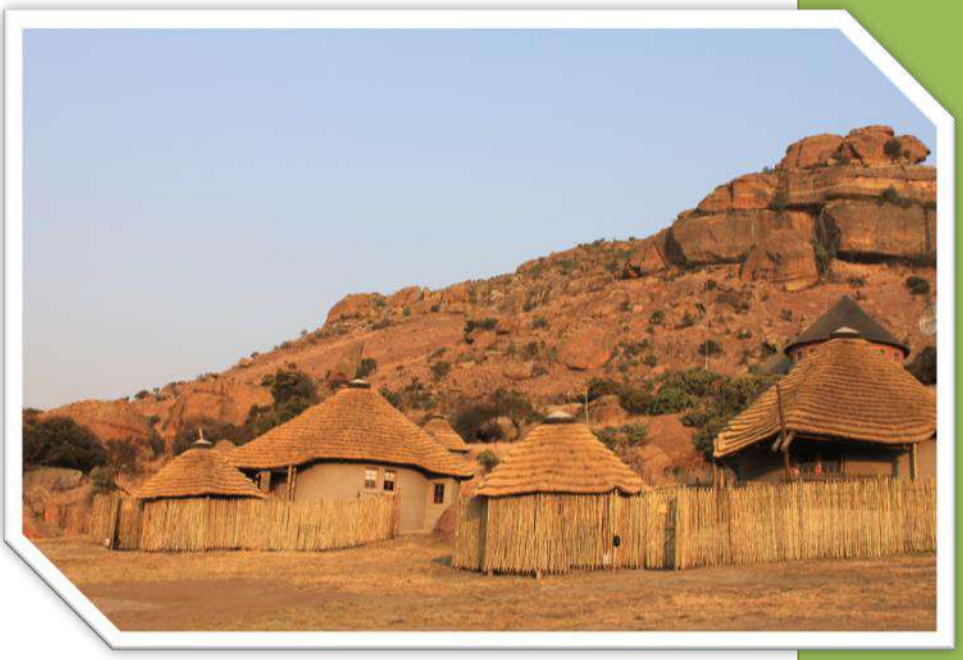
Final Basic Assessment

For the proposed development of a leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, Ngaka Modiri Molema District, North West.

Prepared for: **Makadima Leisure and**

Cultural Village 101 (Pty) Ltd



NW Read Ref No: NWP/EIA/10/2018

December 2018

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FINAL BASIC ASSESSMENT REPORT – Basic Assessment for the proposed development of a leisure and cultural village on farm Moiloa 412-JO, Dinokana Village, North West.

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NW READ Ref No: NWP/EIA/10/2018

CSIR Report Number: CSIR/IU/021SE/IR/2017/0006/A

December 2018

Prepared for:
Makadima Leisure and Cultural Village 101 (Pty) Ltd

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REPORT DETAILS

Title:	**Basic Assessment for the proposed development of a leisure and cultural village on farm Moiloa 412-JO, Dinokana Village, North West.**
Purpose of this report:	The purpose of this BA Report is to: • Present the proposed project and the need for the project; • Describe the affected environment at a sufficient level of detail to facilitate informed decision-making; • Provide an overview of the BA Process being followed, including public consultation; • Assess the predicted positive and negative impacts of the project on the environment; • Provide recommendations to avoid or mitigate negative impacts and to enhance the positive benefits of the project; • Provide an Environmental Management Programme (EMPr) for the proposed project. This final BA Report is submitted to the North West Department of Rural, Environment and Agricultural Development (READ) for decision-making.
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CSIR Report Number:	CSIR/IU/021SE/IR/2017/0006/A
NW READ Ref No:	NWP/EIA/10/2018
Date:	December 2018
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EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

Makadima Leisure and Cultural Village is a project proposed by Makadima Leisure and Cultural Village 101 (Pty) Ltd that will be based in Dinokana Village, outside of Zeerust, in Ngaka Modiri District, North West Province. The project team is composed of community members from Dinokana, which is part of Bahurutshe Ba Ga Moiloa Tribe, and the project site is located on farm Moiloa 412-JO (Co-ordinates: 25°27'22.74"S; 25°51'07.40"E). The Cultural Village is motivated by different tribes within the area wanting to showcase their traditional and cultural heritage. The project team identified an increasing interest and curiosity by tourists in cultural villages within the region, and found that there is a high need in the area and surrounding towns of Mafikeng, Zeerust, Rusternburg and Lichtenburg.

ENVIRONMENTAL ASSESSMENT PROCESS

The Council for Scientific and Industrial Research (CSIR), appointed by National Department of Environmental Affairs (DEA), runs the Special Needs and Skills Development Programme which is aimed at providing Environmental Services, *pro-bono*, to small-scale businesses. The programme offers the undertaking of a Basic Assessment for projects that require this assistance in applying for Environmental Authorisation. The CSIR is currently undertaking a Basic Assessment Process for Makadima Leisure and Cultural Village 101 (Pty Ltd for their proposed development **of a leisure and cultural village on farm Moiloa 412-JO, Dinokana Village, near Zeerust, North West Province.**

The development triggers listed activities in terms of the Environmental Impact Assessment (EIA) Regulations, Government Regulations (GNR) 324 and 327 of April 2017 promulgated under the National Environmental Management Act (NEMA) (Act no 107 of 1998). In terms of these Regulations, a Basic Assessment (BA) should be undertaken for the proposed project. The EAP will be managing the BA process on behalf of the project applicant.

In terms of the amended NEMA EIA Regulations published in GNR 324, 325, 326 and 327 on the 7 April 2017 Government Gazette Number 40772, a BA process is required as the project triggers the following listed activities (detailed in Table 1 below).

Table 1: Listed activity relating to the proposed development.

Relevant notice:	Activity No (in terms of the relevant notice) :	Description of each listed activity as per the Government Notice:	
GNR 327, 7 April 2017	27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- i) the undertaking of a linear activity; or ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The construction and development of approximately 10 hectares that consists of 2 ha Resting/Recreational Park, Conference/Wedding facility, Restaurant & Pub, 2.5 ha Accommodation Facilities, 1 ha Cultural Museum, and 3 ha Adventure Facilities.
GNR 324, 7 April 2017	6(h)(iv)&(vi)	The development of resorts, lodges, hotels and tourism or hospitality facilities that sleep 15 people or more in iv. Critical Biodiversity area as identified in systematic biodiversity plans adopted by the competent authority (North West) vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.	The construction of accommodation facilities that will cover approximately 2.5 hectare footprint and will include 16 hotel rooms, 5 couple chalets and 6 family chalets, accommodating a maximum of 48 people at a time. The development falls within a Critical Biodiversity Area identified in the North West Biodiversity Sector Plan; it also falls within 1oo metres of the Dinokana Eye, a Kastic spring and wetland.
GNR 324, 7 April 2017	11(h)(iv)&(vi)	The development of tracks or routes for the testing, recreational use or outdoor racing of motor powered vehicles excluding conversion of existing tracks or routes for the testing, recreational use or outdoor racing or motor powered vehicles. iv. Critical Biodiversity area as identified in systematic biodiversity plans adopted by the competent authority (North West); vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.	The construction of an adventure facility which will include the development of tracks for outdoor racing for the purpose of go karting. The development falls within a Critical Biodiversity Area identified in the North West Biodiversity Sector Plan; it also falls within 1oo metres of the Dinokana Eye, a Kastic spring and wetland.
GNR 324, 7 April 2017	12(h)(iv)&(vi)	The clearance of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with the maintenance purposes undertaken in accordance with a maintenance plan with in iv. Critical Biodiversity area as identified in systematic biodiversity plans adopted by the competent authority (North West); vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.	The construction and development of approximately 10 hectares that consists of 2 ha Resting/Recreational Park, Conference/Wedding facility, Restaurant & Pub, 2.5 ha Accommodation Facilities, 1 ha Cultural Museum, and 3 ha Adventure Facilities. The development falls within a Critical Biodiversity Area identified in the North West Biodiversity Sector Plan; it also falls within 1oo metres of the Dinokana Eye, a Kastic spring and wetland.

These listed activities require Environmental Authorisation from the Department of Rural, Environmet and Agricultural Development (READ).

PROJECT DESCRIPTION

The Village will consist of various developments on the 85 hectare plot and will be built in phases within three years. The total development footprint will be approximately 10 hectares (Figure 1). Accommodation and leisure facilities will be constructed first, followed by the cultural village, recreational facilities, and an adventure park. The accommodation facilities will be cover approximately 2.5 hectares and include 16 hotel rooms, 5 couple chalets, and 6 family chalets. The Events & Picnic Gardens will be 1.5 hectares and will consist of picnic gardens, event stage, mini volleyball court, playground, and a swimming pool. The Cultural village will be 1 hectare, and will consist of a boma, craft market, and arts & culture museum. The recreational facilities will cover 2 hectares and will include an outdoor gym, braai area and park benches. Lastly, the adventure park will be approximately 3 hectares and will consist of GoKarting racing track and quad biking.

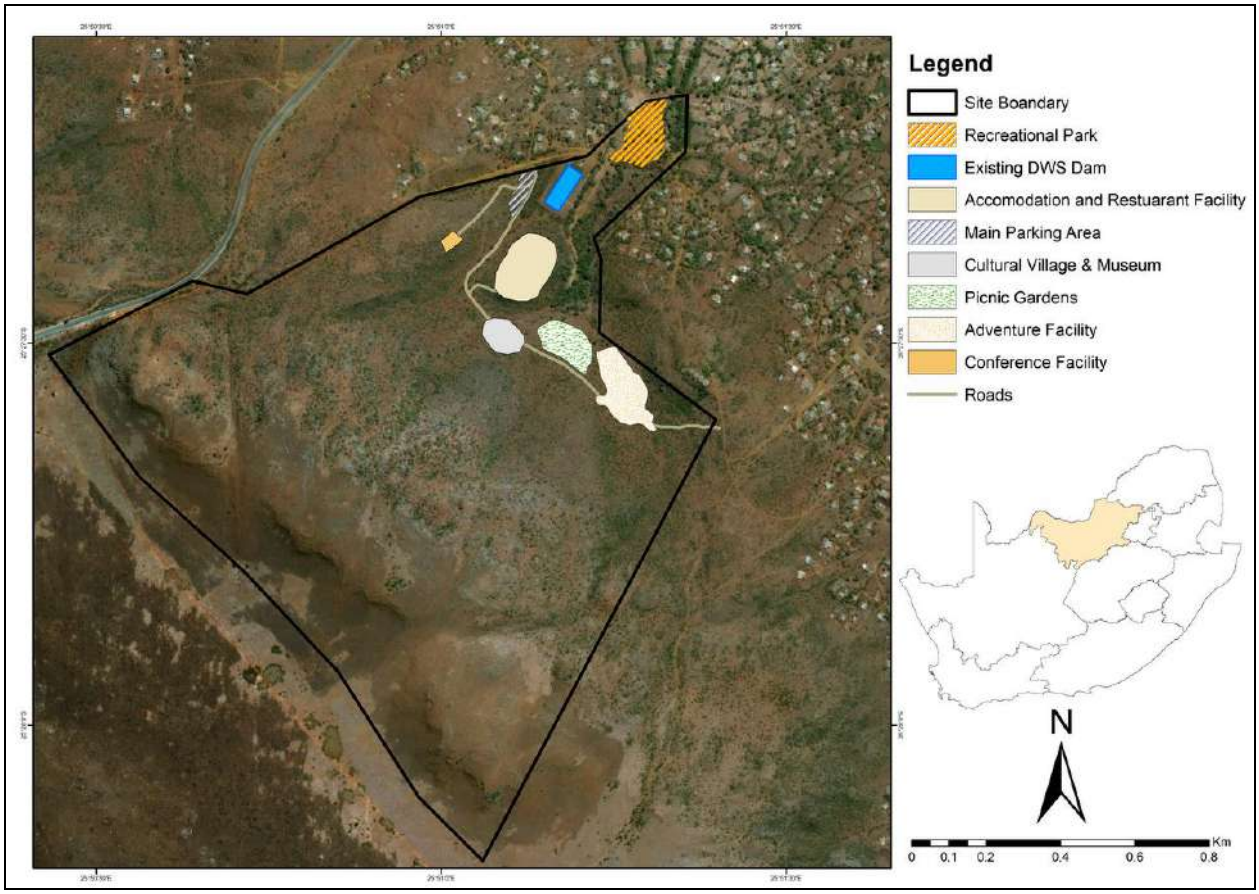

Figure 1: Proposed layout of the leisure and cultural village.

The leisure and cultural village plans to receive 150 visitors per day, and accommodate a maximum of 48 people at a time. The conference facility will take up to 40 team members. Lastly, 55 guests will be allowed in the cultural village at a time.

IMPACT ASSESSMENT

Three specialist studies were undertaken as part of the BA Process. Thease studies included a Terrestrial and Wetland Ecological Assessment, a Heritage Impact Assessment and a Traffic Impact Statement. The findings of these studies are summarised in table 1 below.

Table 1: Summary if impact significance, without and with mitigation action.

POTENTIAL IMPACTS	SIGNIFICANCE RATING	
Construction Phase		
Direct loss of wetlands	Fatally flawed (Negative)	Medium (Negative)
Contamination of surface and groundwater resources	High (Negative)	Low (Negative)
Increased dust and erosion	High (Negative)	Low (Negative)

Increased sediment loads	Medium (Negative)	Low (Negative)
Increased flood peaks	Medium (Negative)	Low (Negative)
Decreased water inputs	Medium (Negative)	Low (Negative)
Clearing of (especially riparian) vegetation and faunal habitats	High (Negative)	Medium (Negative)
Introduction and establishment of alien species	High (Negative)	Low (Negative)
Loss of CI or medicinal flora	High (Negative)	Low (Negative)
Sensory disturbance of fauna	Medium (Negative)	Low (Negative)
Loss of CI fauna	Medium (Negative)	Low (Negative)
Altered burning	Medium (Negative)	Low (Negative)
Destruction of palaeontological material	Very low (Medium)	Very Low (Negative)
Destruction of archaeological artefacts	Very low (Medium)	Very Low (Negative)
Increase in traffic	Low (Negative)	Low (Negative)
Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	High (Negative)	Medium (Negative)
Emissions from dust generation and construction vehicles	Medium (Negative)	Low (Negative)
Opportunities for employment and skills development	High (Positive)	High (Positive)
Potential visual impacts as the result of construction activities	Low (Negative)	Low (Negative)
Potential noise impact as the result of the use of construction equipment	Medium (Negative)	Medium (Negative)
Potential impact on the safety of construction workers and Health injuries to construction personnel as a result of construction work	Medium (Negative)	Medium (Negative)
OPERATION PHASE		
Further loss / degradation of wetlands	High (Negative)	Medium (Negative)
Contamination of surface and groundwater resources	High (Negative)	Low (Negative)
Decreased water inputs	Medium (Negative)	Medium (Negative)
Continued introduction and proliferation of alien species	High (Negative)	Low (Negative)
Loss of CI or medicinal flora	High (Negative)	Low (Negative)
Sensory disturbance of fauna	High (Negative)	Medium (Negative)
Loss of CI fauna	Medium (Negative)	Low (Negative)
Erosion	High (Negative)	Low (Negative)
Altered burning	Medium (Negative)	Low (Negative)
Increase in traffic	Very low (Medium)	Very Low (Negative)
Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	High (Negative)	Medium (Negative)
Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Medium (Negative)	Low (Negative)
Destruction of palaeontological material	Very low (Medium)	Very Low (Negative)
Destruction of archaeological artefacts	Very low (Medium)	Very Low (Negative)
Opportunities for employment and skills development	Medium (Positive)	Medium (Positive)
Night lighting of the development on the nightscape of the surrounding landscape	Low (Negative)	Low (Negative)
Minor accidents to the public and moderate accidents to operational staff	Medium (Negative)	Low (Negative)
Decommission		
Further loss/degradation of wetlands	High (Negative)	Medium (Negative)
Contamination of surface and groundwater resources	High (Negative)	Low (Negative)
Increased dust and erosion	High (Negative)	Low (Negative)
Increased sediment loads	Medium (Negative)	Low (Negative)
Continued proliferation of alien species	High (Negative)	Low (Negative)
Loss of CI or medicinal flora	High (Negative)	Low (Negative)
Sensory disturbance of fauna	Medium (Negative)	Low (Negative)
Loss of CI fauna	Medium (Negative)	Low (Negative)
Altered Burning	Medium (Negative)	Low (Negative)
Destruction of palaeontological material	Very low (Medium)	Very Low (Negative)
Destruction of archaeological artefacts	Very low (Medium)	Very Low (Negative)

Increase in traffic	Low (Negative)	Low (Negative)
Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	High (Negative)	Medium (Negative)
Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Medium (Negative)	Low (Negative)
Noise generation from demolition activities	Medium (Negative)	Low (Negative)
Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste	Medium (Negative)	Low (Negative)

EAPS RECOMMENDATION

Based on the findings of this BA Process, it is therefore the opinion of the EAP that conducted this BA Process, that there are no negative impacts that should be considered as "fatal flaws" from an environmental perspective provided that the mitigation measures are diligently applied and adhered to; and thereby necessitate the development of the leisure and cultural.

To reduce the environmental impacts, specifically on the semi-arid ephemeral wetland system, a revised infrastructure layout has been recommended (Figure 2). The development cannot have a borehole, and should apply for use of municipal water, because of potential contamination of the groundwater system.

Based on the findings of this Final BA Report, it is the opinion of the EAP that the project benefits outweigh the negative environmental impacts, and that the project will make a positive contribution towards skills development, women empowerment and economic growth in the Ramotshere Moiloa Local Municipality. An Environmental Management Programme (EMPr) has been compiled for the proposed project. This Draft EMPr captures the project specific information for all phases of the development and includes all mitigation actions identified in this BA Process. The Draft EMPr is a dynamic document that should be updated regularly and provide clear and implementable measures for the establishment and operation of the proposed project. It is our recommendation that all the mitigation measures be implemented for the proposed project.

Concluding statement from EAP: Provided that the revised layout is used and the specified mitigation measures are applied effectively, it is proposed that the project receives Environmental Authorisation in terms of the EIA Regulations promulgated under the NEMA.

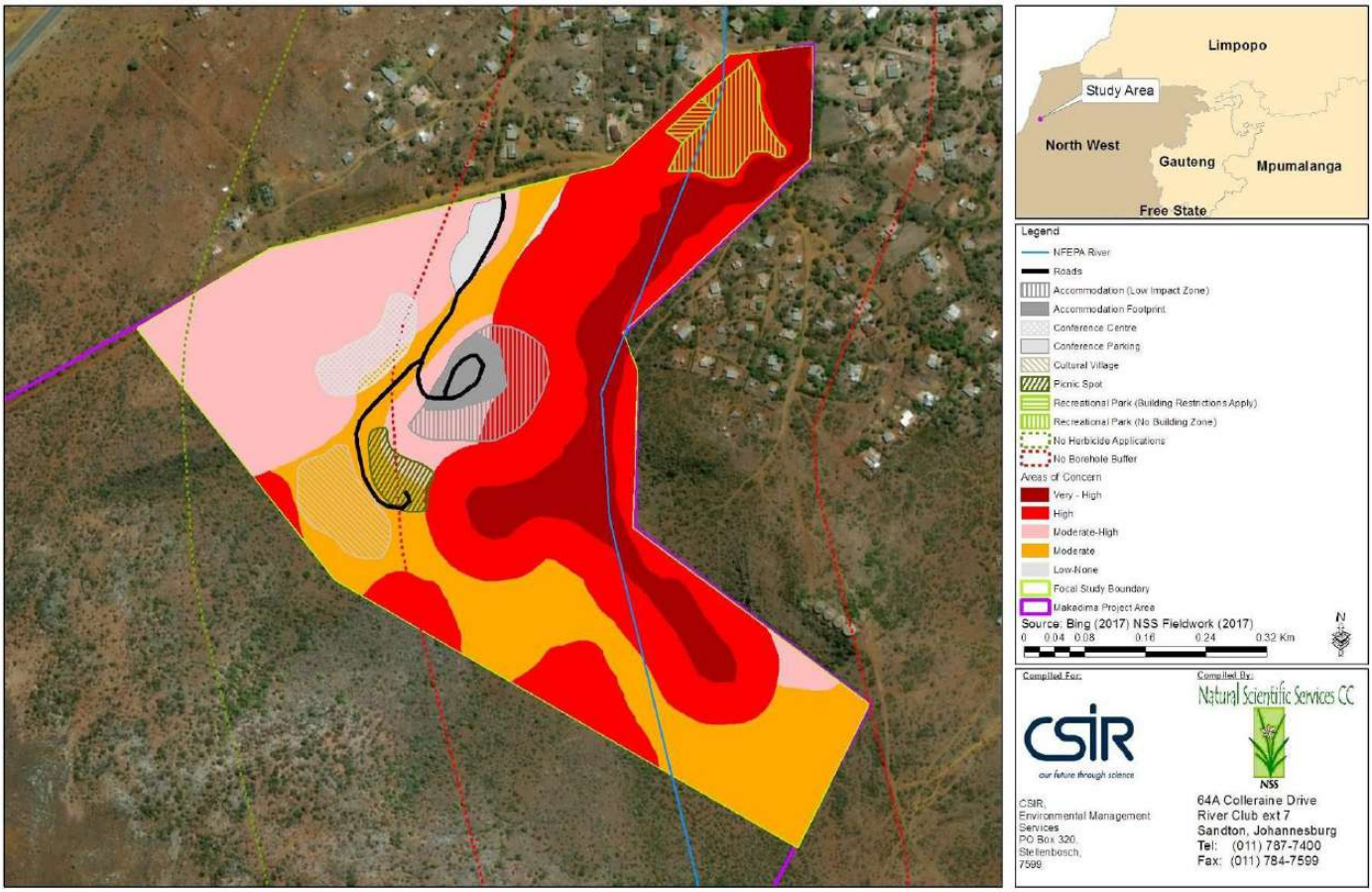

Figure 2: Proposed revised infrastructure layout & areas of concern. (Areas of biodiversity concern, superimposed with proposed infrastructure layout). Data source: Natural Scientific Services, 2018

GLOSSARY

BA	Basic Assessment
BID	Background Information Document
CSIR	Council for Scientific and Industrial Research
DEA	National Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
EAPs	Environmental Assessment Practitioners
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
I&AP	Interested and Affected Party
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
NWA	National Water Act (Act 36 of 1998)
NEM: AQA	National Environment Management: Air Quality Act (Act 39 of 2004)
NEM: ICMA	National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008)
NEMA	National Environmental Management Act (Act 107 of 1998)
NHRA	National Heritage Resources Act (Act 25 of 1999)
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SDF	Spatial Development Framework
READ	Department of Rural, Environmental and Agricultural Development
TOR	Terms of Reference

Summary of where requirements of Appendix 1 of the 2017 NEMA EIA Regulations (GN R 326, as amended) are provided in this Basic Assessment Report.

APPENDIX 1 OF THE REGULATIONS	YES / NO	SECTION IN BAR
1) A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-		
(a) details of – i. the EAP who prepared the report; and	√	Appendix K
ii. the expertise of the EAP, including a curriculum vitae;	√	Appendix K
(b) the location of the activity, including i) the 21 digit Surveyor General code of each cadastral land parcel;	√	Section A
(ii) where available, the physical address and farm name;	√	Section A
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	√	Section A
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity (iii) is to be undertaken;	√	Section A, Appendix A & B
(d) a description of the scope of the proposed activity, including (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including associated structures and infrastructure ;	√	Section A1
(e) a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools	√	Section A11

APPENDIX 1 OF THE REGULATIONS	YES / NO	SECTION IN BAR
frameworks, and instruments		
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location	√	Section A10
(g) a motivation for the preferred site, activity and technology alternative;	√	Section A2
(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the	√	Section C & D Appendix G & I

APPENDIX 1 OF THE REGULATIONS	YES / NO	SECTION IN BAR
activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;		
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including- (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	√	Section C Appendix G
(j) an assessment of each identified potentially significant impact and risk, including- (I) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	√	Section C Appendix I
(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	√	Appendix G
(l) an environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	√	Section C2

APPENDIX 1 OF THE REGULATIONS	YES / NO	SECTION IN BAR
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;	√	Section E
(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	√	Appendix E
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	√	Appendix G
(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	√	Section E
(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	√	N/A
(r) an undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and	√	Appendix K
(s) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	**N/A**	N/A
(t) any specific information that may be required by the competent authority; and	**N/A**	N/A
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act.	**N/A**	N/A

Department:
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(For official use only)

Provincial Reference Number:	
NEAS Ref Number:	
Date Received:	

Basic assessment report in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

Kindly note that:

1. This **basic assessment report** is a standard report that may be required by a competent authority in terms of the EIA Regulations, 2014 and is meant to streamline applications.
2. This report format is current as of **December 2014**. It is the responsibility of the applicant to ascertain whether subsequent versions of the form have been published or produced by the competent authority
3. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.
4. Where applicable **tick** the boxes that are applicable in the report.
5. The use of "not applicable" in the report must be done with circumspection. An incomplete report or that does not meet the requirements in terms of Regulation 19 of the NEMA EIA Regulations, 2014, will be rejected to be revised and be resubmitted.
6. The report must be handed in at offices of the relevant competent authority as determined by each authority.
7. No faxed or e-mailed reports will be accepted.
8. The signature of the Environmental Assessment Practitioner (EAP) on the report must be an original.
9. The report must be compiled by an independent EAP.
10. Unless protected by law, all information in the report will become public information on receipt by the competent authority. Any interested and affected party should be provided with the information contained in this report on request, during any stage of the application process.

11. A competent authority may require that for specified types of activities in defined situations only parts of this report need to be completed.

12. Should a specialist report or report on a specialised process be submitted at any stage for any part of this application, the terms of reference for such report must also be submitted.

13. Two (2) colour hard copies and one (1) electronic copy of the report must be submitted to the competent authority.

14. Shape files (.shp) for maps must be included on the electronic copy of the report submitted to the competent authority.

SECTION A: ACTIVITY INFORMATION

1. PROJECT DESCRIPTION

a) Describe the project in association with the listed activities applied for

Background and Introduction

Makadima Leisure and Cultural Village is a project proposed by Makadima Leisure and Cultural Village 101 (Pty) Ltd that will be based in Dinokana Village, outside of Zeerust, in Ngaka Modiri District, North West Province. The project team is composed of community members from Dinokana, which is part of Bahurutshe Ba Ga Moiloa Tribe, and the project site is located on farm Moiloa 412-JO (Co-ordinates: 25°27'22.74"S; 25°51'07.40"E) (Figure 1).

Makadima Leisure and Cultural Village proposes a project that is based in Dinokana Village. The project is championed by a team of committed and determined youth of Dinokana Village, which is part of the Bahurutshe Ba Ga Moiloa Tribe. There is a demand for a leisure facility within the area and immediate surroundings. Tourism that is focused on culture has been on the rise and there is a keen interest in having a cultural village that aligns with Bahurutshe Ba Ga Moiloa in order to retain and increase knowledge on the traditional and cultural customs.

The Cultural Village will be located on property that has been allocated by Bahurutshe Ba Ga Moiloa, which is approximately 85 hectares for the purpose of constructing the leisure centre and cultural village.
The project intends to develop a resort outside the fenced water springs/eye area. The first phase will be the establishment of a Leisure/recreational Park and followed by Accommodation; Conferencing facilities; Cultural Village in the medium term.

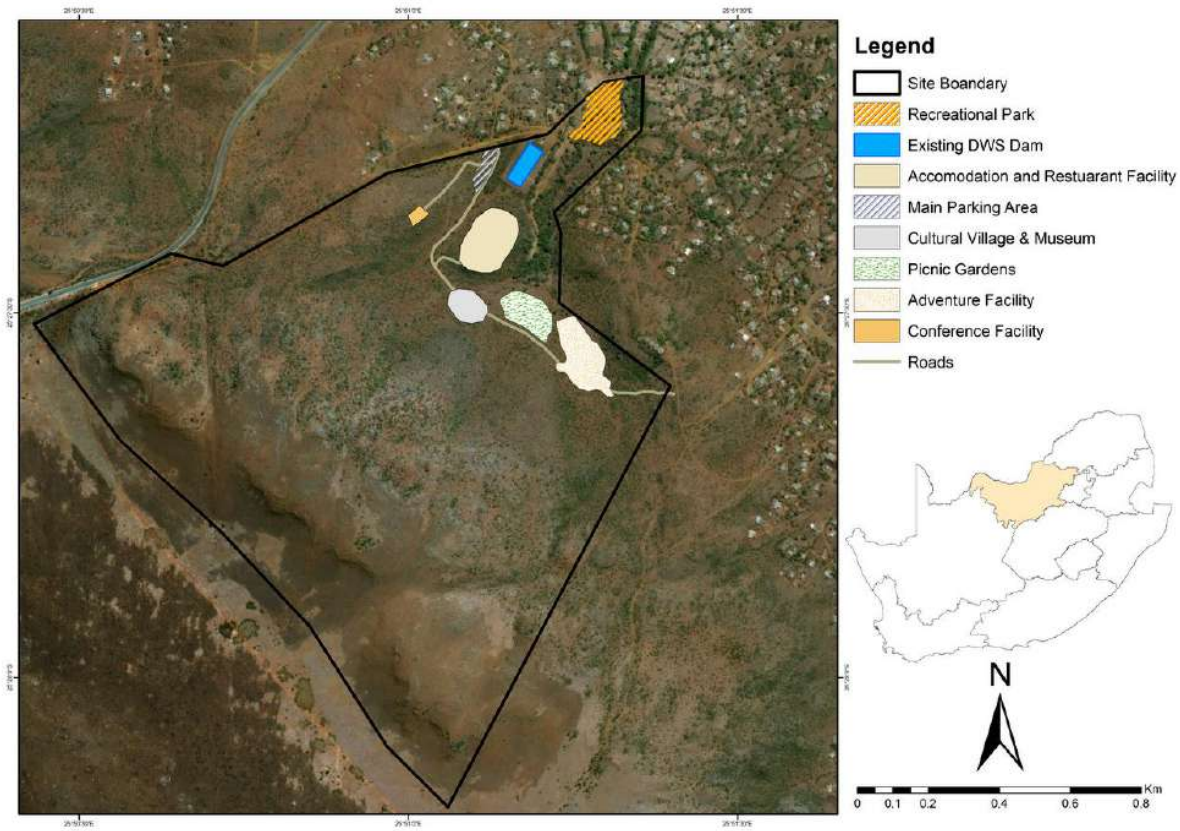

Figure 1: locality and layout of proposed leisure and cultural village.

Project Description and Layout

The leisure and cultural village is proposed to be developed around the perimeter of the Dinokana Eye, which is one of the key attractions in Dinokana village. The Tribal Authority, Bahurutshe ba Moiloa, who allocated the land for the purpose of constructing the leisure and cultural village.

The proposed infrastructure of the leisure and cultural village will entail the following:

- Resting/Recreational Park (2 ha), which consists an outdoor gym, braai area and park benches.

- Conference facility (0.2 ha)

- Main Parking (0.8 ha)

- Accommodation Facilities (2.5 ha), which consists of 8 x 2 Hotel rooms, 5 Couple chalets and 6 Family chalets.

- Cultural Village (1 ha), which will be a replica traditional village, and consists boma, craft market, and arts & culture museum

- Events & Picnic Gardens(1.5 ha), which consist picnic gardens, event stage, mini volleyball court, playground, and a swimming pool

- Adventure Facilities (2 ha), which consist GoKarting racing track and quad biking track.

The facility is planned to receive at least 150 visitors per day, accommodating 48 beds, 40 team members for team building sessions/ conferences at any time, 40 guest in the boma and 15 guest in the museum per session.

Need and Desirability

Makadima Leisure and Cultural Village is a project championed by a team of committed and determined youth of Dinokana Village. A feasibility study showed that there is a demand for an accommodation and cultural village facility in the area and the surrounding towns of Zeerust, Mahikeng, Rustenburg and Lichtenburg. Many cultural village projects have been initiated over the last five years across the country, and have been arranged by tribal authorities who want to showcase their traditions and cultural heritage. Tourists have in turn, shown a growing interest in cultural villages. There is a demand from customers for the facilities that will be developed at the leisure and cultural village. The cultural village will be and landmark that will showcase Bahurutshe Ba Ga Moiloa Tribe's rich traditional heritage in line with the other tribes across the country, such as the Zulu and Xhosa.

The Cultural village is expected to increase the prospects of tourists visiting the establishment and surrounding areas. Furthermore, the increase in tourist will benefit other businesses in the surrounding area. The project is expected to create more than 150 job opportunities and businesses in the local area. This will include permanent workers at the leisure and cultural village and members of the Dinokana community will be integrated in the project through dance troupes and craftspeople, who will be able to promote their small businesses. The project will create opportunities for SMMEs in the village for the supply products and services to the project during the construction and operational phase of the development.

The employment policy of Makadima Leisure and Cultural Village favours the empowerment of disadvantaged groups of the community, especially women and youth, The development will result in skills transfer from experiences members form the community to those less experienced.

Lastly, the project will contribute towards the conservation of the environment and promotion of the cultural heritage of the Village.

Description of Baseline Environment

Current Land Use

Dinokana village, where the proposed site is located, is a rural settlement that is situated approximately 20 km north west of the town of Zeerust. The proposed development site is situated on the western fringes of Dinokana village and approximately 1 km south of the N4 tar road from Zeerust to the Botswana border post. The site is open and accessible through tracks leading from Dinokana village.

Within the project site area, lies the Dinokana eye, a spring (figure 2), a feature considered to be a sacred site by the local community and one of the main attractions in Dinokana. The "Eye" has been fenced off in a 1.5 hectare enclosure, strictly monitored and restricted from public access. These security measures have been put in place and are managed by the Department of Water and Sanitation to safeguard the degradation of the water feature by people and livestock. The spring feeds several reservoirs in the area and serves as the main water source for the surrounding communities.

The entrance of the proposed development, where the recreational park is proposed is currently being used as a recreational space, with little to no infrastructure. This area also has the remains of a previous construction camp that was erected for the construction of roads throughout the village. There are a few tracks that cross some parts of the property. Except for the fencing of the water source and a completed reservoir, there is no other infrastructure situated in the property.

The site of the proposed development has not been previously utilised, except for the grazing of livestock and for the collection of firewood. The location has no previous settlements or any items of historical significance, and

that is one of the reasons why the project was approved in principle by the Bahurutshe ba Moiloa Tribal Authority.

Below are images that show the current land use of the different sites described (Figure 2).

Centre of site area: The Dinokana Eye

North of site: downstream from the Eye, and the proposed recreational park.

North- centre of site area: Dam/Reservoir

Centre of site: Rocky hill, and proposed site for accommodation and restaurant

South-centre: valley plain, and proposed cultural village

North- centre of site area: Dam/Resevoir

North-west of site area: hill and proposed conference facility

Figure 2: Photographs of the site areas

Climate

The regional climate features summer rainfall with very dry winters. Mean annual precipitation is about 550–650mm. Frost is fairly frequent in winter in lower-lying areas, but less so on the hills. Mean monthly maximum and minimum temperatures for Lindleyspoort-Irr weather station are 35.2°C and –0.4°C for January and June, respectively. Corresponding values for the Marico-Irr weather station are 36.7°C and -0.4°C (Mucina & Rutherford 2006).

Figure 3 shows the monthly rainfall and atmospheric temperatures measured for Zeerust between January 2016 and November 2017 (weatherunderground.com.)

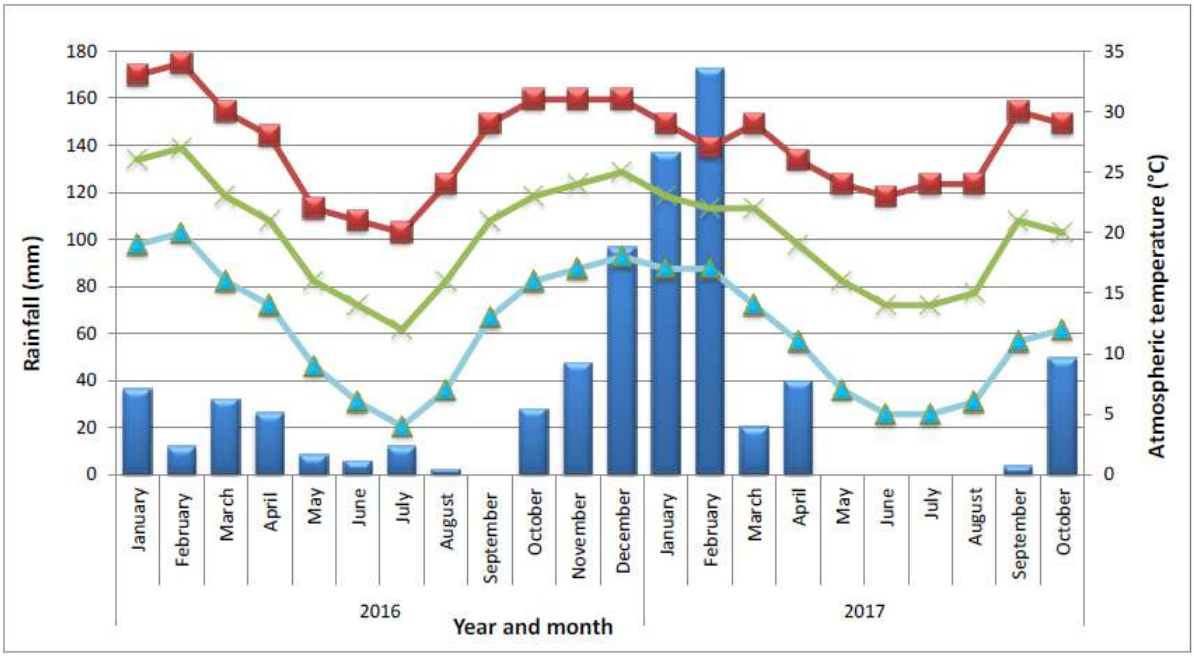

Figure 3: Measurements of monthly rainfall and atmospheric temperature for Zeerust. Data source: www.weatherunderground.com.

Land Types

Most of the development site falls on land type Ib40. The northern most part of the site enters landtype Ae33, and the southern section of the farm is situated in land type Fa9. Land type Ib40 includes shales, quartzites and andesites of the Pretoria Group (which is part of the Transvaal Supergroup, Figure 4), and has stony, shallow soils of the Glerosa and Mispah soil forms, with some deep, freely drained soils. Land type Ae33 includes sediments of the Pretoria Group, in particular the Silverton and Rayton Formations; they are mostly shale with less quartzite and conglomerate. Land type Fa9, in contrast, features dolomite and chert of the Malmani Subgroup (Transvaal Supergroup), and supports mainly shallow Mispah and Glenrosa soil forms.

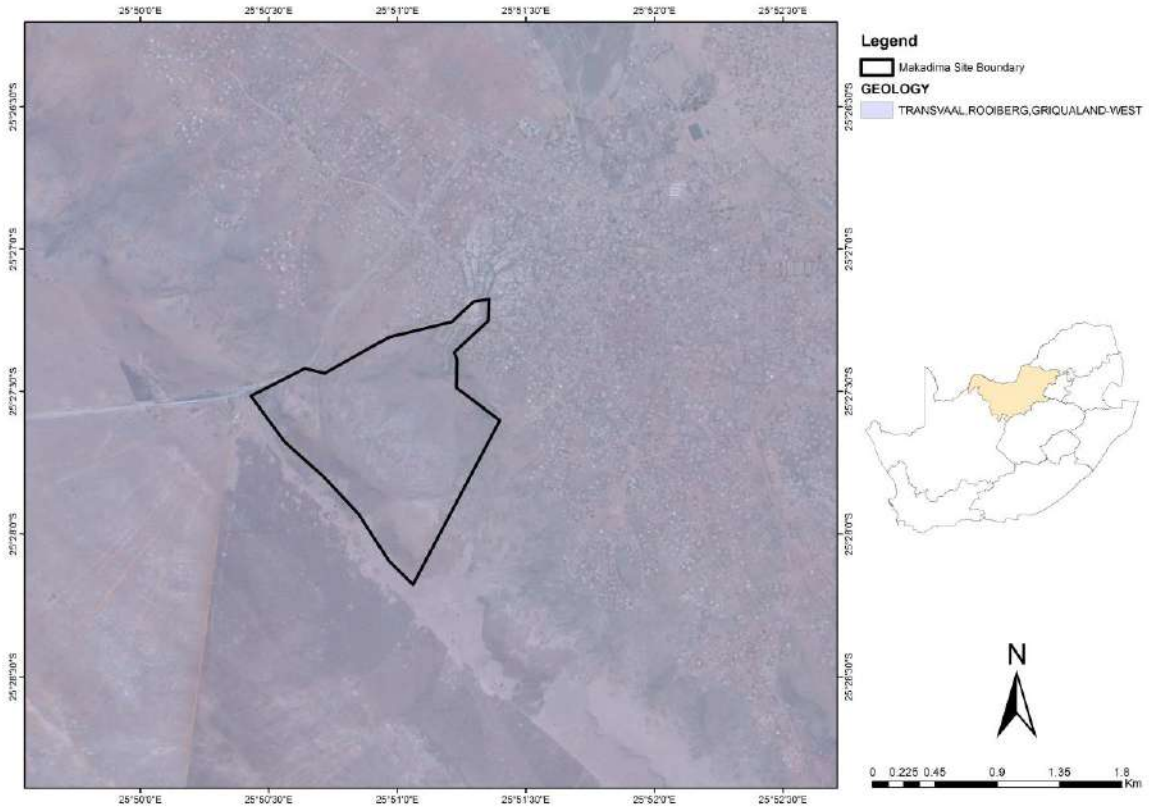

Figure 4: The underlying geology of Makadima is that of the the Transvaal Supergroup

Vegetation

The proposed development falls within the Savanna Biome and is divided between three vegetation units. The Dwarsberg-Swartruggens Mountain Bushveld and Carletonville Dolomite Grassland vegetation types to the south-west of the site; and the Zeerust Thornveld vegetation type to the north-east (Mucina & Rutherford, 2006) (Figure 5). The Dwarsberg-Swartruggens Mountain Bushveld features rocky, low to medium-high hills and ridges with steep faces in places (reaching about 300m in height above the surrounding plains). The vegetation consists of a combination of trees, shrubs and often a dense grass layer This unit is not considered to be threatened, with less than 2% that is statutorily conserved. Approximately 7% of the vegetation type has been transformed, mainly by cultivation, and scattered alien flora (e.g. *Cereus jamacaru* and *Acacia mearnsii*) occur in places. Erosion is mostly very low to low (Mucina & Rutherford 2006).

The Carletonville Dolomitic Grassland is found on slightly undulating plains, dissected by prominent rocky chert ridges. This species-rich grassland type forms a complex mosaic pattern dominated by many species. It is listed as Vulnerable, with only a small extent of this vegetation type privately and statutorily conserved. Almost a quarter

of the Carletonville Dolomitic Grassland vegetation type has been transformed by cultivation, mining, urban development and damming. Erosion is very low to low (Mucina & Rutherford 2006).

The Zeerust Thornveld represents deciduous, open to dense, short, thorny woodland dominated by *Acacia* species with a herbaceous layer of mainly grasses. It is found on deep, high-base status and some clay soils on plains and lowlands, and also between rocky ridges of Dwarsberg-Swartruggens Mountain Bushveld. Zeerust Thornveld is also Least Threatened, but less than 4% is statutorily conserved. About 16% of the vegetation type has been transformed, mainly by cultivation, but also urban development. Alien flora (e.g. *Cereus jamacaru*) occur in a few very scattered areas. Erosion is also very low to low (Mucina & Rutherford 2006).

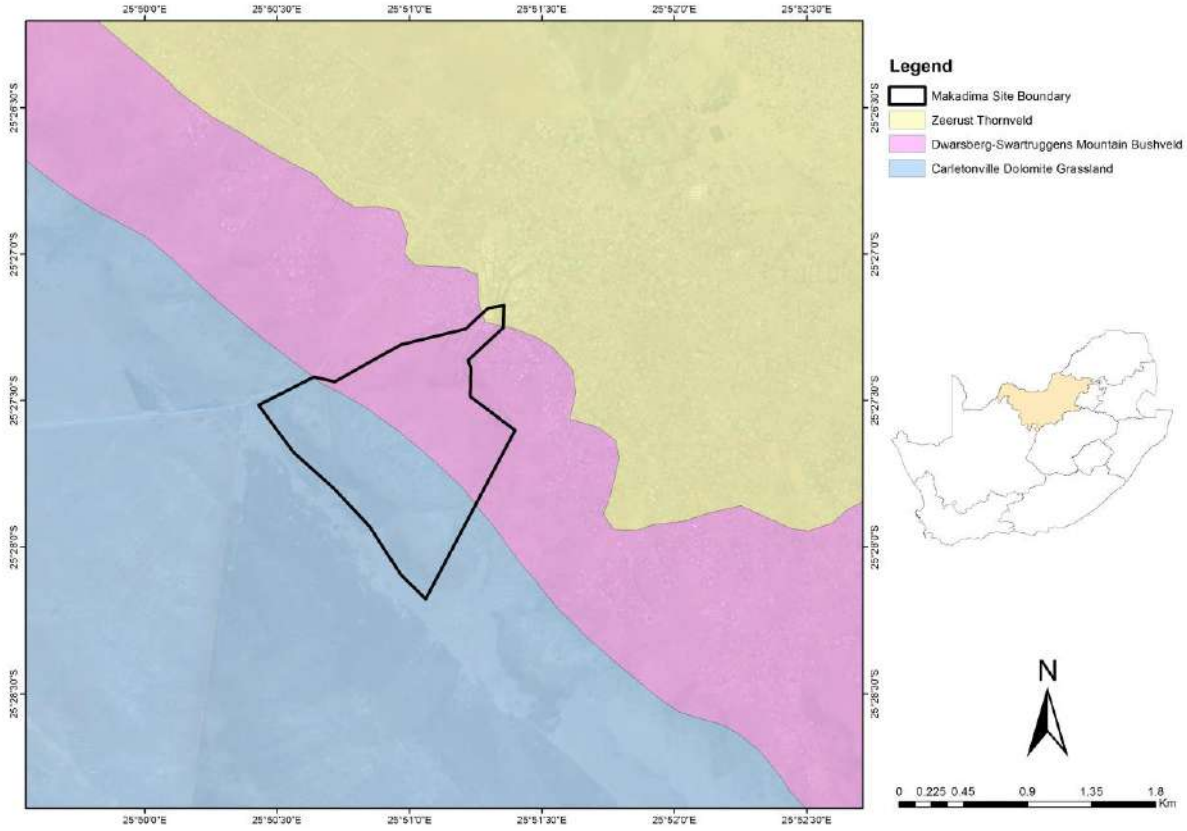

Figure 5: the Vegetation types/units found within Makadima's farm boundary are the Zeerust Thornveld, Dwarsberg-Swartruggens Mountain Bushveld, and rhe Carletonville Dolomite Grassland.

b) Provide a detailed description of the listed activities associated with the project as applied for

Listed activity as described in GN R.983, 984 and 985	Description of project activity
Example: ***GN R.983 Activity 12(iii): The development of a bridge exceeding 100 square metres where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse,***	***A bridge measuring 10m in length, 12 metres wide will be built over the Crocodile river***

excluding where such development will occur within existing roads or roads reserve.	
GNR 325, 7 April 2017. Activity 27. The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous land occurring inside and urban area where the total land to be developed is bigger than 5 hectares.	The construction and development of approximately 10 hectares that consists of 2 ha Resting/Recreational Park, Conference/Wedding facility, Restaurant & Pub, 2.5 ha Accommodation Facilities, 1 ha Cultural Museum, and 3 ha Adventure Facilities
GNR 324, 7 April 2017. Activity 6(h). The development of a resorts, lodges, hotels and tourism or hospitality facilities that sleep less than 15 people.	The construction of accommodation facilities that will cover approximately 2.5 hectare footprint and will include 16 hotel rooms, 5 couple chalets and 6 family chalets, accommodating a maximum of 48 people at a time.
GNR 324, 7 April 2017. Activity 11(h)(iv). The development of tracks or routes for the testing, recreational use or outdoor racing of motor powered vehicles excluding conversion of existing tracks or routes for the testing, recreational use or outdoor racing or motor powered vehicles.	The construction of an adventure facility which will include the development of tracks for outdoor racing for the purpose of go karting.
GN.R.324, 7 April 2017, Activity 12(h)(iv). The clearance of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with the maintenance purposes undertaken in accordance with a maintenance plan in the North West within critical biodiversity areas identified in systematic biodiversity plans.	The construction and development of approximately 10 hectares that consists of 2 ha Resting/Recreational Park, Conference/Wedding facility, Restaurant & Pub, 2.5 ha Accommodation Facilities, 1 ha Cultural Museum, and 3 ha Adventure Facilities

c) Property description/physical address

Province	North West
District Municipality	Ngaka Modiri Molema District Municipality
Local Municipality	Ramotshere Moiloa Local Municipality
Ward Number(s)	Ward 10
Farm name and number	Farm Moilos 412-JO
Portion number	Portion 37
21 digit Surveyor General Code	T0JO000000003700000; T0JO000000003700001; T0JO000000003700002;

Where a large number of properties are involved (e.g. linear activities) please attach a full list to this application including the same information as indicated above

2. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", **in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—**

(a) the property on which or location where it is proposed to undertake the activity;

(b) the type of activity to be undertaken;

(c) the design or layout of the activity;

(d) the technology to be used in the activity;

(e) the operational aspects of the activity; and

(f) the option of not implementing the activity.

Describe alternatives that are considered in this application as required by EIA Regulation, 2014 Appendix 1(h) . Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity (NOT PROJECT) could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

The determination of whether site or activity (including different processes, etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the, competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

Should the alternatives include different locations and lay-outs, the co-ordinates of the different alternatives must be provided. The co-ordinates should be in degrees, minutes and seconds using the Hartebeeshoek94 WGS84 co-ordinate system.

a) Site alternatives

List alternative sites, if applicable.

Site Alternatives	**Description**

Alternative Site 1 (preferred or only site alternative)	The DEA commissioned the CSIR to run the "Special Needs and Skills Development (SNSD) Programme" which is aimed *pro bono* Environmental Impact Assessments (EIAs) for people who are classified as special needs clients/applicants, spe Small, Medium and Micro Enterprises (SMMEs), Community Trusts, Individuals or Government Programmes. The CSIR re application from Makadima Leisure and Cultural Village 101 (pty) Ltd under the SNSD Programme. The CSIR identified M Leisure and Cultural Village 101 (Pty) Ltd as a client or a special needs applicant and has agreed to assist them with acqu Environmental Authorization for the project on a pro bono basis, including the cost of the basic assessment, specialist st visits and human resources. Makadima Leisure and Cultural Village is a 100% black owned entity supported by governm The applicant has received permission from the Bahurutshe Ba Ga Moiloa Tribal Authority to use the given property for development of the cultural village. Thus, the site which is being investigated in this report is the only site available to th and there are no available alternative sites to be considered.
Alternative Site 2	
Alternative Site 3	

Site Co-ordinates

	Latitude (S):			Longitude (E):		
Alternative S1 (preferred or only site alternative)	25°	27′	22.74″	25°	51′	07.40″
Alternative S2 (if any)						
Alternative S3 (if any)						

In the case of linear activities:

Alternative:	**Latitude (S):**			**Longitude (E):**		
Alternative S1 (preferred or only route alternative)						
• Starting point of the activity						
• Middle/Additional point of the activity						
• End point of the activity						
Alternative S2 (if any)						
• Starting point of the activity						
• Middle/Additional point of the activity						

- End point of the activity

Alternative S3 (if any)

- Starting point of the activity
- Middle/Additional point of the activity
- End point of the activity

For route alternatives that are longer than 500m, please provide an addendum with co-ordinates taken every 250 metres along the route for each alternative alignment.

In the case of an area being under application, please provide the co-ordinates of the corners of the site as indicated on the lay-out map provided in Appendix A.

b) Lay-out alternatives

Alternatives	Description
Alternative 1 (preferred or only alternative)	The layout of the proposed project has been carefully informed by the findings of the Ecological Impact Assessment and the Heritage Impact Assessment (Appendix G) so as to avoid sensitive areas and loss of species of conservation concern. Furthermore the development is within areas that have already been transformed previously to limit the disturbance of natural habitats.
Alternative 2	
Alternative 3	

c) Technology alternatives

Alternatives	Description
Alternative 1 (preferred or only alternative)	The following measures will be used as part of the resource efficiency of the proposed development: The facilities will be carefully considered with structures places in the direction that catches the natural light and warmth of the sun without the excessive glare or overheating that can result from direct sunlight. Dwellings are to be sensitively places to utilise the shade afforded by tree canopies. Furthermore energy saving light bulbs will be used for the development; the use of this energy saving bulbs will improve the efficiency of the development. Furthermore sensor lights will be used thus reducing the energy usage required for lighting.
Alternative 2	

Alternative 3

d) Other alternatives (e.g. scheduling, demand, input, scale and design alternatives)

Alternatives	Description
Alternative 1 (preferred or only alternative)	The facilities will be designed in such a way that considers sustainability and low impact options. All facilities will be developed to ensure that all structures blend into the environment, and that the development is designed in such a way that is removable and without a long lasting footprint. A leisure and cultural facility was preferred over agriculture because the site locations is unfavourable for agricultural practices with many hills, rocky outcrops and slopes. The project has also been selected by the community as a community improvement project that promotes regional and local tourism in the area, as well as jobs, revenue, and is more environmentally friendly, and lastly promotes heritage and traditions instilling pride in the community.
Alternative 2	
Alternative 3	

e) No-go alternative

Should the No-Go Option be implemented, the site would maintain its status quo. As such, the No-Go Option would not be environmentally, socially or economically feasible in the long-term and is thus not deemed feasible. However, the No-Go Option is nevertheless considered and assessed in relation to the potential implications of the proposed project, as required in terms of NEMA and its EIA Regulations

f) **Please motivate for preferred site, activity and technology alternative**

Motivation for the proposed site alternative as well as exclusion of alternatives:

Site location and layout alternatives

The DEA commissioned the CSIR to run the "Special Needs and Skills Development (SNSD) Programme" which is aimed at providing *pro bono* Environmental Impact Assessments (EIAs) for people who are classified as special needs clients/applicants, specifically Small, Medium and Micro Enterprises (SMMEs), Community Trusts, Individuals or Government Programmes. The CSIR received an application from Makadima Leisure and Cultural Village 101 (pty) Ltd under the SNSD Programme. The CSIR identified Makadima Leisure and Cultural Village 101 (Pty) Ltd as a client or a special needs applicant and has agreed to assist them with acquiring Environmental Authorization for the project on a pro bono basis, including the cost of the basic assessment, specialist studies, site visits and human resources. Makadima Leisure and Cultural Village is a 100% black owned entity supported by government funding. The applicant has received permission from the Bahurutshe Ba Ga Moiloa Tribal Authority to use the given property for the development of the cultural village. Thus, the site which is being investigated in this report is the only site available to this entity and there are no available alternative sites to be considered.

The layout of the proposed project has been carefully informed by the findings of the Ecological

Impact Assessment and the Heritage Impact Assessment (Appendix G) so as to avoid sensitive areas and loss of species of conservation concern. Furthermore the development is within areas that have already been transformed previously to limit the disturbance of natural habitats.

Design, technology & activity alternatives

The facilities will be designed in such a way that considers sustainability and low impact options. All facilities will be developed to ensure that all structures blend into the environment, and that the development is designed in such a way that is removable and without a long lasting footprint.

Cooling efficiency

The facilities will be carefully considered with structures places in the direction that catches the natural light and warmth of the sun without the excessive glare or overheating that can result from direct sunlight. Dwellings are to be sensitively places to utilise the shade afforded by tree canopies.

Lighting efficiency

Energy saving light bulbs will be used for the development; the use of this energy saving bulbs will improve the efficiency of the development. Furthermore sensor lights will be used thus reducing the energy usage required for lighting.

Paragraphs 3 – 13 below should be completed for each alternative.

3. PHYSICAL SIZE OF THE ACTIVITY

a) Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Alternative:	**Size of the activity:**
Alternative A1[1] (preferred activity alternative)	100 000 m^2
Alternative A2 (if any)	[redacted]
Alternative A3 (if any)	

or, for linear activities:

Alternative:	**Length of the activity:**

.

Alternative A1 (preferred activity alternative) Alternative A2 (if any) Alternative A3 (if any)	[redacted]

b) Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Alternative:	**Size of the site/servitude:**
Alternative A1 (preferred activity alternative) Alternative A2 (if any) Alternative A3 (if any)	[redacted]

4. SITE ACCESS

Does ready access to the site exist?	**YES**
If NO, what is the distance over which a new access road will be built	[redacted] **m**

Describe the type of access road planned:

[redacted]

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

5. LOCALITY MAP

An A3 locality map must be attached to the back of this document, as Appendix A. The scale of the locality map must be relevant to the size of the development (at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map.). The map must indicate the following:

- an accurate indication of the project site position as well as the positions of the alternative sites, if any;
- indication of all the alternatives identified;
- closest town(s;)
- the accurate indication of the site in relation to closest protected environments or national parks (i.e. within 2.5 km)
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees, minutes and seconds using the Hartebeeshoek94 WGS84 co-ordinate system

6. LAYOUT/ROUTE PLAN

A detailed site or route plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix B to this document.

The site or route plans must indicate the following:

- the property boundaries and numbers of all the properties within 50 metres of the site;
- the current land use as well as the land use zoning of the site;
- the current land use as well as the land use zoning each of the properties adjoining the site or sites;
- the exact position of each listed activity applied for (including alternatives);
- servitude(s) indicating the purpose of the servitude;
- a legend; and
- a north arrow.

7. SENSITIVITY MAP

The layout/route plan as indicated above must be overlain with a sensitivity map that indicates all the sensitive areas associated with the site, including, but not limited to:

- watercourses;
- the 1:100 year flood line (where available or where it is required by Department of Water and Sanitation);
- ridges;
- for gentle slopes the 1 metre contour intervals must be indicated on the plan and whenever the slope of the site exceeds 1:10, the 500mm contours must be indicated on the plan; and
- cultural and historical features;
- areas with indigenous vegetation (even if it is degraded or infested with alien species); and
- critical biodiversity areas and ecological support area.
- protected areas (e.g Magaliesberg Protected Environment, Pilanesberg National Park etc.)

The sensitivity map must also cover areas within 100m of the site and must be part of Appendix B.

8. SITE PHOTOGRAPHS

Colour photographs from the centre of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under Appendix C to this report**.** It must be supplemented with additional photographs of relevant features on the site, if applicable.

9. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of at least 1:200 as Appendix D for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

10. ACTIVITY MOTIVATION

Motivate and explain the need and desirability of the activity (including demand for the activity):

1. Is the activity permitted in terms of the property's existing land use rights?	**YES**		
The proposed development site is not administered by any Town planning Scheme. From the municipality's record the property does not have any zoning in terms of the regulations. As such the development of the leisure and cultural village facility can be permitted.			
2. Will the activity be in line with the following?			
(a) Provincial Spatial Development Framework (PSDF)	**YES**		**Please explain**
The tourism sector has been identified as one of the main backbones of rural development; this is mainly because it has the potential to stimulate economic growth as well as showcase the heritage within the province. The proposed development will contribute towards the growth of tourism of the province in terms of job creation, preservation of heritage and natural resources, as well as skills development. The framework acknowledges the significant role of emerging entrepreneurs towards building the tourism sector. (North West SDF, 2016)			
(b) Urban edge / Edge of Built environment for the area		**NO**	
The proposed development is situated within the Dinokana village, which is one of the rural areas on Ramotshere Moiloa Local Municipality.			

(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	**YES**	[redacted]	**Please explain**
According to the IDP of Ramotshere Moiloa Local Municipality, tourism, culture and agriculture are considered the dominant economic activities that contribute to the growth of the local economy by creating sustainable jobs. Furthermore the strategic objectives outlined in the Integrated Development Plan (2014/2015) and Spatial Development Framework (2015) is to improve the tourism, and to unlock the potential of Dinokana as a heritage site.			
(d) Approved Structure Plan of the Municipality	[redacted]		**Please explain**
The development is not part of the approved structural plan of the Municipality. However, the Ramotsehre Moiloa Local Municipality has approved acknowledged the development of the Leisure and Cultural Village. See Appendix L.			

(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)		**NO**	**Please explain**
According to the Draft environmental management By Law of Ramotshere Moiloa Municipality (2017), The municipality is yet to develop a sensitive habitat management and conservation plan. In addition, The environmental management By law also outlines the principles of NEMA which promotes development that is socially, economically and environmentally sustainable. The undertaking of the Basic Assessment ensures that negative environmental impacts are avoided and minimised where possible.			
(f) Any other Plans (e.g. Guide Plan)			
The EAP is not aware of any other plans within the proposed development site			
3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	**YES**		**Please explain**
Tourism is currently a focal point in developmental prospects within the municipality. As such the proposed development of a cultural village aligns with the priorities identifies in the IDP (2014/2015).			

4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	**YES**		**Please explain**
According to the municipal IDP (2014/2015), Dinokana village have identifies local economic growth as a priority of development within the municipality. Therefore, Dinokana has been identified as a development node that requires investment, of which tourism is one, in order to inspire the growth of the local economy Currently, only Groot Marico has any form of tourism within the entire Local Municipality. Dinokana is has a high potential for tourism as the community is located ideally next to the N4 from Zeerust to Botswana, and tourism is seen as an great economic activity that will enable revenue and job creation for the community.			
5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? (Confirmation by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix E.)	**YES**		**Please explain**
The applicant shall lodge an application with Eskom for electricity needs of the project. Furthermore the applicant will use groundwater. An application for a Water use License shall be lodged with the Department of Water and Sanitation.			
6. Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? (Comment by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)			**Please explain**
The applicant shall lodge an application for additional capacity with the municipality. Proof of this application will be included in the Final BA Report *(if they will be doing it by then)*			
7. Is this project part of a national programme to address an issue of national concern or importance?	**YES**		**Please explain**
The proposed development aims to address challenges of unemployment and low economic growth in South Africa on a local scale. This will be done through employment and skills development and training of local community members and local economic growth from potential income received from visitors.			

8. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	**YES**		**Please explain**
The development falls within a near natural ecosystem, where it will play on the natural elements as part of its attraction. Furthermore it is located strategically close to a national road, providing easy access for visitors. The community of Dinokana falls under the Bahurutshe Ba Moiloa Tribal Authority, which prides itself in its culture and heritage. The rural setting of the village combined with the want to showcase culture and tradition makes the leisure and cultural village the ideal location for tourism. Furthermore, the natural setting with sparse urban area ensures that the locations is prime for secluded accommodations that is ideal for tourists who would like to experience more nature away from urban areas.			
9. Is the development the best practicable environmental option for this land/site?	**YES**		**Please explain**
The development footprint of the site has been carefully informed by the sensitivities on site and will occur in areas of low-moderate sensitivities ensuring minimal destruction of important flora and fauna.			
10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	**YES**		**Please explain**
The project benefits outweigh the negative impacts; the project will make a positive contribution to sustainable economic growth, skills development and employment opportunities in Ramotshere Moiloa Local Municipality. Furthermore it will be undertaken in a manner that aims to minimise environmental impacts of the cultural village.			
11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	**YES**		
The cultural village is the first of its kind within the village and rural area. It has the potential to inspire similar activities from the local community members at it brings an economic injection within Dinokana.			
12. Will any person's rights be negatively affected by the proposed activity/ies?		**NO**	**Please explain**
The project will not affect the rights of the local community. The project developers are from the community and have ensured community engagement with assistance of the Tribal Authority in order to ensure that people's rights are not affected; in fact it will economically benefit the local community by creating job opportunities.			

13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?		**NO**	**Please explain**
The proposed development is located outside the urban edge as defined by the local municipality.			
14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?		**NO**	**Please explain**
The proposed development is on a small scale and does not contribute towards the Strategic Integrated projects.			
15. What will the benefits be to society in general and to the local communities?			**Please explain**
The benefits of the project entail employment, skills development, preservation of culture and heritage for the local community.			
16. Any other need and desirability considerations related to the proposed activity?			**Please explain**
The development of a leisure and cultural village has less environmental impact relative to other land uses, specifically agriculture.			
17. How does the project fit into the National Development Plan for 2030?			**Please explain**
The National Development Plan recognises tourism as a key driver of employment, economic growth and the national transformation agenda. Tourism contributes to the improvement of many lives from individuals, families, communities and small enterprises. The improvement in tourism will contribute towards improving the business environment and investment climate, increase national pride and serve as a growth engine to power development and transformation. As such the proposed development aligns with the NDP. The proposed development aims to assist in building an economy that is sustainable, and also seeks to eliminate inequalities and poverty amongst households.			
18. Please describe how the general objectives of Integrated Environmental Management as set out in Section 23 of NEMA as amended have been taken into account.			
The general objectives of Integrated Environmental Management were taken into account by considering all the potential negative and positive impacts of the proposed project on both the biophysical and socio-economic environments. In order to avoid potentially significant impacts, specialist inputs were obtained in relation to terrestrial and aquatic ecology. Based on the findings of the specialist studies a number of recommendations / mitigation measures have been identified for consideration in further project design and implementation. The public and authorities will be given adequate opportunity to comment on the proposed project and to participate in the Basic Assessment Process			

19. Please describe how the principles of environmental management as set out in Section 2 of NEMA as amended have been taken into account.
The basic needs of landowners and the public were taken into account during the planning phase of the proposed project, which aims to stimulate economic growth, create employment opportunities and make significant contribution towards food security. Minimisation of potential negative impacts and optimisation of potential positive impacts will be ensured by way of effective implementation of the Construction EMPr. Thus the proposed project is deemed to be socially, environmentally and economically sustainable.

11. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy or guideline	**Applicability to the project**	**Administering authority**	**Date**
The Constitution of the Republic of South Africa (No. 108 of 1996)	The constitution states that "everyone has the right to an environment that is not harmful to their health or well-being".	National and Provincial	1996
National Environmental Management Act, 1998 (Act 107 of 1998).	The proposed development triggers listed activities within this act	National Government, and National Department of Environmental Affairs	1998
National Environmental Management Act EIA Regulations (7 April 2017)	A number of listed activities have been identified that have triggered the need for a Basic Assessment in terms of these regulations	National Government, and National Department of Environmental Affairs	2017
National Water Act, 1998 (Act 36 of 1998).	The proposed development uses groundwater	Department of Water Affairs	1998
The National Heritage Resources Act, 1999 (Act No 25 of 1999) as amended, particularly Chapter II, Section 38	The proposed development is aimed at preserving and showcasing its local culture and heritage.	South African Heritage Resource Agency	1999
National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004)	The NEMBA aims to conserve and provide management of biodiversity in the country. The proposed development site is within a critical biodiversity area.	National Government, and National Department of Environmental Affairs	2004
National Environmental Management: Waste Act	Protection of the surrounding environment through efficient	National Government, and National	2008

(Act 59 of 2008) (as amended)	waste management by the appointed Contractor.	Department of Environmental Affairs	
North West Biodiversity Sector Plan	The development falls under biodiversity priority areas identified by the sector plan that needed to be investigated in the Ecology Specialist Study.	North West Department of Rural, Environment and Agricultural Development	2015
Local Municipal By-Laws	Any municipal by laws that may have jurisdiction over this project	Rustenburg Local Municipality	

12. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?	YES [redacted]
If YES, what estimated quantity will be produced per month?	1400 m^3
How will the construction solid waste be disposed of (describe)?	

A. Commit to reuse and recycle. Appoint someone or myself with overall project authority committed to recycling. He/she can issue a statement explaining that construction waste recycling is important to the project and why. This statement can be used in many ways – in worker training materials etc.

B. Put recycling into specifications and into all contracts – allocate bins for different materials, assign haulers or vendors to collect materials place a bin on site. This will also generate money back into the project that can be used to buy sports gear for the local school or other charity activities.

C. Establish who will control the debris. Establish one project authority, usually the construction manager or general contractor, to control all project waste, provide dumpsters and waste services for the project, and enforce recycling rules with all contractors(Make sure to put a trash container near recycling containers or the recycling container may become a trash container). For example the department of Public Works may use debris from building to strengthen the roads leading to the site as it becomes muddy and slippery during rains.

D. Include waste reduction, reuse and recycling from the start

a) Order materials just in time, send back extra inventory, utilize reused building materials, consider ways you can reduce and reuse waste during construction and put these methods into contracts
b) Ask suppliers to reduce packaging, send you recyclable packaging or take packaging back
c) Discuss and encourage reduction, reuse and recycling at pre-construction meetings

E. Select a coordinator – designate a staff member (typically construction project manager with the cooperation of the site superintendent) to promote and monitor the recycling program. The coordinator will educate staff and subcontractors.

Where will the construction solid waste be disposed of (describe)?

A. Recyclable materials will be collected or delivered to haulers (recyclers): Who in turn give monetary remuneration for materials such as scrap metal.

B. Debris such as brick, asphalt and concrete to be scattered over road to avoid muddiness during rain.

C. Assign dumpsters (bins) by reputable waste management companies e.g. Waste Group who will periodically pick the bin when it's full for disposing. This will remove materials from the construction site that is otherwise left behind by the haulers.

Will the activity produce solid waste during its operational phase?	YES [redacted]
If YES, what estimated quantity will be produced per month?	1500m^3

How will the solid waste be disposed of (describe)?

Most of the solid waste will be household waste generated by:
A. Normal waste and household rubbish: Disposed of into municipal waste stream.

If the solid waste will be disposed of into a municipal waste stream, indicate which registered landfill site will be used.

Municipal waste will be collected and dumped at the Zeerust Landfill (dumpsite)

Where will the solid waste be disposed of if it does not feed into a municipal waste stream (describe)?

If for some reason the municipal waste is not collected periodically then the local authority will be immediately and the councillor asked to intervene and investigate.

If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the NEM:WA?	NO

If YES, inform the competent authority and request a change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

Is the activity that is being applied for a solid waste handling or treatment facility?	NO

If YES, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

b) Liquid effluent

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	YES
If YES, what estimated quantity will be produced per month?	100 m^3
Will the activity produce any effluent that will be treated and/or disposed of on site?	NO

If YES, describe the type of effluent and the disposal mechanism/method

Will the activity produce effluent that will be treated and/or disposed of at another facility?	YES

If YES, provide the particulars of the facility:

Facility name:	Zeerust WasteWater Treatment Works		
Contact person:	Mr Wonder Sehole		
Postal address:	PO Box 92, Zeerust		
Postal code:	2865		
Telephone:	028 642 1081	**Cell:**	n/a
E-mail:	n/a	**Fax:**	018 642 3586

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

[redacted]

c) Emissions into the atmosphere

Will the activity release emissions into the atmosphere other that exhaust emissions and dust associated with construction phase activities?	[redacted] NO
If YES, is it controlled by any legislation of any sphere of government?	NO

If YES, the applicant must consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
If NO, describe the emissions in terms of type and concentration:

N/A

d) Waste Licence/Registration

Will any aspect of the activity produce waste that will require a waste licence/registration in terms of the NEM:WA?	[redacted] NO

If YES, please submit evidence that an application for a waste licence/registration has been submitted to the competent authority

e) Generation of noise

Will the activity generate noise?	[redacted] NO
If YES, is it controlled by any legislation of any sphere of government?	NO

If YES, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
If NO, describe the noise in terms of type and level:

Noise during construction by trucks and general construction activities. Please see EMPr attached as Appendix J for a description of the mitigation measures and management actions that pertain to noise reduction and management during construction.

13. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(es):

Municipal	[redacted]

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month:	[redacted]
Does the activity require a water use authorisation (general authorisation or water use license) from the Department of Water and Sanitation?	NO

If YES, please provide proof that the application has been submitted to the Department of Water and Sanitation. **The project developer is currently applying for a water use license and the proof of application will be provided in the Final BAR document in Appendix L**.

14. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

The following measures will be used as part of the resource efficiency of the proposed development:

Cooling efficiency
The facilities will be carefully considered with structures places in the direction that catches the natural light and warmth of the sun without the excessive glare or overheating that can result from direct sunlight. Dwellings are to be sensitively places to utilise the shade afforded by tree canopies.

Lighting efficiency
Energy saving light bulbs will be used for the development; the use of this energy saving bulbs will improve the efficiency of the development. Furthermore sensor lights will be used thus reducing the energy usage required for lighting

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

[redacted]

Has a specialist been consulted to assist with the completion of this section?	[redacted]	NO

If YES, please complete the form entitled "Details of specialist and declaration of interest" for the specialist appointed and attach in Appendix F.

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

1. For linear activities (pipelines, etc) as well as activities that cover very large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section B and indicate the area, as it appears on the Site Plan.

2. Paragraphs 1 - 6 below must be completed for each alternative.

Current land-use zoning as per local municipality IDP/records:	The proposed development site is not administered by any Town planning Scheme

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to, to this application.

Is a change of land-use or a consent use application required?	NO

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative S1:

1:20 – 1:15	

Alternative S2 (if any):

Alternative S3 (if any):

2. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site:

2.1 Ridgeline		2.4 Closed valley		2.7 Undulating plain / low hills	√
2.2 Plateau		2.5 Open valley	√	2.8 Dune	
2.3 Side slope of hill/mountain	√	2.6 Plain	√	2.9 Seafront	

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following?

	Alternative S1:	**Alternative S2 (if any):**	**Alternative S3 (if any):**
Shallow water table (less than 1.5m deep)	YES		

Dolomite, sinkhole or doline areas	YES	
Seasonally wet soils (often close to water bodies)	YES	
Unstable rocky slopes or steep slopes with loose soil		NO
Dispersive soils (soils that dissolve in water)		NO
Soils with high clay content (clay fraction more than 40%)		NO
Any other unstable soil or geological feature		NO
An area sensitive to erosion	YES	

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted.

4. GROUNDCOVER

Indicate the types of groundcover present on the site. The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Natural veld - good condition[E]	Natural veld with scattered aliens[E]
Sport field	

If any of the boxes marked with an "[E] "is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

5. SURFACE WATER

Indicate the surface water present on and or adjacent to the site and alternative sites?

Perennial River	YES	
Non-Perennial River		NO
Permanent Wetland	YES	
Seasonal Wetland		NO
Artificial Wetland	YES	

If any of the boxes marked YES or UNSURE is ticked, please provide a description of the relevant watercourse.

The development site is near a wetland system fed predominantly by groundwater inputs from the Dinokana Eye as well as surface runoff from the clearly defined catchment basin that is found immediately upstream. The Dinokana Eye is a strategic Karstic spring that is an important resource that supplies large volumes of clean water for human use, and it also has an ecological value in supporting unique species assemblages and diversity of life in an otherwise surrounding dry environment (Figure 6).

The Dinokana Eye drains into the Ngotwane River, which enters the Limpopo River at Pala Camp, north-east of Gaborone.

The Dinokana Eye is located within a well fenced off area away from development by the Department of Water and Sanitation in order to ensure that the good water quality of the spring ad surface water is not compromised.

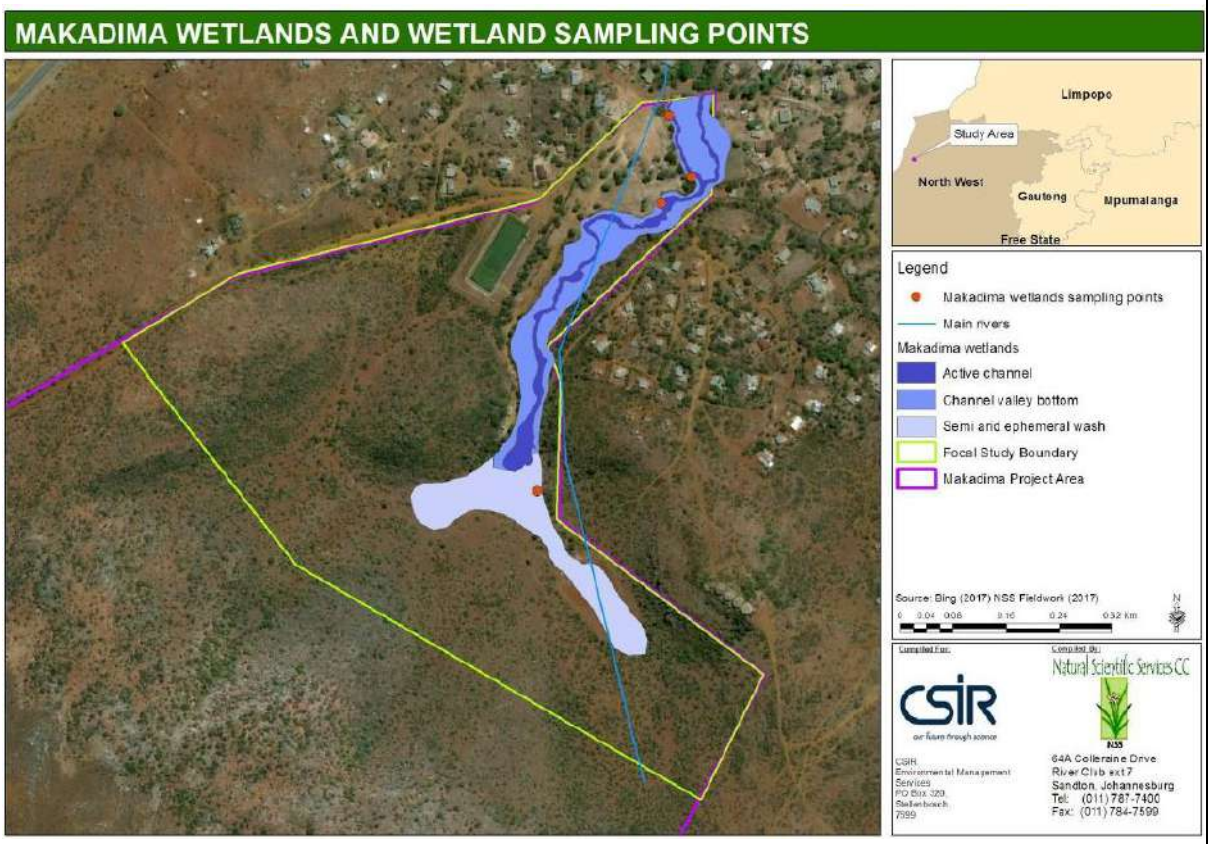

Figure 6: Current wetland extent.

6. LAND USE CHARACTER OF SURROUNDING AREA

Indicate land uses and/or prominent features that currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

Natural area	Dam or reservoir	
Low density residential		
Medium density residential		
		Agriculture
		River, stream or wetland [N]
		Mountain, koppie or ridge [N]

If any of the boxes marked with an "[N] "are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain

Loss of wetland if construction occurs within the wetland buffer or upstream of the Dinokana Eye from sedimentation by construction activities. The construction of the accommodation facilities will be on a koppie, the development has a potential impact on the integrity of the koppie, including the floral and faunal habits/communities found.

If any of the boxes marked with an "[AN]" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

If any of the boxes marked with an "[H]" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

Does the proposed site (including any alternative sites) fall within any of the following:

Critical Biodiversity Area (as per provincial conservation plan)	YES	
Core area of a protected area?		NO
Buffer area of a protected area?		NO
Planned expansion area of an existing protected area?		NO
Existing offset area associated with a previous Environmental Authorisation?		NO

If the answer to any of these questions was YES, a map indicating the affected area must be included in Appendix B (as part of sensitivity map).

7. BIODIVERSITY

Please note: The Department may request specialist input/studies depending on the nature of the biodiversity occurring on the site and potential impact(s) of the proposed activity/ies. To assist with the identification of the biodiversity occurring on site and the ecosystem status consult http://bgis.sanbi.org or BGIShelp@sanbi.org. Information is also available on compact disc (cd) from the Biodiversity-GIS Unit, Ph (021) 799 8698. This information may be updated from time to time and it is the applicant/ EAP's responsibility to ensure that the latest version is used. A map of the relevant biodiversity information (including an indication of the habitat conditions as per (b) below) and must be provided as an overlay map to the property/site plan as Appendix B to this report.

a) Indicate the applicable biodiversity planning categories of all areas on site and indicate the reason(s) provided in the biodiversity plan for the selection of the specific area as part of the specific category)

Systematic Biodiversity Planning Category			**If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan**
Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)		This CBA was likely assigned because the site is situated within the Carleton Dolomitic Grassland which is considered a Vulnerable vegetation ecosystem type. While the Zeerust Thornveld, the vegetation type, is considered Least Threatened. (Please refer to the Ecologcial Study, Appendix G)

b) Indicate and describe the habitat condition on site

Habitat Condition	Percentage of habitat condition class (adding up to 100%)	Description and additional Comments and Observations (including additional insight into condition, e.g. poor land management practises, presence of quarries, grazing, harvesting regimes etc).
Natural	%	
Near Natural (includes areas with low to moderate level of alien invasive plants)	96 %	The development site is in a relatively natural state, which contains 3 % of the savanna biome core area, and had a high species richness and species diversity.
Degraded (includes areas heavily invaded by alien plants)	%	
Transformed (includes cultivation, dams, urban, plantation, roads, etc)	4 %	The immediate study area has been transformed through construction infrastructure, reservoirs, dams and a football field

c) Complete the table to indicate:

(i) the type of vegetation, including its ecosystem status, present on the site; and

(ii) whether an aquatic ecosystem is present on site.

Terrestrial Ecosystems		Aquatic Ecosystems
Ecosystem threat status as per the National Environmental Management: Biodiversity Act (Act	**Endangered**	**Wetland (including rivers, depressions, channelled and unchanneled wetlands, flats, seeps pans, and artificial wetlands)**
	Vulnerable	

No. 10 of 2004)		**NO**	

d) Please provide a description of the vegetation type and/or aquatic ecosystem present on site, including any important biodiversity features/information identified on site (e.g. threatened species and special habitats)

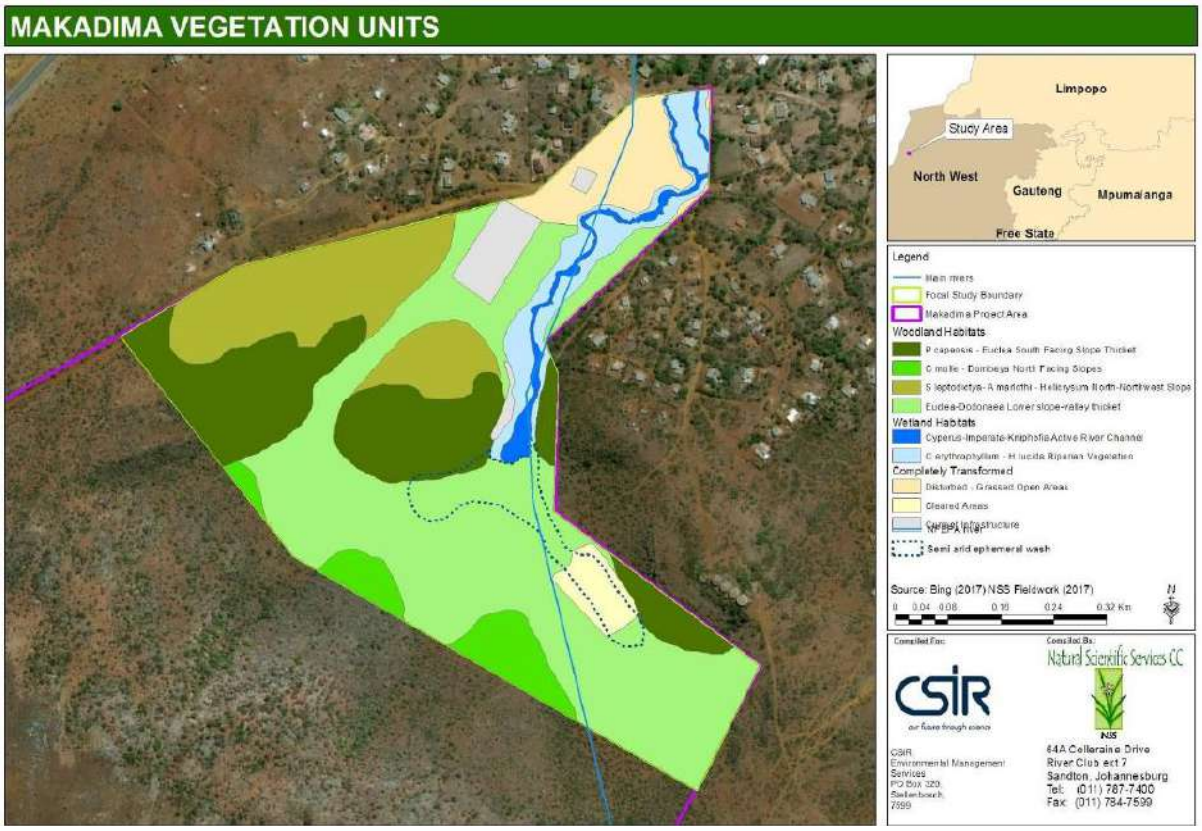

Figure 7: Vegetation units within the proposed development site

From the field investigations the study area is still in a relatively natural state. The site falls within two geological zones, the Shales of the Pretoria group and the Dolomites of the Malmani Supergroup. To the northwest of Zeerust, bands of chert make up the upper part of the Dolomite beds which gradually go over to ferruginous and cherty quartzites and finally turn into brown and black banded ironstones (Du Toit, 1954). Due to their hardness they have formed a series of low hills (Dinokana Hills) capping the dolomite and extending further northwest towards the Botswana border (Du Toit, 1954; Van der Meulen, 1979). Analyses performed in the Western Central Basin (WCB) where the study site occurs, confirmed that even though the WCB contains only 3% of the savanna biome core area, it harbours 41% of its species richness and has a species/area ratio of 0.07. This high gamma[5] diversity in such a small area can be explained by a low beta diversity between the species rich communities of the savanna and consequently of the WCB. The species richness in the WCB is not equally distributed, some areas are clearly more species rich than others with species richness increasing along an N–S and NW–SE gradient with the highest mean species richness in areas with high variation in relief: 1) hills and lowlands 2) slightly undulating plains 3) lowlands with parallel hills (Kurzweg, 2012).

The vegetation on site is distributed in a complex mosaic pattern, and is not dominated by a single or a few species. This can be seen in the vegetation structure on site, with more diversity occurring within the dolomitic outcrop areas (*C molle - Dombeya* North Facing Slopes). Shale mountainous communities include the *Pappea capensis - Euclea* South Facing Slope Thicket and the similar *Searsia leptodictya- Aloe marlothi - Helichrysum* North Slope Thicket. Within the valley bottom, on deeper red soils, the community is dominated by species such as *Euclea* and *Dodonaea* (*Euclea-Dodonaea* Lower slope-valley thicket). Along the river (from the Eye of the spring towards downstream) there is a well defined Riparian Zone (*Combretum erythrophyllum - Halleria lucida* Riparian Zone) and along the immediate streambank more hydrophytic species are found (*Cyperus-Imperata-Kniphofia* Active River Channel community)(Figure 8 & 9).

Table 1: Vegetation units within the proposed development site

Vegetation Community	Conservation Significance	Area -
Woodland Habitats		
P capensis -Euclea South Facing Slope Thicket	Moderate-High	6.743
C molle- Dombeya North Facing Slopes	Moderate-High	1.756
S leptodictya- A marlothi- Helichrysum North-Northwest Slope	Moderate-High	5.297
Euclea-Dodonaea Lower slope-valley thicket	Moderate	14.592
Wetland Habitats		
Cyperus-Imperata-Kniphofia Active River Channel	Very High	0.686
C erythrophyllum - H lucida Riparian Vegetation	Very High	2.065
Completely Transfromed		
Distrubed- Grassed Open Areas	Low	2.035
Cleared Areas	Low	0.786
Current Infrastructure	Low-None	1.008

C erythrophyllum - H lucida Riparian Vegetation

S leptodictya- A marlothi - Helichrysum Slope Habitat

Euclea-Dodonaea Lower slope-valley thicket

Cleared Areas (Transformed habitat)

Figure 8: Photographs of the different habitats within and surrounding the site (Photos by: NSS, 2017)

Dodonaea viscosa

Combretum molle

Aloe marlothi

Dombeya rotundifolia

Figure 9: Photographs of Examples of vegetation species found on site(Photos by: NSS, 2017).

8. CULTURAL/HISTORICAL FEATURES

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including Archaeological or paleontological sites, on or close (within 20m) to the site? If YES, explain:	NO

Will any building or structure older than 60 years be affected in any way?	NO
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	NO

If YES, please provide proof that this permit application has been submitted to SAHRA or the relevant provincial authority.

The site survey conducted by Heritage Contracts and Archaeological Consulting CC(HCAC) found no site of heritage significance. Possible impacts were identified and mitigation measures proposed in accordance to section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999).

There site contains no standing structures older than 60 years.

Archaeology of Dinokana:

The Archaeology of the area consists of the Stone Age and Iron Age. No archaeological sites or material was recorded during the survey. Therefore, no further mitigation prior to construction is recommended in terms of the archaeological component of Section 35 of the NHRA for the proposed development to proceed.

Historical Information of Dinokana:

Dinokana became the main town of the baHurutshe in 1849, when Kgosi Moiloa I settled it with about 1,500 people, who had been displaced following the Difaqane. Kgosi Moiloa was accompanied by the Reverend Walter Inglis of the London Missionary Society.

The Cultural Landscape of the property:

The property under investigation is located near Dinokana, about 1 km to the south west of the N4 National Road, 24 km north west of Zeerust, and about 20 km east of the Botswana border in North West Province. Long term impact on the cultural landscape is considered to be low as the surrounding area is rural in character with some road developments. Visual impacts to scenic routes and sense of place are also considered to be low due to the extensive township developments in the larger area and the tourism development is in line with the character of the area.

9. SOCIO-ECONOMIC CHARACTER

a) Local Municipality

Please provide details on the socio-economic character of the local municipality in which the proposed site(s) are situated.

Level of unemployment:

Ramotshere Moiloa Local Municipality has 30.37% of unemployment, with 69.63% of the population employed in the formal and informal sectors. Table 2 depicts the levels of employment and unemployment from 2010 to 2013 (Ramotshere IDP, 2017).

Table 2: Levels of employment and unemployment between 2010 and 2013

Labour force/Economically active (Number)		Employed - Formal and informal	Unemployed (Number)
2010	Number of people	18753	10119
	% of people	64,95%	35,05%
2011	Number of people	17809	8892
	% of people	66,70%	33,30%
2012	Number of people	18017	8443
	% of people	68,09%	31,91%
2013	Number of people	18961	8272
	% of people	69,63%	30,37%

Economic profile of local municipality:

The percentage of economically active people in the municipality is 20.15%, with 79.85% of the population not being economically active. The table 3 below shows the trends of economic activity between 2010 and 2013, indicating little change in percentage of economic active vs non-economic active.

Table 3: the Labour force of Ramotshere Moiloa Local Municipality(Source: Ramotshere Moiloa IDP)

Labour force	2010	2011	2012	2013
Not economically active	77,98%	79,66%	80,13%	79,85%
Economically active	22,02%	20,34%	24,79%	20,15%

The main sectors of employment and economic activity are retail trade and services in the

terrestrial sector. The rural areas are characterised mostly by small scale/subsistence agriculture, game farming, and a few active mines, while manufacturing and services sectors are located in towns. The table 4 below indicates the types of employment sectors found in the municipality and the GVA.

Table 4: The GVA and employment sector of Ramotshere Moiloa Municipality (Source: Ramotshere Moiloa IDP)

Industry	GVA 2011		Employment 2011	
	R' million	Share of GVA	Number of employed	Share of employment
Agriculture	66	2,1%	659	3,5%
Mining	161	5,1%	451	2,4%
Manufacturing	151	4,8%	766	4,0%
Electricity	157	4,9%	227	1,2%
Construction	69	2,2%	759	4,0%
Retail	926	29,2%	7 138	37,6%
Transport	165	5,2%	536	2,8%
Finance	439	13,8%	1 467	7,7%
Community and social	367	11,6%	3 281	17,3%
General government	669	21,1%	3 676	19,4%

Level of education:

The majority of Ramotshere Moiloa Local Municipality's population have some form of education, with only 15.5% of the population having no schooling, while 28.8% have matric and only 5/8% have a higher education in 2016. The table 5 below shows the percentage of the population with no schooling decreased from 2011 compared to 2016. While also highlighting and increase in the number of matriculants over the same period.

Table 5: Level of Education of the population of Ramotshere Moiloa (Source: Ramotshere Moiloa IDP)

Level of education	2011	2016
No schooling	20.4%	15.5%
Matric	20.7%	28.8%
Higher Education	6.0%	5.8%

b) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	R22 878 039.00

What is the expected yearly income that will be generated by or as a result of the activity?	R2 705 175.00
Will the activity contribute to service infrastructure?	YES [redacted]
Is the activity a public amenity?	[redacted] NO
How many new employment opportunities will be created in the development and construction phase of the activity/ies?	+-200
What is the expected value of the employment opportunities during the development and construction phase?	R2 549 265.00
What percentage of this will accrue to previously disadvantaged individuals?	100%
How many permanent new employment opportunities will be created during the operational phase of the activity?	11 permanent employees
What is the expected current value of the employment opportunities during the first 10 years?	R 1593 384.00
What percentage of this will accrue to previously disadvantaged individuals?	100%

10. SPECIALIST(S) CONSULTATION

Has a specialist been consulted to assist with the completion of this section? **YES** [redacted]

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed and attach it in Appendix F. All specialist reports must be contained in Appendix G and must meet the requirement in Appendix 6 of EIA Regulations, 2014.

SECTION C: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

Provide a summary and anticipated significance of the potential direct, indirect and cumulative impacts that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed. This impact assessment must be applied to all the identified alternatives to the activities identified in Section A(2) of this report.

