Basic Assessment for the development of a 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.

Client: Mokate Estates (Pty) Ltd
Reference: CSIR/CAS/EMS/IR/2016/0001/A

FINAL BASIC ASSESSMENT REPORT

CSIR
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November 2016

Basic Assessment Process

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

BASIC ASSESSMENT REPORT

DARDLEA Reference Number: **1/3/1/16/1N-69**
CSIR Report Number: CSIR/CAS/EMS/IR/2016/0001/A

November 2016

Prepared for:
Mokate Estates (Pty) Ltd

Prepared by:
CSIR
P O Box 320, Stellenbosch, 7599
Tel: +27 21 888 2432
Fax: +27 21 888 2473

Lead Authors:
Rirhandzu Marivate (Cand. Sci. Nat)

Reviewed by:
Minnelise Levendal

report details

Title:	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.
Purpose of this report:	This Basic Assessment (BA) Report forms part of a series of reports and information sources that are being provided during the BA Process for the 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. 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 BA Report is being made available to all Interested and Affected Parties (I&APs) and stakeholders for a 30-day review period. All comments submitted during the review of the BA Report will be incorporated into the finalised BA Report as applicable and where necessary. This finalised BA Report will then be submitted to the National Department of Environmental Affairs (DEA) for decision-making.
Prepared for:	Mokate Estates (Pty) Ltd
Prepared by:	CSIR P O Box 320, Stellenbosch, 7599 Tel: +27 21 888 2432 Fax: +27 21 888 2473
Authors:	Rirhandzu Marivate (Cand. Sci. Nat) and Minnelise Levendal
CSIR Report Number: CSIR Project Number:	CSIR/CAS/EMS/IR/2016/0001/A CSIR/CAS/EMS/IR/2016/0001/A
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To be cited as:	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

opportunity for review

Opportunity for Review:

The Final Basic Assessment Report and Draft Environmental Management Programme (EMPr) were made available to all Interested and Affected Parties (I&APs) and stakeholders for a 30-day review period extending from 8th September 2016 to 10th October 2016. All comments received during the review of the Draft Basic Assessment Report will be incorporated into the Final Basic Assessment Report and EMPr which will be submitted to the Gauteng Department of Mpumalanga Department of Agriculture, Rural Development, Land & Environmental Affairs (DARDLEA) for decision-making.

All comments on the Draft Basic Assessment Report and Draft EMPr are to be submitted to the CSIR by 10 October 2016 at the details provided below.

EAP – Rirhandzu Marivate (Cand. Sci. Nat)

Council for Scientific and Industrial Research (CSIR)
Postal Address: P. O. Box 320, Stellenbosch, 7599
Phone: 021 888 2432
Fax: 021 888 2693
Email: rmarivate@csir.co.za

contents

appendices

APPENDIX A:	Site plan(s)
APPENDIX B:	Site photographs
APPENDIX C:	Maps and facility illustration(s)
APPENDIX D:	Public Participation information • D1: Proof of site notice • D2: Written Notices to Neighbouring Landowners and I&APs • D3: Proof of newspaper advertisements • D4: Comments and Responses Report
APPENDIX E:	Environmental Management Programme
APPENDIX F:	Specialist Studies • F1: Freshwater Impact Assessment • F2: Terrestrial Ecology Impact Assessment
APPENDIX G:	Other items: • G1: Comments from SAHRA • G2: Exemption Letter from Heritage Specialist • C3: Comments from SANCO
APPENDIX H:	CVs of Project Team: • H1: Minnelise Levendal (Project Leader) • H2: Rirhandzu Marivate (Project Manager)

tables

figures

executive summary

The Council for Scientific and Industrial Research (CSIR), Environmental Management Services (EMS), has been appointed as the Environmental Assessment Practitioners (EAPs) to assist Mokate Estates (Pty) Ltd by conducting a Basic Assessment (BA) for their proposed piggery production and chicken broiler facility. This appointment is through the Department of Environmental Affairs (DEA) Special Needs and Skills Development Programme (SNSD). The SNSD aims to provide pro bono Environmental Impact Assessments(EIAs) for people who are classified as special needs clients/applicants, specifically Small, Medium to Micro Enterprises(SMMEs), community trusts, individuals and some government programmes.

Mokate Estates (Pty) Ltd is proposing to establish a start-up enterprise comprising of a commercial pig production facility and chicken broiler near Delmas, Mpumalanga. The start-up enterprise plans to build 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on a 328 hectare farm. The property is currently occupied. The current occupants use the location as a cattle and sheep feedlot with the livestock both being housed on site.

The proposed piggery production and chicken broiler facilities triggered the need for an Environmental Authorisation (EA) through a Basic Assessment (BA) Process. Furthermore the property is an area that has organisms of Conservation Importance.

The BA follows the legislative process that is prescribed in the Environmental Impact Assessment (EIA) Regulations of 2014. This report constitutes the Final Basic Assessment Report (fBAR) that details the environmental outcomes, impacts and residual risks of the proposed activities. The report aims to assess the key environmental issues and impacts associated with the development, and to document the Interested and Affected Parties' (I&APs) issues and concerns. It also provides background information of the proposed project, a motivation and details of the proposed project, and describes the public participation undertaken to date.

The objective of this report is to provide the project's I&APs, stakeholders, commenting authorities and the competent authority (CA), with a thorough project description and BA process description. The outcome of the process is to engender productive comment or input, based on all information generated to date and presented herein.

In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of significant portions of environmental legislation that were taken into consideration during this study and are elaborated on in this report.

The Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) is the competent authority for this BA process and the development needs to be authorised by this Department.

This Final BAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed construction and operations of the piggery production and chicken broiler facility. Having duly considered the project, in the opinion of the Environmental Assessment Practitioner (EAP), the project does not pose a detrimental impact on the receiving environment and its inhabitants. The impacts that have been highlighted through the impact assessment can be mitigated significantly with the use of an Environmental Management Programme (EMP). The applicant should be bound to stringent conditions to maintain compliance and responsible executions of the project.

The impacts identified and assessed by way of risk ratings, have been extensively outlined in this report. The fBAR will be made available for viewing by the public and review by competent authority. The final cBAR will, together with a comprehensive issues trail and the final EMPr, and all the addenda as referred to, will be submitted to the Mpumalanga DARDLEA, for decision making. The final BAR will thus be a culmination of scientific specialist studies' finding, public contribution via formal comment, and the drawing of conclusions by the EAP as the environmental specialist.

Summary of where requirement of Appendix 1 (3) of the 2014 NEMA EIA Regulations (GN R 982, 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	**Yes**	Appendix G, Annexure 3
ii. the expertise of the EAP, including a curriculum vitae;	**Yes**	Appendix G, Annexure 3
(b) the location of the activity, including i) the 21 digit Surveyor General code of each cadastral land parcel;	**Yes**	Section 1
(ii) where available, the physical address and farm name;	**Yes**	Section 1
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	**Yes**	Section 1
(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;	**Yes**	Section 1
(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;	**Yes**	Section 2, 3
(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 frameworks, and instruments	**Yes**	Section 2

APPENDIX 1 OF THE REGULATIONS	YES / NO	SECTION IN BAR
(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	**Yes**	Section 3
(g) a motivation for the preferred site, activity and technology alternative;	**Yes**	Section 1
(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 activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	**Yes**	Section 1
(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- (ii) a description of all environmental issues and risks that were identified during the environmental	**Yes**	Section 8

APPENDIX 1 OF THE REGULATIONS	YES / NO	SECTION IN BAR
impact assessment process; and (iii) 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;		
(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;	**Yes**	Section 8; Appendix F
(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;	**Yes**	Section 8; Appendix E
(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;	**Yes**	Section 8
(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;	**Yes**	Section E5
(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;	**Yes**	Section 9; Appendix E
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	**Yes**	Section 9
(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;	**Yes**	Section 9

APPENDIX 1 OF THE REGULATIONS	YES / NO	SECTION IN BAR
(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 l&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	**Yes**	Section 9; Appendix D
(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

glossary

BA	Basic Assessment
BAR	Basic Assessment Report
BEE	Black Economic Empowerment
BID	Background Information Document
CA	Competent Authority
cBAR	Consultation Basic Assessment Report
CI	Conservation Important
CSIR	Council for Scientific and Industrial Research
CV	Curriculum Vitae
DAFF	Department of Agriculture, Fisheries and Forestry
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs (Mpumalanga)
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EMS	Environmental Management Services
EO	Environmental Officer
GA	General Authorisation
GIS	Geographic Information System
GNR	Government Notice Number
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IU	Implementation Unit
IWULA	Integrated Water Use Licence Application
MAR	Mean Annual Run-off
MASL	Meter Above Sea Level
MSL	Mean Sea Level
NBA	National Biodiversity Assessment
NBSAP	National Biodiversity Strategy and Action Plans
NEMA	National Environmental Management Act (Act No 107 of 1998)

NEM:AQA	National Environmental Management Air Quality Act (Act No 39 of 2004)
NEM:BA	National Environmental Management Biodiversity Act (Act No 10 of 2004)
NEM:PAA	National Environmental Management Protected Areas Act (Act No 57 of 2003)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NFA	National Forests Act (Act No. 84 of 1998)
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NSS	Natural Scientific Services
NWA	National Water Act (Act No. 36 of 1998)
OHSA	Occupational Health and Safety Act (Act No 85 of 1993)
PES	Present Ecological State
PPE	Personnel Protective Equipment
PPP	Public Participation Process
ROW	Right of Way
SACNASP	South African Council of Natural Science Professionals
SAHRA	South African Heritage Resource Agency
SANRAL	South African National Roads Agency Limited
SAPPO	South African Pork Producers Organisation
SAS	Scientific Aquatic Services
SEA	Strategic Environmental Assessment
SEMA	Suite of Environmental Management Acts
SMME	Small, Medium to Micro Enterprise
SNSD	Special Needs and Skills Development Programme
SWMP	Stormwater Management Plan
WUL	Water Use Licence

Activity	An action either planned or existing that may result in environmental impacts through pollution or resource use. For the purpose of this report, the terms 'activity' and 'development' are freely interchanged.
Alternatives	Different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity. *Note: There are no project alternatives for this development.*
Applicant	The project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.
Biodiversity	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.
Buffer	A buffer is seen as an area that protects adjacent communities from unfavourable conditions. A buffer is usually an artificially imposed zone included in a management plan.
Construction	The building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.
Cumulative Impact	The impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
Decommissioning	The demolition of a building, facility, structure or infrastructure.
Direct Impact	Impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.
Ecological Reserve	The water that is necessary to protect the water ecosystems of the water resource. It must be safeguarded and not used for other purposes. The Ecological Reserve specifies both the quantity and quality of water that must be left in the national water resource. The Ecological Reserve is determined for all major water resources in the different water management areas to ensure sustainable development.
Ecosystem	A dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.
Environment	In terms of the National Environmental Management Act (NEMA) (Act No 107 of 1998) (as amended), "Environment" means the surroundings within which humans exist and that are made up of: i. the land, water and atmosphere of the earth; ii. micro-organisms, plants and animal life; iii. any part or combination of (i) and (ii), and the interrelationships among and between them; and iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Assessment	The generic term for all forms of environmental assessment for projects, plans, programmes or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.
Environmental Authorisation	An authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.
Environmental Assessment Practitioner (EAP)	The individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental

1. INTRODUCTION

1.1. Background

Mokate Estates (Pty) Ltd (hereforth Mokate Estates) is a start-up commercial pig production and chicken broiler enterprise founded by Thamsanqa Sydney Mokate and was registered in July 2013 with the Companies Intellectual Property Commission (CIPC) of the Department of Trade and Industry in South Africa (company registration number: 2013/114133/07). Mokate Estates offices and Production Operations will be based on a 328 hectare farm situated on the border of Bapsfontein (Gauteng and Delmas (Mpumalanga).

The Council for Scientific and Industrial Research (CSIR), Environmental Management Services (EMS), has been appointed as the Environmental Assessment Practitioners (EAPs) for the proposed development which will be conducting a Basic Assessment (BA). This appointment is through the Department of Environmental Affairs (DEA) Special Needs and Skills Development Programme (SNSD). The SNSD aims to provide pro bono Environmental Impact Assessments(EIAs) for people who are classified as special needs clients/applicants, specifically Small, Medium to Micro Enterprises(SMMEs), community trusts, individuals and some government programmes.

The need for a BA arises for the proposed development as it triggers listed activities in terms of the Environmental Impact Assessment (EIA) Regulations, Government Regulations (GNR) 983 and 985 of December 2014 promulgated under the National Environmental Management Act (NEMA) (Act no 107 of 1998).

Mokate Estates' development is located on farm Rietvalei, portion 1 and 6, in Bapsfontein near Delmas, Mpumalanga (**Figure 1.1**), (26° 4' 27.34" S; 28° 34' 25.60"E). Mokate Estates has seen an opportunity in the pork and poultry industry in South Africa, as there has been and increasing demand since 2007. The demand for pork and poultry meat continues to escalate, which allows Mokate Estates to realistically gain substantial milestones in the domestic market.

In addition, Mokates Estates will initially provide full-time employment to 10 people from the surrounding local communities of Delmas in Mpumalanga, Kwa-Thema (Springs) and Daveyton (Benoni) in Gauteng, of which 7 will be women. In terms of capacity building, the employees will be trained in pig production and gain qualifications of NQF Level 1 and 2. They will also be given exposure in the fields of business, operations, finance, human resources and farm management. The enterprise could be a huge economic benefit to the viability of the pork and poultry industry in general and to the local community.

