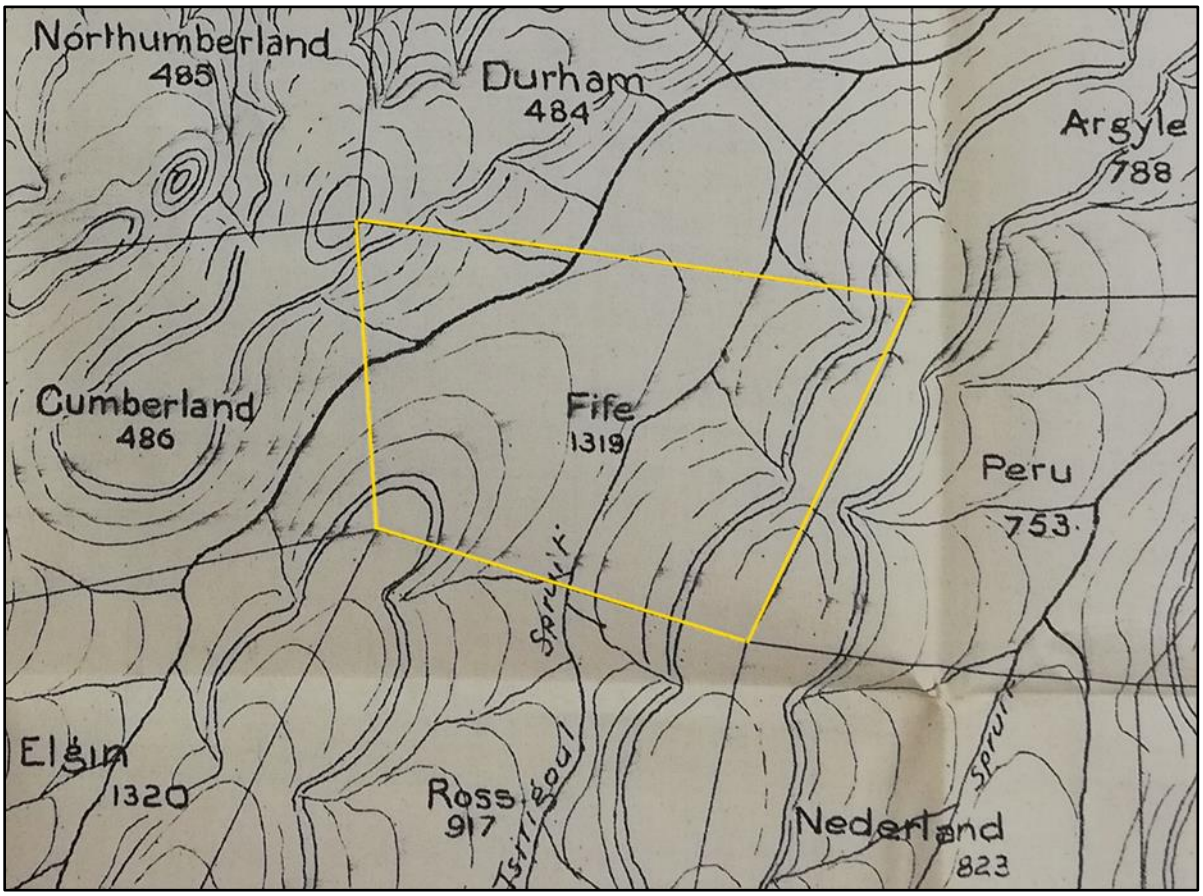

Figure 4.2. Major Jackson map of the Olifants River area, dated 1904. At the time, the farm was known as Fife 1319. The study area would have been situated in the northeastern corner of the farm. No buildings or other developments can be seen on the farm (Surveyor General, 1904).