Activity	Impact summary	Significance	▪ Proposed mitigation
▪ **Design and Layout**			
Direct Impacts	Loss or degradation of the wetland on the access road	Low (Negative)	▪ Design measures to effectively control vehicle access, vehicle speed, dust, stormwater run-off, erosion and sedimentation on the road. ▪ Implement the measures that were designed to control impacts on the road preferably during winter, when the risk of erosion should be least.
	Loss of terrestrial vegetation and faunal habitat	Low (Negative)	▪ Ensure that all infrastructure avoids all Very High and High sensitive areas ▪ Clearly demarcate or fence in the construction site. Relocate CI plant and animal specimens from the construction footprint, with advice from an appropriate specialist. ▪ Commence (and preferably complete) construction during winter, when the risk of disturbing growing plants should be least.
	Loss of CI or medicinal flora	Low (Negative)	▪ Obtain permits to remove CI species ▪ Transplant CI and medicinally important floral specimens from the infrastructure footprint to suitable locations in the surrounding area. ▪ Obtain guidance from a suitably qualified vegetation specialist or horticulturist regarding the collection, propagation/storage and transplantation of plants.
	Loss of CI fauna	Low (Negative)	▪ Appoint an appropriate specialist to relocate CI fauna from vegetation, termitaria and soil that is removed from the infrastructure footprint. ▪ Commence (and preferably complete) construction

Activity	Impact summary	Significance	▪ Proposed mitigation
			during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least. ▪ Check open trenches for trapped animals (e.g. hedgehogs, reptiles and frogs), and relocate trapped animals with advice from an appropriate specialist. ▪ Prohibit disturbance and persecution (e.g. poaching) of fauna, and introduction of pets and other alien fauna (apart from the production chickens). ▪ Provide notices and training to inform workers about dangerous animals (e.g. venomous snakes and scorpions) and prohibited activities (e.g. poaching) ▪ Walk fence lines to remove snares.
	Introduction and proliferation of alien species	Low (Negative)	▪ Carefully regulate / limit access by vehicles and materials to the construction site. Demarcate or fence in the construction area. ▪ Prohibit the introduction of domestic animals such as dogs and cats. ▪ Remove any woody alien species that germinate. ▪ Plant only locally indigenous flora if landscaping needs to be done ▪ Keep construction activities neat and tidy. When complete, remove all sand piles and landscape all uneven ground while re-establishing a good topsoil layer ▪ Remove Category species using mechanical methods, and minimize soil disturbance as far as possible.
	Increased dust and erosion	Low (Negative)	▪ Limit vehicles, people and materials to the construction site. ▪ Commence (and preferably complete) construction during winter, when the risk of erosion should be least. ▪ Revegetate denude areas with locally indigenous flora a.s.a.p. ▪ Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed. ▪ Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting.
	Sensory disturbance of fauna	Low (Negative)	▪ Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least. ▪ Minimize noise to limit its impact on calling and other sensitive fauna (e.g. frogs and Secretary bird). ▪ Limit construction activities to day time hours ▪ Minimize or eliminate security and construction

Activity	Impact summary	Significance	▪ Proposed mitigation
			lighting, to reduce the disturbance of nocturnal fauna.
	Destruction of palaeontological material	Very Low (Negative)	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
	Destruction of archaeological artefacts	Very Low (Negative)	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
	Emissions from dust generation and construction vehicles	Medium (Negative)	▪ Ensure that cleared (excavated) areas and unpaved surfaces are sprayed with water (obtained from an approved source) to minimise dust generation. ▪ Approved soil stabilisers may be utilised to limit dust generation. ▪ Ensure that construction vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour. ▪ Limit vehicles, people and materials to the construction site ▪ Adequate dust control strategies should be applied to minimise dust deposition, for example: Periodic spraying of water on the entrance road when necessary
	Potential spillage of by spillage or discharge of construction waste water	Low (Negative)	▪ Ensure that adequate containment structures are provided for the storage of construction materials on site. ▪ Ensure the adequate removal and disposal of construction waste and material
	Potential Pollution of the surrounding water and ground as a result of generation of building rubble and waste scrap material	High (Negative)	▪ Ensure that adequate containment structures are provided for the storage of construction materials on site. ▪ Ensure the adequate removal and disposal of construction waste and material
	Opportunities for employment and skills development	Medium (Positive)	▪ Enhance the use of local labour and local skills as far as reasonably possible. ▪ Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained. ▪ Ensure that an equitable percentage allocation is provided for local labour employment as well as specify the use of small-to-medium enterprises and

Activity	Impact summary	Significance	▪ Proposed mitigation
			training specifications in the Contractors contract. ▪ Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.
	Potential visual impacts as the result of construction activities	Low (Negative)	▪ No specific mitigation measures are required other than standard construction site housekeeping and dust suppression. These are included below: ▪ The contractor(s) should maintain good housekeeping on site to avoid litter and minimise waste. ▪ Litter and rubble should be timeously removed from the construction site and disposed at a licenced waste disposal facility. ▪ The project developer should demarcate construction boundaries and minimise areas of surface disturbance. ▪ Appropriate plans should be in place to minimise fire hazards and dust generation. ▪ Night lighting of the construction site should be minimised within requirements of safety and efficiency.
	Potential noise impact as the result of the use of construction equipment	Medium (Negative)	▪ Limit construction activities to day time hours
	Potential impact on the safety of construction workers and Health injuries to construction personnel as a result of construction work	Medium (Negative)	▪ Ensure that a skilled and competent Contractor is appointed during the construction phase. The Contractor must be evaluated during the tender/appointment process in terms of safety standards. ▪ The Contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate. ▪ The Contractor must undertake a Construction Phase Risk Assessment. ▪ A Construction Site Manager or Safety Supervisor should be appointed, in conjunction with the project manager, to monitor all safety aspects during the construction phase. This could be the same person that is assigned to co-ordinate the construction traffic.
	Traffic, congestion and potential for collisions	Low (Negative)	▪ Ensure that roads are not closed during construction, which may restrict access for emergency services. ▪ The Contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate
▪ **Construction Phase**			
Direct Impacts	Direct loss of wetlands	Medium (Negative)	▪ Modify the original infrastructure layout based on the layout and recommendations made by ecological specialist to as far as possible avoid wetland areas and their buffers

Activity	Impact summary	Significance	▪ Proposed mitigation
			▪ Demarcate the construction site and ensure that all activities are carried out within that area. Additionally mark out the wetland on the ground to ensure activities stay out of it. ▪ Do not build any infrastructure upstream of the Eye. ▪ Avoid construction within the "no building zone" as indicated on ecological specialist's proposed infrastructure map
	Contamination of surface and groundwater resources	Low (Negative)	▪ Highlight all prohibited activities (e.g. Mixing of concrete in wetland areas littering, cutting of large trees, using the wetland as an ablution development) to workers through training and sign notices. ▪ Do not make use of fertilisers, pesticides or herbicides on site especially upstream of the Eye.
	Increased dust and erosion	Low (Negative)	▪ Limit vehicles, people and materials to the construction site. ▪ Commence (and preferably complete) construction during winter, when the risk of erosion should be least. ▪ Revegetate denude areas with locally indigenous flora a.s.a.p. ▪ Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed. ▪ Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting.
	Increased sediment loads	Low (Negative)	▪ Commence (and preferably complete) construction activities during winter when the risk of erosion and wetland sedimentation is lowest. ▪ Keep all construction activities to within the demarcated footprint areas (keep out of wetland). ▪ Keep cleared areas to a minimum by constructing one development at a time. ▪ Revegetate remaining cleared areas by planting indigenous grasses and other vegetation as soon as possible. ▪ Do not stockpile soil in the catchment area above the Eye or within the delineated wetland areas. ▪ Design measures to effectively control vehicle access, vehicle speed, dust, stormwater run-off, erosion and sedimentation on the road.
	Increased flood peaks	Low (Negative)	▪ Rehabilitate the head cut erosion within HGM Unit 2 (just upstream of the Eye outside the DWS fence) by stabilising the channel banks. This may be achieved by filling and levelling the channel to remove the drop which creates the erosive vortex during rainfall events. Start with coarser material (e.g. rock) deeper down and progress to finer sands and topsoils towards the

Activity	Impact summary	Significance	▪ Proposed mitigation
			surface. Thereafter employ temporary flow attenuation structures such as branches and rows of small hessian bags across the channel filled with grass and sand held in place by thin logs pegged in place with wooden stakes. ▪ Preferably prohibit or otherwise monitor the levels of livestock grazing to avoid the overutilisation of the grass sward. ▪ Make sure that the access road is well cambered with enough drainage berms to prevent erosion. ▪ Minimise the extent of cleared ground and hardened surfaces.
	Decreased water inputs	Low (Negative)	▪ Do not sink boreholes for the development upstream of the Eye or within 100 m of the delineated wetlands.
	Clearing of (especially riparian) vegetation and faunal habitats	Medium (Negative)	▪ Do not clear any riparian vegetation for the development. This is the vegetation occurring within the delineated wetland boundaries. Additionally wherever possible minimise the disturbance to vegetation within the prescribed wetland buffer zones. ▪ Modify the layout of planned infrastructure to avoid important floral communities and large indigenous trees. Avoid construction of infrastructure within the ecological specialist's infrastructure map demarcated as "no building zone". Integrate the planned infrastructure into the surrounding environment (blending in). ▪ Identify and mark indigenous trees on the ground. Those that are small and cannot be avoided should be transplanted elsewhere on site. ▪ Demarcate or fence in the construction site. ▪ Highlight all prohibited activities to workers through training and notices. ▪ Commence (and preferably complete) construction activities during winter, when the risk of disturbing growing plants should be least. ▪ Briefly and effectively stockpile topsoil preferably 1-1.5m in height. ▪ Use the topsoil to allow natural vegetation to establish in disturbed areas. If recovery is slow, then a seed mix for the area (using indigenous grass species listed within this report) should be sourced and planted. ▪ Do not undertake any landscaping with alien flora.
	Introduction and establishment of alien species	Low (Negative)	▪ Demarcate or fence in the construction site. ▪ Carefully limit / regulate access by vehicles and materials to the construction site. ▪ Prohibit further introduction of domestic animals such as cattle, goats, horses, donkeys, chickens, dogs and

Activity	Impact summary	Significance	▪ Proposed mitigation
			cats. ▪ Keep construction activities neat and tidy. ▪ When complete, remove all sand piles, and landscape all uneven ground while re-establishing a good topsoil layer. ▪ Plant only locally indigenous flora if landscaping needs to be done. ▪ Remove Category species using mechanical methods, and minimize soil disturbance as far as possible. Alien wood could be donated to the surrounding community.
	Loss of CI or medicinal flora	Low (Negative)	▪ Obtain permits to remove CI species. ▪ Transplant CI and medicinally important floral specimens from the infrastructure footprint to suitable and safe locations elsewhere on site or nearby. ▪ Obtain guidance from a suitably qualified vegetation specialist or horticulturist regarding the collection, propagation/storage and transplantation of plants. ▪ Highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).
	Sensory disturbance of fauna	Low (Negative)	▪ Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least. ▪ Minimize noise to limit its impact on calling and other sensitive fauna (e.g. frogs). ▪ Limit construction activities to day time hours. ▪ Minimize or eliminate security and construction lighting, to reduce the disturbance of nocturnal fauna.
	Loss of CI fauna	Low (Negative)	▪ Appoint an appropriate specialist to relocate CI fauna from rocky areas, water, termitaria, trees and soil that will be disturbed. ▪ Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least. ▪ Check open trenches for trapped animals (e.g. reptiles, frogs and small terrestrial mammals), and relocate trapped animals with advice from an appropriate specialist. ▪ Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited

Activity	Impact summary	Significance	▪ Proposed mitigation
			activities to workers through training and notices. ▪ Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).
	Altered burning	Low (Negative)	▪ Create safe storage on the premises for flammable materials. ▪ If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures. ▪ Maintain an effective fire break between the development and the surrounding natural environment. ▪ Ensure that there are appropriate control measures in place for any accidental fires. ▪ Educate workers about the fire plan and emergency procedures with regular training and notices.
	Destruction of palaeontological material	Very Low (Negative)	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
	Destruction of archaeological artefacts	Very Low (Negative)	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
	Increase in traffic	Low (Negative)	▪ Should abnormal loads have to be transported by road to the site, a permit needs to be obtained. ▪ Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and ▪ Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00); ▪ A speed limit of 60 km/h should be maintained on the N4.
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Medium (Low)	▪ Adhere to speed limits applicable to all roads used; and ▪ Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.
	Impact on air quality	Low (Negative)	▪ Implement management strategies for dust

Activity	Impact summary	Significance	▪ Proposed mitigation
	due to dust generation, noise and release of air pollutants from vehicles and construction equipment		generation e.g. apply dust suppressant on exposed areas and stockpiles; ▪ Postpone or reduce dust-generating activities during periods with strong wind; ▪ Limit noisy maintenance/operational activities to daytime only; ▪ Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased; ▪ Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the Applicant; and ▪ Avoid using old and noisy construction equipment and ensure equipment is well maintained.
	Opportunities for employment and skills development	Medium (Positive)	▪ Enhance the use of local labour and local skills as far as reasonably possible. ▪ Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained. ▪ Ensure that an equitable percentage allocation is provided for local labour employment as well as specify the use of small-to-medium enterprises and training specifications in the Contractors contract. ▪ Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.
	Potential visual impacts as the result of construction activities	Low (Negative)	▪ No specific mitigation measures are required other than standard construction site housekeeping and dust suppression. These are included below: ▪ The contractor(s) should maintain good housekeeping on site to avoid litter and minimise waste. ▪ Litter and rubble should be timeously removed from the construction site and disposed at a licenced waste disposal facility. ▪ The project developer should demarcate construction boundaries and minimise areas of surface disturbance. ▪ Appropriate plans should be in place to minimise fire hazards and dust generation. ▪ Night lighting of the construction site should be minimised within requirements of safety and efficiency.
	Potential noise impact as the result of the use of construction equipment	Medium (Negative)	▪ Limit construction activities to day time hours
	Potential impact on the safety of construction workers and Health injuries to	Medium (Negative)	▪ Ensure that a skilled and competent Contractor is appointed during the construction phase. The Contractor must be evaluated during the tender/appointment process in terms of safety standards.

Activity	Impact summary	Significance	▪ Proposed mitigation
	construction personnel as a result of construction work		▪ The Contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate. ▪ The Contractor must undertake a Construction Phase Risk Assessment. ▪ A Construction Site Manager or Safety Supervisor should be appointed, in conjunction with the project manager, to monitor all safety aspects during the construction phase. This could be the same person that is assigned to co-ordinate the construction traffic.
▪ **OPERATION PHASE**			
	Further loss / degradation of wetlands	Medium (Negative)	▪ Monitor the success of the rehabilitated erosion gully in HGM Unit 2 ▪ Keep future developments outside of the delineated wetland areas and associated buffers.
	Contamination of surface and groundwater resources	Low (Negative)	▪ Ensure that all waste water (sewerage and grey water) is contained in properly lined septic tanks. Which are serviced regularly. ▪ Do not make use of french drains or long drops. ▪ Minimise sinkhole formation by regularly inspect all water pipelines and thoroughly mend any leaks as soon as they arise. ▪ Ensure that the development is run in accordance with international best practice norms, and with advice from an appropriate specialist, to ensure that there is no environmental contamination from effluent, fodder, carcasses and other waste, and to ensure that there is also effective storm water management. ▪ Signpost the site especially the picnic area with all prohibited activities which should include (amongst others) no littering, no wood collecting, no abluting in the stream or bush, no making of fires except within the braai areas. ▪ All hazardous waste should be disposed of at an appropriate licensed facility for this. ▪ Waste recycling should be incorporated into the development's operations as far as possible. ▪ Educate workers about the development's waste management and handling of hazardous substances with regular training and notices.
	Decreased water inputs	Medium (Negative)	▪ Diligently monitor and measure water usage in measurable Units. Keep a spreadsheet and compare data to DWS flow rates for the Dinokana Eye on an annual basis. ▪ Reduce water usage wherever possible. Put up signs in the accommodation encouraging visitors to spare water and re-use laundry during their stay if not too dirty. Investigate the possibility of capturing rainwater.
	Continued	Low (Negative)	▪ Carefully limit / regulate access by vehicles and

Activity	Impact summary	Significance	▪ Proposed mitigation
	introduction and proliferation of alien species		materials to the site. ▪ Prohibit further introduction of domestic animals such as cattle, goats, horses, donkeys, chickens, dogs and cats. ▪ Employ best practices regarding tilling of soil and weed management. ▪ Plant only locally indigenous flora if landscaping needs to be done. ▪ Remove Category species using mechanical methods, and minimize soil disturbance as far as possible. Alien wood could be donated to the surrounding community.
	Loss of CI or medicinal flora	Low (Negative)	▪ Highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).
	Sensory disturbance of fauna	Low (Negative)	▪ Install motion-sensitive lights. ▪ Ensure that all outdoor lights are angled downwards and/or fitted with hoods. ▪ Use bulbs that emit warm, long wavelength (yellow-red) light, or use UV filters or glass housings on lamps to filter out UV. ▪ Avoid using metal halide, mercury or other bulbs that emit high UV (blue-white) light that is highly and usually fatally attractive to insects. ▪ Conduct regular maintenance of machinery, fans and other noisy equipment. ▪ Encourage workers to minimize light and noise pollution through training and notices.
	Loss of CI fauna	Medium (Negative)	▪ Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).
	Erosion	Low (Negative)	▪ Limit vehicles and people to the development footprint. ▪ Revegetate denude areas with locally indigenous flora a.s.a.p. ▪ Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed.
	Altered burning	Low (Negative)	▪ Create safe storage on the premises for flammable materials. ▪ If artificial burning is considered necessary, establish

Activity	Impact summary	Significance	▪ Proposed mitigation
			and implement a fire management plan with emergency fire procedures. ▪ Maintain an effective fire break between the development and the surrounding natural environment. ▪ Ensure that there are appropriate control measures in place for any accidental fires. ▪ Educate workers about the fire plan and emergency procedures with regular training and notices.
	Increase in traffic	Very Low (Negative)	▪ Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and ▪ Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00); ▪ A speed limit of 60 km/h should be maintained on the N4. ▪
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Medium (Negative)	▪ Adhere to speed limits applicable to all roads used; and ▪ Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.
	Destruction of palaeontological material	Very Low (Negative)	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
	Destruction of archaeological artefacts	Very Low (Negative)	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
	Opportunities for employment and skills development	Medium (Positive)	▪ Enhance the use of local labour and local skills as far as reasonably possible. ▪ Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained. ▪ Ensure that an equitable percentage allocation is provided for local labour employment as well as specify the use of small-to-medium enterprises and training specifications in the Contractors contract.

Activity	Impact summary	Significance	▪ Proposed mitigation
			▪ Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.
	Night lighting of the development on the nightscape of the surrounding landscape	Medium (Negative)	▪ No specific mitigation measures are recommended as it is assumed that night lighting of the proposed storage facility will be planned in such a manner so as to minimize light pollution such as glare and light spill (light trespass) by: ▪ Using light fixtures that shield the light and focus illumination on the ground (or only where light is required). ▪ Avoiding elevated lights within safety/security requirements. ▪ Using minimum lamp wattage within safety/security requirements. ▪ Where possible, using timer switches or motion detectors to control lighting in areas that are not occupied continuously (if permissible and in line with minimum security requirements). ▪ Switching off lights when not in use in line with safety and security
	Minor accidents to the public and moderate accidents to operational staff	Medium (Negative)	▪ An Emergency Plan should be compiled in order to deal with potential spillages and fires. Records of practices should be kept on site. ▪ Scheduled inspections should be implemented by operating personnel in order to assure and verify the integrity of hoses, piping and storage lagoon. ▪ Portable fire extinguishers and fire water hydrants (i.e. appropriate fire-fighting equipment) should be provided at the facility as required.
▪ **Decommission**			
Direct Impacts	Further loss/degradation of wetlands	Medium (Negative)	▪ Keep decommissioning activities outside of the delineated wetland areas and associated buffers. ▪ Demarcate the decommissioning site and ensure that all activities are carried out within that area. Additionally mark out the wetland on the ground to ensure activities stay out of it. ▪ Avoid disturbing the "no building zone" as indicated on the NSS proposed infrastructure map.
	Contamination of surface and groundwater resources	Low (Negative)	▪ Do not make use of french drains or long drops. ▪ Minimise sinkhole formation by sealing or otherwise inspecting water pipelines and thoroughly mend any leaks. ▪ Ensure that storm water management remains effective during and following decommissioning. ▪ All grey water, sewage and other hazardous waste should be disposed of at an appropriate licensed facility for this. ▪ Waste recycling should be incorporated into

Activity	Impact summary	Significance	▪ Proposed mitigation
			decommissioning as far as possible. ▪ Educate workers about the development's waste management and handling of hazardous substances with regular training and notices.
	Increased dust and erosion	Low (Negative)	▪ Limit vehicles, people and materials to the decommissioning site. ▪ Commence (and preferably complete) decommissioning during winter, when the risk of erosion should be least. ▪ Revegetate denude areas with locally indigenous flora a.s.a.p. ▪ Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed. ▪ Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting.
	Increased sediment loads	Low (Negative)	▪ Commence (and preferably complete) decommissioning activities during winter when the risk of erosion and wetland sedimentation is lowest. ▪ Keep all decommissioning activities to within the demarcated footprint areas (keep out of wetland). ▪ Keep cleared areas to a minimum by demolishing one development section at a time. ▪ Revegetate remaining cleared areas by planting indigenous grasses and other vegetation as soon as possible. ▪ Do not stockpile soil in the catchment area above the Eye or within the delineated wetland areas. ▪ Design measures to effectively control vehicle access, vehicle speed, dust, stormwater run-off, erosion and sedimentation on the road.
	Continued proliferation of alien species	Low (Negative)	▪ Remove Category species using mechanical methods, and minimize soil disturbance as far as possible. Alien wood could be donated to the surrounding community.
	Loss of CI or medicinal flora	Low (Negative)	▪ Highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).
	Sensory disturbance of fauna	Low (Negative)	▪ Conduct regular maintenance of machinery, fans and other noisy equipment. ▪ Encourage workers to minimize light and noise pollution through training and notices.
	Loss of CI fauna	Low (Negative)	▪ Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited

Activity	Impact summary	Significance	▪ Proposed mitigation
			activities to workers through training and notices. ▪ Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).
	Altered Burning	Low (Negative)	▪ Create safe storage on the premises for flammable materials. ▪ If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures. ▪ Maintain an effective fire break between the development and the surrounding natural environment. ▪ Ensure that there are appropriate control measures in place for any accidental fires. ▪ Educate workers about the fire plan and emergency procedures with regular training and notices.
	Destruction of palaeontological material	Very Low (Negative)	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
	Destruction of archaeological artefacts	Very Low (Negative)	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
	Emissions from decommissioning vehicles and generation of dust	Medium (Negative)	▪ Ensure that cleared (excavated) areas and unpaved surfaces are sprayed with water (obtained from an approved source) to minimise dust generation. ▪ Approved soil stabilisers may be utilised to limit dust generation. ▪ Ensure that decommissioning vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour.
	Noise generation from demolition activities	Medium (Negative)	▪ A method statement, including detailed procedures, must be drawn up prior to any decommissioning of existing tanks. ▪ Decommissioning personnel must wear proper hearing protection, which should be specified as part of the Decommissioning Phase Risk Assessment carried out by the Contractor. ▪ The Contractor must ensure that all decommissioning personnel are provided with adequate PPE, where appropriate.

Activity	Impact summary	Significance	▪ Proposed mitigation
	Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste	Medium (Negative)	▪ General waste (i.e. building rubble, demolition waste, discarded concrete, bricks, tiles, wood, glass, plastic, metal, excavated material, packaging material, paper and domestic waste etc.) and hazardous waste (i.e. empty tins, paint and paint cleaning liquids, oils, fuel spillages and chemicals etc.) generated during the decommissioning phase should be stored temporarily on site in suitable (and correctly labelled) waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate. ▪ Should the on-site storage of general waste and hazardous waste exceed 100 m3 and 80 m3 respectively, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to ▪ Ensure that general waste and hazardous waste generated are removed from the site on a regular basis and disposed of at an appropriate, licensed waste disposal facility by an approved waste management Contractor. Waste disposal slips or waybills should be kept on file for auditing purposes as proof of disposal. ▪ Ensure that sufficient general waste disposal bins are provided for all personnel throughout the site. These bins must be emptied on a regular basis. ▪ Appropriately time demolition / rehabilitation activities to minimise sensory disturbance to fauna.
Indirect impacts: *Cumulative impacts:*	▪ Should the proposed development be approved the cumulative impacts will result from the construction and operational phase. ▪ Impacts arising from the construction phase include: ▪ Noise pollution, this can be mitigated by activities occurring during working hours and dust pollution which can be mitigated by dust reduction strategies. ▪ The above impacts can be mitigated. This small size of the development is relatively small and thus there would not be a need or many construction vehicles.		
Alternative 2			
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Alternative 3			
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Activity	Impact summary	Significance	▪ Proposed mitigation
No-go option Direct impacts: Indirect impacts: Cumulative impacts:	Direct impacts: ▪ None of the impacts mentioned above will occur. ▪ If the proposed project does not proceed, increased income and economic spin-off activities will not be realised. ▪ Approximately 20 new permanent jobs will not be created during the operational phase. ▪ If the proposed project does not proceed, the industries that rely on the supply of poultry products could experience hindered economic growth potential. Indirect impacts: There are no indirect impacts during the construction phase for the No-go Option.Cumulative impacts: ▪ There are no cumulative impacts during the construction phase for the No-go Option		

A complete impact assessment which include process undertaken to identify, assess and rank the impacts, the activity will impose on the site through the life of the activity in terms of EIA Regulation 2014, Appendix 1(i) and (j) of GN R.982 must be included as Appendix H.

2. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Alternative A (preferred alternative)

This layout has been amended to ensure that the proposed development does not affect environmentally sensitive areas with buffers implemented in order to ensure that there is minimal impact on the Dinokana wetland system. The potential impact of the development with the proposed mitigation measures was rated **Low significance.**

Waste will be generated through-out the life cycle of the development. However with proper waste disposal measures, waste impacts will be of low probability post mitigation.

Please see Appendix H for full impact assessment and their significance.

Alternative B

[redacted]

Alternative C

[redacted]

No-go alternative (compulsory)

The 'No-Go' option assumes that a conservative approach that would ensure that the environment is not disturbed. It is important to state that this assessment is informed by the current condition of the area. Should the Competent Authority decline the application, the 'No-Go' option will be followed and the status quo of the site will remain.

SECTION D: PUBLIC PARTICIPATION

1. ADVERTISEMENT AND NOTICE

Publication name	**Zeerust News**	
Date published	**28 July 2017**	
Site notice position	**Latitude**	**Longitude**
	25° 51' 54.3" E	**25° 27' 08.2" S**
Date placed	**28 July 2017**	

Include proof of the placement of the relevant advertisements and notices in Appendix I1.

2. DETERMINATION OF APPROPRIATE MEASURES

Provide details of the measures taken to include all potential I&APs as required by Regulation 41(2)(e) and 41(6) of GN R.982.

Key stakeholders (other than organs of state) identified in terms of Regulation 40(2)(d) of GN R.982:

Affiliation/Key Stakeholder Status	Name and Surname	Address/ Contact Details
Neighbouring Landowner	Kelebogile Mosele	House Number 2234, P.O Dinokana, 2868
Neighbouring Landowner	Sylvia Medupe	House Number 2207, P.O Dinokana, 2868
Neighbouring Landowner	Joyce Montshosi	House Number 2216, P.O Dinokana, 2868
Neighbouring Landowner	Thabo Medupe	House Number 2212, P.O Dinokana, 2868
Neighbouring Landowner	Agnes Mokotama	House Number 2200, P.O Dinokana, 2868
Neighbouring Landowner	Kealeboga Letebele	House Number 2147, P.O Dinokana, 2868
Neighbouring Landowner	Ofentse Kgasi	House Number 2063, P.O Dinokana, 2868
Neighbouring Landowner	M Mokgatlhe	House Number 2149, P.O Dinokana, 2868
Neighbouring Landowner	Daniel Mooketsi	House Number 2075, P.O Dinokana, 2868
Neighbouring Landowner	Ontiretse Mosimane	House Number 2121, P.O Dinokana, 2868
Neighbouring Landowner	Tebogo Tshukutswane	House Number 2229, P.O Dinokana, 2868
Neighbouring Landowner	Tshepo Montshosi	House Number 2228, P.O Dinokana, 2868
Neighbouring Landowner	Sello Tshukutswane	House Number 2076, P.O Dinokana, 2868
Neighbouring Landowner	Doris Moeketsi	House Number 2230A, P.O Dinokana, 2868
Neighbouring Landowner	Karabo Sehume	House Number 2194, P.O Dinokana, 2868
Neighbouring Landowner	Gaongalelwe Mooketsi	House Number 2120, P.O Dinokana, 2868
Neighbouring Landowner	Omphemetse Monchwe	House Number 2173, P.O Dinokana, 2868
Neighbouring Landowner	Kamogelo Mereyotlhe	House Number 2188B, P.O Dinokana, 2868
Neighbouring Landowner	David Mosweu	House Number 2189, P.O Dinokana, 2868
Neighbouring Landowner	Obakeng Mosimane	House Number 2188, P.O Dinokana, 2868
Neighbouring Landowner	Keolebogile Moswele	House Number 2234, P.O Dinokana, 2868
Ward Councillor (Ward	Richard Pholo Mogorosi	

10)		
Endangered Wildlife Trust (EWT)	Stephanie Aken	stephaniea@ewt.org.za
AgriLand	Anneliza Collett	Private Bag X120, Pretoria 0001
Grasslands Society of South Africa	Feyni Du Toit	P.O. Box 41, Hilton, 3245
Leads 2 Business	Carmen Barends	carmenb@l2b.co.za

Include proof that the key stakeholder received written notification of the proposed activities as Appendix I2. This proof may include any of the following:

- e-mail delivery reports;
- registered mail receipts;
- courier waybills;
- signed acknowledgements of receipt; and/or
- or any other proof as agreed upon by the competent authority.

3. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

See **The Comments and Responses Trail** in Appendix I, Public Participation.

4. COMMENTS AND RESPONSE REPORT

The practitioner must make report (s) available to I&APs record all comments received from I&APs and respond to each comment before is submitted. The comments and responses must be captured in a comments and response report as prescribed in the EIA Regulations and be attached to the Final BAR as Appendix I3.

5. AUTHORITY PARTICIPATION

Authorities and organs of state identified as key stakeholders. Key stakeholders identified in terms of Regulation 7(1) and (2) and Regulation 40(2) (a)-(c) of GN R.982:

Authority/Organ of State	Contact Person (Name and Surname)	Postal Address	Tel number	e-mail
Department of Environmental Affairs-National	Sibusisiwe Hlela	Fedsure Building Private Bag X447 315 Pretorius Street Pretoria 0002		SHlela@environment.gov.za
Local Government & Traditional Council	Lucky Fourie		018-388-1083	lfourie@nwpg.gov.za
Department of Economic Development, Conservation and Tourism	Nedick Bila	Development House, Cnr Provident Str and University Drive, Mmabatho, 2735	078-256-1298	mbila@nwpg.gov.za

North West Department of Finance, Economy & Enterprise Development (FEED)	Mercy Tumane		018-387-7778	mtumane@nwpg.gov.za
Department of Rural Environment and Agricultural Development (NW READ)	Rhuleni Mathebula		018-389-5122	rmathebula@nwpg.gov.za
Department of Water and Sanitation	Wendy Ralekoa	Water Quality Office, Old Rustenburg Road, Hartebeespoort, 0216	012 253 1026	RalekoaW@dws.gov.za
Ramotshere Moiloa Local Municipality	Mrs B Seabi (Planning & Local Economic Development Director)	Cnr President & Coetzee Streets, Zeerust, 2865	018 642 1081	
Ngaka Modiri Molema District Municipality	Municipal Manager	Cnr Carrington Street & 1st Avenue, Industrial Site, Mahikeng, 2745	018 381 0561	-
North West Parks & Tourism Board	Andrew Mvundle		078-921-1916	andrew.mvundle@gmail.com
NW Parks Board Bird Sanctuary	Sampie van der Merwe		082-443-9777	barbersp@lantic.net
South African Heritage Resources Agency (SAHRA)	Marie South	PO Box 4637, Cape Town, 8000		

Include proof that the Authorities and Organs of State received written notification and draft reports of the proposed activities as Appendix I4.

6. CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for any activities (linear or other) where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that sub-regulation to the extent and in the manner as may be agreed to by the competent authority.

Proof of any such agreement must be provided, where applicable. Application for any deviation from the regulations relating to the public participation process must be submitted prior to the commencement of the public participation process.

A list of registered I&APs must be included as Appendix I5.

Copies of any correspondence and minutes of any meetings held must be included in Appendix I6.

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?	YES

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment).

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application.

This Final BA Report has investigated and assessed the significance of the predicted positive and negative impacts associated with the proposed development of a leisure and cultural village. No negative impacts have been identified within this BA that, in the opinion of the Environmental Assessment Practitioner who conducted this BA Process, should be considered "fatal flaws" from an environmental perspective. There is a necessity for a re-design of the project in order to ensure minimising the impacts of the development on the receiving environment, but not termination of the project.

Taking into consideration the findings of the BA Process, including the findings of the specialist studies, it is the opinion of the Environmental Assessment Practitioner, that the project benefits outweigh the costs and that the project will make a positive contribution to sustainable economic growth, skills development and employment opportunities in the Ramotshere Moiloa Local Municipality.

It is recommended that the project receive Environmental Authorisation in terms of the EIA Regulations promulgated under the National Environmental Management Act (Act 107 of 1998, as amended) subjected to the following conditions:

- The EMPr of the proposed development must be adhered to during all phases of the development
- All the recommendations of the specialists must be implemented for the proposed project

In order to ensure the effective implementation of the mitigation and management actions, a Draft EMPr has been compiled and is included in Appendix F of this Final BA Report. The mitigation measures necessary to ensure that the project is planned, constructed, operated and decommissioned in an environmentally responsible manner are listed in this Draft EMPr. The EMPr is a dynamic document that should be updated regularly and provides clear and implementable measures for proposed development of a leisure and cultural village.

The EMPr that meet the requirements of EIA Regulation,2014, Appendix 4, must be attached as Appendix J.

Is an EMPr attached?	YES	

The details of the EAP who compiled the BAR and the expertise of the EAP to perform the Basic Assessment process must be included as Appendix K

If any specialist reports were used during the compilation of this BAR, please attach the declaration of interest for each specialist in Appendix F

Any other information relevant to this application and not previously included must be attached in Appendix L.

SECTION F: AFFIRMATION BY EAP

I Rirhandzu Marivate (name of person representing EAP) of the Council for Scientific and Industrial Research (name of company) declare that the information provided is correct and relevant to the activity/ project and that, the information was made available to interested and affected parties for their comments. All specialist (s) reports are relevant for the competent authority to make informed decision.

_____ ____

SIGNATURE OF EAP **DATE**

SECTION F: APPENDICES

The following appendices must be attached:

Appendix A: A3 Locality Map

Appendix B: Layout Plan and Sensitivity Maps

Appendix C: Photographs

Appendix D: Facility illustration(s)

Appendix E: Confirmation of services by Municipality (servitude and infrastructure planning)

Appendix F: Details and expertise of Specialist and Declaration of Interest

Appendix G: Specialist reports (including terms of reference)

Appendix H: Impact Assessment

Appendix I: Public Participation

Appendix J: Environmental Management Programme (EMPr)

Appendix K: Details of EAP and expertise

Appendix L: Any other Information

Appendix M: Financial Provision (if applicable) **– N/A**

Appendix N: Closure Plan (where applicable) as described in Appendix 5 of EIA Regulations, 2014-**N/A**

APPENDICES

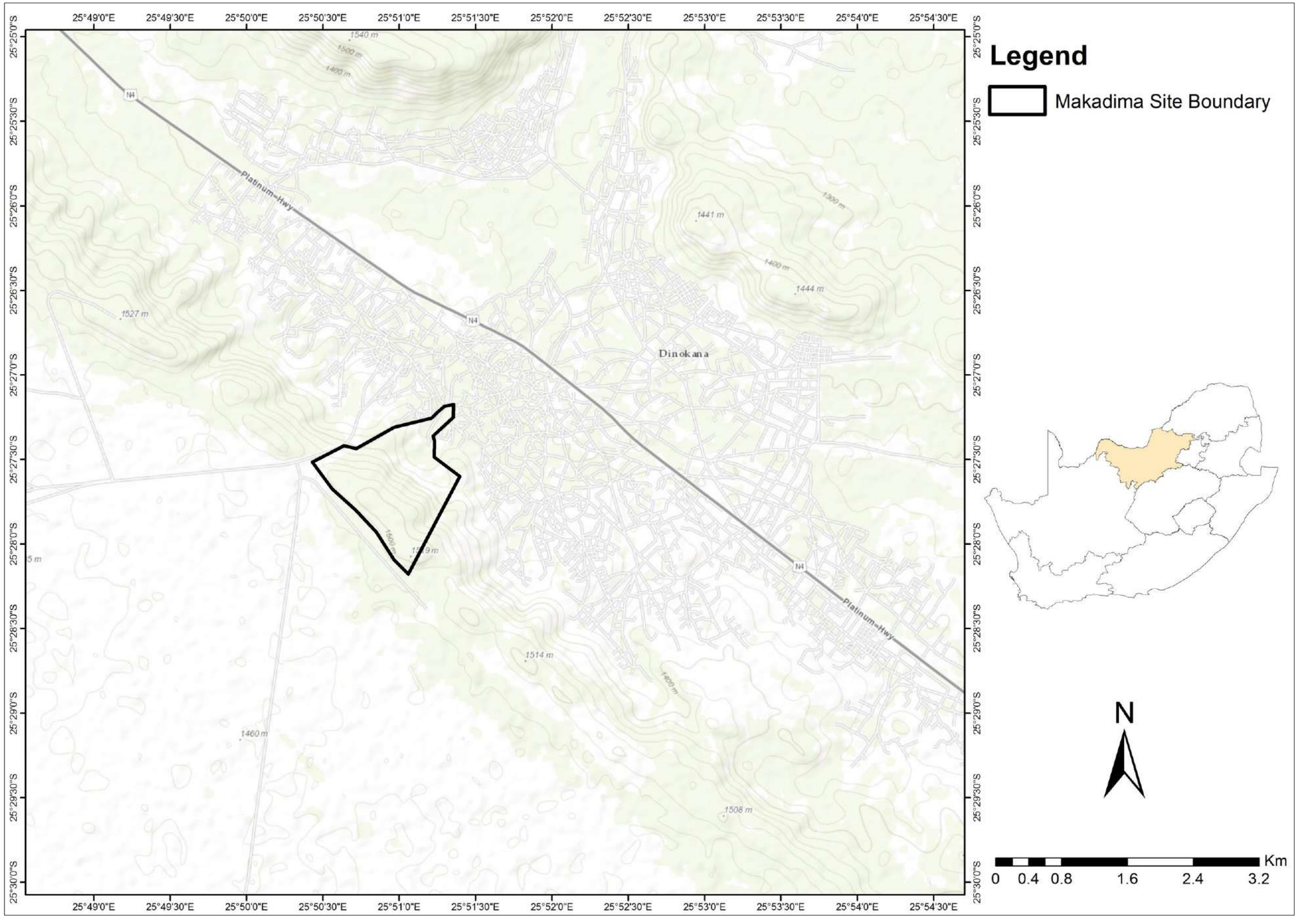
Appendix A	A3 Locality Map
Appendix B	Layout Plan and Sensitivity Maps
Appendix C	Photographs
Appendix D	Facility illustration(s)
Appendix E	Confirmation of services by Municipality (servitude and infrastructure planning)
Appendix F	Details and expertise of Specialist and Declaration of Interest
Appendix G	Specialist reports (including terms of reference)
Appendix H	Impact Assessment
Appendix I	Public Participation
Appendix J	Environmental Management Programme (EMPr)
Appendix K	Details of EAP and expertise
Appendix L	Any other Information
Appendix M	Financial Provision (if applicable) N/A
Appendix N	Closure Plan (where applicable) as described in Appendix 5 of EIA Regulations, 2014 N/A

BASIC ASSESSMENT REPORT

APPENDIX A: LOCALITY MAP

CONTENTS

Appendix A.1: Locality Map

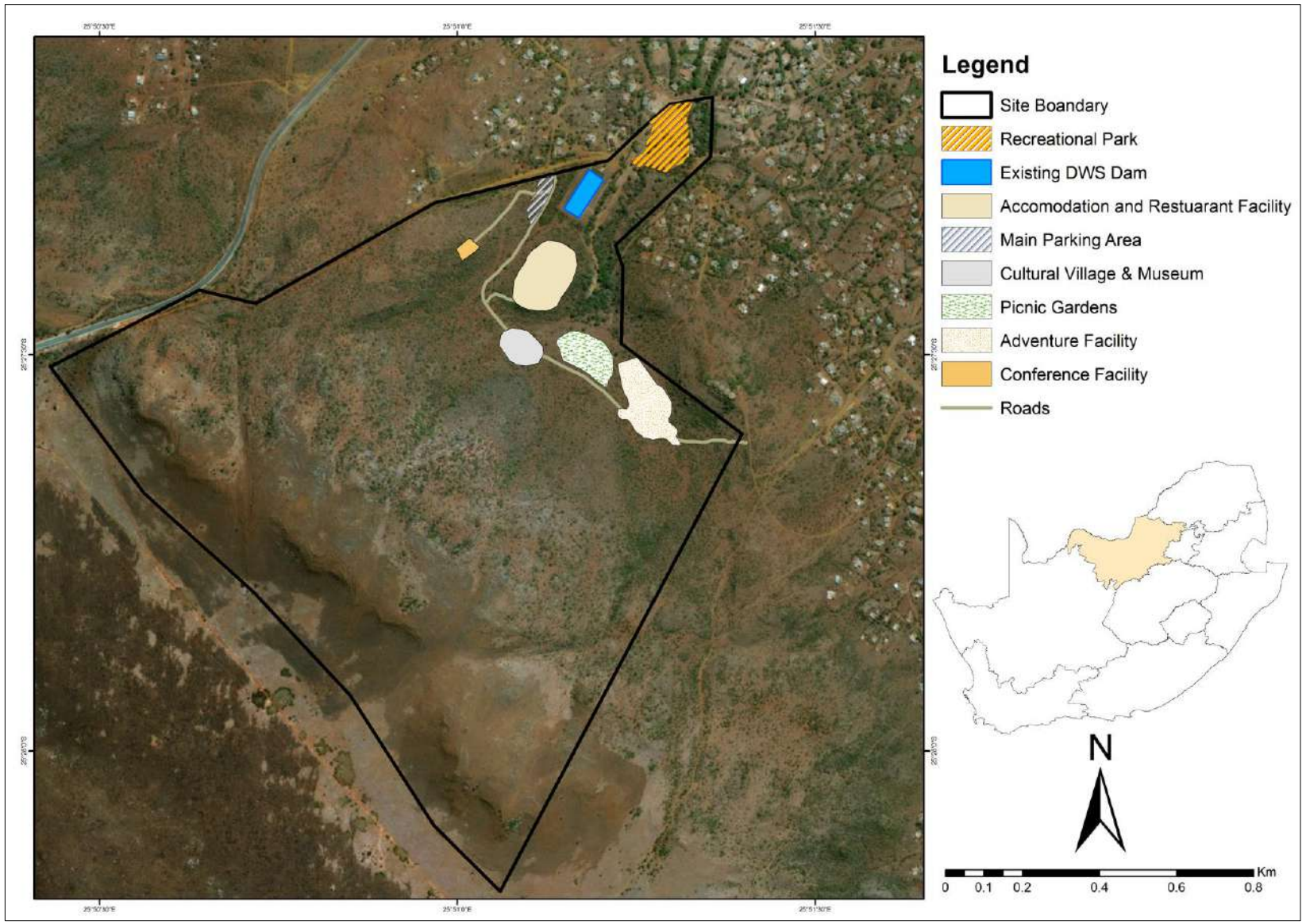


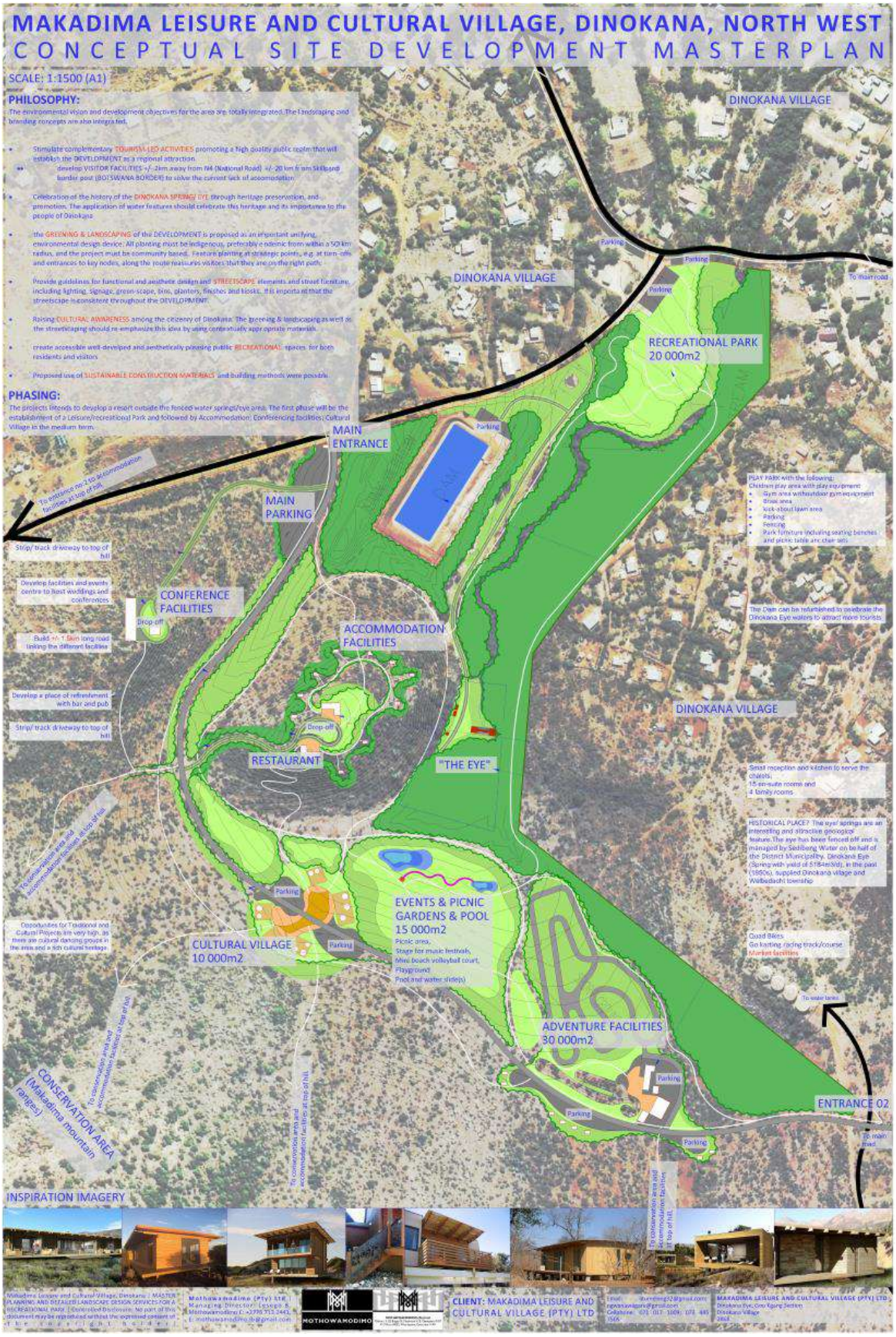
BASIC ASSESSMENT REPORT

APPENDIX B:
LAYOUT PLAN AND SENSITIVITY MAPS

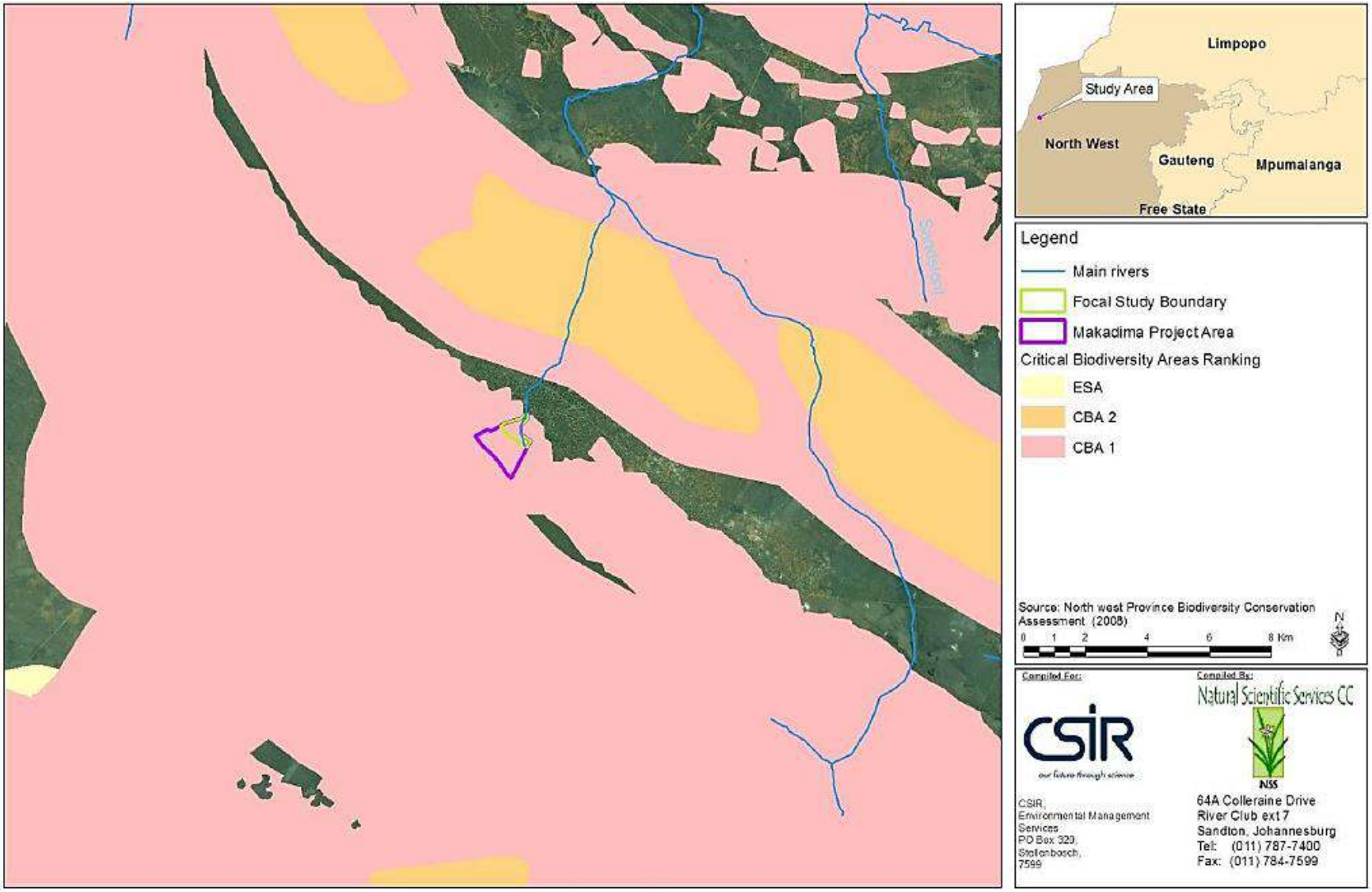
CONTENTS

Appendix B.1: Site layout of the proposed development site (as supplied by the Project Proponent

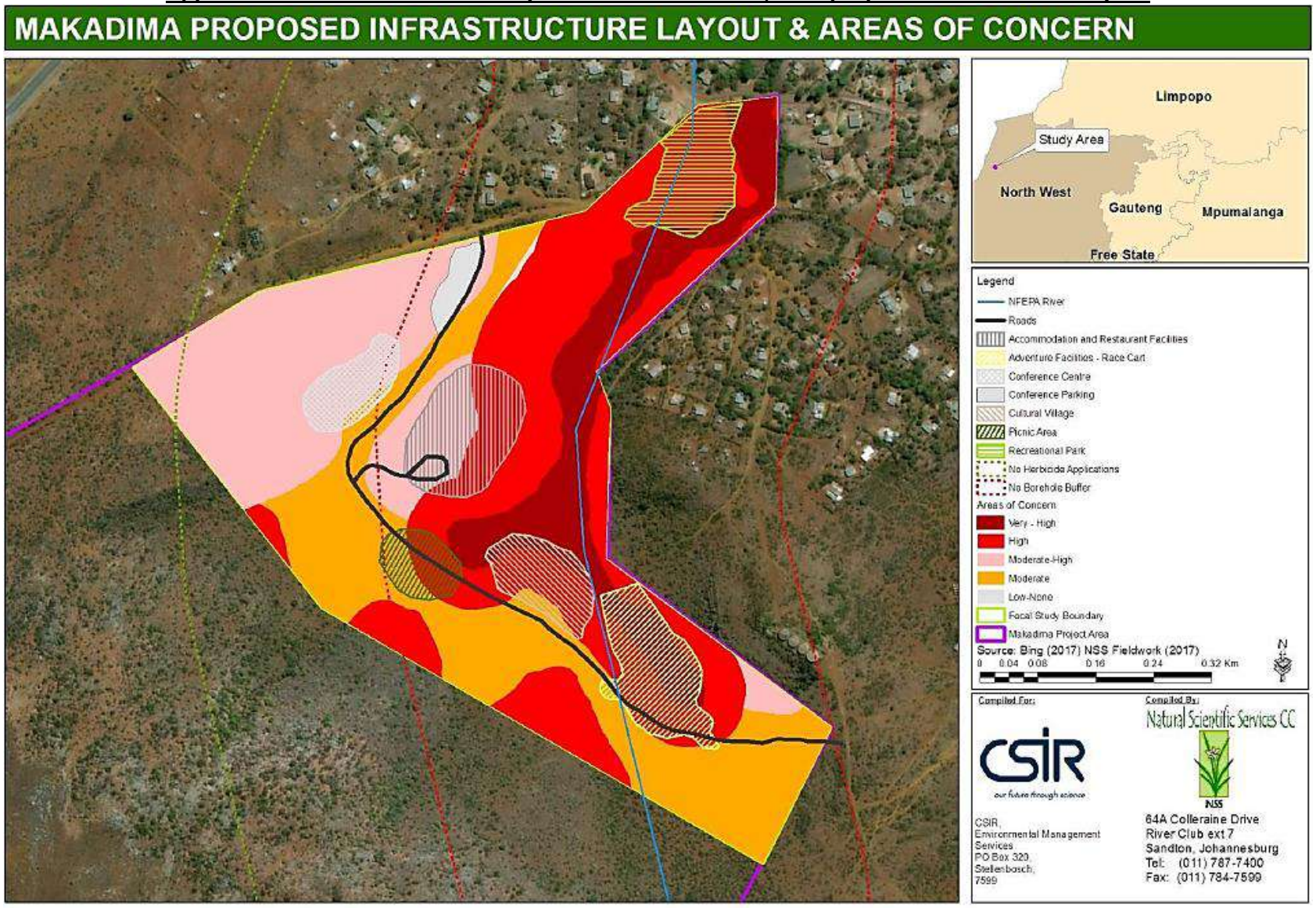



MAKADIMA LEISURE AND CULTURAL VILLAGE, DINOKANA, NORTH WEST
CONCEPTUAL SITE DEVELOPMENT MASTERPLAN
SCALE: 1:1500 (A1)
PHILOSOPHY:
PHASING:
DINOKANA VILLAGE
RECREATIONAL PARK 20 000m2
MAIN ENTRANCE
MAIN PARKING
CONFERENCE FACILITIES
ACCOMMODATION FACILITIES
RESTAURANT
"THE EYE"
EVENTS & PICNIC GARDENS & POOL 15 000m2
CULTURAL VILLAGE 10 000m2
ADVENTURE FACILITIES 30 000m2
ENTRANCE 02
CONSERVATION AREA (Makadima mountain range)
INSPIRATION IMAGERY
CLIENT: MAKADIMA LEISURE AND CULTURAL VILLAGE (PTY) LTD

Appendix B.2: Layout of the proposed development within a Critical Biodiversity Area



Appendix B.3: Areas of biodiversity conservation concern, with proposed infrastructure layout

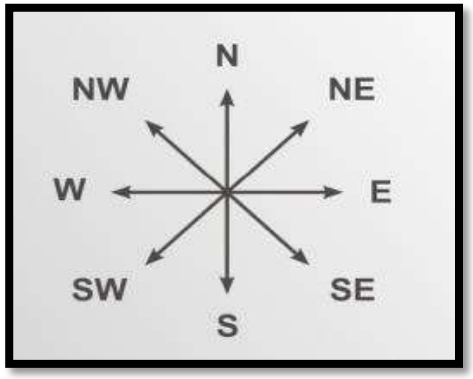


BASIC ASSESSMENT REPORT

APPENDIX C: PHOTOGRAPHS

CONTENTS

Makadima Site photographs taken in the eight major compass directions



BASIC ASSESSMENT REPORT

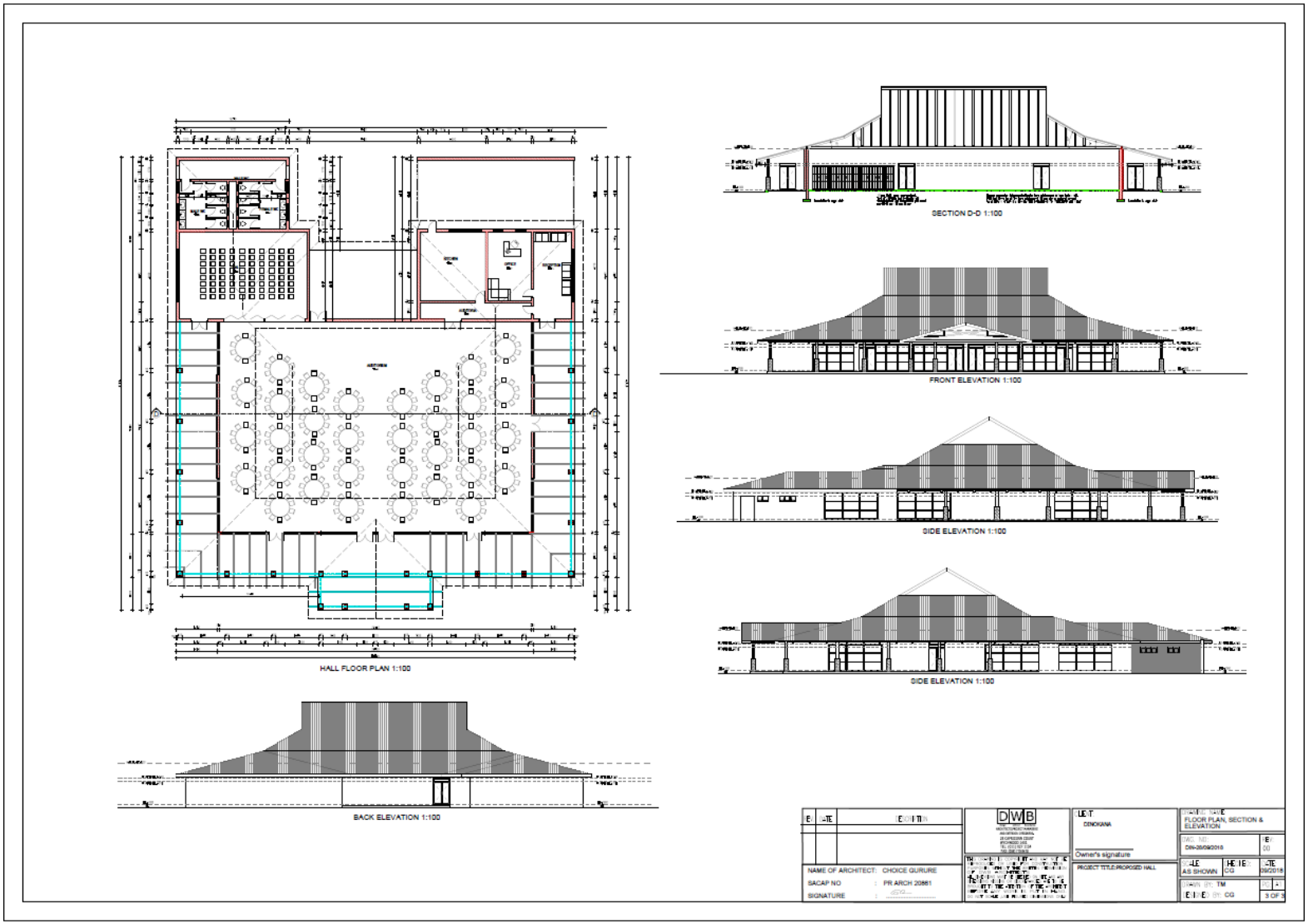
APPENDIX D: FACILITY ILLUSTRATION(S)

CONTENTS

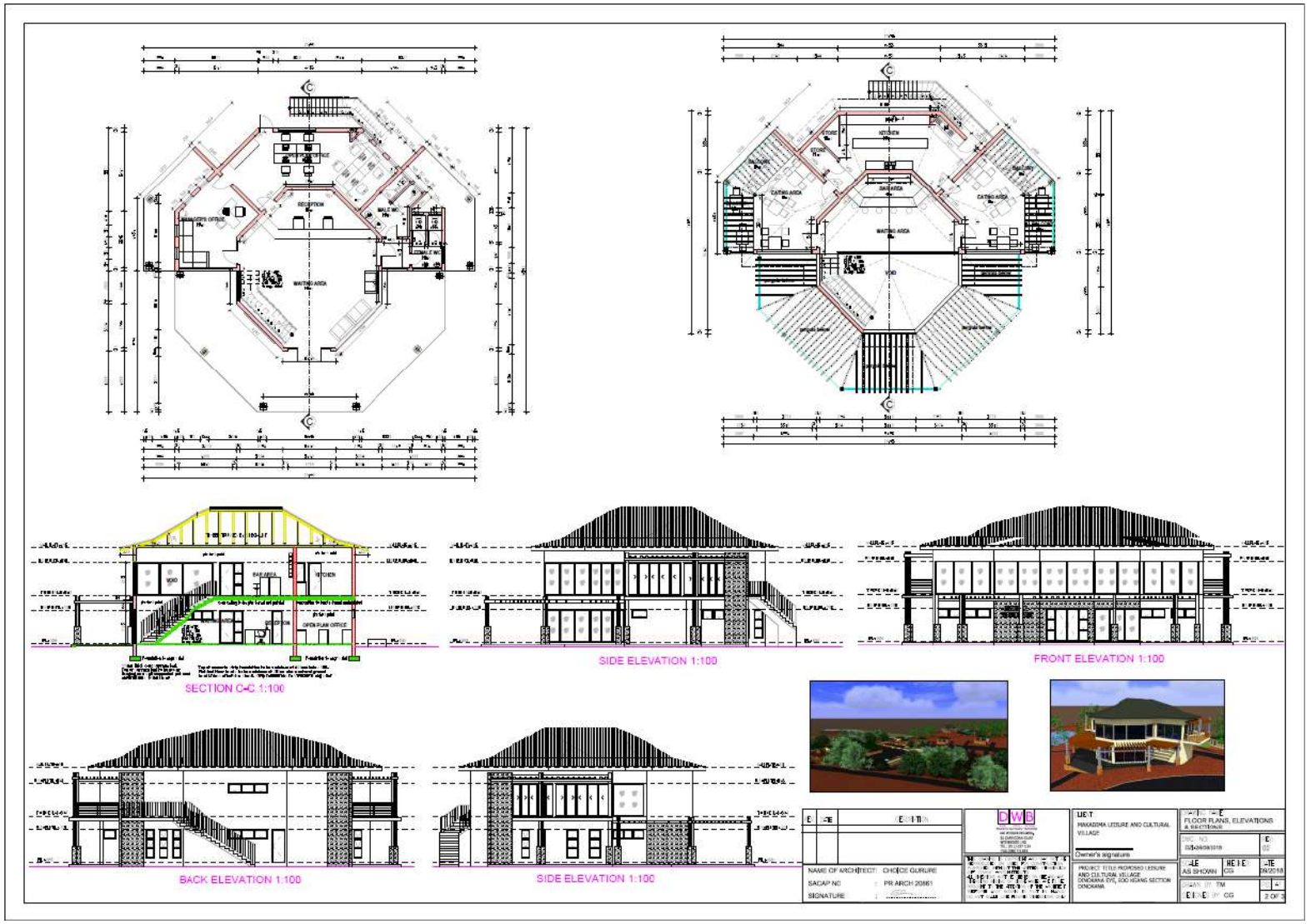
A.1: General Site Plan of Proposed Cultural Village

A.2: Floor Plans and Section Elevations for Conference Hall, Restaurant, Artist, Accommodation Villas

Conference Hall

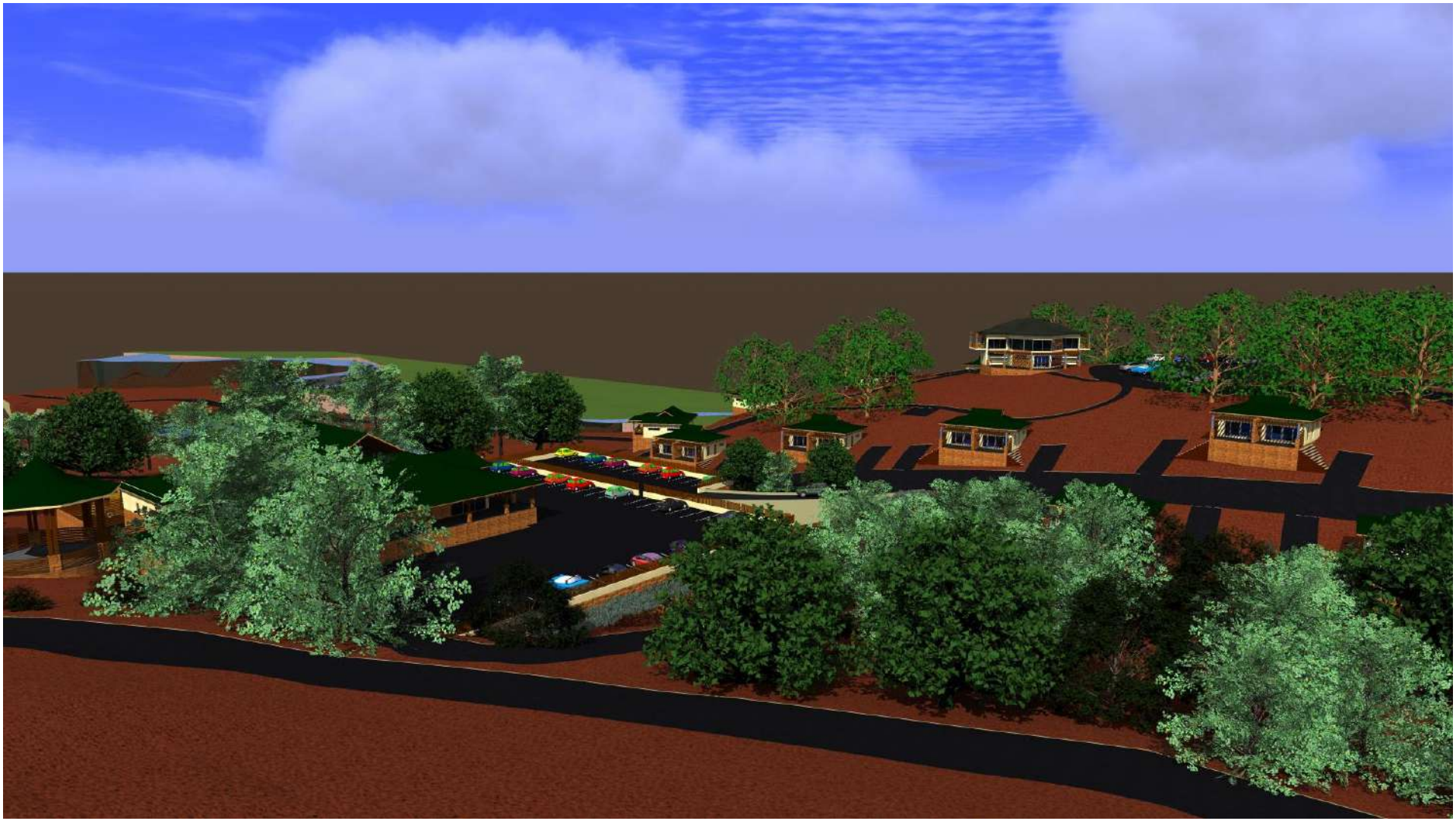


Restaurant


SECTION C-C 1:100
SIDE ELEVATION 1:100
FRONT ELEVATION 1:100
BACK ELEVATION 1:100
SIDE ELEVATION 1:100

Accommodation Villas

A.3: Artist Impression of Cultural Village Facilities



BASIC ASSESSMENT REPORT

APPENDIX E:
Confirmation of services by Municipality (servitude and infrastructure planning)

CONTENTS

RAMOTSHERE MOILOA LOCAL MUNICIPALITY

P.O. Box 92,
C/o President & Coetzee Street
ZEERUST
2865

Tel : 018 – 642 1081 ext.202
Fax : 018 – 642 2618/ 018 642 1175
Email : lesego.pine@ramotshere.gov.za

MUNICIPAL PLANNING AND DEVELOPMENT

Ref : *8/2/1/1*
Inq : *O. Gasealahwe*

TO : **MAKADIMA LEISURE AND CULTURAL VILLAGE 101 (PTY) LTD**

FROM : **TOWN PLANNING UNIT**

DATE : **15 OCTOBER 2018**

SUBJECT : **ACKNOWLEDGEMENT OF RECEIPT OF YOUR APPLICATION FOR A WRITTEN CONSENT**

Dear Sir,

This letter serves to acknowledge receipt of your application for a written consent from the municipality.

Should you have any query please do not hesitate to contact our office.

Regards,

MR. O.I GASEALAHWE
UNIT MANAGER: TOWN PLANNING

Page 1 of 1

BASIC ASSESSMENT REPORT

APPENDIX F:
Details and expertise of Specialist and Declaration of Interest

3. Declaration by Specialist

I, Susan Abell (Name of Specialist) of Natural Scientific Services (name of company) declare that;

- I act as an independent specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant/ Environmental Assessment Practitioner appointed by applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- **all the particulars furnished by me in this form are true and correct; and**
- **I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of Section 48B(2) of the Act.**

SAbell

Signature of the specialist

Natural Scientific Services

Name of company (if applicable)

18/12/2017

Date

Lucas

Signature of the Commissioner of Oaths

19/12/2017

Date

BANK MANAGER

Designation

Official stamp:

COMMISSIONER OF OATHS
BY VIRTUE OF MY OFFICE AS A DULY AUTHORISED REPRESENTATIVE OF
FNB MORNINGSIDE
Corner Rivonia and Outspan Street, Morningside
SANDTON 2196
Lucas 19/12/2017
SIGNATURE
SHOVAGNE LUCAS
NAME

3. Declaration by Specialist

I, Jaco van der Walt (Name of Specialist) of HCAC. (name of company) declare that;

- I act as an independent specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant/ Environmental Assessment Practitioner appointed by applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- **all the particulars furnished by me in this form are true and correct; and**
- **I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of Section 48B(2) of the Act.**

Signature of the specialist

HCAC.
Name of company (if applicable)

14 Dec 2017.
Date

Signature of the Commissioner of Oaths

15-12-2017
Date

Designation

Official stamp:

COMMISSIONER OF OATHS
NALIZE VAN NIEKERK
PROFESSIONAL ACCOUNTANT (SA) (SAIPA) ex officio (RSA)
PRACTICE NUMBER 22988
FARM KOPJE - ALLEEN TUINPLAAS
PO BOX 3395 MODIMOLLE 0510

3. Declaration by Specialist

I,Surina Laurie----------(Name of Specialist) of the CSIR----------(name of company) declare that;

- I act as an independent specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant/ Environmental Assessment Practitioner appointed by applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- **all the particulars furnished by me in this form are true and correct; and**
- **I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of Section 48B(2) of the Act.**

Signature of the specialist

The CSIR

Name of company (if applicable)

19 December 2017

Date

Signature of the Commissioner of Oaths

Date

Designation

Official stamp:

BASIC ASSESSMENT REPORT

APPENDIX G:

SPECIALIST REPORTS

ECOLOGICAL SCAN

FOR THE PROPOSED MAKADIMA LEISURE & CULTURAL VILLAGE IN NORTH WEST PROVINCE

Compiled By:

Natural Scientific Services

64A Coleraine Drive
Riverclub Ext 7
Sandton
2191
Tel: +27 11 787 7400
Fax: +27 11 784 7599

Compiled For:

CSIR (Council for Scientific & Industrial Research)
CAS -EMS Unit

11 Jan Cilliers Street
Stellenbosch
7600
Tel: +27 21 888 2432
Fax: + 27 21 888 2473

NSS Ref No: 2391
Date: November 2017

All pictures taken on site

PROPOSED MAKADIMA LEISURE & CULTURAL VILLAGE IN NORTH WEST PROVINCE

ECOSCAN REPORT

Compiled For:

CSIR Stellenbosch (CAS, EMS)
11 Jan Cilliers Street
Stellenbosch, 7600
Western Cape, South Africa
Tel: (021) 888 2432
Fax: (021) 888 2473

Compiled By:

Natural Scientific Services CC

64 Coleraine Dr
River Club Ext 7
Sandton 2191
Tel: (011) 787-7400
Fax: (011) 784-7599

Ref No: 2391
Date: November 2017

EXECUTIVE SUMMARY

Natural Scientific Services CC was appointed by the Council for Scientific and Industrial Research to perform a floral, faunal and wetland ecoscan assessment (with in situ water testing) for the proposed Makadima Leisure and Cultural Village on the Farm Moiloa 412-JO in Dinokana, North West Province.

Desktop research and findings from our site visit in October 2017 confirmed that the Dinokana Eye, which is a sacred cultural feature, a local important water source, and a national Freshwater Ecosystem Priority Area (FEPA), has Very High sensitivity and conservation importance. By law wetland systems are deemed sensitive and should be protected by a minimum 100m buffer, measured from the edge of the riparian zone. Surrounding hills and ridges, which intrude into the study area, and which may support conservation important species, were rated with High conservation importance. Some large indigenous trees that remain in the study area, and which are targeted for medicinal or other purposes, are at high risk of extirpation and deserve improved protection.

Summarized in the **Table** below are potential impacts of the proposed development on biodiversity, without and with mitigation. Without mitigation, the most significant potential impacts include:

- Destruction of the in situ wetland system (which represents a national FEPA) during construction of the development.
- Contamination of surface and groundwater from poor management of construction, operation and decommissioning activities (e.g. cement mixing), poor sanitation, and waste.
- Increased dust, erosion and sedimentation from development activities and livestock over-grazing.
- Clearing of (especially riparian) vegetation and faunal habitats during construction.
- Introduction and proliferation of invasive alien flora from the influx of vehicles, people and materials, soil disturbance, and uncontrolled livestock activity.
- Increased harvesting and hunting of flora and fauna resulting in possible extirpation of targeted taxa such as remaining large indigenous trees.
- Increased noise, light and other forms of sensory disturbance of fauna from development activities.

Table Summary of impact significance, without and with mitigation

POTENTIAL IMPACTS	SIGNIFICANCE	
CONSTRUCTION	Without mitigation	With mitigation
Direct loss of wetlands	**Fatally flawed**	**Medium**
Contamination of surface and groundwater resources	**High**	**Low**
Increased dust and erosion	**High**	**Low**
Increased sediment loads	**Medium**	**Low**
Increased flood peaks	**Medium**	**Low**

POTENTIAL IMPACTS	SIGNIFICANCE	
Decreased water inputs	Medium	Low
Clearing of (especially riparian) vegetation and faunal habitats	High	Medium
Introduction and establishment of alien species	High	Low
Loss of CI or medicinal flora	High	Low
Sensory disturbance of fauna	Medium	Low
Loss of CI fauna	Medium	Low
Altered burning	Medium	Low
OPERATION		
Further loss / degradation of wetlands	High	Medium
Contamination of surface and groundwater resources	High	Low
Decreased water inputs	Medium	Low
Continued introduction and proliferation of alien species	High	Low
Loss of CI or medicinal flora	High	Low
Sensory disturbance of fauna	High	Medium
Loss of CI fauna	Medium	Low
Erosion	High	Low
Altered burning	Medium	Low
DECOMMISSIONING		
Further loss / degradation of wetlands	High	Medium
Contamination of surface and groundwater resources	High	Low
Increased dust and erosion	High	Low
Increased sediment loads	Medium	Low
Continued proliferation of alien species	High	Low
Loss of CI or medicinal flora	High	Low
Sensory disturbance of fauna	Medium	Low
Loss of CI fauna	Medium	Low
Altered burning	Medium	Low

With the implementation of the mitigation measures suggested in this report, the significance of impacts on site can be reduced to **Medium** or **Low**. Based on the information obtained in the site visit and the information that was available to date, it is NSS's opinion that the project should only go ahead provided that the recommended mitigation measures are diligently implemented. *Most importantly, the Dinokana Eye wetland system must be protected from all forms of disturbance, and the various recommended wetland buffers must be strictly adhered to.*

DECLARATION

I, Susan Abell, in my capacity as a specialist consultant, hereby declare that I -

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Have and will not have 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 has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- 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;
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member;
- Based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability; and
- Reserve the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field.

Susan Abell *Pr.Nat.Sci.*
SACNASP Reg. No. 400116/05
(Ecological & Environmental Science)

November 2017
Date

LIST OF ACRONYMS & ABBREVIATIONS

ACRONYM	DESCRIPTION
ADU	Animal Demography Unit – a research unit of the Department of Zoology at the University of Cape Town
AGIS	Agricultural Geo-referenced Information System
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
CI	Conservation Important
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
C-Plan	Conservation Plan
CR	Critically Endangered
CRSA	Constitution of the Republic of South Africa (Act 108 of 1996).
CSIR	Council for Scientific and Industrial Research
D	Declining population trend
d	Dominant
DACE	Department of Agriculture, Conservation and Environment
DD	Data Deficient
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DREAD	Department of Rural, Environment and Agricultural Development
DWA	Department of Water Affairs (previously known as DWAF)
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation (previously known as DWAF and DWA)
ECA	Environmental Conservation Act (Act 73 of 1989)
EIS	Ecological Importance & Sensitivity
EMC	Ecological Management Class
EN	Endangered
End	Endemic
ES	Ecological Sensitivity
ESA	Ecological Support Area
EW	Extinct in the Wild
EWT	Endangered Wildlife Trust
EX	Extinct
FEPA	Freshwater Ecosystem Priority Area
GG	Government Gazette
GIS	Geographic Information System
GN	Government Notice
GN	Government Notice
HGM	Hydro-geomorphic
I	Increasing
IA	Impact Assessment
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature and Natural Resources, based in

ACRONYM	DESCRIPTION
	Gland, Switzerland
LC	Least Concern
LoO	Likelihood of Occurrence of a taxon in an area
NBI	National Botanical Institute
NE	Not Evaluated
NEM:AQA	National Environmental Management: Air Quality Act (Act 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act (Act 57 of 2003)
NEM:WA	National Environmental Management: Waste Act (Act 59 of 2008)
NEMA	National Environmental Management Act (Act 107 of 1998)
NEPAD	New Partnership for Africa's Development
NFAPTS	National Forests Act (Act 84 of 1998) and Protected Tree Species
NFEPA	National Freshwater Ecosystem Priority Areas project
NHRA	National Heritage Resources Act (Act 25 of 1999)
NMPRDA	National Mineral and Petroleum Resources Development Act (Act 28 of 2002)
NSS	Natural Scientific Services CC
NT	Near Threatened
NVFFA	National Veld and Forest Fire Act (Act 101 of 1998)
NWA	National Water Act (Act 36 of 1998)
OG	Ordinary Game
PES	Present Ecological State
PG	Protected Game
POSA	Plants of Southern Africa (website)
Pr.Nat.Sci.	Professional Natural Scientist
PRECIS	Pretoria (PRE) Computerised Information System
PS	Protected Species
PWA	Protected Wild Animal
QDS	Quarter Degree Square – the basic unit used by the Surveyor General for creation of 1:50 000 topographical maps
S	Stable population trend
SABAP 1 & 2	First and second Southern African Bird Atlas Projects, managed by the ADU
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SCH	Schedule Species
ToPS	Threatened or Protected Species
U	Unknown population trend
UJ	University of Johannesburg
UP	University of Pretoria
VU	Vulnerable
WA	Wild Animal
WITS	University of the Witwatersrand
WSA	Water Services Act (Act 108 of 1997)

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1. Introduction

South African legislation affirms the national commitment to conservation. The National Environmental Management Act (NEMA; Act 107 of 1998) provides for "the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations." The National Environmental Management: Biodiversity Act (NEM:BA; Act 10 of 2004) affords *inter alia*: the management and conservation of South Africa's biodiversity within the framework of NEMA; the protection of species and ecosystems that warrant national protection; and the sustainable use of indigenous biological resources. The National Water Act (NWA; Act 36 of 1998) is the principle legal instrument relating to water resource management in South Africa. All wetlands are protected under the NWA, wherein numerous measures are stipulated "which are together intended to ensure the comprehensive protection of all water resources."

The Council for Scientific and Industrial Research's (CSIR's) "Special Needs Skills and Development Programme" is currently undertaking the necessary environmental authorisations under NEMA, NEM:BA and the NWA for the proposed Makadima Leisure and Cultural Village on the Farm Moiloa 412-JO in Dinokana, North West Province. To this end the CSIR appointed Natural Scientific Services CC (NSS) to perform a floral, faunal and wetland ecoscan assessment (with in situ water testing) for the proposed project.

Biodiversity is defined as "…***the variability among living organisms from all sources including…terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems***" (The Convention of Biological Diversity, 1992). In other words, plants, animals and micro-organisms, their genes, and the ecosystems that living organisms inhabit, are all facets of biodiversity.

2. Terms of Reference

The ecoscan was performed according to the methodology agreed between the CSIR and NSS and in accordance with current requirements under NEM:BA (Appendix 6 – GN R982) - as indicated in the appended table under **section 13.10** - this report includes:

- A broad description of (relevant) biophysical attributes of the study area;
- A list of applicable legislation, guidelines, standards and criteria to be considered in project planning;
- A broad determination of the (national and provincial) conservation importance of local biodiversity;
- A description of *in situ* vegetation and floral communities, including their structure, dominant plant species composition and condition;

- Discussion about observed and potentially occurring conservation important (e.g. Protected, Red List and medicinal) species;
- An assessment of potential impacts of the proposed project on biodiversity, and recommended measures to mitigate these.

3. Project Team

All aspects of the ecoscan were performed by NSS (**Table 3-1**). The NSS team has extensive experience in completing biodiversity assessments involving floral, faunal, wetland and aquatic work, as well as Environmental Impact Assessments, Environmental Management Programme Reports, Strategic Management Plans and Environmental Management Plans for the conservation, mining, waste, commercial and industrial sectors. In terms of accreditation and professional registrations the following is applicable to NSS:

- Senior team members are registered Professional Natural Scientists in the ecological, environmental and zoological fields. The CVs of Senior NSS personnel who were involved in the present assessment have been appended under section **13.9**.
- The senior wetland team member is acknowledged by the Department of Water and Sanitation (DWS) as a competent wetland delineator.

Table 3-1 NSS project team

ROLE	NAME	QUALIFICATIONS
Flora	Susan Abell	M.Sc. Resource Conservation Biology (WITS). Pr.Sci.Nat. registered (400116/05) – Ecology & Environmental Science
Fauna	Dr Caroline Lötter	Ph.D. – Zoology (UP). Pr.Sci.Nat. registered (400182/09) – Zoology.
Wetlands	Tyron Clark	M.Sc. – Zoology (WITS) – in progress.
GIS Mapping	Tim Blignaut	B.Sc. Honours - Geography (UJ).

4. Applicable Legislation, Policies & Guidelines

Legislation, policies and guidelines, which could apply to impacts of the proposed project on biodiversity, are listed below. Although the list is comprehensive, additional legislation, policies and guidelines that have not been mentioned may apply.

4.1. International Agreements

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- (Bonn) Convention on the Conservation of Migratory Species of Wild Animals.
- Convention on Biological Diversity including eco-systems and genetic resources.

- Agenda 21 regarding the sustainable development at global and national levels.
- Johannesburg Declaration and Plan of Implementation for sustainable development.

4.2. Regional Agreements

- Action Plan of the Environmental Initiative of NEPAD for sustainable development in Africa.

4.3. National Legislation

- Conservation of Agricultural Resources Act (Act 43 of 1983).
- Environmental Conservation Act (Act 73 of 1989).
- Constitution of the Republic of South Africa (Act 108 of 1996).
- Water Services Act (Act 108 of 1997).
- National Water Act (Act 36 of 1998).
- National Forests Act (Act 84 of 1998) and Protected Tree Species.
- National Veld and Forest Fire Act (Act 101 of 1998).
- National Environmental Management Act (NEMA; Act 107 of 1998).
- National Heritage Resources Act (Act 25 of 1999).
- National Mineral and Petroleum Resources Development Act (Act 28 of 2002).
- Draft Sustainable Utilization of Agricultural Resources Bill (2003).
- National Environmental Management: Protected Areas Act (Act 57 of 2003).
- National Environmental Management: Biodiversity Act (NEM:BA; Act 10 of 2004):
    - National list of Ecosystems Threatened and in need of Protection (Government Gazette [GG] 34809, Government Notice [GN] 1002, 9 December 2011).
    - Alien and Invasive Species Regulations (GG 37885, 1 August 2014).
    - Threatened or Protected Species Regulations (GG 587, GN 38600, 31 March 2015).
- National Environmental Management: Air Quality Act (Act 39 of 2004).
- National Environmental Management: Waste Act (Act 59 of 2008).

4.4. National Policies, Guidelines & Programmes

- National Aquatic Ecosystem Health Monitoring Program including the River Health Programme (initiated by the DWAF, now the DWA), which has recently been replaced with the River Eco-status Monitoring Programme.
- South African Water Quality Guidelines (DWAF 1996).
- White Paper on Environmental Management Policy for South Africa (1998).
- National Spatial Biodiversity Assessment (Driver *et al*. 2004) including Priority Areas and Threatened Ecosystems.
- National Biodiversity Strategy and Action Plan (DEAT 2005).
- National Freshwater Ecosystem Priority Areas project (Driver *et al*. 2011).
- Mining and Biodiversity Guideline (DEA *et al.* 2013).
- National Water Resource Strategy (DWAF 2013).
- Draft national guidelines on biodiversity offsets (DEA 2012 and 2015).

4.5. Provincial Legislation, Policies & Guidelines

- **North West Biodiversity Conservation Act (Act 4 of 2016).**
- Transvaal Nature Conservation Ordinance (1983).
- North West State of the Environment Report (Walmsley & Walmsley 2002).
- North West Environmental Outlook Report (DACE 2008).
- North West Conservation Plan (C-Plan; DREAD 2012).

5. Project Description

The Makadima Leisure and Cultural Village will be based on the Farm Moiloa 412-JO in Dinokana, outside of Zeerust, in Ngaka Modiri District, North West Province. The purpose of the Village is to showcase the culture of different tribes in the province. “The project team identified an increasing interest and curiosity by tourists in cultural villages within the region, and found that there is a high need in the area and surrounding towns of Mafikeng, Zeerust, Rustenburg and Lichtenburg.” The project will generate 20 permanent and 50 temporary employment opportunities for people from Dinokana, and will hopefully also create business opportunities for villagers (CSIR 2017).

The farm portion is 85ha but the total development footprint will be approximately 10ha. The Village will comprise various developments, which will be built in phases over three years. “Accommodation and leisure facilities will be constructed first, followed by the cultural village, recreational facilities, and an adventure park. The 2.5ha accommodation facilities will include 16 hotel rooms, 5 couple chalets, and 6 family chalets. The 1.5ha leisure facilities will consist of picnic gardens and a swimming pool. The 1ha Cultural Village will consist of a boma, craft market, and arts and culture museum. The 2ha recreational facilities will include an outdoor gym, braai area and park benches. The 3ha adventure park will comprise a race track for go-karts and quad bikes (CSIR 2017).

The entire development should receive 150 visitors per day, and accommodate a maximum of 48 people at a time. The conference facility will take up to 40 team members, and 55 guests will be allowed in the Village at a time (CSIR 2017).

6. Study Region

6.1. Land-use

The project site is surrounded by the rural Dinokana settlement to the north and east, and mostly natural bush to the south and west, and is situated near the Dinokana Eye (25°27’22.74”S; 25°51’07.40”E) – “a feature considered to be a sacred site by the local community and one of the main attractions in Dinokana” (CSIR 2017). The Eye is presently

protected by security guards inside a small (~1.5ha) area enclosed by palisade and electrified fencing. The security measures have been put in place by the national Department of Water and Sanitation to safeguard the Eye from degradation by people and livestock. North of the Eye is an old reservoir or "dam," and south-east of the Eye is an informal soccer field. Photographs of the site are provided in **Figure 6-1**.

Centre of study area: Dinokana Eye

North: downstream from the Eye
(proposed recreational park)

North-centre: dam

Centre: rocky hill
(proposed accommodation and restaurant)

South-centre: valley plain
(proposed cultural village and picnic area)

South-east: soccer field
(proposed race track and adventure facilities)

Figure 6-1 Photographs of the site

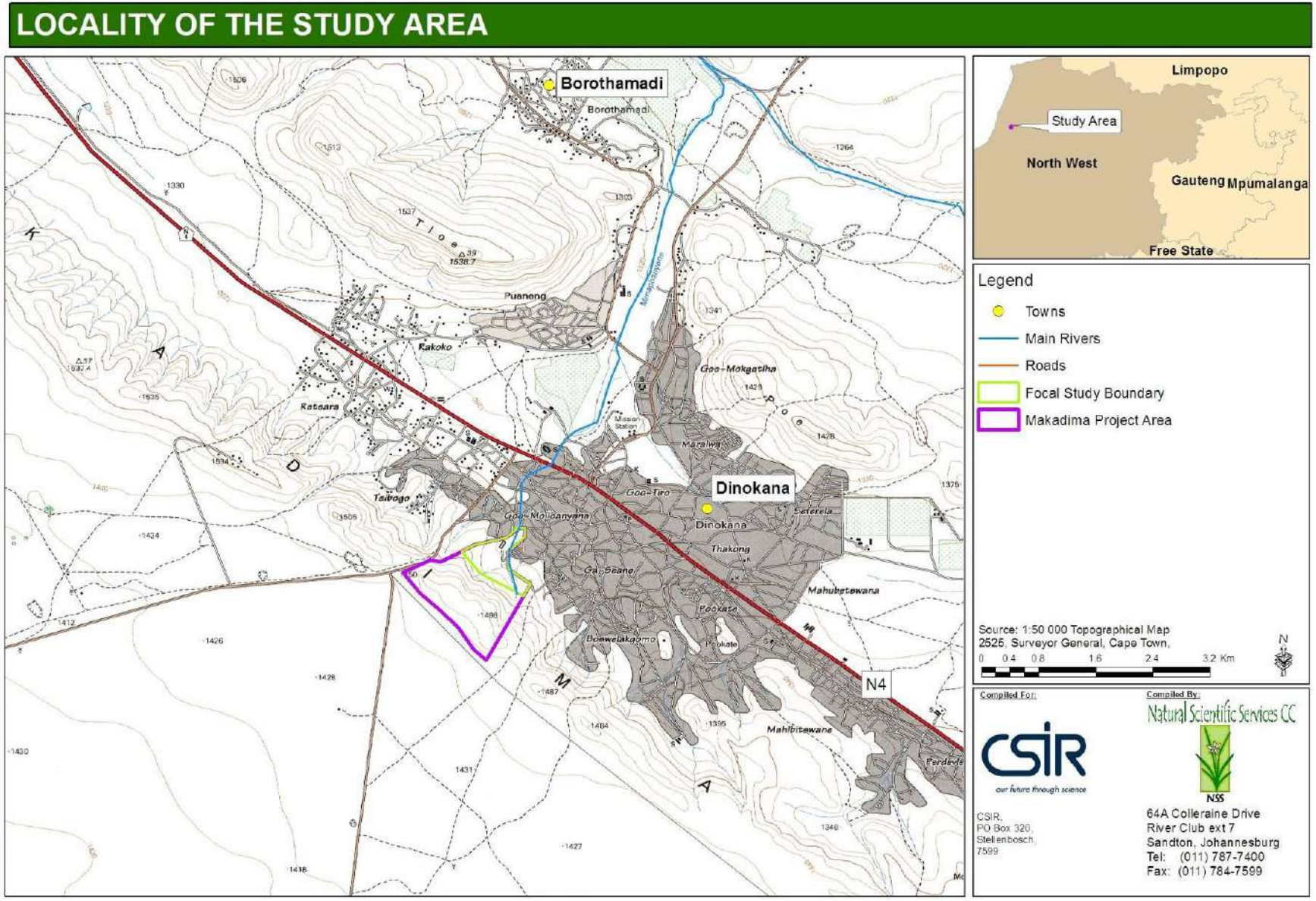


Figure 6-2 Site location

6.2. Climate

The regional climate features summer rainfall with very dry winters. Mean annual precipitation is about 550–650mm. Frost is fairly frequent in winter in lower-lying areas, but less so on the hills. Mean monthly maximum and minimum temperatures for Lindleyspoort-Irr weather station are 35.2°C and –0.4°C for January and June, respectively. Corresponding values for the Marico-Irr weather station are 36.7°C and -0.4°C (Mucina & Rutherford 2006).

Shown in **Figure 6-3** is monthly rainfall and atmospheric temperatures measured at Zeerust between January 2016 and November 2017 (data obtained from www.weatherunderground.com). This approximate rainfall data indicate that during the 12-month period preceding our site visit on 19 October 2017, the region had received an average annual amount of ~567mm rain. The approximate temperature data in **Figure 6-3** indicate that temperatures were generally cooler during October 2017 than during the October 2016. On the day that we visited the site, the weather was hot, and our observation of fresh sheet and gully erosion in places, indicated that the area had recently received rain. Conditions were, therefore, favourable for our floral, faunal and wetland survey work.

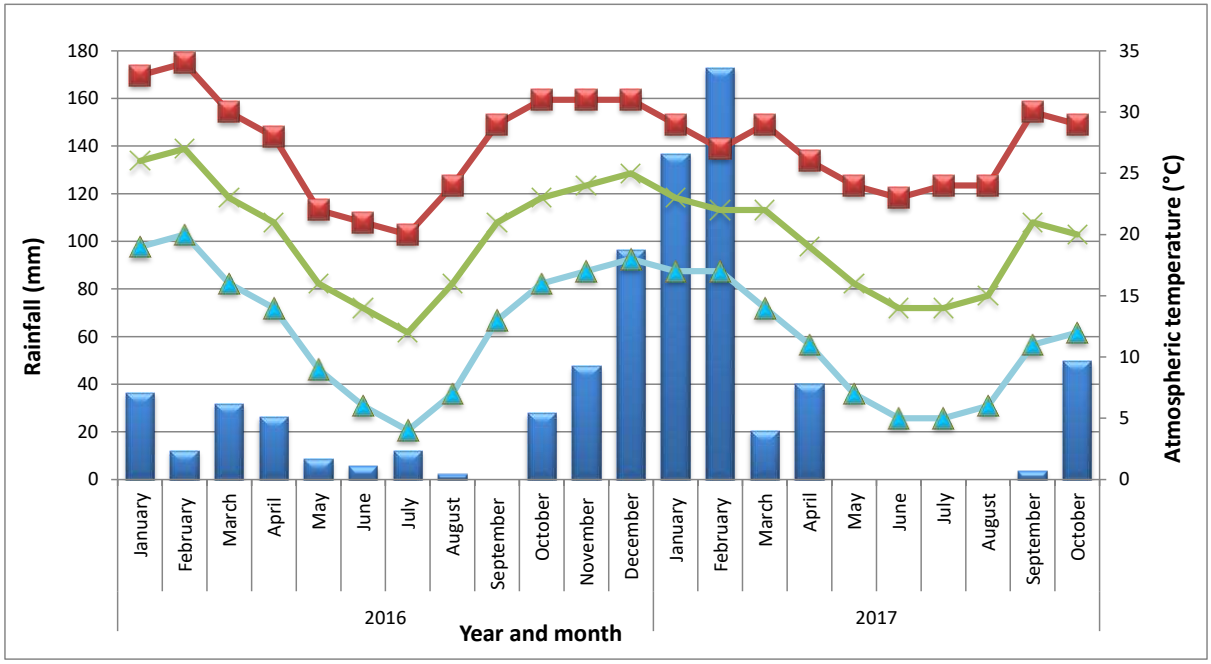


Figure 6-3 Measurements of monthly rainfall at Zeerust (www.weatherunderground.com)

6.3. Hydrology

The northern extremity of the site straddles the 7.04 ecoregion (to the north-east) and 11.09 ecoregion (to the south-west), and the southern section of the farm straddles quaternary catchment A10A (to the north-east) and D41A (to the south-west; **Figure 6-4**).

Both catchments have been rated with HIGH (Low Confidence) Ecological Sensitivity (ES), (DWAF 2011). The Dinokana Eye drains into the Ngotwane River, which enters the Limpopo River at Pala Camp, north-east of Gaborone. The Limpopo eventually flows through the

Kruger National Park before entering Mozambique. In contrast, quaternary catchment D41A feeds the Ramatlabama River, which enters the Molopo River, and which eventually drains into the Orange River.

6.4. Land Types

"Land types," which have been identified by the ARC's Institute for Soil, Climate and Water, represent areas that are uniform with respect to climate, terrain form, geology and soil. The data, obtained through the Agricultural Geo-referenced Information System (AGIS 2010), provide useful baseline information on land capability (especially agricultural potential). According to this data, most of the project footprint is situated in land type Ib40. The northern extremity of the site enters land type Ae33, and the southern section of the farm is situated in land type Fa9 (**Figure 6-5**).

Land type Ib40 features shales, quartzites and andesites of the Pretoria Group (Transvaal Supergroup) with stony shallow soils of the Glenrosa and Mispah soil forms, with some deep, freely drained soils. Within land type Ae33, sediments of the Pretoria Group (Transvaal Supergroup) - particularly the Silverton and Rayton Formations - are mostly shale with less quartzite and conglomerate. Carbonates, volcanic rocks, breccias and diamictites also occur in the Pretoria Group. Bronzite, harzburgite, gabbro and norite of the Rustenburg Layered Suite (Bushveld Igneous Complex) are also found. Soils are mostly deep, red-yellow, apedal, freely drained with high base status also with some vertic or melanic clays. Land type Fa9, in contrast, features dolomite and chert of the Malmani Subgroup (Transvaal SuperGroup) supporting mostly shallow Mispah and Glenrosa soil forms.

6.5. Vegetation

The project footprint is situated in the Savanna Biome, mainly within the SVcb 4 Dwarsberg-Swartruggens Mountain Bushveld regional vegetation type, but with the north-eastern extremity of the study area situated in the Svcb 3 Zeerust Thornveld vegetation type - as defined by Mucina & Rutherford (2006). To the south-west, the remainder of the farm portion straddles the Dwarsberg-Swartruggens Mountain Bushveld and the Gh 15 Carletonville Dolomitic Grassland vegetation types (**Figure 6-5**).

Dwarsberg-Swartruggens Mountain Bushveld features rocky, low to medium-high hills and ridges with steep faces in places (reaching about 300m in height above the surrounding plains). The structure of the vegetation is variable depending on slope, exposure, aspect and local habitat. Various combinations of tree and shrub layers occur, often with a dense grass layer. Bush clumps also occur. Dominant floral species within the Dwarsberg-Swartruggens Mountain Bushveld vegetation type are listed in **Table 6-1**. Although this vegetation type is not threatened, less than 2% is statutorily conserved (mainly in the Marico Bushveld Nature Reserve). Approximately 7% of the vegetation type has been transformed, mainly by cultivation, and scattered alien flora (e.g. *Cereus jamacaru* and *Acacia mearnsii*) occur in places. Erosion is mostly very low to low (Mucina & Rutherford 2006).

Zeerust Thornveld represents deciduous, open to dense, short, thorny woodland dominated by *Acacia* species with a herbaceous layer of mainly grasses. It is found on deep, high-base status and some clay soils on plains and lowlands, and also between rocky ridges of Dwarsberg-Swartruggens Mountain Bushveld. Zeerust Thornveld is also Least Threatened, but less than 4% is statutorily conserved between four reserves including the Pienaar and Marico Bushveld Nature Reserves. About 16% of the vegetation type has been transformed, mainly by cultivation, but also urban development. Alien flora (e.g. *Cereus jamacaru*) occur in a few very scattered areas. Erosion is also very low to low (Mucina & Rutherford 2006).