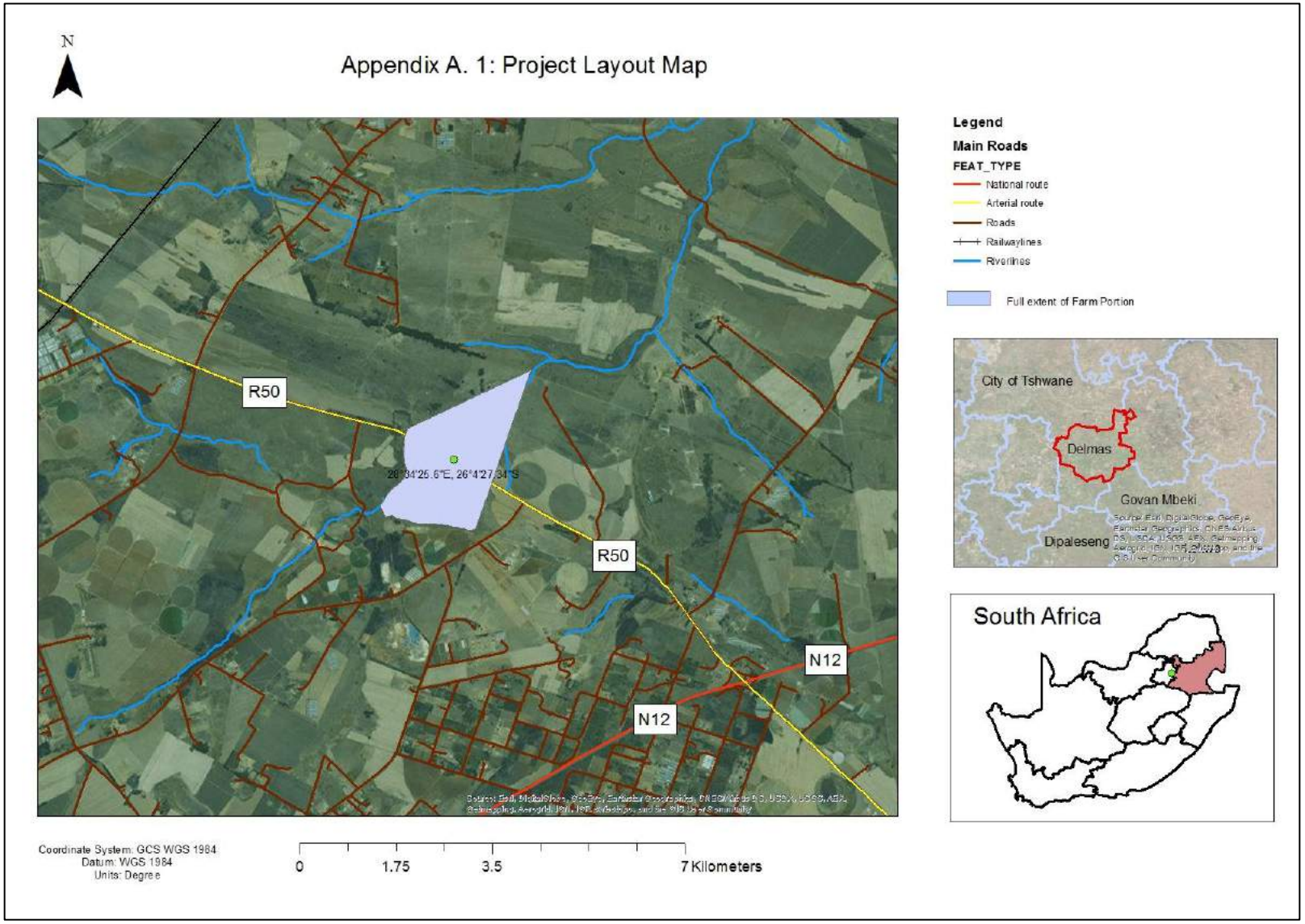


Figure 1.1: Map indicating the Location of Mokate Estates, in Bapsfontein near Delmas, Mpumalanga.

1.1.1. Project Description and Development Phases

Mokate Estates is proposing to establish a start-up enterprise comprising of a commercial pig production facility and chicken broiler near Delmas, Mpumalanga. The start-up enterprise plans to construct a pig production and chicken broiler facility comprising 5.5 ha and 2.5 ha respectively.. The start-up enterprise plans to produce pigs for slaughter in commercial quantities of 372 pigs per week and an initial 480 600 broiler chickens per cycle.

The proposed project is located on Portion 1 and 6 of Farm Rietvalei near Delmas, Mpumalanga. The property comprises 328 hectare and contains a borehole, which pumps approximately 8 000 litres of water per hour. The water from the borehole will be used for household needs.

Mokate Estates plans a phased development. The phases for the pig production and chicken broiler facilities are described in the following section. The initial project development and future expansion are set up in order to accommodate capital growth. Mokate Estates envisions making a positive gross income within the first two years, the money generated will be put back into the business in order to complete the expansion. The initial capital will be used for the development of phase 1 of both the piggery production and chicken broiler facilities. Phase 2 & 3 of the piggery production facility and phase 2 of the chicken broiler facility will then be built, followed by the phase 3 of the chicken broiler facility.

Piggery Production Facility

The Piggery production facility will comprise of three phases of construction. Phase 1 will be developed first, while phase 2 and phase 3 will be constructed concurrently. Phase one consist of the construction of a Dry Sow House, a Farrowing House, a Weaner House, three Grower/Finisher Houses and a Gilt House. Phase 1 will also be accompanied by the construction of a Waste Storage Facility (a concrete effluent holding tank) and a Pig feeding Mill.

Phase 2 & 3 will include the construction of two additional Dry Sow Houses, Farrow Houses, Weaner Houses and six additional Grower/Finisher Houses.

Chicken Broiler Facility

The chicken broiler facility also consists of three phases of construction. Each phase will include the construction of four chicken houses; at the end there will be a total of twelve chicken houses which have feeding silos

1.1.2. Proposed Development

Mokate Estate plans to construct a 5.5 hectare pig production facility and a 2.5 hectare chicken broiler facility with accompanying auxiliary infrastructure. The project development details are as follows:
Construction of:

- **Pig production facility consisting of:**
  - 3 x Dry Sow House, with a footprint of 675 square metres;
  - 1 x Gilt House, with a footprint of 252 square metres;
  - 3 x Farrow Houses, with footprint of 780 square metres;
  - 3 x Weaner Houses, with a footprint of 520.8 square metres; and
  - 9 x Grower/Finisher Houses, with a footprint of 135 square metres.
  - 1 x Main Office Building, with a footprint of 135 square metres;
  - 1 x Electricity Standby Generator/ Workshop Building, with a footprint of 121.5 square metres;
  - 1 x Workers Showers/ Kitchen & Canteen Building with a footprint of 121. 5 square metres;
  - 1 x Pig Delivery Truck Washing Bay Building, with a footprint of 300 square metres;
  - 1 x Pig Feed Milling & Mixing Plant Building, with a footprint of 900 square metres;
  - 18 x Feed silos;
  - 1 x 100kVa Stand by Electricity Generator;
  - 1 x Concrete effluent (slurry) holding tank (Installed under the truck washing bay building);
  - 1 x Concrete filtrate (liquid) holding tank (Installed under truck washing bay building); Waste: pigs 2 x 7000 m2 effluent tanks.
  - 1 x Opti-press II (effluent screw press) to separate effluent from holding tank;
  - Water storage units to capture rainfall on the roofs of the buildings;
  - Drinking water storage tanks;
  - 1 x Gas storage facility to accommodate 5000kg LPG for heating; and
  - 1x 24m Klerk Scale weighbridge of 80 tonne capacity.

- **Chicken broiler Facility consisting of:**
  - 12 x environmentally controlled houses with a footprint of 1 845 square metres each;
  - 1 x 100kVa Standby Generator;
  - 12 x flat concrete slabs covering 120m x 15m per structure;
  - 2 x feed silos;
  - 1 x Building with additional storage facility for chemicals, control room and wash room;
  - 1 x Drinking-water storage tanks;
  - 1 x Gas storage facility to accommodate 5000 kg LPG for heating; and
  - 1 x 24 m Klerk Scale weighbridge of 80 tonne capacity.

1.1.3. Alternatives

The Department of Environmental Affairs (DEA) commissioned the Council for Scientific and Industrial Research (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 Mokate Estates under the SNSD Programme. The CSIR identified Mokate Estates 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.

Mokate Estate (Pty) Ltd is a 100% black owned entity supported by government funding through the Land Bank. The Land Bank offers support to previously disadvantaged individuals who do not have the startup capital to launch their own enterprise. Thus, the site which is being investigated in this report is the only site available to this entity. However, the project layout has been considered and was carefully informed by the findings of the Specialist Studies as described in the impact assessment section of the report **(Section 7).**

1.1.3.1. Alternative Layout

The alternative layout was the original layout that was submitted by the applicant. The layout was also used as a reference for the Specialist Studies and the findings of the Impact Assessment are informed by this layout. Piggery Phase 1, Poultry Phase 1 and proposed Waste Management site were found to fall within the freshwater buffer zones, and may have required a Water Use Licence (WUL).

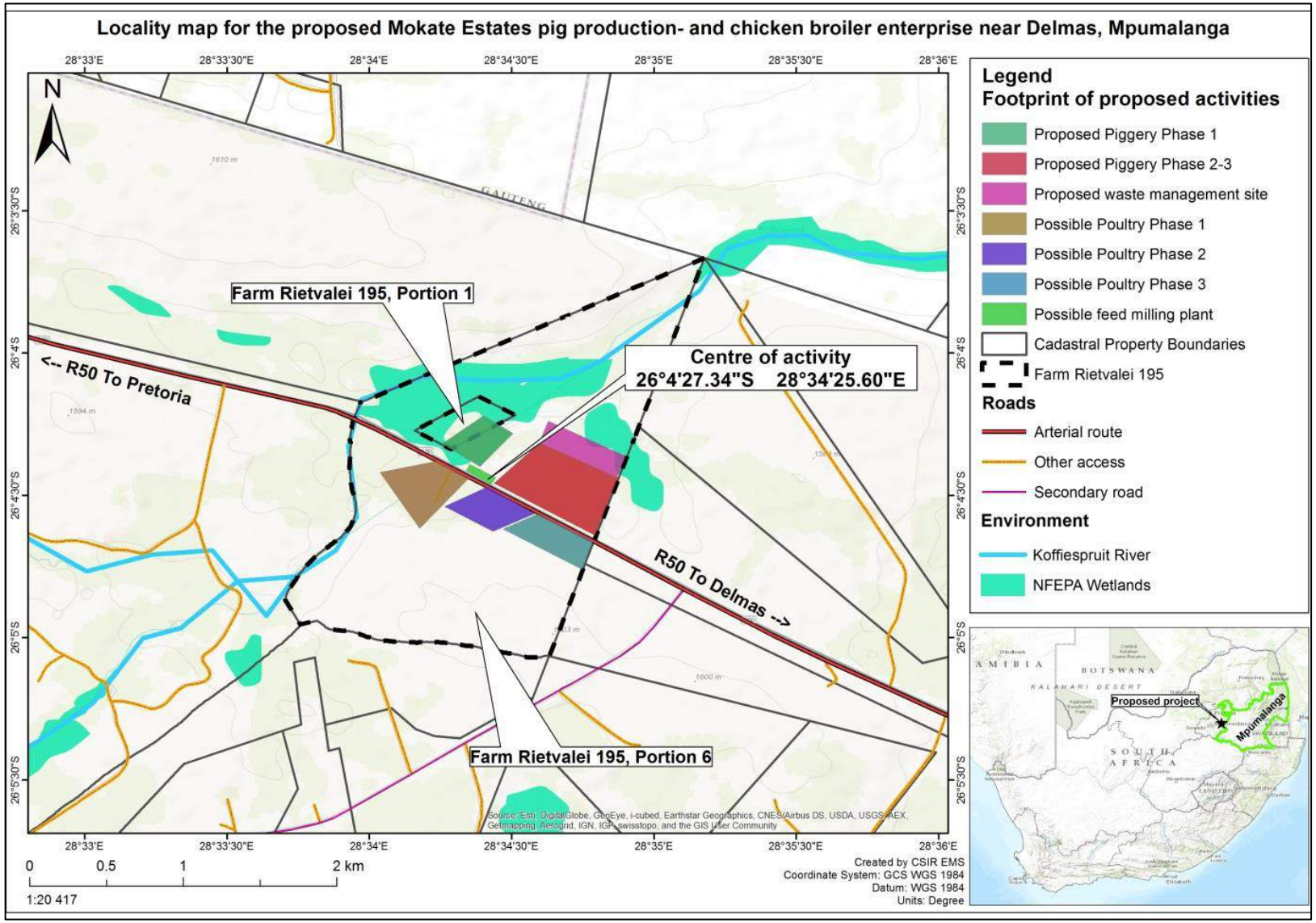


Figure 1.2: Alternative layout for the Pig production and Chicken Broiler Facilities.

1.1.3.2. Preferred Layout

The preferred layout is the result of the findings from the impact assessment for this project, from the original layout (Alternative Layout). The layout of the proposed Piggery Phase 1, Poultry Phase 1 and proposed Waste Management site were altered in order to meet the impact assessment requirements (especially the freshwater requirements). The three altered infrastructure avoid the freshwater buffer zones, furthermore they have been carefully informed by the findings of the impact assessment, so as to avoid removing too many species of special concern.