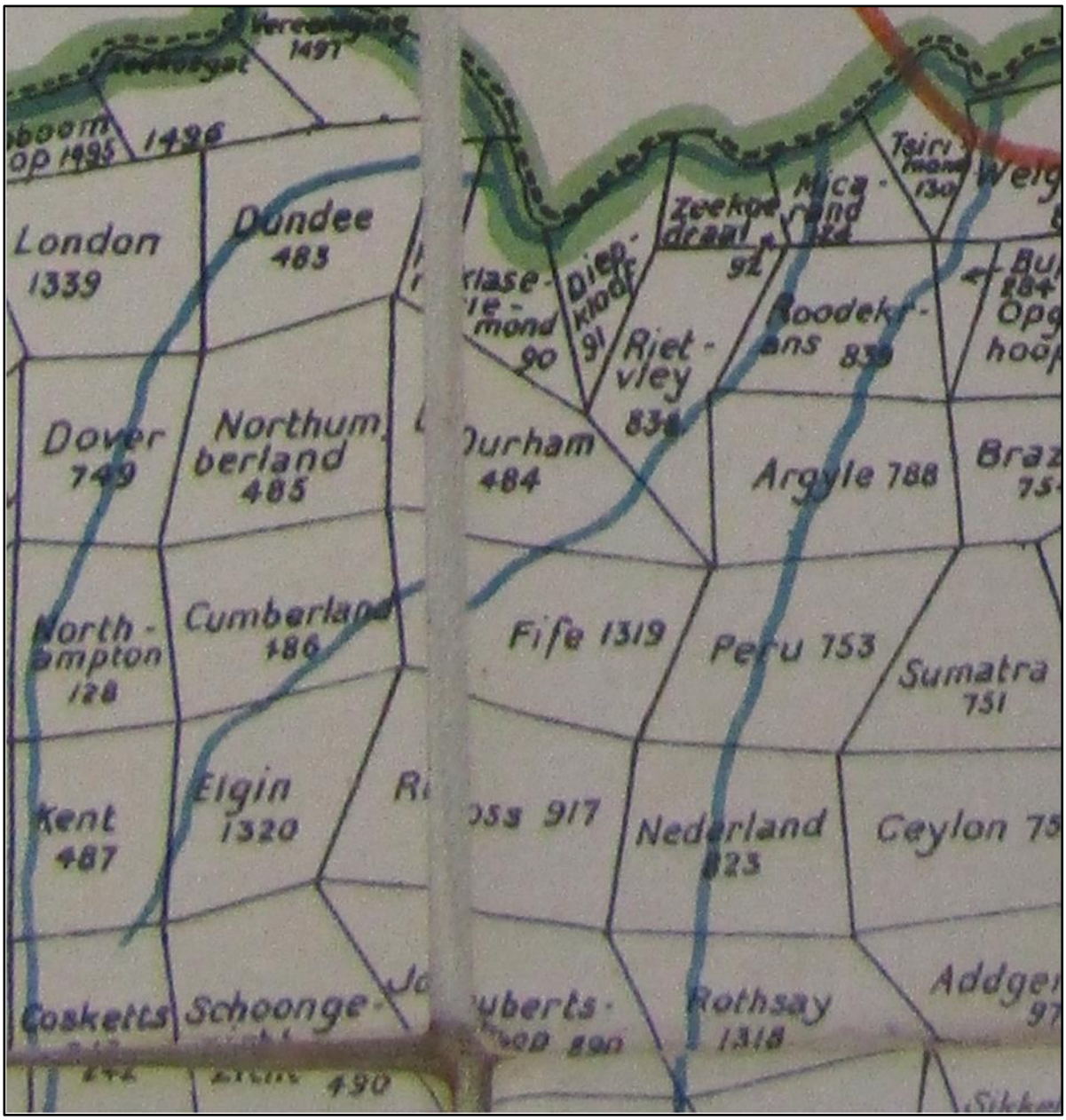

Figure 4.3. A map of the Transvaal during the 1920's. At the time, the farm under investigation was known as Fife 1319 (Anon, 1920s).

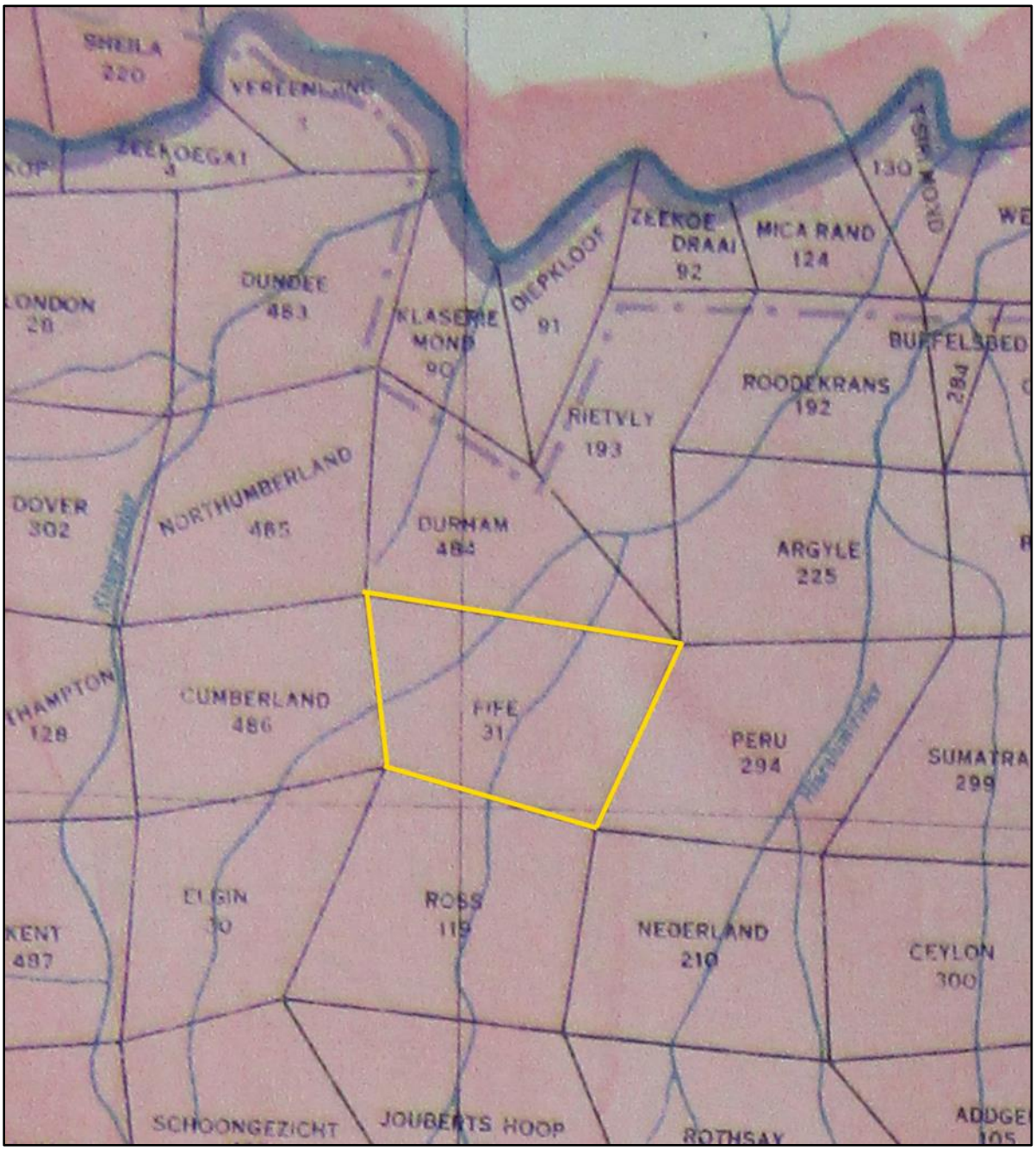

Figure 4.4. Map of the Kruger National Park and surrounds, dated approximately 1930. At the time, the farm under investigation was known as Fife 31. Two rivers can be seen flowing through the farm (NARSSA Maps: 3/1254).