Carletonville Dolomitic Grassland is found on slightly undulating plains, dissected by prominent rocky chert ridges. This species-rich grassland type forms a complex mosaic pattern dominated by many species. It is listed as **Vulnerable**, with only a small extent of this vegetation type privately and statutorily conserved (in the Cradle of Humankind World Heritage, Oog van Malmanie, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei and Groenkloof protected areas). Almost a quarter of the Carletonville Dolomitic Grassland vegetation type has been transformed by cultivation, mining, urban development and damming. Erosion is very low to low (Mucina & Rutherford 2006).

Table 6-1 Dominant flora comprising the Dwarsberg-Swartruggens Mountain Bushveld vegetation type

GROWTH FORM	DOMINANT SPECIES
Tall Tree:	*Acacia robusta (d)*
Small Trees:	*Acacia caffra (d), A. erubescens (d), Burkea africana (d), Combretum apiculatum (d), Faurea saligna (d), Protea caffra (d), Combretum imberbe, C. molle, Cussonia paniculata, C. transvaalensis, Dombeya rotundifolia, Ozoroa paniculosa, Pappea capensis, Peltophorum africanum, Spirostachys africana, Vangueria infausta, Ziziphus mucronata.*
Succulent Tree:	*Aloe marlothii subsp. marlothii (d).*
Tall Shrubs:	*Dichrostachys cinerea (d), Croton pseudopulchellus, Ehretia rigida subsp. rigida, Grewia flava, Mundulea sericea, Tarchonanthus camphoratus, Vitex zeyheri.*
Low Shrubs:	*Athrixia elata, Pavonia burchellii, Searsia magalismontana subsp. magalismontana, S. rigida var. rigida.*
Woody Climber:	*Asparagus africanus.*
Graminoids:	*Aristida canescens (d), Cenchrus ciliaris (d), Chrysopogon serrulatus (d), Digitaria eriantha subsp. eriantha (d), Enneapogon scoparius (d), Loudetia simplex (d), Schizachyrium sanguineum (d), Setaria lindenbergiana (d), Bewsia biflora, Bothriochloa insculpta, Cymbopogon caesius, C. pospischilii, Elionurus muticus, Eragrostis rigidior, Fingerhuthia africana, Heteropogon contortus, Melinis nerviglumis, Panicum maximum, Setaria sphacelata, Themeda triandra, Trachypogon spicatus, Tristachya biseriata.*
Herbs:	*Barleria macrostegia, Commelina africana, Hermannia depressa, Senecio venosus.*
Geophytic Herbs:	*Hypoxis hemerocallidea, Pellaea calomelanos, Tritonia nelsonii.*

*The genus *Acacia* has been split internationally into *Vachellia* and *Senegalia*. For this report, these species will remain in the *Acacia* genus.

* d = Dominant

Table 6-2 Dominant flora comprising the Zeerust Thornveld vegetation type

GROWTH FORM	DOMINANT SPECIES
Tall Trees:	*Acacia burkei* (d), *Acacia erioloba* (d).
Small Trees:	*Acacia mellifera* subsp. *detinens* (d), *Acacia nilotica* (d), *Acacia tortilis* subsp. *heteracantha* (d), *Searsia lancea* (d), *Acacia fleckii, Peltophorum africanum, Terminalia sericea.*
Tall Shrubs:	*Diospyros lycioides* subsp. *lycioides, Grewia flava, Mystroxylon aethiopicum* subsp. *burkeanum.*
Low Shrubs:	*Agathisanthemum bojeri, Chaetacanthus costatus, Clerodendrum ternatum, Indigofera filipes, Searsia grandidens, Sida chrysantha, Stylsanthes fruticosa.*
Graminoids:	*Eragrostis lehmanniana* (d), *Panicum maximum* (d), *Aristida congesta, Cymbopogon pospischilii.*
Herbs:	*Blepharis integrifolia, Chamaecrista absus, C. mimosoides, Cleome maculata, Dicoma anomala, Kyphocarpa angustifolia, Limeum viscosum, Lophiocarpus tenuissimus.*

*The genus *Acacia* has been split internationally into *Vachellia* and *Senegalia*. For this report, these species will remain in the *Acacia* genus.

* d = Dominant

Table 6-3 Dominant flora comprising the Zeerust Thornveld vegetation type

GROWTH FORM	DOMINANT SPECIES
Low shrubs	*Anthospermum rigidum* subsp. *pumilum, Indigofera comosa, Pygmaethamnus zeyheri* var. *rogersii, Rhus magaliesmontana, Tylosema esculentum, Ziziphus zeyheriana,*
Geoxylic suffrutex	*Elephantorrhiza elephantina, Parinari capensis* subsp. *capensis*
Graminoids	*Aristida congesta, Brachiaria serrata, Cynodon dactylon, digitaria tricholaenoides, Hiheteropogon ampletens, Eragrostis chloromelas, E. racemosa, Heteropogn contortus, Loudetia simplex, Schizachyrium sanguineum, Setaria sphacelata, Themeda triandra, Alloteropsis semilata* subsp. *eckloniana, Andropogon schirensis, Aristida canescens, A. diffusa, Bewsia bifola, Bulbostylis burchellii, Cymbopogan caesius, C. pospibiflora, Elinonurus muticus, Eragrostis curvula, E. gummiflua, E. plantana, Eustachys paspaloides, Hyparrhenia hirta, Melinis nerviglumis, M. repens* subsp. *repens, Monocymbium ceresiiforme, Panicum coloratum, Pogonarthria squarrosa, Trichoneura grandiglumis, Triraphis andropogonoides, Tristachya leucothrix, T. rehmannii*
Herbs	*Aclypha angustata, Barleria macthrix, Chamaecrista mimosoides, Chamaesyce inaequilatera, Crabbea angustifolia, Dianthus mooiensis, Dicoma anomala, Helichrysum caespititium, H. Miconiifolium, H. nudifolium* var. *nudifolium, Ipomoea ommaneyi, Justicia anagalloides, Kohautia amatymbica, Kyphocarpa angustifolia, Ophrestia oblongifolia, Pollichia campestris, Sencio coronatus, Vernonia oligocephala.*
Geophytic herbs	*Boophane disticha, Habenaria mossii*

*The genus *Acacia* has been split internationally into *Vachellia* and *Senegalia*. For this report, these species will remain in the *Acacia* genus.

* d = Dominant

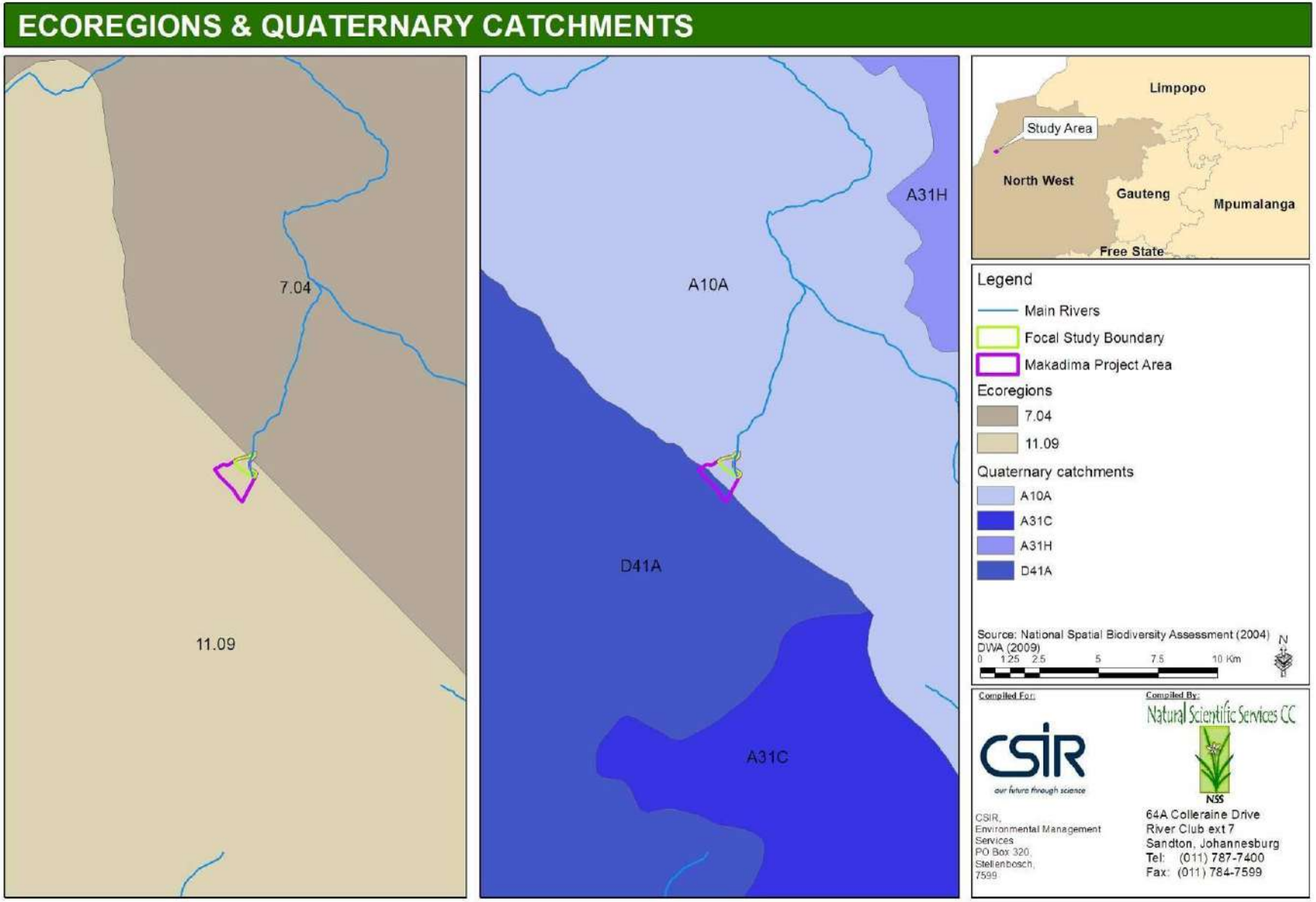


Figure 6-4 Ecoregion and quaternary catchment wherein the development site is situated

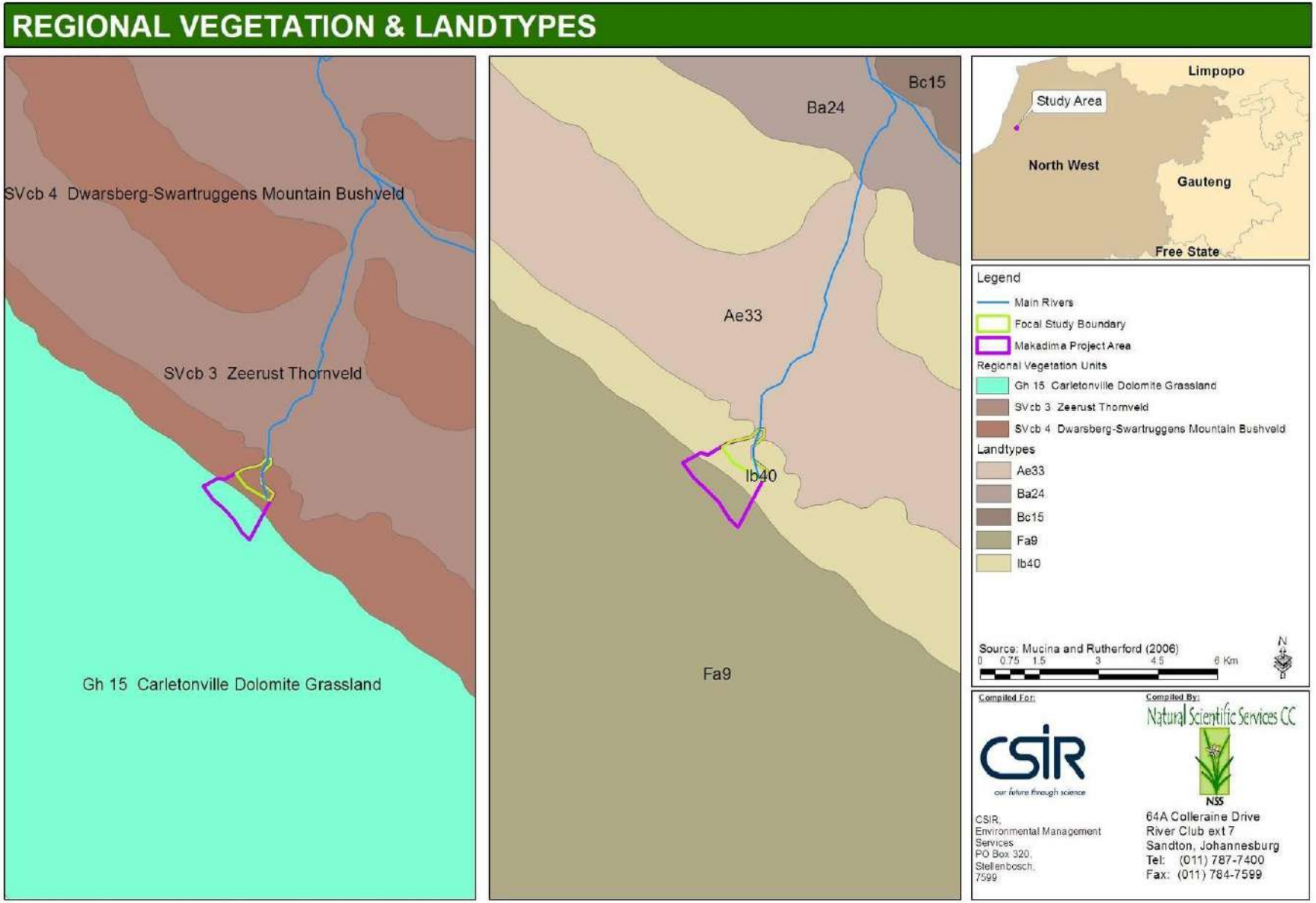


Figure 6-5 **Regional vegetation and land type wherein the development site is situated**

7. Methodology

The ecological scan involved desktop research and fieldwork, which was performed during a site visit on 19 October 2017.

7.1. Vegetation and Floral Communities

7.1.1. Desktop Research

A desktop assessment of the regional vegetation and potential local floral communities was performed using Mucina and Rutherford's (2006) vegetation map of southern Africa, the current biodiversity Sector or Conservation Plan (C-Plan) for North West Province, and SANBI's[1] Plants of South Africa (POSA) data for quarter degree square (QDS) 2525BD.

Conservation Important (CI) plant species records from the study region were sourced mainly from POSA, and the local Likelihood of Occurrence (LO) of each species was rated, based on in situ environmental conditions, as: present, high, possible, low or unlikely due to e.g. a lack of suitable habitat.

7.1.2. Fieldwork

In situ vegetation was sampled at multiple points (mapped in **Figure 7-1**) using the Braun-Blanquet approach. Floral community structure, condition and species composition and cover abundance was noted at each sampling point. Observed flora were identified to species level except when features for specimen identification were limited, in which case the epithet "cf" (meaning 'confer' or 'looks like') has been used. Plant scientific names follow those of POSA (accessed in October 2017).

Observed alien and invasive plant species were also recorded, as listed under both the Conservation of Agricultural Resources Act (Act 43 of 1983) and the National Environmental Management: Biodiversity Act (Act 10 of 2004) Alien and Invasive Species Regulations published on 1 August 2014 in Government Gazette 37885.

7.1.3. Limitations

- The short duration of fieldwork.
- Plant species with short flowering times, or which are small, rare or otherwise difficult to detect may not have been detected even though they are potentially present.
- Delineation of the identified floral communities might not be exact due to variable in-field GPS accuracy, potential georeferencing errors and outdated imagery from Google Earth.

[1] The South African National Biodiversity Institute

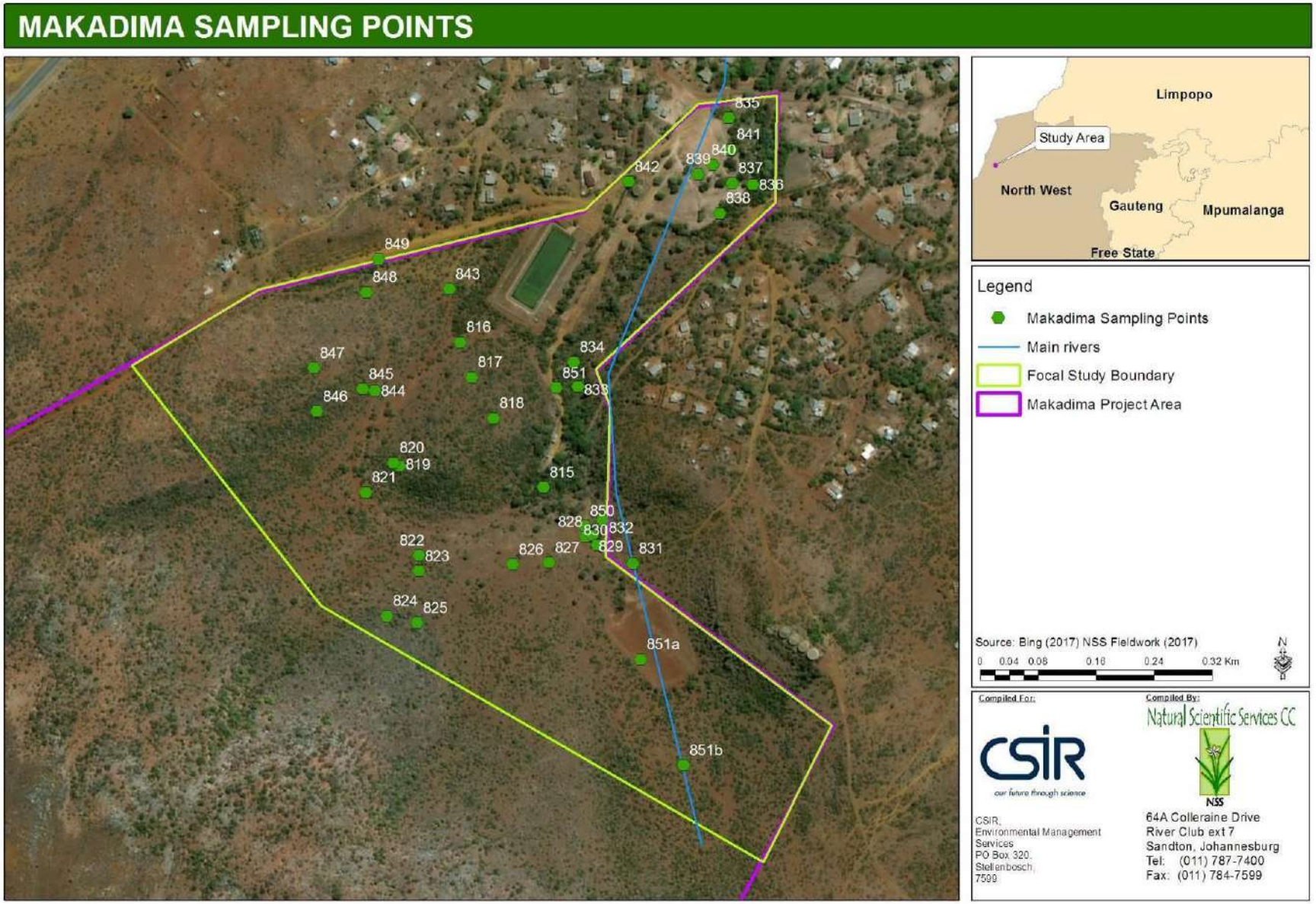


Figure 7-1 Vegetation sampling points

7.2. Fauna

7.2.1. Desktop Research

A list of species potentially occurring in the study area was compiled for:

- Mammals, including bats, using the published species distribution maps in Friedmann & Daly (2004) and Stuart & Stuart (2007), and Monadjem *et al*. (2010), respectively, and online species distribution data from MammalMAP (2017) for quarter degree square (QDS) 2525BD.
- Birds, using the list of bird species for QDS 2525BD from the Roberts VII (2013) mobile phone app., and the latest online list of bird species for pentad 2525_2550 from the second Southern African Bird Atlas Project (SABAP 2), which included records of bird species that were observed in QDS 2525BD during the first SABAP (SABAP 1).
- Reptiles, using the published species distribution maps in Bates *et al*. (2014), and online species distribution data from ReptileMAP (2017) for the relevant QDS.
- Frogs, using the published species distribution maps in Minter *et al*. (2004), and online species distribution data from FrogMAP (2017) for the relevant QDS.
- Butterflies, using the published species distribution maps in Mecenero *et al.* (2013). LepiMAP (2017) had only one species record for QDS 2525BD.
- Odonata, using the published distribution maps in Samways (2008). OdonataMAP (2017) did not have any species records for QDS 2525BD.
- Scorpions, using the published species distribution maps in Leeming (2003). ScorpionMAP (2017) did not have any species records for QDS 2525BD.

The lists were refined based on faunal records for the Dwarsberg-Swartruggens Mountain Bushveld, Zeerust Thornveld and Carletonville Dolomitic Grassland regional vegetation types in North West Province, which were received from DREAD (pers. comm. 2016), and our field observations, where the Likelihood of Occurrence (LO) of each species was rated using the following scale:

1 Present: the species, or signs of its presence, was recorded.
2 High: the species is highly likely to occur.
3 Moderate: the species may occur.
4 Low: the species is unlikely to occur.

7.2.2. Fieldwork

Faunal observations were made while driving, walking, and inspecting different habitats in the study area. Taxa were identified based on observations of dead or live specimens, spoor, droppings, burrows and other evidence. Rocks and logs were turned to find reptiles, scorpions, frogs and invertebrates. A sweep net was used to catch butterflies and odonata.

7.2.3. Conservation Status of Species

The appended faunal lists indicate the status of relevant species according to:

- The latest (2015) list of Threatened or Protected Species (ToPS) under the National Environmental Management: Biodiversity Act (NEM:BA 2004).
- The latest list of Threatened or Protected Species under the relevant provincial legislation, in this case, the Transvaal Nature Conservation Ordinance of 1983.
- The latest national or regional Red List assessment for:
  - Mammals by the SANBI & EWT (2016).
  - Birds by Taylor *et al*. (2015).
  - Reptiles by Bates *et al.* (2014).
  - Frogs by Minter *et al.* (2004).
  - Butterflies by Mecenero *et al.* (2013).
  - Dragonflies and damselflies (odonata) by Samways (2006).
- The IUCN Red List, where the global Red List status of a taxon has not been assessed during the relevant afore-mentioned national or regional Red List assessment.

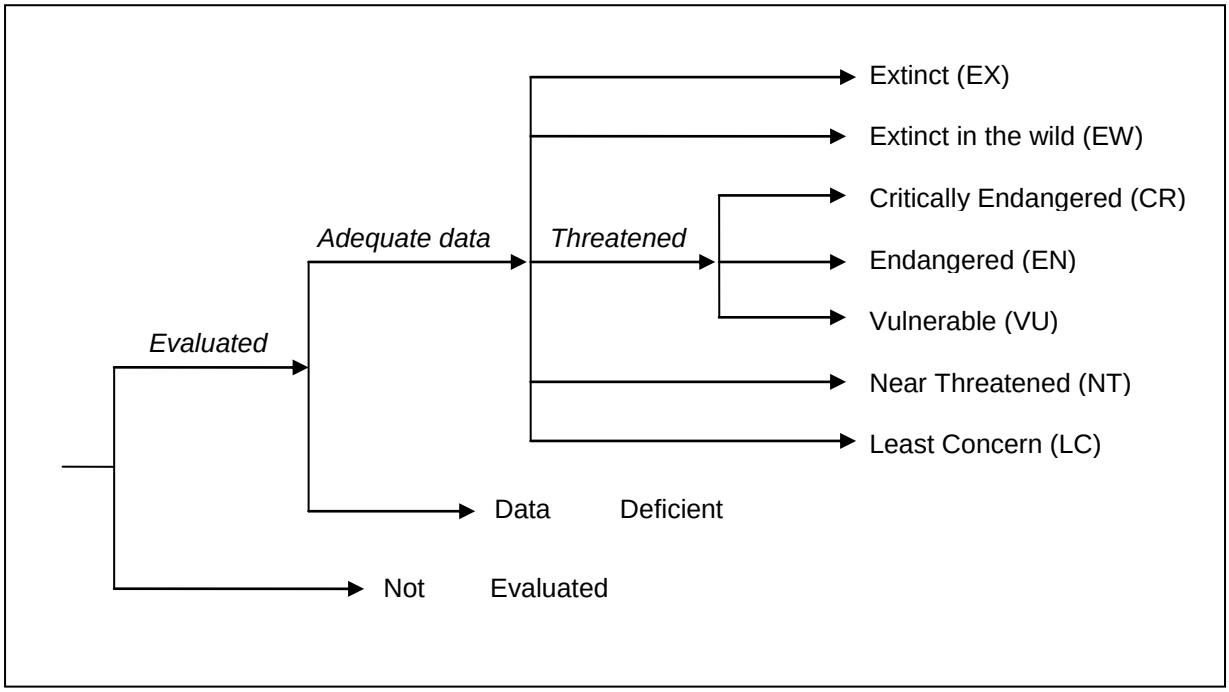


Figure 7-2 IUCN Red List categories

An atlas and Red List assessment for South African scorpion species has not yet been published. Due to spatio-temporal variation in human disturbances, the conservation status of some species differs between the NEM:BA, provincial legislation and the relevant regional or national Red List assessment publication. Unless otherwise stated, the *most* threatened status of a species is provided in text, whether this is at a global or other spatial scale.

Shown in **Figure 7-2** are the IUCN's Red List categories, which have been adopted to a large extent in regional / national /provincial assessments of animal taxa.

7.2.4. Limitations

- The site visit was limited to a few day time hours and, therefore, not all potentially occurring (especially nocturnal) species were likely to be detected.
- Some species, which are uncommon, small, migratory, secretive or otherwise difficult to detect may not have been detected even though they were potentially present.

7.3. Wetlands

7.3.1. Desktop Research

Prior to visiting the site, the area was surveyed at a desktop level using 1:50 000 topographical maps, Google Earth™ Imagery, contour data, provincial and national databases, as reference material to determine the layout of the in situ wetland system.

7.3.2. Wetland Classification

The wetland system was classified using the recently-published "Classification system for Wetlands and other Aquatic Ecosystems in South Africa" by Ollis *et al*. (2013), hereafter referred to as "the Classification System." Ecosystems included by the Classification System encompass all those that are listed under the Ramsar Convention as "wetlands[2]," and include all freshwater (non-marine) systems. The Classification System recognizes three broad inland systems: rivers, wetlands and open water bodies. Like Kotze ***et al's*** (2008) classification of wetlands based on hydro-geomorphic (HGM) units, the Ollis *et al*. (2013) Classification System asserts that the functioning of an inland aquatic ecosystem is determined fundamentally by hydrology and geomorphology. The Classification System has a six-tiered structure where under the determination of a system's HGM unit (Level 4):

Level 1 – Type of system (marine, estuarine or inland).
Level 2 – Regional setting (Level 1 Ecoregions; NFEPA WetVeg units; etc.).
Level 3 – Landscape unit (valley floor, slope, plain, and bench).
Level 4 – Hydro-geomorphic (HGM) unit.
Level 5 – Hydrological regime.
Level 6 – Descriptors (natural vs. artificial; salinity; pH; etc.).

7.3.3. Wetland Extent

The wetland delineation method used in the field is the same as that outlined in the DWS field procedure for the identification and delineation of wetlands and riparian areas (DWAF 2005).

[2] Under the Convention on Wetlands (Ramsar, Iran, 1971) "wetlands" are defined by Articles 1.1 and 2.1 as: Article 1.1: "*For the purpose of this Convention wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres*." Article 2.1 provides that wetlands: "*may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands*".

The following three indicators described by DWAF (2005) were used:

- Terrain Unit Indicator: The topography of the area was used to determine where in the landscape wetlands were likely to occur. McVicar *et al*. (1977) defines five terrain units (**Figure 7-3**). Most wetlands will be found in valley bottoms (unit 5), but can occur on crests, mid slopes and foot slopes (units 1, 3 and 4).

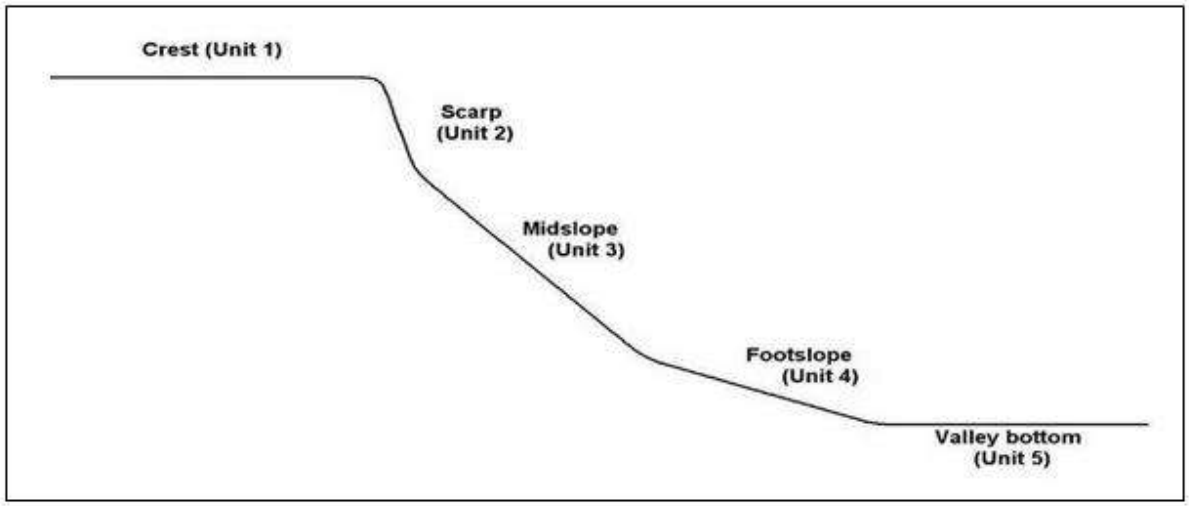


Figure 7-3 Simple depiction of terrain units (adapted from DWAF 2005)

- *Soil Wetness Indicator*: The soil wetness and duration of wetness are indicated by the colour of the soil. A grey soil matrix such as a G-horizon is an indication of wetness for prolonged periods of time and mottles indicate a fluctuating water table. In terms of the DWS guidelines (DWAF 2005), signs of soil wetness must be found within the top 50cm of the soil surface to classify as a wetland. The permanent zone of a wetland is therefore characterised by grey soil, the seasonal zone has a high frequency of low chroma mottles and the temporary zone has less, high chroma, mottles. These mottles are normally most prominent just below the A-horizon. Mottles may occur in non-wetland soils that have a high chroma matrix, and the colour of the matrix must always be considered in conjunction with the presence of mottles.
- *Vegetation Indicator*: Vegetation is a key component of the wetland definition in the National Water Act (Act 36 of 1998), and vegetation can be used as an indicator of wetland conditions. The presence / absence of hydrophytes provide a useful additional criterion in determining the boundaries of wetlands.

7.3.4. Wetland Present Ecological State (PES)

The PES of the in situ wetland system was assessed using the Level 1 WET-HEALTH tool of Macfarlane *et al.* (2008). The WET-HEALTH tool is designed to assess the health or integrity of a wetland. To assess wetland health, the tool uses indicators based on the main wetland drivers: geomorphology, hydrology and vegetation.

Macfarlane *et al.* (2008) explain that the application and methodology of WET-HEALTH uses:

- An impact-based approach, for those activities that do not produce clearly visible responses in wetland structure and function. The impact of irrigation or afforestation in the catchment, for example, produces invisible impacts on water inputs. This is the main approach used in the hydrological assessment.
- An indicator-based approach, for activities that produce clearly visible responses in wetland structure and function, e.g. erosion or alien plants. This approach is mainly used in the assessment of geomorphology and vegetation health.

With WET-HEALTH a wetland is first classified into HGM units (Level 4 – Ollis *et al.* 2013), and each HGM unit is separately assessed in terms of the extent, intensity and magnitude of impacts on the hydrology, geomorphology and vegetation of the unit, which is translated into a health score as follows:

- The *extent* of impact is measured as the proportion (percentage) of a wetland and/or its catchment that is affected by an activity.
- The *intensity* of impact is estimated by evaluating the degree of alteration that results from a given activity.
- The *magnitude* of impact for individual activities is the product of extent and intensity.
- The magnitudes of all activities in each HGM unit are then combined in a structured and transparent way to calculate the overall impact of all activities that affect a unit's hydrology, geomorphology and vegetation, and wetland PES is expressed on a scale of A-F (**Table 7.1**).

In addition, the threat and/or vulnerability of a wetland must be assessed to determine its likely "trajectory of change" (**Table 7-2**). Overall wetland health is then jointly represented by the wetland's PES and trajectory of change. This approach not only provides an indication of hydrological, geomorphological and vegetation health, but also highlights the key causes of wetland degradation.

7.3.5. Wetland Functionality

The WET-EcoServices tool of Kotze *et al.* (2008) provides a means for rapidly assessing ecosystem services supplied by wetlands. More specifically, the tool was designed to help assess the goods and services that individual palustrine wetlands (i.e. marshes, floodplains, vleis and seeps) provide in terms of support planning and decision-making.

The wetland benefits included in the WET-EcoServices model are selected based on their importance for South African wetlands, and how readily these can be assessed. Benefits such as groundwater recharge or discharge and biomass export may be important but are

difficult to characterise at a rapid assessment level, and have thus been excluded. Detailed in **Table 7-3** are the ecosystem services that are assessed during a rapid field assessment.

Table 7-1 Impact scores and Present Ecological State categories

ECOLOGICAL CATEGORY	DESCRIPTION	COMBINED IMPACT SCORE
A	**Unmodified, natural**	0-0.9
B	**Largely natural with few modifications**. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9
C	**Moderately modified**. A moderate change in ecosystem processes and loss of natural habitat has taken place but the natural habitat remains predominantly intact.	2-3.9
D	**Largely modified**. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9
E	**Seriously modified**. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9
F	**Critically modified**. Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10
Source:	Modified from Macfarlane *et al.* (2008)	

Table 7-2 Trajectory of change classes, scores and symbols

TRAJECTORY CLASS	DESCRIPTION	CHANGE SCORE	CLASS RANGE	SYMBOL
Improve markedly	Condition is likely to improve substantially over the next five years	2	1.1 to 2	↑↑
Improve	Condition is likely to improve over the next five years	1	.3 to 1	↑
Remains stable	Condition is likely to remain stable over the next five years	0	-0.2 to +0.2	→
Deterioration slight	Condition is likely to deteriorate slightly over the next five years	-1	-0.3 to -1	↓
Deterioration substantial	Condition is likely to deteriorate substantially over the next five years	-2	-1.1 to 2	↓↓
Source:	Modified from Macfarlane *et al.* (2008)			

7.3.6. Wetland Ecological Importance & Sensitivity (EIS)

The assessment of wetland EIS was based on the DWAF (1999) guidelines. According to these guidelines, the "ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to a system's ability to resist disturbance and its capability to recover from disturbance once this has occurred. A wetland's EIS was then used to determine its Ecological Management Class (EMC). For this, a series of 10 determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates no importance, and Level 4 indicates very high importance (**Table 7-4**). The median of the determinants is then used to assign a wetland's EMC (**Table 7-5**).

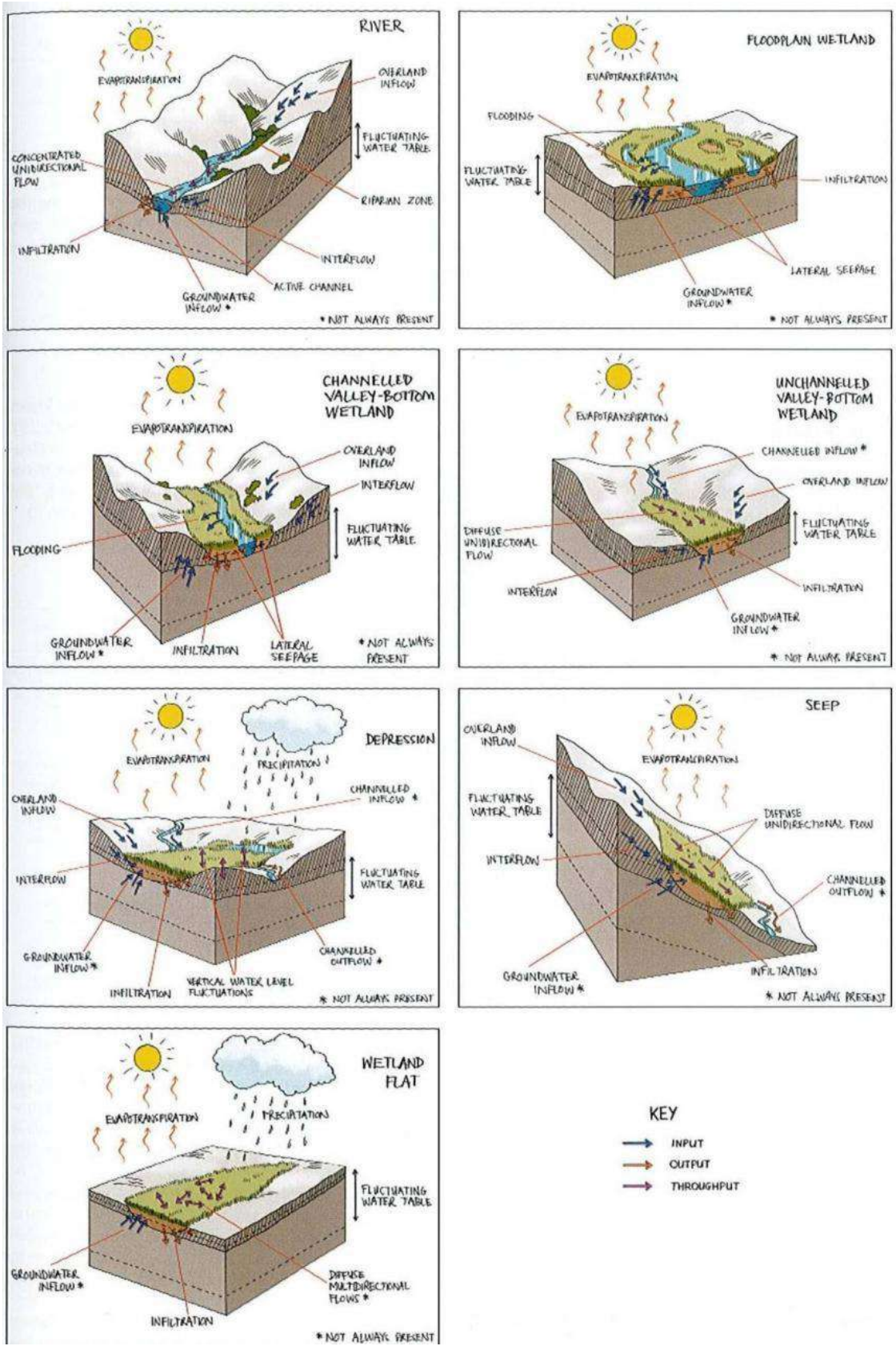


Figure 7-4 Primary wetland HGM types, highlighting dominant water inputs throughputs & outputs (Ollis *et al.* 2013)

The determinants assessed include:

PRIMARY DETERMINANTS

- Rare and endangered species - interpreted as Red Data and other Conservation Important (CI) species.
- Populations of unique species.
- Species / Taxon richness.
- Diversity of habitat types or features.
- Migration route/breeding and feeding site for wetland species.
- Sensitivity to changes in the natural hydrological regime.
- Sensitivity to water quality changes.
- Flood storage, energy dissipation and particulate/element removal.

MODIFYING DETERMINANTS

- Protected status.
- Ecological integrity.

Table 7-3 WET-EcoServices model of wetland ecosystem services (Kotze *et al.* 2000)

Ecosystem Services supplied by Wetlands	**Indirect Benefits**	**Regulating & supporting benefits**	Flood attenuation	The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream
			Streamflow regulation	Sustaining streamflow during low flow periods
			Water quality enhancements: Sediment trapping	The trapping and retention in the wetland of sediment carried by runoff waters
			Water quality enhancements: Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters
			Water quality enhancements: Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters
			Water quality enhancements: Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts) carried by runoff water
			Water quality enhancements: Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation
			Carbon storage	The trapping of carbon by the wetland, principally as soil organic matter
	Direct Benefits	**Biodiversity maintenance**		Through the provision of habitat and maintenance of natural process by the wetland, a contribution is made to maintaining biodiversity
		Biodiversity maintenance is not an ecosystem service as such, but encompasses attributes widely acknowledged as having potentially high value to society		
		Provisioning benefits	Provision of water for human use	The provision of water extracted directly from the wetland for domestic, agriculture or other purposes
			Provision of harvestable resources	The provision of natural resources from the wetland, including livestock grazing, craft plants, fish, etc.
			Provision of cultivated foods	The provision of areas in the wetland favourable for the cultivation of foods
		Cultural benefits	Cultural heritage	Places of special cultural significance in the wetland, e.g., for baptisms or gathering of culturally significant plants
			Tourism and recreation	Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife
			Education and research	Sites of value in the wetland for education or research

Table 7-4 Scoring guideline

SCORE GUIDELINE	CONFIDENCE RATING
Very high = 4	Very high confidence = 4
High = 3	High confidence = 3
Moderate = 2	Moderate confidence = 2
Marginal/Low = 1	Marginal/Low confidence = 1
None = 0	

Table 7-5 Ecological importance and sensitivity categories – Interpretation of median scores for biotic and habitat determinants

RANGE OF MEDIAN	ECOLOGICAL IMPORTANCE & SENSITIVITY (EIS)	RECOMMENDED EMC
>3 and <=4	**Very high** Wetlands that are considered ecologically important and sensitive on a national / international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	**A**
>2 and <=3	**High** Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	**B**
>1 and <=2	**Moderate** Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	**C**
>0 and <=1	**Low/Marginal** Wetlands which are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	**D**

7.3.7. Wetland buffers

A wetland buffer is a strip of land surrounding a wetland in which activities are controlled or restricted. Wetland buffers serve to: reduce the impact of adjacent land uses; slow potentially erosive run-off; capture sediments; absorb nutrients; and provide habitats for wetland-dependant organisms. The reach of the Mmaphanyane on site is registered as a FEPA river and as such 100 m applies to HGM unit 1 for general developments as well as a 250 m buffer on boreholes and a 500 m buffer on herbicide application. A 50 m buffer was

assigned to HGM Unit 2 based on the GDARD minimum requirement for biodiversity assessment protocol for wetlands outside the urban edge.

7.3.8. Limitations

The use of conventional redoximorphic soil indicators of wetland presence (mottles) is severely limited in the type of dolomitic derived soils present on site. This is due to the high manganese and iron content of soil (see wetland section for greater detail). The implication was that soil could not be used as a reliable wetland indicator.

The riparian vegetation zone has undergone considerable clearing and thinning from the reference state. This further hampers the use of vegetation indicators to reliably delineate the wetland boundary.

7.4. Impact Assessment

The Impact Assessment (IA) was performed according to the CSIR's IA methodology, which takes into account:

- Impact nature (direct, indirect and cumulative);
- Impact status (positive, negative or neutral);
- Impact spatial extent (**Table 7-6**);
- Impact duration (**Table 7-7**);
- Potential impact intensity (**Table 7-8**);
- Impact reversibility (high, moderate, low or irreversible);
- Irreplaceability of the impacted resource (high, moderate, low or replaceable);
- Impact probability (**Table 7-9**);
- Our confidence in the ratings (high, moderate or low);

Overall impact significance (**Table 7-10**) is calculated as:

Impact significance = Impact magnitude x Impact probability

where

Impact magnitude = Potential impact intensity + Impact duration + Impact extent

Table 7-6 Rating of impact spatial extent

EXTENT DESCRIPTION	SCORE
Site specific	1
Local (<2km from site)	2
Regional (within 30km of site)	3
National	4
International/Global	5

Table 7-7 Rating of impact duration

DURATION DESCRIPTION	SCORE
Temporary (less than 2 years) or duration of the construction period. This impact is fully reversible. *E.g. the construction noise temporary impact that is highly reversible as it will*	1

DURATION DESCRIPTION	SCORE
stop at the end of the construction period	
Short term (2 to 5 years). This impact is reversible.	2
Medium term (5 to 15 years). The impact is reversible with the implementation of appropriate mitigation and management actions.	3
Long term (>15 years but where the impact will cease after the operational life of the activity). The impact is reversible with the implementation of appropriate mitigation and management actions. *E.g. the noise impact caused by the desalination plant is a long term impact but can be considered to be highly reversible at the end of the project life, when the project is decommissioned*	4
Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient). This impact is irreversible. *E.g. The loss of a paleontological resource on site caused by construction activities is permanent and would be irreversible.*	5

Table 7-8 Rating of potential impact intensity

NEGATIVE POTENTIAL INTENSITY DESCRIPTION	RATING	SCORE
Potential to severely impact human health (morbidity/mortality); or to lead to loss of species[3] (fauna and/or flora)	Very High/Fatal Flaw	16
Potential to reduce faunal/flora population or to lead to severe reduction/alteration of natural process, loss of livelihoods / sever impact on quality of life[4], individual economic loss	High	8
Potential to reduce environmental quality – air, soil, water. Potential Loss of habitat, loss of heritage, reduced amenity	Medium	4
Nuisance	Medium-Low	2
Negative change – with no other consequence	Low	1
POSITIVE POTENTIAL INTENSITY DESCRIPTION	**RATING**	**SCORE**
Potential Net improvement in human welfare	High	8
Potential to improve environmental quality – air, soil, water. Improved individual livelihoods	Medium	4
Potential to lead to Economic Development	Medium-Low	2
Potential positive change – with no other consequence	Low	1

"Irreplaceable loss of a resource" must be factored into the potential intensity rating of an impact

Table 7-9 Rating of impact probability

PROBABILITY DESCRIPTION	SCORE
Improbable (little or no chance of occurring <10%)	0.1
Low probability(10 - 25% chance of occurring)	0.25
Probable (25 - 50% chance of occurring)	0.5
Highly probable (50 – 90% chance of occurring)	0.75
Definite (>90% chance of occurring).	1

[3]*Note that a loss of species is a global issue and is differentiated from a loss of "floral/faunal" populations.*
[4]*Note that a visual impact or air emissions for example could be considered as severely impacting on quality of life should it constitute more than a nuisance but not being life threatening.*

Table 7-10 Rating of overall impact significance

SCORE	RATING	SIGNIFICANCE DESCRIPTION
18-26	Fatally flawed	The project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating.
10-17	High	The impacts will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making.
5-9	Medium	The impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated.
<5	Low	The impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making.

8. Results

8.1. Vegetation and Floral Communities

8.1.1. Comparative Regional Vegetation

SANBI frequently collect/collate floral data within Southern Africa and update their PRECIS database system (National Herbarium Pretoria (PRE) Computerised Information System) which is captured according to quarter degree squares (QDSs). This is referred to the POSA database. For this study, the Site falls within 2525BD, which yielded 225 species. In order to obtain a more representative sample, the QDS 2525DB and 2526AC was incorporated, which yielded 342 species from 79 families. The dominant families being POACEAE, FABACEAE and ASTERACEAE (**Table 8-1**), with the Shrubs representing 29.5%, Herbs representing 18%, and graminiods representing just under 15% of the total species listed for the area (**Table 8-1**). Wooded species in total constitute over 45% of the species within the larger study region. In terms of the site, structural representation was following the trend presented within the larger region, with wooded vegetation being dominant (over 50%). The presence of Graminoids and Geophytic species was limited possibly due to the grazing impacts in the region **(Table 8-1**).

Table 8-1 Top 12 dominant families and most dominant growth forms obtained from the POSA website for the QDS 2525BD, DB, 2526AC and on site

IMPORTANT FAMILIES	No. OF SPP	GROWTH FORMS	% TOTAL SPP	ON SITE
POACEAE	49	Shrub	29.53	9.72
FABACEAE	33	Herb	18.42	13.89
ASTERACEAE	29	Graminoid	14.33	8.33
MALVACEAE	25	Dwarf shrub	10.23	5.56
CYPERACEAE	16	Tree	5.85	36.11

IMPORTANT FAMILIES	No. OF SPP	GROWTH FORMS	% TOTAL SPP	ON SITE
ANACARDIACEAE	11	Climber	4.97	1.39
LAMIACEAE	9	Geophyte	4.97	8.33
RUBIACEAE	9	Cyperoid	4.68	2.78
APOCYNACEAE	7	Succulent	3.22	9.72
COMBRETACEAE	7	Parasite	1.46	-
EUPHORBIACEAE	7	Bryophyte	0.88	2.78
EBENACEAE	6	Hydrophyte	0.29	1.39

8.1.2. On Site - Vegetation Communities

From the field investigations the study area is still in a relatively natural state. The site falls within two geological zones, the Shales of the Pretoria group and the Dolomites of the Malmani Supergroup. To the northwest of Zeerust, bands of chert make up the upper part of the Dolomite beds which gradually go over to ferruginous and cherty quartzites and finally turn into brown and black banded ironstones (Du Toit, 1954). Due to their hardness they have formed a series of low hills (Dinokana Hills) capping the dolomite and extending further northwest towards the Botswana border (Du Toit, 1954; Van der Meulen, 1979). Analyses performed in the Western Central Basin (WCB) where the study site occurs, confirmed that even though the WCB contains only 3% of the savanna biome core area, it harbours 41% of its species richness and has a species/area ratio of 0.07. This high gamma[5] diversity in such a small area can be explained by a low beta diversity between the species rich communities of the savanna and consequently of the WCB. The species richness in the WCB is not equally distributed, some areas are clearly more species rich than others with species richness increasing along an N–S and NW–SE gradient with the highest mean species richness in areas with high variation in relief: 1) hills and lowlands 2) slightly undulating plains 3) lowlands with parallel hills (Kurzweg, 2012).

The vegetation on site is distributed in a complex mosaic pattern, and is not dominated by a single or a few species. This can be seen in the vegetation structure on site, with more diversity occurring within the dolomitic outcrop areas (*C molle - Dombeya* North Facing Slopes). Shale mountainous communities include the *Pappea capensis - Euclea* South Facing Slope Thicket and the similar *Searsia leptodictya- Aloe marlothi - Helichrysum* North Slope Thicket (**Figure 8-1**). Within the valley bottom, on deeper red soils, the community is dominated by species such as *Euclea* and *Dodonaea* (*Euclea-Dodonaea* Lower slope-valley thicket). Along the river (from the Eye of the spring towards downstream) there is a well

[5] Whittaker (1972) defines beta diversity as the extent of differentiation between communities along an environmental gradient. The total diversity of a landscape, the gamma diversity, results from the alpha diversity of its communities and the amount of beta differentiation (beta diversity) among them.

defined Riparian Zone (*Combretum erythrophyllum - Halleria lucida* Riparian Zone) and along the immediate streambank more hydrophytic species are found (*Cyperus-Imperata-Kniphofia* Active River Channel community).

Approximately 4% of the immediate study area has been transformed through the construction of infrastructure, reservoirs, dams and a football field (refer to **Table 8-2**).

Species recorded during the Ecoscan and their associated habitats are within **Table 8-2**.

C erythrophyllum - H lucida Riparian Vegetation

S leptodictya- A marlothi - Helichrysum Slope Habitat

Euclea-Dodonaea Lower slope-valley thicket

Cleared Areas (Transformed habitat)

Figure 8-1 Photographs of the different habitats within and surrounding the site

Table 8-2 Broad Habitat/Vegetation communities

Vegetation Community	Area (hectares)	Conservation Significance
Woodland Habitats		
P capensis - Euclea South Facing Slope Thicket	*6.743*	**Moderate-High**
C molle - Dombeya North Facing Slopes	*1.756*	**Moderate-High**
S leptodictya- A marlothi - Helichrysum North-Northwest Slope	*5.297*	**Moderate-High**
Euclea-Dodonaea Lower slope-valley thicket	*14.592*	**Moderate**
Wetland Habitats		
Cyperus-Imperata-Kniphofia Active River Channel	*0.686*	**Very - High**

C erythrophyllum - H lucida Riparian Vegetation	*2.065*	**Very - High**
Completely Transformed		
Disturbed - Grassed Open Areas	*2.035*	**Low**
Cleared Areas	*0.786*	**Low**
Current Infrastructure	*1.008*	**Low-None**

Dodonaea viscosa

Combretum molle

Aloe marlothi

Dombeya rotundifolia

Figure 8-2 Examples of species found on site

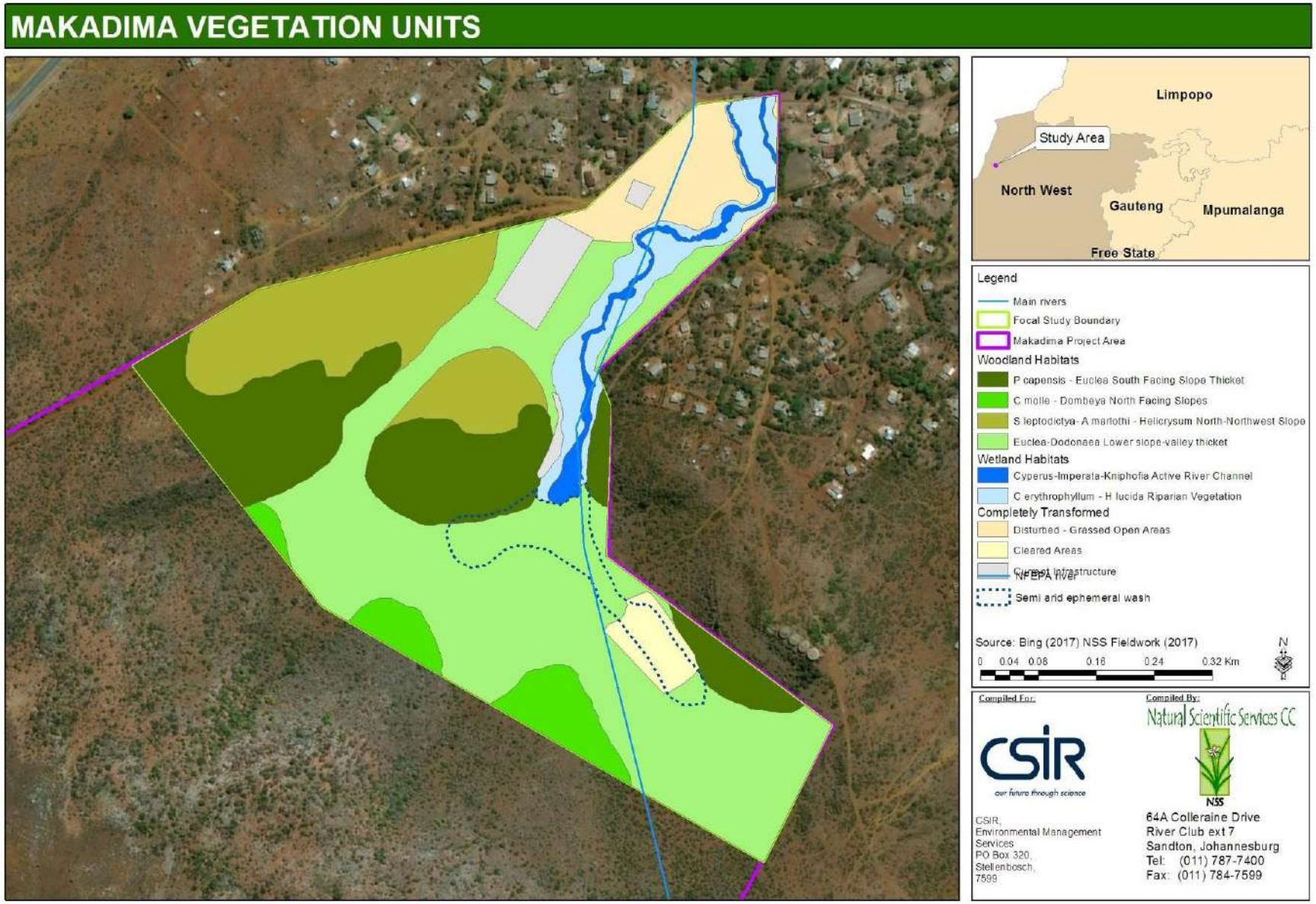


Figure 8-3 Vegetation communities within the study area

Table 8-3 Floral species located during the EcoScan and associated Vegetation Communities

FAMILY	SCIENTIFIC NAME	COMMON NAME	GROWTH	HABITAT					
				Pap- Euc	Com-Dom	Sea-Alo	Euc-Dod	Cyp-Imp	Com-Hal
ACANTHACEAE	*Barleria macrostegia*		Herb			√	√		
ANACARDIACEAE	*Ozoroa paniculosa (Sond.) R.& A.Fern*		Shrub	√		√			
ANACARDIACEAE	*Rhus spp*		Shrub	√					
ANACARDIACEAE	*Searsia lancea (L.f.) F.A.Barkley*	Karee	Tree	√	√	√	√		√
ANACARDIACEAE	*Searsia leptodictya (Diels) T.S.Yi, A.J.Mill. & J.Wen forma leptodictya*		Tree	√	√	√			
ANACARDIACEAE	*Searsia pyroides (Burch.) Moffett var. pyroides*	Common Wild Currant	Tree	√	√	√			√
APOCYNACEAE	*Gomphocarpus fruticosus (L.) Aiton f. subsp. fruticosus*	Milkweed	Dwarf Shrub				√	√	
APOCYNACEAE	*Sarcostemma viminale (L.) R.Br.*	Caustic Vine	Succulent	√	√	√			
APOCYNACEAE	*Tavaresia barklyi*	Bergghaap	Succulent		√				
ASPHODELACEAE	*Aloe cryptopoda Baker*	Geelaalwyn	Succulent			√			
ASPHODELACEAE	*Aloe greatheadii var. davyana (Schonland) Glen & D.S.Hardy*	Spotted Aloe	Succulent			√	√		
ASPHODELACEAE	*Aloe marlothii A.Berger subsp. marlothii*	Mountain Aloe	Succulent	√	√	√			
ASPHODELACEAE	*Bulbine abyssinica A.Rich.*		Geophyte	√	√	√	√		
ASPHODELACEAE	*Kniphofia ensifolia Baker subsp. Ensifolia*		Geophyte					√	
ASTERACEAE	*Felicia muricata (Thunb.) Nees subsp. muricata*	White Felicia	Herb	√	√	√	√		
ASTERACEAE	*Geigeria burkei Harv. subsp. burkei var. burkei*	Vermeersiektebossie	Herb	√	√	√	√		
ASTERACEAE	*Helichrysum spp*		Dwarf Shrub		√		√		
ASTERACEAE	*Helichrysum aureonitens Sch.Bip.*	Golden Everlasting	Herb					√	
ASTERACEAE	*Senecio spp (possibly S pleistocephalus)*		Herb	√		√	√		

FAMILY	SCIENTIFIC NAME	COMMON NAME	GROWTH	HABITAT					
				Pap- Euc	Com-Dom	Sea-Alo	Euc-Dod	Cyp-Imp	Com-Hal
ASTERACEAE	*Helichrysum kraussii Sch.Bip*		Dwarf Shrub			√			
BUDDLEJACEAE	*Buddleja salviifolia*	Weeping Sage	Shrub	√	√	√	√		
CAPPARACEAE	*Boscia albitrunca (Burch.) Gilg & Gilg-Ben*	Sheperd Tree	Tree		√	√			
CELASTRACEAE	*Gymnosporia buxifolia (L.) Szyszyl.*	Common Spike - Thorn	Shrub	√	√	√	√		
CELTIDACEAE	*Celtis africana Burm.f.*	White Stinkwood	Tree						√
COMBRETACEAE	*Combretum erythrophyllum (Burch.) Sond.*	River Bushwillow	Tree				√		√
COMBRETACEAE	*Combretum molle R.Br. ex G.Don*	Velvet Bushwillow	Tree	√	√	√			
COMBRETACEAE	*Combretum zeyheri Sond.*	Large-fruited Bushwillow	Tree		√	√	√		
CRASSULACEAE	*Kalanchoe paniculata Harv.*		Succulent	√	√	√			
CYPERACEAE	*Carex spp*	Wood Sedge	Sedge					√	√
CYPERACEAE	*Isolepis cf. costata Hochst. ex A.Rich*		Sedge					√	√
EBENACEAE	*Diospyros lycioides Desf. subsp. lycioides*	Bluebush	Shrub	√	√	√	√		√
EBENACEAE	*Euclea undulata Thunb.*	Small - leaved Guarri	Shrub	√		√	√		
EUPHORBIACEAE	*Croton gratissimus Burch.*	Fever Berry	Tree		√	√			
FABACEAE	*Acacia caffra (Thunb.) Willd.*	Common Hook Thorn	Tree		√	√	√		
FABACEAE	*Acacia karroo Hayne*	Sweet - thorn	Tree	√		√	√		√
FABACEAE	*Acacia nilotica (L.) Willd. ex Delile var. kraussiana (Benth.) A.F.Hill*	Scented-pod Acacia	Tree	√		√	√		
FABACEAE	*Acacia tortilis (Forssk.) Hayne subsp. heteracantha (Burch.) Brenan*	Umbrella Thorn	Tree	√	√	√	√		
HYACINTHACEAE	*Albuca spp*	Albuca	Geophyte				√		
HYACINTHACEAE	*Ledebouria spp*		Geophyte		√		√		
IRIDACEAE	*Moraea pallida (Baker) Goldblatt*		Geophyte					√	√

FAMILY	SCIENTIFIC NAME	COMMON NAME	GROWTH	HABITAT					
				Pap- Euc	Com-Dom	Sea-Alo	Euc-Dod	Cyp-Imp	Com-Hal
LAMIACEAE	*Leucas capensis (Benth.) Engl.*	African Pitocine	Herb		√		√		√
MALVACEAE	*Dombeya rotundifolia (Hochst.) Planch. var. rotundifolia*	Wild Pear	Tree	√	√				
MALVACEAE	*Grewia flava DC.*	Grey Raisin	Shrub	√	√	√	√		
MORACEAE	*Ficus ingens (Miq.) Miq.*	Red - Leaved Rock Fig	Tree		√				
OLEACEAE	*Olea europaea L. subsp. africana (Mill.) P.S.Green*	African Olive	Tree						√
POACEAE	*Aristida canescens Henrard subsp. canescens*		Graminoid	√	√	√	√		
POACEAE	*Aristida congesta Roem. & Schult. subsp. congesta*	Cat's-tail Three-awned Grass	Graminoid	√	√	√	√		
POACEAE	*Cynodon dactylon (L.) Pers.*	Couch Grass	Graminoid	√	√	√	√	√	√
POACEAE	*Elionurus muticus (Spreng.) Kunth*	Lemon-scented Grass	Graminoid	√	√	√	√		
POACEAE	*Imperata cylindrica (L.) Raeusch.*	Cottonwool Grass	Graminoid					√	√
POACEAE	*Schizachyrium sanguineum (Retz.) Alston*		Graminoid	√	√	√	√		
PTERIDACEAE	*Adiantum capillus-veneris*	Maidenhair Fern	Bryophyte					√	√
RHAMNACEAE	*Ziziphus mucronata Willd. subsp. mucronata*	Buffalo Thorn	Tree	√	√		√		√
RUBIACEAE	*Vangueria infausta Burch. subsp. infausta*	Wild Medlar	Tree	√	√	√			
SAPINDACEAE	*Dodonaea viscosa Jacq. var. angustifolia (L.f.) Benth.*	Cape Sand Olive	Shrub	√	√	√	√		
SAPINDACEAE	*Pappea capensis Eckl. & Zeyh.*	Jacket Plum	Tree	√	√	√			
SCROPHULARIACEAE	*Halleria lucida L.*	Tree Fuschia	Tree						√
SCROPHULARIACEAE	*Jamesbrittenia aurantiaca (Burch.) Hilliard*		Herb				√		
SINOPTERIDACEAE	*Pellaea calomelanos (Sw.) Link var. calomelanos*	Hard Fern	Bryophyte	√	√	√			

FAMILY	SCIENTIFIC NAME	COMMON NAME	GROWTH	HABITAT					
				Pap- Euc	Com-Dom	Sea-Alo	Euc-Dod	Cyp-Imp	Com-Hal
TYPHACEAE	*Typha capensis (Rohrb.) N.E.Br.*	Bulrush	Hydrophyte					√	
VITACEAE	*Rhoicissus tridentata (L.f.) Wild & R.B.Drumm. subsp. tridentata*	Bushman's Grape	Climber	√					√
KEY:	Pap- Euc Com-Dom Sea-Alo Euc-Dod Cyp-Imp Com-Hal	*P capensis - Euclea* South Facing Slope Thicket *C molle - Dombeya* North Facing Slopes *S leptodictya- A marlothi - Helichrysum* North-Northwest Slope *Euclea-Dodonaea* Lower slope-valley thicket *Cyperus-Imperata-Kniphofia* Active River Channel *C erythrophyllum - H lucida* Riparian Vegetation							

8.1.3. Conservation Important Species

It is well documented that heterogeneous landscapes, diverse geology and a range of environmental conditions, provide a diverse number of habitats for plant species (Pickett, *et.al*. 1997; O'Farrell, 2006; KNNCS, 1999). These areas are normally associated with high levels of species endemism and richness. For example, at least 74% of the 23 threatened Highveld plant taxa occur on the crests and slopes of ridges and hills (Pfab & Victor 2002). However, homogenous landscapes, either natural or that have been transformed through historical farming practices and infrastructural development contain minimal diversity and endemism.

With reference to the WCB, a total of 21 (0.9%) endemic species have been recorded for the WCB, (half of the predicted species thought to occur – 43 species). Compared to the Succulent Karoo, which is comparable in size and climate, the degree of endemism in the WCB flora is comparatively low (Cowling & Hilton-Taylor, 1994). However, most of the WCB endemic species are rare (e.g. *Gladiolus filiformis*) or threatened with extinction. In terms of Dolomitic hills, studies have shown that there is a positive trend between species diversity and high dolomite percentage areas (Touré & Ge, 2014). The current site is within relatively natural habitat and situated on moderate sloped hills. These hills are either shale or dolomite based. From the field visit, the dolomitic hills showed (as per studies such as Touré & Ge, 2014) more species diversity than the surrounding habitats.

Although considered a brief Vegetation Scan report, NSS has included a section on Conservation Important (CI) species that were detected or could possibly be detected on site. Within this section the CI species are discussed. These include the National Threatened Plant Species Programme (TSP) lists, any Protected species according to the North West Biodiversity Management (NWBMA) Act 4 of 2016 and any specific Endemic or Rare species.

The Threatened Plant Species Programme (TSP) is an ongoing assessment that revises all threatened plant species assessments made by Craig Hilton-Taylor (1996), using IUCN Red Listing Criteria modified from Davis *et al.* (1986). According to the TSP Red Data list of South African plant taxa (accessed December 2016), there are 46 Red Data listed species (**Table 8-4**) out of a possible 2416 species within North West Province (including Data Deficient species) of which 2 species are Critically Endangered (CR), 4 Endangered (EN), 8 are Vulnerable (VU) and 8 are Near Threatened.

Table 8-4 Numbers of conservation important plant species per Red Data category within South Africa and North West (date accessed: October 2017)

Threat Status	South Africa	NORTH WEST	2525BD /DB
EX (Extinct)	28	0	0
EW (Extinct in the wild)	7	0	0

Threat Status	South Africa	NORTH WEST	2525BD /DB
CR PE (Critically Endangered, Possibly Extinct)	57	0	0
CR (Critically Endangered)	332	2	0
EN (Endangered)	716	4	0
VU (Vulnerable)	1217	8	1
NT (Near Threatened)	402	8	0
Critically Rare (known to occur only at a single site)	153	1	1
Rare (Limited population but not exposed to any direct or potential threat)	1212	4	0
Declining (not threatened but processes are causing a continuing decline in the population)	47	7	2
LC (Least Concern)	13 856	1935	336
DDD (Data Deficient - Insufficient Information)	348	0	0
DDT (Data Deficient - Taxonomically Problematic)	904	12	2
Total spp (including those not evaluated)	**23 399**	**2416**	**342**

**Date accessed – October 2017 (Data on POSA last updated in March 2012)

From the POSA website (2525BD /DB and 2526AC) 6 listed CI species have been recorded in the greater region (**Table 8-5**). Please not that this list is not exhaustive and there is still the potential for other listed species to occur in the region. In addition, the Dwarsberg-Swartruggens Mountain Bushveld is listed as containing the Central Bushveld endemic *Erythrophysa transvaalensis* and the South African endemic *Euphorbia perangusta* (DDT and protected under the NWBMA, Act 4 of 2016). However, *Euphorbia perangusta* likes southern or south-eastern slopes of quartzite ridges (not typical of the study area).

Table 8-5 Potential CI species based on information obtained from 2527BB & 2527BD QDG

FAMILY	SPECIES	STATUS	FLOWERING TIME	HABITAT	LoO
FABACEAE	*Acacia erioloba* E.Mey.	Declining	Late winter to summer	Deep dry sandy soils	Possible
AMARYLLIDACEAE	*Boophone disticha* (L.f.) Herb.	Declining	July - October	Dry grassland and rocky areas.	Possible
EUPHORBIACEAE	*Euphorbia knobelii* Letty	DDT		Woodland / thornveld, wedged among large rocks on the slopes of quartzitic ridges, 1000-1200 m.	Possible (shales and Quartzites of the Pretoria Group)
IRIDACEAE	*Gladiolus filiformis* Goldblatt & J.C.Manning	Critically Rare	Mainly December, but can extend from October to February	Grassland and scrubland on hill slopes and plateaus.	Possible
MYROTHAMN-	*Myrothamnus*	DDT	Spring-	In shallow soil	Possible

FAMILY	SPECIES	STATUS	FLOWERING TIME	HABITAT	LoO
ACEAE	*flabellifolius Welw.*		Summer	over sheets of rock	
ANACARDIACEAE	*Searsia maricoana* (Baker f.) Moffett	VU	Summer	Grassland, at the transition from bushveld, in dark soil among igneous rocks.	Unlikely

* Vulnerable – VU; Data Deficient Taxonomically – DDT

Although no Red Listed species were recorded, unique plants included species such as *Kniphofia ensifolia* and the succulent *Tavaresia barklyi* (Bergghaap) (**Figure 8-4)**. Although *Tavaresia barklyi* has a wide distribution range, it is rarely abundant. According to the latest assessment, the Bergghaap is listed as of Least Concern in South Africa (2009). It is, however, protected under the neighbouring Limpopo Environmental Management Act 2003 in the Limpopo Province (South Africa). The Bergghaap is mainly grown by plant collectors and enthusiasts. Except for its horticultural use, not much is known about other uses. It has been reported that the plant is crushed and externally applied to painful and aching parts of the body as a kind of dressing to alleviate pain.

Tavaresia barklyi

Kniphofia ensifolia subsp. *ensifolia*

Figure 8-4 Photographs of Conservation Important or unique plant species on Site

8.1.4. Alien and Invasives Species

Alien, especially invasive[6] plant species are a major threat to the ecological functioning of natural systems and to the productive use of land. The trend within areas with such high past disturbances and transformation, is considered to be infested with a number of alien species.

A survey conducted in 2007 investigated the indigenous knowledge of the local community towards weeds and alien invasive plants in the Dinokana area (Itholeng, 2007). As part of this study a vegetation survey was conducted. The vegetation survey indicated that there were more *Populus canescens* than other plant species within the region. Approximately 9.4 ha of the land in Maramage Village were invaded by *Populus canescens*. The predominant height classes in terms of Tree Equivalent per hectare (TE/ha) was 2 to 3 meters with a density of 34073 TE/ha, followed by trees of more than 4 meters with a density of 61687 TE/ha (Itholeng, 2007). Directly in the Dinokana Village, the most prominent species identified were mainly *Opuntia imbricata*, *Melia azedarach* and *Lantana camara*. During the NSS surveys, the areas containing the most alien records were along the channel and within the areas where human movements and development was present. According to Smith & Panetta (2002), riparian ecosystems are important for maintaining biodiversity and ecosystem functioning within landscapes. They are prone to alien invasions due to their dynamic nature and high nutrient level. Some of the invasive species, called "transformer species", are capable of markedly changing ecosystem structure and functioning. When the functional values of a riparian system are compromised, downstream ecosystems may be negatively affected. This may occur via reduced water quality and increased nutrient and sediment flows. Once invaded, the riparian vegetation can act as a source of weed propagules for downstream and upstream habitats. It is therefore imperative that these areas obtain priority for alien species removal.

Alien Invasive Categories according to NEM:BA; Act 10 of 2004:

Category 1a
Species requiring compulsory control.
Category 1b
Invasive species controlled by an invasive species management programme
Category 2
Invasive species controlled by area
Category 3

From the ecoscan that was conducted, most of the species recorded were NEMBA Category 1b listed species (**Table 8.5** and **Figure 8-5**) with two Category 2 species present.

[6] Two main pieces of national legislation are applicable to alien, invasive plants, namely the:

- Conservation of Agriculture Resources Act (CARA; Act 43 of 1983); and
- National Environmental Management: Biodiversity Act (NEM:BA; Act 10 of 2004):

Table 8-6 Alien and Invasive Species detected during the survey

Family	Species	Growth forms	NEMBA
ASTERACEAE	*Cirsium vulgare (Savi) Ten.*	Herb	1b
OLEACEAE	*Ligustrum spp*	Tree	1b
MELIACEAE	*Melia azedarach L.*	Tree	1b, (3 urban)
CACTACEAE	*Opuntia ficus-indica (L.) Mill.*	Succulent	1b
ARECACEAE	*Phoenix spp*	Tree	Weed
SALICACEAE	*Populus × canescens (Populus alba hybrid)*	Tree	2
RANUNCULACEAE	*Ranunculus multifidus Forssk.*	Herb	Weed
EUPHORBIACEAE	*Ricinus communis L. var. communis*	Herb	2
CACTACEAE	*Cereus jamacaru DC.*	Succulent	1b
BIGNONIACEAE	*Jacaranda mimosifolia*	Tree	1b

Populus x canesens
(Grey Poplar)

Cirsium vulgare
(Scottish Thistle)

Ligustrum sp.

Jacaranda mimosifolia
(Jacaranda)

Cereus jamacaru
(Queen of the Night)

Figure 8-5 Photographic representation of alien species found in the study area

8.2. Fauna

Provided in the appended lists under **13.2-13.8** is the name and conservation status of each mammal, bird, reptile, frog, butterfly, odonata (dragonfly and damselfly) and scorpion species that was recorded, or was rated with a high, moderate or low Likelihood of Occurrence (LO) in the study area.

8.2.1. Mammals

Approximately 57 mammal species are considered highly likely or likely to occur at least sporadically in the study area (**Appendix 13.2**). This represents 64-67% of the total number of 85 and 89 mammal species recorded, respectively, in the Dwarsberg-Swartruggens and Zeerust Thornveld vegetation types (DREAD unpubl. data). Most of the 33-36% of mammal species, which are known to occur in the regional vegetation types, but which have not been listed for the study area, represent species that are typically vulnerable to anthropogenic disturbance.

Local project team members and other community members indicated that mongeese and tree squirrels are seen regularly in the study area. Kudu, jackals, porcupines, baboons and Brown Hyenas are reportedly encountered on occasion in the surrounding region. A number of Southern African / Common Mole-rat mounds were found in the proposed picnic area, and Scrub Hare and/or Jameson's Red Rock Hare / Rabbit droppings were found amidst the rocky hill slopes on site (**Figure 8-6**).

Other regionally-occurring rupiculous mammal species, which were rated with a high or moderate LO in the study area include e.g. Eastern Rock Elephant Shrew, Namaqua Rock Mouse and Rock Hyrax. Large, regionally-occurring wetland-associated mammal species e.g. African / Cape Clawless Otter, Greater Cane Rat, and Marsh / Water Mongoose, were rated with a low LO due to the small size of the in situ wetland system and local high levels of anthropogenic disturbance. Poor grass cover caused by livestock over-grazing potentially precludes mammal taxa such as climbing mice, the Near Threatened (NT) Southern African Hedgehog and Serval.

Common regionally-occurring fauna such as Bush / Common Duiker, Steenbok, Vervet Monkey and Warthogs were rated with a low LO on site due to local high levels of anthropogenic disturbance and lacking anecdotal accounts of these taxa. The widely exploited Ground Pangolin probably no longer occurs. An estimated 14 bat species were rated with a high or moderate LO in the study area. While some of these bat species are expected to roost in trees and buildings in the study area, others are expected to roost in nearby caves (such as the Derdepoort limestone and Marico Eye caves), which have formed in the dolomitic terrain that extends south-westwards from the site. Alien mammals, which were detected in the study area, included cattle, horses, donkeys, goats and dogs (**Figure 8-6**). Domestic cats presumably also occur.

Common Mole-rat
(*Cryptomys hottentotus*) mounds

Scrub Hare (*Lepus saxatilis*) and/or
Jameson's Red Rock Rabbit (*Pronolagus randensis*) droppings

Cattle
(*Bos taurus*)

Horses
(*Equus caballus*)

Donkeys
(*Equus asinus*)

Probable goat
(*Capra aegagrus hircus*) droppings

Figure 8-6 Evidence of mammal species in the study area

At least four mammal species with a known threatened or Protected status may occur or least visit the study area on occasion (**Table 8-7**).

- The regionally Endangered (EN) Percival's Short-eared Trident Bat (SANBI & EWT unpubl. data) is sparsely distributed mainly in north-eastern South Africa. “The entire southern African population may well be restricted to less than 20 caves”; although the species could be more common given that it is difficult to catch with conventional bat-catching mist-nets (Monadjem *et al.* 2010). According to DREAD (unpubl. data), Percival's Short-eared Trident Bat has been recorded in each of the three regional vegetation types. “The habitat preferences of this species is not well known, but it appears to be associated with woodland” (Monadjem *et al.* 2010. Percival's Short-eared Trident Bat was, therefore, rated with a moderate LO in the study area.
- The Brown Hyena is a national Protected Species (PS) and is listed as globally and regionally Near Threatened (NT; SANBI & EWT unpubl. data). In North West Province (and elsewhere) this species favours areas with rugged terrain (Power 2011) and, as previously mentioned, community members indicated that this species is known to occur in the surrounding region. Given the local high level of anthropogenic disturbances, however, this species was rated with a moderate LO within the study area.
- The regionally NT Blasius’s Horseshoe Bat (SANBI & EWT unpubl. data) is widely but sparsely distributed in savanna woodland in eastern southern Africa, where it roosts in small groups of up to four individuals in caves and mine adits. Considering that the study region may provide suitable foraging and roosting habitat for this species, given its typical rarity, it was rated with a moderate LO in the study area.
- The Swamp Musk Shrew is regionally NT (SANBI & EWT unpubl. data). Little is known about this small, inconspicuous insectivore except that it typically inhabits dense, matted vegetation near wetlands (Stuart & Stuart 2000). According to DREAD (unpubl. data), the Swamp Musk Shrew has been recorded in each of the three regional vegetation types. As NSS has found that Swamp Musk Shrews are common at wetlands, which remain in good condition within this species’ distribution range, it was rated with a high LO along (especially the protected headwaters) of the in situ wetland system.

8.2.2. Birds

Approximately 396 bird species are listed for QDS 2525BD (Roberts VII 2013), of which 300 were rated with a high or moderate LoO in the study area. Approximately 196 bird species have been recorded in pentad 2525_2550 (SABAP 2 2017), and 55 bird species were detected during our brief site visit (**Appendix 13.3**). Bird species that were recorded during the site visit mostly represent common, widespread species that are tolerant to a large extent of anthropogenic disturbance (e.g. bulbuls, doves, mousebirds, prinias, robins, shrikes, swallows, weavers). Along the in situ wetland system, Dark-capped and Red-eyed bulbuls, Cape Weavers, Robin-chats, Wagtails and White-eyes, Speckled Mousebirds,

Southern Boubou, Neddicky, and Black-chested and Tawny-flanked prinias were frequently heard. In the surrounding bushveld Black-throated Canaries, Laughing Doves, Kalahari and White-browed Scrub robins, Cape Glossy and Red-winged Starlings, Chestnut-vented Tit-babblers, and Blue Waxbills were repeatedly detected. Observed aerial-feeding birds included European Bee-eaters, Common and Little swifts, Greater and Lesser striped swallows, Red-breasted Swallows and Rock Martins.The most note-worthy bird observation was that of a single **Critically Endangered (CR) White-backed Vulture** soaring overhead.

Apart from many regionally-occurring bird species that are classified as provincial Protected Game, at least 12 bird species, which are nationally Protected and/or globally or regionally threatened, were rated with a high or moderate LO in the study area (**Table 8-8**).

- The White-backed Vulture, which is globally and regionally CR, and nationally EN under NEM:BA, typically inhabits lowland savanna with *Acacia* trees. It is a gregarious species congregating at carcasses, in thermals, and at roost sites. Breeding birds nest in loose colonies, and require tall trees for nesting. Although this species was seen soaring overhead during our visit, it is unlikely to nest on site due to the paucity of large trees and local high levels of disturbance. If, however, carrion becomes available, White-backed Vultures *might* forage on site depending on prevailing disturbances.
- The Cape Vulture, which is EN globally, regionally and under NEM:BA, is usually found near mountains where it breeds and roosts on cliffs. However, individuals can travel large distances to search for carrion in open country. As with the White-backed Vulture, if carrion becomes available, Cape Vultures *might* forage on site depending on their risk of disturbance. This species was, therefore, rated with an optimistic moderate LO.
- The Lappet-faced Vulture, which is EN globally, regionally and under NEM:BA, typically inhabits dry savanna where it constructs solitary nests mainly in *Acacia*, but also *Terminalia* and *Balanites* trees. Individual Lappet-faced Vultures can travel large distances in search of carrion, although this vulture species is also known to hunt prey. As with the afore-mentioned vulture species, Lappet-faced Vultures *might* forage on site and, therefore, this species was also rated with an optimistic moderate LO.
- The Steppe Eagle, which does not have a national threatened or Protected status, has been listed as globally EN. This is because within its European range, the Steppe Eagle has undergone extremely rapid population declines as a result of the conversion of steppes to agricultural land, combined with their direct persecution and mortality on power lines and wind turbines (BirdLife International 2016). Steppe Eagles preferably inhabit open savanna woodland where they prey primarily on termites but also Red-billed Quelea nestlings. Considering that there is no SABAP 2 record of this species from pentad 2525_2550 and no SABAP 1 record of this species from QDS 2525BD (SABAP 2 2017), the LO of this species in the study area was rated as moderate.

Table 8-7 Potentially occurring conservation important mammal species

SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	RSA RED LIST STATUS	QDS (MammalMAP 2017)	LO ON SITE
Cloeotis percivali	Percival's Short-eared Trident Bat			LC (U)	EN	3	3
Hyaena brunnea	Brown Hyena	PS	PG	NT (D)	NT	2	3
Rhinolophus blasii	Blasius's Horseshoe Bat			LC (D)	NT	3	3
Crocidura mariquensis	Swamp Musk Shrew			LC (U)	NT	2	2

Status: D = Declining; EN = Endangered; LC = Least Concern; NT = Near Threatened; PG = Protected Game; PS = Protected Species; U = Unknown population trend

Likelihood of Occurrence (LO): 2 = High; 3 = Moderate

Sources: Transvaal Nature Conservation Ordinance (1983); Stuart & Stuart (2007); Monadjem *et al.* (2010); NEM:BA ToPS (2015); IUCN (2016); MammalMAP (2017); DREAD (unpubl. data)

Table 8-8 Potentially occurring conservation important bird species

SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	REGIONAL RED LIST STATUS	QDS (ROBERTS VII)	QDS (SABAP 1)	PENTAD (SABAP 2)	LO ON SITE
Gyps africanus	White-backed Vulture	EN	PG	CR	CR	1			1
Gyps coprotheres	Cape Vulture	EN	PG	EN	EN	1	1		3
Torgos tracheliotos	Lappet-faced Vulture	EN	PG	EN	EN	1	1		3
Aquila nipalensis	Steppe Eagle		PG	EN	LC	1			3
Sagittarius serpentarius	Secretarybird		PG	VU	VU	1	1		3
Falco biarmicus	Lanner Falcon		PG	LC	VU	1	1		3
Gorsachius leuconotus	White-backed Night Heron		PG	LC	VU	1			3
Falco vespertinus	Red-footed Falcon		PG	NT	NT	1			3
Certhilauda chuana	Short-clawed Lark		PG	LC	NT	1			3
Ciconia abdimii	Abdim's Stork		PG	LC	NT	1			3
Coracias garrulus	European Roller		PG	LC	NT	1		1	2
Leptoptilos crumeniferus	Marabou Stork		PG	LC	NT	1			3

Status: CR = Critically Endangered; EN = Endangered; LC = Least Concern; NT = Near Threatened; PG = Protected Game; VU = Vulnerable

Likelihood of Occurrence (LO): 1 = Present; 2 = High; 3 = Moderate

Sources: Transvaal Nature Conservation Ordinance (1983); Roberts VII (2013); NEM:BA ToPS (2015); Taylor *et al.* (2015); SABAP 2 (2017)

- The globally and regionally VU Secretarybird inhabits a diversity of grasslands and savanna where breeding birds typically nest on flat-topped *Acacia* trees. Although this species was recorded in QDS 2525BD during the SABAP 1 (SABAP 2 2017), and although Secretarybirds could potentially forage in the study area, there are few trees that seem suitable for nesting, and local levels of disturbance are potentially too high for this sensitive species. This species was, therefore, rated with a moderate LO in the study area.
- The regionally VU Lanner Falcon favours open grassland or woodland in the vicinity of cliff or electricity pylon breeding sites (Roberts VII 2013). Although there appears to be no nearby cliffs and pylons, there are small birds and other suitable prey for Lanner Falcons in the study area. Given this, and that the species was recorded in QDS 2525BD during the SABAP 1, it was rated with a moderate LO in the study area.
- The regionally VU White-backed Night Heron is regarded as an uncommon species - although this nocturnal bird is often overlooked. It occurs singly or in pairs in overhanging vegetation along the quiet backwaters of clear, slow-flowing perennial rivers and streams (Roberts VII 2013). Considering that these habitat conditions are available around the protected headwaters of the Dinokana Eye, this species was rated with a moderate LO although there is no record of this species from pentad 2525_2550 (SABAP 2 2017).
- The globally and nationally NT Red-footed Falcon favours open semi-arid and arid savannas, and preys mainly on insects, especially termites and grasshoppers (Roberts VII 2013). However, as there is no SABAP 2 record of this species from pentad 2525_2550, and no SABAP 1 record of this species from QDS 2525BD (SABAP 2 2017), it was only rated with a moderate LO in the study area.
- The regionally NT Abdim's Stork, which is a non-breeding visitor in South Africa, generally occurs in large flocks in savanna, grassland, cultivated lands and even suburban areas, feeding on termite alates, grasshoppers, crickets, locusts and other large insects (Roberts VII 2013). As there is no SABAP 2 record of this species from pentad 2525_2550, and no SABAP 1 record of this species from QDS 2525BD (SABAP 2 2017), and as flocks of this species would be vulnerable to disturbance in the study area, it was rated with a moderate LO at best.
- The regionally NT European Roller overwinters in South Africa primarily in dry wooded savanna and bushy plains, and is known to forage in agricultural habitats including fallow lands. Habitat conditions appear to be suitable on site for the European Roller, and considering that there is a 2013 record of this species from pentad 2525_2550 (SABAP 2, 2017), it was rated with a high LO.
- The regionally NT Marabou Stork favours semi-arid areas where populations are concentrated in game reserves where carrion is readily available. Marabou Storks are primarily scavengers, which may frequent rubbish dumps, but also catch small vertebrate and insect prey. Nests are constructed in tall trees often near water, and birds roost communally at traditional sites (Roberts VII 2013). Although Marabous are unlikely to roost or nest on site, like vultures, they *might* feed on available carrion and have, therefore, been rated with an optimistic moderate LO.

- The regionally NT Short-clawed Lark has a small, fragmented distribution in central and north-western South Africa and south-eastern Botswana, where it favours sparsely vegetated semi-arid *Acacia* savanna (Roberts VII 2013). As the arid bushveld on site is not dominated by *Acacia*s, and as there is also no SABAP record of this species from pentad 2525_2550 (SABAP 2 2017), this species was also rated with an optimistic moderate LO on site.

An additional 24 regionally-occurring bird species with a threatened and/or Protected status were rated with a low LO (**Appendix 13.3**) due to unsuitable conditions (e.g. high levels of disturbance, unsuitable habitat, limited suitable prey, etc.) in the study area. Examples include the African Finfoot, Grass-owl and Marsh Harrier, both flamingo and pelican species, Black and Yellow-billed Storks, Blue Crane, the White-bellied Korhaan and Kori Bustard.

8.2.3. Reptiles

Approximately 47 reptile species are considered highly likely or likely to occur at least occasionally in the study area (**Appendix 13.4**). This represents 75% of the total number of 63 reptile species recorded in both the Dwarsberg-Swartruggens and Zeerust Thornveld vegetation types (DREAD unpubl. data). Most of the 25% of reptile species, which are known to occur in the regional vegetation types, but which have not been listed for the study area, represent species that are typically vulnerable to anthropogenic disturbance.

During our site visit Southern Rock Agama (**Figure 8-7**) was detected on a rocky hill slope, and Speckled Rock Skink was found on built infrastructure near the Eye. Variable Skink, Cape Skink, Spotted Sand Lizard, Yellow-throated Plated Lizard, Common Dwarf Gecko, Cape/Transvaal Gecko and Southern Tree Agama are likely also common in the study area. Local project team members and other community members indicated that the Rock Monitor, Common Flap-neck Chameleon, Boomslang, Mozambique Spitting Cobra and Python are known to occur in the greater study region.

Southern Rock Agama
(*Agama atra*)

Red Toad
(*Schismaderma carens*)

Figure 8-7 Evidence of reptile and frog species on site

Table 8-9 Potentially occurring conservation important reptile and frog species

SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL OR REGIONAL RED LIST STATUS	QDS (Community pers. comm.)	LO ON SITE
Python natalensis	Southern African Python	**PS**	**WA**	2LC	1*	3
Pyxicephalus adspersus	Giant Bullfrog		**PG**	**1NT**	1*	4

Status: 1 = Global; 2 = Regional; D = Declining; LC = Least Concern; NT = Near Threatened; PG = Protected Game; PS = Protected Species; WA = Wild Animal

Likelihood of Occurrence (LO): 1* = Present (based on anecdoctal accounts of community members); 3 = Moderate; 4 = Low

Sources: Transvaal Nature Conservation Ordinance (1983); Minter *et al.* (2004); Bates *et al.* (2014); NEM:BA ToPS (2015); IUCN (2016); FrogMAP (2017); ReptileMAP (2017)

Red-lipped and Brown Water snakes likely occur in association with the in situ wetland system. The Common and Jone's girdled lizards were rated with a moderate LO on site as they are most likely to occur south-westwards of the site, where large rocks over appropriate sized cracks and crevices for these lizards.

The South African Marsh Terrapin, Lobatse Hinged Tortoise, Speke's Hinged Tortoise, Serrated Tent Tortoise and Leopard Tortoise were rated with a low LO on site considering the high local level of anthropogenic disturbances. Local project team members and other community members indicated that although tortoises are found in the surrounding region, they are no longer seen in the study area. The only potentially occurring CI reptile species is the python (**Table 8-9**).

- The Southern African Python is listed as a Protected Species under NEM:BA. It typically inhabits savanna where it favours rocky areas and water. Suitable habitat for this species is, therefore, present in the area and, as previously mentioned, community members indicated that Python is known to occur in the region. Given, however, the high levels of anthropogenic disturbance in the vicinity of the Eye, the Python was only rated with a moderate LO on site.

8.2.4. Frogs

Approximately 19 frog species are considered highly likely or likely to occur at least occasionally in the study area (**Appendix 13.5**). This matches the total number of 19 and 20 frog species recorded, respectively, in the Zeerust Thornveld and Dwarsberg-Swartruggens vegetation types (DREAD unpubl. data). In other words, all frog species which are known to occur in the regional vegetation types are also expected to occur on site.

During our site visit a Red Toad was found in close proximity to the in situ wetland (**Figure 8-7**), and Plain Grass Frogs were heard calling in the stream channel. The Common Platanna and Queckett's River Frog were rated with a high LO in the in situ wetland system. Bubbling Kassina, Common Caco, Guttural and Olive toads likely also occur.

The terrestrial-breeding Bushveld Rain Frog was rated with a high LO. Common, regionally-occurring frog species, which favour shallow, still-standing temporary or ephemeral water for breeding, such as the Banded Rubber Frog, Tremolo Sand Frog and Southern Pygmy Toad, were rated with a moderate LO given the apparent limited availability of such habitat on site. Community members indicated that bullfrogs occur in the surrounding region. The only potentially occurring conservation important frog species is the Giant Bullfrog (**Table 8-9**).

- The Giant Bullfrog is listed as regionally NT by Minter *et al.* (2004). For most of the year bullfrogs are buried in a state of torpor, and are typically active aboveground for a night or two after heavy rain in November-January. Bullfrog breeding is limited to a few days in the year and occurs in shallow, standing, seasonal water with emergent grassy

vegetation. Bullfrog foraging appears to be concentrated around their burrows, which may be situated up to 1km from their breeding site (Yetman & Ferguson 2011). Therefore, although the perennial, flowing in situ wetland is unlikely to support bullfrog breeding, Giant Bullfrogs could occasionally disperse and migrate through the study area. The Giant Bullfrog was, therefore, rated with a moderate LO on site.

8.2.5. Butterflies

Based on the published butterfly distribution maps in Mecenero *et al.* (2013), approximately 87 butterfly species were rated with a high or moderate LO in the study area (**Appendix 13.6**). Sixteen butterfly species were detected during our site visit, which included the common and widespread African Monarch, Broad-bordered Grass Yellow, Brown-veined White, Citrus Swallowtail and Yellow Pansy. A number of common and widespread Lycaenid butterfly species were seen throughout the site, which were concentrated at mud puddles on the dirt road near the Eye (**Figure 8-8**). No potentially occurring butterfly species has a known threatened or Protected status.

8.2.6. Odonata

Based on the published odonatan distribution maps in Samways (2006), approximately 28 dragonfly and damselfly species were rated with a high or moderate LO in the study area (**Appendix 13.6**). Four species were detected at or near the Eye during our site visit. These included the Broad Scarlet, Powder-faced / Kersten's Sprite, Dancing Jewel and Guinea Skimmer (**Figure 8-8**), which have Biotic Index scores of 0, 1, 2 and 4, respectively. Samways' (2008) Biotic Index is "based on three criteria: geographical distribution, conservation status and sensitivity to change in habitat. It ranges from a minimum of 0 to a maximum of 9. A very common, widespread species which is highly tolerant of human disturbance scores 0. In contrast, a range-restricted, threatened and sensitive endemic species scores 9." The presence of Guinea Skimmers at the Eye indicates that at this point, the system remains in fair (or better) condition. The VU Makabusi Sprite, which has a localised distribution in Limpopo Province, was rated with a low LO, but cannot be discounted. No other potentially occurring odonatan species has a known threatened or Protected status.

8.2.7. Scorpions

Approximately eight scorpion species are considered highly likely or likely to occur in the study area (**Appendix 13.8**). Although no specimens were found during our visit, rock-turning revealed that the presence of millipede carcasses, suggesting that scorpions are indeed present on site. Scorpion species most likely to occur based on their published distributions (Leeming 2003) and observed habitat conditions (especially substrates and shelter) on site, include the highly venomous *Parabuthus mossambicensis* and *P. transvaalicus*, and *Uroplectes carinatus* and *Opistophthalmus glabifrons*, which are found in scrapes under rocks and surface debris in areas of hard substrate. None of the potentially occurring scorpion species has a threatened or Protected status.

Topaz Babul Blue
(*Azanus jesous*)

Citrus Swallowtail
(*Papilio demodocus demodocus*)

Pea Blue
(*Lampides boeticus*)

Peppered Hopper
(*Platylesches ayresii*)

Guinea-fowl Butterfly
(*Hamanumida daedalus*)

Dusky Line Blue
(*Pseudonacaduba sichela sichela*)

Dotted Blue
(*Tarucus sybaris sybaris*)

Veined Tip
(*Colotis vesta argillaceus*)

Brown-veined White
(*Belenois aurota*)

Tiny / Gaika Grass Blue
(*Zizula hylax*)

Cupreous Blue
(*Eicochrysops messapus mahallakoaena*)

Twin-spot Blue
(*Lepidochrysops plebeia plebeia*)

Figure 8-8 Evidence of butterfly species on site

Dancing Jewel
(*Platycypha caligata*)

Broad Scarlet
(*Crocothemis erythraea*)

Guinea Skimmer
(*Orthetrum guineense*) male

Guinea Skimmer
(*Orthetrum guineense*) female

Powder-faced / Kersten's Sprite
(*Pseudagrion kersteni*) male

Powder-faced / Kersten's Sprite
(*Pseudagrion kersteni*) female

Figure 8-9 Evidence of odonata species on site

8.3. Wetlands

In spite of the semi-arid setting, the study area supports wetland systems fed predominantly by groundwater inputs from the Dinokana Eye as well as surface water runoff from the clearly defined catchment basin immediately upstream. Karstic springs such as these are important resources, not least in terms of their strategic value in supplying large volumes of clean water for human use but also their ecological value in supporting unique species assemblages and a diversity of life in an otherwise dry environment. The source of this groundwater is the Dinokana-Lobatse Aquifer which forms part of a much larger karstic landscape known as the north-west dolomites.