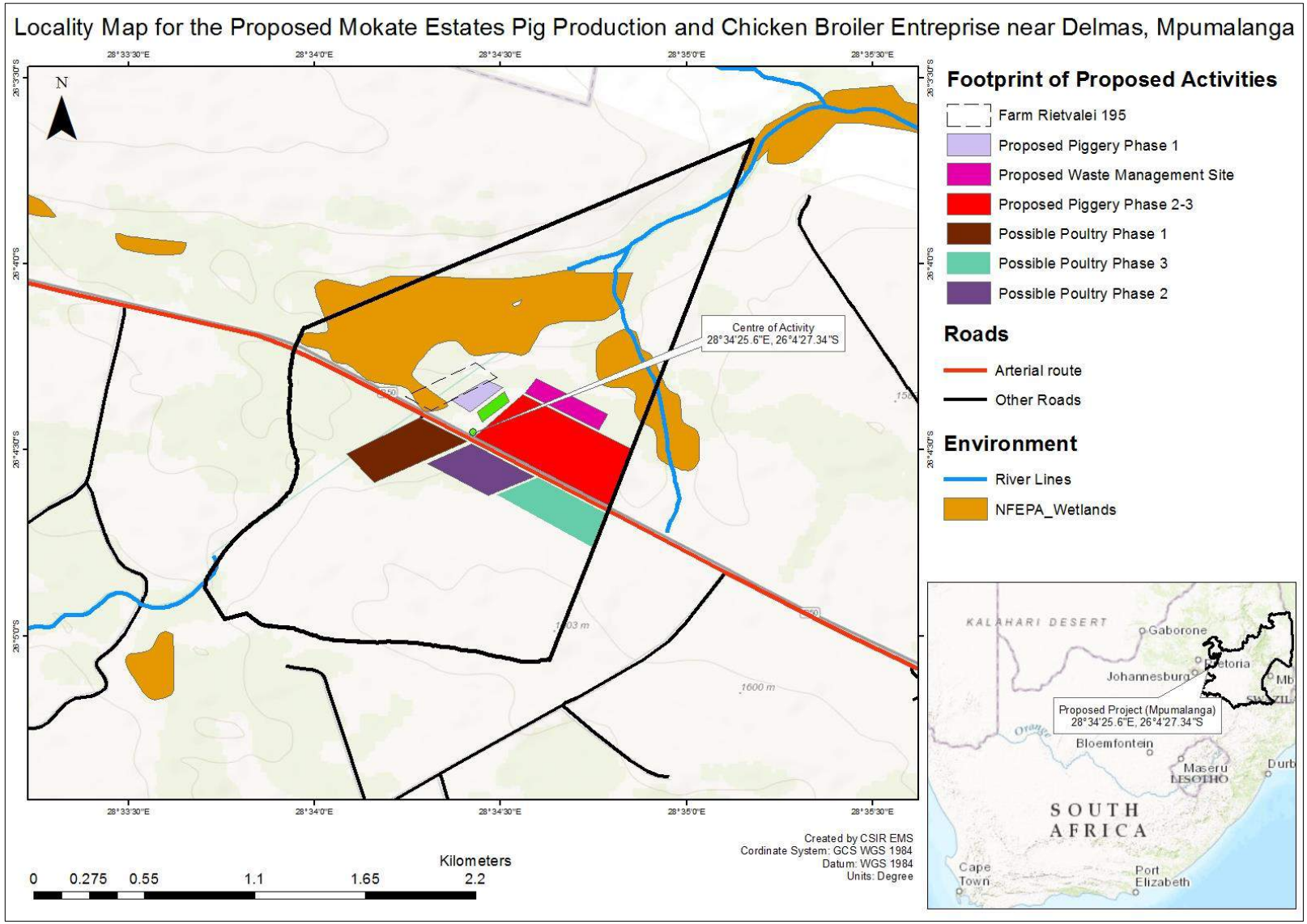


Figure 1.3: Prefered layout for the Pig production and Chicken Broiler Facilities.

1.2. Objectives of Study

The BA for Mokate Estates aims to achieve the following:

- Conduct a consultative process
- Determine the policy and legislative context within which the proposed activity is undertaken and how the activity complies with and responds to the policy and legislative context.
- Describe the need and desirability of the proposed alternatives.
- Undertake an impact and risk assessment process inclusive of cumulative impacts (where applicable). The focus will include- determine the geographical, physical, and biological sensitivity of the sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine the nature, significance, consequence, extent, duration, and probability of the impacts occurring to, and the degree to which these impacts can be reversed, may cause irreplaceable loss of resources, and can be avoided, managed or mitigated.

1.3. Approach to the Study

1.3.1. Application for Environmental Authorisation

An Application for EA was submitted to the Mpumalanga DARDALEA on 9th September 2016.

1.3.2. Basic Assessment Report

This Basic Assessment Report(BAR) has been compiled in accordance with the stipulated requirements in GNR 982 Appendix 1 of the EIA Regulations of 2014, which outlines the legislative BA process and requirements for assessment of outcomes, impacts and residual risks of the proposed development. The BAR further incorporates the findings and recommendations of the specialist studies conducted for the project.

1.3.3. Environmental Management Programme

An Environmental Management Programme report (EMPr) has been compiled according to Appendix 4 of the GNR 982 of the EIA Regulations (2014) for the construction, operational and decommissioning phases of the project.

The EMPr has been compiled as a stand-alone document from the BAR and will be submitted to the Mpumalanga DARDALEA along with the BAR. The EMPr provides the actions for the management of identifies environmental impacts emanating from the project and a detailed outline of the implementation programme to minimise and/or eliminate any anticipated negative environmental impacts and to enhance positive impacts. The EMPr provides strategies to be used to address the roles and responsibilities of environmental management personnel on site, and a framework for environmental compliance and monitoring.

The EMPr includes the following:

- Details of the person who prepared the EMPr and the expertise of the person to prepare an EMPr;
- Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in the BAR, including environmental impacts or objectives in respect of operation or undertaking of the activities, rehabilitation of the environment and closure where relevant;
- A detailed description of the aspects of the activity that are covered by the EMPr;
- An identification of the persons who will be responsible for the implementation of the measures;
- Where appropriate, time periods within which the measures contemplated in the EMPr must be implemented;
- Proposed mechanisms for monitoring compliance with the EMPr and reporting thereon;
- An environmental awareness plan; and
- Procedures for managing incidents which have occurred as a result of undertaking the activity and rehabilitation measures.

The table below (**Table 1.1**) outlines the plans that have been prepared in support of the EMPr.

Table 1.1: Specialist Studies used to support EMPr

Specialist Study	Organisation	Appendix
Freshwater Impact Assessment	Scientific Aquatic Studies	Appendix F
Terrestrial Ecology Impact Assessment	Natural Scientific Services	Appendix F
Heritage Impact Assessment	ASHA Consulting	Appendix G

1.3.4. Specialist Studies

The CSIR was assisted by a number of specialists in order to comprehensively identify potentially positive and negative environmental impacts associated with the project, and where possible to provide mitigation to reduce the potentially negative impacts and to enhance the positive impacts. Specialist input ensures the scientific vigour and a robust assessment of impacts.

The specialist Studies that have been conducted are outlined in the table below (**Table 1.2**).

Table 1.2: List of Specialist Studies conducted for the BA

Specialist Studies	Organisation	Appendix
Freshwater Impact Assessment	Scientific Aquatic Studies	Appendix F
Terrestrial Ecological Impact Assessment	Natural Scientific Services	Appendix F
Heritage Impact Assessment	ASHA Consulting	Appendix G

1.4. Details of Project Proponent

Mokate Estates is the Applicant and Developer. The details of the contact person from Mokate Estates are presented in **Table 1.3** below.

Table 1.3: Applicant Contact Details.

Applicant	Mokate Estates (Pty) Ltd
Contact Person	Thamsanqa Sydney Mokate
Physical Address	212 Cornwell Street Extension 7A KwaThema, Springs, Gauteng
Postal Address	212 Cornwell Street Extension 7A KwaThema, Springs, Gauteng
Telephone	073 507 7824
Fax	086 617 4533
E-mail	mokateestates@hotmail.com

1.5. Details of the Environmental Assessment Practitioner

The environmental team of Environmental Management Services (EMS), or the Council for Scientific Industrial Research (CSIR), has been appointed as the independent Environmental Assessment Practitioner (EAP) by Mokate Estates under the Special Needs & Skills Development Programme to undertake appropriate environmental studies for this proposed project.

EMS is a unit under the Implementation Unit (IU) within the CSIR. The CSIR is amongst the largest multi-disciplinary research and development organisation in Africa, which undertakes applied research and development for promoting sustainability across the continent. The organisation also provides consulting services to government, private sector, international agencies and non-governmental organisations. It is one of the leading organisations in South Africa contributing to the development and implementation of environmental assessments, ecosystem management methodologies and sustainability science. The Environmental Management Services' (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.

The CSIR's approach builds on its experience from conducting renewable energy, industrial and port related BAs and EIAs through-out Southern Africa. We have in-depth experience in conducting BAs, EIAs and preparing EMPs in accordance with South African and international requirements. Through our involvement in BAs and EIAs undertaken in South Africa, we have extensive experience in meeting the requirements of the EIA Regulations and accompanying guidelines. We were actively engaged in commenting on the EIA Regulations under the National Environmental Management Act (NEMA) and are therefore familiar with the changes to the EIA process as it should now be conducted.

The table (**Table 1.4**) below provides contact details of EAP and supervisor for Mokate Estates BA.

Table 1.4: CSIR EAP and supervisor's description and contact information.

Consultant	CSIR	CSIR
Contact Person	Rirhandzu Marivate (EAP)	Minnelise Levendal (supervisor)
Postal Address	PO Box 320 Stellenbosch 7599	PO Box 320 Stellenbosch 7599
Telephone	021 888 2432	
Fax	021 888 2473	021 888 2473
E-mail	rmarivate@csir.co.za	mlevendal@csir.co.za
Qualifications	*Bsc (Hons) Ecology, Environment and Conservation*	*MSc Environmental Sciences*

1.6. Structure of Report

The BAR is structured as follows (**Table 1.5**):

Table 1.5: Structure and description of BAR.

Chapter	Description
1	Introduction – provides the background to the project as well as details of the project proponent and EAP
2	Environmental Legislation – Details the pertinent environmental legislation and the applicability to the project
3	Project Context & Motivation – provides the site locality, project description and need and desirability of the project
4	Description of Baseline Environment – describes the pre-development context of the site
5	Public Participation Process – explains the public consultation undertaken
6	Specialist Assessments – describes the impact assessment and finding of the specialist studies
7	Impact Assessment – details the impact assessment methodology and quantifies the impacts anticipated
8	Environmental Impact Statement – provides the EAP opinion and summaries the impact assessment
9	Conclusion & Recommendations

2. ENVIRONMENTAL LEGISLATIVE CONTEXT

In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of significant pieces of environmental legislation that need to be considered during this study. These include:

2.1. The Constitution of South Africa

Section 24 of the Constitution of South Africa (No. 108 of 1996) states that:
"…everyone has the right – … (a) to an environment that is not harmful to their health or well-being; and … (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that … (c) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development. These principles are embraced in the NEMA and given further expression.

2.2. Sustainable Development

The principle of Sustainable Development has been established in the Constitution of the Republic of South Africa (Act No. 108 of 1996) and given effect by NEMA. Section 1(29) of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations.

Therefore, Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- The disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- Waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

2.3. National Legislation and Regulations

This section outlines the applicable national legislation which needs to be taken cognisance of.

2.3.1. National Environmental Management Act

The National Environmental Management Act (Act No. 107 of 1998)(as amended), or otherwise known as NEMA, is South Africa's overreaching environmental legislation and has, as its primary objective to provide for co-operative, environmental governance by establishing principles for decision–making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state, and to provide for matters connected therewith.

The principles of the Act are the following:

- Environmental management must place people and their needs at the forefront of its concern;
- Development must be socially, environmentally and economically sustainable;
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated;
- Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person;
- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued;
- Responsibility for the environmental health and safety consequences of a policy, programme, project or activity exists throughout its life cycle;
- The participation of all interested and affected parties in environmental governance must be promoted;
- Decisions must take into account the interests needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge including traditional and ordinary knowledge;
- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness;
- The social, economic and environmental impacts of activities including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment;
- The right of workers to refuse work that is harmful to human health or the environment;
- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the low;
- There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment;
- The environment is held in public trust for the people, the beneficial use of the environment resources must serve the public interest and the environment must be protected as the people's common heritage;
- The cost of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment; and
- The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.

2.3.2. Regulation 47 of NEMA EIA 2014 (as amended)

An environmental authorisation is also required for relatively small developments. Many emerging entrepreneurs, companies, SMMEs and community trusts in South Africa cannot commence with developments due to the burden of the cost. The cost associated with obtaining environmental authorisation (EA) may contribute to unequal economic opportunities in South Africa. A legal mandate within the NEMA EIA Regulations, 2014, Regulation 47, has made provision for assisting people who are unable to afford environmental assessment services.
Regulation 70 "Assistance to people with Special Needs" states that:
"The component authority processing an application must give reasonable assistance to people with: (a) illiteracy; (b) a disability; and (c) any other disadvantage, who cannot, but desire to, comply with these Regulations."

2.3.3. EIA Regulations

The nature of the proposed project includes activities listed in the following Listing Notices – GNR 983 (Listing Notice 1) and GNR 985 (Listing Notice 3) of the EIA Regulations (2014) – refer to **Table 2.1** below.

Table 2.1: Listed activities to be triggered

Relevant notice:	Activity No (s) (in terms of the relevant notice) :	Description of each listed activity as per the Government Notice:
GNR 983, 4 December 2014	4. (ii) b)	The development and related operations of facilities or infrastructure for the concentration of animals for the purpose of commercial production in densities that exceed 8 square meters per small stock unit and more than 250 pigs per facility excluding piglets that are not yet weaned.
GNR 983, 4 December 2014	5.(ii)	The development and related operations of facilities or infrastructure for the concentration of more than 5000 poultry per facility situated outside an urban area, excluding chicks younger than 20 days.
GNR 985 , 4 December 2014	12. a)	The clearance of an area 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 maintenance management plan, in Mpumalanga.

2.3.4. National Water Act

The National Water Act (NWA; Act 39 of 1998) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

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."*

Water use in South Africa is managed through a water use authorisation process, which requires that every water use is authorised by the Department of Water and Sanitation (DWS) or an established Catchment Management Agency (CMA, if applicable for that region), once the water requirements for the Reserve have been determined.

A water use must be licensed unless it (a) is listed in Schedule 1, (b) is an existing lawful use, (c) is permissible under a general authorisation (GA), or (d) if a responsible authority waives the need for a licence. If none of these are relevant a so-called water use licence (WUL) must be applied for and obtained prior to the commencement of such listed activity. In terms of such a WUL the Minister may choose to limit the amount of water which a responsible authority (e.g. CMA, water board, municipality) may allocate. In making regulations and determining items such as GAs, the Minister may differentiate between different water resources, classes of water resources, and geographical areas.

The NWA defines a water resource to be a watercourse, surface water, estuary, or groundwater (aquifer). Included under surface water are manmade water channels, estuaries and watercourses.

2.3.5. National Environmental Management Biodiversity Act

The project must comply with the National Environmental Management: Biodiversity Act (NEMBA; Act No. 10 of 2004) in providing the cooperative governance in biodiversity management and conservation. NEM:BA provides for the Minister to publish a notice in the Government Gazette that issues norms and standards, and indicators for monitoring progress for the achievement of any of the objectives of the Act. The NEM:BA also provides for:

- The National Biodiversity Framework;
- Bioregional Plans;
- Biodiversity Management Plans;
- Biodiversity Management Agreements;
- The identification, listing and promotion of threatened or protected ecosystems; and
- Alien invasive species control and enforcement.