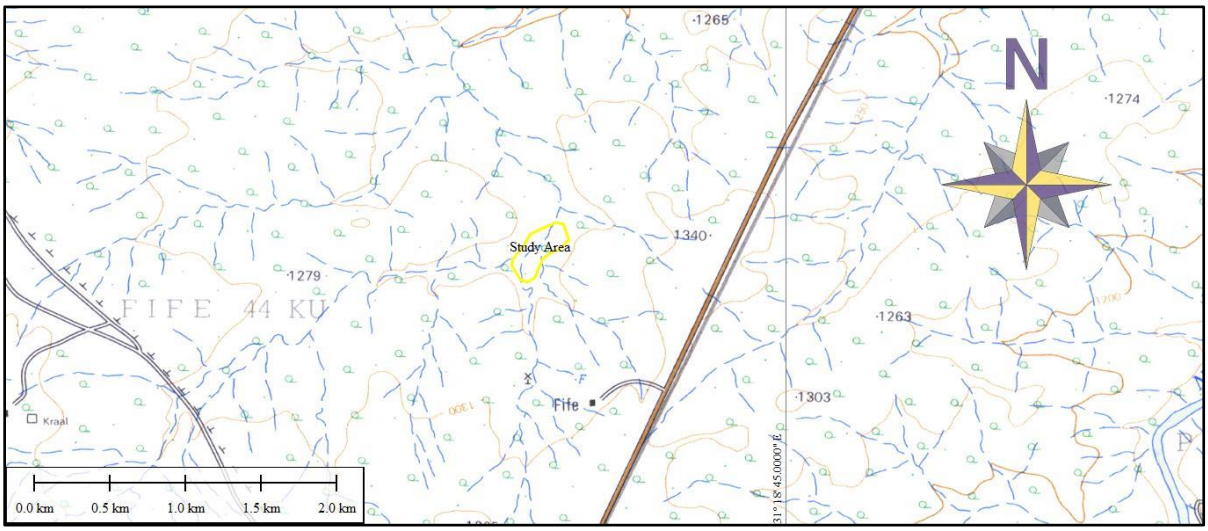

Figure 4.5. A Topographical map of the area under investigation, dated 1970. By this time the farm was known as Fife 44 KU. A yellow border shows the approximate location of the study area. The study area consists of bushveld and several streams can be seen. No buildings or other developments can be seen within the study area (Topographical Map, 2431 AB, 1970).

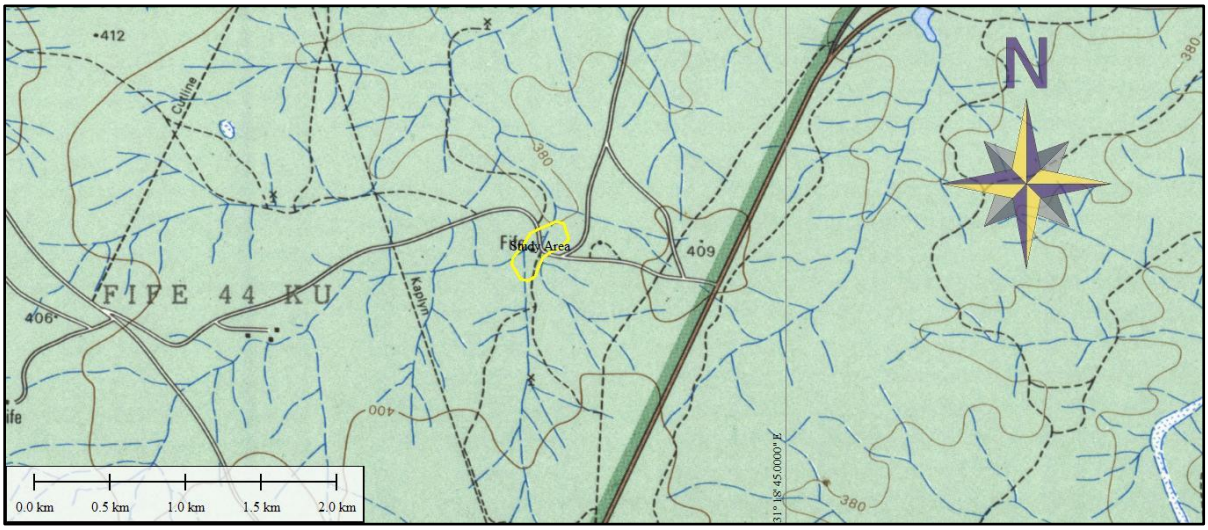

Figure 4.6. A Topographical map of the area under investigation dated 1986. A yellow border shows the approximate location of the study area. Roads, two hiking trails and a building can be seen within the study area (Topographical Map, 2431 AB, 1986).