Unlike the wetlands on site (for which there is very limited information) the active channel of the Mmaphanyane has been well studied. The Department of Water Affairs and Sanitation (DWS) monitors flow rate (since 1960) and water quality (since 1971) from the gauging station at Dinokana Upper (WMS 101764, A1H001; co-ordinates: 25° 27' 25.2"S and 25° 51' 11.9"E). Monitoring data (2005-2014) on the fish and aquatic macro-invertebrate assemblages exists for the reaches below the Eye (DWS, 2015). Results of these studies suggest that the water quality is of a good standard and that these near oligotrophic conditions support a variety of unique and sensitive aquatic biota. The data from DWS (2017) are depicted in **Figure 8-11**.

Since 1971, the 17 measured water quality parameters have all remained within “very good” limits. Water flow has fluctuated around a median value of 0.1m^3/s from a high of 0.263m^3/s in the late 1970s, to a low of 0.054m^3/s in the late 1990s and again from 2016 until February 2017 (**Figure 8-11**). As DWS biomonitoring data are not available post-February 2017, during the October 2017 site visit NSS also performed an in situ water quality test at co-ordinates 25°27'24.12"S and 25°51'12.07"E, close to the DWS WMS 101764. Our water sampling revealed a pH of 7.51(neutral tending to alkaline), electrical conductivity (EC) of 0.1, and TDS of 201mg/L (all within the TWQR for aquatic ecosystems). These values correspond with the latest available (February 2017) data from the DWS (2017). Evidently, in the upper reaches of the Dinokana wetland system, water quality remains very good and is, therefore, of high economic and conservation importance, and disturbances that could impact the system’s water quality and flow should be strictly prohibited.

The average flow rate of 3.56 Mm^3/a far exceeds those recorded at all three of the other major eyes within the Dinokana / Lobatse Aquifer. Water flow has fluctuated around a median value of 0.1m^3/s from a high of 0.263m^3/s in the late 1970s, to a low of 0.054m^3/s in the late 1990s and again from 2016 until February 2017. However, the data also show that the overall trend in flow is negative (**Figure 8-10**). Current impacts to the various wetland HGM units identified on site are detailed in **Section 8.1.2** and summarised together with other important information in **Table 8-10** and **Table 8-11.**

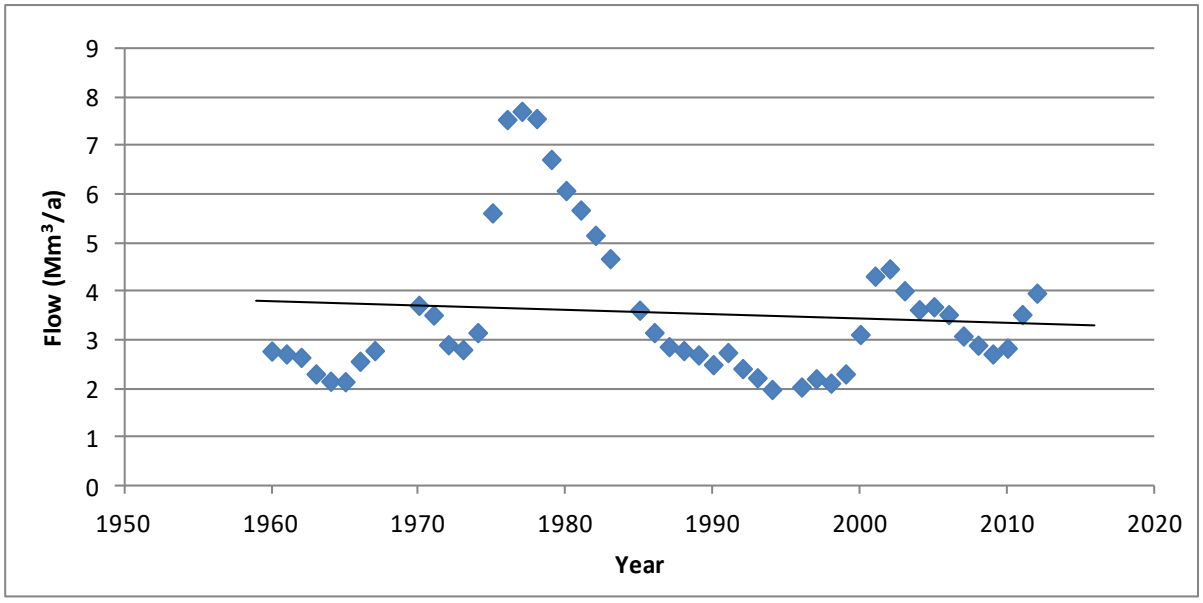


Figure 8-10 Flow volumes recorded at the upper Dinokana Eye (data courtesy of DWS)

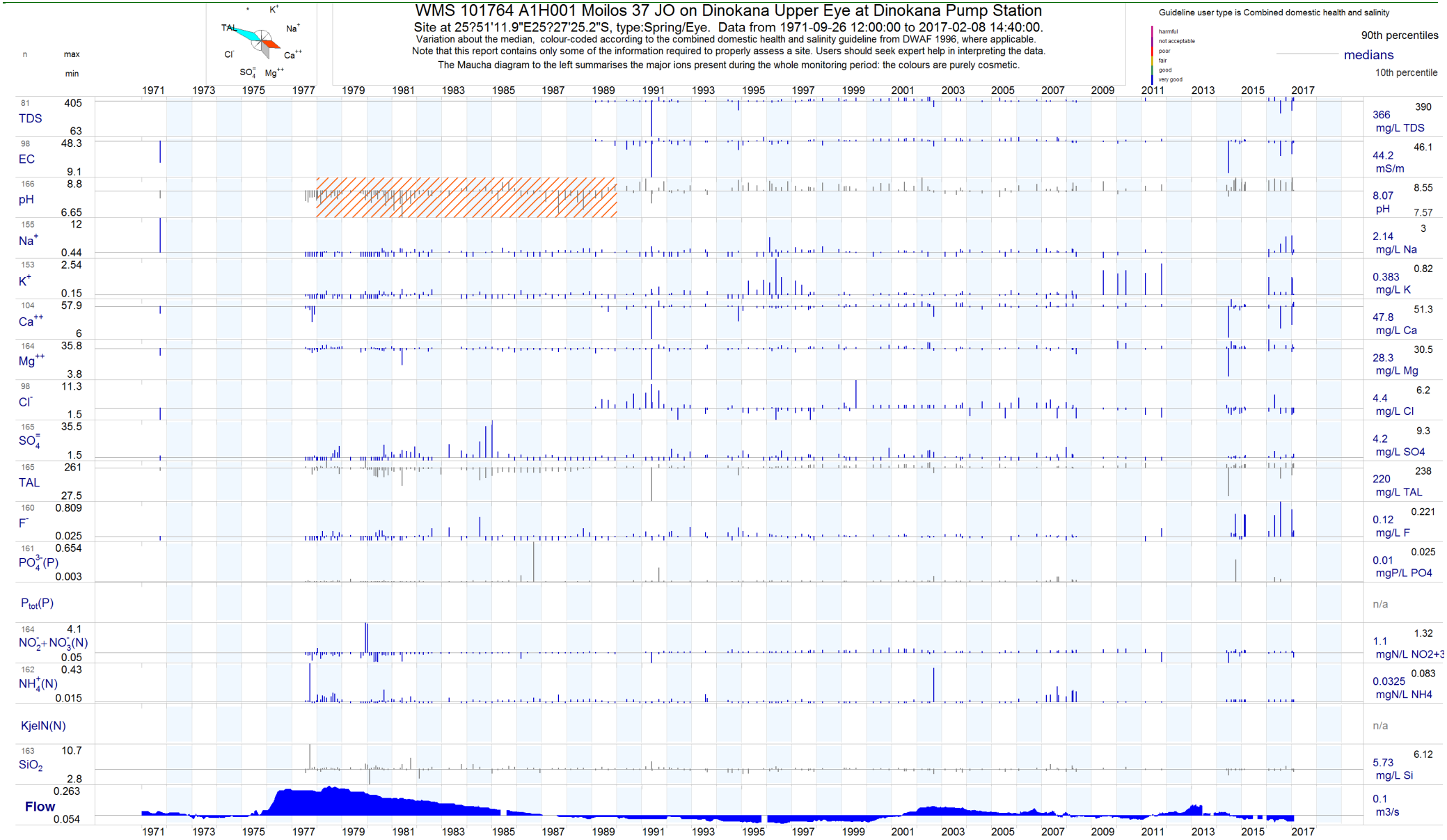


Figure 8-11 Water quality and flow data from the upper Dinokana wetland (data courtesy of DWS)

Table 8-10 Wetland summary HGM Units 1 & 3

HGM Units 1 & 3 – Channelled Valley-bottom with Active Channel			
			
	Seep	Seep	
			
HGM Unit 1 (light blue) & 3 (dark blue)	Mottling in Dundee soils	*Cyperus* cf. *congestus*	
SETTING			
Coordinates (Centroid)	25°27'26.52"S; 25°51'11.85"E	Level 1: System	Inland
Altitude (m.a.s.l)	1350	Level 2a: Ecoregion	11.09 / 7.04
Aspect	NNE	Level 2b: NFEPA WetVeg	Central Bushveld Group 1
Regional vegetation	SVcb4	Level 3: Landscape unit	Valley floor
Quaternary catchment	A10A	Level 4a:	Channelled valley-bottom
CPLAN V3.3	CBA 1	Level 4b:	NA
Area (ha)	2.85	FEPA Wet Veg Status	CR / NP
SITE DESCRIPTION			
Overview	A narrow channelled valley-bottom system fed by a karstic spring (Dinokana Eye) in semi arid bushveld. A DWA pump, gauging and purification station occurs at the Eye. Water quality good.		
Wetland indicators	Vegetation and topographic indicators present. Redoxymorphic features (mottles) absent. Use of mottles as a reliable wetland indicator in dolomitic soils is limited.		
Impacts	Moderate to high levels of abstraction of both groundwater (boreholes for regional water provision) and surface water (partial diversion through furrow to dams for local water provision), clearing of riparian vegetation, settlements, human activity, livestock trampling and poaching of wetland vegetation, sedimentation, downstream litter, cultural practices and minor encroachment by alien and invasive vegetation.		
Vegetation	Riparian zone dominated by large trees such as *Searsia lancea, Celtis africana, Combretum erythrophyllum, Halleria lucida, Rhamnus prunoides, Ziziphus mucronata*		
Soil characteristics	Ubiquitous red iron and manganese rich sandy soils, no mottles present.		
Present Ecological State (PES)			
Hydrology	Geomorphology	Vegetation	
D	**C**	**C**	
Wetland Ecosystem Services			
Mostly direct provisional (clean water and crops) and cultural (tourism and spiritual value) benefits but also biodiversity maintenance (supports various sensitive aquatic macro-invertebrate and unique / conservation important plant taxa).			
Wetland Importance and Sensitivity			
Hydrological	Ecological	Cultural	
Very High (3.6)	**High (2.4)**	**Very High (3.3)**	

Table 8-11 Wetland summary HGM Unit 2

HGM Unit 2 – Semi-arid Ephemeral Wash			
 HGM Unit 2	 Channelled outflow Mottling in Dundee soils	 Soccer pitch in HGM unit  Deep red soils *Cyperus* cf. *congestus*	
SETTING			
Coordinates (Centroid)	25°27'28.82"S; 25°51'12.86"E	Level 1: System	Inland
Altitude (m.a.s.l)	1351	Level 2a: Ecoregion	11.09
Aspect	N	Level 2b: NFEPA WetVeg	Central Bushveld Group 1
Regional vegetation	SVcb4	Level 3: Landscape unit	Slope
Quaternary catchment	A10A	Level 4a:	Seep
CPLAN V3.3	CBA 1	Level 4b:	With channelled outflow
Area (ha)	1.94	FEPA Wet Veg Status	EN / NP
SITE DESCRIPTION			
Overview	Indistinct, ephemeral wash system.		
Wetland indicators	Topographical. Signs of sheet flow obvious. Vegetation indicators indistinct apart from slight difference in structure. Use of mottles as a reliable wetland indicator in dolomitic soils is limited.		
Impacts	Head cut erosion upstream of Eye, clearing for soccer field and increased bare and exposed surfaces due to overgrazing		
Vegetation	*Searcia lancea*, *Dodonaea viscosa*, *Acacia tortillis* , *Grewia flava*		
Soil characteristics	Deep red iron and manganese rich sandy Hutton soils, no mottles present		
Present Ecological State (PES)			
Hydrology	Geomorphology	Vegetation	
B	**C**	**C**	
Wetland Ecosystem Services			
Mostly catchment of water, sediment trapping, provision of clean water, and tourism / cultural benefits.			
Wetland Importance and Sensitivity			
Hydrological	Ecological	Cultural	
Very High (3.2)	**High (2)**	**High (2.2)**	

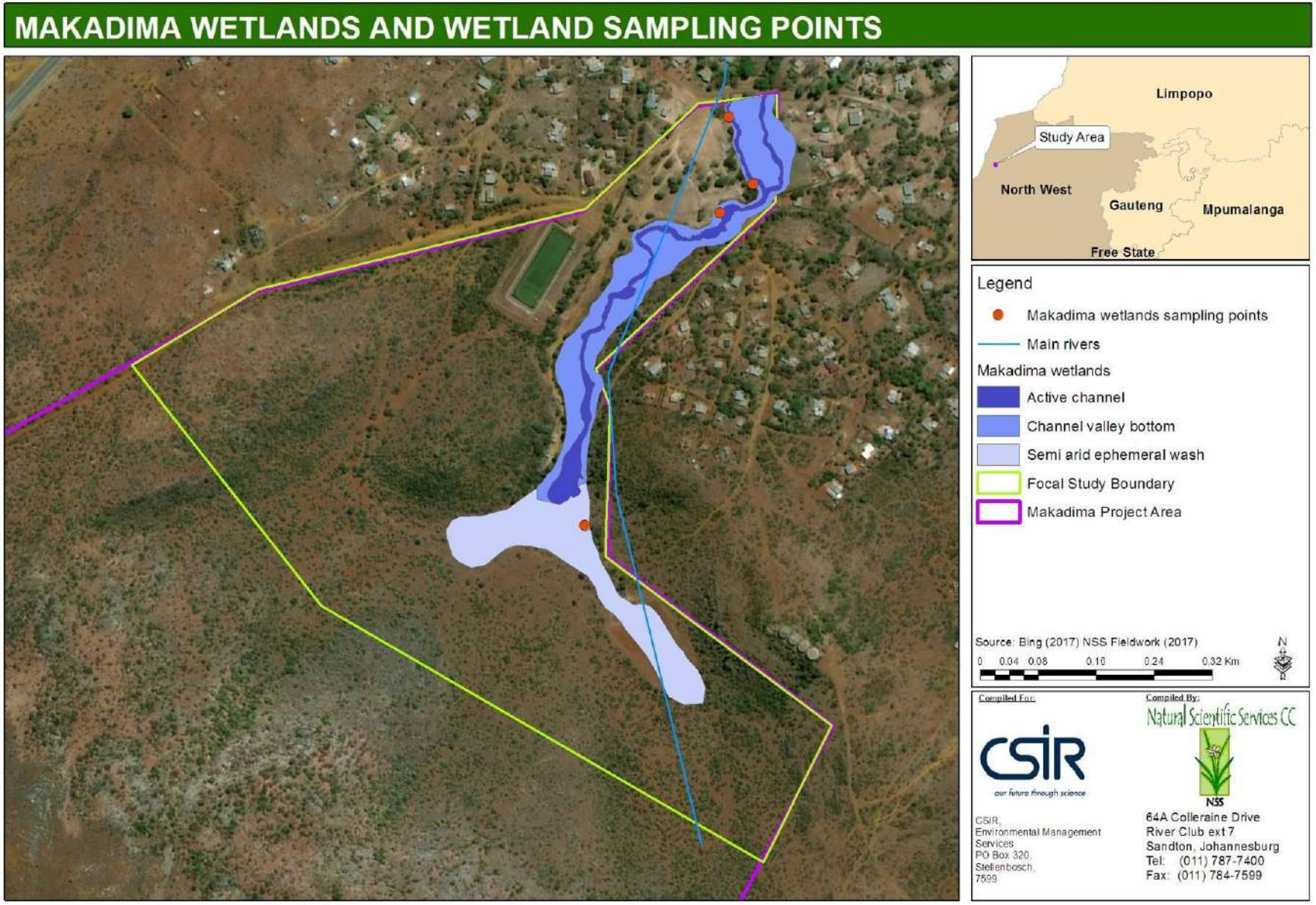


Figure 8-12 Current wetland extent

8.3.1. Wetland Classification and Extent

Three HGM units were identified on site. These include the Mmaphanyane Channelled Valley-bottom wetland (HGM Unit 1) and associated active channel (HGM Unit 3) as well as the semi-arid ephemeral wash immediately upstream of the Dinokana Eye (HGM Unit 2). The active channel (HGM Unit 3) was distinguished as its own HGM Unit following the recommendations made in Ollis *et al.* 2013 but was not assessed individually but rather grouped under the HGM Unit 1 following the broader RAMSAR definition of a wetland which includes the active channel as part of the wetland. The Level 1-4 wetland classification (Ollis *et al.* 2013) for both wetland HGM units is given in **Table 8-10** and **Table** 8-11**.** The current wetland extent is depicted in **Figure 8-12**.

It is important to note that the site was located on dolomitic ground and consequently the lack of redoximorphic features (mottles) in the soil samples meant that the wetland boundaries had to be delimited primarily using terrain (contour data) and vegetation indicators (partly based on species composition and partly on vegetation structure). A study by Mudaly (2015) showed that the use of mottles as a reliable wetland indicator on dolomitic ground is limited due to the high manganese content of the soil resulting in a high oxidative and electron demand capacity which acts to inhibit the reduction of iron to its more mobile ferrous (Fe^{2+}) state and consequently mottle formation, even in areas of high soil moisture. Additionally the use of vegetation indicators was, itself, limited due to the extensive clearing of the riparian zone, semi-arid conditions, overgrazing and ephemeral nature of HGM Unit 3. Together these factors limit the accuracy of the delineated wetland boundaries.

8.3.2. Wetland Present Ecological State

Overall HGM Unit 1 score C (Moderately Modified) in line with recent river health programme aquatic assessments. HGM Unit 2 was also rated as C (Moderately Modified). A summary of the PES of the wetland HGM unit identified on site is provided in **Table 8-12** and discussed in greater detail per wetland driver (hydrology, geomorphology and vegetation) below. Examples of the main existing wetland impacts are given in **Figure 8-13**.

Table 8-12 Wetland present ecological state

NAME	Ha	EXTENT (%)	HYDROLOGY		GEOMORPHOLOGY		VEGETATION		OVERALL
			IMPACT	CHANGE	IMPACT	CHANGE	IMPACT	CHANGE	
HGM Unit 1	2.85	59	**D (4)**	-1	**C (2.9)**	-1	**C (3.1)**	-1	**C (3.4)**
HGM Unit 2	1.94		**B (1)**	-1	**C (3.4)**	-1	**C (2.3)**	-1	**C (2)**

Hydrology : Overall HGM Unit 1 and 2 scored D (Largely Modified) and B (Largely natural) respectively for hydrology. The score for HGM Unit 1 was based on the considerable water pressure due to both high levels of catchment (exceeding sustainable levels based on calculated recharge rates) and on site water use (surface water diversion and domestic use). The largely Natural rating for HGM Unit 2 was based on the mostly intact and relatively undisturbed nature of the catchment.

Changes to water input characteristics from the catchment centre on relatively high levels of groundwater abstraction from the dolomitic compartments that feed the Dinokana Eye and in turn HGM units 1 and 3. This takes the form of several high yielding boreholes, installed to meet the water needs of both the regional and local community. For HGM Unit 2 minor decreases in water inputs likely occur as a result of increased evaporation from decreased from livestock grazing and the resultant decreased grass cover and increased hardened surfaces. Both these factors together with vegetation clearing (soccer field) are likely to decrease infiltration and retention of water within the soil with the effect of increasing the flood peaks during high rainfall events in all HGM the units. Within system impacts include a small furrow near the source which partially diverts flow into a dam that supplies the local community and a DWS pump, gauging and water purification station with a small weir. However, this small gauging weir does not appear to cause any adverse backlogging impacts. Some additional domestic use does take place but not as intensively as the reach downstream of the study area. Additionally there has been an overall decrease in vegetative roughness from the reference state due to clearing, trampling and poaching by livestock and human traffic.

Geomorphology: Both HGM Units 2 and 3 scored C (Moderately Modified) for geomorphology based on the moderate signs of sedimentation and erosion respectively. Increased runoff and erosion within HGM Unit 2 following high rainfall events is likely the cause of the increased sediment loads evident within the active channel (HGM Unit 3). Although little erosion is present within HGM Units 1 and 3 (likely due to the incidence of a shallow bedrock layer) the deeper and highly erosive Hutton soils together with steep catchment slopes and decreased vegetation roughness from overgrazing make HGM Unit 2 particularly prone to erosion. Indeed signs of early but significant head cut erosion where evident within this system, immediately upstream of the Eye (**Figure 8-13**).

Vegetation: In terms of vegetation, the majority of the upper catchment remains in a relatively natural state and is a good representation of the region's dolomitic grassland and mountain bushveld, perhaps spared to some degree by high slope gradients and rugged dolomitic outcrops which make cultivation and settlement difficult. However, much of the vegetation within HGM Unit 2 has been cleared for a soccer pitch and has been heavily impacted by livestock grazing. Hence, the rating of C (Moderately Modified). The riparian zone fringing HGM Units 1 and 3 has been considerably altered; such that it is far narrower and less dense than would be expected in its reference state hence it's rating of C (Moderately Modified). Although some large riparian trees remain they are scattered often at quite some distance from the channel suggesting the riparian zone was once considerably more extensive than current. Stumps and remaining buttress roots testament to the presence of many more large indigenous along the system which have since been cut down. Further downstream vegetation disturbance intensifies with increased soil disturbance, infilling, clearing, grazing, trampling and poaching by livestock and settlement. In spite of this alien and invasive species encroachment is negligible limited to small scattered patches

(e.g. *Populus* and *Jacaranda mimosifolia*) with a low prevalence of herbaceous / annual alien species.


Trampling and sedimentation


Channel modification


Head cut erosion


Clearing of riparian zone


Populus deltoides


Gauging weir

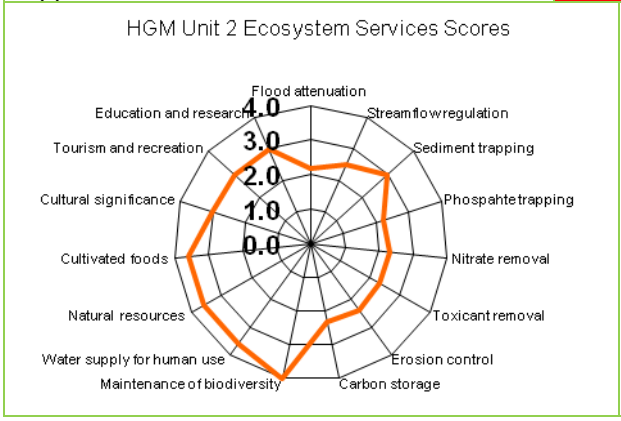
Figure 8-13 Examples of existing wetland impacts

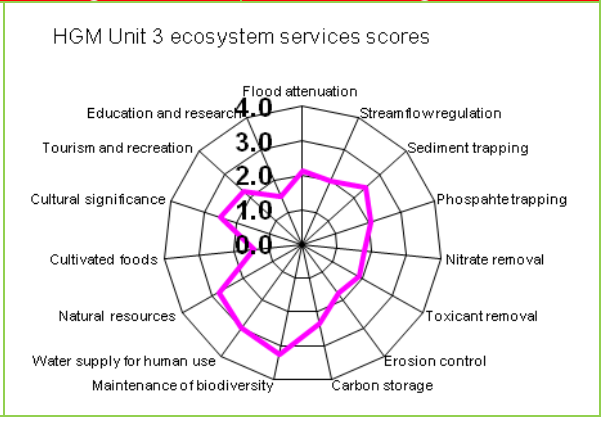
8.3.3. Wetland Ecosystem Services

Overall HGM Unit 1 (together with the active channel HGM Unit 3) provides mostly direct services that include the provision of good quality water for human use and the provision of water for subsistence farming (original channel has been highly dissected into a network of drainage canals for crop irrigation as well as a strong cultural value in terms of spiritual beliefs and mythologies. These centre on the reverence of a large water serpent referred to as “Watermuys” which, according to local inhabitants, has powers that extend into the super natural (e.g. ability to control weather or ones fortune). Additionally HGM Unit 1 is important in terms of biodiversity maintenance in that it supports various sensitive aquatic macro-invertebrate taxa and unique and / or conservation important plant species. HGM Unit 2 in contrast is important in terms of the catchment of water, sediment trapping, provision of clean water, and tourism / cultural value. The results of the eco-system services assessment for the HGM unit are summarised in **Table 8-13**.

Table 8-13 Ecosystem services supplied by the identified wetland HGM units

			HYDRO-GEOMORPHIC SETTING	RATING	
				HGM UNIT 2	HGM UNIT 3
Ecosystem Services	Indirect benefits	Regulating/supporting	Flood attenuation	Moderately High	Moderately High
			Streamflow regulation	Moderately High	Intermediate
			Sediment trapping	High	Moderately High
			Phosphate trapping	Moderately High	Moderately High
			Nitrate removal	Moderately High	Intermediate
			Toxicant removal	Moderately High	Intermediate
			Erosion control	Moderately High	Intermediate
			Carbon storage	Moderately High	Moderately High
	Direct benefits		Maintenance of biodiversity	High	High
		Provisional	Water supply for human use	High	High
			Natural resources	High	Moderately High
			Cultivated foods	High	Moderately Low
		Cultural	Cultural significance	High	Moderately High
			Tourism and recreation	High	Moderately High
			Education and research	High	Intermediate
Threats				High	High
Opportunities				High	High





8.3.4. Wetland Importance and Sensitivity

Both identified wetland HGM units (1 and 2) are considered have of High to Very High importance from an Ecological, Hydrological and Human perspective (**Table 8-14**). Of particular significance is the high importance of the clean water provided by this near oligotrotrophic karstic spring system which is, of the three major springs in the Dinokana / Lobatse Aquifer, by far the highest yielding. Aside from providing clean water for human use and feeding the downstream Ngotwane dam these conditions support a unique assemblage of diatoms and other aquatic biota dependant on good water quality.

In terms of biodiversity, the longstanding presence of the high density rural settlement of Dinokana (high livestock grazing pressure and disturbance levels) limits the number of regionally occurring CI species on site, particularly with regards to terrestrial fauna.

However, HGM Units 1 & 3 provide ideal habitat for a high diversity of aquatic macro-invertebrates including taxa that are highly sensitive and / or indicative of good water quality (DWS, 2015). The overall Present Ecological State of aquatic conditions monitored at some distance below the Eye between 2005 and 2014 by DWS has been rated as A = natural or B = largely natural. DWS (2015) obtained a high rating of roughly 291 using the aquatic macro-invertebrate South African Scoring System (SASS; Dickens & Graham 2002), and recorded a total of 48 aquatic macro-invertebrate taxa. This yielded an Average Score Per Taxon (ASPT) of 6.06. Recorded sensitive taxa included species belonging to e.g. the stonefly family Perlidae, the mayfly family Baetidae, the net-spinning caddisfly family Hydropsychidae, and the jewel damselfly family Chlorocyphidae. Although our scope of work did not include an assessment of aquatic biota, and as mentioned in the preceding faunal results **section 8.2**, during our site visit the moderately-sensitive Dancing Jewel (*Platycypha caligata*) was recorded at the Eye. *Pyxicephalus* bullfrogs reportedly occur in the region, and might occur if/where downstream conditions provide suitable habitat for these frogs. The presence of the VU Makabusi Sprite (*Pseudagrion makabusiense*) was rated with a low likelihood, but cannot be discounted. Additionally the potential for Bushveld Smallscale Yellowfish (*Labeobarbus polylepis*) occurring on site is possible given its occurrence further downstream in the Ngotwane River (O'brein, 2009). The lack of large natural open water bodies and mudflats suggests that significant congregations of migratory waterfowl are unlikely. Nonetheless, the Dinokana wetland system may still serve as an important movement corridor and foraging habitat for wildlife albeit highly degraded, fragmented and densely populated downstream. In terms of flora some unique and / or CI floral species were observed within HGM Unit 1 (*Kniphofia* sp.) and others may occur.

Although none of the identified HGM units occur within a statutorily protected area, wetlands are nevertheless protected under the national water act. HGM Unit 1 and 2 fall within the Central Bushveld Group 1 wetlands. According to the NFEPA Wet Veg database channelled valley-bottom wetlands (HGM unit 1) within this zone are recognised as Critically Endangered and Not Protected whereas Seeps (HGM unit 2) are listed as Endangered and Not Protected. Additionally the area within which the wetlands are located has been zoned as a Critical Biodiversity Area (CBA) 1. Furthermore the entire Mmaphanyane extending well up into the catchment is recognised as a FEPA river.

Table 8-14 Wetland importance and sensitivity

WETLAND IMPORTANCE AND SENSITIVITY			
NAME	**ECOLOGICAL**	**HYDROLOGICAL**	**HUMAN**
HGM Unit 1	Very High (3.6)	High (2.4)	Very high (3.3)
HGM Unit 2	Very High (3.2)	High (2)	High (2.2)

9. Areas of Significance

The site significance assessment, which includes a significance map for flora, fauna and the in situ wetland system, was based on the findings from the ecological scan, as well as relevant international, national and provincial planning and other biodiversity conservation initiatives as described below.

9.1. International Areas of Conservation Significance

The site does not fall into any proclaimed:

- *Ramsar Site.*
- *World Heritage Site.*
- *Important Bird Area (IBA)* – see **Figure 9-1**.

9.2. National and Regional Areas of Conservation Significance

The site does not fall into any national:

- *Protected Area* - see **Figure 9-1.**
- *Priority Area or Threatened Ecosystem* – see **Figure 9-2**.

However, the following biodiversity features with recognised national or provincial conservation importance do require consideration.

9.2.1. Water Resources

A broad spectrum of international, regional and national legislation and guidelines applies to the protection of wetlands and their biodiversity. The National Water Act (NWA; Act 36 of 1998) is the principle legal instrument relating to water resource management in South Africa. Under the NWA, all wetlands and their buffer zones are protected.

The NWA points out that it is:

> "*the National Government's overall responsibility for and authority over the nation's water resources and their use, including the equitable allocation of water for beneficial use, the redistribution of water, and international water matters.*"

According to Chapter 3 of the NWA on the protection of water resources:

> *"The protection of water resources is fundamentally related to their use, development, conservation, management and control. Parts 1, 2 and 3 of this Chapter lay down a series of measures which are together intended to ensure the comprehensive protection of all water resources."*

9.2.2. Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas project (NFEPA; Driver *et al.* 2011) provides strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources in South Africa. Freshwater Ecosystem Priority Areas (FEPAs) were identified using a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries. **The NFEPA spatial data indicate that the in situ Dinokana Eye and downstream wetland system is a recognized national FEPA** (**Figure 9-3**).

9.2.3. North West C-Plan

The North West Conservation or C-Plan is the outcome of systematic conservation planning by the North West Department of Rural, Environment and Agricultural Development (DREAD 2012), for improved conservation of biodiversity in the province.

According to the latest available C-Plan, the entire site and farm are situated within an Irreplaceable or Critical Biodiversity Area 1 (CBA1; Figure 9-4). The CBA was presumably assigned because of the sensitive dolomitic terrain and associated caves, springs, and **Vulnerable** Carletonville Dolomitic Grassland vegetation type.

9.3. Local Areas of Conservation Significance

The conservation significance of local biodiversity was rated and mapped based on:

- Ecological sensitivity (including renewability/success for rehabilitation);
- Level/Extent of disturbance.
- Presence of CI species (identified at the vegetation unit/habitat level); and
- Conservation value (at a regional, national, provincial and local scale).

Identified habitat units within the study site were ranked into ***Very High, High, Moderate-High***, ***Moderate*** or ***Low*** classes in terms of significance. This was undertaken according to a sensitivity-value analysis and included input based on knowledge of the area, on-the-ground investigations and experience when dealing with ecological systems and processes. A summary overview of the Areas of Local Conservation Significance is presented in **Figure 9-5**. Based on our findings and relevant national and provincial biodiversity conservation planning initiatives, the following is applicable (**Figure 9-5**):

- **Very High** rated areas include:
  - The *Cyperus-Imperata-Kniphofia* Active River Channel; and
  - The *C. erythrophyllum-H. lucida* Riparian Vegetation.

    In addition to being protected by law under the NWA, the local wetland system is also classified as a national FEPA. The system currently provides good quality water, and its upper reach remains in a good state. Here it supports a high abundance of unique species such as *Kniphofia*, and might also support threatened fauna such as the NT Swamp Musk Shrew and VU White-backed Night Heron.

- **High** rated areas include:
  - A minimum 100m protective buffer around the afore-mentioned wetland system,
  - The *C. molle–Dombeya* North Facing Slopes, which are based on dolomites and contain a higher diversity of species (based on the Ecoscan observations and literature). These areas also contain more unique species to the lower lying deeper red clays.
- **Moderate-High** rated areas include:
  - The *P. capensis–Euclea* South Facing Slope Thicket;
  - The *S. leptodictya–A. marlothi– Helicrysum* North-North-West Slope.

  Both these habitat are on slopes which are genuinely more heterogeneous.
- **Moderate** rated areas include:
  - The *Euclea-Dodonaea* Lower Slope-Valley Thicket.
- **Low** rated areas include:
  - Roads, buildings and other infrastructure.

In recognition of the status of the local wetland as a national FEPA, the following additional buffers also apply around the system:

- A minimum 500m buffer wherein the use of any herbicide must be strictly prohibited, to avoid adversely impacting wetland water quality, integrity and biodiversity.
- A minimum 250m buffer wherein boreholes must be strictly prohibited to avoid adversely impacting wetland hydrology, integrity and biodiversity.

The Areas of Significance map should guide the proposed development where:

- Disturbances should preferentially occur in Moderate – Low and Low sensitive areas.
- **Very High** sensitive areas should be avoided AND protected.
- **High** sensitive areas should be avoided.
- **Moderate-High** sensitive areas should be subject to very limited disturbance and rigorous mitigation.
- **Moderate** sensitive areas may be disturbed with effective mitigation.
- **Low** sensitive areas should be rehabilitated if not developed.

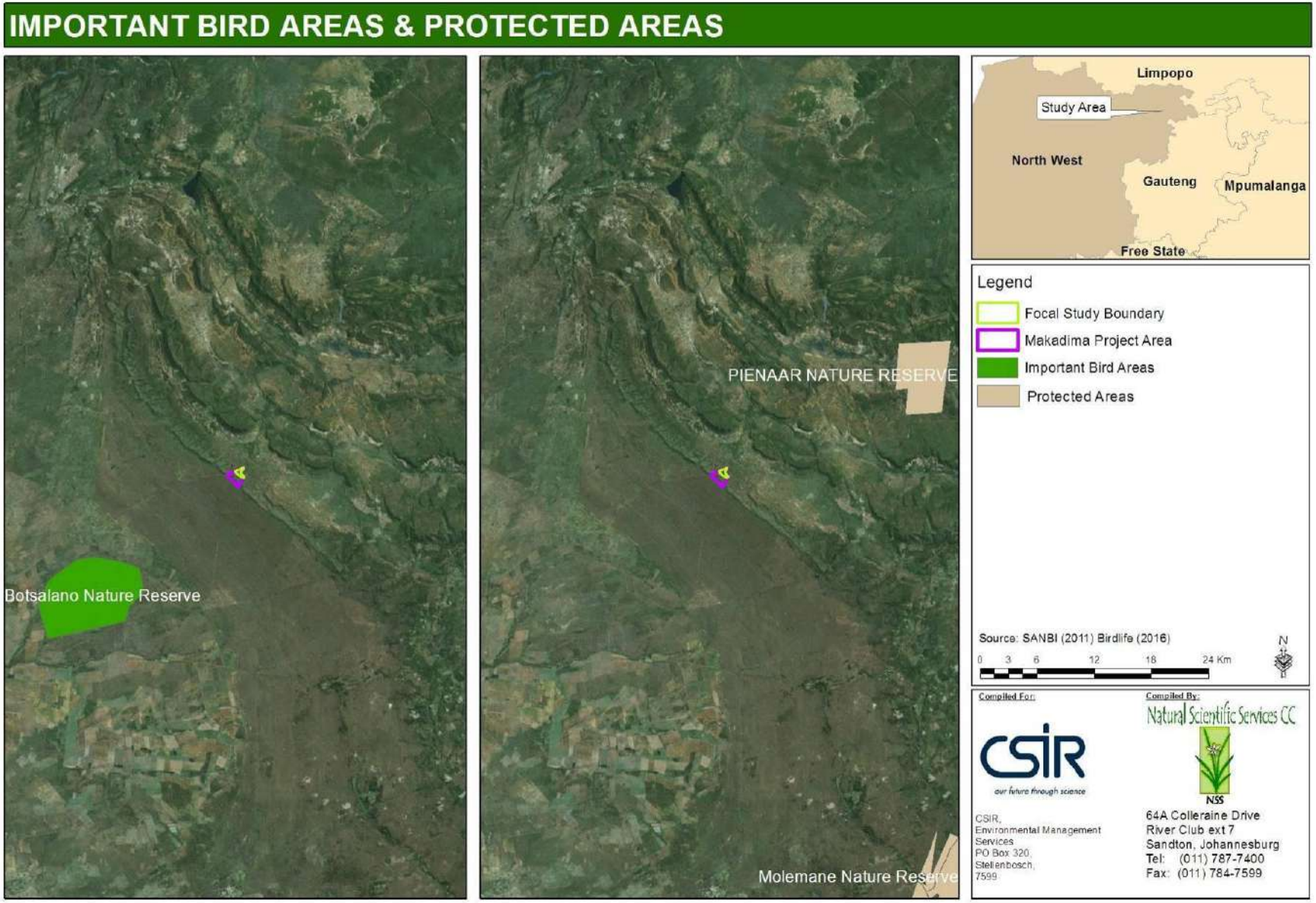


Figure 9-1 Location of the site in relation to Important Bird Areas, and Protected Areas

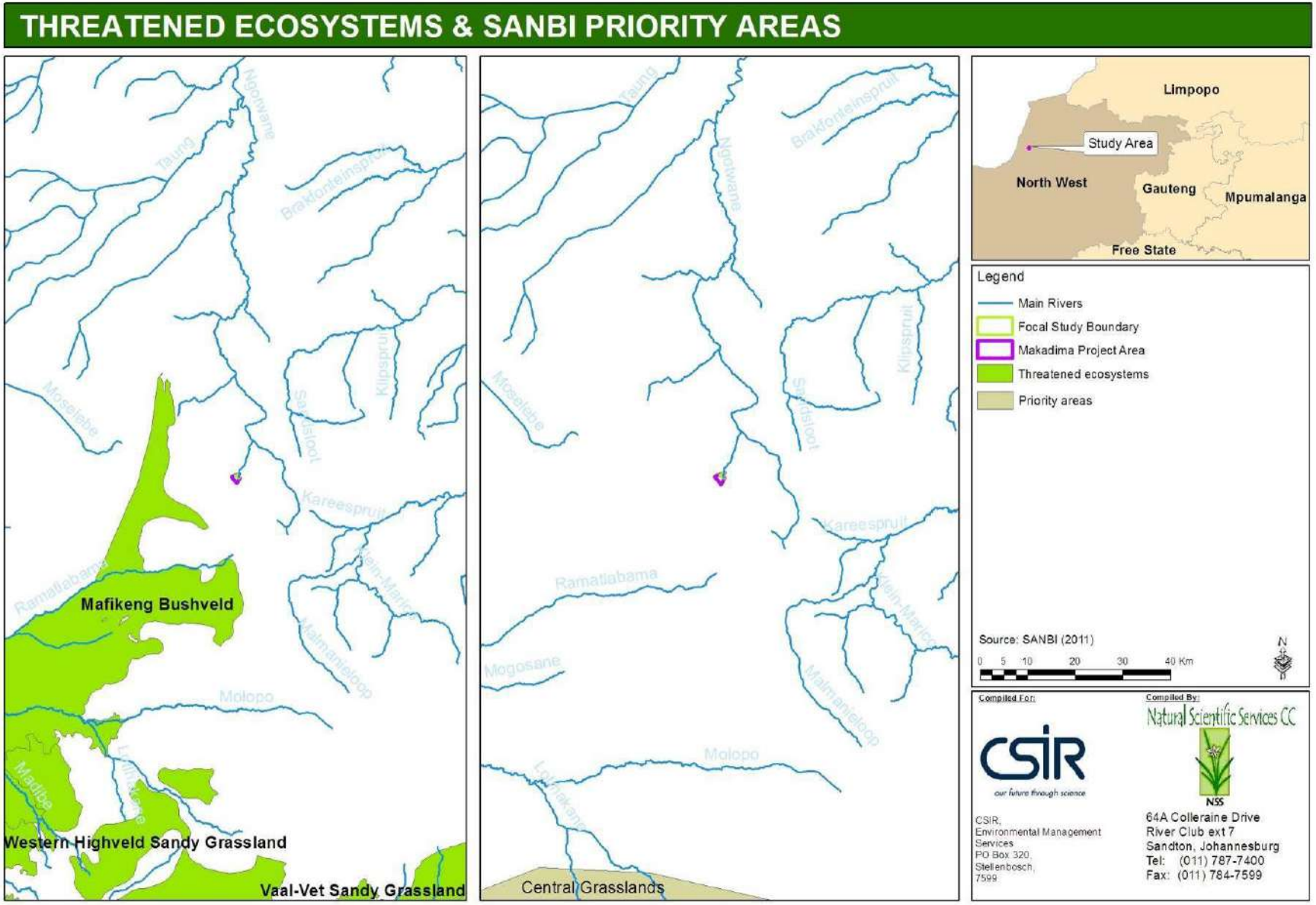


Figure 9-2 Location of the site relative to regional terrestrial Priority Areas and Threatened Ecosystems

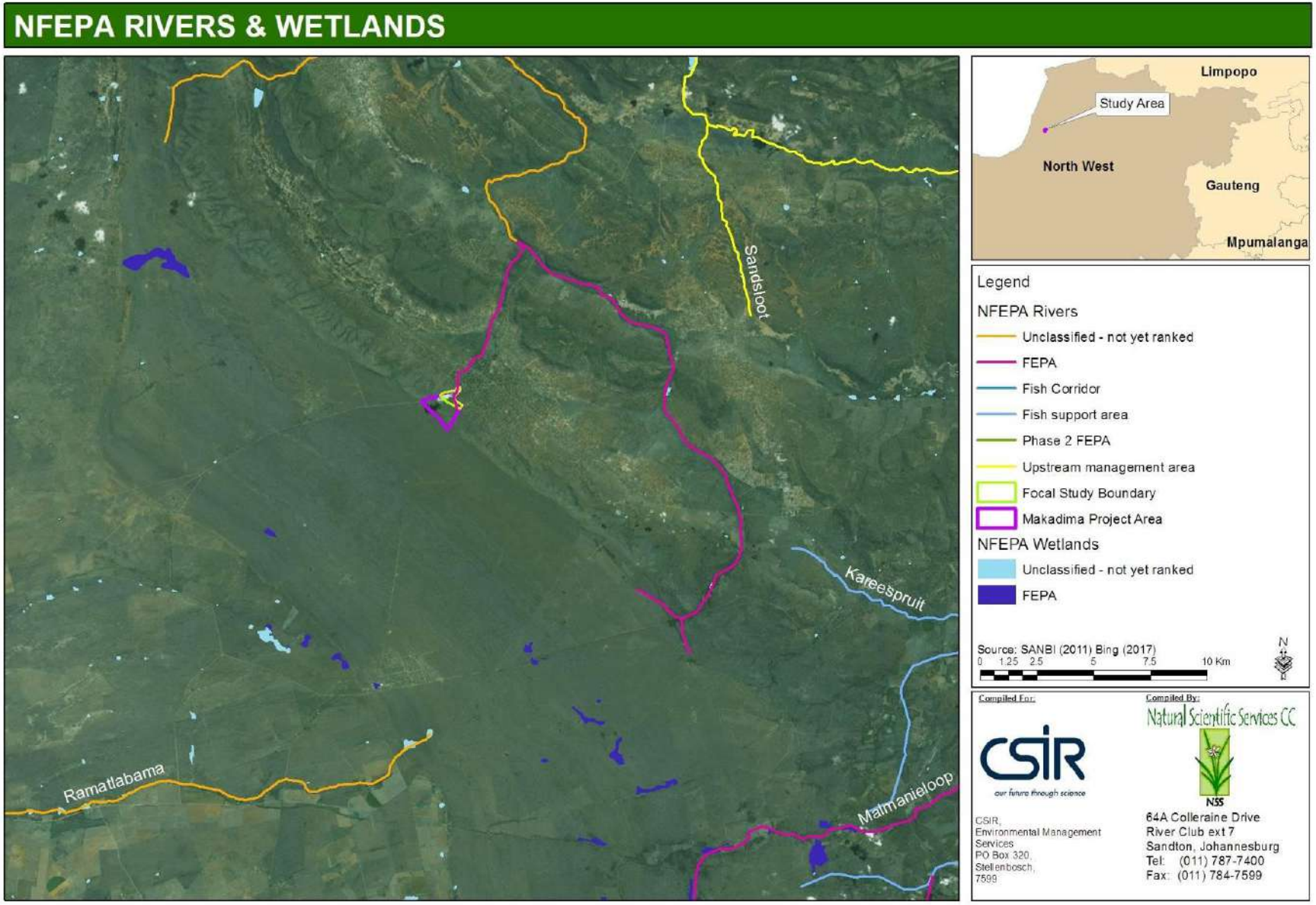


Figure 9-3 Location of the site in relation to regional Freshwater Ecosystem Priority Areas

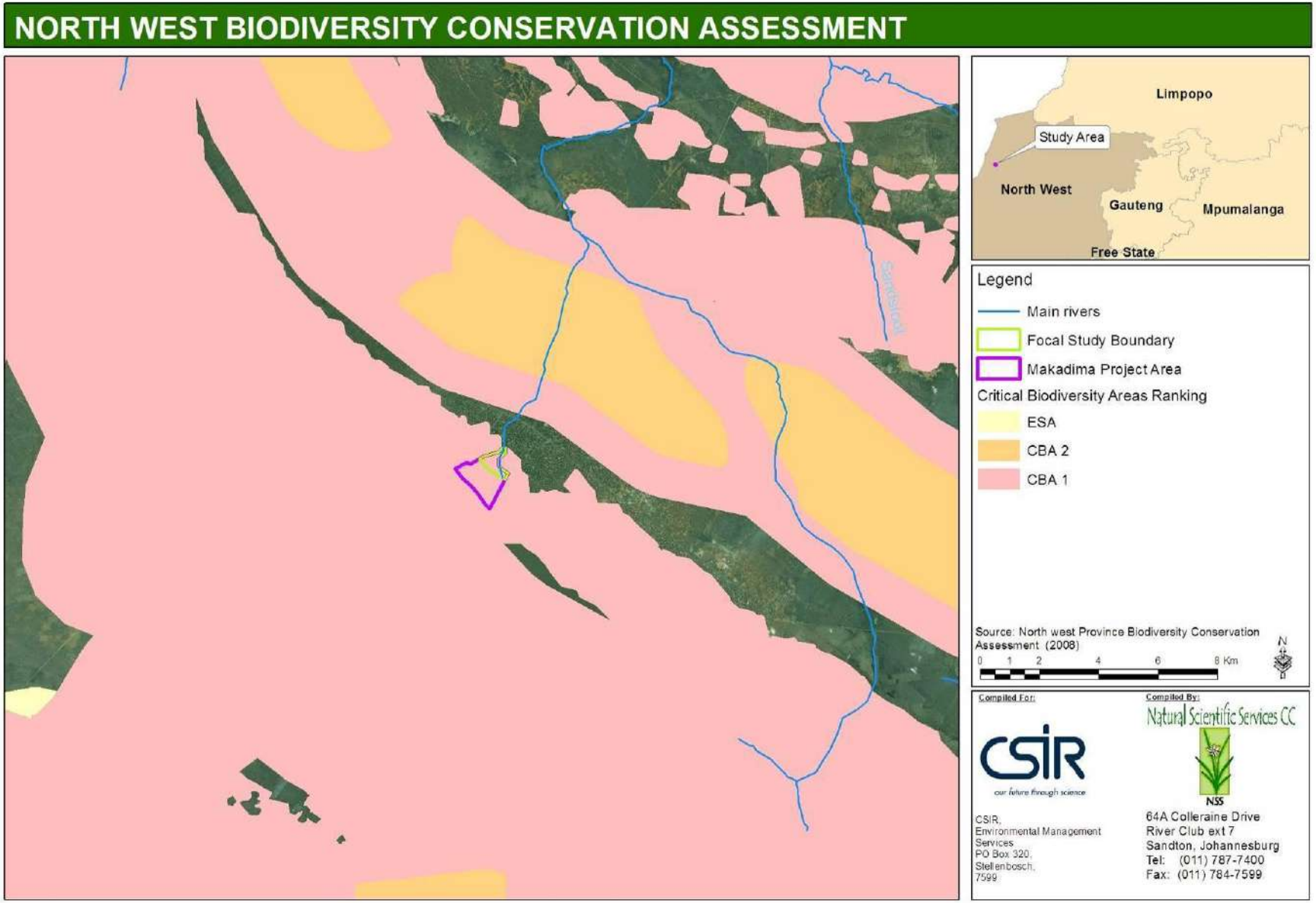


Figure 9-4 Location of the site in relation to North West CBAs and ESAs

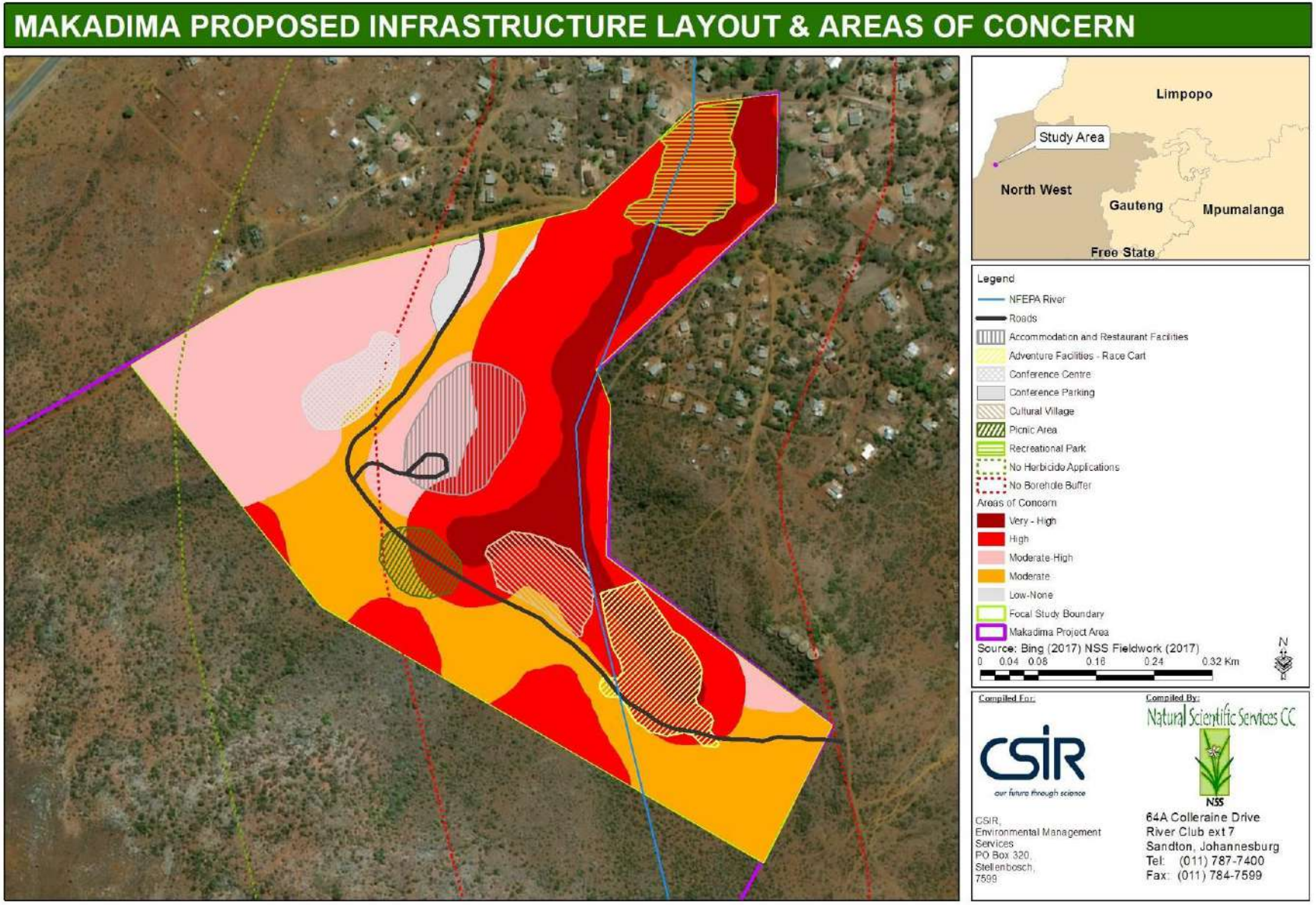


Figure 9-5 **Areas of biodiversity conservation concern, superimposed with Makadima's proposed infrastructure layout**

10. Impacts & Mitigation

Potential impacts of the proposed project on biodiversity are summarized in **Table 11-1** and briefly discussed below, followed by recommended measures to mitigate these during relevant phases of the development.

10.1. Impacts

10.1.1. Direct loss of wetlands

The current proposed infrastructure footprint will result in the loss of a large portion of the semi-arid ephemeral wash system (HGM Unit 2), and encroaches upon the buffer of HGM Unit 1 along its downstream reaches. A revised infrastructure layout as recommended by NSS has been provided in **Figure 11-1**.

10.1.2. Contamination of surface and groundwater resources

The groundwater resource from the Eye is of a good quality, and is heavily relied upon for water provision at both local and regional scales. However, the site for the proposed infrastructure development is situated within a dolomitic landscape with strong surface - groundwater linkages. Here the potential for contamination of pristine groundwater by surface water (or visa-versa) is high, and particular caution should be practiced with regards to water management in and around the development. One potential impact may be the eutrophication of groundwater through inappropriate sewerage and grey water management. Another pertinent impact may be the potential contamination of the groundwater resource through sinkhole formation, which could arise as a result of leaking water pipes or prolonged discharge of water in one location, such as a French drain. Any increases in nutrient levels entering this near oligotrophic system are of high significance, not least from a water security perspective, but also because of the unique and sensitive aquatic biota which rely on clean, clear water.

10.1.3. Increased sediment loads

Clearing of vegetation and levelling for construction will increase the opportunity for sediment loads to enter HGM Units 1 and 3 following rainfall events. During aquatic biomonitoring conducted during from 2005 to 2014, there were reported visual observations of a distinct increase in the levels of sediment within the channel immediately below the Eye (HGM Unit 3). Water clarity is high within the channel, and any increase in sediment will have implications for water purification and biota (particularly benthic organisms).

10.1.4. Increased flood peaks

Clearing and landscaping during the construction phase, and subsequent establishment of impervious surfaces (e.g. roofs, paving, pathways and roads), will concentrate storm flows

and decrease rainfall infiltration. This could exacerbate existing head cut erosion within HGM Unit 2.

10.1.5. Decreased water inputs

Water use to supply the proposed development has the potential to impact the local groundwater balance, especially if boreholes are sunk upstream of the Eye. This has implications for water security, aquatic biota, and the integrity (thinning) of the riparian zone.

10.1.6. Clearing of (especially riparian) vegetation and faunal habitats

Although most of the proposed infrastructure is situated away from HGM Unit 1, the proposed recreational area is positioned within the wetland buffer. The construction of buildings and associated infrastructure for the recreational area, if poorly designed, could result in some loss of remaining riparian vegetation. This could impact the availability of suitable habitat for wetland-associated fauna including potentially occurring CI species such as the **NT** Swamp Musk Shrew and **VU** White-backed Night Heron. Fauna will also be impacted where terrestrial vegetation and habitats are cleared. Taxa that will likely be impacted most include those with poor mobility e.g. scorpions and baboon spiders.

10.1.7. Introduction and proliferation of alien plant species

Increased vehicle, human and material traffic, clearing of vegetation and soil disturbance will further increase the prevalence of invasive alien flora in the study area. If left to proliferate without control, invasive alien could eventually threaten the hydrology, integrity and biodiversity of the local wetland system because it is small and largely fed by groundwater.

10.1.8. Loss of CI or medicinal flora

Observed and potentially occurring Protected, Red Listed and/or medicinal plant species could be lost as a result of vegetation clearing during construction, and increased traffic and harvesting during all phases of the development.

10.1.9. Sensory disturbance of fauna

Sensory disturbance of fauna from noise and light pollution could cause remaining sensitive taxa to vacate the area, at least temporarily during construction and decommissioning. Animals that would be most adversely affected include calling and/or secretive nocturnal species.

10.1.10. Loss of CI fauna

With potential habitat destruction and/or degradation, increased sensory disturbance, and possibly increased persecution (hunting, poisoning, etc), certain fauna including potential CI species could be lost from the area. Possible examples include visiting scavengers such as the various threatened vultures and Brown Hyena (**NT**), wetland-dependent species such as the Swamp Musk Shrew (**NT**) and secretive, nocturnal White-backed Night Heron (**VU**), and the feared and traded Southern African Rock Python (**PS**).

10.1.11. Increased dust and erosion

Clearing of vegetation and earth-moving activities during construction are likely to increase bare ground, dust and the land's susceptibility to erosion.

10.1.12. Altered burning

The development could result in an increase or decrease in wild fires in the study area. Although fires might on the one hand be accidentally ignited, it is more likely that burning will be prohibited for human and infrastructural safety. Lack of fire will eventually cause local vegetation to become more woody / bush-encroached.

10.2. Management and Mitigation Recommendations

Recommended management and mitigation measures are detailed in **Table 11-2**. With successful implementation of the recommended measures, the significance of most impacts can be reduced to **Low,** as highlighted in **Table 10-1**.

Table 10-1 Summary of impact significance, without and with mitigation

POTENTIAL IMPACTS	SIGNIFICANCE	
CONSTRUCTION	**Without mitigation**	**With mitigation**
Direct loss of wetlands	**Fatally flawed**	**Medium**
Contamination of surface and groundwater resources	**High**	**Low**
Increased dust and erosion	**High**	**Low**
Increased sediment loads	**Medium**	**Low**
Increased flood peaks	**Medium**	**Low**
Decreased water inputs	**Medium**	**Low**
Clearing of (especially riparian) vegetation and faunal habitats	**High**	**Medium**
Introduction and establishment of alien species	**High**	**Low**
Loss of CI or medicinal flora	**High**	**Low**
Sensory disturbance of fauna	**Medium**	**Low**
Loss of CI fauna	**Medium**	**Low**
Altered burning	**Medium**	**Low**
OPERATION		
Further loss / degradation of wetlands	**High**	**Medium**
Contamination of surface and groundwater resources	**High**	**Low**
Decreased water inputs	**Medium**	**Low**
Continued introduction and proliferation of alien species	**High**	**Low**
Loss of CI or medicinal flora	**High**	**Low**
Sensory disturbance of fauna	**High**	**Medium**
Loss of CI fauna	**Medium**	**Low**
Erosion	**High**	**Low**
Altered burning	**Medium**	**Low**
DECOMMISSIONING		
Further loss / degradation of wetlands	**High**	**Medium**
Contamination of surface and groundwater resources	**High**	**Low**
Increased dust and erosion	**High**	**Low**
Increased sediment loads	**Medium**	**Low**

POTENTIAL IMPACTS	SIGNIFICANCE	
Continued proliferation of alien species	**High**	**Low**
Loss of CI or medicinal flora	**High**	**Low**
Sensory disturbance of fauna	**Medium**	**Low**
Loss of CI fauna	**Medium**	**Low**
Altered burning	**Medium**	**Low**

Figure 10-1 Examples of potential picnic spot designs (from existing sites around the Savanna biome) – blending into the surrounding environment

11. Concluding Remarks

With the implementation of the mitigation measures suggested in this report, the significance of impacts on site can be reduced to **Medium** / **Low**. Based on the information obtained in the site visit and the information that was available to date, it is NSS's opinion that the project should only go ahead provided that the recommended mitigation measures are diligently implemented. *Most importantly, the Dinokana Eye wetland system must be protected from all forms of disturbance, and the various recommended wetland buffers must be strictly adhered to.*

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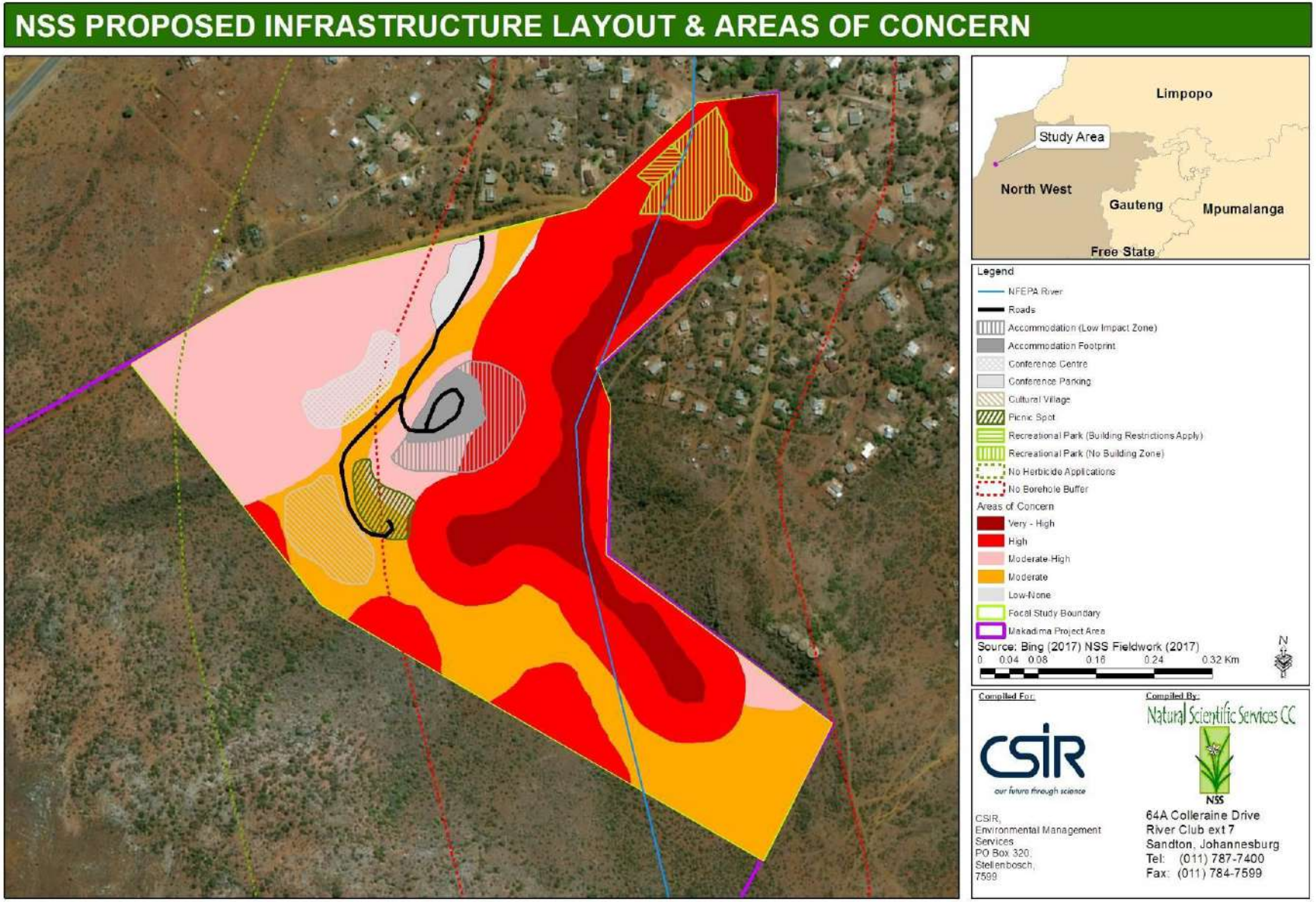

Figure 11-1 Areas of biodiversity conservation concern, superimposed with NSS's proposed infrastructure layout

Table 11-1 Impact Assessment

POTENTIAL IMPACTS	MITIGATION	STATUS	EXTENT		DURATION		INTENSITY		REVERSIBILITY	IRREPLACEABILITY	PROBABILITY		SIGNIFICANCE		CONFIDENCE	
			RATING	SCORE	RATING	SCORE	RATING	SCORE	RATING	RATING	RATING	SCORE	RATING	SCORE	RATING	SCORE
CONSTRUCTION																
Direct loss of wetlands																
Potential loss of a large portion of the semi-arid ephemeral wash system (HGM Unit 2) and encroachment on the buffer of HGM Unit 1	Without	Negative	Regional (within 30km of site)	3	Permanent	5	Very high / Fatal flaw	16	Low reversibility	High irreplaceability	Definite (>90% chance)	1	**Fatally flawed**	**24.00**	High	3
	With	Negative	Site specific	1	Permanent	5	Medium	4	Low reversibility	High irreplaceability	Probable (25-50% chance)	0.5	**Medium**	**5.00**	High	3
Contamination of surface and groundwater resources																
Potential contamination / nutrient loading of clean ground and surface water resources through construction activities (e.g. concrete mixing, poor site sanitation)	Without	Negative	Local (<2km from site)	2	Permanent	5	Very high / Fatal flaw	16	Low reversibility	High irreplaceability	Probable (25-50% chance)	0.5	**High**	**11.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	High reversibility	Low irreplaceability	Low probability (10-25% chance)	0.25	**Low**	**1.00**	High	3
Increased dust and erosion																
from clearing of vegetation, earth-moving activities, increased vehicle traffic, and uncontrolled livestock activity	Without	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**10.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	High reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Increased sediment loads																
Potential increase in sediment loads entering HGM Unit 1 from exposed soil and building materials stored within the prescribed wetland buffers or upstream of the Eye	Without	Negative	Regional (within 30km of site)	3	Short term (2-5 years)	2	Medium	4	Low reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**6.75**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Low reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Increased flood peaks																
Clearing and levelling resulting in increased hardened surface will increase runoff and potentially exacerbate the existing head cut erosion in HGM Unit 2.	Without	Negative	Regional (within 30km of site)	3	Long term (>15 years)	4	Medium	4	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**8.25**	High	3
	With	Negative	Local (<2km from site)	2	Temporary (<2 years)	1	Low	1	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Decreased water inputs																
Water use to supply the proposed development has the potential to impact upon the local groundwater balance especially if boreholes are sunk upstream of the Eye	Without	Negative	Regional (within 30km of site)	3	Short term (2-5 years)	2	High	8	Moderate reversibility	High irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**9.75**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Clearing of (especially riparian) vegetation and faunal habitats																
Construction of buildings and associated infrastructure may result in the loss of some of the remaining riparian vegetation	Without	Negative	Site specific	1	Permanent	5	High	8	Low reversibility	Moderate irreplaceability	Definite (>90% chance)	1	**High**	**14.00**	High	3
	With	Negative	Site specific	1	Long term (>15 years)	4	Medium-low	2	Low reversibility	Low irreplaceability	Definite (>90% chance)	1	**Medium**	**7.00**	High	3
Introduction and establishment of alien species																
from influx of vehicles, people and materials, site disturbance, uncontrolled livestock activity, and lack of alien species control	Without	Negative	Local (<2km from site)	2	Permanent	5	High	8	Moderate reversibility	High irreplaceability	Definite (>90% chance)	1	**High**	**15.00**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Low	1	High reversibility	Low irreplaceability	Probable (25-50% chance)	0.5	**Low**	**1.50**	High	3
Loss of CI or medicinal flora																
from clearing of vegetation, and increased vehicle and human activity including harvesting, and uncontrolled livestock activity	Without	Negative	Local (<2km from site)	2	Permanent	5	High	8	Low reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**11.25**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Low reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Sensory disturbance of fauna																
from increased vehicle and human activity, noise, dust and light	Without	Negative	Local (<2km from site)	2	Short term (2-5 years)	2	Medium	4	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**6.00**	High	3
	With	Negative	Local (<2km from site)	2	Short term (2-5 years)	2	Low	1	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.50**	High	3
Loss of CI fauna																
from clearing of vegetation, earth-moving activities, habitat degradation and uncontrolled vehicle, livestock and human activity including harvesting	Without	Negative	Local (<2km from site)	2	Medium term (5-15 years)	3	High	8	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Medium**	**6.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Altered burning																
from clearing of vegetation, built infrastructure, increased vehicle and human activity, and uncontrolled livestock activity	Without	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium	4	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**7.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Low	1	High reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**1.50**	High	3
OPERATION																

POTENTIAL IMPACTS	MITIGATION	STATUS	EXTENT		DURATION		INTENSITY		REVERSIBILITY	IRREPLACEABILITY	PROBABILITY		SIGNIFICANCE		CONFIDENCE	
			RATING	SCORE	RATING	SCORE	RATING	SCORE	RATING	RATING	RATING	SCORE	RATING	SCORE	RATING	SCORE
Further loss / degradation of wetlands																
Further loss/ degradation to wetlands from continued erosion and poor water and veld management practices	Without	Negative	Regional (within 30km of site)	3	Permanent	5	High	8	Moderate reversibility	High irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**12.00**	High	3
	With	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium	4	Low reversibility	Low irreplaceability	Probable (25-50% chance)	0.5	**Medium**	**5.00**	High	3
Contamination of surface and groundwater resources																
Potential contamination / nutrient loading of clean ground and surface water resources from inappropriate plumbing, sanitation and waste water management practices or the creation of sinkholes from leaking water pipes.	Without	Negative	Regional (within 30km of site)	3	Permanent	5	High	8	Low reversibility	High irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**12.00**	High	3
	With	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium-low	2	Low reversibility	Moderate irreplaceability	Low probability (10-25% chance)	0.25	**Low**	**2.00**	High	3
Decreased water inputs																
Inappropriate water use during operation	Without	Negative	Regional (within 30km of site)	3	Long term (>15 years)	4	Medium	4	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Medium**	**5.50**	High	3
	With	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium-low	2	Moderate reversibility	Moderate irreplaceability	Low probability (10-25% chance)	0.25	**Low**	**2.00**	High	3
Continued introduction and proliferation of alien species																
from continued influx of vehicles, people and materials, uncontrolled livestock activity, and lack of alien species control	Without	Negative	Local (<2km from site)	2	Permanent	5	High	8	Moderate reversibility	High irreplaceability	Definite (>90% chance)	1	**High**	**15.00**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Low	1	High reversibility	Low irreplaceability	Probable (25-50% chance)	0.5	**Low**	**1.50**	High	3
Loss of CI or medicinal flora																
from uncontrolled vehicle, livestock and human activity including harvesting	Without	Negative	Local (<2km from site)	2	Permanent	5	High	8	Low reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**11.25**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Low reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Sensory disturbance of fauna																
from continuous vehicle and human activity, noise and light	Without	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**10.50**	High	3
	With	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium	4	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Medium**	**5.00**	High	3
Loss of CI fauna																
from habitat degradation and uncontrolled vehicle, livestock and human activity including harvesting	Without	Negative	Local (<2km from site)	2	Permanent	5	High	8	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Medium**	**7.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Erosion																
from uncontrolled livestock activity, and lack of alien species control	Without	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**10.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	High reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Altered burning																
from built infrastructure, vehicle and human activity, and uncontrolled livestock activity	Without	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium	4	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**7.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Low	1	High reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**1.50**	High	3
DECOMMISSIONING																
Further loss / degradation of wetlands																
Further loss/ degradation to wetlands from continued erosion and poor water and veld management practices	Without	Negative	Regional (within 30km of site)	3	Permanent	5	High	8	Moderate reversibility	High irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**12.00**	High	3
	With	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium	4	Low reversibility	Low irreplaceability	Probable (25-50% chance)	0.5	**Medium**	**5.00**	High	3
Contamination of surface and groundwater resources																
Potential contamination / nutrient loading of clean ground and surface water resources from destruction of infrastructure, poor waste management or the creation of sinkholes from pipes that are left underground without maintenance.	Without	Negative	Regional (within 30km of site)	3	Permanent	5	High	8	Low reversibility	High irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**12.00**	High	3
	With	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium-low	2	Low reversibility	Moderate irreplaceability	Low probability (10-25% chance)	0.25	**Low**	**2.00**	High	3
Increased dust and erosion																
from traffic, demolition and possible earth-moving activities, and uncontrolled livestock activity	Without	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**10.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	High reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Increased sediment loads																

POTENTIAL IMPACTS	MITIGATION	STATUS	EXTENT		DURATION		INTENSITY		REVERSIBILITY	IRREPLACEABILITY	PROBABILITY		SIGNIFICANCE		CONFIDENCE	
			RATING	SCORE	RATING	SCORE	RATING	SCORE	RATING	RATING	RATING	SCORE	RATING	SCORE	RATING	SCORE
Potential increase in sediment loads entering HGM Unit 1 from exposed soil and building materials stored within the prescribed wetland buffers or upstream of the Eye	Without	Negative	Regional (within 30km of site)	3	Short term (2-5 years)	2	Medium	4	Low reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**6.75**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Low reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Continued proliferation of alien species																
from uncontrolled livestock activity, and lack of alien species control	Without	Negative	Local (<2km from site)	2	Permanent	5	High	8	Moderate reversibility	High irreplaceability	Definite (>90% chance)	1	**High**	**15.00**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Low	1	High reversibility	Low irreplaceability	Probable (25-50% chance)	0.5	**Low**	**1.50**	High	3
Loss of CI or medicinal flora																
from uncontrolled vehicle, livestock and human activity including harvesting	Without	Negative	Local (<2km from site)	2	Permanent	5	High	8	Low reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**High**	**11.25**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Low reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Sensory disturbance of fauna																
from vehicle and human activity, noise, dust and light	Without	Negative	Local (<2km from site)	2	Short term (2-5 years)	2	Medium	4	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**6.00**	High	3
	With	Negative	Local (<2km from site)	2	Short term (2-5 years)	2	Low	1	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.50**	High	3
Loss of CI fauna																
from habitat degradation and uncontrolled vehicle, livestock and human activity including harvesting	Without	Negative	Local (<2km from site)	2	Medium term (5-15 years)	3	High	8	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Medium**	**6.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Medium-low	2	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**2.00**	High	3
Altered burning																
from demolished and remaining infrastructure, vehicle and human activity, and uncontrolled livestock activity	Without	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium	4	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0.75	**Medium**	**7.50**	High	3
	With	Negative	Site specific	1	Temporary (<2 years)	1	Low	1	High reversibility	Moderate irreplaceability	Probable (25-50% chance)	0.5	**Low**	**1.50**	High	3

Table 11-2 Mitigation measures

OBJECTIVE / TARGET	MITIGATION / MANAGEMENT ACTION	METHODOLOGY	FREQUENCY	RESPONSIBILITY
CONSTRUCTION				
Direct loss of wetlands				
To avoid loss and degradation of wetland resources.	Minimise loss of and disturbance to wetlands through planning and proactive management.	*Modify the original infrastructure layout based on the layout and recommendations made by NSS to as far as possible avoid wetland areas and their buffers.	Once-off during the planning phase prior to construction	CSIR, Makadima Management
		*Demarcate the construction site and ensure that all activities are carried out within that area. Additionally mark out the wetland on the ground to ensure activities stay out of it.	First phase of construction before any earth moving commences	Makadima Management
		*Do not build any infrastructure upstream of the Eye.	Project lifetime	Makadima Management
		*Avoid construction within the "no building zone" as indicated on the NSS proposed infrastructure map.	During construction	Makadima Management
Contamination of surface and groundwater resources				
To avoid the contamination of ground and surface water resources.	Minimise contamination of surface water from inappropriate water and waste management	*Highlight all prohibited activities (e.g. Mixing of concrete in wetland areas littering, cutting of large trees, using the wetland as an ablution development) to workers through training and sign notices.	Weekly toolbox talks with signs displayed throughout construction	Makadima Management
		*Do not make use of fertilisers, pesticides or herbicides on site especially upstream of the Eye.	Life of operation	Makadima Management
Increased dust and erosion				
Minimize dust and erosion.	Implement effective measures to control dust and erosion.	*Limit vehicles, people and materials to the construction site.	During construction	Makadima Management, Construction Crew
		*Commence (and preferably complete) construction during winter, when the risk of erosion should be least.	During construction	Makadima Management, Construction Crew
		*Revegetate denude areas with locally indigenous flora a.s.a.p.	During construction	Makadima Management, Construction Crew
		*Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed.	During construction	Makadima Management, Construction Crew
		*Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting.	During construction	Makadima Management, Construction Crew
Increased sediment loads				
To avoid further sedimentation of the upper Mmaphanyane (HGM Unit 1).	Keep the extent of exposed soil and other sediment sources to a minimum.	*Commence (and preferably complete) construction activities during winter when the risk of erosion and wetland sedimentation is lowest.	Try to keep construction to within the winter seasons	Makadima Management
		*Keep all construction activities to within the demarcated footprint areas (keep out of wetland).	Throughout construction	Makadima Management
		*Keep cleared areas to a minimum by constructing one development at a time.	Throughout construction	Makadima Management
		*Revegetate remaining cleared areas by planting indigenous grasses and other vegetation as soon as possible.	Immediately revegetate as construction finishes in one area	Makadima Management
		*Do not stockpile soil in the catchment area above the Eye or within the delineated wetland areas.	Life of operation	Makadima Management
		*Design measures to effectively control vehicle access, vehicle speed, dust, stormwater run-off, erosion and sedimentation on the road.	Life of operation	Makadima Management
Increased flood peaks				
To decrease the incidence of flood peaks during high rainfall events.	Minimise the extent of hardened surfaces and stem the head cut erosion in HGM Unit 2.	*Rehabilitate the head cut erosion within HGM Unit 2 (just upstream of the Eye outside the DWS fence) by stabilising the channel banks. This may be achieved by filling and levelling the channel to remove the drop which creates the erosive vortex during rainfall events. Start with coarser material (e.g. rock) deeper down and progress to finer sands and topsoils towards the surface. Thereafter employ temporary flow attenuation structures such as branches and rows of small hessian bags across the channel filled with grass and sand held in place by thin logs pegged in place with wooden stakes.	Conduct before construction and complete during winter	DWS and Makadima Management in association with a Wetland Specialist
		Preferably prohibit or otherwise monitor the levels of livestock grazing to avoid the overutilisation of the grass sward.	Life of operation	Makadima Management
		Make sure that the access road is well cambered with enough drainage berms to prevent erosion.	Life of operation	Makadima Management
		Minimise the extent of cleared ground and hardened surfaces.	Life of operation	Makadima Management
Decreased water inputs				

OBJECTIVE / TARGET	MITIGATION / MANAGEMENT ACTION	METHODOLOGY	FREQUENCY	RESPONSIBILITY
To avoid negatively impacting on the flow rates from the Dinokana Eye.	Avoid impacting on the water levels directly from the Dinokana Lobatse aquifer immediately upstream of the Eye.	Do not sink boreholes for the development upstream of the Eye or within 100 m of the delineated wetlands.	Prior to and during construction	Makadima Management
Clearing of (especially riparian) vegetation and faunal habitats				
Minimize loss and degradation of (especially riparian) terrestrial vegetation and faunal habitat.	Avoid unnecessary loss of existing (especially riparian) indigenous vegetation and faunal habitats.	*Do not clear any riparian vegetation for the development. This is the vegetation occurring within the delineated wetland boundaries. Additionally wherever possible minimise the disturbance to vegetation within the prescribed wetland buffer zones.	Especially during construction but also during operation	Makadima Management and Construction Crew
		*Modify the layout of planned infrastructure to avoid important floral communities and large indigenous trees. Avoid construction of infrastructure within the NSS infrastructure map demarcated as "no building zone". Integrate the planned infrastructure into the surrounding environment (blending in). NSS has provided some picnic examples in **Figure 10-1**.	Pre-construction	CSIR, Makadima Management, with advice from a Botanist / Horticulturist
		*Identify and mark indigenous trees on the ground. Those that are small and cannot be avoided should be transplanted elsewhere on site.	Pre-construction	Makadima Management, Construction Crew, with advice from a Botanist / Horticulturist
		*Demarcate or fence in the construction site.	Prior to and during construction	Makadima Management, Construction Crew
		*Highlight all prohibited activities to workers through training and notices.	Prior to and during construction	Makadima Management, Construction Crew
		*Commence (and preferably complete) construction activities during winter, when the risk of disturbing growing plants should be least.	Prior to and during construction	Makadima Management, Construction Crew
	Promote re-establishment of indigenous vegetation in disturbed areas.	*Briefly and effectively stockpile topsoil preferably 1-1.5m in height.	During construction	Makadima Management, Construction Crew
		*Use the topsoil to allow natural vegetation to establish in disturbed areas. If recovery is slow, then a seed mix for the area (using indigenous grass species listed within this report) should be sourced and planted.	During construction	Makadima Management, Construction Crew, with advice from a Botanist / Horticulturist
		*Do not undertake any landscaping with alien flora.	During construction	Makadima Management, Construction Crew, with advice from a Botanist / Horticulturist
Introduction and establishment of alien species				
Minimize the introduction and proliferation of invasive alien species during construction.	Limit / Regulate access by potential vectors of alien flora.	*Demarcate or fence in the construction site.	Prior to and during construction	Makadima Management, Construction Crew
		*Carefully limit / regulate access by vehicles and materials to the construction site.	Prior to and during construction	Makadima Management, Construction Crew
		*Prohibit further introduction of domestic animals such as cattle, goats, horses, donkeys, chickens, dogs and cats.	During construction	Makadima Management
	Maintain a tidy construction site.	*Keep construction activities neat and tidy.	During construction	Makadima Management, Construction Crew
		When complete, remove all sand piles, and landscape all uneven ground while re-establishing a good topsoil layer.	During construction	Makadima Management, Construction Crew
		*Plant only locally indigenous flora if landscaping needs to be done.	During construction	Makadima Management, Construction Crew, with advice from a Botanist / Horticulturist
	By law, remove and dispose of Category 1b alien species on site. All Category 2 species that remain on site will require a permit.	*Remove Category species using mechanical methods, and minimize soil disturbance as far as possible. Alien wood could be donated to the surrounding community.	During construction	Makadima Management, Construction Crew, with advice from a Botanist / Horticulturist
Loss of CI or medicinal flora				
Minimize loss of CI and medicinally important flora.	Adhere to law and best practice guidelines regarding CI and medicinally important flora.	*Obtain permits to remove CI species.	Pre-construction	CSIR, Makadima Management
		*Transplant CI and medicinally important floral specimens from the infrastructure footprint to suitable and safe locations elsewhere on site or nearby.	Pre-construction	Makadima Management, Construction Crew, with advice from a Botanist / Horticulturist
		*Obtain guidance from a suitably qualified vegetation specialist or horticulturist regarding the collection, propagation/storage and transplantation of plants.	During construction	Makadima Management, Construction Crew, with advice from a Botanist / Horticulturist
	Prohibit harvesting of CI and medicinally important flora	*Highlight all prohibited activities to workers through training and notices.	Prior to and during construction	Makadima Management, Construction Crew
		*Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).	During construction	Makadima Management

OBJECTIVE / TARGET	MITIGATION / MANAGEMENT ACTION	METHODOLOGY	FREQUENCY	RESPONSIBILITY
Sensory disturbance of fauna				
Minimize sensory disturbance of fauna.	Time construction activities to minimize sensory disturbance of fauna.	*Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least.	Prior to and during construction	Makadima Management, Construction Crew
	Minimize noise pollution.	*Minimize noise to limit its impact on calling and other sensitive fauna (e.g. frogs).	During construction	Makadima Management, Construction Crew
	Minimize light pollution.	*Limit construction activities to day time hours.	During construction	Makadima Management, Construction Crew
		*Minimize or eliminate security and construction lighting, to reduce the disturbance of nocturnal fauna.	During construction	Construction Crew
Loss of CI fauna				
Minimize mortality and displacement of fauna, especially CI species such as the NT Giant Bullfrog.	Adhere to law and best practice guidelines regarding the displacement of CI faunal species.	*Appoint an appropriate specialist to relocate CI fauna from rocky areas, water, termitaria, trees and soil that will be disturbed.	Pre-construction	Makadima Management with advice from a Zoologist / Ecologist
		*Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least.	Prior to and during construction	Makadima Management, Construction Crew
		*Check open trenches for trapped animals (e.g. reptiles, frogs and small terrestrial mammals), and relocate trapped animals with advice from an appropriate specialist.	Daily during construction	Makadima Management, Construction Crew, with advice from a Zoologist / Ecologist
	Prohibit disturbance and harvesting of CI and other indigenous fauna	*Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited activities to workers through training and notices.	Prior to and during construction	Makadima Management
		*Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).	During construction	Makadima Management
Altered burning				
Control fire	Avoid fire on site, without prohibiting wild fires in the surrounding natural environment.	*Create safe storage on the premises for flammable materials.	Pre-construction	Makadima Management, Construction Crew
		*If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures.	Pre-construction	CSIR, Makadima Management, with advice from a Botanist / Horticulturist
		*Maintain an effective fire break between the development and the surrounding natural environment.	Pre-construction	Makadima Management, Construction Crew
		*Ensure that there are appropriate control measures in place for any accidental fires.	Pre-construction	Makadima Management, Construction Crew
		*Educate workers about the fire plan and emergency procedures with regular training and notices.	Prior to and during construction	Makadima Management, Construction Crew
OPERATION				
Further loss / degradation of wetlands				
Minimize loss and degradation of wetland areas and their buffers.	Maintain measures on the access road to reduce dust, erosion and sedimentation.	Monitor the success of the rehabilitated erosion gully in HGM Unit 2	Annually	CSIR, DWS and Makadima Management in association with a Wetland Specialist
		Keep future developments outside of the delineated wetland areas and associated buffers.	Throughout operation	DWS, Makadima Management
Contamination of surface and groundwater resources				
To not degrade the ground or surface water quality	Minimise contamination of surface water from inappropriate water and waste management	*Ensure that all waste water (sewerage and grey water) is contained in properly lined septic tanks. Which are serviced regularly.	Once-off during construction, monitor for leaks on a regular basis throughout operation	Makadima Management
		*Do not make use of french drains or long drops.	Throughout operation	Makadima Management
		*Minimise sinkhole formation by regularly inspect all water pipelines and thoroughly mend any leaks as soon as they arise.	Throughout operation	Makadima Management
		*Ensure that the development is run in accordance with international best practice norms, and with advice from an appropriate specialist, to ensure that there is no environmental contamination from effluent, fodder, carcasses and other waste, and to ensure that there is also effective storm water management.	Throughout operation	Makadima Management
		Signpost the site especially the picnic area with all prohibited activities which should include (amongst others) no littering, no wood collecting, no abluting in the stream or bush, no making of fires except within the braai areas.	Throughout operation	Makadima Management
		*All hazardous waste should be disposed of at an appropriate licensed facility for this.	Throughout operation	Makadima Management
		*Waste recycling should be incorporated into the development's operations as far as possible.	Throughout operation	Makadima Management

OBJECTIVE / TARGET	MITIGATION / MANAGEMENT ACTION	METHODOLOGY	FREQUENCY	RESPONSIBILITY
		*Educate workers about the development's waste management and handling of hazardous substances with regular training and notices.	Quarterly notice board updates, Monthly meetings and a yearly AGM	Makadima Management
Decreased water inputs				
To avoid negatively impacting on the flow rates from the Dinokana Eye.	Avoid impacting on the water levels directly from the Dinokana Lobatse aquifer immediately upstream of the Eye.	Diligently monitor and measure water usage in measurable Units. Keep a spreadsheet and compare data to DWS flow rates for the Dinokana Eye on an annual basis.	Monthly for life of operation	DWS, Makadima Management
		Reduce water usage wherever possible. Put up signs in the accommodation encouraging visitors to spare water and re-use laundry during their stay if not too dirty. Investigate the possibility of capturing rainwater.	Start of operation	Makadima Management
Continued introduction and proliferation of alien species				
Minimize the introduction and proliferation of invasive alien species during operation.	Limit / Regulate access by potential vectors of alien flora.	*Carefully limit / regulate access by vehicles and materials to the site.	Throughout operation	Makadima Management
		*Prohibit further introduction of domestic animals such as cattle, goats, horses, donkeys, chickens, dogs and cats.	Throughout operation	Makadima Management
	Maintain a tidy development.	*Employ best practices regarding tilling of soil and weed management.	Throughout operation	Makadima Management
		*Plant only locally indigenous flora if landscaping needs to be done.	Throughout operation	Makadima Management, with advice from a Botanist / Horticulturist
	By law, remove and dispose of Category 1b alien species on site. All Category 2 species that remain on site will require a permit.	*Remove Category species using mechanical methods, and minimize soil disturbance as far as possible. Alien wood could be donated to the surrounding community.	Throughout operation	Makadima Management, with advice from a Botanist / Horticulturist
Loss of CI or medicinal flora				
Prohibit harvesting of CI and medicinally important flora.	Harvesting of indigenous flora for medicine, fire wood, building materials, and other purposes must be prohibited.	*Highlight all prohibited activities to workers through training and notices.	Prior to and during operation	Makadima Management
		*Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).	Throughout operation	Makadima Management
Sensory disturbance of fauna				
Minimize sensory disturbance of fauna.	Minimize essential lighting	*Install motion-sensitive lights.	Construction and operation	Makadima Management
		*Ensure that all outdoor lights are angled downwards and/or fitted with hoods.	Construction and operation	Makadima Management
		*Use bulbs that emit warm, long wavelength (yellow-red) light, or use UV filters or glass housings on lamps to filter out UV.	Throughout operation	Makadima Management
		*Avoid using metal halide, mercury or other bulbs that emit high UV (blue-white) light that is highly and usually fatally attractive to insects.	Throughout operation	Makadima Management
	Minimize unavoidable noise	*Conduct regular maintenance of machinery, fans and other noisy equipment.	Throughout operation	Makadima Management
	Prevent unnecessary light and noise pollution	*Encourage workers to minimize light and noise pollution through training and notices.	Throughout operation	Makadima Management
Loss of CI fauna				
Prohibit harvesting of CI and other fauna.	Harvesting of indigenous fauna for food, sport, medicine, and other purposes must be prohibited.	*Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited activities to workers through training and notices.	Prior to and during operation	Makadima Management
		*Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).	Throughout operation	Makadima Management
Erosion				
Minimize erosion.	Implement effective measures to control erosion.	*Limit vehicles and people to the development footprint.	Throughout operation	Makadima Management
		*Revegetate denude areas with locally indigenous flora a.s.a.p.	Throughout operation	Makadima Management
		*Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed.	Throughout operation	Makadima Management
Altered burning				
Control fire	Avoid fire on site, without prohibiting wild fires in the surrounding natural environment.	*Create safe storage on the premises for flammable materials.	Construction and operation	Makadima Management
		*If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures.	Construction and operation	CSIR, Makadima Management, with advice from a Botanist / Horticulturist
		*Maintain an effective fire break between the development and the surrounding natural environment.	Construction and operation	Makadima Management
		*Ensure that there are appropriate control measures in place for any accidental fires.	Construction and operation	Makadima Management
		*Educate workers about the fire plan and emergency procedures with regular training and notices.	Throughout operation	Makadima Management
DECOMMISSIONING				
Further loss / degradation of wetlands				

OBJECTIVE / TARGET	MITIGATION / MANAGEMENT ACTION	METHODOLOGY	FREQUENCY	RESPONSIBILITY
Minimize loss and degradation of wetland areas and their buffers.	Minimise loss of and disturbance to wetlands through planning and proactive management.	*Keep decommissioning activities outside of the delineated wetland areas and associated buffers.	During decommissioning	DWS, Makadima Management, Decommissioning Crew
		*Demarcate the decommissioning site and ensure that all activities are carried out within that area. Additionally mark out the wetland on the ground to ensure activities stay out of it.	First phase of decommissioning before any demolition activities commence	Makadima Management, Decommissioning Crew
		*Avoid disturbing the "no building zone" as indicated on the NSS proposed infrastructure map.	During decommissioning	Makadima Management, Decommissioning Crew
Contamination of surface and groundwater resources				
To not degrade the ground or surface water quality	Minimise contamination of surface water from inappropriate water and waste management	*Do not make use of french drains or long drops.	During decommissioning	Makadima Management
		*Minimise sinkhole formation by sealing or otherwise inspecting water pipelines and thoroughly mend any leaks.	During decommissioning	Makadima Management
		*Ensure that storm water management remains effective during and following decommissioning.	During decommissioning	Makadima Management
		*All grey water, sewage and other hazardous waste should be disposed of at an appropriate licensed facility for this.	During decommissioning	Makadima Management, Decommissioning Crew
		*Waste recycling should be incorporated into decommissioning as far as possible.	During decommissioning	Makadima Management, Decommissioning Crew
		*Educate workers about the development's waste management and handling of hazardous substances with regular training and notices.	Quarterly notice board updates, Monthly meetings and a yearly AGM	Makadima Management, Decommissioning Crew
Increased dust and erosion				
Minimize dust and erosion.	Implement effective measures to control dust and erosion.	*Limit vehicles, people and materials to the decommissioning site.	During decommissioning	Makadima Management, Decommissioning Crew
		*Commence (and preferably complete) decommissioning during winter, when the risk of erosion should be least.	During decommissioning	Makadima Management, Decommissioning Crew
		*Revegetate denude areas with locally indigenous flora a.s.a.p.	During decommissioning	Makadima Management, Decommissioning Crew
		*Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed.	During decommissioning	Makadima Management, Decommissioning Crew
		*Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting.	During decommissioning	Makadima Management, Decommissioning Crew
Increased sediment loads				
To avoid further sedimentation of the upper Mmaphanyane (HGM Unit 1).	Keep the extent of exposed soil and other sediment sources to a minimum.	*Commence (and preferably complete) decommissioning activities during winter when the risk of erosion and wetland sedimentation is lowest.	Try to keep decommissioning to within the winter seasons	Makadima Management
		*Keep all decommissioning activities to within the demarcated footprint areas (keep out of wetland).	Throughout decommissioning	Makadima Management, Decommissioning Crew
		*Keep cleared areas to a minimum by demolishing one development section at a time.	Throughout decommissioning	Makadima Management, Decommissioning Crew
		*Revegetate remaining cleared areas by planting indigenous grasses and other vegetation as soon as possible.	Throughout decommissioning	Makadima Management, Decommissioning Crew
		*Do not stockpile soil in the catchment area above the Eye or within the delineated wetland areas.	Throughout decommissioning	Makadima Management, Decommissioning Crew
		*Design measures to effectively control vehicle access, vehicle speed, dust, stormwater run-off, erosion and sedimentation on the road.	Throughout decommissioning	Makadima Management
Continued proliferation of alien species				
Minimize the continued proliferation of invasive alien species during decommissioning.	By law, remove and dispose of Category 1b alien species on site. All Category 2 species that remain on site will require a permit.	*Remove Category species using mechanical methods, and minimize soil disturbance as far as possible. Alien wood could be donated to the surrounding community.	Throughout decommissioning until all Category 1b and Category 2 alien species have been effectively removed from the site	Makadima Management
Loss of CI or medicinal flora				
Prohibit harvesting of CI and medicinally important flora.	Harvesting of indigenous flora for medicine, fire wood, building materials, and other purposes must be prohibited.	*Highlight all prohibited activities to workers through training and notices.	Prior to and during decommissioning	Makadima Management, Decommissioning Crew
		*Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).	During decommissioning	Makadima Management
Loss of CI fauna				

OBJECTIVE / TARGET	MITIGATION / MANAGEMENT ACTION	METHODOLOGY	FREQUENCY	RESPONSIBILITY
Prohibit harvesting of CI and other fauna.	Harvesting of indigenous fauna for food, sport, medicine, and other purposes must be prohibited.	*Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited activities to workers through training and notices.	Prior to and during decommissioning	Makadima Management
		*Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).	During decommissioning	Makadima Management
Sensory disturbance of fauna				
Minimize sensory disturbance of fauna.	Minimize unavoidable noise	*Conduct regular maintenance of machinery, fans and other noisy equipment.	During decommissioning	Makadima Management, Decommissioning Crew
	Prevent unnecessary light and noise pollution	*Encourage workers to minimize light and noise pollution through training and notices.	During decommissioning	Makadima Management, Decommissioning Crew
Altered burning				
Control fire	Avoid fire on site, without prohibiting wild fires in the surrounding natural environment.	*Create safe storage on the premises for flammable materials.	Prior to and during decommissioning	Makadima Management, Decommissioning Crew
		*If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures.	Prior to and during decommissioning	CSIR, Makadima Management, with advice from a Botanist / Horticulturist
		*Maintain an effective fire break between the development and the surrounding natural environment.	Prior to and during decommissioning	Makadima Management, Decommissioning Crew
		*Ensure that there are appropriate control measures in place for any accidental fires.	Prior to and during decommissioning	Makadima Management, Decommissioning Crew
		*Educate workers about the fire plan and emergency procedures with regular training and notices.	Prior to and during decommissioning	Makadima Management, Decommissioning Crew

12. References

AGIS (AGRICULTURAL GEO-REFERENCED INFORMATION SYSTEM). 2010. Website: www.agis.agric.za. Accessed in 2010.