2.3.6. National Environmental Management Waste Act

The National Environmental Management Waste Act (NEMWA; Act No. 59 of 2008)– the 'Waste Act' reforms the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning

matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

The objectives of this Act are:

a) "to protect health, well-being and the environment by providing reasonable measures for –
   i. minimising the consumption of natural resources;
   ii. avoiding and minimising the generation of waste;
   iii. reducing, re-using, recycling and recovering waste;
   iv. treating and safely disposing of waste as a last resort;
   v. preventing pollution and ecological degradation;
   vi. securing ecologically sustainable development while promoting justifiable economic and social development;
   vii. promoting and ensuring the effective delivery of waste services;
   viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and
   ix. achieving integrated waste management reporting and planning;
b) to ensure that people are aware of the impact of waste on their health, well-being and the environment;
c) to provide for compliance with the measures set out in paragraph (a); and
d) generally to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being."

The NEM:WA has been considered, however, no activities have been identified for the proposed development.

2.3.7. National Heritage Resources Act

In terms of section 38 of the National Heritage Resources Act (NHRA; Act 25 of 1999) (subject to the provisions of subsections (7), (8) and (9) of the Act), any person who intends to undertake a development categorised as:

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- The construction of a bridge or similar structure exceeding 50 m in length;
- Any development or other activity which will change the character of a site:
- Exceeding 5 000 m² in extent;
- Involving three or more existing erven or subdivisions thereof; or
- Involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- The costs of which will exceed a sum set in terms of regulations by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority;
- The re-zoning of a site exceeding 10 000 m2 in extent; or
- Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development,

notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

2.3.8. National Forests Act

According to the National Forest Act (NFA; Act No. 122 of 1984), the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that:
'*no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister*'.

In essence the National Forests Act (NFA) prohibits the destruction of indigenous trees in any natural forest without a licence.

2.3.9. Occupational Health and Safety Act

The Occupational Health and Safety Act (OHSA; Act 85 of 1993) provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work, against hazards to health and safety arising out of or in connection with the activities of persons at work.

2.3.10. National Environmental Management: Air Quality Act

The NEMA Air Quality Management Act (NEM:AQA; Act 39 of 2004) states the following as it primary objective:

"To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government, for specific air quality measures, and for matters incidental thereto.

Whereas the quality of ambient air in many areas of the Republic is not conducive to a healthy environment for the people living in those areas let alone promoting their social and economic advancement and whereas the burden of health impacts associated with polluted ambient air falls most heavily on the poor, And whereas air pollution carries a high social, economic and environmental cost that is seldom borne by the polluter, And whereas atmospheric emissions of ozone-depleting substances, greenhouse gases and other substances have deleterious effects on the environment both locally and globally, and whereas everyone has the constitutional right to an environment that is not harmful to their health or well-being, and whereas everyone has the constitutional right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources.

And whereas minimisation of pollution through vigorous control, cleaner technologies and cleaner production practices is key to ensuring that air quality is improved, and whereas additional legislation is necessary to strengthen the Government's strategies for the protection of the environment and, more specifically, the enhancement of the quality of ambient air, in order to secure an environment that is not harmful to the health or well-being of people."

2.3.11. Hazardous Substances Act and Regulations

The object of the Act is inter alia to 'provide for the control of substances which may cause injury or ill health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure thereby in certain circumstances; for the control of electronic products; for the division of such substances or products into groups in relation to the degree of danger; for the prohibition and control of such substances'.

In terms of the Act, substances are divided into schedules, based on their relative degree of toxicity, and the Act provides for the control of importation, manufacture, sale, use, operation, application, modification, disposal and dumping of substances in each schedule.

Pollution control in South Africa is affected through numerous national statutes, provincial ordinances and local authority by-laws. Only the more significant legislation pertaining to the regulation of water, air, noise and waste pollution is dealt with in this section.

2.4. National Development Plan

The South African Government through the Presidency has published a National Development Plan. The Plan aims to eliminate poverty and reduce inequality by 2030. The Plan has the target of developing people's capabilities to be to improve their lives through education and skills development, health care, better access to public transport, jobs, social protection, rising income, housing and basic services, and safety. It proposes to the following strategies to address the above goals:

1. Creating jobs and improving livelihoods;
2. Expanding infrastructure;
3. Transition to a low-carbon economy;
4. Transforming urban and rural spaces;
5. Improving education and training;
6. Providing quality health care;
7. Fighting corruption and enhancing accountability;
8. Transforming society and uniting the nation.

2.5. Provincial Legislation, Policies and Guidelines

2.5.1. Victor Khanye Local Municipality SDF and IDP

An Integrated Development Plan (IDP) is a single multi-sectorial strategic planning tool for a municipality, which in terms of the Local Government: Systems Act 32 of 2000 (hereunder referred to as Systems Act),

is the principal strategic planning instrument which guides and informs all planning and development, and all decisions with regard to planning, management and development in the municipality. The IDP links integrates and coordinates all planning activities and aligns the resources and capacity of the municipality to the overall development objectives of the municipality.

The Spatial Development Framework (SDF) is the legislated component of the municipality's IDP that prescribes development strategies and policy guidelines to restructure and reengineer the urban and rural form. The SDF is the municipality's long-term vision of what it wishes to achieve spatially, and within the IDP programmes and projects. The SDF should not be interpreted as a blueprint or master plan aimed at controlling physical development, but rather the framework giving structure to an area while allowing it to grow and adapt to changing circumstances.

The proposed development falls within the Victor Khanye Local Municipality (VKLM)

i. Mpumalanga Parks Board Act (Act 6 of 1995).
ii. Mpumalanga Nature Conservation Act (Act 10 of 1998).
iii. Mpumalanga Tourism and Parks Agency (MTPA) Act (Act 5 of 2005).
iv. MTPA Guidelines for Biodiversity Assessments (MTPA).
v. Mpumalanga Biodiversity Sector Plan (MTPA 2013).

The Mpumalanga Biodiversity Sector Plan (MBSP) is the outcome of systematic conservation planning by the Mpumalanga Tourism and Parks Agency (MTPA 2013) for improved conservation of biodiversity in this province. The entire proposed development area has been classified by the MBSP as "Modified," with the exception of three small patches of rocky grassland in the south, which have been classified as "Other Natural Areas," but which have less conservation priority relative to identified provincial Critical Biodiversity and Ecological Support areas.

2.6. Mining and Biodiversity Guideline

The Mining and Biodiversity Guideline (MBG) interprets the best available biodiversity knowledge and science in terms of the implications and risks for mining in a practical and user-friendly guideline for integrating relevant biodiversity information into decision making. Although the proposed development is not related to mining, the Guideline nonetheless provides a useful indication of the relative sensitivity of biodiversity in a given area.

2.7. Climate Change Consideration

The proposed project will take into account energy efficient technologies and consider international best practice in terms of the construction methodologies and management of finite resources.

Since climate change concerns include unpredictability and severity in weather patterns, the provision of basic human needs, such as fresh water supply, is considered critical.

3. PROJECT CONTEXT & MOTIVATION

3.1. Background to the Study Area

3.1.1. Property Descriptions

The proposed activity is situated in Bapsfontein near Delmas as shown in **Figure 1.1**. The properties are listed in the following (**Table 3.1**) together with the Surveyor General 21 Digit Codes (**Table 3.2**):

Table 3.1: Property Name and Ownership

Property Name	Ownership
Portion 1 of 195 of Farm Rietvlei	Greenfields Bale Warehouse CC
Portion 6 of 195 of Farm Rietvlei	Greenfields Bale Warehouse CC

Table 3.2: Surveyor General 21 Digit Codes

T	**0**	**1**	**R**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**9**	**5**	**0**	**0**	**0**	**1**
T	0	1	R	0	0	0	0	0	0	0	0	0	1	9	5	0	0	0	6

3.1.2. Land Use Zoning

Table 3.3: Land Use Zoning

Zoning:	Undetermined/Agriculture
Is a change of land use or a consent use application required?	No
Must a building plan be submitted to the local authority?	No

The property currently comprises mainly of cultivates pasture fields, pockets of grasslands and farms buildings and other infrastructure.

3.1.3. Property Co-ordinates

Table 3.4: Co-ordinates for proposed development

Point	Latitude	Longitude
Centre of Farm Rietvalei	26° 4’ 27.34” S	28° 34’ 25.60”E
Centre of Piggery Production Facility	26° 4’ 26.80” S	28° 34’ 35.90”E
Centre of Chicken Broiler Facility	26° 4’ 33.20” S	28° 34’ 24.40”E

3.1.4. Access/ Direction

From the N12 to Witbank, take Bapsfontein/ Delmas off-ramp, take left towards Bapsfontein on R50 Road, travel 19km to the entrance of the farm on the sides of the R50 Road. Co-ordinates: -26.0734, 28.5737.

3.1.5. Current and Surrounding Land Uses

The development area currently comprises mainly of cultivates pasture fields, pockets of grassland, and farms buildings and other minor infrastructure, as can be seen in recent satellite imagery (Google Earth 2016; **Figure 3.1**).

The surrounding region mostly comprises farms of a similar nature, with the nearest large infrastructure developments representing poultry production facilities situated approximately 1.5 – 2 km south of the development area.

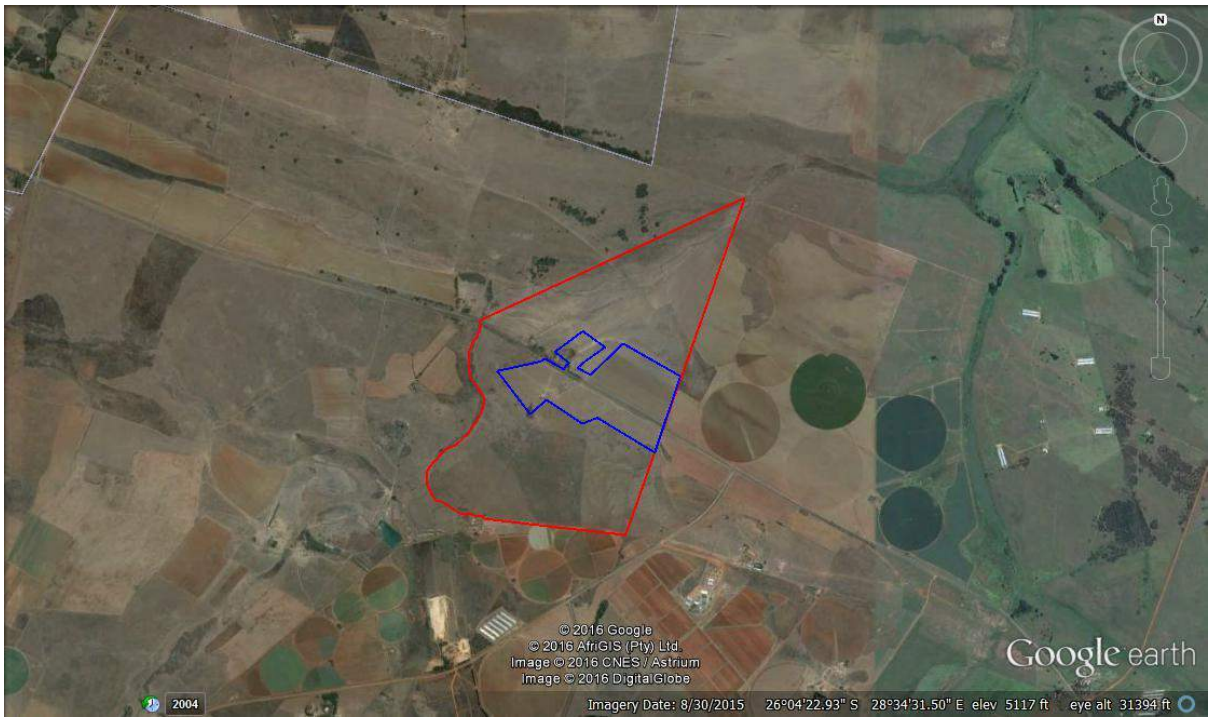


Figure 3.1: 2016 satellite imagery from Google Earth (2016), showing land use in and around the farm (red boundary) and development area (blue boundary)

3.2. Project Motivation

3.2.1. Need & Desirability

Mokate Estates (Pty) Ltd is proposing to establish a start-up enterprise comprising of a commercial pig production facility and chicken broiler near Delmas, Mpumalanga. The start-up enterprise plans to build 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on a 328 hectare farm. The start-up plans to produce pigs for slaughter in commercial quantities of 372 pigs per week and it will initially 480 600 chickens will be house on site.

Mokate Estates has seen an opportunity in the pork and poultry industry in South Africa, as there has been and increasing demand since 2007. There is a guaranteed market for pork meat for domestic use in South Africa, as the demand has increased by 24% since 2007. The domestic use of pork products has increased by almost 12% from 2010 to 2012. However the number of pigs slaughtered has decreased by 14.41% between 2011 and 2012. The poultry industry plays an important role in meat and egg

production, the gross production value of the broiler industry being over R 5 171 million per annum and contributes 16.2% of the gross value of agricultural production. The demand for pork and poultry meat continues to escalate, which allows Mokate Estates to realistically gain substantial milestones in the domestic market.

In addition, Mokates Estates will initially provide full-time employment to 10 people from the surrounding local communities of Delmas in Mpumalanga, Kwa-Thema (Springs) and Daveyton (Benoni) in Gauteng, of which 7 will be women. In terms of capacity building, the employees will be trained in pig production and gain qualifications of NQF Level 1 and 2. They will also be given exposure in the fields of business, operations, finance, human resources and farm management. The enterprise could be a huge economic benefit to the viability of the pork and poultry industry in general and to the local community.

Mokate Estates has applied for funds from Land Bank and the Department of Agriculture, Forestry and Fisheries (DAFF), which will enable them to purchase the farming land, construction of the pig production and chicken broiler facilities, purchasing of pigs and chickens, all the machinery and equipment etc., necessary for an efficient pig and chicken production business. The investment will also be sufficient to carry the business to profitability and will allow them to build assets to a level where they can fund further growth and opportunity for further local employment.

This funding will allow Mokate Estates to achieve socio-economic objectives (poverty alleviation, creating employment, utilisation of physical resources for economic gain and function as a productive economic unit within the pig production industry by maintaining production yields, infrastructure, equipment and positive net cash flows. Thus, Mokate Estates' objective is to fully utilise the potential of the land to create wealth, capacity building, and employment opportunities and to contribute positively to the economy of our country.