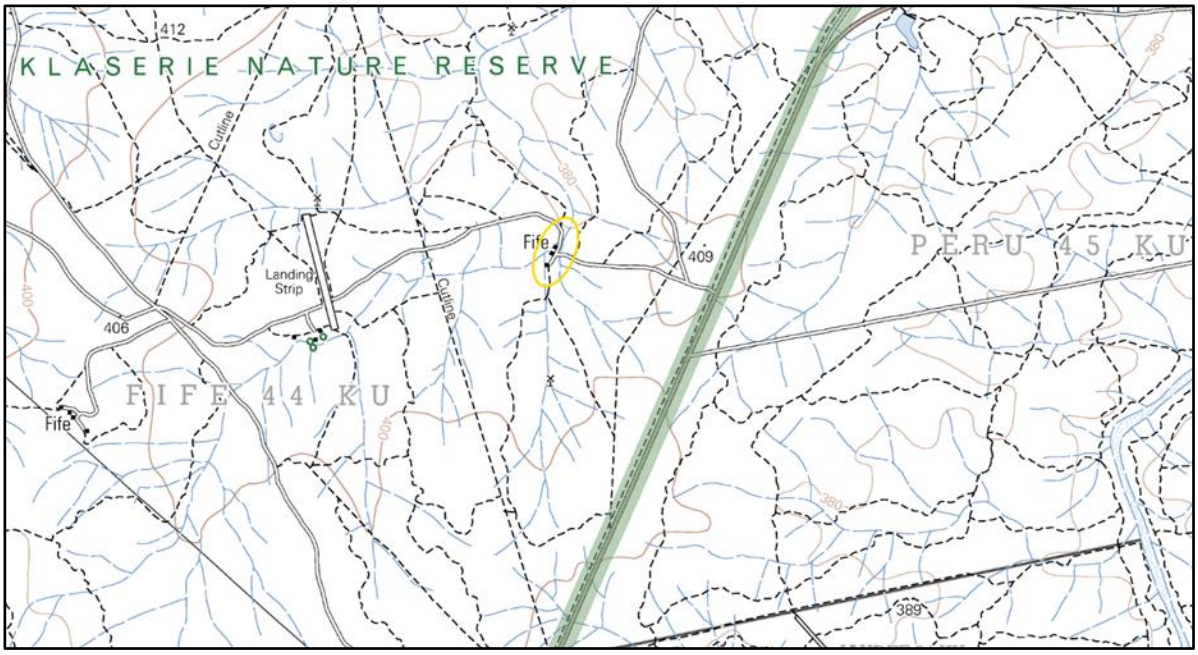

Figure 4.7. A Topographical map of the area under investigation dated 2008. A yellow border shows the approximate location of the study area. A road, several hiking trials as well as three buildings can be seen within the study area (Topographical Map, 2431 AB, 2008).

4.1.6. Historical overview and development of the farm Fife 44 KU

Online sources and information found at the National Archives Repository of South Africa were used to compile a historic background for the property. Firstly, a record of historical landowners will be provided. Thereafter follows a discussion of how the study area and surrounds was historically used and developed.

Record of historical landowners

Fife 1319, ward Ohrigstadrivier, Lydenburg District, was first inspected by P. D. de Villiers in December 1869 and again by P. B. Swart between July and October 1897. According to P. D. de Villiers, the property measured 5177 morgen 462 square roods and P. B. Swart measured the property at 4000 morgen. The title deed to Fife 1319 was first granted to Joseph Brindley on 18 December 1872. The following details could be found regarding subsequent historical landowners: (NARSSA TAB, RAK: 2937)

Entry number	Date of transfer	Portion	Transported from	Transported to	Purchase amount
2	21/1/73	Farm	J Brindley	Martinus Jacobus Smuts	£20
3	21/1/73	Farm	MJ Smuts	Prescott Oxley Funmer	£15
4	16/9/88	Farm	Est. late PO Funmer	Isodor Nicholson	£13
5		Farm	I Nicholson	Herman Ludwig Eckstein	£450
6	10/6/92	Farm	HL Eckstein	The Transvaal Consolidated Land and Exploration Company Ltd	£50 000
7	30/11/46	Farm	Transvaal Cons. Land and Expl. Coy. Ltd.	Augusta M[illegible] Steyn Marthinus Jacobus du Preez Carl Petrus Johannes Roos	£2499
8	30/11/46	Farm	AM Steyn & two others	Daniel Francois Joubert Francois Victor Joubert	£4527.7.6
9	3/9/47	Portion 4	[illegible]	Francois Victor Joubert	-
10	3/9/47	Remaining extent	[illegible]	Daniel Francois Joubert	-
11	3/9/47	Portion 2	Certificate of registered title	Daniel Francois Joubert	-
12	3/9/47	Portion 3	Certificate of registered title	Daniel Francois Joubert	-
13	3/9/47	Portion 1	DF Joubert	Marthinus Gysbertus Etzebeth Johannes Machiel Etzebeth	£1750
14	3/9/47	5/8 share in Portion 2	DF Joubert	Marthinus Gysbertus Etzebeth Johannes Machiel Etzebeth	£1750
15	3/9/47	3/8 share in Portion 2	DF Joubert	Jacob Lourens Carolus Erasmus Lourens Jacobus Erasmus	£525
16	3/9/47	5/12 share in Portion 3	DF Joubert	Robert James Bernhardt	£350
17	3/9/47	7/12 share in Portion 3	DF Joubert	Franz Wilhelm Ernst Rabe Hermann Thom Arthur Adolf Heinrich Wilhelm Dedekind Partners Fife Trio Ranch	£537
18	3/9/47	Remaining Extent	DF Joubert	Franz Wilhelm Ernst Rabe Hermann Thom Arthur Adolf Heinrich Wilhelm Dedekind Partners Fife Trio Ranch	£535.10
19	3/9/47	5/8 share in Portion 2	MG Etzebeth	Jacob Lourens Carolus Erasmus Lourens Jacobus Erasmus	£875
20	3/9/47	Portion 1	MG Etzebeth	Georg Diederich Viljoen Willem Francois Potgieter	£1250
21	10/2/48	½ share in Portion 1	Certificate of registered title	Willem Francois Potgieter	-
22	13/8/48	Portion 2 [illegible]	JLC Erasmus	Napoleon Pretorius	£2600
23	21/7/49	Portion 1	GD Viljoen	Napoleon Pretorius	
24	19/11/49	Remaining extent	JWE Rabe	Gideon Jacobus van Zyl	£2939.10.3
25	19/11/49	7/12 share in Portion 3	JWE Rabe	Gideon Jacobus van Zyl	£2939.10.3

An enquiry on the Windeed Search Engine provided the following details regarding the more recent landowners of Portion 4 of Fife 44 KU:

Owner	Title Deed	Registration Date	Purchase Price (R)
Fife Landgoed Pty Ltd	T42324/1964		Unknown
Fife Landgoed Cc	T42324/1964		Unknown
Fife Safari Camp Cc	T42324/1964	20/11/1964	Unknown

(Windeed Search Engine, 2021).