BATES, M.F., BRANCH, W.R., BAUER, A.M., BURGER, M., MARAIS, J., ALEXANDER, G.J. & DE VILLIERS, M.S. 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Strelitzia 32. SANBI, Pretoria.

BIRDLIFE SOUTH AFRICA (2016).Website: www.birdlife.org.za. Accessed in 2016.

COWLING, & HILTON, T.C.. (1994). Patterns of plant diversity and endemism in southern Africa: an overview. DACE. 2008. North West Province. Environment Outlook. DACE.

DAVIS S.D, DROOP S.J.M., GREGERSON P., HENSON L., LEON C.J., VILA-LOBOS J.L., SYNGE H. & ZANTOVSKA J. 1986. Plants in Danger: What do we Know? IUCN, Gland.

DEA (DEPARTMENT OF ENVIRONMENTAL AFFAIRS), DMR (DEPARTMENT OF MINERAL RESOURCES), CoM (CHAMBER OF MINES), SAMBF (SOUTH AFRICAN MINING & BIODIVERSITY FORUM) & SANBI (SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE). 2013. Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector. DEA, Pretoria.

DEAT (DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM). 2005. South Africa's National Biodiversity Strategy and Action Plan. DEAT, Pretoria.

DEPARTMENT OF WATER AFFAIRS AND FORESTRY (DWAF), 1996. South African Water Quality Guidelines, Volume 7: Aquatic Ecosystems. Department of Water Affairs and Forestry. Pretoria, South Africa.

DEPARTMENT OF WATER AND SANITATION (DWS), 2014. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Secondary: B3. Compiled by RQIS-RDM: http://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx

DRIVER A., MAZE K., LOMBARD A.T., NEL J., ROUGET M. & TURPIE J.K. 2004. South African National Spatial Biodiversity Assessment Summary Report.

DRIVER, A., Nel, J.L., SNADDON, K., MURRAY, K., ROUX, D.J., HILL L., SWARTZ, E.R., MANUEL, J. & FUNKE, N. 2011. Implementation Manual for Freshwater Ecosystem Priority Areas. Water Research Commission, Pretoria.

DU PREEZ L. & CARRUTHERS V. 2009. A Complete Guide to the Frogs of Southern Africa. Struik Nature, Cape Town.

DWAF (DEPARTMENT OF WATER AFFAIRS AND FORESTRY). 1999. Resource Directed Measures for Protection of Water Resources. Volume 4. Wetland Ecosystems. Version 1.0. DWAF, Pretoria.

DWAF. 2005. A practical field procedure for identification and delineation of wetland riparian areas. DWAF, Pretoria.

DWAF. 2013. Website: http://www.dwaf.gov.za/WAR/systems.html. Accessed in August 2011.

DWS (DEPARTMENT OF WATER AND SANITATION). 2017. National Water Management System data extracted on 2017-10-18. DWS, Pretoria.

FRIEDMANN Y. & DALY B. 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), EWT, Johannesburg.

FROGMAP. 2017. Website: http://vmus.adu.org.za. Accessed in October 2017.

G.A., KRUGER M.A., PRINGLE, E.L., TERBLANCHE R.F. & WILLIAMS M.C. 2013. Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas. Saftronics and the ADU, University of Cape Town, Cape Town.

HILTON-TAYLOR, C. 1996. Red Data List of southern African plants. Strelitzia 4. National Botanical Institute, Pretoria, South Africa.

IUCN. 2016 and 2017. The IUCN Red List of Threatened Species. Website: www.iucnredlist.org. Accessed in 2016 and 2017.

ITHOLENG, K.B.I. (2007). The indigenous knowledge of the local community towards weeds and alien invasive plants in the dinokana area, north-west province, south africa/by kebalepile benedict itholeng. In: North-west University

KNNCS, 1999. Nomination Proposal for the Drakensberg Park alternatively known as Ukhahlamba Park to be listed as a World Heritage Site. Kwazulu-Natal Nature Conservation Service. Amafa Akwazulu Natali - Heritage Kwazulu Natal.

KOTZE, D.C, MARNEWECK, G.C, BATCHELOR, A.L., LINDLEY, D.S. & COLLINS, N.B., 2008. WET-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands. WRC Report No TT 339/08, Water Research Commission, Pretoria.

KURZWEG SEMJ 2012 standardizing quarter degree grid data for plant species in the western central bushveld for more explicit use in spatial models. Nwu msc

LEEMING J. 2003. Scorpions of Southern Africa. Struik Publishers, Cape Town.

LEPIMAP. 2017. Website: http://vmus.adu.org.za. Accessed in October 2017.

MACFARLANE D.M., KOTZE D.C., ELLERY W.N., WALTERS D., KOOPMAN V., GOODMAN P., GOODMAN P. & GOGE C. 2008. WETLAND TOOLS ASSESSMENT. WRC REPORT

MAMMALMAP. 2017. Website: http://vmus.adu.org.za. Accessed in October 2017.

MCVICAR C.N. (Ed.) 1977. *Soil classification: A Binomial System for South Africa.* Department of Agriculture. In DWAF (2005). A practical field procedure for identification and delineation of wetland riparian areas. DWAF, Pretoria.

MECENERO, S., BALL J.B., EDGE D.A., HAMER M.L., HENNING

MINTER L., BURGER M., HARRISON J.A., BRAACK H.H., BISHOP P.J. & KLOEPFER D. 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series #9. Smithsonian Institution, Washington DC.

MONADJEM A., TAYLOR P.J., COTTERILL F.P.D. & SCHOEMAN M.C. 2010. Bats of Southern and Central Africa – A Biogeographic and Taxonomic Synthesis. Wits University Press, Johannesburg.

MUCINA L. & RUTHERFORD M.C. 2006. The Vegetation Map of South Africa, Lesotho and Swaziland. Strelitzia 19, SANBI, Pretoria.

O'FARRELL P. 2006. Ecosystem Services and Benefits to Farmers. Conservation Farming Project.

ODONATAMAP. 2017. Website: http://vmus.adu.org.za. Accessed in October 2017.

OLLIS, D., SNADDON, K., JOB, N & MBONA, N. 2013. Wetland Classification using the recently published Classification Systems for Wetlands: Inland Systems. SANBI, Pretoria.

PFAB M.F. & VICTOR J.E. 2002. Threatened Plants of Gauteng, South Africa. South African Journal of Botany 68: 370-375.

PICKETT S.T.A., OSTFELD R.S., SHACHAK M. & LICKENS G.E. 1997. The Ecological Basis of Conservation: Heterogeneity, Ecosystems, and Biodiversity. Chapman and Hall. New York.

REPTILEMAP. 2017. Website: http://vmus.adu.org.za. Accessed in October 2017.

SABAP 2 (SECOND SOUTHERN AFRICAN BIRD ATLAS PROJECT). 2017. Website: http://sabap2.adu.org.za. Accessed in October 2017.

SAMWAYS, M. J. 2008. Dragonflies and Damselflies of South Africa. Pensoft, Sofia, 297 pp.

SAMWAYS, M.J. 2006. National Red List of South African dragonflies (Odonata). Odonatologica, 35: 341–368.

SMITH, G.V. & PANETTA, D. 2002. Going with the flow: Dispersal of invasive vines in Coastal catchments. Alan Fetcher Research Station. (S.N).

SCORPIONMAP. 2017. Website: http://vmus.adu.org.za. Accessed in October 2017.

STUART C. & STUART T. 2007. Field Guide to the Mammals of Southern Africa. Struik Nature, Cape Town.

TAYLOR, M.R., PEACOCK, F. & WANLESS, R.M. (eds). 2015. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Johannesburg: BirdLife South Africa.

TOPS (THREATENED OR PROTECTED SPECIES LIST). 2007. National Environmental Management: Biodiversity Act, 2004 (Act No. 10, 2004): Publication of lists of Critically Endangered, Endangered, Vulnerable and Protected Species. February 2007.\

TOURÉ, D & JIWEN Ge, 2014. The Response of Plant Species Diversity to the Interrelationships between Soil and Environmental Factors in the Limestone Forests of Southwest China. *Journal of Environment and Earth Science.* ISSN 2224-3216 (Paper) ISSN 2225-0948 (Vol.4, No.8, 2014 105)

von STADEN, L. 2008. Cullen holubii (Burtt Davy) C.H.Stirt. National Assessment: Red List of South African Plants version 2015.1. Accessed on 2017/02/14

WALMSLEY, D. & J. WALMSLEY. 2002. North West Province State of the Environment Report. Overview 2002. Mzuri Consultants, Pretoria.

YETMAN C.A. 2012. Conservation Biology of the Giant Bullfrog, *Pyxicephalus adspersus* (Tschudi, 1838). PhD thesis. University of Pretoria, Pretoria

www.weatherunderground.com

DU TOIT, 1954

; VAN DER MEULEN, 1979

13. Appendices

13.1. POSA list for QDS 2525BD

Family		Species	Growth forms
ACANTHACEAE		Barleria pretoriensis C.B.Clarke	Dwarf shrub
ACANTHACEAE		Crabbea angustifolia Nees	Herb
ACANTHACEAE		Dyschoriste transvaalensis C.B.Clarke	Dwarf shrub
ACANTHACEAE		Hypoestes forskaolii (Vahl) R.Br.	Herb
AMARANTHACEAE	*	Achyranthes aspera L. var. aspera	Herb
AMARANTHACEAE		Aerva leucura Moq.	Herb
AMARANTHACEAE		Guilleminea densa (Willd. ex Roem. & Schult.) Moq.	Herb
AMARANTHACEAE		Pupalia lappacea (L.) A.Juss. var. lappacea	Herb
AMARYLLIDACEAE		Boophone disticha (L.f.) Herb.	Geophyte
AMARYLLIDACEAE		Scadoxus puniceus (L.) Friis & Nordal	Geophyte
ANACARDIACEAE		Lannea discolor (Sond.) Engl.	Tree
ANACARDIACEAE		Ozoroa paniculosa (Sond.) R.& A.Fern. var. paniculosa	Shrub, tree
ANACARDIACEAE		Sclerocarya birrea (A.Rich.) Hochst. subsp. caffra (Sond.) Kokwaro	Tree
ANACARDIACEAE		Searsia lancea (L.f.) F.A.Barkley	Shrub, tree
ANACARDIACEAE		Searsia leptodictya (Diels) T.S.Yi, A.J.Mill. & J.Wen forma leptodictya	Shrub, tree
ANACARDIACEAE		Searsia magalismontana (Sond.) Moffett subsp. magalismontana	Dwarf shrub
ANACARDIACEAE		Searsia pallens (Eckl. & Zeyh.) Moffett	Shrub, tree
ANACARDIACEAE		Searsia pyroides (Burch.) Moffett var. pyroides	Tree
APOCYNACEAE		Ancylobotrys capensis (Oliv.) Pichon	Climber
APOCYNACEAE		Carissa bispinosa (L.) Desf. ex Brenan	Shrub
APOCYNACEAE		Gomphocarpus fruticosus (L.) Aiton f. subsp. fruticosus	Shrub
APOCYNACEAE		Marsdenia sylvestris (Retz.) P.I.Forst.	Climber
APOCYNACEAE		Orbea lutea (N.E.Br.) Bruyns subsp. lutea	Succulent
APOCYNACEAE		Sarcostemma viminale (L.) R.Br. subsp. viminale	Climber
ARALIACEAE		Cussonia paniculata Eckl. & Zeyh. subsp. sinuata (Reyneke & Kok) De Winter	Succulent
ASPARAGACEAE		Asparagus cooperi Baker	Dwarf shrub
ASPARAGACEAE		Asparagus suaveolens Burch.	Shrub
ASPHODELACEAE		Aloe cryptopoda Baker	Dwarf shrub
ASPHODELACEAE		Kniphofia ensifolia Baker subsp. ensifolia	Herb
ASPLENIACEAE		Asplenium cordatum (Thunb.) Sw.	Geophyte
ASTERACEAE		Berkheya radula (Harv.) De Wild.	Herb
ASTERACEAE	*	Bidens bipinnata L.	Herb
ASTERACEAE	*	Bidens pilosa L.	Herb
ASTERACEAE	*	Conyza bonariensis (L.) Cronquist	Herb
ASTERACEAE		Dicoma anomala Sond. subsp. gerrardii (Harv. ex F.C.Wilson) S.Ortíz & Rodr.Oubiña	Herb
ASTERACEAE		Emilia ambifaria (S.Moore) C.Jeffrey	Succulent
ASTERACEAE	*	Flaveria bidentis (L.) Kuntze	Herb

Family		Species	Growth forms
ASTERACEAE		Gazania krebsiana Less. subsp. serrulata (DC.) Roessler	Herb
ASTERACEAE		Geigeria burkei Harv. subsp. burkei var. zeyheri (Harv.) Merxm.	Herb
ASTERACEAE		Helichrysum paronychioides DC.	Dwarf shrub
ASTERACEAE		Helichrysum setosum Harv.	Shrub
ASTERACEAE		Kleinia longiflora DC.	Shrub
ASTERACEAE		Nidorella resedifolia DC. subsp. resedifolia	Herb
ASTERACEAE		Pseudognaphalium oligandrum (DC.) Hilliard & B.L.Burtt	Herb
ASTERACEAE		Psiadia punctulata (DC.) Vatke	Shrub
ASTERACEAE	*	Tagetes minuta L.	Herb
ASTERACEAE		Tarchonanthus camphoratus L.	Shrub, tree
ASTERACEAE	*	Xanthium spinosum L.	Herb
BORAGINACEAE		Ehretia rigida (Thunb.) Druce subsp. nervifolia Retief & A.E.van Wyk	Shrub
BUDDLEJACEAE		Buddleja saligna Willd.	Shrub, tree
BUDDLEJACEAE		Nuxia congesta R.Br. ex Fresen.	Shrub, tree
BURSERACEAE		Commiphora africana (A.Rich.) Engl. var. africana	Dwarf shrub
BURSERACEAE		Commiphora glandulosa Schinz	Shrub, tree
CAPPARACEAE		Boscia albitrunca (Burch.) Gilg & Gilg-Ben.	Shrub, tree
CAPPARACEAE		Maerua cafra (DC.) Pax	Shrub, tree
CELASTRACEAE		Gymnosporia buxifolia (L.) Szyszyl.	Shrub, tree
CELTIDACEAE		Celtis africana Burm.f.	Shrub, tree
CHRYSOBALANACEAE		Parinari capensis Harv. subsp. capensis	Dwarf shrub
COMBRETACEAE		Combretum apiculatum Sond. subsp. apiculatum	Shrub, tree
COMBRETACEAE		Combretum erythrophyllum (Burch.) Sond.	Shrub, tree
COMBRETACEAE		Combretum molle R.Br. ex G.Don	Tree
COMBRETACEAE		Combretum zeyheri Sond.	Shrub, tree
COMBRETACEAE		Terminalia sericea Burch. ex DC.	Tree
CONVOLVULACEAE		Ipomoea oblongata E.Mey. ex Choisy	Succulent
CRASSULACEAE		Kalanchoe paniculata Harv.	Shrub
CRASSULACEAE		Kalanchoe rotundifolia (Haw.) Haw.	Dwarf shrub
CUCURBITACEAE		Momordica balsamina L.	Climber
CYPERACEAE		Bulbostylis burchellii (Ficalho & Hiern) C.B.Clarke	Cyperoid
CYPERACEAE		Cladium mariscus (L.) Pohl subsp. jamaicense (Crantz) Kük.	Cyperoid
CYPERACEAE		Cyperus cyperoides (L.) Kuntze subsp. pseudoflavus (Kük.) Lye	Cyperoid
CYPERACEAE		Cyperus decurvatus (C.B.Clarke) C.Archer & Goetgh.	Cyperoid
CYPERACEAE		Cyperus digitatus Roxb. subsp. auricomus (Sieber ex Spreng.) Kük.	Cyperoid
CYPERACEAE		Cyperus indecorus Kunth var. inflatus (C.B.Clarke) Kük.	Cyperoid
CYPERACEAE		Cyperus longus L. var. tenuiflorus (Rottb.) Boeck.	Cyperoid
CYPERACEAE		Cyperus margaritaceus Vahl var. margaritaceus	Cyperoid
CYPERACEAE		Kyllinga alba Nees	Cyperoid
CYPERACEAE		Pycreus betschuanus (Boeckeler) C.B.Clarke	Cyperoid
CYPERACEAE		Schoenoplectus muricinux (C.B.Clarke) J.Raynal	Cyperoid

Family		Species	Growth forms
DRACAENACEAE		Sansevieria aethiopica Thunb.	Geophyte
EBENACEAE		Diospyros lycioides Desf. subsp. lycioides	Shrub
EBENACEAE		Euclea crispa (Thunb.) Gürke subsp. crispa	Shrub, tree
EBENACEAE		Euclea natalensis A.DC. subsp. angustifolia F.White	Shrub, tree
EBENACEAE		Euclea undulata Thunb.	Shrub, tree
EUPHORBIACEAE		Acalypha glabrata Thunb. var. pilosa Pax	Shrub, tree
EUPHORBIACEAE		Clutia pulchella L. var. pulchella	Dwarf shrub
EUPHORBIACEAE		Croton gratissimus Burch. var. subgratissimus (Prain) Burtt Davy	Shrub, tree
EUPHORBIACEAE		Spirostachys africana Sond.	Shrub, tree
EUPHORBIACEAE		Tragia rupestris Sond.	Climber
FABACEAE		Acacia caffra (Thunb.) Willd.	Shrub, tree
FABACEAE		Acacia erioloba E.Mey.	Shrub, tree
FABACEAE		Acacia fleckii Schinz	Shrub, tree
FABACEAE		Acacia hebeclada DC. subsp. hebeclada	Shrub, tree
FABACEAE		Acacia karroo Hayne	Shrub, tree
FABACEAE		Acacia mellifera (Vahl) Benth. subsp. detinens (Burch.) Brenan	Shrub, tree
FABACEAE		Acacia nigrescens Oliv.	Tree
FABACEAE		Acacia nilotica (L.) Willd. ex Delile subsp. kraussiana (Benth.) Brenan	Tree
FABACEAE		Acacia robusta Burch. subsp. robusta	Tree
FABACEAE		Acacia tortilis (Forssk.) Hayne subsp. heteracantha (Burch.) Brenan	Shrub, tree
FABACEAE		Burkea africana Hook.	Tree
FABACEAE		Chamaecrista biensis (Steyaert) Lock	Herb
FABACEAE		Crotalaria orientalis Burtt Davy ex I.Verd. subsp. orientalis	Dwarf shrub
FABACEAE		Crotalaria spartioides DC.	Shrub
FABACEAE		Dichrostachys cinerea (L.) Wight & Arn. subsp. africana Brenan & Brummitt var. africana	Shrub, tree
FABACEAE		Dolichos pratensis (E.Mey.) Taub.	Climber
FABACEAE		Elephantorrhiza burkei Benth.	Shrub, tree
FABACEAE		Elephantorrhiza elephantina (Burch.) Skeels	Dwarf shrub
FABACEAE		Indigofera bainesii Baker	Dwarf shrub
FABACEAE		Indigofera cryptantha Benth. ex Harv. var. cryptantha	Dwarf shrub
FABACEAE		Indigofera daleoides Benth. ex Harv. var. daleoides	Herb
FABACEAE		Indigofera hofmanniana Schinz	Dwarf shrub
FABACEAE		Indigofera vicioides Jaub. & Spach var. vicioides	Herb
FABACEAE		Mundulea sericea (Willd.) A.Chev. subsp. sericea	Shrub, tree
FABACEAE		Neonotonia wightii (Wight. ex Arn.) J.A.Lackey	Climber
FABACEAE		Otoptera burchellii DC.	Climber
FABACEAE		Peltophorum africanum Sond.	Tree
FABACEAE		Stylosanthes fruticosa (Retz.) Alston	Dwarf shrub
FABACEAE		Tephrosia burchellii Burtt Davy	Herb
FABACEAE		Zornia glochidiata Rchb. ex DC.	Herb
FLACOURTIACEAE		Flacourtia indica (Burm.f.) Merr.	Shrub, tree

Family		Species	Growth forms
GERANIACEAE		Monsonia burkeana Planch. ex Harv.	Herb
GISEKIACEAE		Gisekia africana (Lour.) Kuntze var. africana	Herb
HYACINTHACEAE		Ledebouria marginata (Baker) Jessop	Geophyte
HYACINTHACEAE		Schizocarphus nervosus (Burch.) Van der Merwe	Geophyte
IRIDACEAE		Gladiolus filiformis Goldblatt & J.C.Manning	Geophyte
IRIDACEAE		Moraea pallida (Baker) Goldblatt	Geophyte
LAMIACEAE		Salvia runcinata L.f.	Herb
LAMIACEAE		Stachys spathulata Burch. ex Benth.	Herb
LAMIACEAE		Tetradenia brevispicata (N.E.Br.) Codd	Shrub
LAMIACEAE		Teucrium trifidum Retz.	Herb
LAMIACEAE		Vitex zeyheri Sond.	Tree
LORANTHACEAE		Agelanthus natalitius (Meisn.) Polhill & Wiens subsp. zeyheri (Harv.) Polhill & Wiens	Parasite
LORANTHACEAE		Tapinanthus quequensis (Weim.) Polhill & Wiens	Parasite
MALPIGHIACEAE		Sphedamnocarpus pruriens (A.Juss.) Szyszyl. subsp. pruriens	Climber
MALVACEAE		Corchorus kirkii N.E.Br.	Shrub
MALVACEAE		Dombeya rotundifolia (Hochst.) Planch. var. rotundifolia	Shrub, tree
MALVACEAE		Grewia flava DC.	Shrub
MALVACEAE		Grewia flavescens Juss.	Shrub
MALVACEAE		Grewia monticola Sond.	Shrub, tree
MALVACEAE		Grewia subspathulata N.E.Br.	Shrub
MALVACEAE		Hermannia depressa N.E.Br.	Herb
MALVACEAE		Hibiscus engleri K.Schum.	Herb
MALVACEAE		Hibiscus micranthus L.f. var. micranthus	Shrub
MALVACEAE		Melhania prostrata DC.	Dwarf shrub
MALVACEAE		Sida dregei Burtt Davy	Dwarf shrub
MALVACEAE		Triumfetta rhomboidea Jacq. var. rhomboidea	Shrub
MALVACEAE		Waltheria indica L.	Herb
MELIACEAE		Turraea obtusifolia Hochst.	Climber
MOLLUGINACEAE		Limeum sulcatum (Klotzsch) Hutch. var. sulcatum	Herb
MOLLUGINACEAE		Limeum viscosum (J.Gay) Fenzl subsp. viscosum var. viscosum	Herb
MORACEAE		Ficus abutilifolia (Miq.) Miq.	Shrub, tree
MORACEAE		Ficus ingens (Miq.) Miq.	Tree
MORACEAE		Ficus salicifolia Vahl	Tree
MYROTHAMNACEAE		Myrothamnus flabellifolius Welw.	Dwarf shrub
NYCTAGINACEAE	*	Boerhavia diffusa L. var. diffusa	Herb
OCHNACEAE		Ochna inermis (Forssk.) Schweinf.	Shrub, tree
OCHNACEAE		Ochna pulchra Hook.f.	Shrub, tree
OLACACEAE		Ximenia americana L. var. microphylla Welw. ex Oliv.	Shrub, tree
OLACACEAE		Ximenia caffra Sond. var. caffra	Shrub, tree
OLEACEAE		Olea europaea L. subsp. africana (Mill.) P.S.Green	Shrub, tree
OXALIDACEAE	*	Oxalis corniculata L.	Herb

Family		Species	Growth forms
PEDALIACEAE		Dicerocaryum senecioides (Klotzsch) Abels	Herb
PHYLLANTHACEAE		Bridelia mollis Hutch.	Shrub, tree
PHYLLANTHACEAE		Flueggea virosa (Roxb. ex Willd.) Voigt subsp. virosa	Shrub, tree
PHYLLANTHACEAE		Phyllanthus maderaspatensis L.	Herb
PLUMBAGINACEAE		Plumbago zeylanica L.	Shrub
POACEAE		Aristida canescens Henrard subsp. canescens	Graminoid
POACEAE		Aristida congesta Roem. & Schult. subsp. barbicollis (Trin. & Rupr.) De Winter	Graminoid
POACEAE		Aristida junciformis Trin. & Rupr. subsp. junciformis	Graminoid
POACEAE		Aristida stipitata Hack. subsp. graciliflora (Pilg.) Melderis	Graminoid
POACEAE		Cymbopogon prolixus (Stapf) E.Phillips	Graminoid
POACEAE		Dichanthium annulatum (Forssk.) Stapf var. papillosum (A.Rich.) de Wet & Harlan	Graminoid
POACEAE		Digitaria eriantha Steud.	Graminoid
POACEAE		Eleusine coracana (L.) Gaertn. subsp. africana (Kenn.-O'Byrne) Hilu & de Wet	Graminoid
POACEAE		Eragrostis barbinodis Hack.	Graminoid
POACEAE		Eragrostis chloromelas Steud.	Graminoid
POACEAE		Eragrostis heteromera Stapf	Graminoid
POACEAE		Eragrostis rigidior Pilg.	Graminoid
POACEAE		Hyparrhenia anamesa Clayton	Graminoid
POACEAE		Melinis repens (Willd.) Zizka subsp. repens	Graminoid
POACEAE		Panicum maximum Jacq.	Graminoid
POACEAE		Perotis patens Gand.	Graminoid
POACEAE		Pogonarthria squarrosa (Roem. & Schult.) Pilg.	Graminoid
POACEAE		Setaria verticillata (L.) P.Beauv.	Graminoid
POACEAE		Sorghum bicolor (L.) Moench subsp. arundinaceum (Desv.) de Wet & Harlan	Graminoid
POACEAE		Themeda triandra Forssk.	Graminoid
POACEAE		Trichoneura grandiglumis (Nees) Ekman	Graminoid
POACEAE		Urochloa mosambicensis (Hack.) Dandy	Graminoid
POLYGALACEAE		Securidaca longepedunculata Fresen. var. longepedunculata	Shrub, tree
PORTULACACEAE	*	Portulaca oleracea L.	Succulent
PROTEACEAE		Faurea saligna Harv.	Tree
PTERIDACEAE		Adiantum capillus-veneris L.	Geophyte
RANUNCULACEAE		Clematis brachiata Thunb.	Climber
RHAMNACEAE		Berchemia zeyheri (Sond.) Grubov	Tree
RHAMNACEAE		Ziziphus mucronata Willd. subsp. mucronata	Shrub, tree
RHAMNACEAE		Ziziphus zeyheriana Sond.	Dwarf shrub
RUBIACEAE		Pavetta zeyheri Sond. subsp. zeyheri	Shrub, tree
RUBIACEAE		Psydrax livida (Hiern) Bridson	Shrub, tree
RUBIACEAE		Pygmaeothamnus zeyheri (Sond.) Robyns var. zeyheri	Dwarf shrub
RUBIACEAE		Rothmannia capensis Thunb.	Tree
RUBIACEAE		Vangueria infausta Burch. subsp. infausta	Tree
SANTALACEAE		Osyris lanceolata Hochst. & Steud.	Shrub

Family		Species	Growth forms
SAPINDACEAE		Erythrophysa transvaalensis I.Verd.	Shrub, tree
SAPINDACEAE		Pappea capensis Eckl. & Zeyh.	Shrub, tree
SAPOTACEAE		Englerophytum magalismontanum (Sond.) T.D.Penn.	Shrub, tree
SAPOTACEAE		Mimusops zeyheri Sond.	Shrub, tree
SCROPHULARIACEAE		Chaenostoma leve (Hiern) Kornhall	Herb
SCROPHULARIACEAE		Halleria lucida L.	Shrub, tree
SINOPTERIDACEAE		Cheilanthes hirta Sw. var. brevipilosa W.& N.Jacobsen	Herb
SINOPTERIDACEAE		Pellaea calomelanos (Sw.) Link var. calomelanos	Geophyte
SOLANACEAE		Solanum lichtensteinii Willd.	Dwarf shrub
SOLANACEAE		Solanum supinum Dunal var. supinum	Dwarf shrub
STRYCHNACEAE		Strychnos madagascariensis Poir.	Shrub, tree
STRYCHNACEAE		Strychnos pungens Soler.	Shrub, tree
TYPHACEAE		Typha capensis (Rohrb.) N.E.Br.	Hydrophyte
URTICACEAE		Pouzolzia mixta Solms var. mixta	Shrub
VERBENACEAE		Lantana rugosa Thunb.	Shrub
VERBENACEAE		Lippia javanica (Burm.f.) Spreng.	Shrub
VERBENACEAE	*	Verbena aristigera S.Moore	Herb
VISCACEAE		Viscum combreticola Engl.	Parasite
VISCACEAE		Viscum rotundifolium L.f.	Parasite
VISCACEAE		Viscum verrucosum Harv.	Parasite
VITACEAE		Cissus cactiformis Gilg	Climber
VITACEAE		Rhoicissus tridentata (L.f.) Wild & R.B.Drumm. subsp. cuneifolia (Eckl. & Zeyh.) Urton	Climber
VITACEAE		Rhoicissus tridentata (L.f.) Wild & R.B.Drumm. subsp. tridentata	Shrub
ZYGOPHYLLACEAE		Tribulus terrestris L.	Herb

13.2. Mammal list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	RSA RED LIST STATUS	QDS (MammalMAP 2017)	LO ON SITE
BATHYERGIDAE	**Mole-rats**						
Cryptomys hottentotus	Southern African Mole-rat			LC (S)	LC	1	1
BOVIDAE	**Even-toed antelope**						
Oreotragus oreotragus	Klipspringer		PG	LC (S)	LC	2	4
Raphicerus campestris	Steenbok		PG	LC (S)	LC	1	3
Redunca arundinum	Southern Reedbuck		PG	LC (S)	LC	1	4
Redunca fulvorufula	Mountain Reedbuck		PG	LC (S)	EN	1	4
Sylvicapra grimmia	Bush Duiker			LC (S)	LC	1	3
Tragelaphus scriptus	Bushbuck			LC (S)	LC	1	4
Tragelaphus strepsiceros	Greater Kudu			LC (S)	LC	1	4
CANIDAE	**Dogs, foxes, jackals & relatives**						
Canis mesomelas	Black-backed Jackal			LC (S)	LC	2	3
Otocyon megalotis	Bat-eared Fox	PS		LC (U)	LC	3	4
Vulpes chama	Cape Fox	PS		LC (S)	LC	3	4
CERCOPITHECIDAE	**Baboon & monkeys**						
Cercopithecus pygerythrus pygerythrus	Vervet Monkey			LC (S)	LC	1	4
Papio ursinus	Chacma Baboon			LC (S)	LC	2	4
ERINACEIDAE	**Hedgehog**						
Atelerix frontalis (frontalis)	Southern African Hedgehog		PG	LC (S)	NT	2	4
FELIDAE	**Cats**						
Caracal caracal	Caracal			LC (U)	LC	3	3
Felis nigripes	Black-footed Cat	PS		VU (D)	VU	3	4
Felis silvestris	Wildcat			LC (D)	LC	3	4
Leptailurus serval	Serval	PS		LC (S)	NT	2	4
Panthera pardus	Leopard	PS	PWA	NT (D)	VU	1	4
GALAGIDAE	**Bushbabies**						
Galago moholi	Moholi Bushbaby			LC (S)	LC	2	2
GLIRIDAE	**Dormice**						
Graphiurus murinus	Forest African Dormouse			LC (S)	LC	2	2
HERPESTIDAE	**Meerkat & mongooses**						
Atilax paludinosus	Marsh Mongoose			LC (D)	LC	2	4
Cynictis penicillata	Yellow Mongoose			LC (S)	LC	1	2
Helogale parvula	Common Dwarf Mongoose			LC (S)	LC	3	4
Herpestes sanguineus	Slender Mongoose			LC (S)	LC	2	2

FAMILY & SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	RSA RED LIST STATUS	QDS (MammalMAP 2017)	LO ON SITE
Ichneumia albicauda	White-tailed Mongoose			LC (S)	LC	3	4
Mungos mungo	Banded Mongoose			LC (S)	LC	2	4
Suricata suricatta	Meerkat			LC (U)	LC	3	4
HIPPOSIDERIDAE	**Leaf-nosed & related bats**						
Cloeotis percivali	Percival's Short-eared Trident Bat			LC (U)	**EN**	3	3
Hipposideros caffer	Sundevall's Leaf-nosed Bat			LC (D)	LC	3	3
HYAENIDAE	**Aardwolf & hyenas**						
Hyaena brunnea	Brown Hyena	**PS**	**PG**	**NT (D)**	**NT**	2	3
Proteles cristata	Aardwolf		**PG**	LC (S)	LC	2	4
HYSTRICIDAE	**Porcupine**						
Hystrix africaeaustralis	Cape Porcupine			LC (S)	LC	2	4
LEPORIDAE	**Hares & rabbits**						
Lepus capensis	Cape Hare			LC (D)	LC	3	3
Lepus saxatilis	Scrub Hare			LC (D)	LC	2	1
Pronolagus randensis	Jameson's Red Rock Hare			LC (U)	LC	2	
MACROSCELIDIDAE	**Elephant shrews**						
Elephantulus brachyrhynchus	Short-snouted Elephant Shrew			LC (U)	LC	2	2
Elephantulus myurus	Eastern Rock Elephant Shrew			LC (S)	LC	2	2
MANIDAE	**Pangolin**						
Smutsia temminckii	Ground Pangolin	**VU**	**PG**	LC (D)	**VU**	3	4
MOLOSSIDAE	**Free-tailed & related bats**						
Sauromys petrophilus	Roberts's Flat-headed Bat			LC (S)	LC	3	3
Tadarida aegyptiaca	Egyptian Free-tailed Bat			LC (U)	LC	2	2
MURIDAE	**Gerbils, rock mice, vlei rats & relatives**						
Acomys spinosissimus	Southern African Spiny Mouse			LC (S)	LC	3	3
Aethomys chrysophilus	Red Veld Aethomys			LC (U)	LC	3	4
Aethomys ineptus	Tete Veld Aethomys			LC (U)	LC	2	2
Aethomys namaquensis	Namaqua Rock Mouse			LC (S)	LC	1	2
Gerbilliscus brantsii	Highveld Gerbil			LC (U)	LC	2	3
Gerbilliscus leucogaster	Bushveld Gerbil			LC (S)	LC	2	2
Gerbilliscus paeba	Paeba Hairy-footed Gerbil				LC	3	4
Lemniscomys rosalia	Single-Striped Lemniscomys			LC (S)	LC	1	2
Mastomys coucha	Southern African Mastomys			LC (S)	LC	1	2
Mus indutus	Desert Pygmy Mouse			LC (S)	LC	2	2
Mus minutoides	Southern African Pygmy Mouse			LC (S)	LC	2	2

FAMILY & SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	RSA RED LIST STATUS	QDS (MammalMAP 2017)	LO ON SITE
Otomys angoniensis	Angoni Vlei Rat			LC (S)	LC	1	2
Otomys auratus / irroratus	Southern African Vlei Rat			LC (S)	LC	2	2
Rhabdomys pumilio	Xeric Four-striped Grass Rat			LC (S)	LC	2	2
Thallomys paedulcus	Acacia Thallomys			LC (U)	LC	2	3
MUSTELIDAE	**Badger, otters, polecat & weasel**						
Aonyx capensis	African Clawless Otter			LC (S)	**NT**	2	4
Ictonyx striatus	Striped Polecat			LC (S)	LC	2	4
Mellivora capensis	Honey Badger			LC (D)	LC	2	4
Poecilogale albinucha	African Striped Weasel			LC (U)	**NT**	2	4
NESOMYIDAE	**Climbing & fat mice & relatives**						
Dendromus melanotis	Gray African Climbing Mouse			LC (S)	LC	2	4
Saccostomus campestris	Southern African Pouched Mouse			LC (S)	LC	2	2
Steatomys krebsii	Kreb's African Fat Mouse			LC (S)	LC	3	4
NYCTERIDAE	**Slit-faced bats**						
Nycteris thebaica	Egyptian Slit-faced Bat			LC (U)	LC	2	2
ORYCTEROPODIDAE	**Aardvark**						
Orycteropus afer	Aardvark	**PS**	**PG**	LC (U)	LC	3	4
PEDETIDAE	**Spring Hare**						
Pedetes capensis	South African Spring Hare			LC (U)	LC	2	4
PETROMURIDAE	**Dassie Rat**						
PROCAVIIDAE	**Hyraxes**						
Procavia capensis	Rock Hyrax			LC (U)	LC	2	3
RHINOLOPHIDAE	**Horseshoe bats**						
Rhinolophus blasii	Blasius's Horseshoe Bat			LC (D)	**NT**	3	3
Rhinolophus clivosus	Geoffroy's Horseshoe Bat			LC (U)	LC	3	3
Rhinolophus darlingi	Darling's Horseshoe Bat			LC (U)	LC	2	2
Rhinolophus simulator	Bushveld Horseshoe Bat			LC (D)	LC	3	3
SCIURIDAE	**Squirrels**						
Paraxerus cepapi	Smith's Bush Squirrel			LC (S)	LC	2	1*
Xerus inauris	South African Ground Squirrel			LC (S)	LC	1	4
SORICIDAE	**Shrews**						
Crocidura cyanea	Reddish-gray Musk Shrew			LC (S)	LC	2	2
Crocidura fuscomurina	Bicolored Musk Shrew			LC (U)	LC	2	2
Crocidura hirta	Lesser Red Musk Shrew			LC (U)	LC	2	2
Crocidura mariquensis	Swamp Musk Shrew			LC (U)	**NT**	2	2

FAMILY & SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	RSA RED LIST STATUS	QDS (MammalMAP 2017)	LO ON SITE
Crocidura silacea	Lesser Gray-brown Musk Shrew			LC (S)	LC	2	2
Suncus infinitesimus	Least Dwarf Shrew			LC (U)	LC	3	3
Suncus lixus	Greater Dwarf Shrew			LC (U)	LC	3	3
SUIDAE	**Hogs & pigs**						
Phacochoerus africanus	Common Warthog			LC (S)	LC	1	4
Potamochoerus larvatus (koiropotamus)	Bush-pig			LC (S)	LC	2	4
THRYONOMYIDAE	**Cane Rat**						
Thryonomys swinderianus	Greater Cane Rat			LC (U)	LC	3	4
VESPERTILIONIDAE	**House, pipistrelle, serotine & related bats**						
Eptesicus hottentotus	Long-tailed Serotine			LC (U)	LC	3	3
Miniopterus natalensis / shreibersii	Natal / Shreiber's Long-fingered Bat			LC (U)	LC	2	2
Myotis tricolor	Temminck's Myotis			LC (U)	LC	3	3
Neoromicia capensis	Cape Serotine			LC (S)	LC	2	2
Neoromicia zuluensis	Zulu Serotine			LC (U)	LC	2	2
Pipistrellus rusticus	Rusty Pipistrelle			LC (U)	LC	3	3
Scotophilus dinganii	Yellow-bellied House Bat			LC (U)	LC	2	2
VIVERRIDAE	**Civet & genets**						
Civettictis civetta	African Civet			LC (U)	LC	3	4
Genetta genetta	Common Genet			LC (S)	LC	2	3
Genetta maculata	Common Large- / Rusty-spotted Genet			LC(U)	LC	2	3
Genetta tigrina	Cape Genet			LC (U)	LC	2	3

Status: D = Declining; EN = Endangered; LC = Least Concern; NT = Near Threatened; PG = Protected Game; PS = Protected Species; PWA = Protected Wild Animal; S = Stable; VU = Vulnerable; U = Unknown population trend

Likelihood of Occurrence (LO): 1 = Present; 1* = Present according to anectodal account; 2 = High; 3 = Moderate; 4 = Low

Sources: Transvaal Nature Conservation Ordinance (1983); Stuart & Stuart (2007); NEM:BA ToPS (2015); IUCN (2016); MammalMAP (2017); DREAD (unpubl. data); SANBI & EWT (unpubl. data)

13.3. Bird list for the study area

SCIENTIFIC NAME	ALPHABETICAL COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	REGIONAL RED LIST STATUS	QDS (Roberts VII)	PENTAD (SABAP 2) OR QDS (SABAP 1)	LO ON SITE
Apalis thoracica	Apalis, Bar-throated		PG	LC	LC	1		2
Recurvirostra avosetta	Avocet, Pied		PG	LC	LC	1		4
Turdoides jardineii	Babbler, Arrow-marked		PG	LC	LC	1	1	1
Turdoides bicolor	Babbler, Southern Pied		PG	LC	LC	1	1	2
Tricholaema leucomelas	Barbet, Acacia Pied		PG	LC	LC	1	1	2
Lybius torquatus	Barbet, Black-collared		PG	LC	LC	1	1	1
Trachyphonus vaillantii	Barbet, Crested		PG	LC	LC	1	1	1
Batis molitor	Batis, Chinspot		PG	LC	LC	1	1	2
Merops persicus	Bee-eater, Blue-cheeked		PG	LC	LC	1		4
Merops apiaster	Bee-eater, European		PG	LC	LC	1	1	1
Merops pusillus	Bee-eater, Little		PG	LC	LC	1	1	2
Merops hirundineus	Bee-eater, Swallow-tailed		PG	LC	LC	1		3
Merops bullockoides	Bee-eater, White-fronted		PG	LC	LC	1	1	2
Euplectes orix	Bishop, Southern Red		WA	LC	LC	1	1	2
Euplectes afer	Bishop, Yellow-crowned		PG	LC	LC	1		3
Ixobrychus sturmii	Bittern, Dwarf		PG	LC	LC	1		4
Ixobrychus minutus	Bittern, Little		PG	LC	LC	1		4
Telophorus zeylonus	Bokmakierie		PG	LC	LC	1	1	2
Laniarius ferrugineus	Boubou, Southern		PG	LC	LC	1	1	1
Nilaus afer	Brubru		PG	LC	LC	1	1	2
Pycnonotus nigricans	Bulbul, African Red-eyed		WA	LC	LC	1	1	1
Pycnonotus tricolor	Bulbul, Dark-capped		WA	LC	LC	1	1	1
Emberiza capensis	Bunting, Cape		PG	LC	LC	1	1	2
Emberiza tahapisi	Bunting, Cinnamon-breasted		PG	LC	LC	1	1	2
Emberiza flaviventris	Bunting, Golden-breasted		PG	LC	LC	1	1	2
Emberiza impetuani	Bunting, Lark-like		PG	LC	LC	1		2
Malaconotus blanchoti	Bush-shrike, Grey-headed		PG	LC	LC	1		2
Ardeotis kori	Bustard, Kori	PS	PG	NT	NT	1		4
Turnix sylvaticus	Buttonquail, Common (Kurrichane)		PG	LC	LC	1		3
Buteo vulpinus	Buzzard, Common (Steppe)		PG	LC	LC	1	1	2
Pernis apivorus	Buzzard, European Honey		PG	LC	LC	1		4
Buteo rufofuscus	Buzzard, Jackal		PG	LC	LC	1		3
Kaupifalco monogrammicus	Buzzard, Lizard		PG	LC	LC	1		4
Camaroptera brevicaudata	Camaroptera, Grey-backed		PG	LC	LC	1	1	2

SCIENTIFIC NAME	ALPHABETICAL COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	REGIONAL RED LIST STATUS	QDS (Roberts VII)	PENTAD (SABAP 2) OR QDS (SABAP 1)	LO ON SITE
Crithagra atrogularis	Canary, Black-throated		PG	LC	LC	1	1	1
Crithagra flaviventris	Canary, Yellow		PG	LC	LC	1	1	2
Crithagra mozambicus	Canary, Yellow-fronted		PG	LC	LC	1	1	2
Myrmecocichla formicivora	Chat, Ant-eating		PG	LC	LC	1	1	2
Cercomela familiaris	Chat, Familiar		PG	LC	LC	1	1	2
Thamnolaea cinnamomeiventris	Chat, Mocking Cliff		PG	LC	LC	1	1	2
Cisticola textrix	Cisticola, Cloud		PG	LC	LC	1	1	2
Cisticola aridulus	Cisticola, Desert		PG	LC	LC	1	1	2
Cisticola aberrans	Cisticola, Lazy		PG	LC	LC	1		2
Cisticola tinniens	Cisticola, Levaillant's		PG	LC	LC	1		2
Cisticola chiniana	Cisticola, Rattling		PG	LC	LC	1	1	3
Cisticola rufilatus	Cisticola, Tinkling		PG	LC	LC	1		3
Cisticola juncidis	Cisticola, Zitting		PG	LC	LC	1	1	3
Fulica cristata	Coot, Red-knobbed		PG	LC	LC	1	1	3
Phalacrocorax africanus	Cormorant, Reed		WA	LC	LC	1	1	2
Phalacrocorax carbo	Cormorant, White-breasted		WA	LC	LC	1	1	3
Centropus burchellii	Coucal, Burchell's		PG	LC	LC	1	1	2
Rhinoptilus chalcopterus	Courser, Bronze-winged		PG	LC	LC	1		2
Rhinoptilus africanus	Courser, Double-banded		PG	LC	LC	1		2
Cursorius temminckii	Courser, Temminck's		PG	LC	LC	1		3
Crecopsis egregia	Crake, African		PG	LC	LC	1		3
Porzana pusilla	Crake, Baillon's		PG	LC	LC	1		4
Amaurornis flavirostris	Crake, Black		PG	LC	LC	1		2
Porzana porzana	Crake, Spotted		PG	LC	LC	1		4
Anthropoides paradiseus	Crane, Blue	PS	PG	VU	NT	1		4
Sylvietta rufescens	Crombec, Long-billed		PG	LC	LC	1	1	2
Corvus capensis	Crow, Cape		WA	LC	LC	1	1	2
Corvus albus	Crow, Pied		WA	LC	LC	1	1	1
Cuculus gularis	Cuckoo, African		PG	LC	LC	1		2
Cuculus clamosus	Cuckoo, Black		PG	LC	LC	1	1	2
Cuculus canorus	Cuckoo, Common		PG	LC	LC	1		2
Chrysococcyx caprius	Cuckoo, Diederik		PG	LC	LC	1	1	2
Clamator glandarius	Cuckoo, Great Spotted		PG	LC	LC	1		2
Clamator jacobinus	Cuckoo, Jacobin		PG	LC	LC	1	1	2
Chrysococcyx klaas	Cuckoo, Klaas's		PG	LC	LC	1	1	1
Clamator levaillantii	Cuckoo, Levaillant's		PG	LC	LC	1		2

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Cuculus solitarius	Cuckoo, Red-chested		PG	LC	LC	1	1	2
Campephaga flava	Cuckooshrike, Black		PG	LC	LC	1	1	1
Anhinga rufa	Darter, African		PG	LC	LC	1		3
Streptopelia capicola	Dove, Cape Turtle		WA	LC	LC	1	1	1
Turtur chalcospilos	Dove, Emerald-spotted Wood		PG	LC	LC	1	1	3
Streptopelia senegalensis	Dove, Laughing		WA	LC	LC	1	1	1
Oena capensis	Dove, Namaqua		PG	LC	LC	1	1	2
Streptopelia semitorquata	Dove, Red-eyed		WA	LC	LC	1	1	2
Columba livia	Dove, Rock		PG	LC	LC	1		2
Dicrurus adsimilis	Drongo, Fork-tailed		PG	LC	LC	1	1	1
Anas sparsa	Duck, African Black		PG	LC	LC	1		3
Dendrocygna bicolor	Duck, Fulvous Whistling		PG	LC	LC	1		4
Sarkidiornis melanotos	Duck, Knob-billed		PG	LC	LC	1	1	4
Oxyura maccoa	Duck, Maccoa		PG	NT	NT	1		4
Thalassornis leuconotus	Duck, White-backed		PG	LC	LC	1		4
Dendrocygna viduata	Duck, White-facedWhistling		PG	LC	LC	1	1	3
Anas undulata	Duck, Yellow-billed		OG	LC	LC	1	1	2
Haliaeetus vocifer	Eagle, African Fish		PG	LC	LC	1		4
Aquila spilogaster	Eagle, African Hawk		PG	LC	LC	1		3
Hieraaetus ayresii	Eagle, Ayres's Hawk		PG	LC	LC	1		4
Circaetus pectoralis	Eagle, Black-chested Snake		PG	LC	LC	1	1	2
Hieraaetus pennatus	Eagle, Booted		PG	LC	LC	1		4
Circaetus cinereus	Eagle, Brown Snake		PG	LC	LC	1	1	2
Clanga pomarina	Eagle, Lesser Spotted		PG	LC	LC	1		3
Polemaetus bellicosus	Eagle, Martial	EN	PG	VU	EN	1		4
Aquila nipalensis	Eagle, Steppe		PG	EN	LC	1		4
Aquila rapax	Eagle, Tawny	EN	PG	LC	EN	1		4
Aquila verreauxii	Eagle, Verreauxs'		PG	LC	VU	1	1	4
Aquila wahlbergi	Eagle, Wahlberg's		PG	LC	LC	1	1	2
Egretta alba	Egret, Great		PG	LC	LC	1		4
Egretta garzetta	Egret, Little		PG	LC	LC	1		3
Bubulcus ibis	Egret, Western Cattle		PG	LC	LC	1	1	2
Egretta intermedia	Egret, Yellow-billed		PG	LC	LC	1		4
Eremomela usticollis	Eremomela, Burnt-necked		PG	LC	LC	1	1	2
Eremomela icteropygialis	Eremomela, Yellow-bellied		PG	LC	LC	1		2
Falco amurensis	Falcon, Amur		PG	LC	LC	1		2

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Falco biarmicus	Falcon, Lanner		PG	LC	VU	1	1	3
Falco vespertinus	Falcon, Red-footed		PG	NT	NT	1		3
Falco chicquera	Falcon, Red-necked		PG	LC	LC	1		3
Amadina fasciata	Finch, Cut-throat		PG	LC	LC	1	1	2
Amadina erythrocephala	Finch, Red-headed		PG	LC	LC	1	1	2
Sporopipes squamifrons	Finch, Scaly-feathered		PG	LC	LC	1	1	2
Podica senegalensis	Finfoot, African		PG	LC	VU	1		4
Lagonosticta rubricata	Firefinch, African		PG	LC	LC	1		2
Lagonosticta rhodopareia	Firefinch, Jameson's		PG	LC	LC	1		2
Lagonosticta senegala	Firefinch, Red-billed		PG	LC	LC	1	1	2
Lanius collaris	Fiscal, Southern (Common)		PG	LC	LC	1	1	1
Phoenicopterus roseus	Flamingo, Greater		PG	LC	NT	1		4
Phoeniconaias minor	Flamingo, Lesser		PG	NT	NT	1		4
Terpsiphone viridis	Flycatcher, African Paradise		PG	LC	LC	1	1	2
Bradornis infuscatus	Flycatcher, Chat		PG	LC	LC	1		2
Stenostira scita	Flycatcher, Fairy		PG	LC	LC	1		2
Sigelus silens	Flycatcher, Fiscal		PG	LC	LC	1	1	2
Myioparus plumbeus	Flycatcher, Grey Tit-		PG	LC	LC	1		2
Bradornis mariquensis	Flycatcher, Marico		PG	LC	LC	1	1	2
Melaenornis pammelaina	Flycatcher, Southern Black		PG	LC	LC	1	1	2
Muscicapa striata	Flycatcher, Spotted		PG	LC	LC	1		2
Peliperdix coqui	Francolin, Coqui		OG	LC	LC	1		4
Dendroperdix sephaena	Francolin, Crested		OG	LC	LC	1	1	2
Scleroptila levaillantoides	Francolin, Orange River		OG	LC	LC	1	1	3
Corythaixoides concolor	Go-away-bird, Grey		PG	LC	LC	1	1	1
Limosa limosa	Godwit, Black-tailed		PG	NT	NA	1		4
Alopochen aegyptiacus	Goose, Egyptian		OG	LC	LC	1	1	1
Plectropterus gambensis	Goose, Spur-winged		OG	LC	LC	1		4
Melierax gabar	Goshawk, Gabar		PG	LC	LC	1		3
Melierax canorus	Goshawk, Pale Chanting		PG	LC	LC	1	1	2
Podiceps nigricollis	Grebe, Black-necked		PG	LC	LC	1		4
Podiceps cristatus	Grebe, Great Crested		PG	LC	LC	1		3
Tachybaptus ruficollis	Grebe, Little		PG	LC	LC	1	1	3
Tringa nebularia	Greenshank, Common		PG	LC	LC	1		4
Numida meleagris	Guineafowl, Helmeted		PG	LC	LC	1	1	3
Chroicocephalus cirrocephalus	Gull, Grey-headed		PG	LC	LC	1		4

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Scopus umbretta	Hamerkop		PG	LC	LC	1	1	2
Circus ranivorus	Harrier, African Marsh		PG	LC	EN	1		4
Circus maurus	Harrier, Black		PG	VU	EN	1		4
Circus pygargus	Harrier, Montagu's		PG	LC	LC	1		4
Circus macrourus	Harrier, Pallid		PG	NT	NT	1		4
Aviceda cuculoides	Hawk, African Cuckoo		PG	LC	LC	1		2
Polyboroides typus	Hawk, African Harrier-		PG	LC	LC	1		2
Prionops plumatus	Helmet-shrike, White-crested		PG	LC	LC	1	1	3
Egretta ardesiaca	Heron, Black		PG	LC	LC	1		4
Nycticorax nycticorax	Heron, Black-crowned Night		PG	LC	LC	1		3
Ardea melanocephala	Heron, Black-headed		PG	LC	LC	1	1	2
Butorides striata	Heron, Green-backed		PG	LC	LC	1		3
Ardea cinerea	Heron, Grey		PG	LC	LC	1	1	2
Ardea purpurea	Heron, Purple		PG	LC	LC	1		4
Ardeola ralloides	Heron, Squacco		PG	LC	LC	1		4
Gorsachius leuconotus	Heron, White-backed Night		PG	LC	VU	1		3
Falco subbuteo	Hobby, Eurasian		PG	LC	LC	1		3
Prodotiscus regulus	Honeybird, Brown-backed		PG	LC	LC	1		2
Indicator indicator	Honeyguide, Greater		PG	LC	LC	1		2
Indicator minor	Honeyguide, Lesser		PG	LC	LC	1		3
Upupa africana	Hoopoe, African		PG	LC	LC	1	1	1
Tockus nasutus	Hornbill, African Grey		PG	LC	LC	1	1	1
Tockus erythrorhynchus	Hornbill, Southern Red-billed		PG	LC	LC	1	1	2
Tockus leucomelas	Hornbill, Southern Yellow-billed		PG	LC	LC	1	1	2
Threskiornis aethiopicus	Ibis, African Sacred		PG	LC	LC	1		2
Plegadis falcinellus	Ibis, Glossy		PG	LC	LC	1		2
Bostrychia hagedash	Ibis, Hadeda		PG	LC	LC	1	1	1
Vidua purpurascens	Indigobird, Purple		PG	LC	LC	1		4
Vidua chalybeata	Indigobird, Village		PG	LC	LC	1		3
Actophilornis africanus	Jacana, African		PG	LC	LC	1		4
Falco rupicoloides	Kestrel, Greater		PG	LC	LC	1	1	2
Falco rupicolus	Kestrel, Rock		PG	LC	LC	1		3
Halcyon albiventris	Kingfisher, Brown-hooded		PG	LC	LC	1	1	2
Megaceryle maximus	Kingfisher, Giant		PG	LC	LC	1		2
Halcyon leucocephala	Kingfisher, Grey-headed		PG	LC	LC	1		4
Alcedo cristata	Kingfisher, Malachite		PG	LC	LC	1	1	2

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Ceryle rudis	Kingfisher, Pied		PG	LC	LC	1		2
Halcyon chelicuti	Kingfisher, Striped		PG	LC	LC	1	1	4
Halcyon senegalensis	Kingfisher, Woodland		PG	LC	LC	1	1	2
Milvus migrans	Kite, Black		PG	LC	LC	1		3
Elanus caeruleus	Kite, Black-shouldered		PG	LC	LC	1	1	1
Milvus aegyptius	Kite, Yellow-billed		PG	LC	LC	1	1	2
Afrotis afraoides	Korhaan, Northern Black		PG	LC	LC	1	1	4
Lophotis ruficrista	Korhaan, Red-crested		PG	LC	LC	1	1	4
Eupodotis senegalensis	Korhaan, White-bellied		PG	LC	VU	1	1	4
Vanellus senegallus	Lapwing, African Wattled		PG	LC	LC	1	1	2
Vanellus armatus	Lapwing, Blacksmith		PG	LC	LC	1	1	2
Vanellus coronatus	Lapwing, Crowned		PG	LC	LC	1	1	2
Eremopterix leucotis	Lark, Chestnut-backed Sparrow-		PG	LC	LC	1	1	2
Mirafra fasciolata	Lark, Eastern Clapper		PG	LC	LC	1	1	3
Calendulauda africanoides	Lark, Fawn-coloured		PG	LC	LC	1		3
Eremopterix verticalis	Lark, Grey-backed Sparrow		PG	LC	LC	1	1	2
Mirafra cheniana	Lark, Melodious		PG	NT	LC	1	1	4
Mirafra passerina	Lark, Monotonous		PG	LC	LC	1		2
Spizocorys conirostris	Lark, Pink-billed		PG	LC	LC	1		3
Calandrella cinerea	Lark, Red-capped		PG	LC	LC	1	1	2
Mirafra africana	Lark, Rufous-naped		PG	LC	LC	1	1	2
Calendulauda sabota	Lark, Sabota		PG	LC	LC	1	1	1
Certhilauda chuana	Lark, Short-clawed		PG	LC	NT	1		3
Chersomanes albofasciata	Lark, Spike-heeled		PG	LC	LC	1	1	2
Macronyx capensis	Longclaw, Cape		PG	LC	LC	1	1	4
Spermestes cucullatus	Mannikin, Bronze		PG	LC	LC	1	1	2
Riparia cincta	Martin, Banded		PG	LC	LC	1	1	2
Riparia paludicola	Martin, Brown-throated		PG	LC	LC	1		2
Delichon urbicum	Martin, Common House		PG	LC	LC	1	1	2
Hirundo fuligula	Martin, Rock		PG	LC	LC	1	1	1
Riparia riparia	Martin, Sand		PG	LC	LC	1		4
Gallinula chloropus	Moorhen, Common		PG	LC	LC	1	1	3
Urocolius indicus	Mousebird, Red-faced		WA	LC	LC	1	1	1
Colius striatus	Mousebird, Speckled		WA	LC	LC	1	1	1
Colius colius	Mousebird, White-backed		WA	LC	LC	1	1	2
Acridotheres tristis	Myna, Common		PG			1	1	1

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Cisticola fulvicapilla	Neddicky		PG	LC	LC	1	1	1
Caprimulgus europaeus	Nightjar, European		PG	LC	LC	1		3
Caprimulgus pectoralis	Nightjar, Fiery-necked		PG	LC	LC	1	1	3
Caprimulgus tristigma	Nightjar, Freckled		PG	LC	LC	1		4
Caprimulgus rufigena	Nightjar, Rufous-cheeked		PG	LC	LC	1		2
Oriolus larvatus	Oriole, Black-headed		PG	LC	LC	1	1	1
Oriolus oriolus	Oriole, Eurasian Golden		PG	LC	LC	1		3
Pandion haliaetus	Osprey, Western		PG	LC	LC	1		4
Struthio camelus	Ostrich, Common			LC	LC	1		4
Tyto capensis	Owl, African Grass		PG	LC	VU	1		4
Otus senegalensis	Owl, African Scops		PG	LC	LC	1		2
Asio capensis	Owl, Marsh		PG	LC	LC	1		4
Ptilopsis granti	Owl, Southern White-faced		PG	LC	LC	1		2
Bubo africanus	Owl, Spotted Eagle-		PG	LC	LC	1		2
Bubo lacteus	Owl, Verreaux's Eagle-		PG	LC	LC	1		4
Tyto alba	Owl, Western Barn		PG	LC	LC	1		2
Glaucidium perlatum	Owlet, Pearl-spotted		PG	LC	LC	1	1	2
Buphagus erythrorhynchus	Oxpecker, Red-billed		PG	LC	LC	1	1	3
Poicephalus meyeri	Parrot, Meyer's		PG	LC	LC	1		3
Pelecanus onocrotalus	Pelican, Great White		PG	LC	VU	1		4
Pelecanus rufescens	Pelican, Pink-backed		PG	LC	VU	1		4
Anthoscopus minutus	Penduline-tit, Cape		PG	LC	LC	1	1	2
Anthoscopus caroli	Penduline-tit, Grey		PG	LC	LC	1		4
Petronia superciliaris	Petronia, Yellow-throated		PG	LC	LC	1		2
Treron calvus	Pigeon, African Green		PG	LC	LC	1		2
Columba arquatrix	Pigeon, African Olive		PG	LC	LC	1		3
Columba guinea	Pigeon, Speckled		PG	LC	LC	1	1	1
Anthus cinnamomeus	Pipit, African		PG	LC	LC	1	1	2
Anthus vaalensis	Pipit, Buffy		PG	LC	LC	1		2
Anthus caffer	Pipit, Bushveld		PG	LC	LC	1		2
Anthus similis	Pipit, Long-billed		PG	LC	LC	1	1	2
Anthus leucophrys	Pipit, Plain-backed		PG	LC	LC	1		2
Anthus lineiventris	Pipit, Striped		PG	LC	LC	1		4
Charadrius asiaticus	Plover, Caspian		PG	LC	LC	1		3
Charadrius pallidus	Plover, Chestnut-banded		PG	NT	NT	1		4
Charadrius hiaticula	Plover, Common Ringed		PG	LC	LC	1		4

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Charadrius pecuarius	Plover, Kittlitz's		PG	LC	LC	1		4
Charadrius tricollaris	Plover, Three-banded		PG	LC	LC	1		4
Charadrius marginatus	Plover, White-fronted		PG	LC	LC	1		4
Netta erythrophthalma	Pochard, Southern		PG	LC	LC	1		4
Glareola nordmanni	Pratincole, Black-winged		PG	NT	NT	1		4
Prinia flavicans	Prinia, Black-chested		PG	LC	LC	1	1	1
Prinia subflava	Prinia, Tawny-flanked		PG	LC	LC	1	1	1
Dryoscopus cubla	Puffback, Black-backed		PG	LC	LC	1	1	1
Pytilia melba	Pytilia, Green-winged		PG	LC	LC	1	1	1
Coturnix coturnix	Quail, Common		PG	LC	LC	1		3
Coturnix delegorguei	Quail, Harlequin		PG	LC	LC	1		4
Ortygospiza atricollis	Quail-finch, African		PG	LC	LC	1	1	2
Quelea quelea	Quelea, Red-billed		WA	LC	LC	1	1	2
Rallus caerulescens	Rail, African		PG	LC	LC	1		4
Cercotrichas paena	Robin, Kalahari Scrub		PG	LC	LC	1	1	1
Cercotrichas leucophrys	Robin, White-browed Scrub		PG	LC	LC	1	1	1
Cossypha caffra	Robin-chat, Cape		PG	LC	LC	1	1	1
Cossypha humeralis	Robin-chat, White-throated		PG	LC	LC	1		1
Coracias garrulus	Roller, European		PG	LC	NT	1	1	2
Coracias caudatus	Roller, Lilac-breasted		PG	LC	LC	1	1	2
Coracias naevius	Roller, Purple		PG	LC	LC	1		3
Philomachus pugnax	Ruff		PG	LC	LC	1		4
Pterocles burchelli	Sandgrouse, Burchell's		PG	LC	LC	1		2
Pterocles bicinctus	Sandgrouse, Double-banded		PG	LC	LC	1		3
Actitis hypoleucos	Sandpiper, Common		PG	LC	LC	1		4
Calidris ferruginea	Sandpiper, Curlew		PG	NT	LC	1		4
Tringa ochropus	Sandpiper, Green		PG			1		4
Tringa stagnatilis	Sandpiper, Marsh		PG	LC	LC	1		4
Tringa glareola	Sandpiper, Wood		PG	LC	LC	1		4
Rhinopomastus cyanomelas	Scimitarbill, Common		PG	LC	LC	1	1	2
Sagittarius serpentarius	Secretarybird		PG	VU	VU	1	1	3
Crithagra gularis	Seedeater, Streaky-headed		PG	LC	LC	1		3
Tadorna cana	Shelduck, South African		PG	LC	LC	1		3
Accipiter badius	Shikra		PG	LC	LC	1		3
Anas smithii	Shoveler, Cape		PG	LC	LC	1		3
Laniarius atrococcineus	Shrike, Crimson-breasted		PG	LC	LC	1	1	2

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Lanius minor	Shrike, Lesser Grey		PG	LC	LC	1	1	2
Corvinella melanoleuca	Shrike, Magpie		PG	LC	LC	1	1	2
Lanius collurio	Shrike, Red-backed		PG	LC	LC	1	1	2
Eurocephalus anguitimens	Shrike, Southern White-crowned		PG	LC	LC	1		2
Gallinago nigripennis	Snipe, African		PG	LC	LC	1		2
Passer melanurus	Sparrow, Cape		WA	LC	LC	1	1	2
Passer motitensis	Sparrow, Great		PG	LC	LC	1	1	2
Passer domesticus	Sparrow, House		PG			1	1	2
Passer diffusus	Sparrow, Southern Grey-headed		PG	LC	LC	1	1	2
Accipiter melanoleucus	Sparrowhawk, Black		PG	LC	LC	1		4
Accipiter minullus	Sparrowhawk, Little		PG	LC	LC	1		4
Accipiter ovampensis	Sparrowhawk, Ovambo		PG	LC	LC	1		4
Plocepasser mahali	Sparrow-weaver, White-browed		PG	LC	LC	1	1	2
Platalea alba	Spoonbill, African		PG	LC	LC	1		4
Pternistis natalensis	Spurfowl, Natal		OG	LC	LC	1		3
Pternistis swainsonii	Spurfowl, Swainson's		PG	LC	LC	1	1	3
Lamprotornis australis	Starling, Burchell's		PG	LC	LC	1	1	2
Lamprotornis nitens	Starling, Cape Glossy		PG	LC	LC	1	1	1
Lamprotornis bicolor	Starling, Pied		PG	LC	LC	1		2
Onychognathus morio	Starling, Red-winged		WA	LC	LC	1	1	1
Cinnyricinclus leucogaster	Starling, Violet-backed		PG	LC	LC	1	1	1
Creatophora cinerea	Starling, Wattled		PG	LC	LC	1	1	2
Himantopus himantopus	Stilt, Black-winged		PG	LC	LC	1		4
Calidris minuta	Stint, Little		PG	LC	LC	1		4
Saxicola torquatus	Stonechat, African		PG	LC	LC	1		2
Ciconia abdimii	Stork, Abdim's		PG	LC	NT	1		4
Ciconia nigra	Stork, Black		PG	LC	VU	1		4
Leptoptilos crumeniferus	Stork, Marabou		PG	LC	NT	1		3
Ciconia ciconia	Stork, White		PG	LC	LC	1		4
Mycteria ibis	Stork, Yellow-billed		PG	LC	EN	1		4
Chalcomitra amethystina	Sunbird, Amethyst		PG	LC	LC	1	1	2
Cinnyris mariquensis	Sunbird, Marico		PG	LC	LC	1	1	2
Cinnyris talatala	Sunbird, White-bellied		PG	LC	LC	1	1	1
Hirundo rustica	Swallow, Barn		PG	LC	LC	1	1	2
Hirundo cucullata	Swallow, Greater Striped		PG	LC	LC	1	1	1
Hirundo abyssinica	Swallow, Lesser Striped		PG	LC	LC	1	1	1

SCIENTIFIC NAME	ALPHABETICAL COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	REGIONAL RED LIST STATUS	QDS (Roberts VII)	PENTAD (SABAP 2) OR QDS (SABAP 1)	LO ON SITE
Hirundo dimidiata	Swallow, Pearl-breasted		PG	LC	LC	1		3
Hirundo semirufa	Swallow, Red-breasted		PG	LC	LC	1	1	1
Hirundo spilodera	Swallow, South African Cliff		PG	LC	LC	1		4
Hirundo albigularis	Swallow, White-throated		PG	LC	LC	1		3
Porphyrio madagascariensis	Swamphen, African (Purple)		PG	LC	LC	1		4
Apus barbatus	Swift, African Black		PG	LC	LC	1		3
Cypsiurus parvus	Swift, African Palm		PG	LC	LC	1	1	3
Tachymarptis melba	Swift, Alpine		PG	LC	LC	1		3
Apus apus	Swift, Common		PG	LC	LC	1	1	1
Apus horus	Swift, Horus		PG	LC	LC	1		2
Apus affinis	Swift, Little		PG	LC	LC	1	1	1
Apus caffer	Swift, White-rumped		PG	LC	LC	1	1	2
Tchagra senegalus	Tchagra, Black-crowned		PG	LC	LC	1	1	2
Tchagra australis	Tchagra, Brown-crowned		PG	LC	LC	1	1	2
Anas capensis	Teal, Cape		PG	LC	LC	1		3
Anas hottentota	Teal, Hottentot		PG	LC	LC	1		3
Anas erythrorhyncha	Teal, Red-billed		OG	LC	LC	1		2
Sterna caspia	Tern, Caspian		PG	LC	VU	1		4
Chlidonias hybrida	Tern, Whiskered		PG	LC	LC	1		4
Chlidonias leucopterus	Tern, White-winged		PG	LC	LC	1		4
Burhinus capensis	Thick-knee, Spotted		PG	LC	LC	1		2
Psophocichla litsipsirupa	Thrush, Groundscraper		PG	LC	LC	1	1	1
Turdus smithi	Thrush, Karoo		PG	LC	LC	1	1	2
Turdus libonyanus	Thrush, Kurrichane		PG	LC	LC	1	1	2
Monticola brevipes	Thrush, Short-toedRock		PG	LC	LC	1	1	2
Pogoniulus chrysoconus	Tinkerbird, Yellow-fronted		PG	LC	LC	1	1	2
Parus cinerascens	Tit, Ashy		PG	LC	LC	1	1	2
Parus niger	Tit, Southern Black		PG	LC	LC	1	1	2
Parisoma subcaeruleum	Tit-Babbler, Chestnut-vented		PG	LC	LC	1	1	1
Gyps coprotheres	Vulture, Cape	EN	PG	EN	EN	1	1	3
Torgos tracheliotus	Vulture, Lappet-faced	EN	PG	EN	EN	1	1	3
Gyps africanus	Vulture, White-backed	EN	PG	CR	CR	1		1
Motacilla aguimp	Wagtail, African Pied		PG	LC	LC	1		2
Motacilla capensis	Wagtail, Cape		PG	LC	LC	1	1	1
Motacilla flava	Wagtail, Western Yellow		PG	LC	LC	1		4
Acrocephalus baeticatus	Warbler, African Reed		PG	LC	LC	1		3

SCIENTIFIC NAME	ALPHABETICAL COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	REGIONAL RED LIST STATUS	QDS (Roberts VII)	PENTAD (SABAP 2) OR QDS (SABAP 1)	LO ON SITE
Calamonastes fasciolatus	Warbler, Barred Wren-		**PG**	LC	LC	1	1	2
Sylvia borin	Warbler, Garden		**PG**	LC	LC	1		3
Acrocephalus arundinaceus	Warbler, Great Reed		**PG**	LC	LC	1		4
Hippolais icterina	Warbler, Icterine		**PG**	LC	LC	1		4
Acrocephalus gracilirostris	Warbler, Lesser Swamp		**PG**	LC	LC	1		3
Bradypterus baboecala	Warbler, Little Rush		**PG**	LC	LC	1		3
Acrocephalus palustris	Warbler, Marsh		**PG**	LC	LC	1		4
Hippolais olivetorum	Warbler, Olive-tree		**PG**	LC	LC	1		4
Malcorus pectoralis	Warbler, Rufous-eared		**PG**	LC	LC	1		2
Acrocephalus schoenobaenus	Warbler, Sedge		**PG**	LC	LC	1		3
Phylloscopus trochilus	Warbler, Willow		**PG**	LC	LC	1	1	3
Estrilda erythronotos	Waxbill, Black-faced		**PG**	LC	LC	1	1	2
Uraeginthus angolensis	Waxbill, Blue		**PG**	LC	LC	1	1	1
Estrilda astrild	Waxbill, Common		**PG**	LC	LC	1	1	2
Amandava subflava	Waxbill, Orange-breasted		**PG**	LC	LC	1		3
Granatina granatina	Waxbill, Violet-eared		**PG**	LC	LC	1	1	2
Ploceus capensis	Weaver, Cape		**WA**	LC	LC	1		1
Ploceus intermedius	Weaver, Lesser Masked		**PG**	LC	LC	1		2
Bubalornis niger	Weaver, Red-billed Buffalo		**PG**	LC	LC	1		4
Anaplectes rubriceps	Weaver, Red-headed		**PG**	LC	LC	1		3
Philetairus socius	Weaver, Sociable		**PG**	LC	LC	1	1	3
Ploceus velatus	Weaver, Southern Masked		**WA**	LC	LC	1	1	1
Ploceus cucullatus	Weaver, Village		**WA**	LC	LC	1		2
Oenanthe pileata	Wheatear, Capped		**PG**	LC	LC	1		2
Oenanthe monticola	Wheatear, Mountain		**PG**	LC	LC	1	1	2
Zosterops virens	White-eye, Cape		**PG**	LC	LC	1	1	1
Sylvia communis	Whitethroat, Common		**PG**	LC	LC	1	1	2
Vidua paradisaea	Whydah, Long-tailed Paradise		**PG**	LC	LC	1	1	2
Vidua macroura	Whydah, Pin-tailed		**PG**	LC	LC	1	1	2
Vidua regia	Whydah, Shaft-tailed		**PG**	LC	LC	1	1	2
Euplectes progne	Widowbird, Long-tailed		**PG**	LC	LC	1	1	4
Euplectes ardens	Widowbird, Red-collared		**PG**	LC	LC	1		4
Euplectes albonotatus	Widowbird, White-winged		**PG**	LC	LC	1	1	3
Phoeniculus purpureus	Wood-hoopoe, Green		**PG**	LC	LC	1	1	1
Dendropicos namaquus	Woodpecker, Bearded		**PG**	LC	LC	1	1	2
Campethera bennettii	Woodpecker, Bennett's		**PG**	LC	LC	1		2

SCIENTIFIC NAME	ALPHABETICAL COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	REGIONAL RED LIST STATUS	QDS (Roberts VII)	PENTAD (SABAP 2) OR QDS (SABAP 1)	LO ON SITE
Dendropicos fuscescens	Woodpecker, Cardinal		**PG**	LC	LC	1	1	2
Campethera abingoni	Woodpecker, Golden-tailed		**PG**	LC	LC	1	1	2

Status: CR = Critically Endangered; EN = Endangered; LC = Least Concern; NT = Near Threatened; OG = Ordinary Game; PG = Protected Game; PS = Protected Species; PWA = Protected Wild Animal; VU = Vulnerable; WA = Wild Animal
Likelihood of Occurrence (LO): 1 = Present; 2 = High; 3 = Moderate; 4 = Low

Sources: Transvaal Nature Conservation Ordinance (1983); Roberts VII (2013); NEM:BA ToPS (2015); Taylor *et al.* (2015); BirdLife South Africa (2016); SABAP 2 (2017)

13.4. Reptile list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	RED LIST STATUS	QDS (ReptileMAP 2017)	LO ON SITE
AGAMIDAE	**Agamas**					
Acanthocercus atricollis atricollis	Southern Tree Agama		**PG**	1LC	2	2
Agama aculeata distanti	Distant's Ground Agama		**PG**	1LC	1	2
Agama atra	Southern Rock Agama		**PG**	1LC	1	1
AMPHISBAENIDAE	**Worm lizards**					
Monopeltis capensis	Cape Worm Lizard		**PG**	1LC	4	4
CHAMAELEONIDAE	**Chameleons**					
Chamaeleo dilepis dilepis	Common Flap-neck Chameleon		**PG**	2LC	2	1*
COLUBRIDAE	**Typical snakes**					
Crotaphopeltis hotamboeia	Red-lipped Snake		**WA**	2LC	2	2
Dasypeltis scabra	Rhombic Egg-eater		**WA**	2LC	2	2
Dispholidus typus typus	Boomslang		**WA**	2LC	1	2
Philothamnus semivariegatus	Spotted Bush Snake		**WA**	2LC	1	2
Telescopus semiannulatus semiannulatus	Eastern Tiger Snake		**WA**	2LC	3	3
CORDYLIDAE	**Crag, flat & girdled lizards**					
Cordylus jonesii	Jones' Girdled Lizard		**PG**	1LC	1	3
Cordylus vittifer	Common Girdled Lizard		**PG**	1LC	1	3
ELAPIDAE	**Cobras, mambas & relatives**					
Aspidelaps scutatus scutatus	Speckled Shield Cobra		**WA**	1LC	4	4
Dendroaspis polylepis	Black Mamba		**WA**	2LC	4	4
Elapsoidea sundevallii media	Highveld Garter Snake		**WA**	1LC	3	3
Naja annulifera	Snouted Cobra		**WA**	2LC	2	2
Naja mossambica	Mozambique Spitting Cobra		**WA**	2LC	1	2
GEKKONIDAE	**Geckos**					
Chondrodactylus turneri	Turner's Gecko		**PG**	1LC	2	2
Hemidactylus mabouia	Common Tropical House Gecko		**PG**	2LC	2	3
Homopholis wahlbergii	Wahlberg's Velvet Gecko		**PG**	1LC	4	4
Lygodactylus capensis capensis	Common Dwarf Gecko		**PG**	1LC	1	2
Pachydactylus capensis	Cape Gecko		**PG**	2LC	1	2
GERRHOSAURIDAE	**Plated lizards & seps**					
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard		**PG**	2LC	1	2
LACERTIDAE	**Typical lizards**					
Meroles squamulosus	Common Rough-scaled Lizard		**PG**	1LC	2	2
Nucras holubi	Holub's Sandveld Lizard		**PG**	2LC	2	2
Nucras intertexta	Spotted Sandveld Lizard		**PG**	2LC	3	3

FAMILY & SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	RED LIST STATUS	QDS (ReptileMAP 2017)	LO ON SITE
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard		**PG**	2LC	1	1
LAMPROPHIIDAE	**Lamprophid snakes**					
Aparallactus capensis	Black-headed Centipede-eater		**WA**	2LC	2	2
Atractaspis bibronii	Bibron's Stiletto Snake		**WA**	2LC	4	4
Boaedon capensis	Brown House Snake		**WA**	2LC	2	2
Lycodonomorphus rufulus	Brown Water Snake		**WA**	1LC	1	2
Lycophidion capense capense	Cape Wolf Snake		**WA**	2LC	2	2
Prosymna bivittata	Two-striped Shovel-snout		**WA**	1LC	4	4
Psammophis brevirostris	Short-snouted Grass Snake		**WA**	1LC	1	2
Psammophis subtaeniatus	Western Yellow-bellied Sand Snake		**WA**	2LC	2	2
Psammophis trinasalis	Fork-marked Sand Snake		**WA**	2LC	1	2
Psammophylax tritaeniatus	Striped Grass Snake		**WA**	2LC	2	2
Pseudaspis cana	Mole Snake		**WA**	2LC	2	2
Xenocalamus bicolor bicolor	Bicoloured Quill-snouted Snake		**WA**	1LC	4	4
LEPTOTYPHLOPIDAE	**Thread snakes**					
Leptotyphlops scutifrons scutifrons	Peters' Thread Snake		**WA**	1LC	2	2
PELOMEDUSIDAE	**Terrapins**					
Pelomedusa galeata	South African Marsh Terrapin		**PG**		2	4
PYTHONIDAE	**Python**					
Python natalensis	Southern African Python	**PS**	**WA**	2LC	1*	3
SCINCIDAE	**Skinks**					
Acontias occidentalis	Western Legless Skink		**PG**	1LC	4	4
Mochlus (sundevallii) sundevallii	Sundevall's Writhing Skink		**PG**	2LC	1	2
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink		**PG**	1LC	2	2
Trachylepis capensis	Cape Skink		**PG**	2LC	1	2
Trachylepis punctatissima	Speckled Rock Skink		**PG**	2LC	1	1
Trachylepis punctulata	Speckled Sand Skink		**PG**	2LC	1	2
Trachylepis varia	Variable Skink		**PG**	2LC	1	2
TESTUDINIDAE	**Tortoises**				1*	
Kinixys lobatsiana	Lobatse Hinged Tortoise		**PG**	1LC	3	4
Kinixys spekii	Speke's Hinged Tortoise		**PG**	2LC	3	4
Psammobates oculifer	Serrated Tent Tortoise		**PG**	1LC	3	4
Stigmochelys pardalis	Leopard Tortoise		**PG**	1LC	3	4
TYPHLOPIDAE	**Blind snakes**					
Afrotyphlops bibronii	Bibron's Blind Snake		**WA**	1LC	2	2
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake		**WA**	2LC	1	2

FAMILY & SCIENTIFIC NAME	COMMON NAME	RSA LEGAL STATUS	NORTH WEST LEGAL STATUS	RED LIST STATUS	QDS (ReptileMAP 2017)	LO ON SITE
VARANIDAE	**Monitors**					
Varanus albigularis albigularis	Rock Monitor		**WA**	2LC	1*	4
Varanus niloticus	Water Monitor		**WA**	2LC	3	4
VIPERIDAE	**Adders**					
Bitis arietans arietans	Puff Adder		**WA**	2LC	1*	2

Status: 1 = Global status; 2 = Regional status; LC = Least Concern; PG = Protected Game; PS = Protected Species; WA = Wild Animal

Likelihood of Occurrence (LO): 1 = Present; 1* = Present according to anectodal account; 2 = High; 3 = Moderate; 4 = Low

Sources: Transvaal Nature Conservation Ordinance (1983); Bates *et al.* (2014); NEM:BA ToPS (2015); ReptileMAP (2017); DREAD (unpubl. data)

13.5. Frog list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	NORTH WEST LEGAL STATUS	GLOBAL RED LIST STATUS	REGIONAL RED LIST STATUS	QDS (FrogMAP 2017)	LO ON SITE
BREVICIPITIDAE	**Rain frogs**					
Breviceps adspersus adspersus	Bushveld Rain Frog		LC (U)	LC	2	2
BUFONIDAE	**True toads**					
Poyntonophrynus vertebralis	Southern Pygmy Toad		LC (U)	LC	2	3
Schismaderma carens	Red Toad		LC (U)	LC	1	1
Sclerophrys garmani	Olive Toad		LC (U)	LC	1	2
Sclerophrys gutturalis	Guttural Toad		LC (I)	LC	3	3
Sclerophrys poweri	Power's Toad		LC (U)	LC	3	3
HYPEROLIIDAE	**Leaf-folding & reed frogs**					
Kassina senegalensis	Bubbling Kassina		LC (U)	LC	1	3
MICROHYLIDAE	**Rubber frogs**					
Phrynomantis bifasciatus	Banded Rubber Frog		LC (U)	LC	1	3
PHRYNOBATRACHIDAE	**Puddle frogs**					
Phrynobatrachus natalensis	Snoring Puddle Frog		LC (S)	LC	2	3
PIPIDAE	**African clawed frogs**					
Xenopus laevis	Common Platanna		LC (I)	LC	2	2
PTYCHADENIDAE	**Grass frogs**					
Ptychadena anchietae	Plain Grass Frog		LC (U)	LC	1	1
Ptychadena mossambica	Broad-banded Grass Frog		LC (U)	LC	1	3
PYXICEPHALIDAE	**Moss, river, sand & stream frogs**					
Amietia quecketti	Queckett's River Frog		LC (S)	LC	2	2
Cacosternum boettgeri	Common Caco		LC (U)	LC	2	2
Pyxicephalus adspersus	Giant Bullfrog	**PG**	LC (D)	**NT**	1*	3
Pyxicephalus edulis	African Bullfrog		LC (U)	LC		3
Tomopterna cryptotis	Tremolo Sand Frog		LC (S)	LC	1	3
Tomopterna krugerensis	Knocking Sand Frog		LC (U)	LC	3	4
Tomopterna natalensis	Natal Sand Frog		LC (U)	LC	3	3
RHACOPHORIDAE	**Foam Nest Frog**					
Chiromantis xerampelina	Southern Foam Nest Frog		LC (U)	LC	2	3

Status: D = Declining; I = Increasing; LC = Least Concern; NT = Near Threatened; PG = Protected Game; S = Stable; U = Unknown population trend

Likelihood of Occurrence (LO): 1 = Present; 1* = Present according to anectodal account; 2 = High; 3 = Moderate; 4 = Low

Sources: Transvaal Nature Conservation Ordinance (1983); Minter *et al.* (2004); Du Preez & Carruthers (2009); IUCN (2013.1); NEM:BA ToPS (2015); FrogMap (2017); DREAD (unpubl. data)

13.6. Butterfly list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	NORTH WEST LEGAL STATUS	RED LIST STATUS	QDS (LepiMAP 2017)	LO ON SITE
HESPERIIDAE	**Sandmen, skippers, sylphs & relatives**				
Coeliades forestan forestan	Striped Policeman		1LC	3	3
Coeliades pisistratus	Two-pip Policeman		1LC	2	2
Gegenes niso niso	Common Hottentot		1LC	2	2
Gegenes pumilio gambica	Dark Hottentot		1LC	2	2
Leucochitonea levubu	White-cloaked Skipper		1LC	3	3
Platylesches ayresii	Peppered Hopper		1LC	4	1
Platylesches neba	Flower-girl Hopper		1LC	3	3
Spialia delagoae	Delagoa Sandman		1LC	3	3
Spialia diomus ferax	Common Sandman		1LC	2	2
Spialia mafa mafa	Mafa Sandman		1LC	2	2
Spialia paula	Mite Sandman		1LC	3	3
Spialia spio	Mountain Sandman		1LC	3	4
LYCAENIDAE	**Blues, coppers, opals & relatives**				
Aloeides taikosama	Dusky Copper		1LC	2	2
Anthene amarah amarah	Black Striped Hairtail		1LC	2	2
Anthene definita definita	Common Hairtail		1LC	3	3
Anthene talboti	Talbot's Hairtail		1LC	3	3
Axiocerses amanga amanga	Bush Scarlet		1LC	2	2
Axiocerses tjoane tjoane	Eastern Scarlet		1LC	2	2
Azanus jesous	Topaz Babul Blue		1LC	2	1
Azanus moriqua	Black-bordered Babul Blue		1LC	2	2
Azanus ubaldus	Velvet-spotted Babul Blue		1LC	2	2
Chilades trochylus	Grass Jewel		1LC	2	2
Cigaritis ella	Ella's Bar		1LC	2	2
Cigaritis natalensis	Natal Bar		1LC	3	3
Cigaritis phanes	Silvery Bar		1LC	3	3
Crudaria leroma	Silver Spotted Grey		1LC	3	3
Cupidopsis cissus cissus	Common Meadow Blue		1LC	3	3
Cupidopsis jobates jobates	Tailed Meadow Blue		1LC	2	2
Eicochrysops messapus mahallakoaena	Cupreous Blue		1LC	2	2
Lampides boeticus	Pea Blue		1LC	2	1

FAMILY & SCIENTIFIC NAME	COMMON NAME	NORTH WEST LEGAL STATUS	RED LIST STATUS	QDS (LepiMAP 2017)	LO ON SITE
Lepidochrysops glauca	Silvery Blue		1LC	3	3
Leptotes pirithous pirithous	Common Zebra Blue		1LC	2	2
Lepidochrysops plebeia plebeia	Twin-spot Blue		1LC	3	1
Pseudonacaduba sichela sichela	Dusky Line Blue		1LC	3	1
Tarucus sybaris sybaris	Dotted Blue		1LC	2	1
Tuxentius calice	White Pie		1LC	3	3
Tuxentius melaena melaena	Black Pie		1LC	2	2
Virachola antalus	Brown Playboy		1LC	3	3
Virachola dinochares	Apricot Playboy		1LC	2	2
Zintha hintza hintza	Hintza Pierrot		1LC	2	2
Zizeeria knysna knysna	African / Sooty Grass Blue		1LC	2	2
Zizula hylax	Tiny / Gaika Grass Blue		1LC	1	1
NYMPHALIDAE	**Acraeas, browns, charaxes & relatives**				
Acraea anemosa	Broad-bordered Acraea		1LC	2	2
Acraea axina	Little Acraea		1LC	3	3
Acraea caldarena caldarena	Black-tipped Acraea		1LC	3	3
Acraea horta	Garden Acraea		1LC	3	3
Acraea neobule neobule	Wandering Donkey Acraea		1LC	2	2
Acraea stenobea	Suffused Acraea		1LC	3	3
Byblia anvatara acheloia	Joker		1LC	3	3
Byblia ilithyia	Spotted Joker		1LC	2	1
Catacroptera cloanthe cloanthe	Pirate		1LC	3	3
Charaxes jasius saturnus	Foxy Charaxes	**SCH**	1LC	3	3
Coenyropsis natalii natalii	Natal Brown		1LC	3	3
Danaus chrysippus orientis	African Monarch, Plain Tiger		1LC	2	1
Hamanumida daedalus	Guinea-fowl Butterfly		1LC	2	1
Heteropsis perspicua perspicua	Eyed Bush Brown		1LC	3	3
Hypolimnas misippus	Common Diadem		1LC	2	2
Junonia hierta cebrene	Yellow Pansy		1LC	2	1
Junonia oenone oenone	Blue Pansy		1LC	3	3
Junonia orithya madagascariensis	Eyed Pansy		1LC	3	3
Phalanta phalantha aethiopica	African Leopard		1LC	2	2
Physcaeneura panda	Dark-webbed Ringlet		1LC	2	2

FAMILY & SCIENTIFIC NAME	COMMON NAME	NORTH WEST LEGAL STATUS	RED LIST STATUS	QDS (LepiMAP 2017)	LO ON SITE
Precis archesia archesia	Garden Commodore		1LC	2	2
Telchinia rahira rahira	Marsh Acraea		1LC	3	3
Telchinia serena	Dancing Acraea		1LC	2	2
Vanessa cardui	Painted Lady		1LC	2	2
PAPILIONIDAE	**Swallowtails, swordtails & relatives**				
Papilio demodocus demodocus	Citrus Swallowtail		1LC	2	1
Papilio nireus lyaeus	Green-banded Swallowtail		1LC	2	3
PIERIDAE	**Tips, whites & relatives**				
Belenois aurota	Brown-veined White		1LC	2	1
Catopsilia florella	African Migrant		1LC	2	2
Colias electo electo	African Clouded Yellow		1LC	2	2
Colotis annae annae	Scarlet Tip		1LC	2	2
Colotis antevippe gavisa	Red Tip		1LC	2	2
Colotis euippe omphale	Smoky Orange Tip		1LC	2	2
Colotis evagore antigone	Small Orange Tip		1LC	2	2
Colotis evenina evenina	Orange Tip		1LC	2	2
Colotis lais	Kalahari Orange Tip		1LC	2	2
Colotis pallene	Bushveld Orange Tip		1LC	3	3
Colotis regina	Queen Purple Tip		1LC	3	3
Colotis vesta argillaceus	Veined Tip		1LC	3	3
Eurema brigitta brigitta	Broad-bordered Grass Yellow		1LC	2	1
Mylothris agathina agathina	Common Dotted Border		1LC	2	1
Mylothris rueppellii haemus	Twin Dotted Border		1LC	3	3
Pinacopteryx eriphia eriphia	Zebra White		1LC	2	2
Pontia helice helice	Common Meadow White		1LC	2	2
Teracolus agoye agoye	Speckled Sulphur Tip		1LC	3	3
Teracolus agoye bowkeri	Speckled Sulphur Tip		1LC	3	3
Teracolus eris eris	Banded Gold Tip		1LC	2	2
Teracolus subfasciatus	Lemon Traveller		1LC	2	2

Status: 1 = Global; LC = Least Concern; SCH = Schedule species

Likelihood of Occurrence (LO): 1 = Present; 2 = High; 3 = Moderate; 4 = Low

Sources: Transvaal Nature Conservation Ordinance (1983); Mecenero *et al.* (2013); LepiMAP (2017)

13.7. Odonata list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	BIOTIC INDEX SCORE	RSA RED LIST STATUS	QDS (Samways 2008)	LO ON SITE
AESHNIDAE	**Hawkers**				
Anax ephippiger	Vagrant Emperor	2		3	3
Anax imperator	Blue Emperor	1		3	4
Pinheyschna subpupillata	Stream Hawker	4		3	3
Zosteraeschna minuscula	Friendly Hawker	5		3	3
CHLOROCYPHIDAE	**Jewels**				
Platycypha caligata	Dancing Jewel	2		2	1
COENAGRIONIDAE	**Pond damsels**				
Ceriagrion glabrum	Common Citril	0		2	3
Ischnura senegalensis	Tropical / Marsh Bluetail	0		2	2
Pseudagrion kersteni	Powder-faced / Kersten's Sprite	1		2	1
Pseudagrion makabusiense	Makabusi / Green-striped Sprite	4	**VU**	3	4
Pseudagrion salisburyense	Slate Sprite	1		3	3
LESTIDAE	**Spreadwings**				
Lestes pallidus	Pallid / Pale Spreadwing	2		2	3
Lestes plagiatus	Highland Spreadwing	2		2	3
LIBELLULIDAE	**Skimmers**				
Brachythemis leucosticta	Southern Banded Groundling	2		2	2
Crocothemis erythraea	Broad Scarlet	0		2	1
Crocothemis sanguinolenta	Little Scarlet	3		2	2
Diplacodes luminans	Barbet Percher	3		3	3
Orthetrum chrysostigma	Epaulet Skimmer	2		2	2
Orthetrum guineense	Guinea Skimmer	4		3	1
Palpopleura jucunda	Yellow-veined Widow	2		2	3
Palpopleura lucia	Lucia Widow	2		3	3
Pantala flavescens	Wandering Glider / Pantala	0		3	3
Sympetrum fonscolombii	Red-veined Darter / Nomad	0		2	2
Tramea basilaris	Keyhole Glider	0		3	4
Trithemis annulata	Violet Dropwing	1		3	3
Trithemis arteriosa	Red-veined Dropwing	0		2	2
Trithemis donaldsoni	Denim Dropwing	4		2	2
Trithemis dorsalis	Highland / Round-hook Dropwing	0		3	4

FAMILY & SCIENTIFIC NAME	COMMON NAME	BIOTIC INDEX SCORE	RSA RED LIST STATUS	QDS (Samways 2008)	LO ON SITE
Trithemis furva	Navy Dropwing	0		3	3
Trithemis kirbyi	Orange-winged / Kirby's Dropwing	0		2	2
Trithemis stictica	Jaunty Dropwing	1		3	3
PLATYCNEMIDIDAE	**Featherlegs**				
Elattoneura glauca	Common Threadtail	1		2	2
SYNLESTIDAE	**Malachites**				
Chlorolestes fasciatus	Mountain Malachite	4		3	3

Status: VU = Vulnerable

Likelihood of Occurrence (LoO): 1 = Present; 2 = High; 3 = Moderate; 4 = Low

Sources: Samways (2006); Samways (2008); OdonataMAP (2017)

13.8. Scorpion list for the study area

FAMILY & SCIENTIFIC NAME	QDS (Leeming 2003)	LO ON SITE
BUTHIDAE (Fat-tailed scorpions)		
Parabuthus granulatus	3	3
Parabuthus mossambicensis	2	2
Parabuthus transvaalicus	2	2
Uroplectes carinatus	2	2
Uroplectes planimanus	3	3
Uroplectes vittatus	3	3
HORMURIDAE (Flat rock scorpions)		
Hadogenes troglodytes	3	3
SCORPIONIDAE (Burrowing scorpions)		
Opistophthalmus carinatus	3	3
Opistophthalmus fitzsimonsi	3	3
Opistophthalmus glabrifrons	2	2

Likelihood of Occurrence (LO): 2 = High; 3 = Moderate

Sources: Leeming (2003)

13.9. CVs of relevant Senior NSS personnel

CURRICULUM VITAE

Name: **SUSAN ABELL (neé BRADLEY)**
Position: Senior Ecologist and Co-Owner of Natural Scientific Services

Date of Birth: 29 March 1976
Nationality: South African
Languages: English (mother tongue), Afrikaans

EDUCATIONAL QUALIFICATIONS

- MSc Resource Conservation Biology (Ecology) (2000 – 2001)
- B Sc Hons University of the Witwatersrand, Johannesburg (1999)
- B Sc University of the Witwatersrand, Johannesburg (1998)

KEY QUALIFICATIONS

- **Environmental Impact Assessment**:

  Compiled numerous Environmental Impact Assessments, Scoping Reports and Environmental Management Programmes as required by the Environment Conservation Act (Act No. 73 of 1989) and the National Environmental Management Act (Act 107 of 1998).