Furthermore the Victor Khanye Integrated Development Plan's spatial objectives include promoting the establishment of agro-processing industries associated with agricultural activities, this in order to assist economic growth in order to achieve among others, poverty alleviation.

The project need, desirability and benefits are therefore summarised in **Table 3.5.**

Table 3.5: Project Need, Desirability and Benefits

Project Need			
		YES	NO
1	Was the relevant provincial planning department involved in the application?	YES	
2	Does the proposed land use fall within the relevant provincial planning framework?	YES	
3	If the answer to question 1 and /or 2 was NO, please provide further motivation/ explanation. – N/A		
Desirability			

1	Does the proposed land use/ development fit the surrounding area? The development is a piggery production and chicken broiler facility, and agricultural activity, within a predominantly agricultural area.	YES	
2	Does the proposed land use/ development conform to the relevant structure plans, SDF and planning visions of the area?	YES	
3	Will the benefits of the proposed land use/ development outweigh the negative impacts of it? All impact will be fairly mitigated so as not to cause undue burden or inconvenience during the full project implementation.	YES	
4	If the answer to any of the questions 1-3 was NO, please provide further motivation/Explanation – N/A		
5	Will the proposed land use/development impact on the sense of place? The development falls within an agricultural land use, which is the predominant land use of the area. In addition the current use of the property is for agriculture.		NO
6	Will the proposed land use/ development set a precedent?		NO
7	Will any person's rights be affected by the proposed land use/ development? The property is privately owned by Greenfields Bale Warehouse CC. In addition, Interested and Affected parties have been consulted		NO
8	Will the proposed land use/ development comprise the " urban edge" the area falls within an agricultural/ rural area		NO
9	If the answer to any of the questions 5-8 was YES, please provide further motivation/ explanation- N/A		
Benefits			
1	Will the land use/ development have any benefit for society in general?	YES	
2	Explain: Pork and Chicken Industry South Africa		
3	Will the land use/ development have any benefit for the local communities where it will be located?	YES	
4	Explain: This development will create employment opportunities for the neighbouring disadvantaged communities		

3.2.2. Socio-Economic Value

What is the expected capital value of the activity on completion?	R46 620 379-00
What is the expected yearly income that will be generated by or as a result of the activity?	R 28 096 675-00
Will the activity contribute to service infrastructure?	No
Is the activity a public amenity?	No
How many new employment opportunities will be created in the construction phase of the activity?	50
What is the expected value of the employment opportunities during the development phase?	R3 424 777-00
What percentage of this will accrue to previously disadvantaged individuals?	100%
How many permanent new employment opportunities will be created during the first 10 years?	18
What is the expected current value of the employment opportunities during the first 10 years?	R 8 785 037-00
What percentage of this will accrue to previously disadvantaged individuals?	100%

4. DESCRIPTION OF BASELINE ENVIRONMENT

4.1. Climate

The regional climate features temperate to warm wet summers and very dry winters. Mean annual precipitation for the regional vegetation type ranges between 570 mm and 730 mm. The incidence of frost ranges from 10 to 40 days (Mucina & Rutherford, 2006).

Figure 4.1 indicates the monthly amount of rainfall measured at Springs, Gauteng, between 1 March 2015 and 18 March 2016 (data obtained from AccuWeather, 2016). This approximate rainfall data indicated that during the 12 month period, the region had received a slightly-below average amount of roughly 500 mm rain.

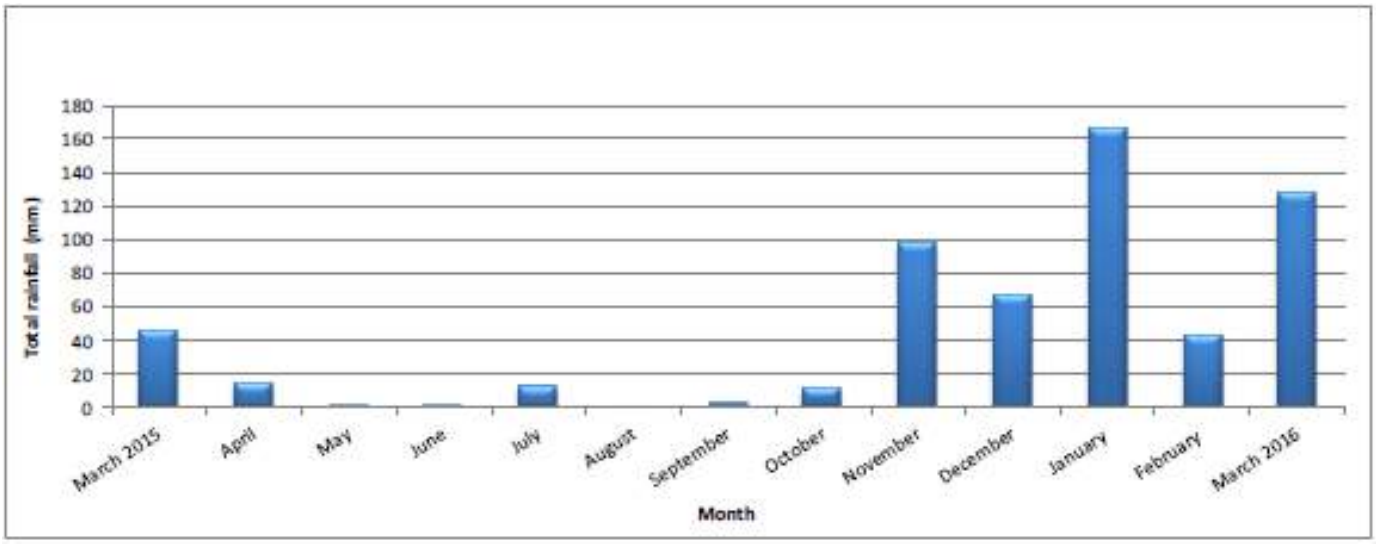


Figure 4.1: Monthly rainfall measured at Springs between 1 March 2015 and 18 March 2016 (AccuWeather, 2016)

4.2. 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, the development area is situated in a single land type referred to as Ba3 (**Figure 4.2**). This land type features variable landscapes with extensive undulating plains with elevated ridges. The quartzite ridges support soils of various quality but especially shallow Glenrosa and Mispah forms. Within the development area the elevation ranges from approximately 1 551m to 1 578m a.s.l., and hard pan ferricrete is widespread, which limits commercial crop cultivation, and likely explains why livestock farming and pasture fields have instead been practiced.

4.3. Vegetation

The development area is situated in the Grassland Biome within the Gm 11 Rand Highveld Grassland vegetation type (**Figure 4.2**), defined by Mucina & Rutherford (2006). Rand Highveld Grassland represents a wiry, sour and species-rich type of grassland on plains that are interspersed with low, sour shrubland on rocky slopes and outcrops. Most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon*, and *Elionurus.* There is typically a high diversity of herbs, many of which belong to the Asteraceae. Rocky hills and ridges support sparse woody clumps with *Protea caffra* subsp. *caffra*, *Protea welwitschii, Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Searsia* (especially *S. magalismontana*) is most prominent.

Almost 50% of Rand Highveld Grassland has been transformed by cultivation, plantations, urbanization, dam-building, and alien plant invasion. Only 1% is statutorily conserved and, therefore, this vegetation type is listed as Endangered by Mucina & Rutherford (2006). Dominant, biogeographically important, and endemic taxa within the Rand Highveld Grassland vegetation type are listed in **Table 4.1**.

Table 4.1: Rand Highveld Grassland Flora

Growth Form	Dominant Taxa
Low Shrubs	*Anthospermum rigidum subsp. pumilum, Indigofera comosa, Searsia magalismontana, Seriphium plumosum*
Succulent Shrub	*Lopholaena coriifolia*
Geoxylic Suffrutex	*Elephantorrhiza elephantina*
Graminoids (grasses)	*Ctenium concinnum, Cynodon dactylon, Digitaria monodactyla, Diheteropogon amplectens, Eragrostis chloromelas, Heteropogon contortus, Loudetia simplex, Monocymbium ceresiiforme, Panicum natalense, Schizachyrium sanguineum, Setaria sphacelata, Themeda triandra, Trachypogon spicatus, Tristachya biseriata, Tristachya rehmannii*
Geophytic Herbs	*Boophone disticha, Cheilanthes hirta, Haemanthus humilis* subsp. *humilis, Hypoxis rigidula* var. *pilosissima, Ledebouria ovatifolia, Oxalis corniculata*
Succulent Herb	*Aloe greatheadii* var. *davyana*
Herbs	*Acanthospermum australe, Justicia anagalloides, Pollichia campestris*
Biographically Important Taxa	
Geophytic Herbs	*Agapanthus inapertus subsp. pendulus, Eucomis vandermerwei*
Succulent Herb	*Huernia insigniflora*
Low Shrub	*Melhania randii*
Endemic Taxa	
Herbs	*Melanospermum rudolfii, Polygala spicata*
Succulent Herbs	*Anacampseros subnuda* subsp. *lubersii, Frithia humilis*

Succulent Shrubs	*Crassula arborescens,* subsp. *undulatifolia, Delosperma purpureum*
Small Trees	*Encephalartos lanatus, Encephalartos middelburgensis*

4.4. Hydrology

The unnamed tributary that flows adjacent to the development area joins the Koffiespruit approximately 2.5km downstream. Presented in **Table 4.2** is a summary of the Present Ecological State (PES), Ecological Importance (EI), Ecological Sensitivity (ES) and current impacts on the Koffiespruit and its unnamed tributary, as provided by the DWS (2014). The (desktop-determined) PES of the Koffiespruit and its tributary is largely natural (a B category) with only few modifications. A small change in natural habitats and biota has occurred, but ecosystem functions appear to be predominately unchanged. Water quality, and instream and riparian habitats have been impacted by water abstraction and damming. The EI of the Koffiespruit and its tributary is moderate as the local sub-quaternary catchment coincides with the Endangered Rand Highveld Grassland vegetation type (Mucina & Rutherford 2006), with wetland and riparian habitats, as well as locality records for two Protected and two endemic species. The Koffiespruit and its tributary have a high ES since small streams are typically more sensitive to changes in water levels and flow conditions compared to large rivers. The Koffiespruit and its unnamed tributary are classified as Endangered, Upper Foothill systems, and are not protected (Driver et al. 2011; Nel & Driver 2012). The Koffiespruit flows in a north easterly direction and eventually joins the Bronkhorstspruit.

Table 4.2: Summary of the Ecostatus and impacts of the Koffiespruit and its tributary

Quaternary Catchment	Water Resource	Present Ecological State (PES)	Ecological Importance (EI)	Ecological Sensitivity (ES)	Current Impacts
B20B	Tributary of the Koffiespruit	B Largely natural	Moderate	High	Dams and abstraction

The proposed development area is situated within the Level 1 (Highveld) Ecoregion 11 and Level 2 Eco-region 11.03, and the Bronkhorstspruit B20B quaternary catchment in the Upper Olifants Water Management Area (WMA) 4 (**Figure 4.3**). The Bronkhorstspruit quaternary catchment drains an area of approximately 574km2, and the Bronkhorstspruit flows for approximately 77km before its confluence with the Wilge River, which flows for 120km before it reaches the upper Olifants River, upstream from the Loskop Dam.

The Bronkhorstspruit catchment falls within the jurisdiction of the Department of Water and Sanitation (DWS) which manages the water quality of the Olifants River and all the tributaries impacting the water quality of the river and dams on the River, such as the Witbank and Loskop Dams. In recent times there have been serious pollution problems on the tributaries of the Olifants River, the Olifants River itself and the dams on the river, resulting in fish kills and associated loss of wildlife; such as a serious decline in the crocodile numbers in the Loskop Dam. The Olifants River catchment, covering an area of approximately 54 570 km2, is of considerable economic importance as a significant number of mining, industrial and agricultural activities (including intensive irrigation schemes) are concentrated within it. It is critical that any pollution from the proposed pig and poultry production facilities is tightly controlled to prevent contributing further to the problems and challenges faced by the Olifants River.