History of land use

No information could be found that specifically deals with the settlement and development of Portion 4 of Fife 44 KU. However, given its location, the history of this farm is closely linked with the history of the Kruger National Park and the later Klaserie Private Nature Reserve, of which it currently forms part.

The Kruger National Park was proclaimed in 1926 and it brought with it greater conservation awareness in South Africa. A section of land lying to the west of the Park, between the Sabie River in the south and the Olifants River in the north, was the area where the concept of private nature reserves was born. Charles Boyed Varty and Frank A. Unger, both fervent wildlife lovers, purchased the farm Sparta, in the present Sabi Sand Wildtuin, and proceeded to pioneer the “game farm” idea in this area (Klaserie Reserve, 2018).

In 1934, certain landowners who desired the establishment of a scheme of co-operative game protection, approached the Transvaal Land Owners Association for help. Among other things, this organization administrated unoccupied agricultural and game farms for individuals and groups. The “Game Ordinance” was consequently founded in 1935. By the mid-1940s this ordinance had however become obsolete, as modern methods of transport and hunting increased the risk of over hunting. In 1947, the Division of Nature Conservation was established to assist with the protection of wildlife resources in the country (Klaserie Reserve, 2018).

In 1950, the Klaserie River Irrigation District was proclaimed, and it included all the farms along the Klaserie River south of the Klaserie Private Nature Reserve (NASA SAB, BAO: 10984 H124/1080/12).

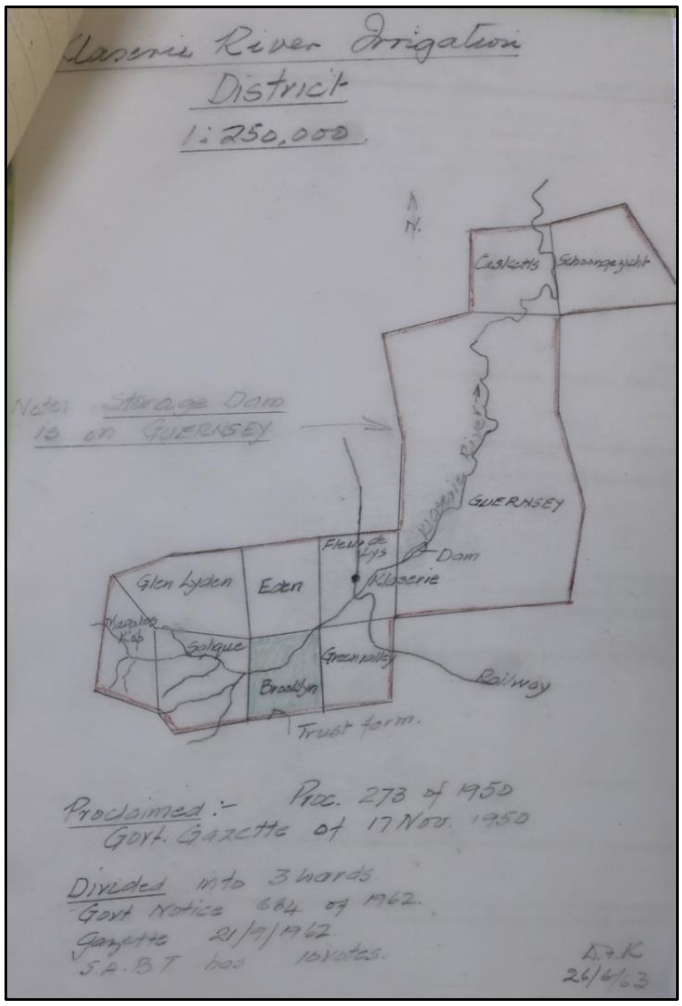

Figure 4.8. A Map of the Klaserie River Irrigation District dated 1963. The study area can be found approximately 7,5 km northeast of the farm Schoongezight 66 KU (NASA SAB, BAO: 10984 H124/1080/12).

In 1954 the Transvaal Game Ordinance (No 23 of 1949) was amended, and people were allowed to form private reserves under certain conditions. The first reserve that was established was the Umbabat Private Nature Reserve, named after the Umbabat River. This reserve's name was changed in 1956 to Timbavati – the Xitsonga name for the river. In 1961 the Kruger National Park started to fence their western boundary, and the Timbavati Private Nature Reserve was also fenced (Klaserie Reserve, 2018).

In 1962, Paul Mouton and Daan du Preez each bought portions of the farm Fife and influenced their friend Jan de Necker to purchase a portion of the farm Charloscar. Cattle farmers were very active on Charloscar and Moscow at the time. Mouton and Du Preez got their mutual friends, Stoffel Botha, who became Administrator of Natal and later Minister of Internal Affairs and of Post and Telegraphs,

and Wynand Lindeque, to buy out these farmers. This was done with the intention of establishing a private nature reserve (Klaserie Reserve, 2018).

By the late 1960s a group of landowners, including De Necker, Mouton, Du Preez and others started lobbying more seriously for the establishment of the Klaserie Private Nature Reserve. Individual landowners had to be approached in the area, among others the Crookes family, who owned four farms along the Klaserie River. The first meeting of 14 landowners was held in Randburg on 28 January 1969, to discuss the formation of the game reserve. On 8 October 1969, at a crucial meeting in Pretoria attended by 36 landowners, each landowner verbally confirmed that he / she wanted to become a member of the reserve and accepted the constitution. The largest private game reserve in South Africa was thus established (Klaserie Reserve, 2018).