- **Specialist Assessments:**

  Over 14 years performing ecological and vegetation surveys within Southern Africa. Expertises are strong in the Savanna and Grasslands within Gauteng, North West, Limpopo, Mpumalanga, KwaZulu Natal, Lesotho and Botswana. Further experience within the Karoid Shrub, Kalahari and Fynbos Areas.

  GIS Mapping, Database management, GIS Modelling undertaken within specialist projects

- **Strategic / Spatial Planning**:

  Co-ordinated and managed strategic spatial planning projects in Gauteng, North West Province and Mpumalanga including the:

  - State of Environment Reporting
  - Gauteng Agricultural Potential Atlas (GAPA)
  - North West Biodiversity Site Inventory and Database Development Atlas
  - Tshwane Macro Open Space Policy
  - Biodiversity Database for Optimum Collieries (BHP Billiton)

- **Conference Presentations:**

  Undertaken numerous presentations at conferences (SAAB; IAIA)

- **Educational Training:**

Education training for organisations such as Wits University and Induction Training in Biodiversity Conservation for Mining Operations

EMPLOYMENT EXPERIENCE

- **Member & Senior Ecologist: Natural Scientific Services. Johannesburg (November 2004-Present)**
  - Project management and administration
  - Project management and compilation of biodiversity assessments within savanna, karoid, fynbos and grassland systems including:
    - Ecological assessments
    - Vegetation/Habitat assessments;
    - Red Data Scans;
    - Ecological Screening, Opinions & Statements;
    - Wetland Assessments.
  - Ecological Sensitivity Mapping;
  - Project management and compilation of Biodiversity Management & Action Plans (BMAPS);
  - Reserve Management Plans (examples below):
    - Blyde River Reserve Strategic Management Plan
    - Monate Reserve Management Plan
  - Alien Invasive Management Plans;
  - Project Management for Rehabilitation and Land-Use Plans;
  - Management and specialist input into Green Star Rating Projects (Ecological Component);
  - Environmental Impact Assessments and Scoping Reports;
  - Project management and compilation of a number of Environmental Impact Control Reports (EICR) for waste management projects;
  - Compilation of Conceptual Closure Plans for a number of mining operations;
  - Tender and proposal compilation;
  - Marketing;
  - Liaison with clients and government officials; and
  - Involvement in Specific GIS-related projects (examples below):
    - Blyde Strategic Management Plan
    - Visual Assessment for Natalspruit Hospital
    - Biodiversity Database – Optimum Collieries

- **Project Manager: Strategic Environmental Focus (SEF) (November 2003-October 2004)**
  - Project management and administration
  - Project Management of and input into Ecological Assessments
  - Tender and proposal compilation
  - Marketing
  - Liaison with clients and government officials
  - Involvement in GIS-related projects.
    - Tshwane Open Space Project
    - Numerous State of the Environment Reports

- **Environmental Manager: SEF, Pretoria (April 2001- November 2003)**
  - Project management and administration
  - Compilation of environmental assessments and scoping reports including:
  - Tourism & Recreational developments
  - Residential developments
  - Commercial and industrial developments
  - Liaison with government officials
  - Management and input into GIS-related projects:
    - Gauteng Agricultural Potential Atlas (GAPA)
    - Gauteng Open Space Plan (GOSP)
    - North West Biodiversity Database Development

- Ecological Assessments / vegetation surveys / opinions/ Red Data Scans for various industries – mining, industrial, business, residential and sampling
- Sensitivity mapping

University of the Witwatersrand (Wits) 1999 – 2001

- Teaching Assistant:
- Mammalian surveys within Wits Rural Facility, Mpumalanga
- Vegetation sampling for SAFARI 2000- Kruger National Park
    - Scientific Paper: Koedoe Journal 44/1 2001
- Vegetation sampling Nylsvley Nature Reserve (2000)
- Monitoring and growth experiments (1998-1999) Electron and Transmission microscopy

MEMBERSHIPS IN PROFESSIONAL SOCIETY

- South African Council for Natural Scientific Professions (*Pr.Sci.Nat*)
- Botanical Society of South Africa
- International Association for Impact Assessment (IAIA)

PAPERS PUBLISHED

- Koedoe Journal 44/1 2001
- Proceedings: Microscopy Society of South Africa, 1999

PAPERS PRESENTED

- Proceedings of the Microscopy Society of Southern Africa, 1999
- Population dynamics and regeneration ecology of *Acacia nilotica* and *Acacia tortilis* in Nylsvley Nature Reserve, SAAB Conference 2000
- Tools for Cooperative Governance: North West Biodiversity Site Inventory And Database Development, IAIA Conference 2003

CURRICULUM VITAE

Name:	**CAROLINE ANGELA LöTTER (YETMAN)**
Firm:	Natural Scientific Services CC
Position:	Terrestrial Ecologist
Date of Birth:	6 November 1979
Nationality:	South African, British
Language:	English, Afrikaans

KEY EDUCATIONAL QUALIFICATIONS

- PhD Zoology (2012). Conservation biology of the Giant Bullfrog, *Pyxicephalus adspersus*. (University of Pretoria).
- MSc African Mammalogy (2002). Effects of body size on the activity budgets of African browsing ruminants. (University of Pretoria).
- BSc Honours Zoology (2001). Terrain ruggedness and forage patch use by African browsing ungulates. (University of Pretoria).
- BSc Ecology (2000). (University of Pretoria).

KEY EXPERIENCE

Specialist Assessments

- International Experience
  - Terrestrial faunal assessments in Sierra Leone (2011 & 2012).
  - Terrestrial faunal assessment in Lesotho (2012).

- Local Experience
  - Biodiversity Management Plans in Gauteng Province (2014-present).
  - Terrestrial faunal assessments in the Free State, Gauteng, Kwa-Zulu Natal, Limpopo, Mpumalanga, Northern Cape and North-West provinces (2011-present).
  - Long-term bat monitoring for wind farm developments in the Western, Eastern, Northern Cape and Kwa-Zulu Natal provinces (2012-2013).
  - Giant Bullfrog assessments in Gauteng, Limpopo, Mpumalanga and North-West provinces (2004-2011).

Research

- Analysis of acoustic bat data using AnalookW (2013).
- Species distribution modelling in MaxEnt (2008-2013).
- Geographic Information Systems (in ArcView and ArcGIS) (2001-2013).
- DNA sequencing and analysis (2003-2011).
- Histology (2003-2011).
- Amphibian and mammal radio- and spool-tracking (2003-2010).
- Amphibian and mammal mark-recapture (2001-2010).
- Extensive data analysis in Statistica (2001-2013).
- Vegetation sampling (1999-2001).
- Cricket behavioural studies (1999-2001).

Applied Conservation

- Biodiversity Management Plans for large gold mines in Gauteng Province (2014-present).
- Monitoring and mitigating impacts on bats at wind farms in South Africa, NSS (2012-2013).
- Giant Bullfrog conservation in South Africa, Endangered Wildlife Trust (2004-2007).
- Captive animal care at the National Zoological Gardens (1993-1998).

Lecturing

- Third year Animal Physiology (2007).
- First year Amphibian Practicals (2007-2012).

- Giant Bullfrogs (2003-2012).

KEY EMPLOYMENT EXPERIENCE

Natural Scientific Services, Johannesburg (November 2011 – present)

- Project Management
  - Biodiversity Management Plans in Gauteng Province (2014-present).
  - Biodiversity Assessments in Gauteng and Mpumalanga provinces (2012-present).
  - Long-term bat monitoring studies in the Western and Northern Cape provinces (2012-2013).
- Field work, data analysis and report writing
  - Terrestrial faunal assessments in Sierra Leone, Lesotho, and South Africa (2011-present).
  - Long-term bat monitoring for wind farm developments in the Western, Eastern, Northern Cape and Kwa-Zulu Natal provinces (2012-2013).

Exclusive Books, Woodlands Boulevard, Pretoria (2008-2011)

- Night-staff management and book sales.

University of Pretoria, Pretoria (1999-2011)

- Government Environmental Inspectorate exam invigilation and marking (2009-2011).
- Lecturing (2007-2011).
- Academic Programme Organizer for Dartmouth College, U.S.A. (2003-2007).
- Editorial Assistant for The Kruger Experience (2005) by Du Toit.
- Research Assistant for behavioural and evolution studies on crickets (1999-2001).

Endangered Wildlife Trust, Johannesburg (2004-2008)

- Project Executant of the Giant Bullfrog Project.

Biodiversity Foundation of Africa, Zimbabwe (December 2001)

- Insect and amphibian collecting expedition on the Barotse Floodplain, Zambia.

National Zoological Gardens, Pretoria (1993-1998)

- Public Educator.
- Assistant Nature Conservator.
- Junior Nature Conservator.

MEMBERSHIP IN PROFESSIONAL SOCIETIES

- International Association for Impact Assessment: 2014-present.
- Gauteng and Northern Regions Bat Interest Group: 2014-present.
- South African Council for Natural Scientific Professions: 2008-present.
- Herpetological Association of Africa: 2004-present.
- Zoological Society of Southern Africa: 2003-present.

PUBLICATIONS

Yetman, C.A., Verburgt, L. & S.D. Laurence (2015). Geographical distributions Pyxicephalidae *Pyxicephalus adspersus* Tschudi, 1838 Giant Bullfrog. *African Herp News* 62: 50-53.

Scott, E., Visser, J.D., Yetman, C.A. & Oliver, L. (2013). Revalidation of Pyxicephalus angusticeps Parry, 1982 (Anura: Natatanura: Pyxicephalidae), a bullfrog endemic to the lowlands of eastern Africa. *Zootaxa* 3599: 201–228.

Verburgt, L. & Yetman, C.A. (2012). Geographical Distributions: Amphibia: Anura: Pyxicephalidae: *Pyxicephalus adspersus* Tchudi, 1838 Giant Bullfrog. *African Herp News* 57: 18-20.

Yetman, C.A., P. Mokonoto & J.W.H. Ferguson (2012). Conservation implications of the age/size distribution of Giant Bullfrogs (*Pyxicephalus adspersus*) at three peri-urban breeding sites. *Herpetological Journal* 22: 23-32.

Yetman, C.A., P. Mokonoto & J.W.H. Ferguson (2012). Conservation implications of the age/size distribution of Giant Bullfrogs (*Pyxicephalus adspersus*) at three peri-urban breeding sites. *Herpetological Journal* 22: 23-32.

Yetman, C.A. & J.W.H. Ferguson (2011). Conservation implications of spatial habitat use by adult Giant Bullfrogs (*Pyxicephalus adspersus*). *Journal of Herpetology* 45: 56-62.

Yetman, C.A. & J.W.H. Ferguson (2011). Spawning and non-breeding activity of adult Giant Bullfrogs (*Pyxicephalus adspersus*). *African Journal of Herpetology* 60: 13-29.

Bateman, P.W., J.W.H. Ferguson & C.A. Yetman (2006). Courtship and copulation, but not ejaculates, reduce the longevity of female field crickets (*Gryllus bimaculatus*). *Journal of Zoology, London* 268: 341-346.

Du Toit, J.T. & C.A. Yetman (2005). Effects of body size on the diurnal activity budgets of African browsing ruminants. *Oecologia* 143: 317-325.

AWARDS

2010-2013: Podium positions for various 10km, 21km, 42km and +50km road and trail-running races in Gauteng, Mpumalanga, Limpopo and North-West provinces.
2012: PhD, Academic Honorary Colours, University of Pretoria.
2009: Best PhD Student Presentation, AGM, Dept. of Zoology & Entomology, University of Pretoria.
2005: Nominated: Science & Technology Category, Shoprite Checkers SABC 2 Woman of the Year.
2003: Best Student Presentation, Conference, Zoological Society of Southern Africa.
2003: MSc, Academic Honorary Colours, University of Pretoria.

OTHER TRAINING

- Permaculture (2016).
- First Aid (2013).
- Comrades Marathon (2012 & 2013)
- Climbing and Fall Arrest at height (2012).
- Basic 4x4ing (2010).
- Snake handling (2008).

CONFERENCES

2014 & 2015: Annual Oppenheimer De Beers Group Diamond Route Research Conference, Johannesburg, Gauteng.
2013: Annual Symposium of the Zoological Society of Southern Africa, Tshipise, Limpopo

13.10. Requirements under NEM:BA which have / have not been met in this report

REQUIREMENTS LISTED IN APPENDIX 6 IN GN R982	ADDRESSED IN THIS REPORT?
1. (1) A specialist report prepared in terms of these Regulations must contain a) details of i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Yes
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Yes
c) an indication of the scope of, and the purpose for which, the report was prepared;	Yes
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Yes
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Yes
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Yes
g) an identification of any areas to be avoided, including buffers;	Yes
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to beavoided, including buffers;	Yes
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Yes
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Yes
k) any mitigation measures for inclusion in the EMPr;	Yes
l) any conditions for inclusion in the environmental authorisation;	Yes
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Yes
n) a reasoned opinion i.as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Yes
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	No - consultation process conducted for a broad level Ecoscan
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	As above
q) any other information requested by the competent authority.	Yes

HERITAGE IMPACT ASSESSMENT

(REQUIRED UNDER SECTION 38(8) OF THE NHRA (No. 25 OF 1999)

FOR THE PROPOSED MAKADIMA LEISURE AND CULTURAL VILLAGE, NORTH WEST PROVINCE

Type of development:

Recreational Facility

Client:

CSIR

Client info:

Rirhandzu Marivate

E – mail: rmarivate@csir.co.za

Developer: Makadima Leisure and Cultural Village 101 (Pty) Ltd

HCAC - Heritage Consultants
Private Bag X 1049
Suite 34
Modimolle
0510
Tel: 082 373 8491
Fax: 086 691 6461
E-Mail: jaco.heritage@gmail.com

Report Author:
Mr. J. van der Walt
Project Reference:
HCAC Project number 217113
Report date:
November 2017

APPROVAL PAGE

Project Name	**Makadima Leisure and Cultural Village**
Report Title	Heritage Impact Assessment Makadima Leisure and Cultural Village
Authority Reference Number	TBC
Report Status	Draft Report
Applicant Name	Makadima Leisure and Cultural Village 101 (Pty) Ltd

	Name	Signature	Qualifications and Certifications	Date
Document Compilation	Jaco van der Walt		MA Archaeology ASAPA #159	November 2017

DOCUMENT PROGRESS

Distribution List

Date	Report Reference Number	Document Distribution	Number of Copies
20 November 2017	217113	CSIR	Electronic Copy

Amendments on Document

Date	Report Reference Number	Description of Amendment

INDEMNITY AND CONDITIONS RELATING TO THIS REPORT

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

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- The results of the project;
- The technology described in any report; and
- Recommendations delivered to the client.

Should the applicant wish to utilise any part of, or the entire report, for a project other than the subject project, permission must be obtained from HCAC to do so. This will ensure validation of the suitability and relevance of this report on an alternative project.

REPORT OUTLINE

Appendix 6 of the GNR 326 EIA Regulations published on 7 April 2017 provides the requirements for specialist reports undertaken as part of the environmental authorisation process. In line with this, Table 1 provides an overview of Appendix 6 together with information on how these requirements have been met.

Table 1. Specialist Report Requirements.

Requirement from Appendix 6 of GN 326 EIA Regulation 2017	Chapter
(a) Details of - (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Section a Section 12
(b) Declaration that the specialist is independent in a form as may be specified by the competent authority	*Declaration of Independence*
(c) Indication of the scope of, and the purpose for which, the report was prepared	Section 1
(cA)an indication of the quality and age of base data used for the specialist report	Section 3.4 and 7.1.
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	9
(d) Duration, Date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3.4
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 8 and 9
(g) Identification of any areas to be avoided, including buffers	Section 8 and 9
(h) Map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Section 8
(I) Description of any assumptions made and any uncertainties or gaps in knowledge	Section 3.7
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity **including identified alternatives on the environment** or activities;	Section 9
(k) Mitigation measures for inclusion in the EMPr	Section 9
(l) Conditions for inclusion in the environmental authorisation	Section 9
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 9
(n) Reasoned opinion - (i) as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 9.2
(o) Description of any consultation process that was undertaken during the course of preparing the specialist report	Section 6
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Refer to BA report
(q) Any other information requested by the competent authority	Section 10

Executive Summary

Makadima Leisure and Cultural Village 101 (Pty) Ltd and the CSIR are conducting a Basic Assessment for the Makadima Leisure and Cultural Village, North West Province. HCAC was appointed to conduct a Heritage Impact Assessment to determine the presence of cultural heritage sites and the impact of the proposed development on these non-renewable resources. The study area was assessed both on desktop level and by a field survey. The field survey was conducted as a non-intrusive pedestrian survey to cover the extent of the development footprint.

No archaeological sites or material of significance was recorded during the survey. A paleontological desktop study was conducted by Rossouw (2017) that concluded: "*As far as the palaeontological heritage is concerned, the proposed development may proceed with no further palaeontological assessments required, provided that all excavation activities are restricted to within the boundaries of the development footprint*.". No further mitigation prior to construction is recommended in terms of the archaeological and paleontological components of Section 35 for the proposed development to proceed.

In terms of the built environment of the area (Section 34), no standing structures older than 60 years occur within the study areas. In terms of Section 36 of the Act no burial sites were recorded. If any graves are located in future they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation. No public monuments are located within or close to the study area. The study area is bordering a large settlement and the proposed development will not impact negatively on significant cultural landscapes or viewscapes. During the public participation process conducted for the project no heritage concerns was raised.

Due to the lack of significant heritage resources in the study area the impact of the proposed project on heritage resources is considered low and it is recommended that the proposed project can commence on the condition that the following recommendations are implemented as part of the EMPr and based on approval from SAHRA:

- Implementation of a chance find procedure.

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Declaration of Independence

Specialist Name	Jaco van der Walt
Declaration of Independence	I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations, that I: • I act as the independent specialist in this application; • I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, and will not engage in, conflicting interests in the undertaking of the activity; • I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; • All the particulars furnished by me in this form are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.
Signature	
Date	15/11/2017

a) Expertise of the specialist

Jaco van der Walt has been practising as a CRM archaeologist for 15 years. He obtained an MA degree in Archaeology from the University of the Witwatersrand focussing on the Iron Age in 2012 and is a PhD candidate at the University of Johannesburg focussing on Stone Age Archaeology with specific interest in the Middle Stone Age (MSA) and Later Stone Age (LSA). Jaco is an accredited member of ASAPA (#159) and have conducted more than 500 impact assessments in Limpopo, Mpumalanga, North West, Free State, Gauteng, KZN as well as he Northern and Eastern Cape Provinces in South Africa.

Jaco has worked on various international projects in Zimbabwe, Botswana, Mozambique, Lesotho, DRC Zambia and Tanzania. Through this he has a sound understanding of the IFC Performance Standard requirements, with specific reference to Performance Standard 8 – Cultural Heritage.

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ABBREVIATIONS

AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BGG Burial Ground and Graves
BIA: Basic Impact Assessment
CFPs: Chance Find Procedures
CMP: Conservation Management Plan
CRR: Comments and Response Report
CRM: Cultural Resource Management
DEA: Department of Environmental Affairs
EA: Environmental Authorisation
EAP: Environmental Assessment Practitioner
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact Assessment Practitioner
EMP: Environmental Management Programme
ESA: Early Stone Age
ESIA: Environmental and Social Impact Assessment
GIS Geographical Information System
GPS: Global Positioning System
GRP Grave Relocation Plan
HIA: Heritage Impact Assessment
LIA: Late Iron Age
LSA: Late Stone Age
MEC: Member of the Executive Council
MIA: Middle Iron Age
MPRDA: Mineral and Petroleum Resources Development Act
MSA: Middle Stone Age
NEMA National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NID Notification of Intent to Develop
NoK Next-of-Kin
PRHA: Provincial Heritage Resource Agency
SADC: Southern African Development Community
SAHRA: South African Heritage Resources Agency

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations and must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological site (remains of human activity over 100 years old)
Early Stone Age (~ 2.6 million to 250 000 years ago)
Middle Stone Age (~ 250 000 to 40-25 000 years ago)
Later Stone Age (~ 40-25 000, to recently, 100 years ago)
The Iron Age (~ AD 400 to 1840)
Historic (~ AD 1840 to 1950)
Historic building (over 60 years old)

1 Introduction and Terms of Reference:

Heritage Contracts and Archaeological Consulting CC (**HCAC)** has been contracted by the CSIR to conduct a heritage impact assessment of the proposed Makadima Leisure and Cultural Village. The report forms part of the Basic Assessment Report (BAR) and Environmental Management Programme Report (EMPR) for the development.

The aim of the study is to survey the proposed development footprint to identify cultural heritage sites, document, and assess their importance within local, provincial and national context. It serves to assess the impact of the proposed project on non-renewable heritage resources, and to submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. It is also conducted to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999). The report outlines the approach and methodology utilized before and during the survey, which includes: Phase 1, review of relevant literature; Phase 2, the physical surveying of the area on foot and by vehicle; Phase 3, reporting the outcome of the study.

During the survey, no heritage sites were identified. General site conditions and features on sites were recorded by means of photographs, GPS locations, and site descriptions. Possible impacts were identified and mitigation measures are proposed in the following report. SAHRA as a commenting authority under section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) require all environmental documents, complied in support of an Environmental Authorisation application as defined by NEMA EIA Regulations section 40 (1) and (2), to be submitted to SAHRA. As such the Basic Assessment report and its appendices must be submitted to the case as well as the EMPr, once it's completed by the Environmental Assessment Practitioner (EAP).

1.1 Terms of Reference

Field study

Conduct a field study to: (a) locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points of sites/areas identified as significant areas; c) determine the levels of significance of the various types of heritage resources affected by the proposed development.

Reporting

Report on the identification of anticipated and cumulative impacts the operational units of the proposed project activity may have on the identified heritage resources for all 3 phases of the project; i.e., construction, operation and decommissioning phases. Consider alternatives, should any significant sites be impacted adversely by the proposed project. Ensure that all studies and results comply with the relevant legislation, SAHRA minimum standards and the code of ethics and guidelines of ASAPA.

To assist the developer in managing the discovered heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999).

Table 2: Project Description

Size of farm and portions	Farm Moiloa 412 JO, Dinokana Village, North West Province.
Magisterial District	Ngaka Modiri District
1: 50 000 map sheet number	2528 BD
Central co-ordinate of the development	25.8528316215, -25.4554713502

Table 3: Infrastructure and project activities

Type of development	Cultural and Leisure village
Project size	Less than 15 hectares.
Project Components	The Makadima Leisure and Cultural Village aims to showcase the culture of different tribes found in the North-West Province. It comprises a leisure village and associated infrastructure.

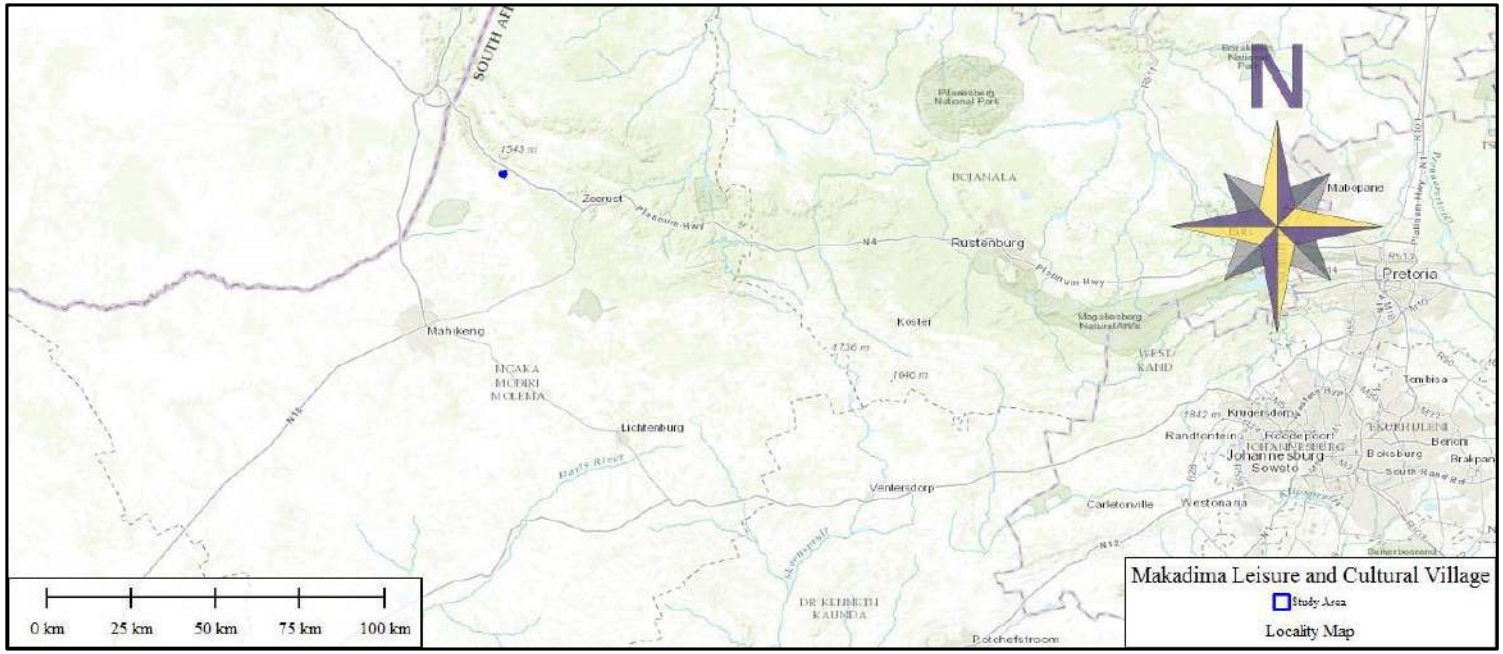

Figure 1. Locality map of the larger area indicating the study area in blue.

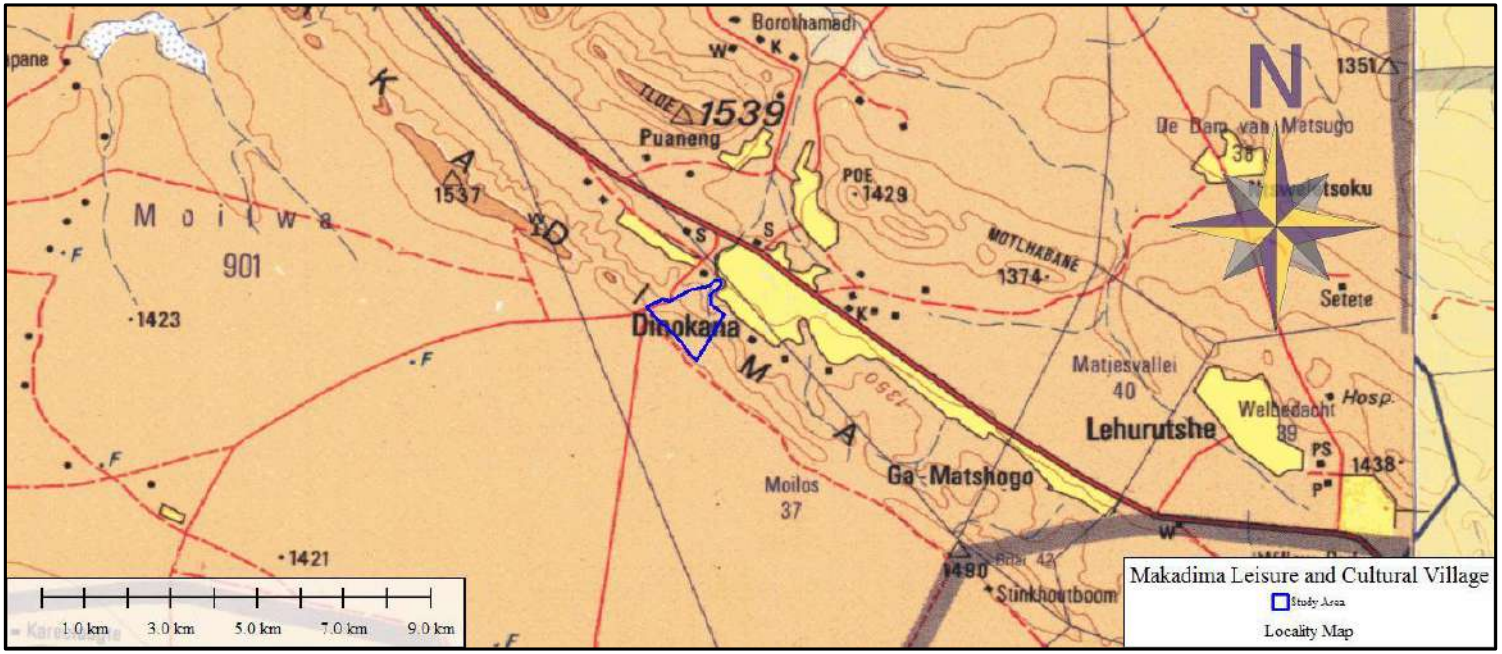

Figure 2. Provincial locality map (1: 250 000 topographical map)

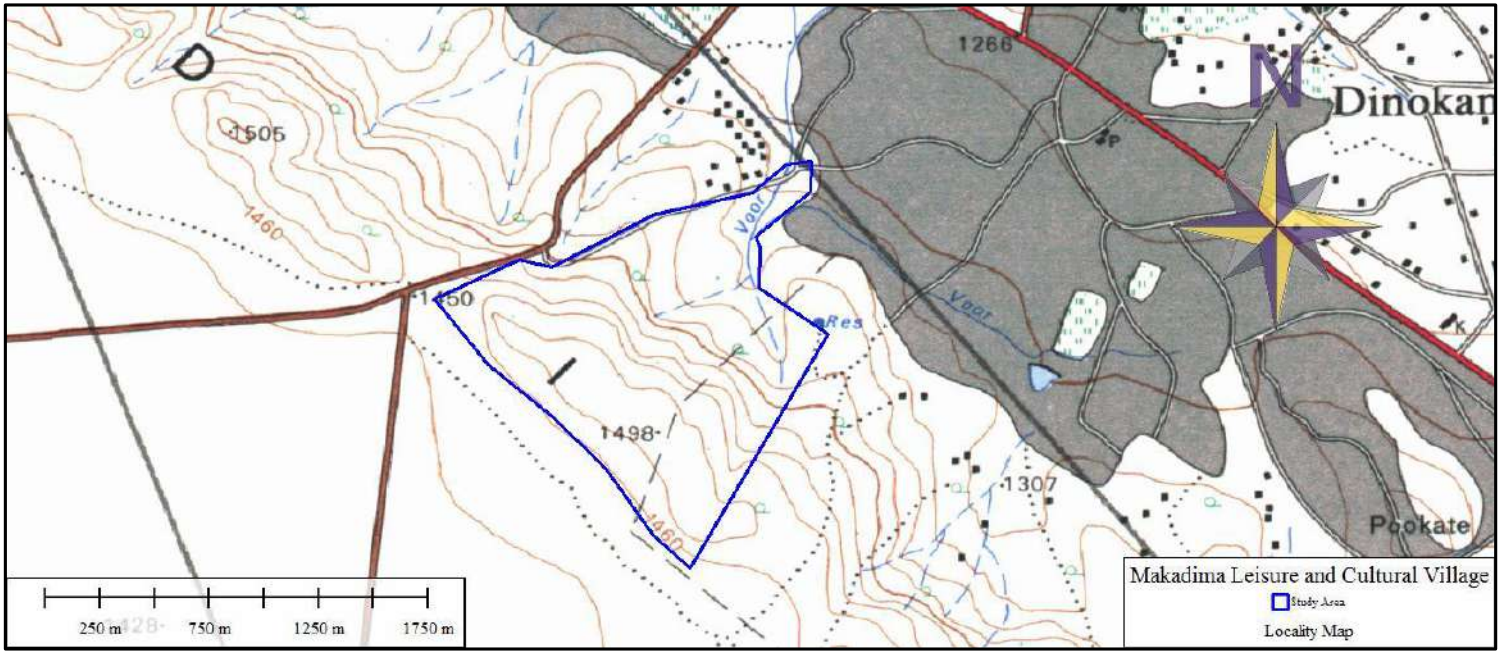

Figure 3: Regional locality map (1:50 000 topographical map).

Figure 4. Satellite image indicating the development footprint (Google Earth 2016).

2 Legislative Requirements

The HIA, as a specialist sub-section of the EIA, is required under the following legislation:

- National Heritage Resources Act (NHRA), Act No. 25 of 1999)
- National Environmental Management Act (NEMA), Act No. 107 of 1998 - Section 23(2)(b)
- Mineral and Petroleum Resources Development Act (MPRDA), Act No. 28 of 2002 - Section 39(3)(b)(iii)

A Phase 1 HIA is a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of heritage specialist input is to:

- Identify any heritage resources, which may be affected;
- Assess the nature and degree of significance of such resources;
- Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- Assess the negative and positive impact of the development on these resources; and
- Make recommendations for the appropriate heritage management of these impacts.

The HIA should be submitted, as part of the impact assessment report or EMPr, to the PHRA if established in the province or to SAHRA. SAHRA will ultimately be responsible for the professional evaluation of Phase 1 AIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 AIA reports and additional development information, as per the impact assessment report and/or EMPr, to be submitted in duplicate to SAHRA after completion of the study. SAHRA accepts Phase 1 AIA reports authored by professional archaeologists, accredited with ASAPA or with a proven ability to do archaeological work.

Minimum accreditation requirements include an Honours degree in archaeology or related discipline and 3 years post-university CRM experience (field supervisor level). Minimum standards for reports, site documentation and descriptions are set by ASAPA in collaboration with SAHRA. ASAPA is based in South Africa, representing professional archaeology in the SADC region. ASAPA is primarily involved in the overseeing of ethical practice and standards regarding the archaeological profession. Membership is based on proposal and secondment by other professional members.

Phase 1 AIA's are primarily concerned with the location and identification of heritage sites situated within a proposed development area. Identified sites should be assessed according to their significance. Relevant conservation or Phase 2 mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Conservation or Phase 2 mitigation recommendations, as approved by SAHRA, are to be used as guidelines in the developer's decision-making process.

Phase 2 archaeological projects are primarily based on salvage/mitigation excavations preceding development destruction or impact on a site. Phase 2 excavations can only be conducted with a permit, issued by SAHRA to the appointed archaeologist. Permit conditions are prescribed by SAHRA and includes (as minimum requirements) reporting back strategies to SAHRA and deposition of excavated material at an accredited repository.

In the event of a site conservation option being preferred by the developer, a site management plan, prepared by a professional archaeologist and approved by SAHRA, will suffice as minimum requirement.

After mitigation of a site, a destruction permit must be applied for with SAHRA by the applicant before development may proceed.

Human remains older than 60 years are protected by the National Heritage Resources Act, with reference to Section 36. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36[5]) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in this age category, located inside a formal cemetery administrated by a local authority, require the same authorisation as set out for graves younger than 60 years, in addition to SAHRA authorisation. If the grave is not situated inside a formal cemetery, but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws, set by the cemetery authority, must be adhered to.

Human remains that are less than 60 years old are protected under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning; or in some cases, the MEC for Housing and Welfare. Authorisation for exhumation and reinternment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. To handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

3 METHODOLOGY

3.1 Literature Review

A brief survey of available literature was conducted to extract data and information on the area in question to provide general heritage context into which the development would be set. This literature search included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS).

3.2 Genealogical Society and Google Earth Monuments

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located; these locations were marked and visited during the field work phase. The database of the Genealogical Society was consulted to collect data on any known graves in the area.

3.3 Public Consultation and Stakeholder Engagement:

Stakeholder engagement is a key component of any BAR process, it involves stakeholders interested in, or affected by the proposed development. Stakeholders are provided with an opportunity to raise issues of concern (for the purposes of this report only heritage related issues will be included). The aim of the public consultation process was to capture and address any issues raised by community members and other stakeholders during key stakeholder and public meetings. The process involved:

- Placement of advertisements and site notices
- Stakeholder notification (through the dissemination of information and meeting invitations);
- Stakeholder meetings undertaken with I&APs;
- Authority Consultation
- The compilation of a Basic Assessment Report (BAR).

Please refer to section 6 for more detail.

3.4 Site Investigation

Conduct a field study to: a) systematically survey the proposed project area to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points of sites/areas identified as significant areas; c) determine the levels of significance of the various types of heritage resources recorded in the project area.

Table 4: Site Investigation Details

	Site Investigation
Date	18 October 2017
Season	Summer. The development footprint was adequately surveyed to record the presence of heritage sites (Figure 5).

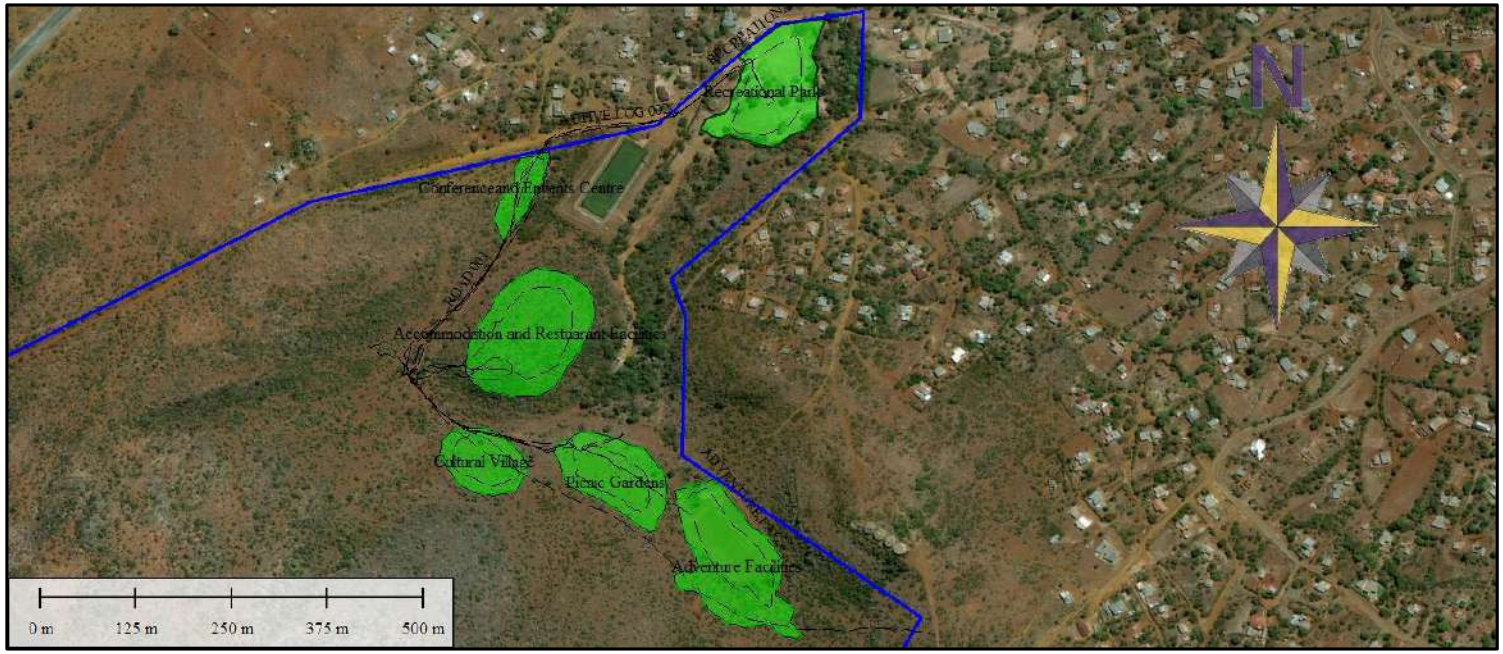

Figure 5: Track logs of the survey in black.

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3.5 Site Significance and Field Rating

Section 3 of the NHRA distinguishes nine criteria for places and objects to qualify as 'part of the national estate' if they have cultural significance or other special value. These criteria are:

- Its importance in/to the community, or pattern of South Africa's history;
- Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;
- Sites of significance relating to the history of slavery in South Africa.

The presence and distribution of heritage resources define a 'heritage landscape'. In this landscape, every site is relevant. In addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire project area, or a representative sample, depending on the nature of the project. In the case of the proposed project the local extent of its impact necessitates a representative sample and only the footprint of the areas demarcated for development were surveyed. In all initial investigations, however, the specialists are responsible only for the identification of resources visible on the surface. This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The following criteria were used to establish site significance with cognisance of Section 3 of the NHRA:

- The unique nature of a site;
- The integrity of the archaeological/cultural heritage deposits;
- 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/is known);
- The preservation condition of the sites; and
- Potential to answer present research questions.

In addition to this criteria field ratings prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purpose of this report. The recommendations for each site should be read in conjunction with section 10 of this report.

FIELD RATING	***GRADE***	***SIGNIFICANCE***	***RECOMMENDED MITIGATION***
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

3.6 Impact Assessment Methodology

The criteria below are used to establish the impact rating on sites:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0-1 years), assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years), assigned a score of 2;
  - medium-term (5-15 years), assigned a score of 3;
  - long term (> 15 years), assigned a score of 4; or
  - permanent, assigned a score of 5;
  - The **magnitude**, quantified on a scale from 0-10 where; 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
  - The **probability of occurrence**, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where; 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
  - The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
  - the **status**, which will be described as either positive, negative or neutral.
  - the degree to which the impact can be reversed.
  - the degree to which the impact may cause irreplaceable loss of resources.
  - the *degree* to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:

S=(E+D+M)P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e., where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e., where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- 60 points: High (i.e., where the impact must have an influence on the decision process to develop in the area).

3.7 Limitations and Constraints of the study

The authors acknowledge that the brief literature review is not exhaustive on the literature of the area. Due to the subsurface nature of archaeological artefacts, the possibility exists that some features or artefacts may not have been discovered/recorded during the survey and the possible occurrence of unmarked graves and other cultural material cannot be excluded. Similarly, the depth of the deposit of heritage sites cannot be accurately determined due its subsurface nature. This report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys. This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.

4 Description of Socio Economic Environmental

Statssa.gov.za indicates that: "*According to census 2011, Ramotshere Moiloa Local Municipality has a total population of 155 513 people, of which 99,6% are black African, with the other population groups making up the remaining 0,4%.*

The report showed that 5,0% people who are aged 20 years and older have completed primary school, 27,5% have some secondary education, 21,1% have completed matric and 6,4% have some form of higher education. The figures also showed that 20,7% have no form of schooling. According to Census 2011, there are 22 437 employed persons, 12 743 unemployed person and 9 030 are classified as discouraged work-seekers. The unemployment rate is 36,2%.

Amongst the youth aged 15–34, 9 329 are employed while 5 609 are unemployed. The unemployment rate for this group is 45,8%" (http://www.statssa.gov.za/?page_id=993&id=ramotshere-moiloa-municipality)

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5 Description of the Physical Environment:

The proposed site is situated next to and on the southern side of Dinokana village approximately 20km north-west of Zeerust. The proposed area for development is situated on the western fringes of Dinokana village and approximately 1km south of the N4 tar road from Zeerust to the Botswana Border. It is set within a valley and on the lower foothills of Makadima Mountain to the south-west.

The prevailing vegetation type and landscape features of the area can be divided into two distinct types. The first is the Zeerust Thornveld and is described as deciduous, open to dense short thorny woodland, dominated by Acacia species with a herbaceous layer of mainly grasses on deep, high base-status and some clay soils on plains and lowlands. It is also found in between the rocky ridges of the Dwarsberg-Swartruggens Mountain Bushveld type (Mucina & Rutherford, 2006).

The second is the Dwarsberg-Swartruggens Mountain Bushveld as mentioned above. This can be described as an area with rocky low to medium high hills and ridges with some steep faces in places. The height above the surrounding plains can reach about 300m. It is with variable vegetation structure depending on slope, exposure, aspect and local habitat, which results in various combinations of tree and shrub layers and often with a dense grass layer. Bush clumps also occur (Mucina & Rutherford, 2006).

The site is open and accessible through tracks leading from Dinokana village. The first area investigated was the proposed conference facility. It is situated along the access road and on the lower slopes of the foothills of Makadima Mountain. The second area is the accommodation location. It is situated on the summit and slopes of a small hill at the foot of Makadima Mountain.

The third area investigated was the proposed cultural village and it is also situated on the lower slopes of Makadima Mountain. The proposed picnic garden and adventure facility are situated a bit further on along the proposed access road and within the valley floor to the north of Makadima Mountain.

Figure 6. General Site conditions

Figure 7. General site conditions.

Figure 8. General site conditions.

Figure 9. General site conditions

6 Results of Public Consultation and Stakeholder Engagement:

6.1.1 Stakeholder Identification

Adjacent landowners and the public at large were informed of the proposed activity as part of the BA process. Site notices and advertisements notifying interested and affected parties were placed at strategic points and in local newspapers as part of the process.

Commented [JvdW 1]: Can you kindly confirm that this is accurate and assist with any comments or questions relating to heritage that were raised during this process in order for us to finalise the report?

7 Literature / Background Study:

7.1 Literature Review

The following reports were conducted in the general vicinity of the study area and were consulted for this report:

Author	Year	Project	Findings
Pelser, A. J.	2016	Archaeological Impact Assessment (AIA) Report For A Proposed 75mw Photovoltaic Solar Facility On The Remainder Of Kameeldoorn 271JP, Portion 15 Of Kameeldoorn 271JP & Portion 14 Of Kruisrivier 270JP, Zeerust, Northwest Province	Stone Age finds, Iron Age sites, Cairns
Van Vollenhoven, A.C.	2008	A Report On A Cultural Heritage Impact Assessment For The Proposed Development Of The New Khunotswana Rural Village Located In The Ramotshere Moiloa Local Municipality, Northwest Province	One LSA site was identified.
Van der Walt, J.	2008	Archaeological Impact Assessment On Portion 1 Of The Farm Kameeldoorn 271 JP, Zeerust District, North West Province	No sites were identified.
Huffman, T.N	2008	Kameeldoorn Archaeological Survey	Stone Age finds, Iron Age sites and historical sites

7.1.1 Genealogical Society and Google Earth Monuments

No known grave sites are indicated in the study area.

7.2 General History of the area

7.2.1 Archaeology of the area

The archaeological record for the greater study area consists of the Stone Age and Iron Age.

7.2.1.1 Stone Age

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. Each of these phases contain sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. The three main phases can be divided as follows;

∗ Later Stone Age; associated with Khoi and San societies and their immediate predecessors. Recently to ~30 thousand years ago

∗ Middle Stone Age; associated with Homo sapiens and archaic modern humans. 30-300 thousand years ago.

∗ Earlier Stone Age; associated with early Homo groups such as Homo habilis and Homo erectus. 400 000-> 2 million years ago.

Stone Age sites are usually associated with stone artefacts found scattered on the surface or as part of deposits in caves and rock shelters.

There are some rock art (engravings) sites located in the larger geographical a few kilometres west of Zeerust and near Groot Marico to the east of Zeerust (Bergh 1999).

7.2.1.2 The Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD
- The Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. From Brits in the east to Zeerust in the west there are many known Iron Age sites (Bergh 1999: 7-8). These all belong to the Later Iron Age (Bergh 1999:8-9). No EIA sites are known to occur in the area (Bergh 1999: 6).

Prof. J.Boeyens of UNISA did extensive archaeological research in the region (Boeyens 2003). He concluded that during the 15th century the earliest settlement of Sotho-Tswana speakers, (Moloko ceramic style), occurred near Tswenyane (Enselsberg) in central Marico, suggesting a migration from the northeast (Boeyens 2003).

A shift in settlement location from the foot of hills to hillsides and spurs, and to hilltop sites occurred, in conjunction with the increased use of stone for building purposes. The change in settlement location commenced in the second half of the 17th century. This change was probably linked to a period of severe drought, political instability and population movements in the South African interior (Boeyens 2003). He also concluded that in the second half of the 18th century a section of the Hurutshe started to aggregate at their capital Mmakgame. Due to conflict with their Tswana neighbours, they relocated to the hilltop settlement of Kaditshwene in central Marico, which was visited by European missionaries shortly before its destruction during the Difaqane.

By the end of the 18th century the BaHurutshe stone walled sites (capitals) were located at Kaditshwene and Tshwenyane north of Zeerust (Bergh 1999).

7.3 Historical Information

Dinokana became the main town of the baHurutshe in 1849, when Kgosi Moiloa I settled it with about 1,500 people, who had been displaced following the Difaqane. Kgosi Moiloa was accompanied by the Reverend Walter Inglis of the London Missionary Society

In the mid-1800s a church was built on the farm of Casper Coetzee. He died before its completion. The church was named Coetzee-Rust (Coetzee's Rest). The town that grew around the parish became known by the abbreviated form of its original name – Coetzee's Rust (http://www.tourismnorthwest.co.za/zeerust/#tab=tab-1). The name Coetzee-Rust was later abbreviated to Zeerust. Municipal status was obtained on 18 March 1936.

7.3.1 Anglo-Boer War

The Anglo-Boer War was the greatest conflict that had taken place in South Africa up to date
here are also various other monuments and memorials in and around Zeerust commemorating tribal wars and the Kleinfontein Memorial which marks the spot of a brutal battle in the Anglo-Boer War

7.3.1. Cultural Landscape

The property under investigation is located near Dinokana, about 1 km to the south west of the N4 National Road, 24 km north west of Zeerust, and about 20 km east of the Botswana border in North West Province.

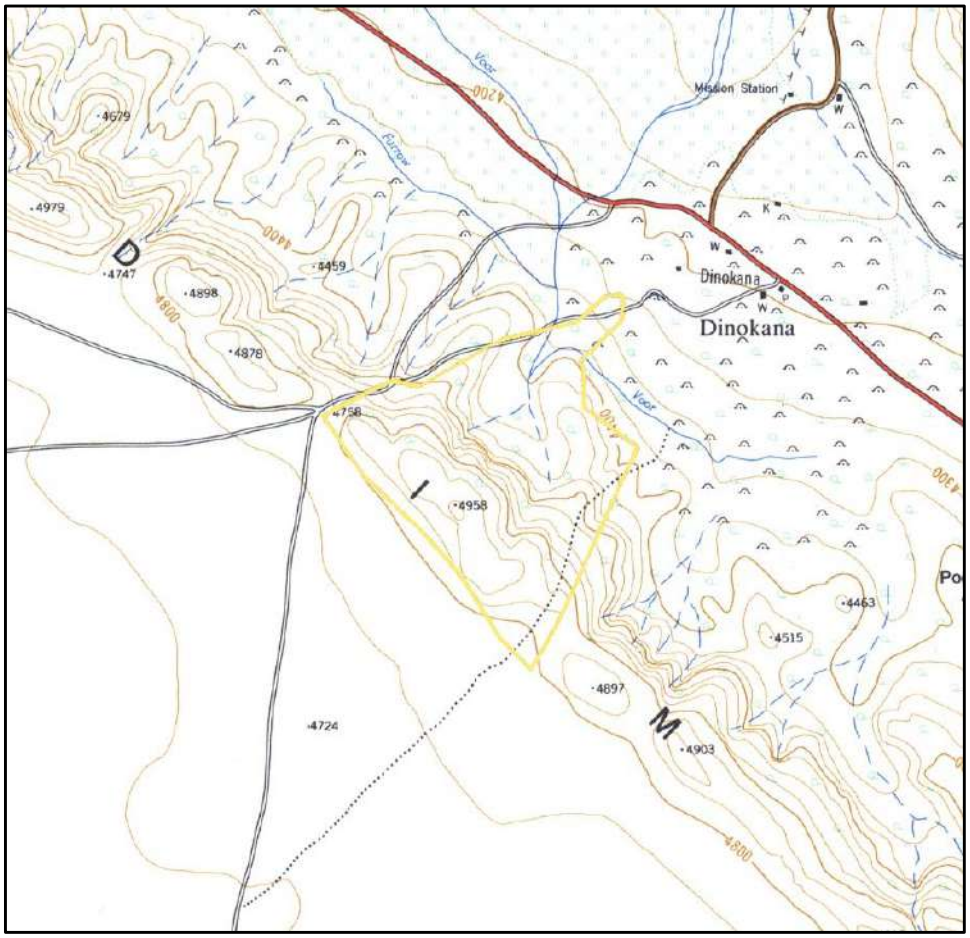

Figure 10. 1967 Topographical map of the site under investigation. The approximate study area is indicated with a yellow border. The town of Dinokana can be seen to the east, with some traditional huts also visible to the north along a water furrow. A large building or structure can be seen to the west of a rather steep slope in the study area. The eastern part of the study area extends into Dinokana, and one can see a furrow stream splitting and ending near the slope. The northern border of the property runs along a farm road, and a track / trail is visible along the south-eastern border. (Topographical Map 1967)

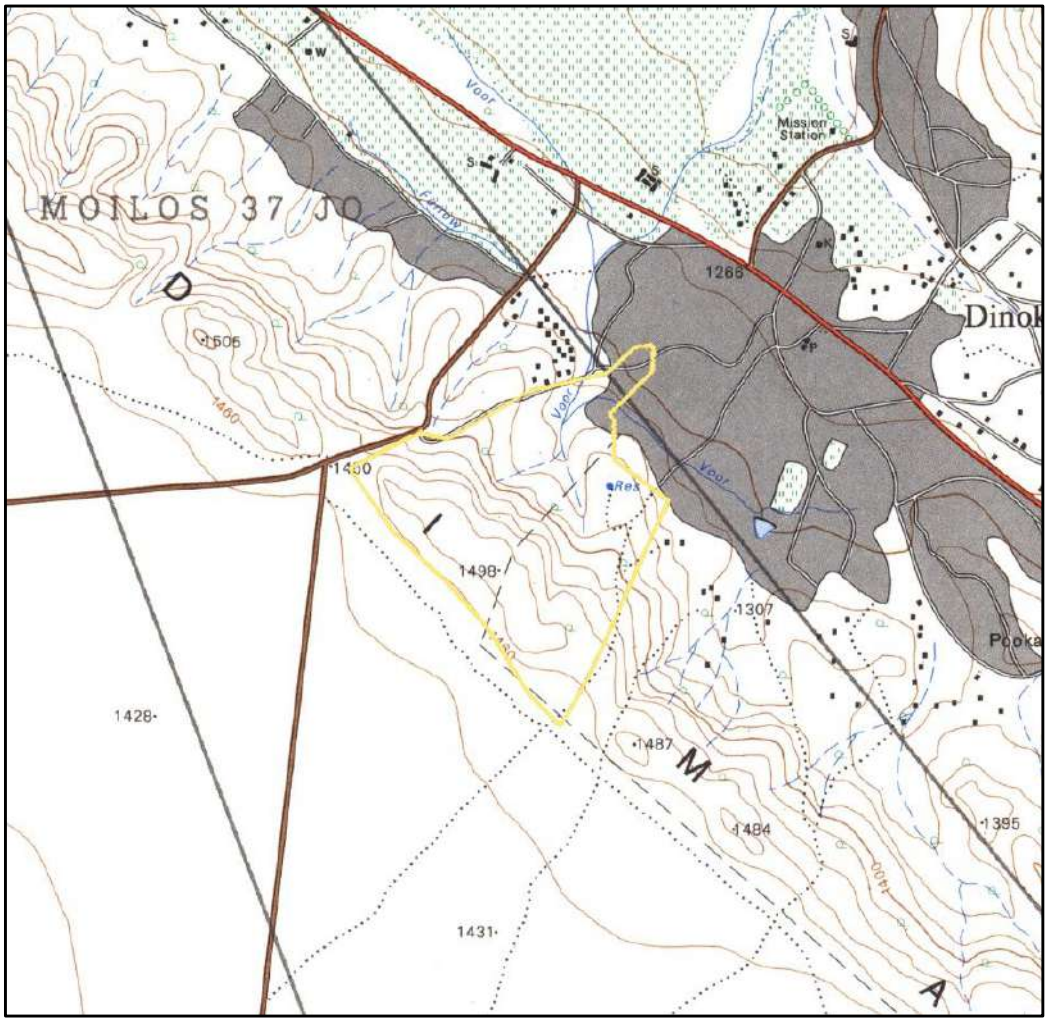

Figure 11. 1984 Topographical map of the site under investigation. The approximate study area is indicated with a yellow border. A large building or structure can still be seen in the western part of the study area. To the east, the study area extended into Dinokana, and one can see a water furrow and reservoir. The northern boundary of the area under investigation runs parallel with a farm road, and some tracks can be seen near the south-eastern border. (Topographical Map 1984)

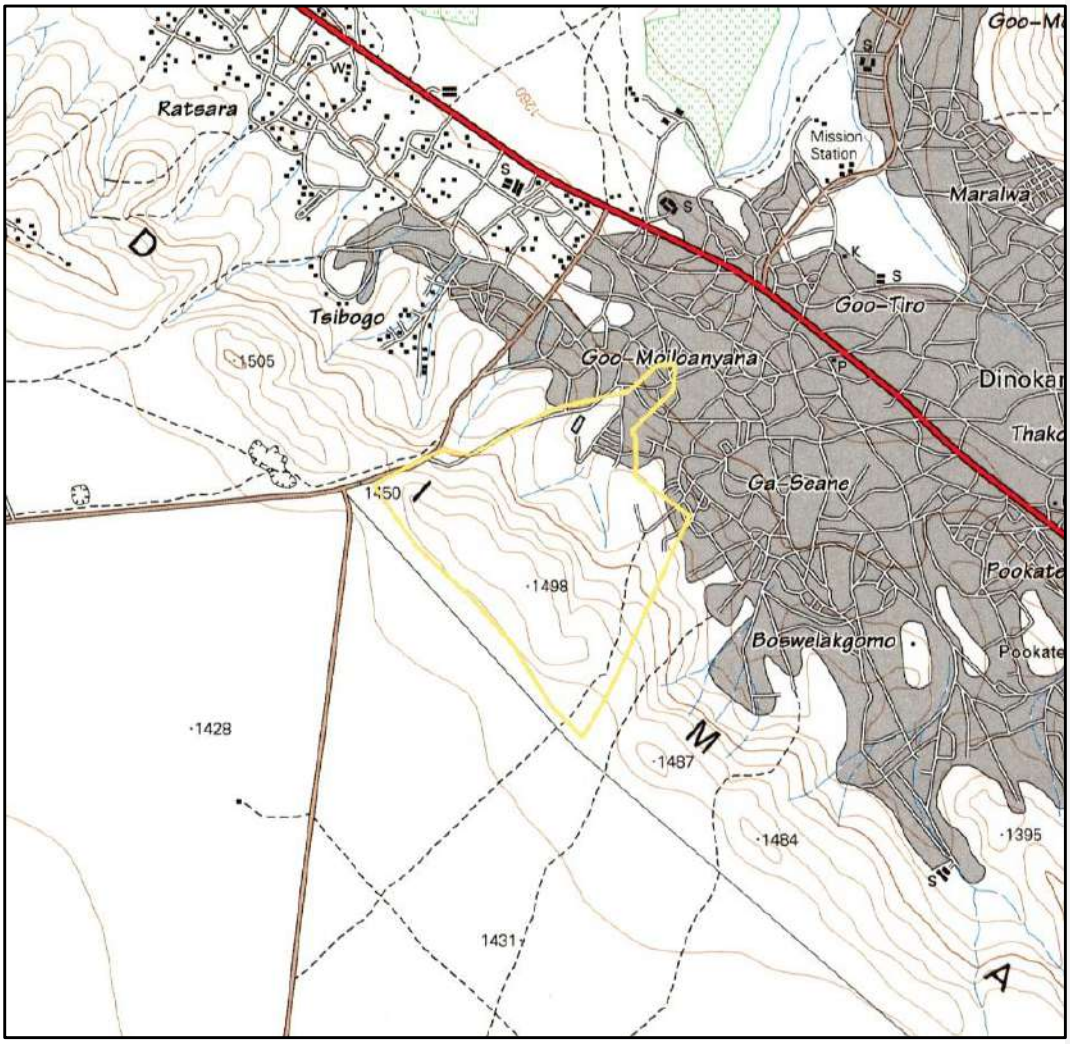

Figure 12. 1996 Topographical map of the site under investigation. The approximate study area is indicated with a yellow border. A large structure can be seen in the north-western corner of the study area, near a secondary road. A farm road branches from this road and runs parallel with the northern border of the property. The study area extends into Dinokana in the east, where one can also see a small reservoir. There was a track / trail running parallel with the south-eastern boundary. (Topographical Map 1996)

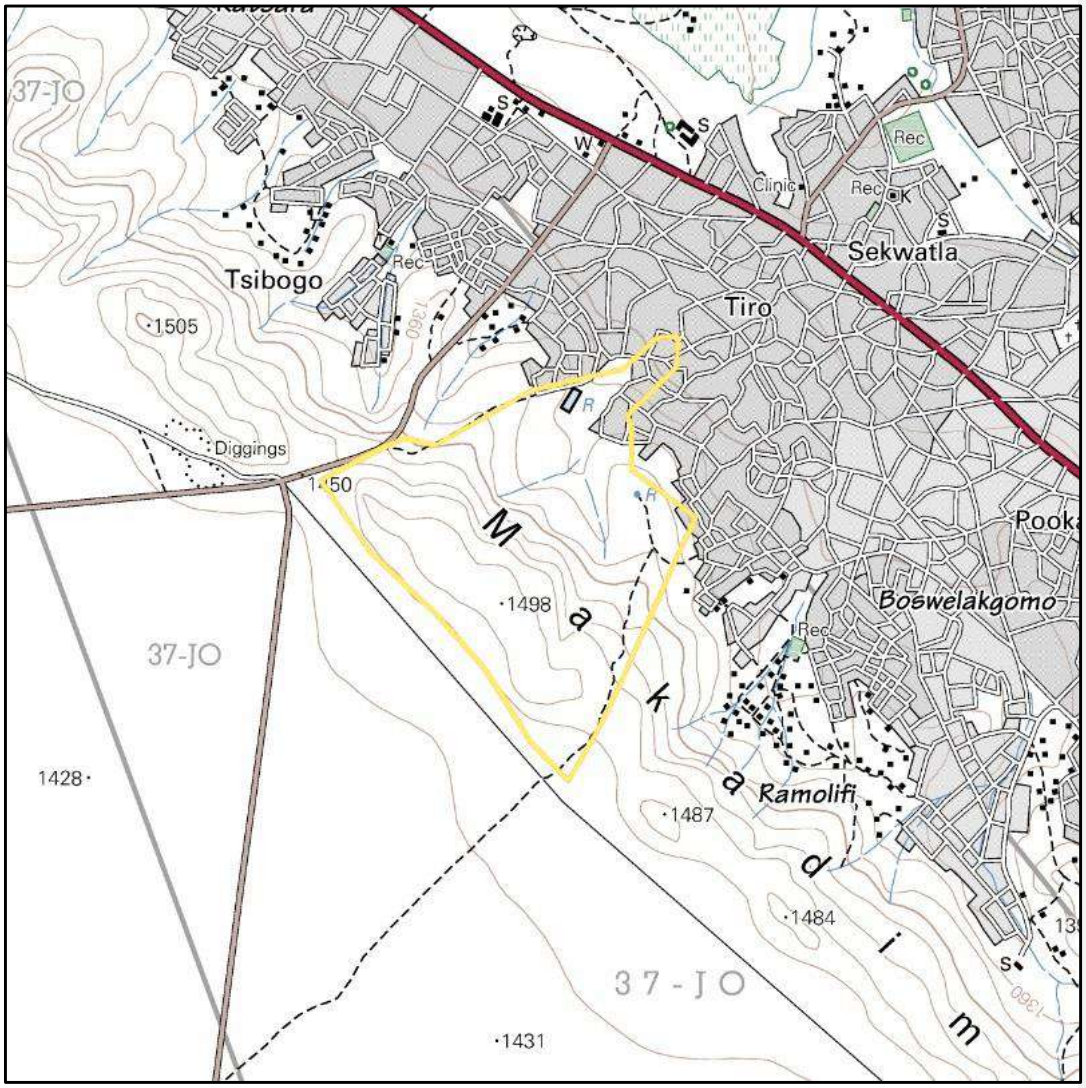

Figure 13. 2006 Topographical map of the site under investigation. The approximate study area is indicated with a yellow border. The large structure in the western part of the study area is no longer visible. In the east the study area extends into Dinokana, and one can see two small reservoirs. Tracks / Trails ran parallel with the northern and south eastern boundaries of the study area. (Topographical Map 2006)

Figure 14. 2017 Google Earth image showing the study area in relation to the N4 National Road, Zeerust, the Skilpadsnek Border Post, the Ramatlabama Border Post and other sites. (Google Earth 2017)

8 Findings of the Survey

It is important to note that only the development footprint of the project was surveyed. The study area was surveyed over a period of 1 day.

The recreational park is situated at the entrance of the proposed development. This area is currently being used as a recreational facility, but without any infrastructure. It is proposed to be developed into an area with proper recreational facilities and infrastructure such as ablutions, water and braai facilities. The remains of a previous construction camp are still visible on one part of the proposed site. The camp was there during the recent construction of roads throughout Dinokana village.

We were accompanied by a local appointed guide, Mr. Akanyang Mogotsi, who showed us the different development areas. He indicated that the area was not previously utilised by the community except for the grazing of livestock and for the collecting of firewood. According to Mr. Mogotsi there are no previous settlements and no graves and that it is part of the reason why the project was approved in principle by the traditional authorities.

A fountain, or eye, is also situated near the proposed development. This water source is fenced off and strictly monitored. It feeds several reservoirs in the area and serves as main water source for the surrounding communities. Except for the fencing of the water source and a completed reservoir, no other infrastructure is situated on this property. A few tracks also cross some parts of the property.

The proposed site is mostly undisturbed as it was not previously utilised or occupied. No other sites or finds of any heritage value or significance were identified at the indicated study area.

8.1 Built Environment (Section 34 of the NHRA)

No standing structures older than 60 years occur in the study area.

8.2 Archaeological and palaeontological resources (Section 35 of the NHRA)

No archaeological sites or material was recorded during the survey. Therefore, no further mitigation prior to construction is recommended in terms of the archaeological component of Section 35 of the NHRA for the proposed development to proceed.

Rossouw (2017) conducted an independent paleontological study and found: " *The proposed study area is underlain by contact metamorphosed, iron – rich sedimentary rocks of the Early Proterozoic Penge Formation (Chuniespoort Group), that are capped by superficial (Quaternary) deposits of low to very low palaeontological sensitivity, the latter being that the impact area is not situated within or near pan, well-developed alluvial or spring deposits. Palaeontologically sensitive cave breccias are not anticipated in the study area, as opposed to the more cave-rich karst environment provided by the underlying Malmani Subgroup dolomites outcropping about 1 km to the southwest. As far as the palaeontological heritage is concerned, the proposed development may proceed with no further palaeontological assessments required, provided that all excavation activities are restricted to within the boundaries of the development footprint. "*

8.3 Burial Grounds and Graves (Section 36 of the NHRA)

In terms of Section 36 of the Act no burial sites were recorded.

8.4 Cultural Landscapes, Intangible and Living Heritage.

Long term impact on the cultural landscape is considered to be low as the surrounding area is rural in character with some road developments. Visual impacts to scenic routes and sense of place are also considered to be low due to the extensive township developments in the larger area and the tourism development is in line with the character of the area.

8.5 Battlefields and Concentration Camps

There are no battlefields or concentration camp sites in the study area.

8.6 Potential Impact

The chances of impacting unknown archaeological sites in the study area is considered to be negligible. Any direct impacts that did occur would be during the construction phase only and would be of very low significance. Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. In the case of the development, it will, with the recommended mitigation measures and management actions, not impact any heritage resources directly. However, this and other projects in the area could have an indirect impact on the larger heritage landscape. The lack of any heritage resources in the immediate area and the extensive existing development surrounding the study area minimises additional impact on the landscape.

8.6.1 Pre-Construction phase:

It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure needed for the construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

8.6.2 Construction Phase

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

8.6.3 Operation Phase:

No impact is envisaged during this phase.

Table 5. Impact Assessment table.

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.		
	Without mitigation	**With mitigation (Preservation/ excavation of site)**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Not probable (2)	Not probable (2)
Significance	**16 (Low)**	**16 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	No resources were recorded	No resources were recorded.
Can impacts be mitigated?	Yes, a chance find procedure should be implemented.	Yes
Mitigation: Due to the lack of apparent significant archaeological resources no further mitigation is required prior to construction.		
Cumulative impacts: A Chance Find Procedure should be implemented for the project should any sites be identified during the construction process.		
Residual Impacts: If sites are destroyed this results in the depletion of archaeological record of the area. However, if sites are recorded and preserved or mitigated this adds to the record of the area.		

9 Conclusion and recommendations

HCAC was appointed to conduct a Heritage Impact Assessment for the Makadima Leisure and Cultural Park. The survey team was accompanied by a local appointed guide, Mr. Akanyang Mogotsi, who indicated the different development areas. He indicated that the area was not previously utilised by the community except for the grazing of livestock and for the collecting of firewood. According to Mr. Mogotsi there are no previous settlements and no graves and that it is part of the reason why the project was approved in principle by the traditional authorities.

During the survey, no archaeological sites or material was recorded. A paleontological desktop study was conducted by Rossouw (2017) that concluded: "*As far as the palaeontological heritage is concerned, the proposed development may proceed with no further palaeontological assessments required, provided that all excavation activities are restricted to within the boundaries of the development footprint*.". No further mitigation prior to construction is recommended in terms of the archaeological and paleontological components of Section 35 for the proposed development to proceed.

In terms of the built environment of the area (Section 34), no standing structures older than 60 years occur within the study area. In terms of Section 36 of the Act no burial sites were recorded. If any graves are located in future they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation. No public monuments are located within or close to the study area. The study area is surrounded by mining developments and infrastructure and the proposed development will not impact negatively on significant cultural landscapes or viewscapes. During the public participation process conducted for the project no heritage concerns was raised.

Due to the lack of significant heritage resources in the study area the impact of the proposed project on heritage resources is considered low and it is recommended that the proposed project can commence on the condition that the following chance find procedure are implemented as part of the EMPr and based on approval from SAHRA

9.1. Chance Find Procedures

The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below.

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.
- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

9.2 Reasoned Opinion

The impact of the proposed project on heritage resources is considered low and no further pre-construction mitigation in terms of archaeological resources is required based on approval from SAHRA. Furthermore, the socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures (i.e. chance find procedure) are implemented for the project.

10. References

Archaeological database, University of the Witwatersrand.
Bergh, J.S. (red.). 1999. Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies. Pretoria: J.L. van Schaik.
Boeyens, J.C.A. 2003. The Late Iron Age Sequence in the Marico and Early Tswana History. The South African Archaeological Bulletin, Vol. 58, No. 178 (Dec., 2003), pp. 63- 78. South African Archaeological Society.
Huffman, T.N. 2007. Handbook to the Iron Age: The Archaeology of Pre-Colonial Farming Societies in Southern Africa. Scotsville: University of KwaZulu-Natal Press.
Huffman, T.N. 2008. Kameeldoorn Archaeological Survey. Unpublished report.
Knudson, S.J. 1978. Culture in retrospect. Chicago: Rand McNally College Publishing Company.
Lombard, M., L. Wadley, J. Deacon, S. Wurz, I. Parsons, M. Mohapi, J. Swart & P. Mitchell. 2012. South African and Lesotho Stone Age Sequence Updated (I). South African Archaeological Bulletin 67 (195): 120–144, 2012.
National Heritage Resources Act (No 25 of 1999). Pretoria: the Government Printer. Republic of South Africa. 1998.
National Environmental Management Act (no 107 of 25 1998). Pretoria: The Government Printer.
Pelser, A. J. 2016. Archaeological Impact Assessment (AIA) Report For A Proposed 75mw Photovoltaic Solar Facility On The Remainder Of Kameeldoorn 271JP, Portion 15 Of Kameeldoorn 271JP & Portion 14 Of Kruisrivier 270JP, Zeerust, Northwest Province. Unpublished reports.
Rossouw, L. 2017. Palaeontological Desktop Assessment of the proposed Makadima residential development near Zeerust, Northwest Province. Unpublished report.
Van der Walt, J. 2008. Archaeological Impact Assessment On Portion 1 Of The Farm Kameeldoorn 271 JP, Zeerust District, North West Province, Unpublished report.
Van Vollenhoven, A.C. 2008. A Report On A Cultural Heritage Impact Assessment For The Proposed Development Of The New Khunotswana Rural Village Located In The Ramotshere Moiloa Local Municipality, Northwest Province. Unpublished report.

MAPS

Topographical map. 1967. *South Africa. 1:50 000 Sheet. 2525BD Gopane, First Edition.* Pretoria: Government Printer.
Topographical map. 1984. *South Africa. 1:50 000 Sheet. 2525BD Gopane, Third Edition.* Pretoria: Government Printer.
Topographical map. 1996. *South Africa. 1:50 000 Sheet. 2525BD Gopane, Fourth Edition.* Pretoria: Government Printer.
Topographical map. 2006. *South Africa. 1:50 000 Sheet. 2525BD Gopane, Fifth Edition.* Pretoria: Government Printer.

Electronic Sources:

Google Earth. 2017. 25°27'39.52" S 25°*51'02.36" E elev 1435 m.* [Online]. [Cited 24 October 2017].
Google Earth. 2017. 25°27'14.62" S 25°*50'21.32" E elev 1415 m.* [Online]. [Cited 24 October 2017].
http://www.tourismnorthwest.co.za/zeerust/#tab=tab-1)

11. Appendices:

Curriculum Vitae of Specialist

Jaco van der Walt
Archaeologist

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Education:

Particulars of degrees/diplomas and/or other qualifications:

Name of University or Institution:		University of Pretoria
Degree obtained	**:**	BA Heritage Tourism & Archaeology
Year of graduation	**:**	2001
Name of University or Institution:		University of the Witwatersrand
Degree obtained	**:**	BA Hons Archaeology
Year of graduation	**:**	2002
Name of University or Institution	**:**	University of the Witwatersrand
Degree Obtained	**:**	MA (Archaeology)
Year of Graduation	:	2012
Name of University or Institution	**:**	University of Johannesburg
Degree	**:**	PhD
Year	:	Currently Enrolled

EMPLOYMENT HISTORY:

2011 – Present:	**Owner – HCAC (Heritage Contracts and Archaeological Consulting CC)**.
2007 – 2010 :	**CRM Archaeologist,** Managed the Heritage Contracts Unit at the University of the Witwatersrand.
2005 - 2007:	**CRM Archaeologist**, Director of Matakoma Heritage Consultants
2004:	**Technical Assistant**, Department of Anatomy University of Pretoria
2003:	**Archaeologist**, Mapungubwe World Heritage Site
2001 - 2002:	**CRM Archaeologists,** For R & R Cultural Resource Consultants, Polokwane
2000:	**Museum Assistant**, Fort Klapperkop.

Countries of work experience include:

Republic of South Africa, Botswana, Zimbabwe, Mozambique, Tanzania, The Democratic Republic of the Congo, Lesotho and Zambia.

SELECTED PROJECTS INCLUDE:

Archaeological Impact Assessments (Phase 1)

Heritage Impact Assessment Proposed Discharge Of Treated Mine Water Via The Wonderfontein Spruit Receiving Water Body Specialist as part of team conducting an Archaeological Assessment for the Mmamabula mining project and power supply, Botswana

Archaeological Impact Assessment Mmamethlake Landfill

Archaeological Impact Assessment Libangeni Landfill

Linear Developments

Archaeological Impact Assessment Link Northern Waterline Project At The Suikerbosrand Nature Reserve

Archaeological Impact Assessment Medupi – Spitskop Power Line,

Archaeological Impact Assessment Nelspruit Road Development

Renewable Energy developments

Archaeological Impact Assessment Karoshoek Solar Project

Grave Relocation Projects

Relocation of graves and site monitoring at Chloorkop as well as permit application and liaison with local authorities and social processes with local stakeholders, Gauteng Province.

Relocation of the grave of Rifle Man Maritz as well as permit application and liaison with local authorities and social processes with local stakeholders, Ndumo, Kwa Zulu Natal.

Relocation of the Magolwane graves for the office of the premier, Kwa Zulu Natal

Relocation of the OSuthu Royal Graves office of the premier, Kwa Zulu Natal

Phase 2 Mitigation Projects

Field Director for the Archaeological Mitigation For Booysendal Platinum Mine, Steelpoort, Limpopo Province. Principle investigator Prof. T. Huffman

Monitoring of heritage sites affected by the ARUP Transnet Multipurpose Pipeline under directorship of Gavin Anderson.

Field Director for the Phase 2 mapping of a late Iron Age site located on the farm Kameelbult, Zeerust, North West Province. Under directorship of Prof T. Huffman.

Field Director for the Phase 2 surface sampling of Stone Age sites effected by the Medupi – Spitskop Power Line, Limpopo Province

Heritage management projects

Platreef Mitigation project – mitigation of heritage sites and compilation of conservation management plan.

MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS:

- Association of Southern African Professional Archaeologists. Member number 159

  Accreditation:
  - Field Director Iron Age Archaeology
  - Field Supervisor Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation
- Accredited CRM Archaeologist with SAHRA
- Accredited CRM Archaeologist with AMAFA
- Co-opted council member for the CRM Section of the Association of Southern African Association Professional Archaeologists (2011 – 2012)

PUBLICATIONS AND PRESENTATIONS

- A Culture Historical Interpretation, Aimed at Site Visitors, of the Exposed Eastern Profile of K8 on the Southern terrace at Mapungubwe.
  - J van der Walt, A Meyer, WC Nienaber
  - Poster presented at Faculty day, Faculty of Medicine University of Pretoria 2003
- 'n Reddingsondersoek na Anglo-Boereoorlog-ammunisie, gevind by Ifafi, Noordwes-Provinsie. South-African Journal for Cultural History 16(1) June 2002, with A. van Vollenhoven as co-writer.
- Fieldwork Report: Mapungubwe Stabilization Project.
  - WC Nienaber, M Hutten, S Gaigher, J van der Walt
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2004
- A War Uncovered: Human Remains from Thabantšho Hill (South Africa), 10 May 1864.
  - M. Steyn, WS Boshoff, WC Nienaber, J van der Walt
  - Paper read at the 12th Congress of the Pan-African Archaeological Association for Prehistory and Related Studies 2005
- Field Report on the mitigation measures conducted on the farm Bokfontein, Brits, North West Province .
  - J van der Walt, P Birkholtz, W. Fourie
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2007
- Field report on the mitigation measures employed at Early Farmer sites threatened by development in the Greater Sekhukhune area, Limpopo Province. J van der Walt
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2008
- Ceramic analysis of an Early Iron Age Site with vitrified dung, Limpopo Province South Africa.
  - J van der Walt. Poster presented at SAFA, Frankfurt Germany 2008

- Bantu Speaker Rock Engravings in the Schoemanskloof Valley, Lydenburg District, Mpumalanga (*In Prep)*
    - J van der Walt and J.P Celliers
- Sterkspruit: Micro-layout of late Iron Age stone walling, Lydenburg, Mpumalanga. W. Fourie and J van der Walt. A Poster presented at the Southern African Association of Archaeologists Biennial Conference 2011
- Detailed mapping of LIA stone-walled settlements' in Lydenburg, Mpumalanga. J van der Walt and J.P Celliers
    - Paper read at the Southern African Association of Archaeologists Biennial Conference 2011
- Bantu-Speaker Rock engravings in the Schoemanskloof Valley, Lydenburg District, Mpumalanga. J.P Celliers and J van der Walt
    - Paper read at the Southern African Association of Archaeologists Biennial Conference 2011
- Pleistocene hominin land use on the western trans-Vaal Highveld ecoregion, South Africa, Jaco van der Walt.
    - J van der Walt. Poster presented at SAFA, Toulouse, France. Biennial Conference 2016

REFERENCES:

1. Prof Marlize Lombard Senior Lecturer, University of Johannesburg, South Africa
   E-mail: mlombard@uj.ac.za
2. Prof TN Huffman Department of Archaeology Tel: (011) 717 6040
   University of the Witwatersrand
3. Alex Schoeman University of the Witwatersrand
   E-mail:Alex.Schoeman@wits.ac.za

Palaeontological Desktop Assessment of the proposed Makadima residential development near Zeerust, Northwest Province.

Report prepared by Palaeo Field Services, PO Box 38806 Langenhovenpark 9330.

17 November 2017

Summary

The proposed study area is underlain by contact metamorphosed, iron – rich sedimentary rocks of the Early Proterozoic Penge Formation (Chuniespoort Group), that are capped by superficial (Quaternary) deposits of low to very low palaeontological sensitivity, the latter being that the impact area is not situated within or near pan, well-developed alluvial or spring deposits. Palaeontologically sensitive cave breccias are not anticipated in the study area, as opposed to the more cave-rich karst environment provided by the underlying Malmani Subgroup dolomites outcropping about 1 km to the southwest. As far as the palaeontological heritage is concerned, the proposed development may proceed with no further palaeontological assessments required, provided that all excavation activities are restricted to within the boundaries of the development footprint.

Introduction

The report is an assessment of potential palaeontological impact with regard to the proposed Makadima residential development , situated west of the N4 National road, about 25 km northwest of Zeerust in Northwest Province (**Fig. 1 & 2).**

Maps

1:50 000 scale topographic 2525 BD Gopane

1:250 000 scale geological map 2526 Rustenburg

Site Coordinates: 25°27'38.14"S 25°50'58.49"E

Methodology

The assessment was carried out in accordance with National Heritage Resources Act 25 of 1999 with the aim to assess the potential impact on palaeontological heritage resources that may result from the proposed development. The palaeontological significance of the affected

areas were evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature.

Assumptions and Limitations

The assessment provided within this report is based upon a desktop study without the benefit of a site visit. The presentation of geological units present within the study area is derived from the 1:1 000 000 scale geological map of South Africa and the 1:250 000 scale geological map 2526 Rustenburg, which may vary in their accuracy. It is also assumed, for the sake of prudence, that fossil remains are always uniformly distributed in fossil-bearing rock units, although in reality their distribution may vary significantly.

Background

According to the 1:250 000 scale geological map 2526 Rustenburg, the proposed development footprint is underlain by contact metamorphosed, iron – rich sedimentary rocks of the Early Proterozoic Penge Formation (*Vp)* of the Chuniespoort Group (Transvaal Supergroup) (Erikson et al 2006) (**Fig. 3**). The Penge Iron Formation varies considerably in thickness owing to folding and erosion that preceded deposition of the Pretoria Group. Confined to the Penge Formation in the Transvaal Basin, the banded iron-formation (BIF) is in part thermally metamorphosed by the Bushveld Complex and exhibits concomitant mineralogical variations (Miyano et al. 1987). It is underlain by the dolomitic Malmani Subgroup (subgroup at the base of the Transvaal Supergroup, which has produced multiple late Cenozoic, fossil-rich breccia caves in the region) and is capped by the siliciclastic Duitschland Formation. The Penge Formation is composed of chert-pebble conglomerate and siltstone, banded cherts, banded hornfels and carbonaceous shale (Miyano and Beukes 1997). A glaciation-related origin is proposed for the iron formations of the Penge Formation, being interpreted as indicating a growth in the oxygen content of the upper/shallower parts of the oceans where iron transported in seawater from deeper anoxic ocean basins, was oxidised and precipitated during photosynthesis (Kasting 1987; Moore et al. 2001).

Impact Statement Recommendation

The desktop investigation indicates that the proposed study area is underlain by partially metamorphosed sediments of the early Proterozoic Penge Formation, that are capped by superficial (Quaternary) deposits of low to very low palaeontological sensitivity, the latter

being that the impact area is not situated within or near pan, well-developed alluvial or spring deposits (considered to be potentially fossiliferous in the region). Palaeontologically sensitive cave breccias are not anticipated in the study area, as opposed to the more cave-rich karst environment provided by the underlying Malmani Subgroup dolomites outcropping about 1 km to the southwest.

As far as the palaeontological heritage is concerned, the proposed development may proceed with no further palaeontological assessments required, provided that all excavation activities are restricted to within the boundaries of the development footprint.

References

Eriksson, P.G. et al. 2006. The Transvaal Supergroup and its Precursors. **In**: Johnson, M.R, Anhaeusser, C.R. and Thomas, R.J. (Eds.) *The geology of South Africa*, pp. 237-260. Geological Society of South Africa, Johannesburg & the Council for Geoscience, Pretoria.

Kasting, J.F., 1987. Theoretical constraints on oxygen and carbon dioxide concentrations in the Precambrian atmosphere. *Precambrian Research (*34): 205–229.

Moore, J.M., Tsikos, H and Polteau, S. 2001. Deconstructing the Transvaal Supergroup, South Africa: implications for Palaeoproterozoic palaeoclimate models. *Journal of African Earth Sciences* 33(3-4): 437 – 444.

Miyano, T., Beukes, N.J. and Van Reenen, D.D. 1987. Metamorphic evidence for early post-Bushveld sil1s in the Penge Iron Formation, Transvaal Sequence, Eastern Transvaal. *South African Journal of Geology* (90): 37-43.

Miyano, T. and Beukes, N.J. 1997. Mineralogy and Petrology of the Contact Metamorphosed Amphibole Asbestos-bearing Penge Iron Formation, Eastern Transvaal, South Africa. *Journal of Petrology* 38 (5): 651 – 676.

DECLARATION OF INDEPENDENCE

I, Lloyd Rossouw, declare that I act as an independent specialist consultant. I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. I have no interest in secondary or downstream developments as a result of the authorization of this project.

17 / 11 / 2017

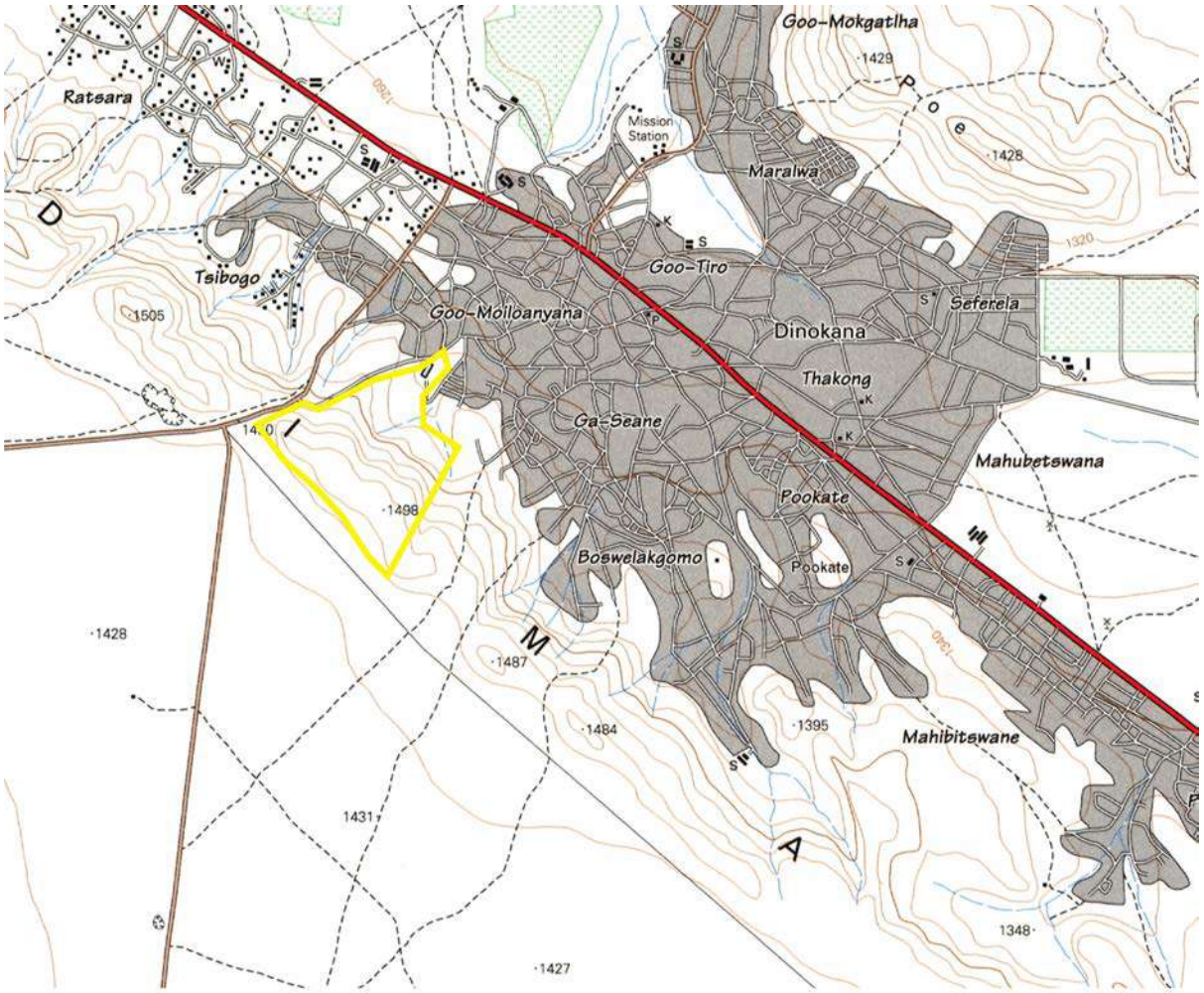


Figure 1. Map of the proposed development footprint (portion of 1:50 000 scale topographic 2525 BD Gopane).

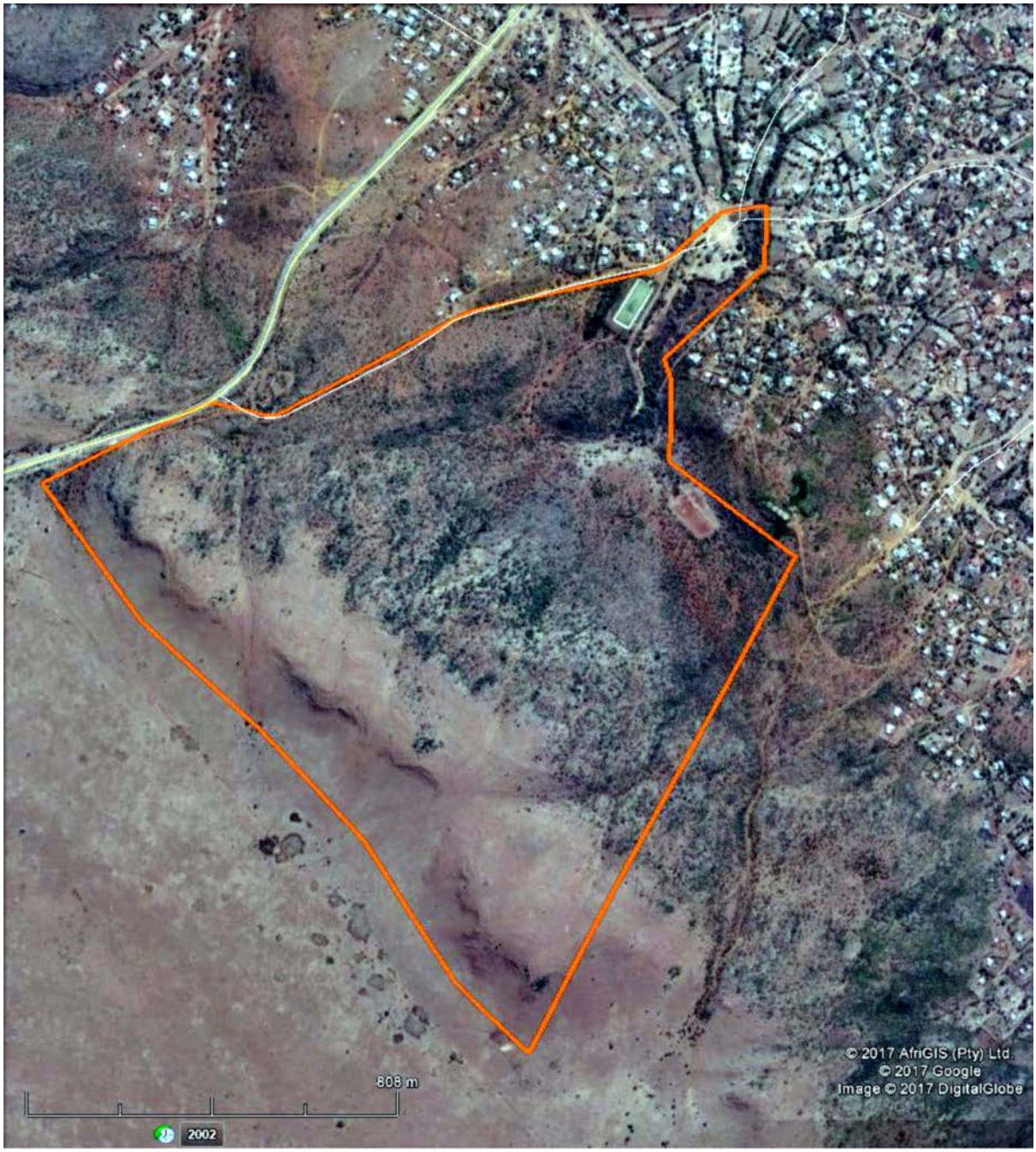
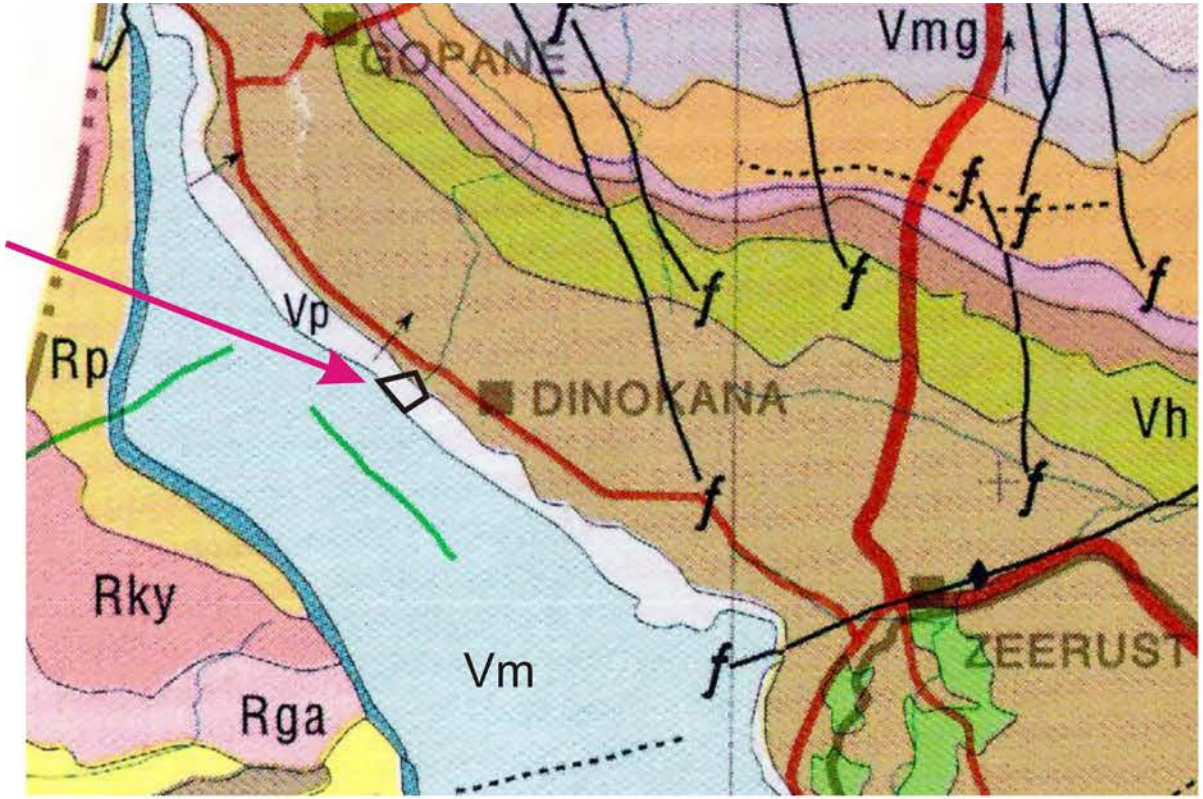


Figure 2. Aerial view of the study area.



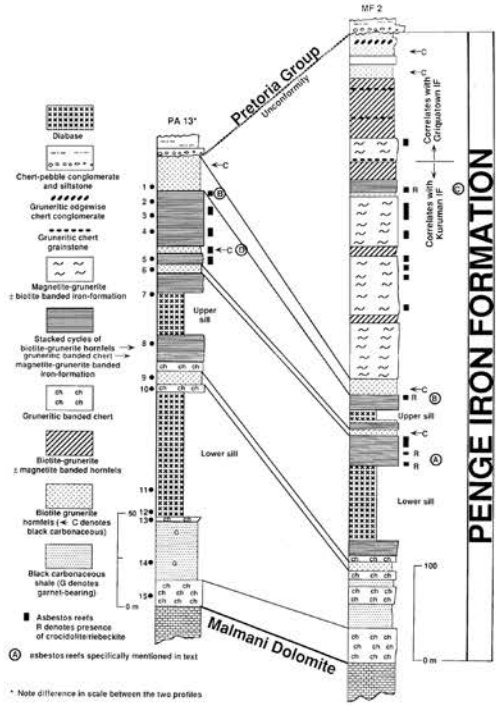


Fig. 2. Lithostratigraphic columns of the Penge Iron Formation at Penge (PA13) and Mafeking (MF2). Numbers on left of the PA13 column denote sample locations for bulk chemistry. (Note difference in scale between the two profiles.)