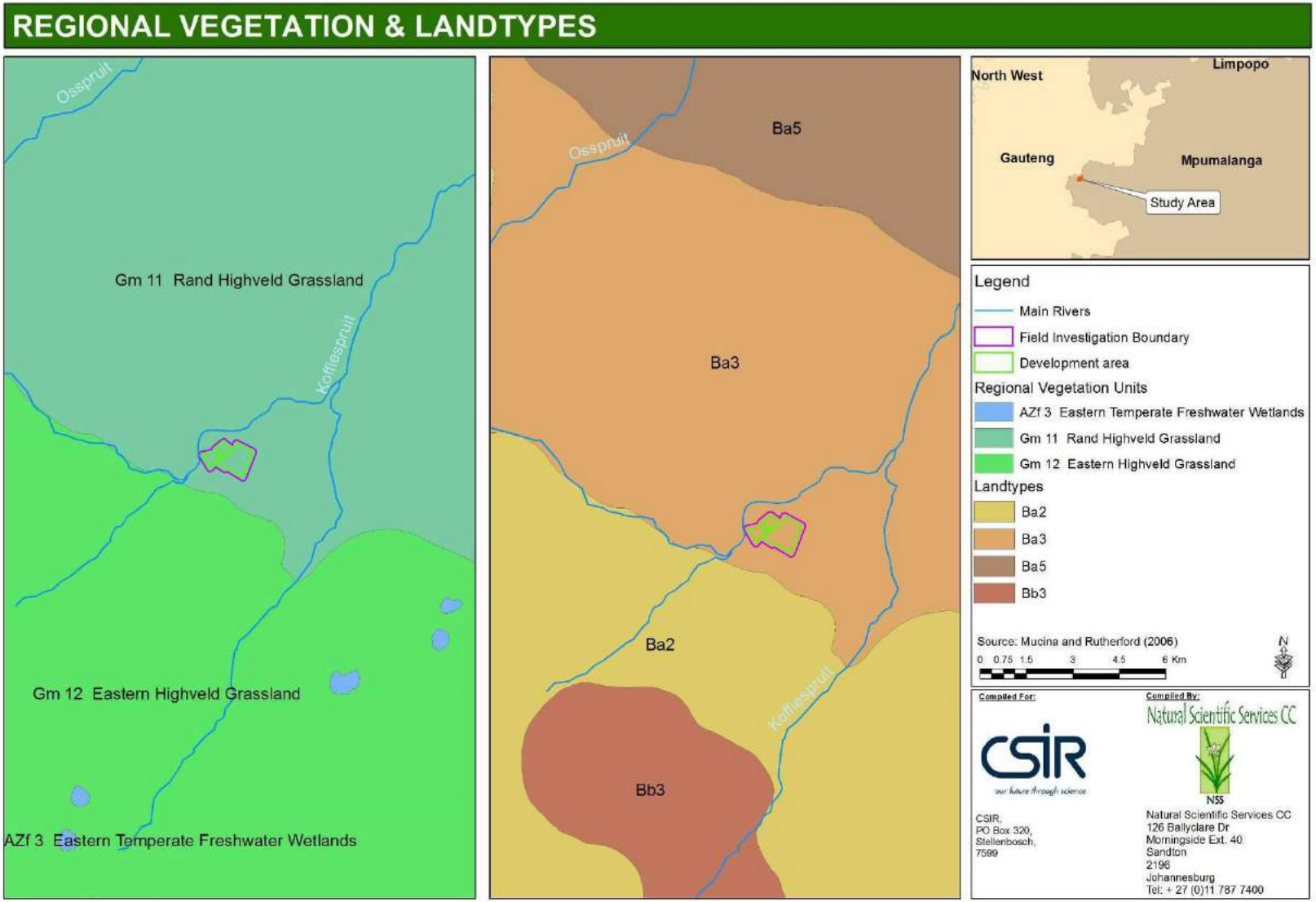


Figure 4.2: Regional vegetation and land types

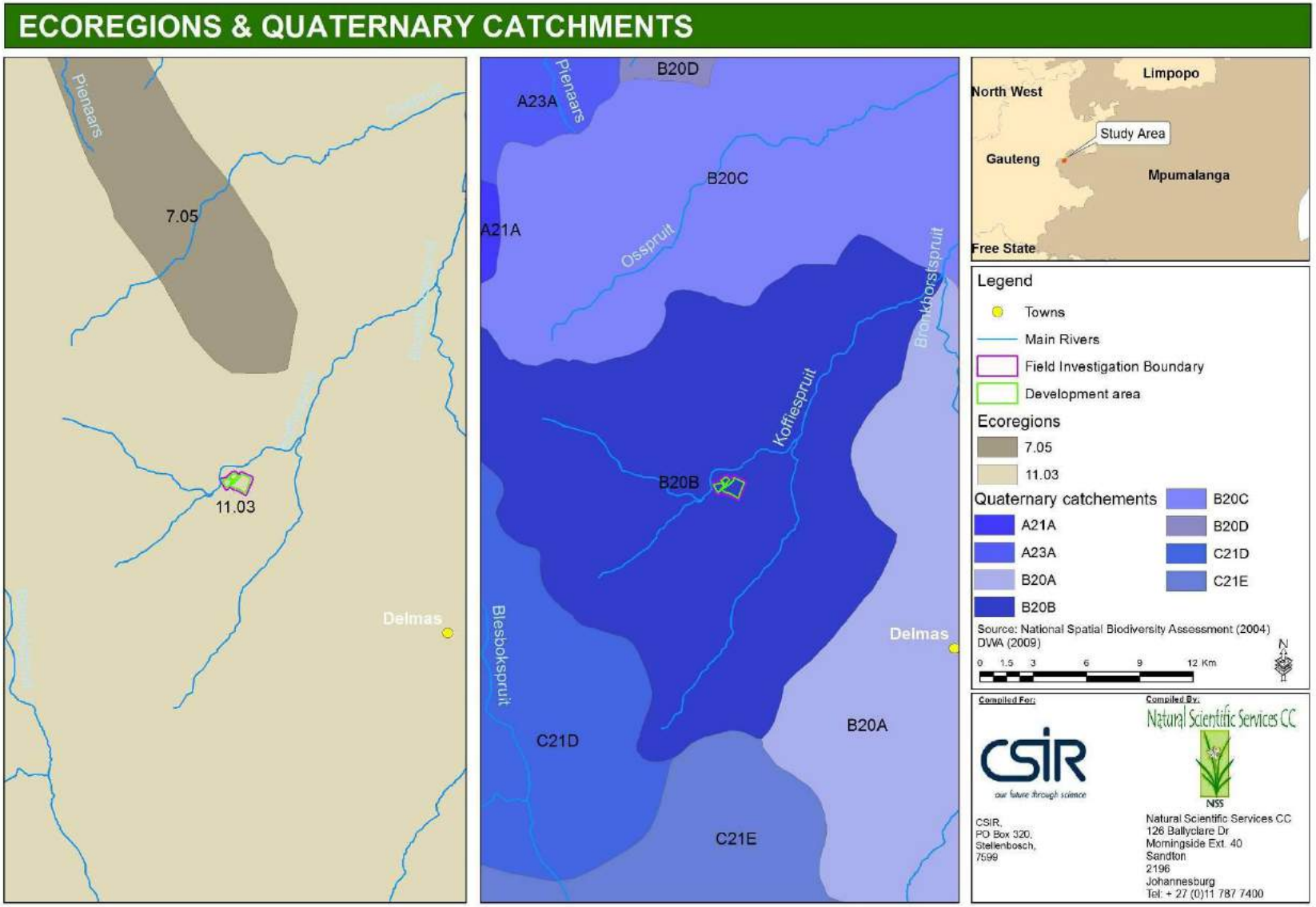


Figure 4.3: Ecoregions and Quaternary Catchments

4.5. Conservation Important Biodiversity Features

As inferred in the preceding legislation section of this report, a number of biodiversity features in the region, which are of recognized national or provincial conservation importance, require consideration.

4.5.1. Terrestrial Priority Areas & Threatened Ecosystems

The Terrestrial Component (Rouget *et al.* 2004) of the National Spatial Biodiversity Assessment integrated data on species, habitats and ecological processes to identify areas of greatest terrestrial biodiversity significance. This resulted in the identification of nine spatial terrestrial Priority Areas, which represent high concentrations of biodiversity features and/or areas where there are few options for meeting biodiversity targets. The proposed development is situated in the Moist Grasslands Priority Area (**Figure 4.4**). Of the nine terrestrial Priority Areas identified during the NSBA, Moist Grasslands were identified as being the most threatened by socioeconomic development and, consequently, have the highest priority ranking in terms of biodiversity conservation (NBI 2004).

A list of Threatened Ecosystems within each terrestrial Priority Area was gazetted on 9 December 2011 under the NEM:BA (Act 10 of 2004). The Threatened Ecosystems occupy 9.5% of South Africa, and were selected according to six criteria which included: (1) irreversible habitat loss; (2) ecosystem degradation; (3) rate of habitat loss; (4) limited habitat extent and imminent threat; (5) threatened plant species associations; and (6) threatened animal species associations. The proposed development area is situated in the Rand Highveld Grassland (Endangered vegetation type and) Threatened Ecosystem (**Figure 4.4**), of which only 1% is formally protected (Mucina & Rutherford 2006).

4.5.2. 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.

A top ranked wetland FEPA is situated on the unnamed tributary of the Koffiespruit approximately 4km upstream of the proposed development area. Other wetland and riverine areas in the vicinity of the development area are “unclassified” under NFEPA (**Figure 4.5**). However, the current “unclassified” status of wetlands and streams under the NFEPA does not mean they are not conservation important. Indeed, according to the more recent Mpumalanga Highveld Wetlands project (SANBI 2014), FEPAs have since been identified on a tributary of the Koffiespruit, which are situated approximately 0.5-1.5km upstream of the proposed development site. The NFEPA guidelines state that FEPAs (including wetland clusters) should be regarded as ecologically important and as generally sensitive to changes in water quality and quantity, owing to their role in protecting freshwater ecosystems and supporting sustainable use of water resources. FEPAs that are in a good condition should remain so, and FEPAs that are not in a good condition should be rehabilitated to their best attainable ecological condition. Land-use practices or activities that will lead to deterioration in the current condition of a FEPA are considered unacceptable, and land-use practices or activities that will make rehabilitation of a FEPA difficult or impossible are also considered unacceptable.

4.5.3. Mpumalanga Sector Plan

The Mpumalanga Biodiversity Sector Plan (MBSP) is the outcome of systematic conservation planning by the Mpumalanga Tourism and Parks Agency (MTPA 2013) for improved conservation of biodiversity in this province. The entire proposed development area has been classified by the MBSP as "Modified," with the exception of three small patches of rocky grassland in the south, which have been classified as "Other Natural Areas," but which have less conservation priority relative to identified provincial Critical Biodiversity and Ecological Support areas.

4.5.4. Mining and Biodiversity Guideline

According to the Mining and Biodiversity Guideline atlas, a large portion of the proposed development area has been classified as having the "Highest Importance" for biodiversity (**Figure 4.8**). Areas of Highest Biodiversity Importance include Ramsar sites, Critically Endangered and Endangered Ecosystems (in this case, the Endangered Rand Highveld Grassland Threatened Ecosystem), river and wetland FEPAs and a 1km buffer around these (in this case, the nearest upstream FEPA and its 1km buffer), and Critical Biodiversity Areas from provincial spatial biodiversity plans. The MBG stipulates that in areas of Highest Importance for Biodiversity: "*Environmental screening, EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licences, and environmental authorisations*."

This biodiversity assessment provides confirmation that a large part of the proposed development area has been transformed by agricultural activities and limited vegetation typical of Rand Highveld Grassland remains. Potential impacts of the proposed development on local water resources, especially those downstream of the development area, are, however, a concern.