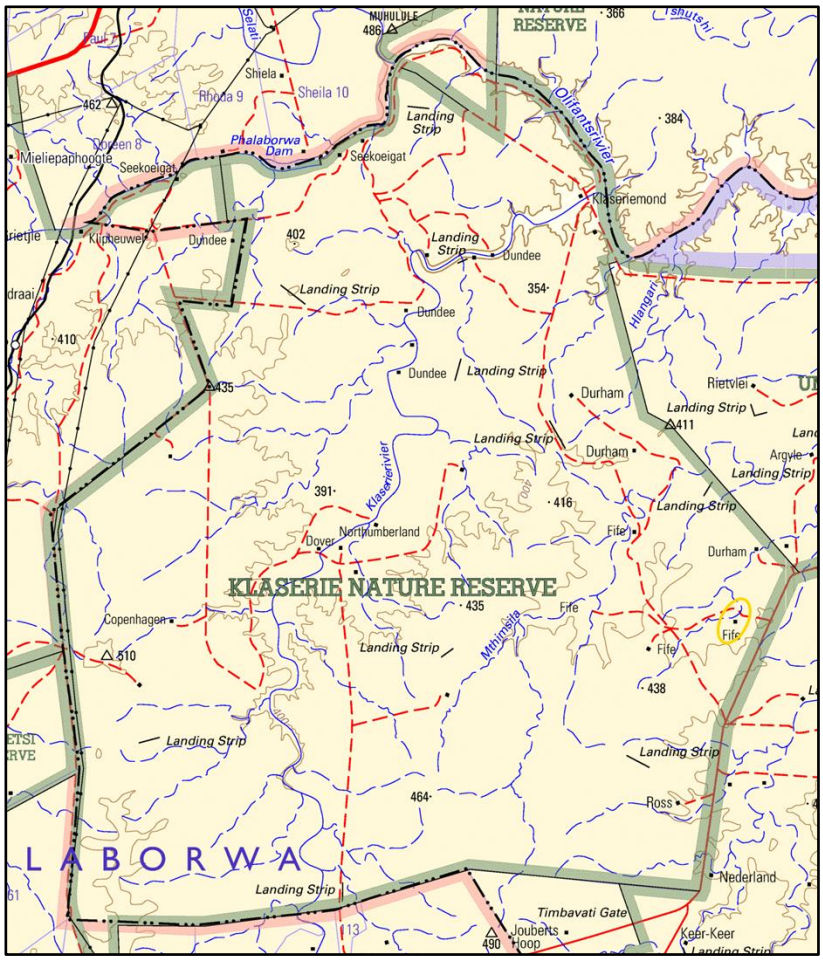

Figure 4.9. A Topographical map of the Klaserie Nature Reserve and surrounds dated 1998. A yellow border shows the approximate location of the study area (Topographical Map, 1998).

A report submitted to the Minister of Agriculture in about 1968, dealt with the agriculture situation in the Hoedspruit and Klaserie areas (NASA *SAB, LPE: 29 NA2/9/2*).

The Hoedspruit irrigation area was said to have developed after World War II with the erection of two canals and there were 80 farmers within this area. Originally, the predominant crop in the area was rice, but with low cost imported rice, this farming stopped in 1958. Instead, tomatoes, tobacco, sugar, pumpkins and to a lesser extent citrus, was then cultivated (NASA *SAB, LPE: 29 NA2/9/2*).

The area was said to be excellent for winter production and that water was cheap and abundant. Transportation from the area was said to be good, however, there were some problems with irrigation and the existing canals needed to be replaced with cement canals (NASA *SAB, LPE: 29 NA2/9/2*).

The Klaserie area was described as an area where agronomy plays an important part. The water supply was said to be stable due to the Klaserie dam further upstream.
According to the report, the water was primarily used in the cultivation of vegetables such as tomatoes, pumpkins and onions; however it was also used in the production of tobacco and maize. Beef farming was said to play a rather insignificant role, and that the area offered ideal conditions for this type of farming. However, the close proximity to the Kruger National Park means that foot and mouth disease as well as lions pose a risk to cattle (NASA *SAB, LPE: 29 NA2/9/2*).

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).

Approximately 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 31odelling 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

No sites or features of heritage significance was located or recorded during the physical survey.

A total of eight survey orientation locations were documented, sites SO 1-8 which includes a GPS location and photographs of the landscape at that particular location.

The survey orientation sites 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	Low
Historical features and ruins	None	N/A
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

Survey orientations:

5.1.1. Site SO 1.

Location: See Appendix B and D (fig. 1, 2)

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view north

5.1.2. Site SO 2.

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 west

5.1.3. Site SO 3.

Location: See Appendix B and D (fig. 4, 5)

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view east

5.1.4. Site SO 4.

Location: See Appendix B and D (fig. 6, 7)

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view south-west

5.1.5. Site SO 5.

Location: See Appendix B and D (fig. 8, 9)

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view south-east

5.1.6. Site SO 6.

Location: See Appendix B and D (fig. 10, 11)

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view south

5.1.7. Site SO 7.

Location: See Appendix B and D (fig. 12, 13)

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view north-east

5.1.8. Site SO 8.

Location: See Appendix B and D (fig. 14, 15)

Description: Survey orientation location.