According to the 1:1 000 000 scale geological map of South Africa (left), the 1:250 000 scale geological map 2526 Rustenburg, and Miyano and Beukes (1997) (right), the site is underlain by contact metamorphosed, iron – rich sedimentary rocks of the Early Proterozoic Penge Formation (*Vp*) of the Chuniespoort Group (Transvaal Supergroup).

Traffic Impact Statement

for the proposed development of a leisure and cultural village on Farm Moila 412-Jo, Dinokana Village, North West Province

Compiled by: Surina Laurie (CSIR)
Tel: 021 888 2561
Date: 19 December 2017

Contents

TRAFFIC IMPACT STATEMENT

1. INTRODUCTION

Makadima Leisure and Cultural Village is a project proposed by Makadima Leisure and Cultural Village 101 (Pty) Ltd that will be based in Dinokana Village, outside of Zeerust, in Ngaka Modiri District, North West Province. The Makadima Leisure and Cultural Village aims to showcase the culture of different tribes found in the North West Province and is proposed on the Moiloa Farm 412-JO. The farm portion is 85 hectares in extent. The project aims to employ 20 permanent and 50 temporary staff, who will be from the surrounding Dinokana Village.

During the Public Participation Process undertaken at the commencement of this project, the South African National Roads Agency (SANRAL) requested that due to the proximity of the proposed development to the N4, a traffic impact study/report should be submitted for consideration. This Traffic Impact Statement (TIS) has been compiled by the CSIR in support of this request.

1.1 Terms of Reference

The key issues associated with the construction and operational phases of the project that will be assessed as part of the traffic assessment are:

- Increase in traffic generation throughout the lifetime of the project;
- Decrease in air quality; and
- Increase in road maintenance required.

1.2 Assumptions

The assessment has been based on the traffic information available at this stage of the project.

2. APPROACH AND METHODOLOGY

2.1 Objectives

- Determine the current traffic conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Identify potential impacts and cumulative impacts that may occur during the construction and operational phases of development;
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts; and
- Incorporate and address all issues and concerns raised by Interested and Affected Parties (I&APs) and the public (if applicable).

2.2 Methodology

The key steps followed in this assessment are:

- Review of available desktop information, including the SANRAL National traffic count information, google earth images; and
- Incorporating the project information received with the desktop information obtained and the determination of appropriate mitigation measures.

3. AFFECTED ENVIRONMENT

The location of the project, the main road and the main access road are shown in Figure 1. The proposed project site can be accessed via an existing access road that intersects with a T- intersection with the N4 at (25°26'36.05"S; 25°51'17.58"E). The existing road is ± 12 m wide and has two lanes. The National Road 4 (N4) is routed from Skilpadshek on the Botswana border, past Rustenburg, Pretoria, Witbank and Nelspruit to Kompatiepoort at the border of Mosambique[1]. This section of the N4 comprises of two lanes, one lane routes to Zeerust and the opposite lane to the Skilpadshek border.

Two traffic counts, available from 2016 SANRAL data show that at point 1651, “Bakwena Dinokana”, and point 1641, “Bakwena Radikhudu”, that the Average Daily Traffic (ADT) is 3989 and 1000, and the Annual Average Daily Truck Traffic (ADTT) is 524 and 388, respectively. These points are also shown in Figure 1.

A photo plate is included (Photo 1-4) to show the intersection of the N4 with the existing access road and the current condition of the roads.

[1] Falkner, John (May 2012). South African Numbered Route Description and Destination Analysis (Report). National Department of Transport. pp. 16–17

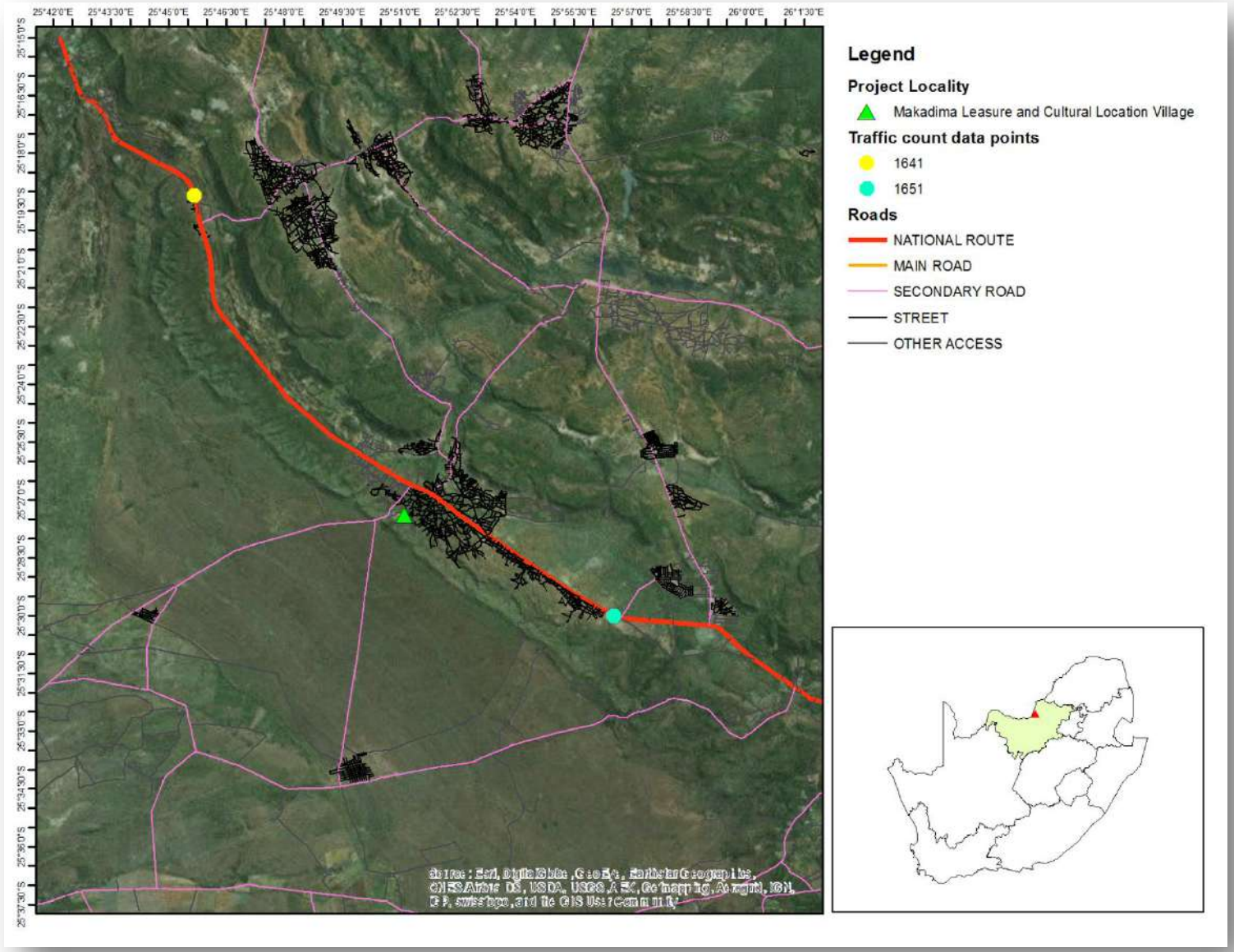


Figure 1. Project locality and existing roads and traffic information available for the site.

Photo 1: Entrance of the site taken from the existing access road

Photo 2: Photo showing the typical condition of the existing access road

Photo 3: T-intersection of the access road and the N4, taken in an northern direction

Photo 4: Intersection between the N4 and the access road, taken in a southern direction

Photo 14. 5: Photo of the turn-off on the N4 in the direction of Zeerust

Photo 14. 6: Photo of the turn-off on the N4 taken in the direction of the Skilpadshek border

3.1 Transport Information

Materials and equipment transported to the site comprise of:

- Building materials (concrete aggregates, cement and gravel); and
- Construction equipment such as piling rigs and cranes.

The general current limitations on road freight transport are:

- Axle load limitation of 7,7 ton front axle, 9 t on single rear axles;
- Axle unit limitations are 18 t for dual axle unit and 24 t for 3 axle unit;
- Gross vehicle mass of 56 t. This means a typical payload of about 30 t;
- Maximum vehicle length of 22 m for interlink, 18,5 m for horse and trailer and 13,5 m for a single unit;
- Width limit of 2,6 m; and
- Height limit 4,3m.

Abnormal permits are required for vehicles exceeding these limits. It is however not anticipated that abnormal vehicles would be required for this development.

3.2 Traffic generation

The traffic generation estimates detailed below have been provided by the Applicant. During all phases (construction and operation) of the project, traffic will be generated. The highest traffic volumes will be created during the construction phase. This includes activities associated with:

- Site preparation and transporting the construction materials, and associated infrastructure to the site; and
- Transportation of employees to and from the site on a daily basis.

Construction Phase:

During the construction phase, the following is anticipated:

- The construction period take 5 to 7 months, during this period, it is anticipated that the following will come to site on a daily basis:
    - 10 tipper trucks;
    - 2 front end loaders;
    - 2 excavators;
    - 2 graders; and
    - 2 normal vehicles.

Based on the above, it is estimated that the number of vehicles trips during the construction phase would be between 2 070 and 2 898. These trips would be made over an estimated period of 5 to 7 months. In the worst case, the number of heavy vehicle trips per day for each facility would be in the order of 12 trips.

Operational Phase:

During the operational phase, the following is anticipated:

- Normal daily operations: minimum of 10 to a maximum of 20 normal vehicles; and
- Special events: minimum of 100 to maximum of 150 normal vehicles.

Decommissioning Phase:

At this stage, it is not anticipated that the proposed project will cease to be utilised and all infrastructure removed from site therefore, this phase was not considered as part of the TIS.

4. IDENTIFICATION OF IMPACTS

The traffic impacts that will be generated by the proposed facility are detailed below. The impacts will largely occur during the construction phase of the project, since this is when the highest amount of traffic will be generated by the proposed facility (refer to Section 3).

The impacts identified and further assessed are:

1. Increase in traffic generation.
2. Accidents with pedestrians, animals and other drivers on the surrounding tarred roads.
3. Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment.

5. ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

This section assesses the significance of the impacts identified in Section 4. Appropriate mitigation and management measures to reduce the significance of the negative impacts and promote the positive impacts have been included in the draft EMPr.

5.1 Increase traffic generation

As discussed in Section 4 of this report, conventional trucks and conventional heavy vehicles transporting loads will need to come to site to deliver the infrastructure required for the development. At worst, during the construction phase, 12 vehicles would need to come to site daily. The impact of this on the general traffic would be negligible as the additional peak hour traffic would be at most 2 trips.

Significance of impacts without mitigation

Although the construction phase would have the greatest impact on traffic generated by the proposed development, the increase in traffic will only result in an addition of 2 trips during peak hour traffic (worst case scenario). Based on the traffic counts discussed in Section 3 of this Chapter, the ADT for this area is between 3989 and 1000 (depending on the direction of the traffic) vehicles. The R27 is designed for 1000 units per day and therefore, the additional traffic generated during the construction phase will have a **low** negative impact.

The operational phase will have a lower traffic generation since only the personnel permanently employed on site and tourists will come daily to site daily. It is not expected that this would exceed 20 rips per day. Although, during special events this amount may increase to up to 150 vehicles. This negative impact would be **very low.**

Proposed mitigation

Even though the traffic generated would not be significant, the following requirements should still be met by the developer during the construction and decommissioning phases:

- Should abnormal loads have to be transported by road to the site, a permit needs to be obtained.
- Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and
- Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00);
- A speed limit of 60 km/h should be maintained on the N4.

Requirements to be met during the operational phase:

- Ensure that where possible, staff members carpool to site.

5.2 Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads.

During all phases of this project, vehicles will need to access the site. There is the potential that should vehicles not indicate soon enough that they are turning off from the N4, an accident can occur. In addition, not adhering to the relevant speed limits may cause accidents with other drivers and collisions with animals.

Significance of impacts without mitigation

The significance of causing an accident with pedestrians, animals and other drivers would have a **high** negative impact significance since the probability of the impact occurring would be highly probable and could be fatal and therefore would cause irreplaceable loss.

Proposed mitigation

- Adhere to speed limits applicable to all roads used; and
- Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.

Significance of impact with mitigation

By implementing the abovementioned mitigation measures the probability of the impact occurring would be lowered significantly which would reduce the significance of the impact to **medium** negative impact.

5.3 Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment

Nature of the impact

During all the phases of the project, there will be a decrease in air quality due to the noise created by and pollutants released from vehicles coming to site during all phases of the projects, construction activities

occurring on site and dust created. Since the site is located in a rural setting, the extent of the impact would remain local.

Significance of impacts without mitigation

As discussed above, the decrease in air quality would be local in extent. The worst case scenario for impacts on air quality is that that construction activities occur throughout very windy conditions and during the night-time. This negative impact would be **medium**, without mitigation.

Proposed mitigation

- Implement management strategies for dust generation e.g. apply dust suppressant on exposed areas and stockpiles;
- Postpone or reduce dust-generating activities during periods with strong wind;
- Limit noisy maintenance/operational activities to daytime only;
- Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased;
- Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the Applicant; and
- Avoid using old and noisy construction equipment and ensure equipment is well maintained.

Significance of impact with mitigation

With the implementation of the mitigation measures detailed above, the probability of noise emissions and dust realised would be lowered and the impact would be of a **low** significance.

5.4 Cumulative impact of traffic generation

At this stage, it is not known that any similar developments are proposed within the area and the addition of the traffic generated by this project is not deemed to be significant (as outlined within this Section of the TIS).

Significance of cumulative impacts

It is assumed that the mitigation measures discussed in this Section 5 of this TIS and included in Table 1 below are implemented, that the traffic generation impacts would be suitably managed to ensure that the impacts are suitably managed. Based on this, the cumulative negative impact is **low**.

Table 14. 1. Traffic Impact Assessment Table

Aspect/Impact Pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confidence Level
										Without Mitigation	*With Mitigation*		
CONSTRUCTION AND DECOMMISSIONING PHASES													
Traffic generation	Increase in traffic	Negative	Regional	Short term	Moderate	Very likely	Yes	Replaceable	• Should abnormal loads have to be transported by road to the site, a permit needs to be obtained. • Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and • Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00); • A speed limit of 60 km/h should be maintained on the N4.	Low	Low	4	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Long term	Extreme	Likely	No	High irreplaceability	• Adhere to speed limits applicable to all roads used; and • Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.	High	Moderate	3	Medium
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Negative	Local	Medium term	Moderate	Unlikely	Yes	Replaceable	• Implement management strategies for dust generation e.g. apply dust suppressant on exposed areas and stockpiles; • Postpone or reduce dust-generating activities during periods with strong wind; • Limit noisy maintenance/operational activities to daytime only; • Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased; • Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the Applicant; and • Avoid using old and noisy construction equipment and ensure equipment is well maintained.	Moderate	Low	4	Medium
Aspect/Impact Pathway	**Nature of impact**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility**	**Irreplaceability**	**Mitigation Measures**	**Significance of Impact/Risk = Consequence x Probability**		**Ranking of Impact/ Risk**	**Confidence Level**
										Without Mitigation	***With Mitigation***		
OPERATIONAL PHASE													

Traffic generation	Increase in traffic	Negative	Regional	Short term	Slight	Very likely	High	Replaceable	• Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and • Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00); • A speed limit of 60 km/h should be maintained on the N4. •	Very low	Very low	5	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Long term	Extreme	Likely	No	High irreplaceability	• Adhere to speed limits applicable to all roads used; and • Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.	High	Moderate	3	Medium
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Negative	Local	Medium term	Moderate	Unlikely	Yes	Replaceable	• Implement management strategies for dust generation e.g. apply dust suppressant on exposed areas and stockpiles; • Postpone or reduce dust-generating activities during periods with strong wind; • Limit noisy maintenance/operational activities to daytime only; • Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased; • Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the Applicant; and • Avoid using old and noisy construction equipment and ensure equipment is well maintained.	Moderate	Low	4	Medium
CUMULATIVE IMPACTS													
Traffic generation	Increase in traffic	Negative	Regional	Long term	Moderate	Very likely	High	Replaceable	n/a	Low	Low	4	Medium

6. TRAFFIC IMPACT STATEMENT

Based on the assessment of the potential impacts that can be associated with the traffic to be generated during the construction and operation the project, the overall impact from traffic generation is deemed to be **low** when implementing suitable mitigation measures, discussed in Section 4 of this Statement. The highest traffic will be generated during the construction phase.

The measures included within the EMPr must be adhered to, with the main requirements outlined below:

- Should abnormal loads have to be transported by road to the site, a permit needs to be obtained.
- Ensure that roadworthy and safety standards are implemented at all time for all construction.
- Adhere to all speed limits applicable to all roads used.
- Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the roads to ensure safe entry and exit.
- Implement management strategies for dust generation e.g. apply dust suppressant on the exposed areas and stockpiles.

BASIC ASSESSMENT REPORT

APPENDIX H: IMPACT ASSESSMENT

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
CONSTRUCTION PHASE													
Direct loss of wetlands	Negative	Regional	Permanent	Very high	Definite	Fatally Flawed	Low	High	3	Yes	Yes	▪ Demarcate the construction site and ensure that all activities are carried out within that area. Additionally mark out the wetland on the ground to ensure activities stay out of it. ▪ Do not build any infrastructure upstream of the Eye. ▪ Avoid construction within the "no building zone" as indicated on the proposed infrastructure map.	Medium
Contamination of surface and groundwater resources	Negative	Local	Temporary	Very high	Probable	High	Low	High	3	No	Yes	▪ Highlight all prohibited activities (e.g. Mixing of concrete in wetland areas littering, cutting of large trees, using the wetland as an ablution development) to workers through training and sign notices. ▪ Do not make use of fertilisers, pesticides or herbicides on site especially upstream of the Eye.	Low
Increased dust and erosion	Negative	Local	Long term	High	Highly probable	High	Moderate	Moderate	3	Yes	Yes	▪ Limit vehicles, people and materials to the construction site. ▪ Commence (and preferably complete) construction during winter, when the risk of erosion should be least. ▪ Revegetate denude areas with locally indigenous flora a.s.a.p. ▪ Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed. ▪ Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting.	Low
Increased sediment loads	Negative	Regional	Short term	Medium	Highly probable	Medium	Low	Moderate	3	Yes	Yes	▪ Commence (and preferably complete) construction activities during winter when the risk of erosion and wetland sedimentation is lowest. ▪ Keep all construction activities to within the demarcated footprint areas (keep out of wetland). ▪ Keep cleared areas to a minimum by constructing one development at a time. ▪ Revegetate remaining cleared areas by planting indigenous grasses and other vegetation as soon as possible. ▪ Do not stockpile soil in the catchment area above the Eye or within the delineated wetland areas. ▪ Design measures to effectively control vehicle access, vehicle speed, dust, stormwater run-off, erosion and sedimentation on the road.	Low
Increased flood peaks	Negative	Regional	Long term	Medium	Highly probable	Medium	Moderate	Moderate	3	Yes	Yes	▪ Rehabilitate the head cut erosion within HGM Unit 2 (just upstream of the Eye outside the DWS fence) by stabilising the channel banks. This may be achieved by filling and levelling the channel to remove the drop which creates the erosive vortex	Low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												during rainfall events. Start with coarser material (e.g. rock) deeper down and progress to finer sands and topsoils towards the surface. Thereafter employ temporary flow attenuation structures such as branches and rows of small hessian bags across the channel filled with grass and sand held in place by thin logs pegged in place with wooden stakes. ▪ Preferably prohibit or otherwise monitor the levels of livestock grazing to avoid the overutilisation of the grass sward. ▪ Make sure that the access road is well cambered with enough drainage berms to prevent erosion. ▪ Minimise the extent of cleared ground and hardened surfaces.	
Decreased water inputs	Negative	Regional	Short term	High	Highly probable	Medium	Moderate	High	3	Yes	Yes	▪ Do not sink boreholes for the development upstream of the Eye or within 100 m of the delineated wetlands.	Low
Clearing of (especially riparian) vegetation and faunal habitats	Negative	Site-Specific	Permanent	High	Definite	High	Low	Moderate	3	No	Yes	▪ Do not clear any riparian vegetation for the development. This is the vegetation occurring within the delineated wetland boundaries. Additionally wherever possible minimise the disturbance to vegetation within the prescribed wetland buffer zones. ▪ Modify the layout of planned infrastructure to avoid important floral communities and large indigenous trees. Avoid construction of infrastructure within the NSS infrastructure map demarcated as "no building zone". Integrate the planned infrastructure into the surrounding environment (blending in). ▪ Identify and mark indigenous trees on the ground. Those that are small and cannot be avoided should be transplanted elsewhere on site. ▪ Demarcate or fence in the construction site. ▪ Highlight all prohibited activities to workers through training and notices. ▪ Commence (and preferably complete) construction activities during winter, when the risk of disturbing growing plants should be least. ▪ Briefly and effectively stockpile topsoil preferably 1-1.5m in height. ▪ Use the topsoil to allow natural vegetation to establish in disturbed areas. If recovery is slow, then a seed mix for the area (using indigenous grass species listed within this report) should be sourced and planted. ▪ Do not undertake any landscaping with alien flora.	Medium
Introduction and establishment of alien species	Negative	Local	Permanent	High	Definite	High	Moderate	High	3	No	Yes	▪ Demarcate or fence in the construction site. ▪ Carefully limit / regulate access by vehicles and materials to the construction site. ▪ Prohibit further introduction of domestic animals such as cattle, goats, horses, donkeys, chickens, dogs and cats. ▪ Keep construction activities neat and tidy. ▪ When complete, remove all sand piles, and	Low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												landscape all uneven ground while re-establishing a good topsoil layer. ▪ Plant only locally indigenous flora if landscaping needs to be done. ▪ Remove Category species using mechanical methods, and minimize soil disturbance as far as possible. Alien wood could be donated to the surrounding community.	
Loss of CI or medicinal flora	Negative	Local	Permanent	High	Highly probable	High	Low	Moderate	3	No	Yes	▪ Obtain permits to remove CI species. ▪ Transplant CI and medicinally important floral specimens from the infrastructure footprint to suitable and safe locations elsewhere on site or nearby. ▪ Obtain guidance from a suitably qualified vegetation specialist or horticulturist regarding the collection, propagation/storage and transplantation of plants. ▪ Highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).	Low
Sensory disturbance of fauna	Negative	Local	Short term	Medium	Highly probable	Medium	Moderate	Moderate	3	No	Yes	▪ Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least. ▪ Minimize noise to limit its impact on calling and other sensitive fauna (e.g. frogs). ▪ Limit construction activities to day time hours. ▪ Minimize or eliminate security and construction lighting, to reduce the disturbance of nocturnal fauna.	Low
Loss of CI fauna	Negative	Local	Local	High	Probable	Medium	Moderate	Moderate	3	No	Yes	▪ Appoint an appropriate specialist to relocate CI fauna from rocky areas, water, termitaria, trees and soil that will be disturbed. ▪ Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least. ▪ Check open trenches for trapped animals (e.g. reptiles, frogs and small terrestrial mammals), and relocate trapped animals with advice from an appropriate specialist. ▪ Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).	Low
Altered burning	Negative	Local	Local	Medium	Highly probable	Medium	Moderate	Moderate	3	No	Yes	▪ Create safe storage on the premises for flammable materials. ▪ If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures. ▪ Maintain an effective fire break between the development and the surrounding natural	Low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												▪ environment. ▪ Ensure that there are appropriate control measures in place for any accidental fires. ▪ Educate workers about the fire plan and emergency procedures with regular training and notices.	
Destruction of archaeological artefacts	Negative	Site-Specific	Permanent	Medium-low	Definite	Very low	Low	High	5	No	No	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Very low
Destruction of palaeontological material	Negative	Site-Specific	Permanent	Medium-low	Probable	Very low	Low	High	5	No	No	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Very low
Increase in traffic	Negative	Regional	Short term	Medium	Very likely	Low	High	Low	3	No	Yes	▪ Should abnormal loads have to be transported by road to the site, a permit needs to be obtained. ▪ Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and ▪ Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00); ▪ A speed limit of 60 km/h should be maintained on the N4	Low
Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Long term	Extreme	Likely	High	Low	High		No	Yes	▪ Adhere to speed limits applicable to all roads used; and ▪ Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.	Medium
Emissions from dust generation and construction vehicles	Negative	Local	Short term	Medium-low	Highly probable	Medium	Moderate	Low	2	No	Yes	▪ Ensure that cleared (excavated) areas and unpaved surfaces are sprayed with water (obtained from an approved source) to minimise dust generation. ▪ Approved soil stabilisers may be utilised to limit dust generation. ▪ Ensure that construction vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour. ▪ Limit vehicles, people and materials to the construction site ▪ Adequate dust control strategies should be applied to minimise dust deposition, for example: Periodic spraying of water on the entrance road when necessary ▪ Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least.	Low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												▪ Noise should also be minimised throughout construction to limit the impact on sensitive fauna such as owls and large terrestrial birds. ▪ Limit construction activities to day time hours	
Opportunities for employment and skills development	Positive	Local	Long term	Medium	Probable	Medium	High	High	3	No	Ye	▪ Enhance the use of local labour and local skills as far as reasonably possible. ▪ Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained. ▪ Ensure that an equitable percentage allocation is provided for local labour employment as well as specify the use of small-to-medium enterprises and training specifications in the Contractors contract. ▪ Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.	High
Potential visual impacts as the result of construction activities	Negative	Local	Short term	Medium-low	Probable	Low	High	High	3	Yes	Yes	▪ No specific mitigation measures are required other than standard construction site housekeeping and dust suppression. These are included below: - The contractor(s) should maintain good housekeeping on site to avoid litter and minimise waste. - Litter and rubble should be timeously removed from the construction site and disposed at a licenced waste disposal facility. - The project developer should demarcate construction boundaries and minimise areas of surface disturbance. - Appropriate plans should be in place to minimise fire hazards and dust generation. ▪ Night lighting of the construction site should be minimised within requirements of safety and efficiency.	Low
Potential noise impact as the result of the use of construction equipment	Negative	Local	Short term	Medium-low	Probable	Medium	Moderate	High	3	No	Yes	▪ Limit construction activities to day time hours	Low
Potential impact on the safety of construction workers and Health injuries to construction personnel as a result of construction work	Negative	Site-specific	Short term	Low	Improbable	Medium	High	High	3	Yes	Yes	▪ Ensure that a skilled and competent Contractor is appointed during the construction phase. The Contractor must be evaluated during the tender/appointment process in terms of safety standards. ▪ The Contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate. ▪ The Contractor must undertake a Construction Phase Risk Assessment. ▪ A Construction Site Manager or Safety Supervisor should be appointed, in conjunction with the project manager, to monitor all safety aspects during the construction phase. This could be the same person that is assigned to co-ordinate the construction traffic. ▪ Ensure that roads are not closed during construction, which may restrict access for emergency services.	Medium

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												▪ The Contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate.	
OPERATION PHASE													
Further loss / degradation of wetlands	Negative	Regional	Permanent	High	High	High	Moderate	High	3	Yes	Yes	▪ Monitor the success of the rehabilitated erosion gully in HGM Unit 2 ▪ Keep future developments outside of the delineated wetland areas and associated buffers.	Medium
Contamination of surface and groundwater resources	Negative	Regional	Permanent	High	High	High	Low	High	3	No	Yes	▪ Ensure that all waste water (sewerage and grey water) is contained in properly lined septic tanks. Which are serviced regularly. ▪ Do not make use of french drains or long drops. ▪ Minimise sinkhole formation by regularly inspect all water pipelines and thoroughly mend any leaks as soon as they arise. ▪ Ensure that the development is run in accordance with international best practice norms, and with advice from an appropriate specialist, to ensure that there is no environmental contamination from effluent, fodder, carcasses and other waste, and to ensure that there is also effective storm water management. ▪ Signpost the site especially the picnic area with all prohibited activities which should include (amongst others) no littering, no wood collecting, no abluting in the stream or bush, no making of fires except within the braai areas. ▪ All hazardous waste should be disposed of at an appropriate licensed facility for this. ▪ Waste recycling should be incorporated into the development's operations as far as possible. ▪ Educate workers about the development's waste management and handling of hazardous substances with regular training and notices.	Low
Decreased water inputs	Negative	Regional	Long term	Medium	Probable	Medium	Moderate	Moderate	3	No	Yes	▪ Diligently monitor and measure water usage in measurable Units. Keep a spreadsheet and compare data to DWS flow rates for the Dinokana Eye on an annual basis. ▪ Reduce water usage wherever possible. Put up signs in the accommodation encouraging visitors to spare water and re-use laundry during their stay if not too dirty. Investigate the possibility of capturing rainwater.	Medium
Continued introduction and proliferation of alien species	Negative	Local	Long term	High	Definite	High	Moderate	High	3	No	Yes	▪ Carefully limit / regulate access by vehicles and materials to the site. ▪ Prohibit further introduction of domestic animals such as cattle, goats, horses, donkeys, chickens, dogs and cats. ▪ Employ best practices regarding tilling of soil and weed management. ▪ Plant only locally indigenous flora if landscaping needs to be done. ▪ Remove Category species using mechanical methods, and minimize soil disturbance as far as	Low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												possible. Alien wood could be donated to the surrounding community.	
Loss of CI or medicinal flora	Negative	Local	Permanent	High	Highly probable	High	Low	Moderate	3	No	Yes	▪ Highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).	Low
Sensory disturbance of fauna	Negative	Local	Long term	High	Highly probable	High	Moderate	Moderate	3	No	Yes	▪ Install motion-sensitive lights. ▪ Ensure that all outdoor lights are angled downwards and/or fitted with hoods. ▪ Use bulbs that emit warm, long wavelength (yellow-red) light, or use UV filters or glass housings on lamps to filter out UV. ▪ Avoid using metal halide, mercury or other bulbs that emit high UV (blue-white) light that is highly and usually fatally attractive to insects. ▪ Conduct regular maintenance of machinery, fans and other noisy equipment. ▪ Encourage workers to minimize light and noise pollution through training and notices.	Medium
Loss of CI fauna	Negative	Local	Permanent	High	Probable	Medium	Moderate	Moderate	3	No	Yes	▪ Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).	Low
Erosion	Negative	Local	Long term	High	Highly probable	High	Moderate	Moderate	3	No	Yes	▪ Limit vehicles and people to the development footprint. ▪ Revegetate denude areas with locally indigenous flora a.s.a.p. ▪ Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed.	Low
Altered burning	Negative	Local	Long term	Medium	Highly probable	Medium	Moderate	Moderate	3	No	Yes	▪ Create safe storage on the premises for flammable materials. ▪ If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures. ▪ Maintain an effective fire break between the development and the surrounding natural environment. ▪ Ensure that there are appropriate control measures in place for any accidental fires. ▪ Educate workers about the fire plan and emergency procedures with regular training and notices.	Low
Increase in traffic	Negative	Regional	Short-term	Low	Very likely	Very low	High	Moderate	3	No	Yes	▪ Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and ▪ Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00); ▪ A speed limit of 60 km/h should be maintained on the N4.	Very low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Long term	High	Likely	High	Low	High	3	No	Yes	▪ Adhere to speed limits applicable to all roads used; and ▪ Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.	Medium
Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment		Local	Medium term	Medium	Unlikely	Medium	High	Moderate	3	No	Yes	▪ Implement management strategies for dust generation e.g. apply dust suppressant on exposed areas and stockpiles; ▪ Postpone or reduce dust-generating activities during periods with strong wind; ▪ Limit noisy maintenance/operational activities to daytime only; ▪ Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased; ▪ Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the Applicant; and ▪ Avoid using old and noisy construction equipment and ensure equipment is well maintained.	Low
Destruction of archaeological artefacts	Negative	Site-Specific	Permanent	Medium-low	Definite	Very low	Low	High	5	No	No	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Very low
Destruction of palaeontological material	Negative	Site-Specific	Permanent	Medium-low	Probable	Very low	Low	High	5	No	No	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Very low
Opportunities for employment and skills development	Positive	Local	Long term	Medium	Probable	Medium	High	High	3	No	Yes	▪ Enhance the use of local labour and local skills as far as reasonably possible. Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained ▪ Ensure that an equitable percentage allocation is provided for local labour employment as well as specify the use of small-to-medium enterprises and training specifications in the Contractors contract.	High
Night lighting of the development on the nightscape of the surrounding landscape	Negative	Local	Long term	Medium	Highly probable	Low	Moderate	Low	3	Yes	No	▪ No specific mitigation measures are recommended as it is assumed that night lighting of the proposed storage facility will be planned in such a manner so as to minimize light pollution such as glare and light spill (light trespass) by: ▪ Using light fixtures that shield the light and focus illumination on the ground (or only where light is required). ▪ Avoiding elevated lights within safety/security	Low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												requirements. ▪ Using minimum lamp wattage within safety/security requirements. ▪ Where possible, using timer switches or motion detectors to control lighting in areas that are not occupied continuously (if permissible and in line with minimum security requirements). ▪ Switching off lights when not in use in line with safety and security.	
Minor accidents to the public and moderate accidents to operational staff	Negative	Local	Long term	Medium-low	Improbable	Medium	Moderate	High	3	Yes	Yes	▪ An Emergency Plan should be compiled in order to deal with potential spillages and fires. Records of practices should be kept on site. ▪ Scheduled inspections should be implemented by operating personnel in order to assure and verify the integrity of hoses, piping and storage lagoon. ▪ Portable fire extinguishers and fire water hydrants (i.e. appropriate fire-fighting equipment) should be provided at the facility as required.	Low
DECOMMISSIONING PHASE													
Further loss/degradation of wetlands	Negative	Regional	Permanent	High	Highly probable	High	Moderate	High	3	No	Yes	• Keep decommissioning activities outside of the delineated wetland areas and associated buffers. • Demarcate the decommissioning site and ensure that all activities are carried out within that area. Additionally mark out the wetland on the ground to ensure activities stay out of it. • Avoid disturbing the "no building zone".	Medium
Contamination of surface and groundwater resources	Negative	Regional	Permanent	High	Highly probable	High	Low	High	3	No	Yes	• *Do not make use of french drains or long drops. • Minimise sinkhole formation by sealing or otherwise inspecting water pipelines and thoroughly mend any leaks. • Ensure that storm water management remains effective during and following decommissioning. • All grey water, sewage and other hazardous waste should be disposed of at an appropriate licensed facility for this. • Waste recycling should be incorporated into decommissioning as far as possible. • Educate workers about the development's waste management and handling of hazardous substances with regular training and notices.	Low
Increased dust and erosion	Negative	Local	Long term	High	Highly probable	High	Low	Moderate	3	No	Yes	• Limit vehicles, people and materials to the decommissioning site. • Commence (and preferably complete) decommissioning during winter, when the risk of erosion should be least. • Revegetate denude areas with locally indigenous flora a.s.a.p. • Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed. • Implement effective and environmentally-friendly dust control measures, such as mulching or periodic	Low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												wetting.	
Increased sediment loads	Negative	Regional	Short term	Medium	Highly probable	Medium	Moderate	Moderate	3	No	Yes	▪ Commence (and preferably complete) decommissioning activities during winter when the risk of erosion and wetland sedimentation is lowest. ▪ Keep all decommissioning activities to within the demarcated footprint areas (keep out of wetland). ▪ Keep cleared areas to a minimum by demolishing one development section at a time. ▪ Revegetate remaining cleared areas by planting indigenous grasses and other vegetation as soon as possible. ▪ Do not stockpile soil in the catchment area above the Eye or within the delineated wetland areas. ▪ Design measures to effectively control vehicle access, vehicle speed, dust, stormwater run-off, erosion and sedimentation on the road.	Low
Continued proliferation of alien species	Negative	Local	Permanent	High	Definite	High	Low	High	3	No	Yes	▪ Remove Category species using mechanical methods, and minimize soil disturbance as far as possible. Alien wood could be donated to the surrounding community.	Low
Loss of CI or medicinal flora	Negative	Local	Medium	High	Highly probable	High	Moderate	Moderate	3	No	Yes	▪ Highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and medicinal flora on site by community members through notices and site access control (e.g. fencing).	Low
Sensory disturbance of fauna	Negative	Local	Long term	Medium	Highly probable	Medium	Moderate	Moderate	3	No	Yes	▪ Conduct regular maintenance of machinery, fans and other noisy equipment. ▪ Encourage workers to minimize light and noise pollution through training and notices.	Low
Loss of CI fauna	Negative	Local	Medium	High	Probable	Medium	Moderate	Moderate	3	No	Yes	▪ Educate workers about dangerous animals (e.g. snakes, scorpions, bees) and highlight all prohibited activities to workers through training and notices. ▪ Prohibit harvesting of CI and other indigenous fauna on site by community members through notices and site access control (e.g. fencing).	Low
Altered Burning	Negative	Local	Long term	Medium	Highly probable	Medium	Moderate	Moderate	3	No	Yes	▪ Create safe storage on the premises for flammable materials. ▪ If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures. ▪ Maintain an effective fire break between the development and the surrounding natural environment. ▪ Ensure that there are appropriate control measures in place for any accidental fires. ▪ Educate workers about the fire plan and emergency procedures with regular training and notices.	Low
Destruction of archaeological artefacts	Negative	Site-Specific	Permanent	Medium-low	Definite	Very low	Low	High	5	No	No	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such	Very low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
												heritage is the property of the state and may require excavation and curation in an approved institution.	
Destruction of palaeontological material	Negative	Site-Specific	Permanent	Medium-low	Probable	Very low	Low	High	5	No	No	▪ If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Very low
Increase in traffic	Negative	Regional	Short term	Medium	Very likely	Low	High	Low	3	No	Yes	▪ Should abnormal loads have to be transported by road to the site, a permit needs to be obtained. ▪ Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and ▪ Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00); ▪ A speed limit of 60 km/h should be maintained on the N4	Low
Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Long term	Extreme	Likely	High	Low	High		No	Yes	▪ Adhere to speed limits applicable to all roads used; and ▪ Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.	Medium
Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste	Negative	Local	Short term	Medium	Probable	Medium	High	High	3	Yes	Yes	• General waste (i.e. building rubble, demolition waste, discarded concrete, bricks, tiles, wood, glass, plastic, metal, excavated material, packaging material, paper and domestic waste etc.) and hazardous waste (i.e. empty tins, paint and paint cleaning liquids, oils, fuel spillages and chemicals etc.) generated during the decommissioning phase should be stored temporarily on site in suitable (and correctly labelled) waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate. • Should the on-site storage of general waste and hazardous waste exceed 100 m3 and 80 m3 respectively, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to. • Ensure that general waste and hazardous waste generated are removed from the site on a regular basis and disposed of at an appropriate, licensed waste disposal facility by an approved waste management Contractor. Waste disposal slips or waybills should be kept on file for auditing purposes as proof of disposal. • Ensure that sufficient general waste disposal bins are provided for all personnel throughout the site. These bins must be emptied on a regular basis. • Appropriately time demolition / rehabilitation activities to minimise sensory disturbance to fauna.	Low

Nature of the Potential Impact/Risk	Status	Spatial Extent	Duration	Intensity	Probability	Significance of Impact/Risk (Without Mitigation)	Reversibility	Irreplaceability	Confidence level	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Residual Impact/Risk (With Mitigation)
Emissions from decommissioning vehicles and generation of dust	Negative	Local	Short term	Medium-low	Highly probable	Medium	Moderate	Low	2	No	Yes	• Ensure that cleared (excavated) areas and unpaved surfaces are sprayed with water (obtained from an approved source) to minimise dust generation. • Approved soil stabilisers may be utilised to limit dust generation. • Ensure that decommissioning vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour.	Low
Noise generation from demolition activities	Negative	Site specific	Short term	Medium-low	Probable	Medium	Moderate	High	3	No	Yes	• A method statement, including detailed procedures, must be drawn up prior to any decommissioning of existing tanks. • Decommissioning personnel must wear proper hearing protection, which should be specified as part of the Decommissioning Phase Risk Assessment carried out by the Contractor. • The Contractor must ensure that all decommissioning personnel are provided with adequate PPE, where appropriate.	Low

BASIC ASSESSMENT REPORT

APPENDIX I: PUBLIC PARTICIPATION

CONTENTS

Appendix I1: Proof of the placement of the relevant advertisements and notices

Proof of newspaper advertisement

Zeerust News — Julie Augustus 2017

Classifieds Vacancies Notices

Send your adverts to: newszeerust@gmail.com or sms 071 578 9123

The first 15 words of a classified is FREE!!! Only ONE classified per person/business.

FOR SALE | TE HUUR | DIENSTE | GESOEK

The first 15 words of a classified is FREE!!!

"Doing business without ADVERTISING is like winking at a girl in the dark... You know what you're doing, but nobody else does!" - Stuart H. Britt -

Like Us On facebook

MATTE GUESTHOUSE
Sale & secure parking
Braai area
House No: 30 Piet Retief Street Zeerust
Bed rest R150 for 3 hours
R250 per night
083 465 8102 / 073 318 5261

Sudoku 88

Hoe om sudoku te speel:
Plaas 'n nommer tussen 1 - 9 in elke blokkie sodat elke ry, elke kolom en elke 3x3 blok al die nommers van 1 - 9 bevat

	4				1			
		6						8
				8		7		5
1			6	3				9
3			5				7	
6			8	4				2
				9		6		1
		2						4
	5				6			

Notice of Basic Assessment for the proposed development of a leisure and cultural village on Farm Hoiloo 412-JO, Dinokana Village, North West.

CSIR

INVITATION FOR PUBLIC PARTICIPATION
NOTICE OF ENVIRONEMNTAL IMPACT ASSESSMENT AND APPLICATION FOR WATER USE LICENSE

PROJECT DESCRIPTION:

PROJECT LOCATION:

IN THE REGIONAL COURT FOR THE REGIONAL DIVISION FREE STATE HELD AT WELKOM

CASE NO: FS/WEL/RC474/2017

In the matter between:
OLUGBENGA JOHN AKINBOHUN — Plaintiff
And
WILLIAM MOREDI — Defendant

NOTICE OF SALE

BE PLEASED TO TAKE NOTICE THAT pursuant to a Judgment obtained in the above Honourable Court on the **19th** day of **JULY 2017**, the following will be sold in execution at **10H00** at **43 COETZEE STREET, ZEERUST'S SHERIFFS OFFICE** on the **04th AUGUST 2017** to the highest bidder.

- 1 X 2006 M-A-N 34 Ton Side Tipper Truck with Registration Numbers and Letters: -DFH 066 FS 1
- 2006 M-A-N 34 Ton Side Tipper Truck with Registration Numbers and Letters: -DYL 033 FS
- 1X Super link Bucket Truck Trailer

TERMS:
CASH – NO CHEQUES WILL BE ACCEPTED.
Dated at Welkom on this the 21st day of JULY 2017.

KEMI AKINBOHUN ATTORNEYS
Attorney for Plaintiff
SUITE 101, NEDBANK BUILDING
10 RYK STREET
Welkom
Tel: (057) 352-5293
(Ref: KFA/PSS/AKI1/6)

Contents of Newspaper Advertisement

Notice of Basic Assessment for the proposed development of a leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, North West.

CSIR Reference No: CSIR/IU/021SE/IR/2017/0006/A

Notice is given of a Basic Assessment (BA) process being undertaken on behalf of the Makadima Leisure and Cultural Village 101(Pty) Ltd (the Project Applicant) for the **proposed leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, North West**.

In terms of the NEMA EIA Regulations published in Government Notice Regulation (GNR) 327 and 324 on 4 April 2017 Government Gazette Number 40772, a BA process is required as the project triggers the following listed activities: *GNR 327 Activity 24 (ii), GNR 327 Activity 27, GNR 327 Activity 30, GNR 324 Activity 6 (h), GNR 324 Activity 11 (h), GNR 324 Activity 12 (h)*. The Council for Scientific and Industrial Research (CSIR) is the Environmental Assessment Practitioner (EAP) who will be managing the process.

You are invited to register as an Interested and/or Affected Party (I&AP) and/or to provide any written comments on the BA process. To obtain further information, to comment and/or to register as an I&AP, please site the CSIR Reference Number and provide your full name, full postal address, phone numbers, email address and state your area of interest and/or concern to: **Ms. Rirhandzu Marivate, CSIR, PO Box 320, Stellenbosch 7599, Phone: (021) 888 2432, Fax: (021) 888 2693 or Email: rmarivate@csir.co.za**. You have until on or before 28 August 2017 to do so (30 days from the date of this publication - including weekends, but excluding public holidays).

CSIR

our future through science

Proof of Site Notice

Contents of the Site Notice

Makadima Leisure and Cultural Village 101 (Pty) Ltd Project Site (North West)

NOTICE OF A BASIC ASSESSMENT (BA) PROCESS

Notice is hereby given, in terms of the Environmental Impact Assessment (EIA) Regulations, under sub-regulation 41(1) and sub-regulation 41(4), published in Government Gazette No 40772 of 4 April 2017, of the National Environmental Management Act, 1998 (Act No 107 of 1998), that the **Makadima Leisure and Cultural Village 101 (Pty) Ltd**, proposes a **leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, North West**.

The Council for Scientific and Industrial Research (CSIR), as the independent Environmental Assessment Practitioner, will manage the required Basic Assessment process for the proposed project. The project will be registered with the North West Department of Rural Environment and Agriculture Development (READ). The need for a Basic Assessment is triggered by the following activities listed in Government Notice Regulations (GNR) 327, 325 and 324 of 4 April 2017:

Government Notice	Listed Activity Number
GNR 327, 4 April 2017	24 (ii)
GNR 327, 4 April 2017	27
GNR 327, 4 April 2017	30
GNR 324, 4 April 2017	6(h)
GNR 324, 4 April 2017	11(h)
GNR 324, 4 April 2017	12(h)

To obtain further information with regards to the project and Basic Assessment process, or to register as Interested and Affected Party (I&AP), please contact:

Ms. Rirhandzu Marivate
PO Box 320, Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2693
Email: rmarivate@csir.co.za

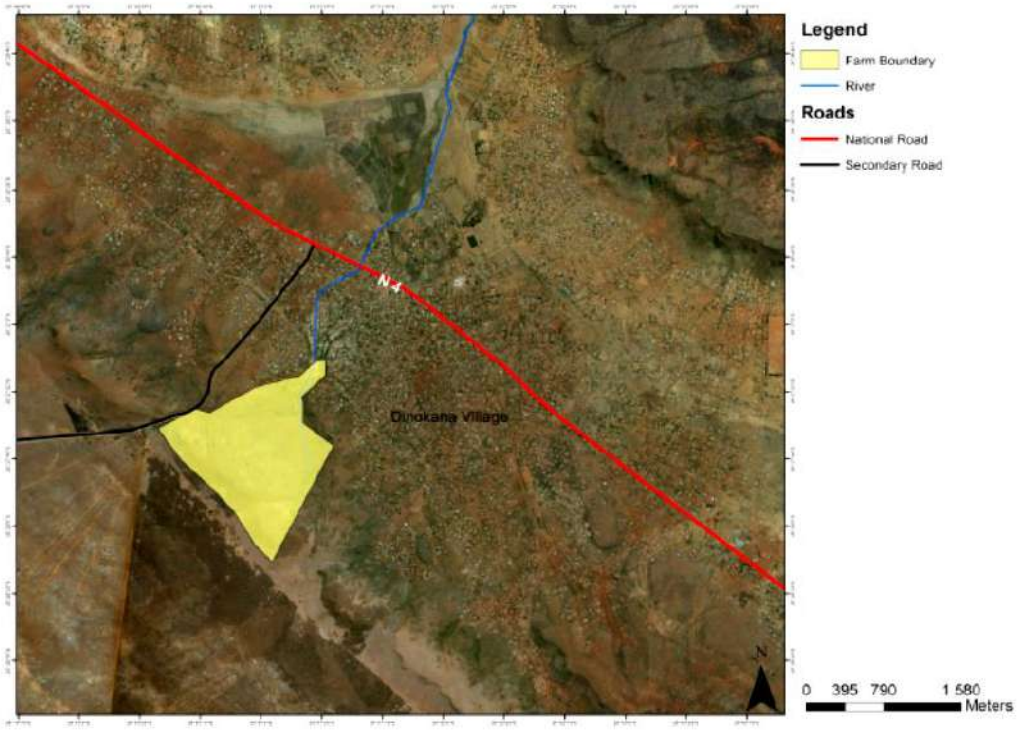


Figure 1: Locality Map of the proposed leisure and cultural village project

Projekte ya Makadima Leisure and Cultural Village 101 (Pty) Ltd (North West)

KITSISO YA TIRELO YA BASIC ASSESSMENT (BA)

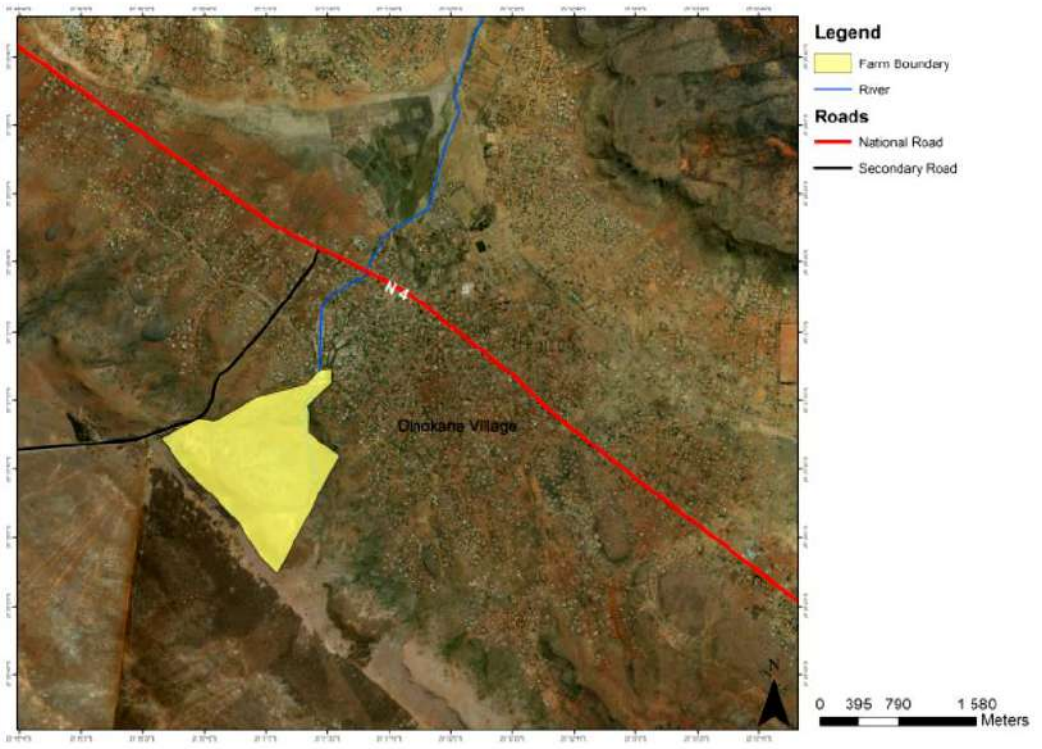
Le itsisiwe gore, go ya ka melao ya Tlhatlhobo ya Tikologo (EIA), ka fa tlase ga molawana-tsamaiso 41(1) le molawana-tsamaiso 41(4), e e gatisitweng ka Gazeteng ya Mmuso ya nomoro 40772 wa 4 Moranang 2017, ya Molao wa Lekgotla la Taolo wa Tikologo, 1998 (Molao 107 wa 1998), **Makadima Leisure and Cultural Village 101 (Pty) Ltd**, e batla go simolola kgwebo ya motse wa boithabiso le setso fa **Tshimong ya Moiloa 412-JO**, **motse wa Dinokana**, **North West**.

Lekgotla la Dipatlisiso tsa Saense le Indasteri (Council for Scientific & Industrial Research -CSIR), le le ikemetseng ka di tlhatlhobo tsa tikologo, le tlo laola tsaimaiso ya tlhatlhobo ya tikologo ya projekte. Projekte e tla kwadisiwa le Lefapha la Rural Environment and Agricultural Development (READ). Tlhatlhobo ya tikologo e tlhokagala gonne e tsositse ditiro tse di latelang tsa Kitsiso ya Melao wa Mmuso(GNR) 327, 325 le 324 ya 4 Moranang 2014.

Kitsiso ya Mmuso	Nomoro ya Tiro
GNR 327, 4 Moranang 2017	24 (ii)
GNR 327, 4 Moranang 2017	27
GNR 327, 4 Moranang 2017	30
GNR 324, 4 Moranang 2017	6 (h)
GNR 324, 4 Moranang 2017	11 (h)
GNR 324, 4 Moranang 2017	12 (h)

Go fitlhela dikitsiso tse di amanang le projekte le tsamaiso ya tlhatlhobo ya tikologo, ikwadise jaaka mokgatlhegi le moamegi wa projekte. Ikopantshe le:

Ms. Rirhandzu Marivate
PO Box 320, Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2693
Email: rmarivate@csir.co.za



Setshwantsho 1: Mmepe o o bontshang lefelo la projekte

Appendix I2: Proof that the key stakeholder received written notification of the proposed activities

Email to I&AP

From: Rirhandzu Marivate [RMarivate@csir.co.za]
Sent: 28 July 2017 09:59 AM
Subject: NOTICE: Basic Assessment for the Development of a Leisure and Cultural Village on Farm Moiloa 421-JO, Dinokana Village, Ngaka Modiri Molema, North West

Dear Interest and/or Affected Party,

The Council for Scientific and Industrial Research is currently conducting a Basic Assessment for Makadima Leisure and Cultural Village 101 (Pty) Ltd, who are proposing to develop a leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, Ngaka Modiri Molema District, North West. The Basic Assessment is conducted through the Special Needs and Skills Development Programme under the National Department of Environmental Affairs.

In line with the Environmental Impact Assessment requirements of 7 April 2017, Interested and Affected Parties (I&APs) must be notified and are requested to register for this project in order to receive future correspondence of this project and/or provide comments on issues of concern that will be considered during the Basic Assessment process. Please find attached a Letter of Invitation, a Background Information Document (BID) and a Comment and Registration form. You have until on or before 28 August 2017 to register and submit your comments for this project.

Kindest Regards,

Rirhandzu Marivate
Junior Environmental Scientist
Environmental Management Services
Implementation Unit
CSIR

tel: 021-888-2432
email: rmarivate@csir.co.za

Delivery Report

amogelang.sefara@moretele.org.za Transferred
Transferred 25/08/2016 14:44
BC: amogelang.sefara@moretele.org.za

andrew.mvundle@gmail.com Transferred
Transferred 25/08/2016 14:45
BC: andrew.mvundle@gmail.com

avanstraaten@nwpg.gov.za Transferred
Transferred 25/08/2016 14:45
BC: avanstraaten@nwpg.gov.za

barbersp@lantic.net Transferred
Transferred 25/08/2016 14:45
BC: barbersp@lantic.net

BotaV@nra.co.za Transferred
Transferred 25/08/2016 14:45
BC: BotaV@nra.co.za

cmmutle@nwpg.gov.za Transferred
Transferred 25/08/2016 14:45
BC: cmmutle@nwpg.gov.za

howard.hendricks@sanparks.org Transfer Delayed
Transfer Delayed 25/08/2016 14:44
Transferred 25/08/2016 15:05
BC: howard.hendricks@sanparks.org

innocents@bojanala.gov.za Transferred
Transferred 25/08/2016 14:45
BC: innocents@bojanala.gov.za

kgauta.mokoena@dmr.gov.za Transferred
Transferred 25/08/2016 14:44
BC: kgauta.mokoena@dmr.gov.za

lfourie@nwpg.gov.za Transferred
Transferred 25/08/2016 14:45
BC: lfourie@nwpg.gov.za

lmotlhanke@nwpg.gov.za Transferred
Transferred 25/08/2016 14:45
BC: lmotlhanke@nwpg.gov.za

mashuduma@daff.gov.za Transferred
Transferred 25/08/2016 14:44
BC: mashuduma@daff.gov.za

mbila@nwpg.gov.za Transferred
Transferred 25/08/2016 14:45
BC: mbila@nwpg.gov.za

mmadire.rampedi@morepele.org.za Undelivered 421 service unavailable

MMolefane@thedti.gov.za Transferred
Transferred 25/08/2016 14:45
BC: MMolefane@thedti.gov.za

MohapiN@dwa.gov.za Transferred
Transferred 25/08/2016 14:45
BC: MohapiN@dwa.gov.za

mosadim@nwpg.gov.za Transferred
Transferred 25/08/2016 14:45

mosadim@nwpg.gov.za Transferred

BC: mosadim@nwpg.gov.za

mosianem@nwpg.gov.za Transferred

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mrabothata@environment.gov.za Transferred

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BC: mrabothata@environment.gov.za

mtumane@nwpg.gov.za Transferred

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BC: mtumane@nwpg.gov.za

MuthraparsadN@dwa.gov.za Transferred

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ncamisile.nkabinde@drdlr.gov.za Transferred

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BC: ncamisile.nkabinde@drdlr.gov.za

ntnango@nwpg.gov.za Undelivered 550 5.1.1 <ntnango@nwpg.gov.za>: Recipient address rejected: undeliverable address: host 10.145.142.11[10.145.142.11] said: 550 No such recipient (in reply to RCPT TO command)

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BC: rmathebula@nwpg.gov.za

Sfoya@geoscience.org.za Transferred

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BC: Sfoya@geoscience.org.za

SHlela@environment.gov.za Transferred

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BC: SHlela@environment.gov.za

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BC: smukhola@nwpg.gov.za

stephaniea@ewt.org.za Transferred

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BC: stephaniea@ewt.org.za

tboshoff@nwpg.gov.za Transferred

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tmakhoana@salga.org.za Transferred

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BC: tmakhoana@salga.org.za

tnemarude@environment.gov.za Transferred

Transferred 25/08/2016 14:44

BC: tnemarude@environment.gov.za

vincent.maseko@yahoo.com Transferred

Transferred 25/08/2016 14:45

BC: vincent.maseko@yahoo.com

Attachments: User: 3,**System: 2**

BID_final.pdf	826 KB (846369 Bytes)	23/08/2016 10:20
I&APs Cover Letter_Draft_ENGLISH.pdf	336 KB (344168 Bytes)	25/08/2016 14:35
Register I&APs_Disclosure of interest_ENGLISH.docx	147 KB (150980 Bytes)	23/08/2016 16:36
MESSAGE	4 KB (4667 Bytes)	25/08/2016 14:44
TEXT.htm	5 KB (5948 Bytes)	25/08/2016 14:44

Send Options:

Letter to I&AP

CSIR Implementation Unit
PO Box 320
Stellenbosch
7599
South Africa
Tel: +27 21 888 2432
Fax: +27 21 888 2693
Email: rmarivate@csir.co.za

28 July 2017

Dear Interested and/or Affected Party

PROPOSED DEVELOPMENT OF A LEISURE AND CULTURAL VILLAGE ON FARM MOILOA 412-JO, DINOKANA VILLAGE, NGAKA MODIRI MOLEMA DISTRICT, NORTH WEST (CSIR/IU/021SE/IR/2017/0006/A)

The National Department of Environmental Affairs (DEA) and the Council for Scientific and Industrial Research (CSIR) have initiated the Special Needs and Skills Development Programme, whereby small-medium micro-enterprises and community trusts who are lacking financial means are provided with *pro-bono* environmental services to decrease the burden of the cost associated with starting a business. Makadima Leisure and Cultural Village 101 (Pty) Ltd has been identified as an eligible client for this service and is proposing to develop a leisure and cultural village that aims to showcase the cultural and traditional heritage of the area. The development will include accommodation, conference facilities, leisure and recreational park, conference facilities, a museum and a craft market.

In terms of Government Notice Regulations (GNR) 326 of 7 April 2017of the National Environmental Management Act (Act 107 of 1998) published in Government Gazette 40772 on 7 April 2017, Environmental Authorisation from the Competent Authority, in this case the North West Department of Rural Environment and Agricultural Development (READ) is required prior to the undertaking of any activity triggered within GNR 324, 325 and/or 327. The need for a Basic Assessment process is required by the inclusion of the activities listed within GNR 327: Activity 24 (ii), 27, 30, and GNR 324: Activity 6h, 11h, 12h. The CSIR, as the independent Environmental Assessment Practitioner (EAP), will be managing the Basic Assessment and Public Participation Process for this proposed project.

In line with the Environmental Impact Assessment requirements of 7 April 2017, Interested and Affected Parties (I&APs) must be notified and are requested to register for this project in order to receive future correspondence on this project and/or provide comments on issues of concern that will be considered during the Basic Assessment process. Please find enclosed with this letter a Background Information Document (BID) and a Comment and Registration form. You have until on or before **31 August 2017** to register and submit your comments for this project. To register and submit comments for the project please complete the Registration Form. Use the CSIR Reference Number above together with your full name, contact details (preferred method of notification, e.g., full postal or email address), fax/phone number(s) and an indication of any direct business, financial, personal or other interest you have in the application to the contact person listed below.
From this point onwards, all communication and documents will be in English.

Yours sincerely,

Ms. Rirhandzu Marivate
Postal address: PO Box 320, Stellenbosch, 7599, South Africa
Tel: 021 888 2432
Fax: 021 888 2693
E-mail: rmarivate@csir.co.za
Website: http://www.csir.co.za/ems/specialneeds/

Proof of Postage

REGISTERED MAIL : R28.55 X 54 - R 412,60.

Name & Signature of person responsible for post: JOHN. : 25.8.2016

32 items –**Registered Post** (Jam Rock (Pty) Ltd BA 24TH August 2016) Reinett Mogotshi 021 888 2432

NMS0076 / RUN / 02100 / 021SE

Grasslands Society of South Africa Feyni Du Toit P.O. Box 41, Hilton 3245	Department of Environmental Affairs- National Mmatlala Rabothata Private Bag X447 Pretoria 0002	Vincent Maseko P O Box 60382 Karen Park 0118
Department of Agriculture, Forestry and Fisheries Mashudu Marubini Private Bag X138 Pretoria 0001	Tharina Boshoff Private Bag X2039 Mmabatho 2739	Steven Muklola Private Bag X2039 Mmabatho 2739
Malefyane Mosadi Private Bag X2039 Mmabatho 2736"	Rhuleni Mathebula Private Bag X2039 Mmabatho 2735"	Moretele Local Municipality Amogelang Sefara Private Bag X367, Makapanstad, North West 0404
Moretele Local Municipality Municipal Manager Private Bag X367, Makapanstad, North West, 0404	Bojanala Platinum District Municipality Goitsimosimo Tau P O Box 1993, Rustenburg,0300	Community Chairman Mr Ngema Private Bag X1031 Bethanie, 0270
Jan Maseko Private Bag X1031 Bethanie 0270	Mathews Mlangeni Private Bag X1031 Bethanie, 0270	David Maseko Private Bag X1031 Bethanie, 0270

Boysee Masango Private Bag X1031 Bethanie, 0270	Joshua Mlangeni Private Bag X1031 Bethanie, 0270	Edwin Lelaka Private Bag X1031 Bethanie, 0270
Senza Ngozo Private Bag X1031 Bethanie, 0270	Alfred Ngobese Private Bag X1031 Bethanie, 0270	Madoda Maseko Private Bag X1031 Bethanie, 0270
Sbongseni Mlangeni Private Bag X1031 Bethanie, 0270	Mndeni Ngozo Private Bag X1031 Bethanie, 0270	South African National Parks (SANParks) Dr. Howard Hendriks PO Box 787, Pretoria 0001
Bongane Radebe Private Bag X1031 Bethanie, 0270	Ntomfuthi Mlangeni Private Bag X1031 Bethanie, 0270	Caiphus Ngozo Private Bag X1031 Bethanie, 0270
Ward Councillor Mr Mosetlhe P O Box 1962 Hammanskraal 0400	North West Provincial Heritage Resources Authority Mr Mosiane Mothlabane Private Bag X90 Mmabatho 2735	AgriLand Anneliza Collett Private Bag X120, Pretoria 0001
Council for Geoscience Dr Stewart Foya Private Bag X 112, Pretoria 0001	South African Heritage Resources Agency (SAHRA) Marie South PO Box 4637, Cape Town 8000	

Appendix I.3: Comments Received from I&AP

The South African National Roads Agency

Subject: RE: NOTICE: Basic Assessment for the Development of a Leisure and Cultural Village on Farm Moiloa 421-JO, Dinokana Village, Ngaka Modiri Molema, North West
Created By: ***BotaV@nra.co.za***
Scheduled Date:
Creation Date: 28/07/2017 10:55
From: "Victoria Bota (HO)" <BotaV@nra.co.za>

Good day Rirhandzu

Please that SANRAL might be affected by the proposed project as it will be in close proximity of the National Route N4. Kindly forward us the traffic impact study/report once finalised for our review and comments.

Kind regards

Ms Victoria Bota
Environmental Co-ordinator
Tel: 012 844 8031
Cell:061 647 5212
Fax:012 348 1512
Email: *botav@nra.co.za*

Northern Region
38 Ida Street
Menlo Park
Pretoria
SANRAL Fraud Hotline: 0800204558

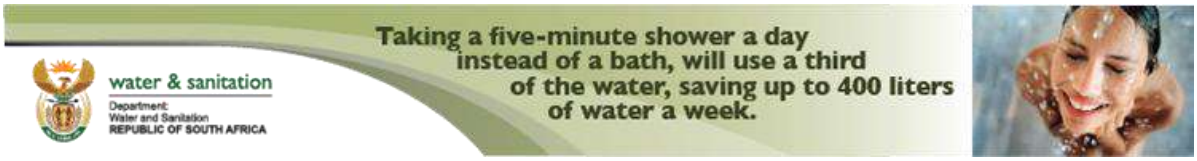
One thing I ask of the LORD, this is what I seek: that I may dwell in the house of the LORD all the days of my life...

The National Department of Water and Sanitation

Subject: RE: NOTICE: Basic Assessment for the Development of a Leisure and Cultural Village on Farm Moiloa 421-JO, Dinokana Village, Ngaka Modiri Molema, North West
Created By: ***AckermanP@dws.gov.za***
Scheduled Date:
Creation Date: 28/07/2017 13:53
From: Ackerman Pieter <AckermanP@dws.gov.za>

Hi
Is any wate ruse authorisation required?
Regards

Pieter Ackerman (PrLArch)
Chief Landscape Architect
Department of Water and Sanitation (DWS), South Africa
Sub Directorate Instream Water Use
Tel: 012 336 8217
Cell: 082 807 3512
Fax: 012 336 6608



Rirhandzu Marivate - RE: Notice of Release of Draft Basic Assessment Report for Makadima Cultural Village, Dinokana, North West

From: Wendy Ralekoa <RalekoaW@dws.gov.za>
To: Rirhandzu Marivate <RMarivate@csir.co.za>, "Botha Rens (GAU)" <BothaR@dw...
Date: 23/05/2018 14:24
Subject: RE: Notice of Release of Draft Basic Assessment Report for Makadima Cultural Village, Dinokana, North West
Cc: Lobakeng Chadwick <LobakengC@dws.gov.za>

[The e-mail server of the sender could not be verified (SPF Record)]

Noted, thanks.

Will revert back to you on this matter soon.

Regards,

WR

From: Rirhandzu Marivate [RMarivate@csir.co.za]
Sent: 23 May 2018 10:55 AM
To: Botha Rens (GAU); Wendy Ralekoa
Cc: Lobakeng Chadwick
Subject: Re: Notice of Release of Draft Basic Assessment Report for Makadima Cultural Village, Dinokana, North West

Good Morning,

I would like to check if you have received the previous e-mail regarding the Environmental Assessment process currently being undertaken on Dinokana. You comments are vital to this process.

Kindest Regards,

Rirhandzu Marivate
Environmental Scientist and Assessment Practitioner
Environmental Management Services
Implementation Unit
CSIR

tel: 021-888-2432 email: rmarivate@csir.co.za web: https://www.csir.co.za/environmental-impact-assessment

>>> Rirhandzu Marivate 16/05/2018 10:47 >>>
Good Morning,

This email serves to notify you of the release of the Draft Basic Assessment report for the proposed development of a leisure and cultural village on farm 412-JO, Dinokana village, North West in terms of Government Notice Regulations (GNR) GNR 324, 325, 326 and 327 of the National Environmental Management Act (Act 107 of 1998) published in Government Gazette 40772 on 7 April 2017.

I have attached the notice of release of the Draft BAR as well as the BID and the layout map for the project for your information. The project is in the same vicinity as the Dinokana Eye, which is protected and managed by DWS.

I would like to submit to the relevant persons for comment in the Department of Water and Sanitation, as part of the public participation process. Please let me know where the report can be submitted and in what form it should be submitted.

Kindest Regards,

Rirhandzu Marivate

Environmental Scientist and Assessment Practitioner

Environmental Management Services

Implementation Unit

CSIR

tel: 021-888-2432 email: rmarivate@csir.co.za web: https://www.csir.co.za/environmental-impact-assessment

The National Department of Agriculture, Forestry & Fisheries

agriculture,
forestry & fisheries

Department:
Agriculture, forestry & fisheries
REPUBLIC OF SOUTH AFRICA

Directorate Land Use and Soil Management, Private Bag x120, Pretoria, 0001
Delpen Building, c/o Annie Botha & Union Streets, Riviera

From: Director: Land Use and Soil Management
Tel: (012) 319 7678 **Fax:** (012) 329 5938 **e-mail:** agriland@nda.agric.za

CSIR IMPLEMENTATION UNIT
P.O. BOX 320
STELLENBOSCH
7599

2017-08-03

Dear Sir/Madam

This serves as a notice of receipt and confirms that your application has been captured in our electronic AgriLand tracking and management system. It is strongly recommended that you use the on-line AgriLand application facility in future.

Detail of your application as captured:

Type:REZONING
Your reference number:
Property Description:MOILOA NO. 412
Dated: 28 JULY 2017

Please use the following reference number in all enquiries:

AgriLand reference number: 2017_08_0027
Enquiries can be made to the above postal, fax or e-mail address.

Yours sincerely,

N.V. MAUMELA
pp DIRECTOR: LAND USE AND SOIL MANAGEMENT

Online application available at: http://www.agis.agric.za/agriland

The South African Heritage Resources Agency

Basic Assessment for the proposed development of a leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, North West.

Our Ref:

an agency of the Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
P.O. Box 4637 | Cape Town | 8001
www.sahra.org.za

Enquiries: Natasha Higgitt
Tel: 021 462 4502
Email: nhiggitt@sahra.org.za
CaseID: 11237

Date: Monday June 11, 2018
Page No: 1

Final Comment

In terms of Section 38(4), 38(8) of the National Heritage Resources Act (Act 25 of 1999)

Attention: Mr Itumeleng Mogwera
Makadima Leisure and Cultural Village 101 (Pty) Ltd

Makadima Leisure and Cultural Village is a project proposed by Makadima Leisure and Cultural Village 101 (Pty) Ltd that will be based in Dinokana Village, outside of Zeerust, in Ngaka Modiri District, North West Province. The project team is composed of community members from Dinokana, which is part of Bahurutshe Ba Ga Moiloa Tribe. The Cultural Village is motivated by different tribes within the area wanting to showcase their traditional and cultural heritage. The project team also state that there has been an increasing interest and curiosity by tourists in cultural villages. The Makadima Leisure and Cultural Village aims to showcase the culture of different tribes found in the North West Province. The leisure and cultural facility will be located on Farm Moiloa 412-JO within the perimeter of the Dinokana Eye (Co-ordinates: 25°27'22.74"S; 25°51'07.40"E) a feature considered to be a sacred site by the local community and one of the main attractions in Dinokana. The farm portion is 85 hectares.

The Council for Scientific and Industrial Research (CSIR) was appointed by Makadima Leisure and Cultural Village 101 (Pty) Ltd to conduct an Environmental Authorisation (EA) Application process for the proposed leisure and cultural village on farm Moiloa 412 JO, Dinokana Village, Ngaka Modiri Molema District, North West. A draft Basic Assessment Report (DBAR) has been completed in terms of the National Environmental Management Act, 1998 (NEMA) and the 2017 EIA Regulations. The proposed development will include the construction and development of approximately 10 ha that will consist of recreational park, conference/wedding facility, restaurant & pub, accommodation facilities, a cultural museum and adventure facilities.

Heritage Contracts and Archaeological Consulting and Palaeo Field Services were appointed to provide the heritage components of the BAR process.

Rossouw, L. 2017. Palaeontological desktop assessment of the proposed Makadima residential development near Zeerust, North West Province.

The proposed development area is underlain by the Early Proterozoic Penge Formation (Chuniespoort Group, Transvaal Supergroup), which is in turn overlain by Quaternary alluvial and aeolian deposits. They are of very low palaeontological sensitivity as they are not deposited within or near pan, well-developed alluvial or spring deposits. No palaeontological sensitive cave breccias are anticipated for the area. Recommendations provided

Basic Assessment for the proposed development of a leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, North West.

Our Ref:

an agency of the
Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
P.O. Box 4637 | Cape Town | 8001
www.sahra.org.za

Enquiries: Natasha Higgitt
Tel: 021 462 4502
Email: nhiggitt@sahra.org.za
CaseID: 11237

Date: Monday June 11, 2018
Page No: 2

in the report include that all construction activities must remain within the boundaries of the proposed development footprint.

Van Der Walt, J. 2017. Heritage Impact Assessment for the proposed Makadima Leisure and Cultural Village, North West Province.

No heritage resources were identified within the proposed development area. Recommendations provided in the report included that a Chance Finds Procedure must be implemented as part of the Environmental Management Programme (EMPr).

Final Comment

The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit has no objection to the development and supports the recommendations of the specialists. The recommendations of the specialists and the following conditions apply to the development and must be included in the Environmental Management Programme:

- The Final BAR and EMPr must be submitted to SAHRA for record purposes;
- If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.
- Should the project be granted Environmental Authorisation, SAHRA must be notified and all relevant documents submitted to the case file.

Should you have any further queries, please contact the designated official using the case number quoted above in the case header.

Yours faithfully

Basic Assessment for the proposed development of a leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, North West.

Our Ref:

an agency of the
Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
P.O. Box 4637 | Cape Town | 8001
www.sahra.org.za

Enquiries: Natasha Higgitt
Tel: 021 462 4502
Email: nhiggitt@sahra.org.za
CaseID: 11237

Date: Monday June 11, 2018
Page No: 3

Natasha Higgitt
Heritage Officer
South African Heritage Resources Agency

Phillip Hine
Acting Manager: Archaeology, Palaeontology and Meteorites Unit
South African Heritage Resources Agency

ADMIN:
Direct URL to case: http://www.sahra.org.za/node/405219
(, Ref:)

Terms & Conditions:

1. This approval does not exonerate the applicant from obtaining local authority approval or any other necessary approval for proposed work.
2. If any heritage resources, including graves or human remains, are encountered they must be reported to SAHRA immediately.
3. SAHRA reserves the right to request additional information as required.

The Department of Rural, Environment and Agricultural Development

read

Department:
Rural, Environment and Agricultural Development
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

2030 NDP

AgriCentre Building
Cnr. Dr. James Moroka
& Stadium Rd
Private Bag X2039,
Mmabatho 2735
Republic of South Africa

CHIEF DIRECTORATE: ENVIRONMENTAL SERVICES

DIRECTORATE: ENVIRONMENTAL QUALITY MANAGEMENT

Tel: +27 (18) 389 5156
Fax: 086 507 6333
E-mail:oskosana@nwpg.gov.za

Reference: NWP/EIA/10/2018

Attention: **Itumeleng Mogwera**
Makadima Leisure and Cultural Village 101 (Pty) Ltd
P.O Box 1634
DINOKANA
2868

Cell No.: 071 017 1009
E-Mail.: itumeleng32@gmail.com

Dear Sir

APPLICATION FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED DEVELOPMENT OF A LEISURE AND CULTURAL VILLAGE ON FARM MOILOA 412 JO DINOKANA VILLAGE, ACTIVITY NUMBER 27 IN GN. NO. R. 327 AND ACTIVITY NUMBERS 6 (h), 11 (h) AND 12 (h) IN GN. NO. R. 324 OF ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS 2014, RAMOTSHERE MOILOA MUNICIPALITY, NORTH WEST PROVINCE

The Department have received the above mentioned Application (Application form and Draft Basic Assessment Report) for Environmental Authorisation on 11 May 2018, and the Application Forms has been **accepted**.

Please note that the application has been assigned to **Mr. Kgahliso Makoli,** Mahikeng Office, reachable at (018) 389 5273 or kmakoli@nwpg.gov.za and /or
Agricentre Building
Cnr. Dr. James Moroka Drive & Stadium Road (Opposite Convention Centre)
Mmabatho
2735
Office No E32

Kindly quote this **reference number** and the **name of the officer** it has been assigned to and submit all any future correspondence in respect of the application including notification to be used for public participation to the assigned officer. Please draw the applicant's attention to the fact that the activity may not commence prior to the decision being issued by the Department.

Yours Faithfully

Mrs. Ellis Thebe
Environmental Officer Control Grade B: Development Impact Management
Date: 19/09/2018

Cc: Ms. Rirhandzu Marivate Fax No: (021) 888 2693/ E-mail: rmarivate@csir.co.za

WE BELONG **WE CARE** **WE SERVE**

read
Department:
Rural, Environment and Agricultural Development
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

2030 NDP

AgriCentre Building
Cnr. Dr. James Moroka and Stadium Rd
Private Bag X2039, Mmabatho 2735

CHIEF DIRECTORATE: ENVIRONMETAL SERVICES
DIRECTORATE: ENVIRONMENTAL QUALITY MANAGEMENT

Tel: +27 (18) 389 5273
E-mail:kmakoli@nwpg.gov.za
Enquires: Kgahliso Makoli

Reference: NWP/EIA/10/2018

Attention: **Ms. Rirhandzu Marivate**
Council for Scientific and Industrial Research
P.O. Box 320
STELLENBOSCH
7599

Tel No.: (021) 888 2432
Fax No.: (021) 888 2473
E-mail: rmarivate@csir.co.za

PER E-MAIL

Dear Madam

DEVELOPMENT OF A LEISURE AND CULTURAL VILLAGE ON FARM MOILOA 412 JO, DINOKANA VILLAGE, RAMOTSHERE MOILOA LOCAL MUNICIPALTY, NORTH WEST PROVINCE

Your Draft Basic Assessment Report dated May 2018 received by this Department on 17 September 2018 has reference.

The Department has reviewed the Draft Basic Assessment Report submitted. The Department hereby requests that the following must be included in the Final Basic Assessment Report:

1) The coordinates provided in the Draft BAR in page 25 do not correspond with those in the application form. With that regard, the Department requests that the correct coordinates must be provided and incorporated in the Final BAR and those coordinates must be the same as those in the application form and the whole report.

2) The project description throughout the Draft BAR must be the same as that one in the application form. For instance, in page 6 of the Draft BAR swimming pool is mentioned whereas in page 17 and the application form is not mentioned. You are requested to do amendments in the final report where necessary and note that consistency is very important as the report is a legal document.

3) Listed activities must be written accurately as prescribed in the Regulations. For instance, in the application form and other part of the Draft BAR activities number 6, 11 and 12 of Government Notice Number R. 324 are not quoted correctly. They must be quoted as, for example, activity number 6 (i) (h) (iv) or (vi) or both. You are requested to amend the application form and the report accordingly.

4) SAHRA letters attached in the Draft BAR are not for this project but for chicken broiler facility. Only correct letters of the project must be attached in the report.

5) The newspaper advert attached in the Draft BAR is invisible; you are requested to attach the visible newspaper advert in the Final BAR.

6) In the Public Participation documents like site notices and newspaper advert, activity 30 of Government Notice Number R. 327 is mentioned but it doesn't appear in the Draft BAR and application form. Clarity is needed and necessary amendments must be made.

7) In page 28 of the Draft BAR it is indicated that the size of the activity is 10 000m^2, which is 1 hectare whereas the footprint of the development is 9, 7 hectares. Correct size of the activity must be provided in the Final BAR.

8) The exact size of the development area must be given. In the Draft BAR is indicated that approximately 10 hectares will be the development footprint and that is the prediction which is not acceptable. Please give the exact number whether is 10 hectares or 9.7 hectares.

9) Question 9 in page 35 and question 10 in page 36 must be answered by ticking YES/NO as indicated.

10) On page 33, the sub-question; (d), must be answered accordingly as it is required.

11) The proof of the application for additional capacity of services to be lodged with the municipality as it is indicated on page 35 for question 6 must be included in the final BAR as it is outlined.

12) It is not mentioned in the report how and where sewage waste will be disposed. In that regard you are requested to furnish the Department with that information whether the applicant will use septic tank or French drain and how and where will it be disposed.

13) In page 41 of the Draft BAR it is indicated that the source of water that will be used for the development is the municipal water, but underneath it's stated that a general authorisation or water use licence from the Department of Water and Sanitation will be required. This is contradiction, therefore you are required to provide accurate information and explain where the development will get water from.

14) Should a water use authorisation be applied for before the final BAR is submitted, then supporting documents must be incorporated in it as proof of the application.

15) The Biodiversity Sector Plan 2015 and the National Environmental Management; Waste Act 59 of 2008 must be included as part of the applicable policies, guidelines and legislation required for the applied for project on page 37.

Should you have any query please do not hesitate to contact this Department.

Yours Faithfully

Ms. Obitseng Moholo
Control Environmental Officer Grade A: Development Impact Management
Department of Rural, Environment and Agricultural Development
Date: 02/11/2018

Appendix I5. Comments and Response Trail

Issues Raised	Commenter	Date	Responses to Comments
Comments from the North West Department of Rural, Environment and Agricultural Development (NW READ)	**Ms Obitseng Moholo- Control Environmental Officer, Development Impact Management**		
1) The coordinates provided in the Draft BAR in page 25 do not correspond with those in the application form. With that regard, the Department requests that the correct coordinates must be provided and incorporated in the Final BAR and those coordinates must be the same as those in the application form and the whole report.		02/11/2018	Thank you and Noted. The co-ordinates reflected in the application form and the report are now the same and are the correct location for the proposed Makadima Leisure and Cultural Village. These co-ordinates are as follow: 25°27'22.74"S; 25°51'07.40"E
2) The project description throughout the Draft BAR must be the same as that one in the application form. For instance, in page 6 of the Draft BAR swimming pool is mentioned whereas in page 17 and the application form is not mentioned. You are requested to do amendments in the final report where necessary and note that consistency is very important as the report is a legal document.			Thank you and Noted. The application form has been amended to ensure that the project description reflects that which is included in the Final BAR.. Please see page 4 of the application form and page 6 and 17 of the Final BAR.
3) Listed activities must be written accurately as prescribed in the Regulations. For instance, in the application form and other part of the Draft BAR activities number 6, 11 and 12 of Government Notice Number R. 324 are not quoted correctly. They must be quoted as, for example, activity number 6 (i) (h) (iv) or (vi) or both. You are requested to amend the application form and the report accordingly.			Thank you and Noted. The Listed Activities have been changed to correctly and accurately represent the activities that have been applied for, for the Basic Assessment process. They are now presented as: 6(h)(iv)&(vi) 11(h)(iv) &(vi) 12(h)(iv) &(vi) These changes have been made both in the

			Application form and the Final BA report.
4) SAHRA letters attached in the Draft BAR are not for this project but for chicken broiler facility. Only correct letters of the project must be attached in the report.			Thank you and Noted. The incorrect SAHRA letter has been removed, and the correct letter, for the Makadima Leisure and Cultural Village has been attached in the Final BAR.
5) The newspaper advert attached in the Draft BAR is invisible; you are requested to attach the visible newspaper advert in the Final BAR			Thank you and Noted. Appendix I now contains a visible newspaper advert as can be seen in I1 above.
6) In the Public Participation documents like site notices and newspaper advert, activity 30 of Government Notice Number R. 327 is mentioned but it doesn't appear in the Draft BAR and application form. Clarity is needed and necessary amendments must be made.			The Activity was removed as the project is not regarded as a threatening process.
7) In page 28 of the Draft BAR it is indicated that the size of the activity is 10 000m2, which is 1 hectare whereas the footprint of the development is 9, 7 hectares. Correct size of the activity must be provided in the Final BAR.			Thank you and Noted. The size of the activity has been corrected in the FBAR to 100 000m^2. This is a sum of: Resting/Recreational Park (2 ha) Conference facility (0.2 ha) Main Parking (0.8 ha) Accommodation Facilities (2.5 ha) Cultural Village (1 ha) Events & Picnic Gardens(1.5 ha) Adventure Facilities (2 ha)
8) The exact size of the development area must be given. In the Draft BAR is indicated that approximately 10 hectares will be the development footprint and that is the prediction which is not acceptable. Please give the exact number whether is 10 hectares or 9.7 hectares.			Noted. Please see above response.
9) Question 9 in page 35 and question 10 in page 36 must be answered by ticking YES/NO as indicated.			Noted and amended.
10) On page 33, the sub-question; (d), must be answered accordingly as it is required.			Noted and Added.
11) The proof of the application for additional capacity of services to be			Noted. An application for additional capacity of

lodged with the municipality as it is indicated on page 35 for question 6 must be included in the final BAR as it is outlined.			services was lodged with the Ramotshere Moiloa Local Municipal's Planning and Development Unit. The Acknowledgement of Receipt of the Application can be found in Appendix E.
12) It is not mentioned in the report how and where sewage waste will be disposed. In that regard you are requested to furnish the Department with that information whether the applicant will use septic tank or French drain and how and where will it be disposed.			Thank you and Noted. The development is situated within a dolomitic landscape, which has a strong linkage to groundwater. The groundwater resources are of good quality. Inappropriate sewage and waste water management may result in the eutrophication of groundwater. Another potential impact is sinkhole formation that may result from water leaking from water pipes or prolonged discharge or water in one location, such as a French Drain. Therefore all waste water (sewerage and grey water) will be contained in properly lined septic tanks that will be serviced regularly. The discharge of waste water will utilise a gravity system. The septic tanks will be serviced regularly and disposed of at the Zeerust Waste Water Treatment plant. The development will utilise municipal services for waste collection and the waste will be disposed at the Zeerust Landfill Site.
13) In page 41 of the Draft BAR it is indicated that the source of water that will be used for the development is the municipal water, but underneath it's stated that a general authorisation or water use licence from the Department of Water and Sanitation will be required. This is contradiction, therefore you are required to provide accurate information and explain where the development will get water from.			The Development will source it's water from the municipality. The requirement of a water use licence, arose from the proximity of the development to the Dinokana Eye wetland system. However, a second review of the wetland assessment of the Ecological Specialist Study was

			conducted by NSS (see appendix G). In accordance with the National Water Act (Act 36 of 1998), Chapter 3 states: *"The protection of water resources is fundamentally related to their use, development, conservation, management and control. Parts 1, 2 and 3 of this Chapter lay down a series of measures which are together intended to ensure the comprehensive protection of all water resources."* The development is situated in close proximity to the Dinokana Eye wetland system. The wetland assessment shows that the wetland ecosystem present is important, and provides good quality clean water for human use and provision for subsistence farming. Therefore, the Dinokana Eye wetland system must be protected from all forms of disturbance that may arise from the development of the cultural village, and the recommended wetland buffer must be strictly adhered to. The initial proposed development footprint would have resulted in the loss of a large portion of the wetland. A revised infrastructure layout was developed from recommendations from the Ecological Specialist (see Appendix G).The revised development footprint, that avoids infrastructure development upstream of the Eye wetland, and also avoids construction within "no build zones" as specified by the Ecological Specialist Study.

			Additional measures that ensure the avoidance of impacts onto the wetland and the protection of the wetland can be found on the EMPr in Appendix J. Therefore, if the revised layout is strictly adhered to, as well as all the recommendations from the Ecological Specialist Study implemented, the development will not require water use authorisation. This information has been added to the report, Executive Summary on page 9&10 and section E on page79.
14) Should a water use authorisation be applied for before the final BAR is submitted, then supporting documents must be incorporated in it as proof of the application.			As stated above, the development does not require a water use authorisation, and therefore supporting documents are not necessary for the submission of the final BAR.
15) The Biodiversity Sector Plan 2015 and the National Environmental Management; Waste Act 59 of 2008 must be included as part of the applicable policies, guidelines and legislation required for the applied for project on page 37.			Thank you and Noted. These two Documents have been added as part of the applicable policies, guidelines and legislation required for the applied for project.
Comments from the South Africa National Roads Agency	Ms Victoria Bota: Environmental Co-ordinator, SANRAL	28/07/2017	
Please 9note) that SANRAL might be affected by the proposed project as it will be in close proximity of the National Route N4. Kindly forward us the traffic impact study/report once finalised for our review and comments			A Traffic Impact Study was conducted as Requested by SANRAL, please find Study in Appendix G. The report was sent to Ms Botha at

			SANRAL for review and comment, no comment has been received to date. A follow-up email was sent on the 6/12/2018.
Comments from the Department of Water and Sanitation (DWS), South Africa	Mr Pietier Ackerman: Chief Landscape Architect. Directorate: Instream Water Use	28/07/2017	
Is any water ruse authorisation required? Regards			The Development footprint has been modified in order to avoid construction within the wetland buffer of the Dinokana Eye Wetland system. The development will strictly adhere to the "no build zone" as recommended, and therefore does not require a water use authorisation.
Comments from the Department of Agriculture, Forestry & Fisheries	NV Maumela, Director: Land Use and Soil Management	03/08/2017	
This serves as a notice of receipt and confirmation that your application has been captured in our electronic AgriLand tracking and management system. It is strongly recommended that you use the on-line AgriLand application facility in future. Detail of your application as captured: Type: REZONING Your reference number: Property Description: Moiloa NO 412 Dated: 28 July 2017 Please use the following reference number in all enquiries:			Thank you for your comment. The application onto AgriLand is Noted.

AgriLand reference number:2017_08_0027 Enquiries can be made to the above postal, fax or e-mail address.			
Comments from the South African Heritage Resource Agency	Ms Natasha Higgitt, Heritage Officer: South African Heritage Resources Agency	11/06/2018	
The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit has no objection to the development and Supports the recommendations of the specialists. The recommendations of the specialists and the following conditions apply to the development and must be included in the Environmental Management Programme: 1. The Final BAR and EMPr must be submitted to SAHRA for record purposes; 2. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt /Phillip Hine 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. 3. Should the project be granted Environmental Authorisation, SAHRA must be notified and all relevant documents submitted to the case file. Should			Thank you for the comments, noted and recommendations from the Heritage Impact Assessment (Appendix G) and SAHRA will be followed. 1. Noted, The Final BAR and the EMPr for this project will be uploaded and submitted to SAHRA. 2. Noted, the procedures recommended by SAHRA shall be followed, in case any evidence of archaeological, palaeontological sites or remains are found. 3. Noted, The Environmental Authorisation, if granted, for this project shall be uploaded and submitted to SAHRA.

you have any further queries, please contact the designated official using the case number quoted above in the case header.			

Appendix I6: A list of registered Interested and Affected Parties

Company/organization	Name	Postal
NATIONAL, PROVINCIAL AND LOCAL		
Department of Environmental Affairs- National	Mmatlala Rabothata	Fedsure Building, Private Bag X447, 315 Pretorius Street, Pretoria, 0002
Department of Environmental Affairs- National	Sibusisiwe Hlela	Fedsure Building, Private Bag X447, 315 Pretorius Street,Pretoria 0002
Department of Environmental Affairs- National	Takalani Nemarude	Fedsure Building, Private Bag X447, 315 Pretorius Street, Pretoria 0002
Department of Rural Development and Land Reform	Bonginkosi Zulu	Fedsure Building, Private Bag X447, 315 Pretorius Street, Pretoria 0002
Department of Agriculture, Forestry and Fisheries	N.V. Maumela	Private Bag X120, Pretoria, 0001
Department of Water and Sanitation	Pieter Ackerman	Private Bag X313, Pretoria, 0001
National Department of Mineral Resources	Kgauta Mokoena	Private Bag X59, Arcadia 0007
South African Local Government Association: North West (SALGA: NW)	Tikologo Makhoana	SALGA House, 56 William Street, Wilkoppies, Klerksdorp, 2571
Department of Economic Development, Conservation and Tourism	Nedick Bila	Development House, Cnr Provident Str and University Drive, Mmabatho, 2735
Department of Economic Development, Conservation and Tourism	Katie Smuts	Development House, Cnr Provident Str and University Drive, Mmabatho, 2735
Department of Economic Development, Conservation and Tourism	Steven Muklola	Development House, Cnr Provident Str and University Drive, Mmabatho, 2735
Department of Economic Development, Conservation and Tourism	Tharina Boshoff	Development House, Cnr Provident Str and University Drive, Mmabatho, 2735
North West Development Corporation	Lovemore T Makunike	PO Box 3011, Mmabatho, 2735
Department of Local Government and Human Settlement	Nonkululeko Myeza	Private Bag X 2145, Mmabatho, 2735
Department of Local Government and Human Settlement	Colleen Mmutle	Private Bag X 2145, Mmabatho, 2736
North West Department of Finance, Economy & Enterprise Development (FEED)	Mercy Tumane	Private Bag X 15, Mmabatho, 2735

North West Department of Finance, Economy & Enterprise Development (FEED)	Ogoleng Kgathea	Private Bag X 15, Mmabatho, 2736
North West Department of Finance, Economy & Enterprise Development (FEED)	Lebogang Motlhanke	Private Bag X 15, Mmabatho, 2737
NW READ	Kgahliso Makoli	Private Bag X2039,Mmabatho,2735
NW READ	Ouma Skosana	Private Bag X2039,Mmabatho,2735
Ramotshere Moiloa Local Municipality	Mrs B Seabi (Planning & Local Economic Development Director)	PO Box 92, Zeerust, 2865
Ramotshere Moiloa Local Municipality	Mr G Makaukau (Technical Services)	PO Box 92, Zeerust, 2865
Ramotshere Moiloa Local Municipality	Mr T Seleka (Community Development Services)	PO Box 92, Zeerust, 2865
Ramotshere Moiloa Local Municipality	Mr T Phakalane (Municipal Manager)	PO Box 92, Zeerust, 2865
Ngaka Modiri Molema District Municipality	Municipal Manager	P O Box 1993, Rustenburg,0300
LANDOWNERS & NEIGHBOURS		
Bahurutshe Ba Ga Moiloa Tribal Authority	Kgosi K.I. Moiloa	Stand No 2621, Kgosing Section, Dinokana, 2868
Neighbouring Landowner	Sylvia Medupe	House Number 2207, P.O Dinokana, 2868
Neighbouring Landowner	Joyce Montshosi	House Number 2216, P.O Dinokana, 2868
Neighbouring Landowner	Thabo Medupe	House Number 2212, P.O Dinokana, 2868
Neighbouring Landowner	Agnes Mokotama	House Number 2200, P.O Dinokana, 2868
Neighbouring Landowner	Kealeboga Letebele	House Number 2147, P.O Dinokana, 2868
Neighbouring Landowner	Ofentse Kgasi	House Number 2063, P.O Dinokana, 2868
Neighbouring Landowner	M Mokgatlhe	House Number 2149, P.O Dinokana, 2868
Neighbouring Landowner	Daniel Mooketsi	House Number 2075, P.O Dinokana, 2868
Neighbouring Landowner	Ontiretse Mosimane	House Number 2121, P.O Dinokana, 2868

Neighbouring Landowner	Tebogo Tshukutswane	House Number 2229, P.O Dinokana, 2868
Neighbouring Landowner	Tshepo Montshosi	House Number 2228, P.O Dinokana, 2868
Neighbouring Landowner	Sello Tshukutswane	House Number 2076, P.O Dinokana, 2868
Neighbouring Landowner	Doris Moeketsi	House Number 2230A, P.O Dinokana, 2868
Neighbouring Landowner	Karabo Sehume	House Number 2194, P.O Dinokana, 2868
Neighbouring Landowner	Gaongalelwe Mooketsi	House Number 2120, P.O Dinokana, 2868
Neighbouring Landowner	Omphemetse Monchwe	House Number 2173, P.O Dinokana, 2868
Neighbouring Landowner	Kamogelo Mereyotlhe	House Number 2188B, P.O Dinokana, 2868
Neighbouring Landowner	David Mosweu	House Number 2189, P.O Dinokana, 2868
Neighbouring Landowner	Obakeng Mosimane	House Number 2188, P.O Dinokana, 2868
Neighbouring Landowner	Keolebogile Moswele	House Number 2234, P.O Dinokana, 2868
Ward Councillor (Ward 10)	Richard Pholo Mogorosi	
Client	Itumeleng Mogwera	IK Mogwera, 4th Floor, Anglo American Zimele, 44 Main Street, Marshalltown, 2001
OTHER		
North West Parks & Tourism Board	Andrew Mvundle	
NW Parks Board Bird Sanctuary	Sampie van der Merwe	
South African National Parks (SANParks)	Dr. Howard Hendriks	PO Box 787, Pretoria, 0001
Council for Geoscience	Dr Stewart Foya	Private Bag x112, Pretoria 0001
South African Heritage Resources Agency (SAHRA)	Marie South	PO Box 4637, Cape Town, 8000
Endangered Wildlife Trust (EWT)	Stephanie Aken	
AgriLand	Anneliza Collett	Private Bag X120, Pretoria 0001
Leads 2 Business	Carmen Barends	

BASIC ASSESSMENT REPORT

APPENDIX J: ENVIRONMENTAL MANAGEMENT PROGRAMME

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 Purpose of the Environmental Management Programme

Makadima Leisure and Cultural Village is a project proposed by Makadima Leisure and Cultural Village 101 (Pty) Ltd that will be based in Dinokana Village, outside of Zeerust, in Ngaka Modiri District, North West Province. The project team is composed of community members from Dinokana, which is part of Bahurutshe Ba Ga Moiloa Tribe, and the project site is located on farm Moiloa 412-JO (Co-ordinates: 25°27'22.74"S; 25°51'07.40"E). The Cultural Village is motivated by different tribes within the area wanting to showcase their traditional and cultural heritage. The project team identified an increasing interest and curiosity by tourists in cultural villages within the region, and found that there is a high need in the area and surrounding towns of Mafikeng, Zeerust, Rusternburg and Lichtenburg.
This Draft Environmental Management Programme (EMPr) is prepared as part of the requirements of the Environmental Impact Assessment (EIA) Regulations (April 2017, as amended) promulgated under the National Environmental Management Act (NEMA) (Act 107 of 1998, as amended). The purpose of this Environmental Management Programme (EMPr) is to ensure "good environmental practice" by taking a holistic approach to the management and mitigation of environmental impacts during the construction, operation and decommissioning phase of the proposed chicken broiler. This EMPr therefore sets out the methods by which proper environmental controls are to be implemented by management of the leisure and cultural village. The Draft EMPr is to be submitted to the North West Department of Rural, Environment and Agricultural Development as part of the Application for Environmental Authorisation.