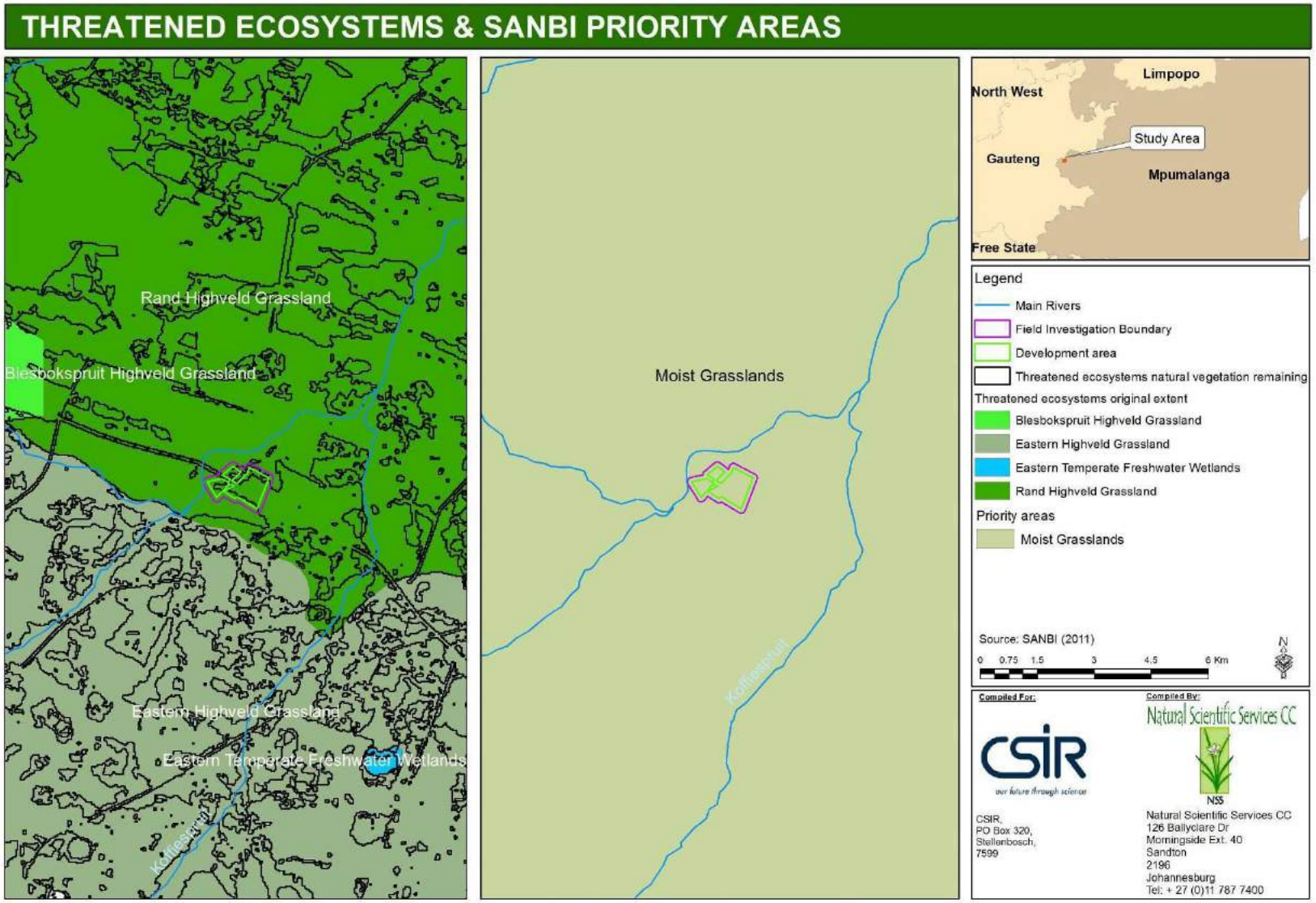


Figure 4.4: Terrestrial Priority Areas and Threatened Ecosystems

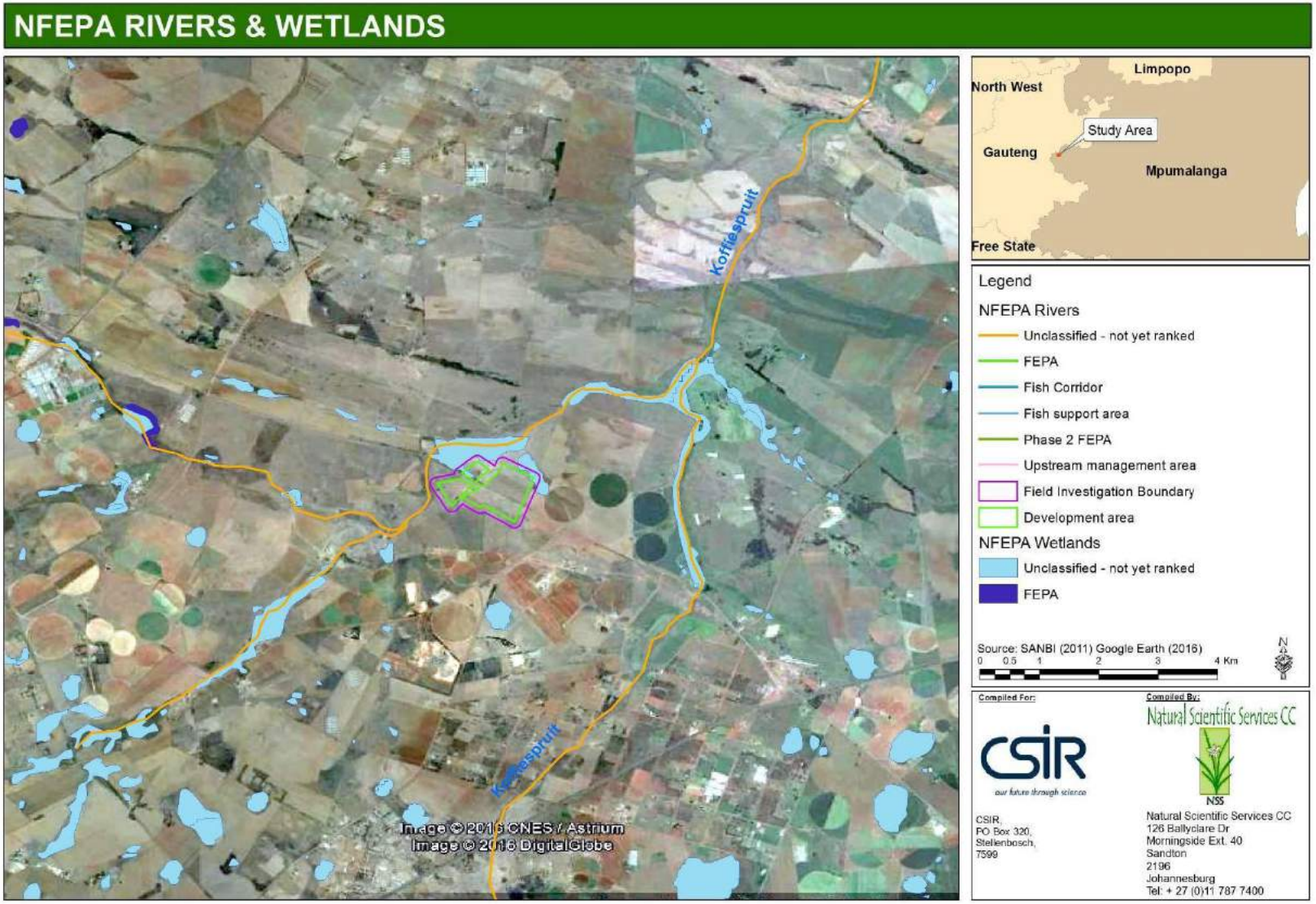


Figure 4.5: Freshwater Ecosystem Priority Areas

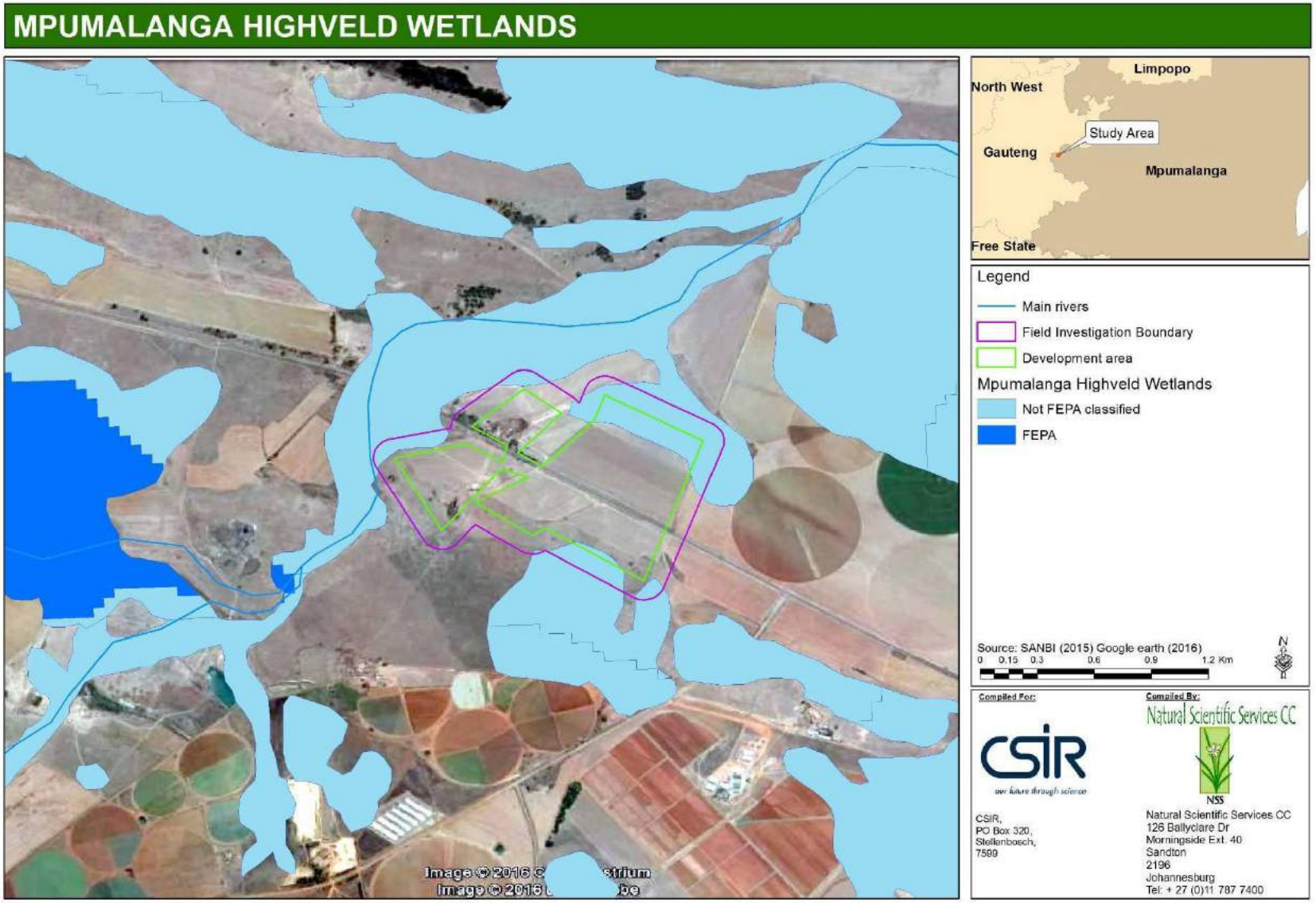


Figure 4.6: Mpumalanga Highveld Wetlands Project

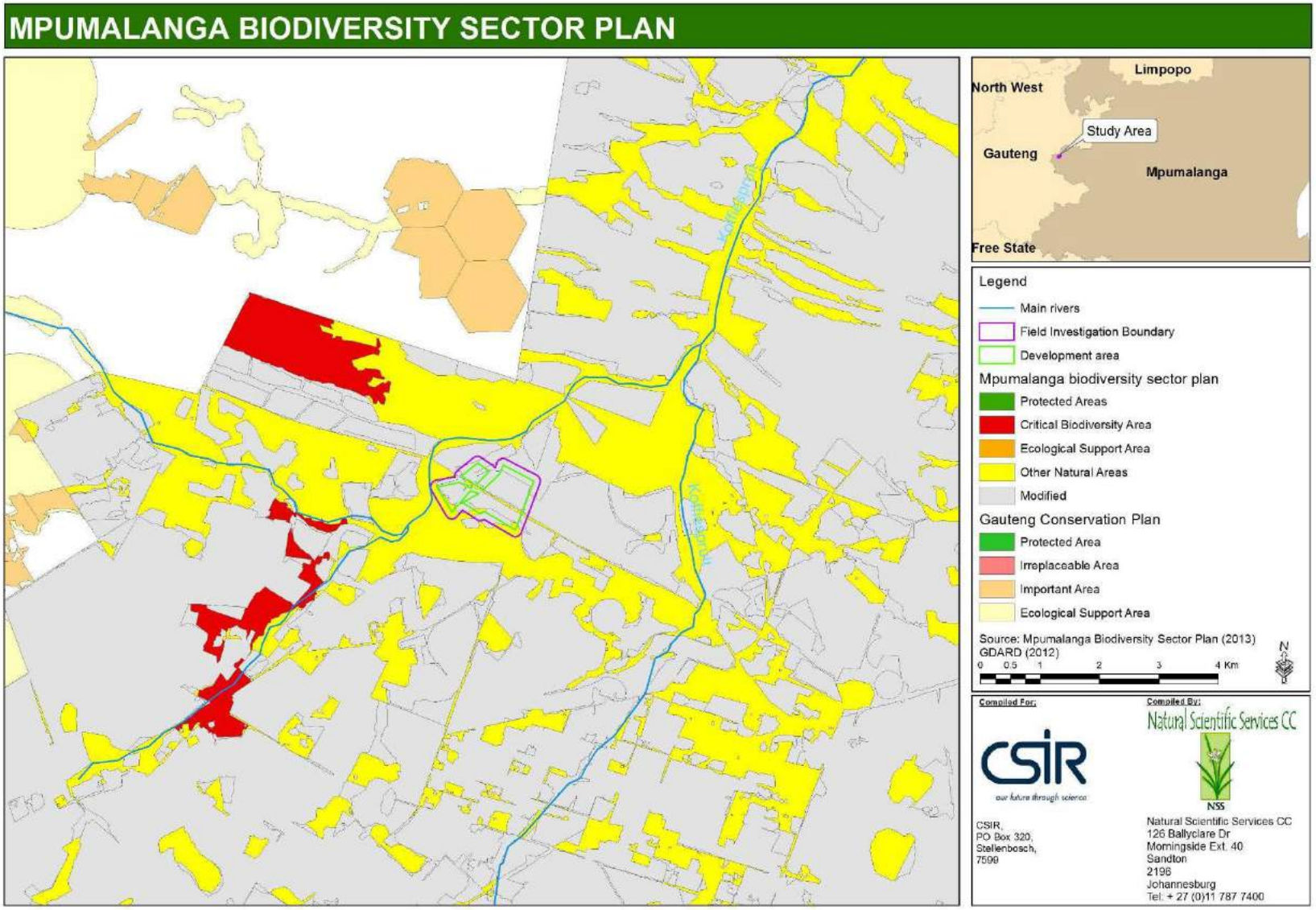


Figure 4.7: Mpumalanga Sector Plan

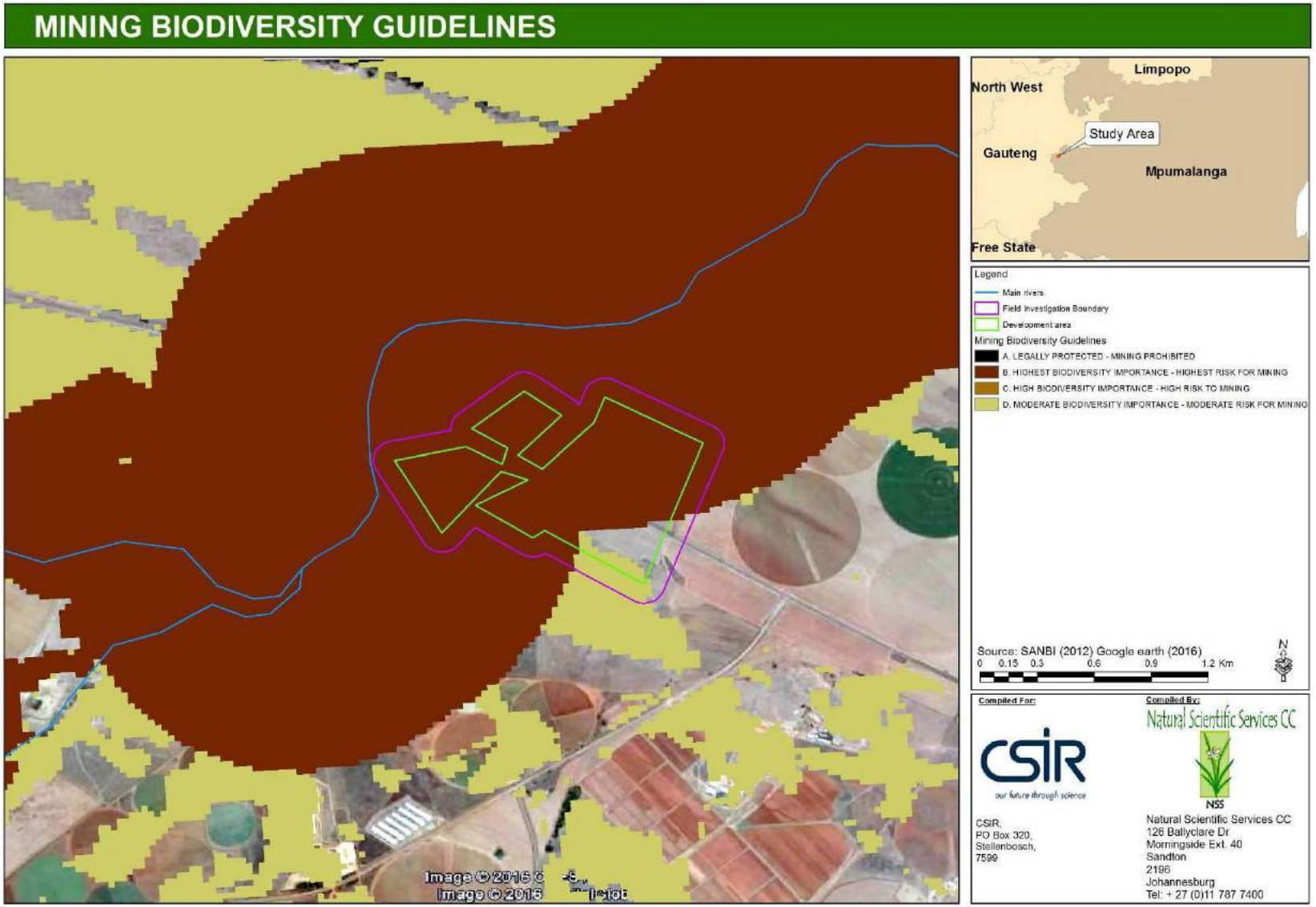


Figure 4.8: Mining and Biodiversity Guideline

4.6. Socio Economy

Mokate Estates is situated under Victor Khanye Local Municipality, which is situated on the western Highveld of the Mpumalanga Province. The Municipality is located in the Western Highveld of the Nkalanga District Municipality and is also strategically located close to the metropolitan areas of Gauteng and Tshwane, and borders the metropolitan area of Ekurhuleni in the west. The region is currently characterised by the increase in the number of Mining and related activities and Agriculture (a major provider of food and energy source – maize and coal Mining); Finance and Manufacturing (capitalising on the proximity to Gauteng).