Impact of the proposed development/ activity: N/A

Recommendation: N/A


Photo view 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
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

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
SO 1	N/A	N/A	N/A	Fife 44 KU, Klaserie	Archaeology: N/A Historically: N/A	-	N/A
SO 2	N/A	N/A	N/A	Fife 44 KU, Klaserie	Archaeology: N/A Historically: N/A	-	N/A
SO 3	N/A	N/A	N/A	Fife 44 KU, Klaserie	Archaeology: N/A Historically: N/A	-	N/A
SO 4	N/A	N/A	N/A	Fife 44 KU, Klaserie	Archaeology: N/A Historically: N/A	-	N/A
SO 5	N/A	N/A	N/A	Fife 44 KU, Klaserie	Archaeology: N/A Historically: N/A	-	N/A
SO 6	N/A	N/A	N/A	Fife 44 KU, Klaserie	Archaeology: N/A Historically: N/A	-	N/A
SO 7	N/A	N/A	N/A	Fife 44 KU, Klaserie	Archaeology: N/A Historically: N/A	-	N/A
SO 8	N/A	N/A	N/A	Fife 44 KU, Klaserie	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
SO 1	Camp construction	N/A	N/A	Short term	High (3)	Highly probable (3)	6
SO 2	Camp construction	N/A	N/A	Short term	High (3)	Highly probable (3)	6
SO 3	Camp construction	N/A	N/A	Short term	High (3)	Highly probable (3)	6
SO 4	Camp construction	N/A	N/A	Short term	High (3)	Highly probable (3)	6
SO 5	Camp construction	N/A	N/A	Short term	High (3)	Highly probable (3)	6
SO 6	Camp construction	N/A	N/A	Short term	High (3)	Highly probable (3)	6
SO 7	Camp construction	N/A	N/A	Short term	High (3)	Highly probable (3)	6
SO 8	Camp construction	N/A	N/A	Short term	High (3)	Highly probable (3)	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), Possible (2), Highly probable (3), Definite (4)

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
SO 1	Neutral	-	-	10	-	10
SO 2	Neutral	-	-	10	-	10
SO 3	Neutral	-	-	10	-	10
SO 4	Neutral	-	-	10	-	10
SO 5	Neutral	-	-	10	-	10
SO 6	Neutral	-	-	10	-	10
SO 7	Neutral	-	-	10	-	10
SO 8	Neutral	-	-	10	-	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. No heritage sites or features was located during the physical survey and therefore no cumulative impacts are identified. Also see section 6.1. Recommended management measures.

6. Summary of findings and recommendations

No sites or features of heritage significance were located or documented during the physical survey.

A total of eight survey orientation locations were documented, sites SO 1-8 which includes a GPS location and photographs of the landscape at that particular location.

In terms of the archaeological component of the Act (25 of 1999, section 35) no sites or features were documented.

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.

It is not within the expertise of this report or the surveyor to comment on possible palaeontological 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

Monitoring programmes which should be followed when a “chance find” of a heritage object or human remains occur, include the following:

- 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 palaeontological 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

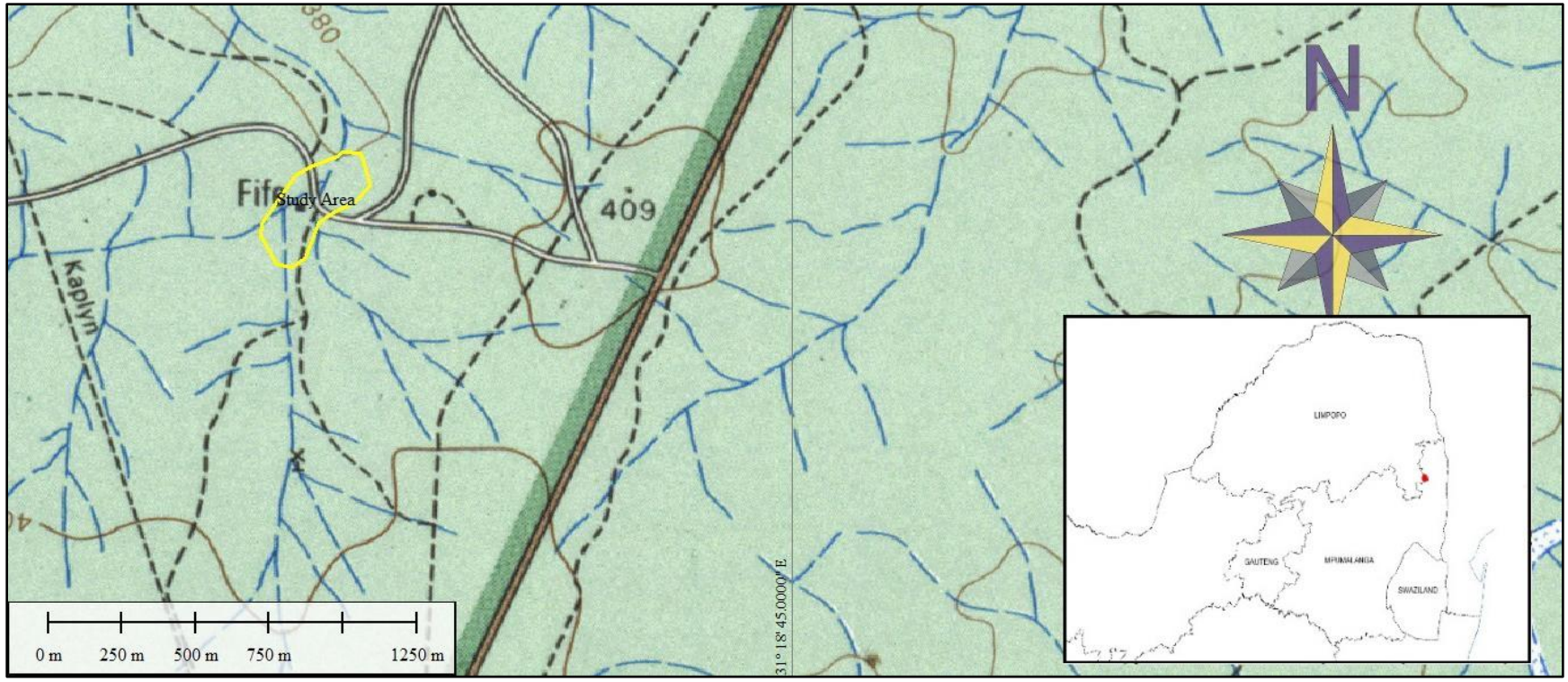
List of sites

No sites or features of heritage significance was recorded. A total of eight survey orientation sites were recorded. The sites were named SO 1-8.

Table A. Survey Orientation Locations.