This EMPr is considered as a document that can be updated as new information becomes available during the construction, operational and operational phases, if applicable, of the proposed development. Mitigations measure need to be implemented as addressed in this EMPr, except where they are not applicable, and additional measures should be considered when necessary. The EMPr identifies the following:

- Construction and Operation activities that will impact on the environment;
- Specifications with which the broiler's management shall comply in order to protect the environment from the identified impacts; and
- Actions that shall be taken in the event of non-compliance.

This EMPr incorporates management plans for the design, construction, operation and decommissioning phases of the project, which consist of the following components:

- **Impact**: The potential positive or negative impact of the development that needs to be enhanced, mitigated or eliminated.
- **Objectives**: The objectives necessary in order to meet the goal; these take into account the findings of the specialist studies.
- **Mitigation/Management Actions**: The actions needed to achieve the objectives, taking into consideration factors such as responsibility, methods, frequency, resources required and prioritisation.
- **Monitoring**: The key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting.

1.2 Contents of the EMPr

This EMPr specifies the management actions necessary to ensure minimal environmental impacts, as well as procedures for monitoring these impacts associated with the proposed activity. In terms of legal compliance,

this EMPr aims to satisfy appendix 4 of Government Notice Regulation 326 of 7 April 2017, presented in Table 1-1 below.

Table 1-1: Compliance with Appendix 4 of Government Notice Regulation 326 of 7 April 2017 and Section 24N of the National Environmental Management Act 107 of 1998.

Requirements according to Appendix 4 of GNR 326 of 7 April 2017	**Section**
(1) An EMPr must comply with section 24N of the Act and include- a) details of - (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Section 1.3 Appendix I
b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 2
c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;	Section 2, Figure 2-1, 2-2, 2-3
d) a description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	Section 4
(i) planning and design;	Section 4
(ii) pre-construction activities;	Section 4
(iii) construction activities;	Section 4
(iv) rehabilitation of the environment after construction and where applicable post closure; and	Section 4
(v) where relevant, operation activities;	Section 4
e) a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	Section 4
f) a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to – i. avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	Section 4
ii. comply with any prescribed environmental management standards or practices;	Section 4
iii. comply with any applicable provisions of the Act regarding closure, where applicable; and	N/A
iv. comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	N/A
g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 4
h) frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 4
i) an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 4
j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 4
k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 4
l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 4

Requirements according to Appendix 4 of GNR 326 of 7 April 2017	Section
m) an environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 4
n) any specific information that may be required by the competent authority.	N/A

1.3 Environmental Assessment Practitioner

The Environmental Management Services (EMS) falls under the Specialist Services (SS) group within the Implementation Unit (IU) of the Council for Scientific and Industrial Research (CSIR). The CSIR is amongst the largest multi-disciplinary research and development organizations in Africa, which undertakes applied research and development for implementation across the continent, as well as providing consulting services to industry, government and international agencies. It has been one of the leading organisations in South Africa contributing to the development and implementation of environmental assessment and management methodologies and sustainability science.

The EMS vision is to assist in ensuring the sustainability of projects or plans in terms of environmental and social criteria, by providing a range of environmental services that extend across the project and planning life cycles. This group has over 20 years of experience in environmental management practices and research methodologies, as well as in conducting environmental assessment and management studies in over 15 countries in Africa, in particular in southern and West Africa, and elsewhere in the world. The EMS group links closely with wider CSIR expertise in areas such as resource mapping, biodiversity assessment, socio-economic assessments, strategic infrastructure development studies, environmental screening studies, natural resource management, etc. The group has also prepared guidelines such as the Integrated Management Series and Guidelines for Environmental Impact Assessment for the Western Cape provincial government.

Rirhandzu Marivate- Rirhandzu holds a BSc degree in Environmental Sciences as well as BSc (Hons) in in Ecology, Environment and Conservation from the University of the Witwatersrand; and has environmental research experience with the University of Cape Town. The research focus has been within the domain of socioecology, looking at investigating local ecological knowledge of stakeholders on the provisioning of freshwater resources and its impacts on the management for of the Berg river in the Western Cape, South Africa. Rirhandzu is currently a junior EAP in the EMS group and her responsibilities include assistance to other EAPs within EMS in their projects; Research in environmental assessment topics (e.g. indications, best practice, legislation); Report writing and project management; Participating in various forms of environmental assessments (BAs, EIAs, SEAs); consultation with stakeholders and public meetings; and Project administration (e.g. contracting and invoicing). She is particularly involved with the Special Needs and Skills Development (SNSD) Programme, which looks at assisting Community Trusts, Small, Micro to Medium Enterprises, with environmental services. She has also been involved with the Monitoring and Evaluation of the National Strategy for Sustainable Development by the Department of Environmental Affairs (DEA). Reinett is a member of the IAIAsa and SACNASP.

Minnelise Levendal – Minnelise is a Senior EAP in the EMS group of the CSIR and holds a Master's degree in Biological Science (Botany) from the Stellenbosch University. She has 16 years of experience in Environmental Management (which includes ten years working as an EAP). Before she joined the CSIR she was employed at the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) for five years where she assessed EIAs, BAs and EMPs. Minnelise is currently managing various EIAs for wind and solar

renewable energy projects in South Africa. She was the CSIR project manager for the 100 MW Ubuntu Wind Energy Facility near Jeffreys Bay (Environmental Authorisation granted in June 2012), as well as the 50 MW Banna Ba Pifhu Wind Energy Facility proposed by WKN Windcurrent near Humansdorp in the Eastern Cape (Environmental Authorisation granted in July 2014). She was the project manager of ten BAs for wind monitoring masts in South Africa as part of the National Wind Atlas Project of the Department of Energy. Environmental Authorisation from the DEA for all the ten masts was obtained in 2010.

This Environmental Management Programme that has been compiled in fulfilment of the requirements of the Environmental Impact Assessment Regulations (2017). This EMPr describe the activities that are proposed, and prescribe the management, mitigation and monitoring measures that must be implemented to ensure that potential negative environmental or socio-economic impacts that may be associated with the development are avoided or mitigated correctly, and to ensure that positive impacts of the proposed development are promoted where possible.

This document also intended to ensure that the principles of Environmental Management specified in the National Environmental Management Act are promoted during the different phases of the proposed development of a broiler.

1.4 Description of applicable legislation and policies

1.4.1 National Environmental Management Act

The National Environmental Management Act (NEMA) (Act 107 of 1998 as amended) is the primary piece of environmental legislation in South Africa, and establishes principles for decision-making on matters affecting the environment, and establishes a framework for integrating good environmental management into all development activities.
Section 2 of NEMA states the principles of environmental management that must be applied through the Republic of South Africa. The key principles that are relevant to the proposed project include:

- Environmental management must place people and their needs at the forefront, and serve their physical, psychological, developmental, cultural and social interests equitably.
- Development must be socially, environmentally and economically sustainable.
- Environmental management must be integrated & take into account the effects of decisions on all aspects of the environment & all people in the environment by pursuing the best practical environmental option.
- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued.
- The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
- The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding. Skills and capacity necessary for achieving equitable and effective participation and participation by vulnerable and disadvantaged persons must be ensured.
- The social, economic and environmental impacts of activities, including disadvantages and benefits must be considered, assessed and evaluated. Decisions must be appropriate in the light of such consideration and assessment.
- The polluter must pay for the cost of remedying pollution, environmental degradation and adverse health effects.
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

In terms of Section 28 of NEMA "Every person who causes, has caused, or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment."

The principles of environmental management and the Duty of Care as stated in NEMA must be observed on site, during all phases of the proposed development of a bridge.

1.4.2 Environmental Impact Assessment Regulations

The Environmental Impact Assessment Regulations of 2017 (GN No. R324, 325 and- 327 of April 2017), published under NEMA, list those activities that may have a potentially detrimental impact on the environment, and which require environmental authorisation before those listed activities can be undertaken.

1.4.3 National Water Act (Act 36 of 1998)

In terms of the National Water Act (Act 36 of 1998), there are eleven types of "water use" that require authorisation from the Department of Water & Sanitation (DWS) before the water use activities commences. Given the nature of the project, the type of water use in terms of Section 21 of the National Water Act that is relevant to the proposed project is: Section 21(i) – altering the beds, banks, course or characteristics of a watercourse.

Authorisation for a Water Use Licence Application is required from the DWS in order to undertake the above activity. An application for Water Use Authorisation will be lodged with the DWS.

1.4.4 National Environmental Management Waste Act (NEM:WA) GNR 921, 29 November 2013

In terms of the National Environmental Management Waste Act (Act 59 of 2008) the proposed project does not trigger a Waste Management License under the National Environmental Management: Waste Act (NEMWA Regulations published in GNR 921 on the 29 November 2013 Government Gazette No 37083).

1.4.5 National Heritage Resources Act 25 of 1999

In terms of the National Heritage Resources Act (Act 25 of 1999) an application for Heritage Resources review was submitted to SAHRA (Case ID: 97840) in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) as amended.

1.4.6 National Environmental Management Biodiversity Act 10 of 2004

The National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) as amended (NEMBA) including all the pertinent legislation published in terms of this act was considered in compiling this EMPr. This included the determination and assessment of the fauna and flora prevailing in the proposed project and the handling thereof in terms of NEMBA.

2 THE APPROACH TO THE EMPR

A typical EMPr takes the planning and design, construction and operational phases of a project into account. The EMPr is based largely on the findings and recommendations of the BA process. However, the EMPr is

considered a "live" document and must be updated with additional information or actions during the lifetime of the project if and when needed.

The EMPr follows an approach of identifying an over-arching goal and objectives, accompanied by management actions that are aimed at achieving these objectives. The management actions are presented in a table format in order to show the links between the goal and associated objectives, actions, responsibilities, monitoring requirements and targets. The management plans for the Design and Layout, Construction and Operational phases consist of the following components:

- Description of the activity taking place;
- The potential impacts associated with that activity;
- The appropriate mitigation measures;
- The responsible party; and
- Monitoring Frequency.

3 ROLES AND RESPONSIBILITIES

For the purposes of the EMPr, the generic roles that need to be defined are those of the:

- Farm Manager and Team;
- The Contractor; and
- Environmental Control Officer.

Note: The specific titles for these functions will vary from project to project. The intent of this section is to give a generic outline of what these roles typically require.

3.1 Makadima Management

Makadima management is responsible to oversee construction, operational and decommissioning aspects of the chicken broiler to make sure that the EMPr is implemented and the conditions of Environmental Authorisation are adhere to throughout the project lifecycle. He will also be responsible for rehabilitation of disturbed areas during construction.

3.2 The Contractor

The person or company appointed to undertake construction or decommissioning of the chicken broiler. For the purposes of this EMPr, "Contractor" may also refer to the person undertaking any of the proposed activities whether awarded a contract or not. The contractor will be responsible for the overall construction and decommissioning activities on site and compliance with all conditions of authorization as well as drafting the method statement that is aimed to protect environmental resources, minimise pollution and to rehabilitate disturbed areas and its implementation thereof.

3.3 Environmental Control Officer

It can either be an internal staff member of the Engineer / Contractor assigned to the project. The Environmental Control Officer will be part of the project staff and will advise the Engineer on all environmental matters relating to the works, in terms of this EMPr. The environmental officer will also be responsible for monitoring construction activities on site to also ensure that all the recommendations of the EMPr are adhere to during construction phase. He/she will also be responsible for the implementation of the EMPr on site.

4 THE PROJECT DESCRIPTION

Makadima Leisure and Cultural Village proposes a project that is based in Dinokana Village. The project is championed by a team of committed and determined youth of Dinokana Village, which is part of the Bahurutshe Ba Ga Moiloa Tribe. There is a demand for a leisure facility within the area and immediate surroundings. Tourism that is focused on culture has been on the rise and there is a keen interest in having a cultural village that aligns with Bahurutshe Ba Ga Moiloa in order to retain and increase knowledge on the traditional and cultural customs.

The Cultural Village will be located on property that has been allocated by Bahurutshe Ba Ga Moiloa, which is approximately 85 hectares for the purpose of constructing the leisure centre and cultural village.
The project intends to develop a resort outside the fenced water springs/eye area. The first phase will be the establishment of a Leisure/recreational Park and followed by Accommodation; Conferencing facilities; Cultural Village in the medium term.

The proposed infrastructure of the leisure and cultural village will entail the following:
- Resting/Recreational Park (2 ha)
- Conference facility (0.2 ha)
- Main Parking (0.8 ha)
- Accommodation Facilities (2.5 ha), which consists of 8 x 2 Hotel rooms, 5 Couple chalets and 6 Family chalets.
- Cultural Village (1 ha), which will be a replica traditional village.
- Picnic Gardens(1.5 ha)
- Adventure Facilities(2 ha)

The facility is planned to receive at least 150 visitors per day, accommodating 48 beds, 40 team members for team building sessions/ conferences at any time, 40 guest in the boma and 15 guest in the museum per session.

Listed Activities

The development triggers listed activities in terms of the Environmental Impact Assessment (EIA) Regulations, Government Regulations (GNR) 324 and 327 of April 2017 promulgated under the National Environmental Management Act (NEMA) (Act no 107 of 1998). In terms of these Regulations, a Basic Assessment (BA) should be undertaken for the proposed project.

In terms of the amended NEMA EIA Regulations published in GNR 324, 325, 326 and 327 on the 7 April 2017 Government Gazette Number 40772, a BA process is required as the project triggers the following listed activities (detailed in Table 1 below).

Table 1: Listed Activities triggered by the leisure and cultural village that require the need for a Basic Assessment.

Relevant notice:	Activity No (in terms of the relevant notice) :	Description of each listed activity as per the Government Notice:	
GNR 327, 7 April 2017	27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- i) the undertaking of a linear activity; or ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The construction and development of approximately 10 hectares that consists of 2 ha Resting/Recreational Park, Conference/Wedding facility, Restaurant & Pub, 2.5 ha Accommodation Facilities, 1 ha Cultural Museum, and 3 ha Adventure Facilities
GNR 324, 7 April 2017	6h	The development of resorts, lodges, hotels and tourism or hospitality facilities that sleep 15 people or more in iv. Critical Biodiversity area as identified in systematic biodiversity plans adopted by the competent authority (North West) vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.	The construction of accommodation facilities that will cover approximately 2.5 hectare footprint and will include 16 hotel rooms, 5 couple chalets and 6 family chalets, accommodating a maximum of 48 people at a time.
GNR 324, 7 April 2017	11h	The development of tracks or routes for the testing, recreational use or outdoor racing of motor powered vehicles excluding conversion of existing tracks or routes for the testing, recreational use or outdoor racing or motor powered vehicles. iv. Critical Biodiversity area as identified in systematic biodiversity plans adopted by the competent authority (North West); vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.	The construction of an adventure facility which will include the development of tracks for outdoor racing for the purpose of go karting.
GNR 324, 7 April 2017	12h	The clearance of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with the maintenance purposes undertaken in accordance with a maintenance plan with in iv. Critical Biodiversity area as identified in systematic biodiversity plans adopted by the competent authority (North West); vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.	The construction and development of approximately 10 hectares that consists of 2 ha Resting/Recreational Park, Conference/Wedding facility, Restaurant & Pub, 2.5 ha Accommodation Facilities, 1 ha Cultural Museum, and 3 ha Adventure Facilities

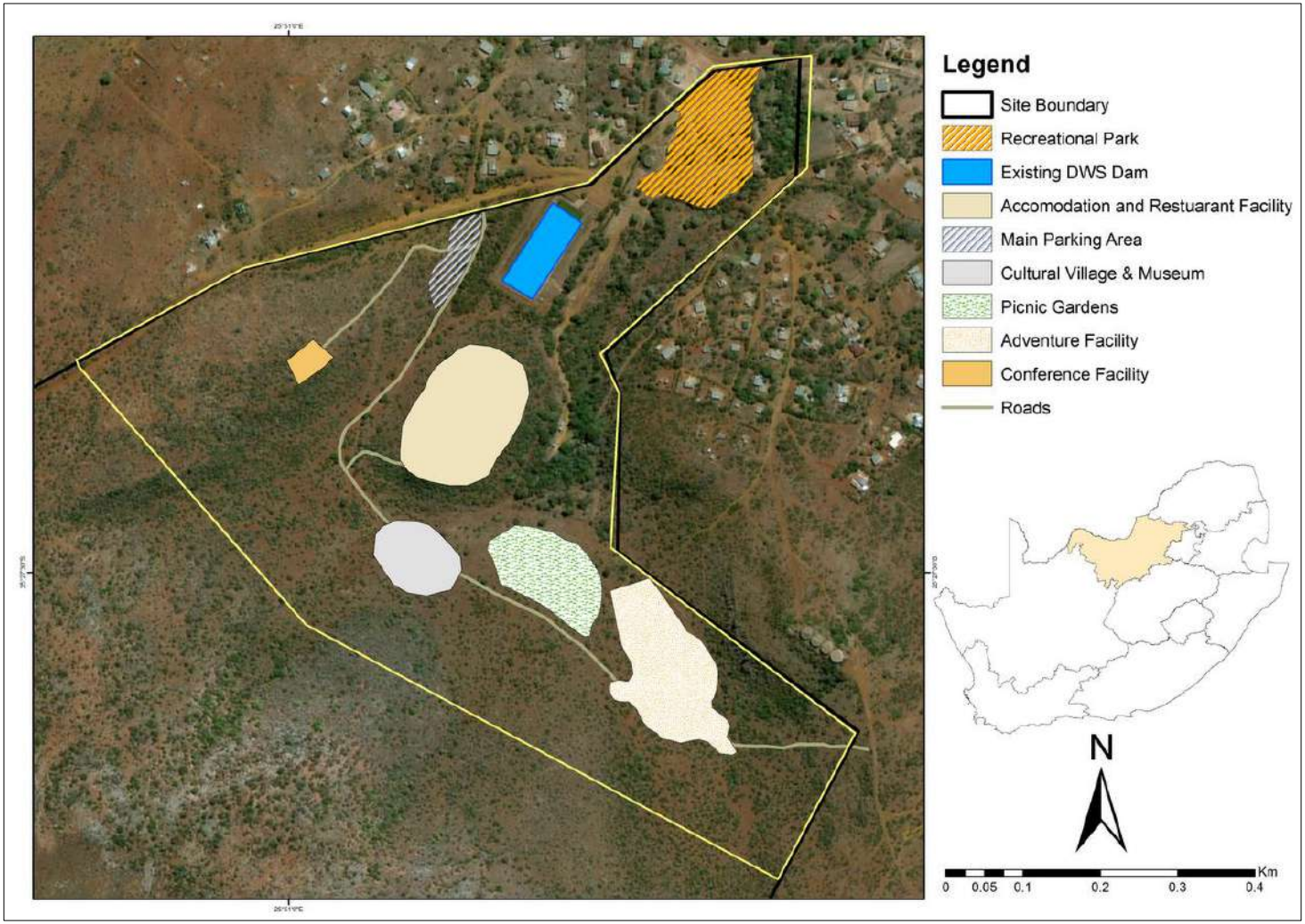


Figure 1: Site layout of the proposed development site (Data source: Makadima Leisure and Cultural Village).

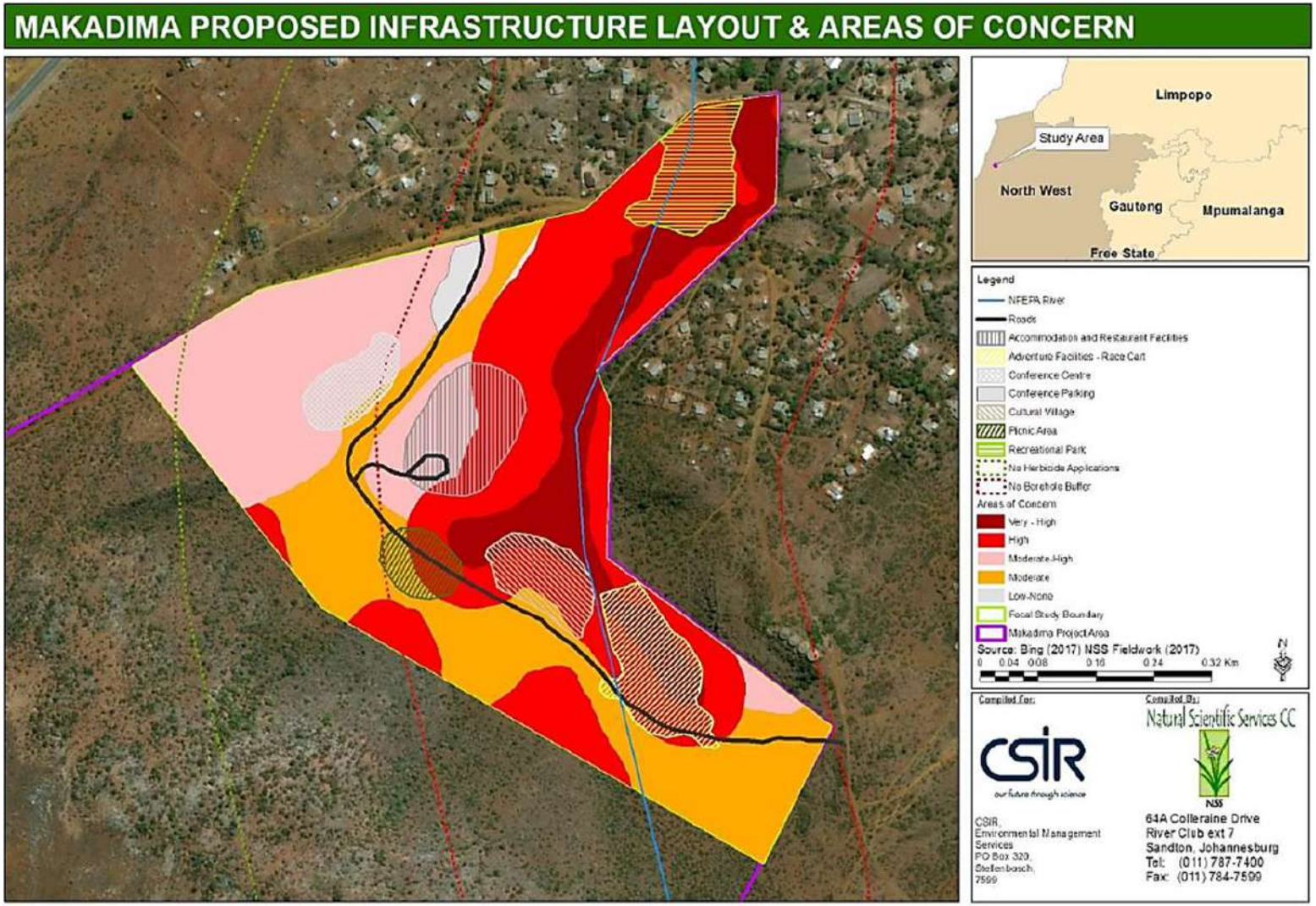


Figure 2: Proposed site layout superimposing environmental sensitivities (Data source: Natural Scientific Services, 2018).

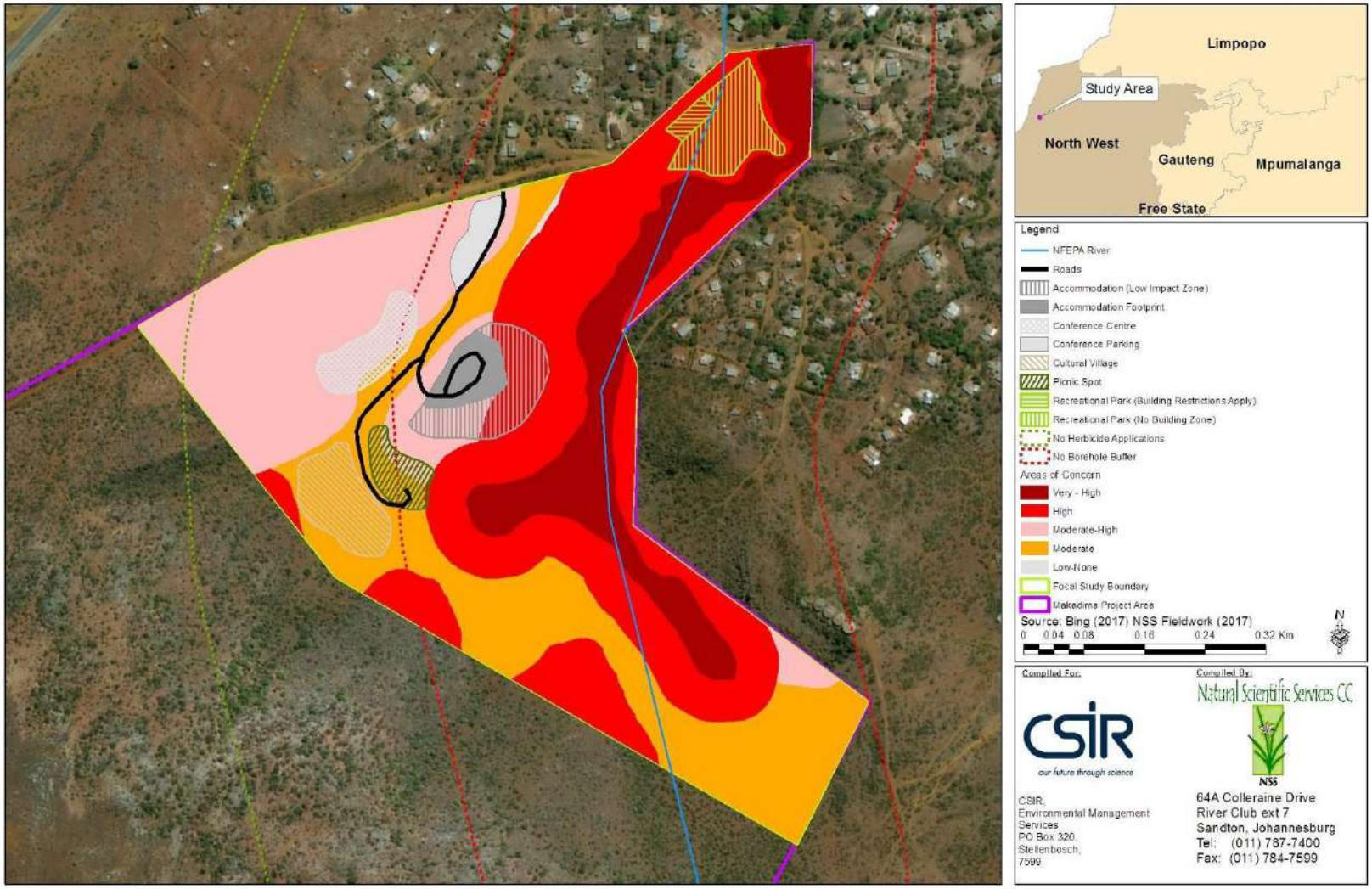


Figure 3: Proposed revised infrastrucuture layout & areas of concern. (Areas of biodiversity concern, superimposed with proposed infrastructure layout). Data source: Natural Scientific Services, 2018.

5 ENVIRONMENTAL MANAGEMENT PLAN

As part of environmental management and enhancement, an identification and description of impact management objectives must be developed, inclusive of the proposed methods and effective management and mitigation measures required during the design, construction and operational phases of the proposed chicken broiler. The table below lists potential impacts and mitigation measures recommended for the proposed chicken broiler facility at the different phases.

Table 5-1: Impact management plan for the proposed Design and Planning Phase

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
BIODIVERSITY IMPACTS				
Loss or degradation of the wetland resources	Minimise loss of and disturbance to wetlands through planning and proactive management.	Modify the original infrastructure layout based on the layout and recommendations as far as possible avoid wetland areas and their buffers.		Makadima Management , Construction Crew
Loss of terrestrial vegetation and faunal habitat	Restrict all clearing of vegetation and disturbance of habitat from construction activities to the final infrastructure footprint.	Ensure that all infrastructure avoids all Very High and High sensitive areas.	During design	CSIR, Makadima Management
		Clearly demarcate or fence in the construction site. Relocate CI plant and animal specimens from the construction footprint, with advice from an appropriate specialist	Pre-construction	Makadima Management
	Avoid unnecessary loss of indigenous trees and termitaria.	Identify and mark indigenous trees on the ground. Those that are small and cannot be avoided should be transplanted elsewhere on site.	Design / pre-construction	Makadima Management, Construction Crew, with advice from an Ecologist
Loss of CI or medicinal flora	Adhere to legal requirements and best practice guidelines regarding the displacement of CI and medicinally important floral species.	Obtain permits to remove CI species	Pre-Construction	Makadima Management
		Transplant CI and medicinally important floral specimens from the infrastructure footprint to suitable locations in the surrounding area.	Pre-Construction	Botanist / horticulturist

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
Loss of CI fauna	Adhere to law and best practice guidelines regarding the displacement of CI faunal species.	Appoint an appropriate specialist to relocate CI fauna from vegetation, termitaria and soil that is removed from the infrastructure footprint	Pre-construction	Zoologist/Ecologist
	Prohibit collection or persecution of fauna.	Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least.	Pre-construction	Makadima Management
Introduction & proliferation of alien spp. - Competition and change in structure	Regulate / limit access by potential vectors of alien plants.	Carefully regulate / limit access by vehicles and materials to the construction site. Demarcate or fence in the construction area	Prior to and during construction	Makadima Management ECO Construction manager
		Prohibit the introduction of domestic animals such as dogs and cats	All Phases	Makadima Management
		Plant only locally indigenous flora if landscaping needs to be done	All Phases	Makadima Management
	Maintain a tidy construction site.	Keep construction activities neat and tidy. When complete remove all sand piles and landscape all uneven ground while re-establishing a good topsoil layer.	During construction	Makadima Management
	By law, remove and dispose of Category 1b alien species on site. All Category 2 species that remain on site must require a permit.	Remove Category species using mechanical methods, and minimise soil disturbance as far as possible	During construction	Makadima Management / Construction Crew
Increase in dust and erosion	Implement effective measures to control dust and erosion.	Limit vehicles, people and materials to the construction site.	During construction	Makadima Management, Construction Crew
		Commence (and preferably complete) construction during winter, when the risk of erosion should be least		
		Revegetate denude areas with locally indigenous flora a.s.a.p.		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Implement erosion protection measures on site to reduce erosion and sedimentation of downstream areas. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed.		
		Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting of the entrance road.		
Sensory disturbance of fauna	Time construction activities to minimise sensory disturbance of fauna.	Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least	During pre-construction and construction planning	Makadima Management, Construction Crew
	Minimise noise pollution	Minimise noise to limit its impact on calling and other sensitive fauna (e.g. frogs and Secretarybird).	Prior to and throughout construction	Makadima Management, Construction Crew
	Minimise light pollution.	Limit construction activities to day time hours.	Throughout construction	Makadima Management, Construction Crew
		Minimise or eliminate security and construction lighting, to reduce the disturbance of nocturnal fauna.	Throughout construction	Construction Crew
WATER QUALITY IMPACTS				
Pollution of the surrounding environment as a result of contamination of stormwater. Contamination could result from chemicals, oils, fuels, sewage, solid waste, litter etc.	Reduce the contamination of stormwater.	The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase.	All phases	Construction Crew and Makadima Management
		Provide secure storage for oil, chemicals and other waste materials in order to prevent contamination of stormwater runoff.		
		Regular inspections of stormwater		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.		
STORMWATER IMPACTS				
Impact of the project if a detailed storm water management plan is not correctly prepared and implemented.	A detailed stormwater management plan outlining appropriate treatment measures to address runoff from disturbed portions of the site must be compiled.	Check compliance with specified conditions.	Once-off during design followed by regular control	Contractor
		Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.		

Table 5-2: Impact management plan for the proposed Construction Phase

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
BIODIVERSITY IMPACTS				
Loss or degradation of the wetland resources	Minimise loss of and disturbance to wetlands through planning and proactive management.	Demarcate the construction site and ensure that all activities are carried out within that area. Additionally mark out the wetland on the ground to ensure activities stay out of it.	During Construction	Makadima Management, Construction Crew
		Do not build any infrastructure upstream of the Eye.	During construction	Makadima Management
		Avoid construction within the "no building zone" as indicated on the proposed infrastructure map.	During construction	Construction Crew
Contamination of surface and	Minimise contamination of surface	Highlight all prohibited activities (e.g. Mixing of	Weekly During	

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
groundwater resources	water from inappropriate water and waste management	concrete in wetland areas littering, cutting of large trees, using the wetland as an ablution development) to workers through training and sign notices.	Construction	
		Do not make use of fertilisers, pesticides or herbicides on site especially upstream of the Eye.		
Loss of CI or medicinal flora	Adhere to legal requirements and best practice guidelines regarding the displacement of CI and medicinally important floral species.	Obtain guidance from a suitably qualified vegetation specialist or horticulturist regarding the collection, propagation/storage and transplantation of plants	During Construction	Botanist / horticulturist
Loss of CI fauna	Prohibit collection or persecution of fauna.	Check open trenches for trapped animals (e.g. hedgehogs, reptiles and frogs), and relocate trapped animals with advice from an appropriate specialist.	Daily, during Construction	Makadima Management
		Prohibit disturbance and persecution (e.g. poaching) of fauna, and introduction of pets and other alien fauna (apart from the production chickens).	All Phases	Makadima Management
		Walk fence lines to remove snares.	All Phases	Makadima Management
		Provide notices and training to inform workers about dangerous animals (e.g. venomous snakes and scorpions) and prohibited activities (e.g. poaching).	All Phases	Makadima Management / External Ecologist (Advisory Capacity)
Clearing of (especially riparian) vegetation and faunal habitats	Avoid unnecessary loss of existing (especially riparian) indigenous vegetation and faunal habitats.	Do not clear any riparian vegetation for the development. This is the vegetation occurring within the delineated wetland boundaries. Additionally wherever possible minimise the disturbance to vegetation within the prescribed wetland buffer zones.	Throughout all phases	Makadima Management and Construction Crew

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Modify the layout of planned infrastructure to avoid important floral communities and large indigenous trees. Avoid construction of infrastructure within the NSS infrastructure map demarcated as "no building zone". Integrate the planned infrastructure into the surrounding environment (blending in).		Makadima Management, with advice from a Botanist / Horticulturist
		Identify and mark indigenous trees on the ground. Those that are small and cannot be avoided should be transplanted elsewhere on site.		Makadima Management, with advice from a Botanist / Horticulturist
		Demarcate or fence in the construction site.		Makadima Management
		Highlight all prohibited activities to workers through training and notices.		Makadima Management
		Commence (and preferably complete) construction activities during winter, when the risk of disturbing growing plants should be least.		Makadima Management
	Promote re-establishment of indigenous vegetation in disturbed areas.	Briefly and effectively stockpile topsoil preferably 1-1.5m in height.	During Construction	Makadima Management
		Use the topsoil to allow natural vegetation to establish in disturbed areas. If recovery is slow, then a seed mix for the area (using indigenous grass species listed within this report) should be sourced and planted.		Makadima Management, with advice from a Botanist / Horticulturist

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Do not undertake any landscaping with alien flora.		Makadima Management, with advice from a Botanist / Horticulturist
Introduction & proliferation of alien spp. - Competition and change in structure	Regulate / limit access by potential vectors of alien plants.	Carefully regulate / limit access by vehicles and materials to the construction site. Demarcate or fence in the construction area	Prior to and during construction	Makadima Management ECO Construction manager
		Prohibit the introduction of domestic animals such as dogs and cats.	Pre-Construction and continued through the life of the project	Makadima Management
		Plant only locally indigenous flora if landscaping needs to be done.	All Phases	Makadima Management
	Maintain a tidy construction site.	Keep construction activities neat and tidy. When complete remove all sand piles and landscape all uneven ground while re-establishing a good topsoil layer.	During construction	Makadima Management
	By law, remove and dispose of Category 1b alien species on site. All Category 2 species that remain on site must require a permit.	Remove Category species using mechanical methods, and minimise soil disturbance as far as possible	During construction	Makadima Management / construction crew
Increased dust and erosion	Implement effective measures to control dust and erosion.	Limit vehicles, people and materials to the construction site.	During construction	Makadima Management / construction crew
		Revegetate denude areas with locally indigenous flora a.s.a.p.		
		Implement erosion protection measures on site. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed		
		Commence (and preferably complete)		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		construction during winter, when the risk of erosion should be least.		
		Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting.		
Minimise sensory disturbance of fauna	Time construction activities to minimise sensory disturbance of fauna.	Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least	During pre-construction and construction planning	Makadima Management, Construction Crew
	Minimise noise pollution	Minimise noise to limit its impact on sensitive fauna such as owls, korhaans and Secretarybirds.	Prior to and throughout construction	Makadima Management, Construction Crew
	Minimise light pollution.	Limit construction activities to day time hours.	Throughout construction	Makadima Management, Construction Crew
		Minimise or eliminate security and construction lighting, to reduce the disturbance of nocturnal fauna.	Throughout construction	Construction Crew
HERITAGE IMPACTS				
Disturbance to and damage to Heritage Artefacts	Prevent damage and destruction to fossils, artefacts and materials of heritage significance.	The construction workers must be briefed on the potential uncovering of heritage features and what actions are then required. In the event that artefacts of heritage significance are discovered, all activities are to cease and the South African Heritage Resources Agency (SAHRA) must be immediately contacted	Prior to and throughout construction	Makadima Management
		If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossilsor other		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		categories of heritage resources are found during the proposed development, SAH RA APM Unit (Natasha Higgitt/John Gribble 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA		
WASTE IMPACTS				
Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste (general and hazardous).	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of general and hazardous waste.	General waste and hazardous waste should be stored temporarily on site in suitable (and correctly labelled) waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, and disposed of at a registered landfill site.	Throughout construction	Makadima Management, Construction Crew
		Should the on-site storage of general waste and hazardous waste exceed 100 m^3 and 80 m^3 respectively, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under Government Notice 926) must be adhered to.		
		Ensure that the construction site is kept clean at all times and that construction personnel are made aware of correct waste disposal		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		methods.		
		Ensure that sufficient general waste disposal bins are provided for all construction personnel throughout the site. These bins must be emptied on a regular basis.		
		No solid waste may be burned on site.		
		Segregation of hazardous waste from general waste to be in place.		
		The Contractor should provide adequate waste skips (or similar) on site and the Construction Contract should specify that the Contractor must be responsible for the correct disposal of the contents of the waste skips.		
		All construction waste (including rubble) should be frequently removed from site and correctly disposed by a licensed municipal landfill site		
		Establish appropriate emergency procedures for accidental contamination of the surroundings. Waste recycling should be incorporated into the facility's operations as far as possible. Designate a secured, access restricted, sign posted room for the storage of potentially hazardous substances such as herbicides, pesticides dips and medications. All hazardous waste should be disposed of at an appropriate licensed facility for this.		
		Records of removal of infectious waste must be kept		
Pollution of the surrounding environment as a result of the handling of sewage	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of sewage.	Make use of a septic facility to temporarily store waste in an underground septic tank	Throughout all phases	Makadima Management
		The applicant to appoint a professional septic drainer for extraction of sewage in a manner		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		that is not detrimental to the environment		
AIR QUALITY IMPACTS				
Increase in dust and erosion	Implement effective measures to control dust and erosion.	Limit vehicles, people and materials to the construction site.	During construction	Makadima Management, Construction Crew
		Commence (and preferably complete) construction during winter, when the risk of erosion should be least		
		Revegetate denude areas with locally indigenous flora a.s.a.p.		
		Implement erosion protection measures on site to reduce erosion and sedimentation of downstream areas. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed.		
		Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting of the entrance road.		
Emissions from construction vehicles and generation of dust as a result of earthworks, demolition, as well as the delivery and mixing of construction materials.	Reduce dust emissions during construction activities.	Ensure that cleared (excavated) areas and unpaved surfaces are sprayed with water (obtained from an approved source) to minimise dust generation.	During pre-construction and construction planning	Construction Crew
		Adequate dust control strategies should be applied to minimise dust deposition, for example: Periodic spraying of water on the entrance road when necessary		
		Ensure that construction vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour.		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least.		
		Noise should also be minimised throughout construction to limit the impact on sensitive fauna such as owls and large terrestrial birds.		
Emissions from construction vehicles and generation of dust as a result of earthworks, demolition, as well as the delivery and mixing of construction materials.	Reduce dust emissions during construction activities.	Ensure that cleared (excavated) areas and unpaved surfaces are sprayed with water (obtained from an approved source) to minimise dust generation.	During pre-construction and construction planning	Construction Crew
		Adequate dust control strategies should be applied to minimise dust deposition, for example: Periodic spraying of water on the entrance road when necessary		
		Ensure that construction vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour.		
		Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least.		
		Noise should also be minimised throughout construction to limit the impact on sensitive fauna such as owls and large terrestrial birds.		
SOCIO-ECONOMIC IMPACTS				

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
Socio-economic Impact: Employment creation and skills development opportunities during the construction phase, which is expected to give rise to approximately 6-12 new jobs. This impact is rated as positive.	Maximise local employment and local business opportunities to promote and improve the local economy.	Enhance the use of local labour and local skills as far as reasonably possible. Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained	During the construction phase	Makadima Management,
		Ensure that an equitable percentage allocation is provided for local labour employment as well as specify the use of small-to-medium enterprises and training specifications in the Contractors contract.		
		Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.		
VISUAL IMPACTS				
Potential visual intrusion of construction/demolition activities on the views of sensitive visual receptors	Prevent unnecessary visual clutter from focusing attention of surrounding visual receptors on the proposed development.	No specific mitigation measures are required other than standard construction site housekeeping and dust suppression such as demarcating construction boundaries and minimise areas of surface disturbance.	All Phases	Construction Crew
		Night lighting of the construction site should be minimised within requirements of safety and efficiency.		
SAFETY, HEALTH AND ENVIRONMENT				
	Prevent unnecessary impacts on the surrounding environment by ensuring that the piling noise is mitigated	Limit construction activities to day time hours	During construction	Construction Crew

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
Noise generation from demolition and construction work (e.g. grinding and use of angle grinders), as well as from the removal of waste material (e.g. crane and truck engines). This impact is rated as neutral.	Reduce the potential noise impacts on the construction workers.	Construction personnel must wear proper hearing protection, which should be specified as part of the Construction Phase Risk Assessment carried out by the Contractor.	During construction	Construction Crew
		The Contractor must ensure that all construction personnel are provided with adequate Personal Protective Equipment (PPE), where appropriate.		
Potential health injuries to construction personnel as a result of construction work (i.e. welding fumes. This impact is rated as neutral.	Prevent respiratory illnesses caused to the construction personnel.	The Contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate.	During construction	Construction Crew
Construction safety injuries: potential impact on the safety of construction workers due to construction activities (such as welding, cutting, working at heights, lifting of heavy items etc.). This impact is rated as neutral.	Prevention of injuries to and fatalities of construction personnel during the construction phase.	Ensure that a skilled and competent Contractor is appointed during the construction phase. The Contractor must be evaluated during the tender/appointment process in terms of safety standards.	During construction	Construction Crew
		The Contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate.		
		A Construction Site Manager or Safety Supervisor should be appointed, in conjunction with the project manager, to monitor all safety aspects during the construction phase. This could be the same person that is assigned to co-ordinate the construction traffic.		
		The Contractor must undertake a Construction Phase Risk Assessment		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Ensure that roads are not closed during construction, which may restrict access for emergency services.		
TRAFFIC IMPACTS				
Traffic, congestion and potential for collisions during the construction phase.	Prevent unnecessary impacts on the surrounding road network by supplying parking for construction vehicles on site.	During the construction phase, suitable parking areas should be created and designated for construction trucks and vehicles.	During construction	Construction Crew
		A construction supervisor should be appointed to co-ordinate construction traffic during the construction phase (by drawing up a traffic plan prior to construction).		
Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Ensure that all road regulations are adhered to prevent any accidents.	Adhere to speed limits applicable to all roads used; and	Throughout all phases	Makadima Management, Construction Crew
		Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.		
WATER QUALITY IMPACTS				
Contamination of surface and groundwater resources	Minimise contamination of surface water from inappropriate water and waste management	Highlight all prohibited activities (e.g. Mixing of concrete in wetland areas littering, cutting of large trees, using the wetland as an ablution development) to workers through training and sign notices.	Weekly toolbox talks with signs displayed throughout construction	Makadima Management

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Do not make use of fertilisers, pesticides or herbicides on site especially upstream of the Eye.	Throughout all phases	Makadima Management
Decreased water inputs that can impact on the flow rates from the Dinokana Eye	Avoid impacting on the water levels directly from the Dinokana Lobatse aquifer immediately upstream of the Eye.	Do not sink boreholes for the development upstream of the Eye or within 100 m of the delineated wetlands.	Prior to and during construction	Makadima Management
Pollution caused by spillage or discharge of construction waste water into the surrounding environment.	Reduce the spillage of domestic effluent and the impact thereof on the environment.	Ensure that adequate containment structures are provided for the storage of construction materials on site.	During construction	Construction Crew
Pollution of the surrounding water and ground as a result of generation of building rubble and waste scrap material.	Prevent unnecessary pollution impacts on the surrounding environment.	The amount of hazardous materials and liquids (such as cleaning materials) handled will be minimal. Fumes generated during welding will be minimal, within a well-ventilated area.	All phases	Makadima Management, Construction Crew
		The construction site should be cleaned regularly		
		The Contractor should provide adequate waste skips (or similar) on site and the Construction Contract should specify that the Contractor must be responsible for the correct disposal of the contents of the waste skips.		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		All construction waste (including rubble) should be frequently removed from site and correctly disposed by a licensed municipal landfill site.		
Pollution of the surrounding environment as a result of contamination of stormwater. Contamination could result from chemicals, oils, fuels, sewage, solid waste, litter etc.	Reduce the contamination of stormwater.	The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase.	All phases	Makadima Management, Construction Crew
		Provide secure storage for oil, chemicals and other waste materials in order to prevent contamination of stormwater runoff.		
		Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.		
STORMWATER IMPACTS				
Diversion and impedance surface water flows as well as increased run-off as the result of construction activities	Prevent interference with natural run-off patterns, diverting flows and increasing the velocity of surface water flows.	Compile a Method Statement for Stormwater Management and verify if a Method Statement for Stormwater Management has been compiled by the Contractor via audits prior to the commencement of the construction phase.	During construction	Construction Crew
		Stormwater and any run-off generated by the hard surfaces should be discharged into retention swales or areas with rock rip-rap (or similar). These could be used to enhance the sense of place, if they are planted with indigenous vegetation.		
		Unnecessary run-off such as over wetting during dust control and irrigation must be avoided.		
		Perform periodic inspections and maintenance of soil erosion measures and stormwater control structures		

Impact	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
Pollution of the surrounding environment as a result of contamination of stormwater. Contamination could result from chemicals, oils, fuels, sewage, solid waste, litter etc.	Reduce the contamination of stormwater.	The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase.	All phases	Makadima Management, Construction Crew
		Provide secure storage for oil, chemicals and other waste materials in order to prevent contamination of stormwater runoff during construction phase.		
		Ensure that the temporary site camp and ablution facilities are established at least 32 m away from areas of high sensitivity.		
		Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.		

Table 5-3: Impact management plan for the proposed Operational Phase

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
HERITAGE IMPACTS				
Disturbance to and damage to Heritage Artefacts	Limit disturbance of any Heritage Artefacts	The construction workers must be briefed on the potential uncovering of heritage features and what actions are then required. In the event that artefacts of heritage significance are discovered, all activities are to cease and the South African Heritage Resources Agency (SAHRA) must be immediately contacted.	Throughout Operation	Makadima Management
		If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossilsor other categories of heritage resources are found during the proposed development, SAH RA APM Unit (Natasha Higgitt/John Gribble 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
AIR QUALITY				
Atmospheric pollution due to fumes, smoke from fires (involving plant and vegetable oils or MEG).	Prevent unnecessary air pollution impacts as a result of the operational procedures.	Portable fire extinguishers and fire water hydrants (i.e. appropriate fire-fighting equipment) should be provided at the terminal as required. Mobile fire-fighting equipment should be provided at the berths as a safety precaution during the vessel offloading process. It should be noted that the products planned to be stored at the terminal have high flash points and low volatility. As a result, fires are unlikely, unsustainable, and can be extinguished with basic fire water and portable fire extinguishers.		Makadima Management and ECO
Emissions from staff vehicles.	Reduce emissions during operation	Efficient movement of traffic through the entrance and exit in order to reduce congestion and vehicle emissions. Ensure that the facility is operated in such a manner whereby potential odours are minimised.		Makadima Management
Altered burning	Ensure that flammable materials are stored in an appropriate safe house. Ensure that there are appropriate control measures in place for any accidental fires. If artificial burning is considered necessary to reduce risks to human and infrastructure safety from wild fires, a fire management plan should be compiled with input from an appropriate floral specialist, and diligently	Create safe storage on the premises for flammable materials. If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures	Throughout Operation	Makadima Management and ECO
		Maintain an effective fire break between the development area and the surrounding natural environment (especially the ridge to the north, where the fire-dependent Highveld Blue butterfly may occur)		
		Educate workers about the plan and emergency procedures with regular training and notices		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
	implemented. Annual wild fires should be strictly prohibited.			
BIODIVERSITY IMPACTS				
Loss or degradation of the wetland on the	Maintain measures on the access road to reduce dust, erosion and sedimentation.	Monitor the success of the rehabilitated erosion gully in HGM Unit 2	During operation	Makadima Management
		Keep future developments outside of the delineated wetland areas and associated buffers.		
Loss of CI or medicinal flora	Harvesting of indigenous flora for medicine, fire wood, building materials, and other purposes must be prohibited	Education of the Farm Management and team required prior to operation and with yearly refresher talks.	Prior to and during operation	Makadima Management
Continued introduction and proliferation of alien species	Regulate / limit access by potential vectors of alien plants.	Carefully regulate / limit access by vehicles and materials to the site	Throughout Operation	Makadima Management and ECO
		Prohibit the introduction of domestic animals such as dogs and cats.		
		Plant only locally indigenous flora if landscaping needs to be done		
	Maintain a neat and tidy production facility	Employ best practices regarding the tilling of soil and weed management		
		Minimise the accumulation or dispersal of excess fodder on site		
	By law, remove and dispose of Category 1b alien species on site. All Category 2 species that remain on site must require a permit.	Remove Category species using mechanical methods, and minimise soil disturbance as far as possible. Alien debris could be donated to a local community.		
Sensory disturbances	Limit the effects of light pollution on nocturnal fauna (including numerous insects, bats and hedgehogs).	Minimise essential lighting. • Ensure that all outdoor lights are angled downwards and/or fitted with hoods. • Avoid using metal halide, mercury or other	During design, construction and operation	Makadima Management

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		bulbs that emit high UV (blue-white) light that is highly and usually fatally attractive to insects. • Use bulbs that emit warm, long wavelength (yellow-red) light, or use UV filters or glass housings on lamps to filter out UV.		
	Limit the effects of noise from operational activities on fauna such as carnivores, frogs and Secretarybirds.	Minimise unavoidable noise • Conduct regular maintenance of machinery and ventilation systems / fans (if any).	Prior to and during operation	Makadima Management
	Prevent unnecessary light and noise pollution	Encourage workers to minimize light and noise pollution through training and notices.	Throughout operation	Makadima Management
SOCIO-ECONOMIC IMPACTS				
Improved service delivery with regards to tourism and recreation.	Maximise service delivery through maintenance of infrastructure	Ensure that the proposed infrastructure is maintained appropriately to ensure that all facilities and infrastructure operate within its design capacity to deliver as the market requires.	During Operation	Makadima Management
VISUAL IMPACTS				
Potential impact of night lighting of the development on the nightscape of the surrounding landscape.	Prevent night lights from impacting on surrounding visual receptors by minimizing glare and light spill.	No specific mitigation measures are recommended as it is assumed that night lighting of the proposed storage facility will be planned in such a manner so as to minimise light pollution such as glare and light spill (light trespass) by: Using light fixtures that shield the light and focus illumination on the ground (or only where light is required).	All phases	Makadima Management

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Avoiding elevated lights within safety/security requirements.		
		Using minimum lamp wattage within safety/security requirements.		
		Where possible, using timer switches or motion detectors to control lighting in areas that are not occupied continuously (if permissible and in line with minimum security requirements). Switching off lights when not in use in line with safety and security.		
HEALTH, SAFETY AND ENVIRONMENT				
Minor accidents to the public and moderate accidents to operational staff		An Emergency Plan should be compiled in order to deal with potential spillages and fires. Records of practices should be kept on site.	Prior to, and through operation	Makadima Management
		Scheduled inspections should be implemented by operating personnel in order to assure and verify the integrity of hoses, piping and storage lagoon.	Monthly throughout operation	Makadima Management
		Portable fire extinguishers and fire water hydrants (i.e. appropriate fire-fighting equipment) should be provided at the facility as required.	During operation	Makadima Management
Altered burning	Ensure that flammable materials are stored in an appropriate safe house. Ensure that there are appropriate control measures in place for any accidental fires. If	Create safe storage on the premises for flammable materials. If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures	Prior to, and through operation	Makadima Management

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
	artificial burning is considered necessary to reduce risks to human and infrastructure safety from wild fires, a fire management plan should be compiled with input from an appropriate floral specialist, and diligently implemented. Annual wild fires should be prohibited.	Create safe storage on the premises for flammable materials. If artificial burning is considered necessary, establish and implement a fire management plan with emergency fire procedures	Prior to, and at least annually during operation	
		Educate workers about the fire plan and emergency procedures with regular training and notices	At least annually during operation	
Potential noise impact from operations and road transport of products during the operational phase (i.e. increased road traffic).	Prevent unnecessary impacts on the surrounding environment by ensuring that the drivers of road tankers minimise the use of air brakes.	It is recommended that the drivers of the vehicles be discouraged from using air brakes at night.	Throughout operation	Makadima Management
		Limit the effects of noise associated disturbances from pigs and operational activities on sensitive fauna such as owls and medium-large mammals (especially carnivores), potentially occurring hedgehogs and large terrestrial birds such as Korhaans and Secretarybirds.		
Groundwater contamination as a result of the	Reduce soil and groundwater contamination as a result of incorrect storage and disposal of waste.	Ensure that that the pig houses and associated drains and slurry facility are designed and lined with impermeable substances (clay-type soils, geosynthetic plastic, or concrete) in accordance with advice from suitably qualified agricultural experts and international best practice norms.	Throughout operation	ECO
		Personnel should ensure careful transportation of waste from the pig facilities to the lagoon as to avoid spillage.		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Adequate infrastructure should ensure waste will not exit the lagoon in an extreme weather event.		
		Ensure adequate treatment of the waste to avoid extreme odours and contaminations.		
Potential impact on the health of operating personnel resulting in potential health injuries.	To ensure that there are no adverse effects on the health of operating personnel.	Operational personnel must wear basic PPE (e.g. gloves, goggles etc.) as necessary during the operational phase.		Makadima Management
Minor accidents to the public and moderate accidents to operational staff (e.g. fires).	Ensure operating personnel or the public are not affected or injured by heat from possible fires.	An Emergency Plan should be compiled in order to deal with potential spillages and fires. Records of practices should be kept on site.	Annually	Makadima Management
		Scheduled inspections should be implemented by operating personnel in order to assure and verify the integrity of hoses, piping and storage lagoon.		
		Portable fire extinguishers and fire water hydrants (i.e. appropriate fire-fighting equipment) should be provided at the facility as required.		
Impact of extra operational vehicles on the road network.	Prevent unnecessary or excessive heavy vehicles	Undertake re-calibration of existing traffic signals if required.		Makadima Management
WASTE MANAGEMENT				
Odour Emissions from operations and environmental contamination of the surrounding environment from chicken organic waste (carcases and manure).	Prevent unnecessary air pollution impacts as a result of the operational procedures.	Odours produced from manure and urine in chicken broiler facility can be reduced by scraping up and removing manure from the facility and washing down using low-volume high-pressure sprays.	Operational	Makadima Management
		Manure should be collected daily and stored in		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		vermin-proof containers at the waste storage facility.		
		Ensure that carcases and feed, and other operational waste are appropriately and effectively contained and disposed of without detriment to the environment.		
		Establish appropriate emergency procedures for accidental contamination of the surroundings. Waste recycling should be incorporated into the facility's operations as far as possible. Designate a secured, access restricted, sign posted room for the storage of potentially hazardous substances such as herbicides, pesticides, dips and medications.		
		The relevant Air Quality norms and standards must be adhered to.		
Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste (general and hazardous).	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of general and hazardous waste.	General waste and hazardous waste should be stored temporarily on site in suitable (and correctly labelled) waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate	Throughout operation	Makadima Management
		Should the on-site storage of general waste and hazardous waste exceed 100 m^3 and 80 m^3 respectively, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under Government Notice 926) must be adhered to.		
		Ensure that the construction site is kept clean at all times and that construction personnel are made aware of correct waste disposal methods.		
		Ensure that sufficient general waste disposal		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		bins are provided for all operational personnel throughout the site. These bins must be emptied on a regular basis.		
		No solid waste may be burned on site.		
		Segregation of hazardous waste from general waste to be in place.		
		The farm manager must be responsible for the correct disposal of the contents of the waste skips.		
		All operational waste (including rubble) should be frequently removed from site and correctly disposed by a licensed municipal landfill site		
		Establish appropriate emergency procedures for accidental contamination of the surroundings. Waste recycling should be incorporated into the facility's operations as far as possible. Designate a secured, access restricted, sign posted room for the storage of potentially hazardous substances such as herbicides, pesticides dips and medications. All hazardous waste should be disposed of at an appropriate licensed facility for this.		
Pollution of the surrounding environment as a result of the handling of sewage	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of sewage.	Make use of a septic facility to temporarily store waste in an underground septic tank	Throughout all phases	Makadima Management
		The applicant to appoint a professional septic drainer for extraction of sewage in a manner that is not detrimental to the environment		
WATER QUALITY IMPACTS				

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
Contamination of surface and groundwater resources	Minimise contamination of surface water from inappropriate water and waste management	Ensure that all waste water (sewerage and grey water) is contained in properly lined septic tanks. Which are serviced regularly.	Weekly toolbox talks with signs displayed throughout construction	Makadima Management Makadima Management
		Do not make use of french drains or long drops.		
		Do not make use of fertilisers, pesticides or herbicides on site especially upstream of the Eye.	Throughout all phases	
		Minimise sinkhole formation by regularly inspect all water pipelines and thoroughly mend any leaks as soon as they arise.		
		Ensure that the development is run in accordance with international best practice norms, and with advice from an appropriate specialist, to ensure that there is no environmental contamination from effluent, fodder, carcasses and other waste, and to ensure that there is also effective storm water management.		
		Signpost the site especially the picnic area with all prohibited activities which should include (amongst others) no littering, no wood collecting, no abluting in the stream or bush, no making of fires except within the braai areas.		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		All hazardous waste should be disposed of at an appropriate licensed facility for this.		
		Waste recycling should be incorporated into the development's operations as far as possible.		
		Educate workers about the development's waste management and handling of hazardous substances with regular training and notices.		
Decreased water inputs that can impact on the flow rates from the Dinokana Eye	Avoid impacting on the water levels directly from the Dinokana Lobatse aquifer immediately upstream of the Eye.	Diligently monitor and measure water usage in measurable Units. Keep a spreadsheet and compare data to DWS flow rates for the Dinokana Eye on an annual basis.	Monthly for life of operation	DWS, Makadima Management
		Reduce water usage wherever possible. Put up signs in the accommodation encouraging visitors to spare water and re-use laundry during their stay if not too dirty. Investigate the possibility of capturing rainwater.	Start of operation	Makadima Management
STORMWATER IMPACTS				
Discharge of contaminated stormwater into the surrounding environment. Contamination could	Reduce the contamination of stormwater during operation.	The appointed Contractor should compile a Method Statement for Stormwater Management during the operation.	Once off and updated as required.	Contractor

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
result from chemicals, oils, fuels, sewage, solid waste, litter etc.		Undertake regular inspections of the stormwater infrastructure (i.e. by implementing walk through inspections).	Throughout Operation	Makadima Management
TRAFFIC IMPACTS				
Increase in traffic	Prevent unnecessary impacts on the surrounding road network by supplying parking for vehicles and abiding by road regulations .	Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and	Throughout operation	Makadima Management
		Plan trips so that it occurs during the day but avoid construction vehicles movement on the N4 during peak time (06:00-10:00 and 16:00-20:00);		
		A speed limit of 60 km/h should be maintained on the N4.		
Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Ensure that all road regulations are adhered to prevent any accidents.	Adhere to speed limits applicable to all roads used; and	Throughout all phases	Makadima Management, Construction Crew
		Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the N4 and the existing access road to ensure safe entry and exit.		

Table 5-4: Impact management plan for the proposed Decommissioning Phase

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
BIODIVERSITY IMPACTS				
Loss or degradation of the wetland	Minimise loss of and disturbance to wetlands through planning and proactive management.	Keep decommissioning activities outside of the delineated wetland areas and associated buffers.	During decommissioning	Makadima Management, Decommissioning Crew
		Demarcate the decommissioning site and ensure that all activities are carried out within that area. Additionally mark out the wetland on the ground to ensure activities stay out of it.		
		Avoid disturbing the "no building zone".		
Introduction & proliferation of alien spp. - Competition and change in structure	By law, remove and dispose of Category 1b alien species on site. All Category 2 species that remain on site must require a permit.	Remove Category species using mechanical methods and minimise soil disturbance as far as possible.	Throughout the decommissioning phase.	Makadima Management and ECO
Sensory disturbances	Time demolition / rehabilitation activities to minimise sensory disturbance of fauna.	Commence (and preferably complete) demolition / rehabilitation during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least.	Throughout the decommissioning phase.	Makadima Management and ECO
	Limit disturbance from noise	Minimise noise to limit its impact on sensitive fauna such as owls, korhaans and Secretarybirds		
	Limit disturbance from light	Limit demolition activities to day time hours		
		Minimise or eliminate security and other lighting, to reduce the disturbance of nocturnal fauna		
AIR QUALITY IMPACTS				
Increase in dust and erosion	Implement effective measures to	Limit vehicles, people and materials to the	Throughout the	Makadima

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
	control dust and erosion.	construction site.	decommissioning phase.	Management
		Commence (and preferably complete) construction during winter, when the risk of erosion should be least		
		Revegetate denude areas with locally indigenous flora a.s.a.p.		
		Implement erosion protection measures on site to reduce erosion and sedimentation of downstream areas. Measures could include bunding around soil stockpiles, and vegetation of areas not to be developed.		
		Implement effective and environmentally-friendly dust control measures, such as mulching or periodic wetting of the entrance road.		
HERITAGE IMPACTS				
Disturbance to and damage to Heritage Artefacts.	Limit disturbance of any Heritage Artefacts	If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an appropriate specialist. Such	Decommissioning phase	Makadima Management
WATER QUALITY IMPACTS				
Contamination of surface and groundwater resources	Minimise contamination of surface water from inappropriate water and waste management	Do not make use of french drains or long drops.	During decommissioning	Makadima Management
		Minimise sinkhole formation by sealing or otherwise inspecting water pipelines and thoroughly mend any leaks.		
		Ensure that storm water management remains		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		effective during and following decommissioning.		
		All grey water, sewage and other hazardous waste should be disposed of at an appropriate licensed facility for this.		
		Waste recycling should be incorporated into decommissioning as far as possible.		
		Educate workers about the development's waste management and handling of hazardous substances with regular training and notices	Quarterly notice board updates, Monthly meetings and a yearly AGM	Makadima Management
Potential spillage of effluent to the surrounding environment (from portable sanitation facilities for decommissioning personnel).	Reduce the spillage of domestic effluent and the impact thereof on the environment.	Normal sewage management practises should be implemented. These include ensuring that portable sanitation facilities are regularly emptied and the resulting sewage is transported safely (by an appointed service provider) for correct disposal at an appropriate, licenced facility. Proof of disposal (in the form of waste disposal slips or waybills) should be retained on file for auditing purposes.	Monthly	ECO
Discharge of contaminated stormwater into the surrounding environment. Contamination could result from chemicals, oils, fuels, sewage, solid waste, litter etc.	Reduce the contamination of stormwater.	The appointed Contractor should compile a Method Statement for Stormwater Management during the decommissioning phase.	Once off (and thereafter updated as required).	Contractor
		Provide secure storage for oil, chemicals and other waste materials to prevent contamination of stormwater runoff.		
Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste.	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of general and hazardous waste.	General waste (i.e. building rubble, demolition waste, discarded concrete, bricks, tiles, wood, glass, plastic, metal, excavated material, packaging material, paper and domestic waste etc.) and hazardous waste (i.e. empty tins, paint and paint cleaning liquids, oils, fuel spillages and chemicals etc.) generated during the	Carry out monitoring for the decommissioning phase.	ECO

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		decommissioning phase should be stored temporarily on site in suitable (and correctly labelled) waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate.		
		Should the on-site storage of general waste and hazardous waste exceed 100 m^3 and 80 m^3 respectively, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to.		
		Ensure that general waste and hazardous waste generated are removed from the site on a regular basis and disposed of at an appropriate, licensed waste disposal facility by an approved waste management Contractor. Waste disposal slips or waybills should be kept on file for auditing purposes as proof of disposal.		
		Ensure that sufficient general waste disposal bins are provided for all personnel throughout the site. These bins must be emptied on a regular basis.		
		Appropriately time demolition / rehabilitation activities to minimise sensory disturbance to fauna.		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
NOISE IMPACTS				
Emissions from decommissioning vehicles and generation of dust as a result of earthworks and demolition.	Reduce dust emissions during decommissioning activities.	Ensure that cleared (excavated) areas and unpaved surfaces are sprayed with water (obtained from an approved source) to minimise dust generation.	Carry out monitoring for the decommissioning phase.	Contractor and ECO
		Approved soil stabilisers may be utilised to limit dust generation.		
		Ensure that decommissioning vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour.		
VISUAL IMPACTS				
Potential visual intrusion of decommissioning activities on the existing views of sensitive visual receptors.	Prevent unnecessary visual clutter from focusing attention of surrounding visual receptors on the proposed development.	No specific mitigation measures are required other than standard site housekeeping and dust suppression. These are included below: The contractor(s) should maintain good housekeeping on site to avoid litter and minimise waste.	Weekly	Construction Crew and ECO
		The project developer should demarcate decommissioning boundaries and minimise areas of surface disturbance.		
		Appropriate plans should be in place to minimise fire hazards and dust generation.		
		Litter and rubble should be timeously removed from the work site and disposed at a licenced waste disposal facility.		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		Night lighting of the decommissioning site should be minimised within requirements of safety and efficiency.		
		Limit the effects of light pollution on nocturnal fauna (e.g. The potentially occurring Hedgehog and Rusty Pipistrelle but also various invertebrate species)		
		Limit the effects of light pollution on nocturnal fauna (e.g. The potentially occurring Hedgehog and Rusty Pipistrelle but also various invertebrate species)		
SAFETY, HEALTH AND ENVIRONMENT				
Noise generation from demolition activities (e.g. grinding, steel falling, use of angle grinders) during the decommissioning phase. This impact is rated as neutral.	Reduce the potential noise impacts on the decommissioning personnel	A method statement, including detailed procedures, must be drawn up prior to any decommissioning of existing tanks.	Throughout the decommissioning phase.	ECO and Contractor
		Decommissioning personnel must wear proper hearing protection, which should be specified as part of the Decommissioning Phase Risk Assessment carried out by the Contractor.		
		The Contractor must ensure that all decommissioning personnel are provided with adequate PPE, where appropriate.		
Potential health injuries to demolition staff during the decommissioning phase. This impact is rated as neutral.	Prevent respiratory illnesses caused to the decommissioning personnel	The Contractor must ensure that all decommissioning personnel are provided with adequate PPE for use where appropriate.	Throughout the decommissioning phase.	ECO and Contractor
TRAFFIC IMPACTS				

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
Heavy traffic, congestion and potential for collisions. This impact is rated as neutral.	Prevention of injuries, fatalities, and damage to equipment and vehicles during the decommissioning phase.	Suitable parking areas should be created and designated for trucks and vehicles.	Throughout the decommissioning phase.	Contractor and ECO
		A supervisor should be appointed to co-ordinate traffic during the decommissioning phase.		
		Road barricading should be undertaken where required and road safety signs should be adequately installed at strategic points within the site.		
WASTE MANAGEMENT				
Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste (general and hazardous).	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of general and hazardous waste.	General waste and hazardous waste should be stored temporarily on site in suitable (and correctly labelled) waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate	Throughout the decommissioning phase.	Makadima Management
		Should the on-site storage of general waste and hazardous waste exceed 100 m^3 and 80 m^3 respectively, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under Government Notice 926) must be adhered to.		
		Ensure that the decommissioning site is kept clean at all times and that construction personnel are made aware of correct waste disposal methods.		
		Ensure that sufficient general waste disposal bins are provided for all decommissioning personnel throughout the site. These bins must be emptied		

Impact Description	Management/Mitigation Measures	Methodology	Monitoring Frequency	Responsibility
		on a regular basis.		
		No solid waste may be burned on site.		
		Segregation of hazardous waste from general waste to be in place.		
		The Contractor should provide adequate waste skips (or similar) on site and the decommissioning Contract should specify that the Contractor must be responsible for the correct disposal of the contents of the waste skips.		
		All decommissioning waste (including rubble) should be frequently removed from site and correctly disposed by a licensed municipal landfill site.		
		Establish appropriate emergency procedures for accidental contamination of the surroundings. Waste recycling should be incorporated into the facility's operations as far as possible. Designate a secured, access restricted, sign posted room for the storage of potentially hazardous substances such as herbicides, pesticides dips and medications. All hazardous waste should be disposed of at an appropriate licensed facility for this.		
Pollution of the surrounding environment as a result of the handling of sewage	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of sewage.	Make use of a septic facility to temporarily store waste in an underground septic tank	Throughout all phases	Makadima Management
		The applicant to appoint a professional septic drainer for extraction of sewage in a manner that is not detrimental to the environment		

6 ENVIRONMENTAL EDUCATION/ ENVIRONMENTAL AWARENESS PLAN

The farm manager will be responsible for implementing a programme that will raise environmental awareness for all construction workers. The environmental awareness training will be presented to all workers in other to promote a successful implementation of the EMPr. An Environmental Control Officer shall be appointed to assist the manager with effective implementation of the programme and to also ensure compliance with all conditions of authorisations received.

The Awareness training shall emphasise the importance of an EMPr in order to promote compliance. All the environmental impacts that are associated with the proposed development should be outlined together with the proposed mitigation measures. The programme should also focus on sensitive areas in order to ensure that sensitive natural resources are protected.

The environmental awareness training should be undertaken when necessary and it is the responsibility of the farm manager to ensure that every person who will be coming to site is educated about the general conduct. Furthermore a register must be signed as part of the monitoring process; this will serve as proof that workers were made aware of the sensitivities on site. A method statement will be compiled by the contractor prior to commencement of construction activities. The method statement will comply with all the recommendations that have been outlined in the EMPr of the project with aims to protect environmental resources, minimise pollution and to rehabilitate disturbed areas.

7 ENVIRONMENTAL MONITORING & REPORTING/ AUDITING

The Environmental Control Officer will be responsible for monitoring of construction activities on site to also ensure that all the recommendations of the EMPr are adhere to during the construction phase of the programme. Monitoring of compliance with all the recommendations should be done regularly in order to protect the natural resources on site.

The construction area must be inspected and the Environmental Control Officer must compile a report after each inspection. Should non-compliance be recorded, the construction activities must be ceased until remedial actions are taken to ensure compliance. The report must be submitted to the Farm manager who can then address any issues raised with the engineer and contractor. The reports will be kept as part of record keeping and will be send to READ should they be requested.

Written records should entail the method statement, the approved EMPr that consists of monitoring reports, a site incident register, relevant authorisations that have been obtained and records of any meeting and training held with the construction workers. The farm manager will also be responsible for post construction phase monitoring programme i.e. clearance of Invasive Alien Species on site, the removal of debris during flooding etc.

BASIC ASSESSMENT REPORT

APPENDIX K: DETAILS OF EAP AND EXPERTISE

CONTENTS

DETAILS OF EAP AND EXPERTISE

Minnelise Levendal (Project Leader)

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South Africa

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CURRICULUM VITAE OF MINNELISE LEVENDAL – PROJECT LEADER

Name of firm	CSIR
Name of staff	Minnelise Levendal
Profession	Environmental Assessment and Management
Position in firm	Project Manager
Years' experience	8 years
Nationality	South African
Languages	Afrikaans and English

CONTACT DETAILS:

Postal Address: P O Box 320, Stellenbosch, 7599
Telephone Number: 021-888 2495/2661
Cell: 0833098159
Fax: 0865051341
e-mail: mlevendal@csir.co.za

BIOSKETCH:

Minnelise joined the CSIR Environmental Management Services group (EMS) in 2008. She is focussing primarily on managing Environmental Impact Assessments (EIAs), Basic Assessments (BAs) and Environmental Screening studies for renewable energy projects including wind and solar projects. These include an EIA for a wind energy facility near Swellendam, Western Cape South Africa for BioTherm (Authorisation granted in September 2011) and a similar EIA for BioTherm in Laingsburg, Western Cape (in progress). She is also managing two wind farm EIAs and a solar Photovoltaic BA for WKN-Windcurrent SA in the Eastern Cape. Minnelise was the project manager for the Basic Assessment for the erection of ten wind monitoring masts at different sites in South Africa as part of the national wind atlas project of the Department of Energy in 2009 and 2010..She was also a member of the Project Implementation Team who managed the drafting of South Africa's Second National Communication under the United Nations Framework Convention on Climate Change. The national Department of Environmental Affairs appointed the South African Botanical Institute (SANBI) to undertake this project. SANBI subsequently appointed the CSIR to manage this project.

EDUCATION:

- M.Sc. (Botany) Stellenbosch University 1998
- B.Sc. (Hons.) (Botany) University of the Western Cape 1994
- B.Sc. (Education) University of the Western Cape 1993

MEMBERSHIPS:

- International Association for Impact Assessment (IAIA), Western Cape (member of their steering committee from 2001-2003)
- IUCN Commission on Education and Communication (CEC); World Conservation Learning Network (WCLN)
- American Association for the Advancement of Science (AAAS)
- Society of Conservation Biology (SCB)

EMPLOYMENT RECORD:

- **1995:** Peninsula Technicon. Lecturer in the Horticulture Department.
- **1996:** University of the Western Cape. Lecturer in the Botany Department.
- **1999:** University of Stellenbosch. Research assistant in the Botany Department (3 months)
- **1999:** Bengurion University (Israel). Research assistant (Working in the Arava valley, Negev – Israel; 2 months). Research undertaken was published (see first publication in publication list)
- **1999-2004:** Assistant Director at the Department of Environmental Affairs and Development Planning (DEA&DP). Work involved assessing Environmental Impact Assessments and Environmental Management Plans; promoting environmental management and sustainable development.
- **2004 to present:** Employed by the CSIR in Stellenbosch:
- September 2004 – May 2008: Biodiversity and Ecosystems Services Group (NRE)
- May 2008 to present: Environmental Management Services Group (EMS)

PROJECT EXPERIENCE RECORD:

The following table presents a list of projects undertaken at the CSIR as well as the role played in each project:

Completion Date	Project description	Role	Client
2011 *(in progress)*	EIA for the proposed Electrawinds Swartberg wind energy project near Moorreesburg in the Western Cape	Project Manager	Electrawinds
2010-2011 *(in progress)*	EIA for the proposed Ubuntu wind energy project, Eastern Cape	Project Manager	WKN Windkraft SA
2010-2011 *(in progress)*	EIA for the proposed Banna ba pifhu wind energy project, Eastern Cape	Project Manager	WKN Windkraft SA
2010-2011	BA for a powerline near Swellendam in the Western Cape	Project Manager	BioTherm Energy (Pty Ltd
2010-2011 *(Environmental Authorisation granted in September 2011)*	EIA for a proposed wind farm near Swellendam in the Western Cape	Project Manager	BioTherm Energy (Pty Ltd
2010 (complete)	Basic Assessment for the erection of two wind monitoring masts near Swellendam and Bredasdorp in the Western Cape	Project Manager	BioTherm Energy (Pty Ltd
2010 (complete)	Basic Assessment for the erection of two wind monitoring masts near Jeffrey's Bay in the Eastern Cape	Project Manager	Windcurrent (Pty Ltd
2009-2010 (*(Environmental Authorisations granted during 2010)*	Basic Assessment Process for the proposed erection of 10 wind monitoring masts in SA as part of the national wind atlas project	Project Manager	Department of Energy through SANERI; GEF

Completion Date	Project description	Role	Client
2010	South Africa's Second National Communication under the United Nations Framework Convention on Climate Change	Project Manager	SANBI
2009 *(Environmental Authorisation granted in 2009)*	Basic Assessment Report for a proposed boundary wall at the Port of Port Elizabeth, Eastern Cape	Project Manager	Transnet Ltd
2008	Developing an Invasive Alien Plant Strategy for the Wild Coast, Eastern Cape	Co-author	Eastern Cape Parks Board
2006-2008	Monitoring and Evaluation of aspects of Biodiversity	Project Leader	Internal project awarded through the Young Researchers Fund
2006	Integrated veldfire management in South Africa. An assessment of current conditions and future approaches.	Co- author	Working on Fire
2004-2005	Biodiversity Strategy and Action Plan Wild Coast, Eastern Cape, SA	Co-author	Wilderness Foundation
2005	Western Cape State of the Environment Report: Biodiversity section. (Year One).	Co- author and Project Manager	Department of Environmental Affairs and Development Planning

PUBLICATIONS:

Bowie, M. (néé Levendal) and Ward, D. (2004). Water status of the mistletoe *Plicosepalus acaciae* parasitic on isolated Negev Desert populations of *Acacia raddiana* differing in level of mortality. Journal of Arid Environments 56: 487-508.

Wand, S.J.E., Esler, K.J. and **Bowie, M.R** (2001). Seasonal photosynthetic temperature responses and changes in ^{13}C under varying temperature regimes in leaf-succulent and drought-deciduous shrubs from the Succulent Karoo, South Africa. South African Journal of Botany 67:235-243.

Bowie, M.R., Wand, S.J.E. and Esler, K.J. (2000). Seasonal gas exchange responses under three different temperature treatments in a leaf-succulent and a drought-deciduous shrub from the Succulent Karoo. South African Journal of Botany 66:118-123.

LANGUAGES

Language	***Speaking***	***Reading***	***Writing***
English	*Excellent*	*Excellent*	*Excellent*
Afrikaans	*Excellent*	*Excellent*	*Excellent*

Minnelise Levendal

April 2018

Rirhandzu Marivate (Project Manager)

CURRICULUM VITAE: RIRHANDZU MARIVATE

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Stellenbosch
7599
South Africa

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Fax : +27 21 888 2473
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Position in Firm: Junior Environmental Assessment Practitioner (305759)
Full Name: Marivate, Rirhandzu Anna
Specialisation: Environmental & Ecological Science
Professional Registration: Cand. Sci. Nat. Environmental Sciences – Reg Number: 100147/14
Date of Birth: 23 February 1989
Nationality: South African

BIOSKETCH

Rirhandzu holds a Bachelor degree in Zoology & Geology, Honours in Ecology, Environment and Conservation from the University of the Witwatersrand; and has environmental research experience with the University of Cape Town. The research focus has been within the domain of socioecology, looking at investigating local ecological knowledge of stakeholders on the provisioning of freshwater resources and its impacts on the management for of the Berg river in the Western Cape, South Africa. The research looked at how perception on resource utilisation affects management priorities, and creating a matrix of perceptions would be used a tool for better decision making within the Berg River Catchment Management Areas. Rirhandzu is currently studying towards her Master in Philosophy in Sustainable Development at the University of Stellenbosch. Here current research interest is looking at environmental planning and management within municipalities and how to optimise green spaces by including ecosystem goods and services to build resilience within those municipalities.

Since 2014, Rirhandzu has worked at the Council for Scientific and Industrial Research (CSIR) as an Environmental Assessment Practitioner (EAP) Intern within the Environmental Management Services (EMS) group, and from 2015 as a Junior Environmental Practitioner for the same group. Her duties include Assistance to other EAPs within EMS in their projects; Research in environmental assessment topics (e.g. indications, best practice, legislation); Report writing and project management; Participating in various forms of environmental assessments (BAs, EIAs, SEAs); consultation with stakeholders and public meetings; and Project administration (e.g. contracting and invoicing). She is particularly involved with the Special Needs and Skills Development (SNSD) Programme, which looks at assisting Community Trusts, Small, Micro to Medium Enterprises, with environmental services. She has also been involved with the Monitoring and Evaluation of the National Strategy for Sustainable Development by the Department of Environmental Affairs (DEA). Rirhandzu has established good client relationships and partnerships with the Land Bank, Department of Agriculture, Forestry and Fisheries (DAFF), and Department of Mineral Resources (DMR) through the SNSD Programme. She is involved as a stakeholder in the continuous consultations for the Development of Environmental Indices in response to the National Development Plan (NDP), led by the DEA.

EXPERIENCE

Completion Date	Project description	Role	Client
2014 (in progress)	**Special Needs and Skills Development Programme:** Programme management and conducting of Basic Assessments for disadvantaged communities/businesses/enterprises	**Project Manager;** Stakeholder Co-ordination; Project Support; Mentorship; Ecological Input	National Department of Environmental Affairs (DEA), South Africa
2013- 2014	**Monitoring and Evaluation** for the National Strategy for Sustainable Development and Action Plan.	**Project Member;** Stakeholder engagement, Researcher, Report Writing	National Department of Environmental Affairs (DEA), South Africa
2013-2015	**Strategic Environmental Assessment (SEA)** for wind and solar PV energy in South Africa.	Data Management	National Department of Environmental Affairs (DEA), South Africa
2014-2016	**Strategic Environmental Assessment (SEA)** for Electricity Grid Infrastructure (EGI).	Stakeholder Engagement	National Department of Environmental Affairs (DEA), South Africa

Completion Date	Project description	Role	Client
2014	**Screening Study (SS)** for the Development of Biochar and Composting Facilities to support land restoration near the proposed Ntambelanga Dam, Umzimvubu Catchment, Eastern Cape**.**	**Project Manager,** Project Research & Report Writing	National Department of Environmental Affairs (DEA), South Africa
2015	**Environmental Screening Study (ESS)** for projects undertaken in the Amatikulu Aquaculture Development Zone, KwaZulu-Natal.	**Project Manager,** Project Research & Report Writing	National Department of Agriculture, Forestry & Fisheries (DAFF), S Africa
2015-2016	**Development of Sustainability Indicators** for the National Integrated State of the Environment Report for Namibia.	**Project Manager**, Project Research & Report Writing	Ministry of Environment and Tourism (MET), Namibia
2016	**Basic Assessment** for the development of a 5.5ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.	**Project Manager**	Mokate Estates (Pty) Ltd
2016	**Basic Assessment** for the development of a 0.6 hectare Chicken Layer Facility on a 7.8 hectare farm in Mashau-Bodwe Village, Makhado District, Limpopo.	**Project Manager**	Wanga Poultry (Pty) Ltd
2016	**Sustainable Development Appraisal for Gold Standard** on a microprogramme of the NOVA Brickstar Wood Stove in the Mahlaba Area, Limpopo.	**Project Member**, Project Researcher, Translator	Gold Standard Foundation
2017 (In Progress)	**Sustainable Development Goal Lab** on "Mainstreaming resilience into climate change adaptation and disaster risk planning."	**Project Member**	Future Earth; Stockholm Resilience Centre; University of Tokyo
2017 (In progress)	**Basic Assessment** for the proposed development of a leisure and cultural village on Farm Moiloa 412-JO, Dinokana Village, North West.	**Project Manager**	Makadima Leisure & Cultural Village 101 (Pty) Ltd
2017 (In progress)	**Basic Assessment** for the expansion of a Chicken Layer Facility on a 4.4 hectare farm on plot 226 Withok Estate, Brakpan, Ekurhuleni District, Gauteng	**Project Manager**	Lewin AgriBusiness (Pty) Ltd
2017 (In progress)	**Basic Assessment** for the expansion of a Chicken Broiler Facility on a 2.57 hectare farm on plot 62, Mapleton, Ekurhuleni District, Gauteng.	**Project Manager**	Mthunzi Chicken Supplier (Pty) Ltd

PAST EMPLOYMENT RECORD

- **2014-2015** CSIR Environmental Management Services (EMS) Environmental Scientist and Assessment Practitioner (Intern).
- **2011-2013** UCT Environmental & Geographical Science Department (N Methner; K Vickery) Researcher & Teaching Assistant
- **2010** WITS School of Animal Plant & Environmental Sciences (Prof K Balkwill) Teaching Assistant.
- **2009** ESKOM Generation Environmental Management (D Herbst) Environmental Officer (Intern).
- **2009** WITS School of Geosciences (Dr G Drennan; Dr M Evans) Teaching & Field Assistant.
- **2008** WITS School of Animal Plant & Environmental Sciences (T Gardiner; Dr W Twine) Environmental Control & Field Assistant.
- **2008** Jane Goodall Institute (Dr L Duncan) Field Assistant.

QUALIFICATIONS

- **2010 University of the Witwatersrand (Wits) BSc Honours (Ecology, Environment and Conservation)**
  Coursework: Approaches to Science, Experimental Design and Biostatistics, Introduction to Statistics Computer programme R, Introduction to Geographic Information Systems, Global Change: Impact on Soils, Plants and the Environment, Ecological Engineering and Phytoremediation, Ethnoecology.
  Thesis: Species Composition and Population Structure of Trees Protected in Cultivated Fields of Rural Villages in the Bushbuckridge Region, Mpumalanga Province (Supervisors: Dr Wayne Twine, Prof Ed Witkowski)
- **2006 – 2009 University of the Witwatersrand (Wits) BSc (Zoology & Ecology)**
  Senior Courses: Research Report Writing; Exploration and Environmental Geochemistry; Introduction to Palaeoclimatology; Environmental Geomorphology; Diversity, Ecology and Economic Importance of Algae; Functional Ecology in Changing Environments; Ecological Communities and Biodiversity Conservation; Structural Geology; Igneous Petrology; Physics of the Earth and Plate Tectonics; Ore Petrology and Mineralisation Processes

SHORT-COURSES, CONFERENCES AND WORKSHOPS

- 2017 Ecosystem-Based Adaptation: Developing Capacity for Implementation, SANBI, Pretoria National Botanical Gardens, June 2017.
- 2015 Practical Adaptation for vulnerable communities by Adaptation Network, Kirstenbosch Botanical Gardens, Cape Town, August 2015.
- 2015 International Association for Impact Assessors South Africa (IAIAsa) National Annual Conference, August 2016, KZN.
- 2015 Sharpening the Tool: New Techniques & Methods in Environmental Impact Assessments, SE Solutions, Stellenbosch, Western Cape
- 2014 CiLLA Project Management I Course on July 2014 at CSIR Stellenbosch
- 2014 International Association for Impact Assessors South Africa (IAIAsa) Air Quality Management (AQM) Workshop on June 2014 in Western Cape
- 2014 South African Environmental Observation Network (SAEON) Graduate Student Network (GSN) Annual Conference September 2014, Eastern Cape.
- 2014 IAIAsa National Conference from August 2014 at Midrand, Gauteng
- 2014 African Student Energy (ASE) Annual Summit Cape Peninsula University of Technology June 2014, Western Cape
- 2014 International Association for Impact Association South Africa (IAIAsa) New National Environmental Management Act (NEMA) regulations March 2014 Western Cape
- 2014 Applied Centre for Climate and Earth Systems Sciences (ACCESS) facilitation for teacher training January 2014,WC.
- 2012 International Conference for Freshwater Governance for Sustainable Development November 2012, KwaZulu-Natal
- 2012 Society of South African Geographers (SSAG) Annual Conference at University of Cape Town June 2012, Western Cape
- 2011 Applied Centre for Climate and Earth System Sciences (ACCESS) teacher training, Western Cape
- 2011 BlueBuck Environmental Network Annual Summit at Rhodes University, Eastern Cape
- 2010 Biodiversity and People Mini-Symposium, University of the Witwatersrand, October 2010, Mpumalanga

LANGUAGES

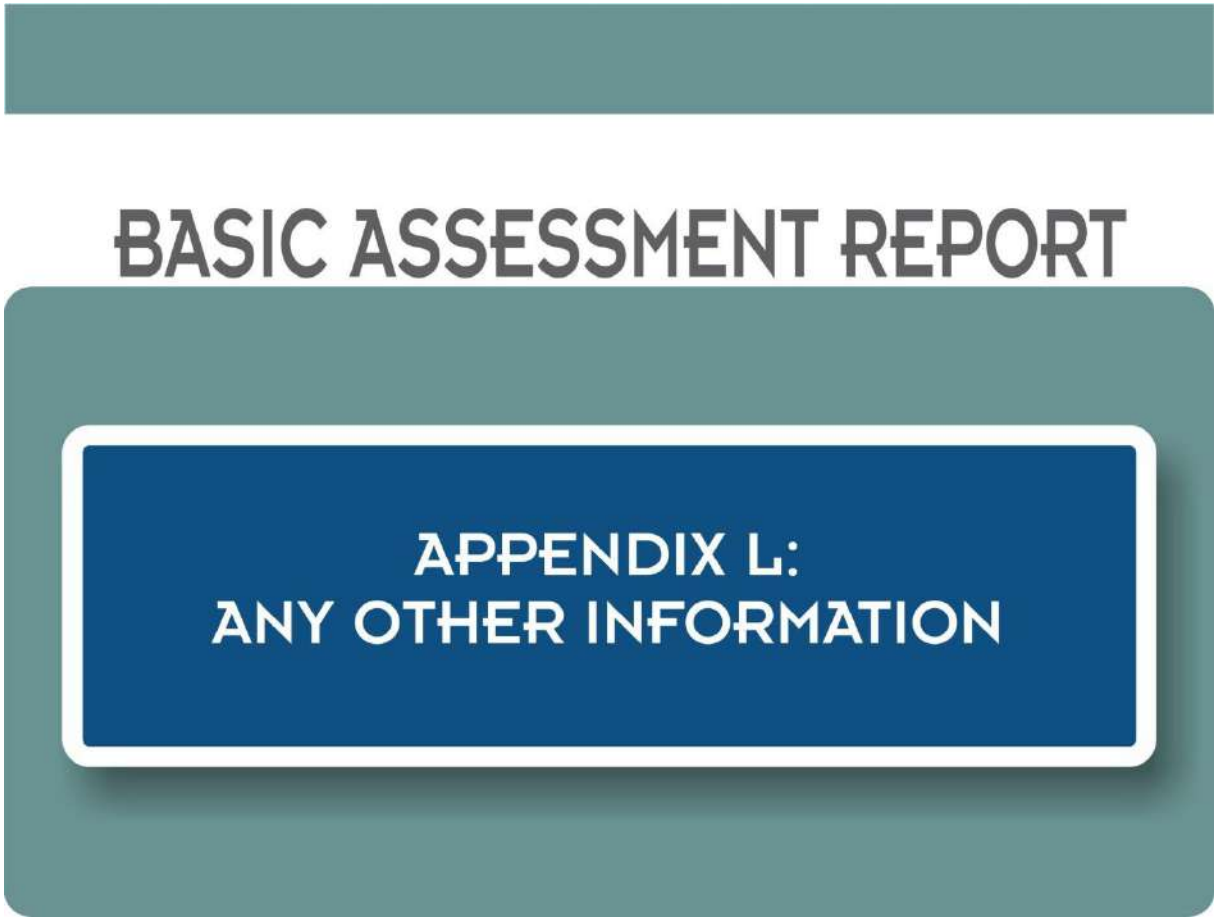
	Speaking	Reading	Writing
Setswana	Excellent	Excellent	Excellent
Xitsonga	Excellent	Excellent	Excellent
English	Excellent	Excellent	Excellent

PROFESSIONAL REGISTRATIONS

- IAIA: Member of International Association of Impact Assessment South Africa (IAIAsa) since 5 February 2014.
- SACNASP: Registered as Candidate Natural Scientist with South African Council for Natural Scientific Professions (SACNASP) since July 2014. Registration number: 100147/14

Rirhandzu Marivate

April 2018

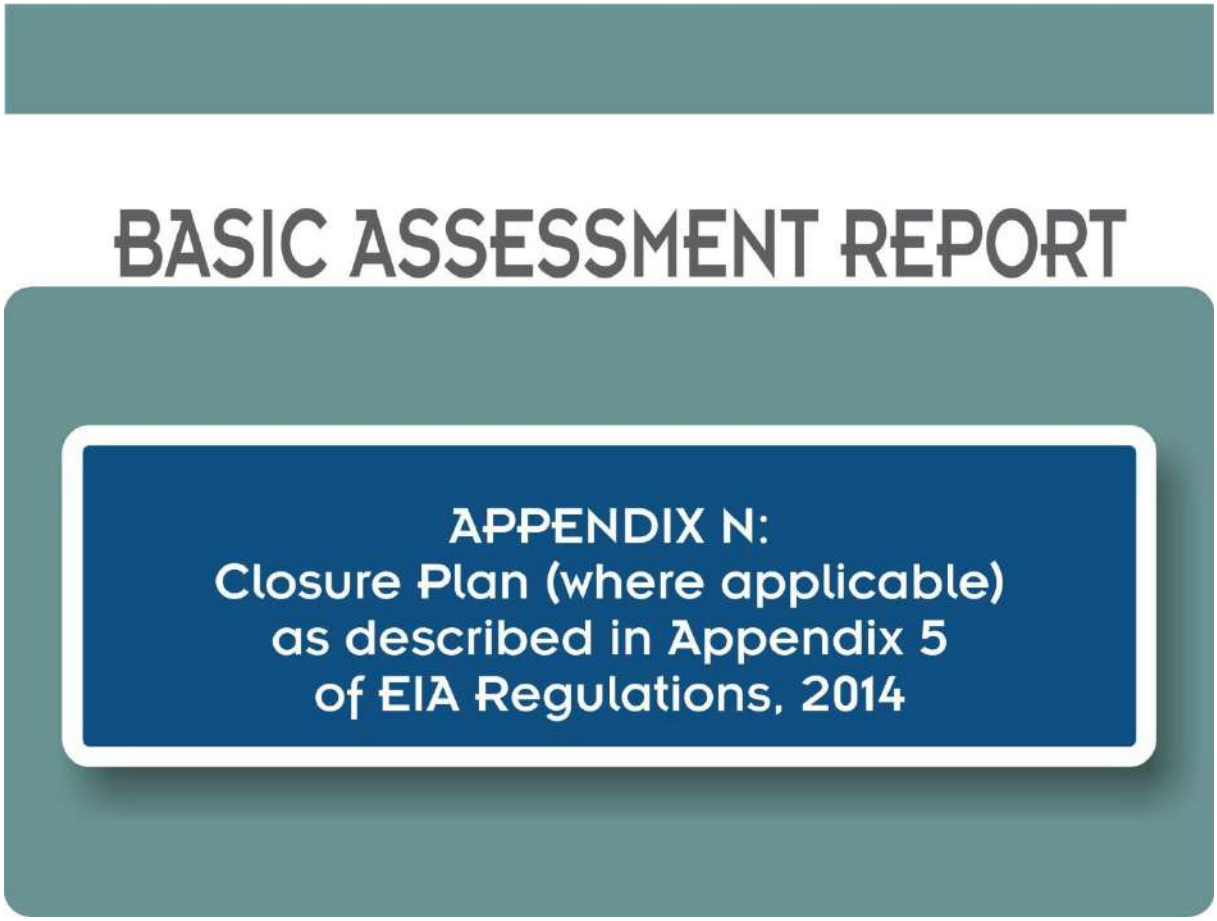


N/A

BASIC ASSESSMENT REPORT

APPENDIX M:
Financial Provision (if applicable)

N/A.


BASIC ASSESSMENT REPORT
APPENDIX N:
Closure Plan (where applicable)
as described in Appendix 5
of EIA Regulations, 2014

N/A.