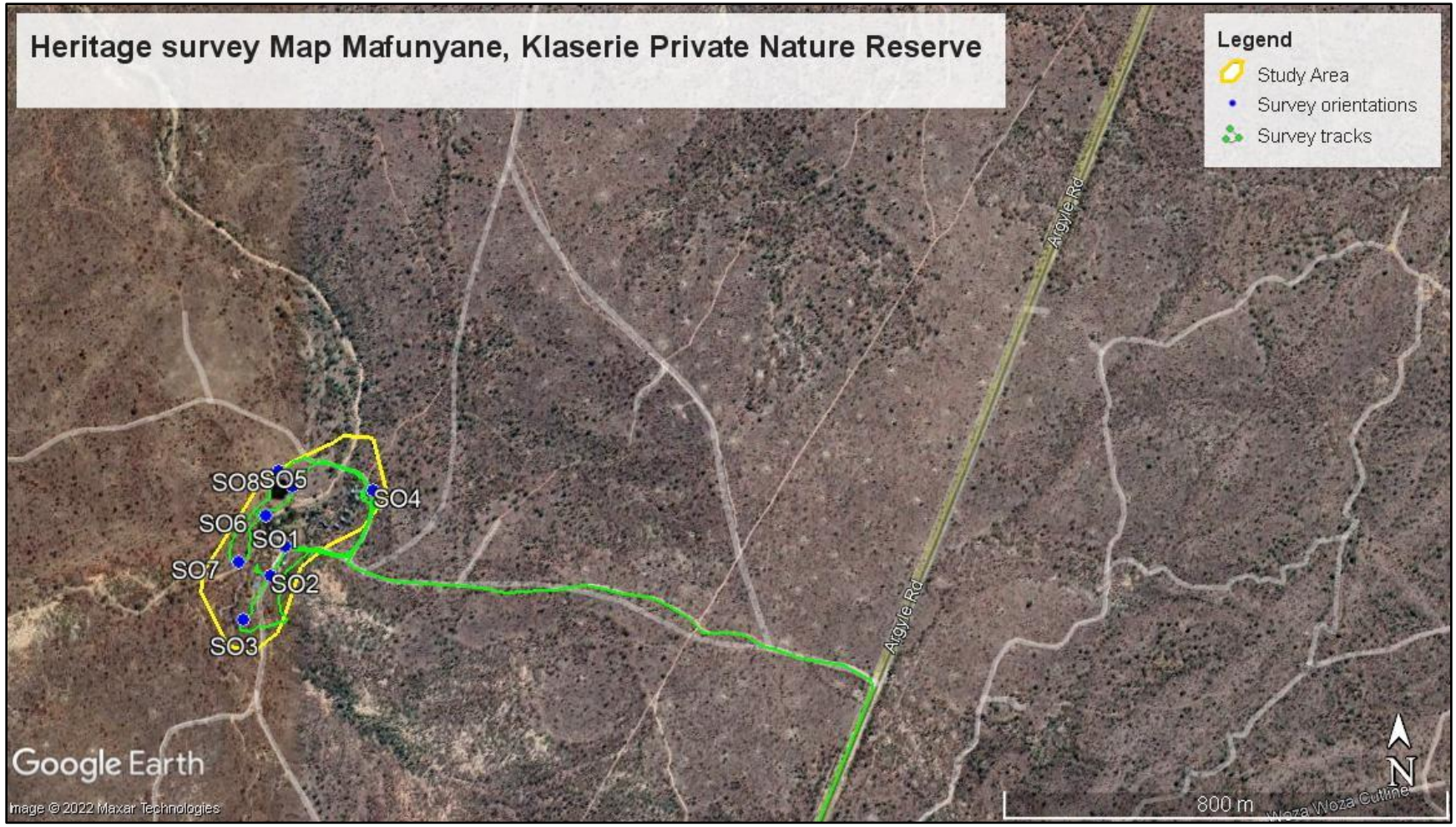
Site Name	Date of compilation	GPS Coordinates		Photo figure No.
SO 1	17/12/2021	S24°13,2661'	E031°17,8656'	1, 2
SO 2	17/12/2021	S24°13,2947'	E031°17,8500'	3
SO 3	17/12/2021	S24°13,3371'	E031°17,8214'	4, 5
SO 4	17/12/2021	S24°13,2125'	E031°17,9604'	6, 7
SO 5	17/12/2021	S24°13,2073'	E031°17,8728'	8, 9
SO 6	17/12/2021	S24°13,2356'	E031°17,8445'	10, 11
SO 7	17/12/2021	S24°13,2808'	E031°17,8158'	12, 13
SO 8	17/12/2021	S24°13,1918'	E031°17,8579'	14, 15

Appendix C



Regional Map 1:50 000 Topographical Map 2431 AB (1986)

Topographical Map 1:50 000 2431 AB (1986)



Aerial view: Google Earth 2021.

Appendix D

Survey Orientation Photos

Fig. 1. Site SO1. Photo taken in southern direction.

Fig. 2. Site SO1. Photo taken in a western direction.

Fig. 3. Site SO2. Photo taken in a south-western direction.

Fig. 4. Site SO 3. Photo taken in a northern direction.

Fig. 5. Site SO 3. Photo taken in a western direction.

Fig. 6. Site SO 4. Photo taken in an eastern direction.

Fig. 7. Site SO 4. Photo taken in a northern direction.

Fig. 8. Site SO 5. Photo taken in a north-western direction.

Fig. 9. Site SO 5. Photo taken in a south-western direction.

Fig. 10. Site SO6. Photo taken in a northern direction

Fig. 11. Site SO 6. Photo taken in a western direction.

Fig. 12. Site SO 7. Photo taken in a north-western direction.

Fig. 13. Site SO 7. Photo taken in a southern direction.

Fig. 14. Site SO 8. Photo taken in a north-western direction.

Fig. 15. Site SO 8. Photo taken in a western direction.