The Municipality also has a good manufacturing and financial sector that is capitilised because of its proximity to Gauteng. Its Natural Resources have also made a significant and direct contribution to the Nkalanga District Economy from coal, water, land, geographical features, climate, ecosystems and conservation areas.

The population of Victor Khanye Municipality is 75 452 (Census, 2011) which has grown by 33.9 % since 2001. The region is exposed to an ever –increasing wave of urbanisation, seeing people from different parts of the country seeking jobs, safety, housing, improved basic services and a more sustainable livelihood. Victor Khanye local Municipality reflects the third largest population growth in Mpumalanga, which is indicative of the migration of labour attracted to the areas as a result of the potential for economic grown and job opportunities.

Approximately 67% of the municipality's population falls under the economically active age group (15-64 years old) category, with the majority being under the age of 35. This trend demonstrated that labour migration may be the contributing factor to the increase resulting from the economic growth potential of the area. The ratio of male to females is marginally in favour of males, who represent 51% of the total population. It is interesting to note that 30.2% of households in the region are headed by females.

In terms of racial groups, the population is approximately 82% Black, 16% White, 1% Coloured, and 1% is Asian and others. The most prevalent first language that is spoken is IsiNdebele at 57%, followed by IsiZulu (33%) and then Afrikaans (2%); with English and other South African languages making up 8%.

The income level per household is considered a better barometer of poverty and reflects that 42% can be classified as Indigent as they earn less than R1600 per month, as per StatsSA (2011). The average household income level in the Victor Khanye Local Municipality is reflected as R80 239 per annum, ranking it 9th with respect to the overall province statistics. The income levels are demonstrated below in **Table 4.3.**

Table 4.3: Income groups in Victor Khanye Local Municipality (Source: StatsSA)

Monthly Income	Victor Khanye	%
no income	3,053	14.9%
R1 - R1,600	5,668	27.6%
R1,600 - R12,800	9,697	47.2%
R12,800 - R51,200	1,835	8.9%
R51,200 - R102,400	175	0.9%
R102,401 plus	120	0.6%
Unspecified	0	0.0%
	20,548	100%

The employment level in the Victor Khanye Local Municipality is currently at 28.9% according to Statistics SA (2011). Based on the 2011 definition of Economically Active Population of 30,415 the unemployment rate is reflected at 28, 2%, this represents an overall gain in employment compared to 2001. This figure is high when we consider the economic activity in the area, but obviously impacted by the migration influx of job seekers.

Leading industries in employment comprise of Trade (18, 7%), Agriculture (18, 2%) and Community Services contributing (14, 3%). However, the former two sectors are experiencing a decline in employment in the last few years whilst Community Services has increased and Mining as an employer has grown and now contributes 12, 7%.

Table 4.4: Employment Statistics of Victor Khanye Local Municipality (Source: StatsSA)

Employment Status	Victor Khanye Local Municipality	%
Employed	21,843	28.9%
Unemployed	8,573	11.4%
Discouraged work-seekers	2,477	3.3%
Not economically active	19,365	25.7%
Others	23,194	30.7%
	75,452	100.0%

5. PUBLIC PARTICIPATION

5.1. Public Participation Process

Public participation is a process that is designed to enable all interested and affected parties (I&APs) to voice their opinions and concerns that enable the practitioner to evaluate all aspects of the proposed development, with the objective of improving the project by maximising its benefits while minimising the adverse effects. I&APs include all interested stakeholders, technical specialists, and the various relevant organs of state who work together to produce better decisions.

The primary aims of the public participation process are:

- to inform I&APs and key stakeholders of the proposed application and environmental studies;
- to initiate meaningful and timeous participation of I&APs;
- to identify issues and concerns of key stakeholders and I&APs with regards to the application for the development (i.e. focus on important issues);
- to promote transparency and an understanding of the project and its potential environmental (social and biophysical) impacts (both positive and negative);
- to provide information used for decision-making;
- to provide a structure for liaison and communication with I&APs and key stakeholders;
- to ensure inclusivity (the needs, interests and values of I&APs must be considered in the decision-making process);
- to focus on issues relevant to the project, and issues considered important by I&APs and key stakeholders; and
- to provide responses to I&AP queries.

The public participation process must adhere to the requirements of Regulations 41 and 42 (GNR 982) under the NEMA (as amended).

In order to achieve a higher level of engagement, a number of key activities have taken place and will continue to take place. These included the following:

- The identification of stakeholders is a key deliverable at the outset, and it is noted that there are different categories of stakeholders that must be engaged, from the different levels and categories of government, to relevant structures in the non-governmental organisation (NGO) sector, to the communities of wards of residential dwellings which surround the works;
- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The fielding of queries from I&APs and others, and providing appropriate information;
- The convening of specific stakeholder groupings/forums as the need arises;
- The preparation of reports based on information gathered throughout the BA via the PPP and feeding that into the relevant decision-makers;
- The PPP includes distribution of pamphlets or Background Information Documents (BIDs) and other information packs; and
- Where appropriate site visits may be organised, as well as targeted coverage by the media.

The proposed Mokate Pig and Chicken Production project BA PPP entails the following activities below.

5.2. Authority Consultation

The competent authority, the Mpumalanga Department DARDALEA, is required to provide an EA, positive or negative, for the project.

5.3. Consultation with Other Relevant Stakeholders

Consultation with other relevant key stakeholders were, and will continue, to be undertaken through telephone calls and written correspondence in order to actively engage these stakeholders from the outset and to provide background information about the project during the BA process.

Relevant key stakeholders were consulted and sent pamphlets or BIDs and other information packs (where requested).

All relevant stakeholders will be allowed an opportunity to comment on the BAR.

5.4. Site Notification

The EIA Regulations (2014) require that a site notice be fixed at a place conspicuous to the public at the boundary or on the fence of the site where the activity to which the application relates and at points of access or high through traffic. The purpose of this is to notify the public of the project and to invite the public to register as stakeholders and inform them of the PP Process.
The CSIR erected a site notice on the perimeter fence of the property that is along the main road, which is the most noticeable area from the property (refer to Appendix F).

5.5. Identification of Interested and Affected Parties

I&APs were identified primarily from responses received from the notices mentioned above. E-mails were sent to key stakeholders and other known I&APs, informing them of the application for the project, the availability of the BAR for review and indicating how they could become involved in the project.
The contact details of all identified I&APs are updated on the project database, which is included in Appendix E.
This database will be updated on an on-going basis throughout the BA process.

5.6. Briefing Paper

I&APs were identified primarily from responses received from the notices mentioned above. E-mails were sent to key stakeholders and other known I&APs, informing them of the application for the project, the availability of the BAR for review and indicating how they could become involved in the project.

The contact details of all identified I&APs are updated on the project database, which is included in Appendix E.

This database will be updated on an on-going basis throughout the BA process.

5.7. Advertising

In compliance with the EIA Regulations (December 2014), notification of the commencement of the BA process for the project was advertised in a local newspaper. A newspaper advert was placed in Streek Nuus (Refer to Appendix E).

I&APs were requested to register their interest in the project and become involved in the BA process. The primary aim of these advertisements was to ensure that the widest group of I&APs possible was informed and invited to provide input and questions and comments on the project.

5.8. Issues Trail

Issues and concerns raised in the public participation process during the BA process have been and will continue to be compiled into an Issues Trail.

The Issues Trail is attached as Appendix E, in which all comments received and responses provided have been captured.

5.9. Key Issues Raised by the Public

5.9.1. Public Review of the Draft Consultation BAR

The draft Consultation BAR (cBAR) was made available for the competent authority and public review for a total of 30 days from 8th September 2016 to 10th October 2016.
The report was made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Delmas Public Library, Cnr Sarel Cilliers Street & Van Riebeeck Avenue, Delmas, 2210; and
- Electronically on the CSIR Website: www.csir.co.za/ems/specialneeds/

5.9.2. Final Consultation BAR

The final stage in the BA process entails the capturing of responses and comments from I&APs on the cBAR in order to refine the BAR, and ensure that all issues of significance are addressed.
The final BAR (i.e. fBAR) is the product of all comments and studies, before being submitted to Mpumalanga DARDALEA review and decision-making.

The final BAR was released to DARDLEA on the 17th November 2017 for their final decision. The report will also be made available to I&AP's for viewing on the following website: **http://www.csir.co.za/ems/specialneeds/.** I&AP's will also be notified of the final decision for Environmental Authorisation when it is made by DARDLEA.

5.9.3. PPP Summary

A summary of the PPP is provided in **Table 5.1** below, with the documents provided in ***Appendix E***.

Table 5.1: Summary of the Public Participation Process.

Activity	Description
Identifying Stakeholders	Stakeholders were identified and a database of all I&APs were compiled
Publishing Newspaper Adverts	Streek Nuus
Distribution of a BID	BIDs were distributed electronically and by post to I&APs.
Erection of Site Notices	Two A3 site notices were erected on the perimeter of the site
Preparation of an on-going Issues Trail	Comments, issues of concern and suggestions received from stakeholders thus far have been captured in an Issues Trail.
Release of Draft Report	The draft Consultation Basic Assessment (cBAR) will be advertised and made available for a period of 30 days for public review and comment.
Release of Final Report	The fBAR will be the product of all comments and studies before being submitted to Mpumalanga DARDLEA for review and decision-making.

6. SPECIALIST ASSESSMENT

6.1. Terrestrial Assessment

The findings of the Terrestrial Assessment were broken down into the following sections. The information found in this section was extracted from the Terrestrial Ecological Study found in **Appendix F2** of the report.

Conservation Important Floral Species

The current site has been affected within the past and present by agricultural practices and those pockets that remain semi-natural are limited in terms of habitat heterogeneity. Within these pockets, conservation important (CI) species were detected, and these include National Threatened Plant Species Programme (TSP) lists, any Protected species according to the Nature Conservation Ordinance (12 of 1983) and any specific Endemic or Rare species.

The Threatened Plant Species Programme (TSP) is an ongoing assessment that revises all threatened plant species assessments using IUCN Red Listing Criteria. According to the TSP Red Data list of South African plant taxa (accessed April 2016), there are 273 Red Data listed species (Table 7-4) within Mpumalanga Province (including Data Deficient species) of which 11 species are Critically Endangered (CR), 29 are Endangered (EN) and 75 are Vulnerable (VU).

From the POSA website (QDS 2628B) 9 CI species has been recorded in the greater region. This includes two Vulnerable species, and three Near Threatened species. In terms of field sampling, the majority of these species were either within their flowering period or containing their leaves and spent flowers during surveying. Species such as *Nerine gracilis*, however, would not have been detected during our survey time. There was a low possibility of these species occurring on site, with a higher potential for them to occur within the surrounding areas (**Table 6.1**). The Declining *Boophone disticha* and the Declining *Hypoxis hemerocallidea* were, however, identified on Site (**Figure 6.1).** These are also considered Protected species under the Nature Conservation Ordinance, 12 of 1983. Another Protected species found within the wetland habitat was *Gladiolus papilio* (**Figure 6.1**). The position of the the mentioned CI floral species are indicated in **Figure 6.2**. Protected Species may not be cut, disturbed, damaged, destroyed without obtaining a permit from Mpumalanga Province or a delegated authority.

Boophone disticha

Gladiolus papilio

Figure 6.1: Photographs of Conservation Important plant species on Site

Table 6.1: List of all significant flora found on development site.

Family	Species	Threat Status	Flowering Times	Habitat	LoO
AMARYLLIDACEAE	*Nerine gracilis* R.A.Dyer	VU	Spring	Undulating grasslands in damp areas	Possible within the wetlands off site
AMARYLLIDACEAE	*Crinum bulbispermum* (Burm.f.) Milne-Redh. & Schweick.	Declining	Spring - Summer	Grows along stream banks and in swampy grasslands that usually dry out during the winter months when these plants are dormant.	Possible within the wetlands off site
APIACEAE	*Alepidea peduncularis* A.Rich.	DDT	Summer (December-March)	Montane grasslands; Rocky areas in sourveld grassland, quartzite rocks.	Possible to the west of site
APOCYNACEAE	*Stenostelma umbelluliferum* (Schltr.) S.P.Bester & Nicholas	NT	September - March, peaking in October - January. (can flower to April.)	Deep black turf, mainly near drainage lines on vertic soils with high clay content in grassland or savanna, at altitudes between 1 050 and 1 280 m.	Possible within the wetlands off site
ASPHODELACEAE	*Kniphofia typhoides* Codd	NT	February - March	Low lying wetlands and seasonally wet areas in climax Themeda triandra grasslands on heavy black clay soils, tends to disappear from degraded grasslands.	Possible within the wetlands off site
ASTERACEAE	*Callilepis leptophylla* Harv.	Declining	Spring	Grassland or open woodland, often on rocky outcrops or rocky hill slopes.	Possible
HYPOXIDACEAE	*Hypoxis hemerocallidea* Fisch., C.A.Mey. & Avé-Lall.	Declining	Summer	Open grassland and woodland	Yes
IRIDACEAE	*Gladiolus robertsoniae* F.Bolus	NT	Spring - Summer	Moist highveld grasslands, found in wet, rocky sites, mostly dolerite outcrops, wedged in rock crevices.	Possible to the west of site
MESEMBRYANTHEMACEAE	*Khadia beswickii* (L.Bolus) N.E.Br.	VU	Summer & Autumn	Rocky spots with shallow soil	Possible to the west of site

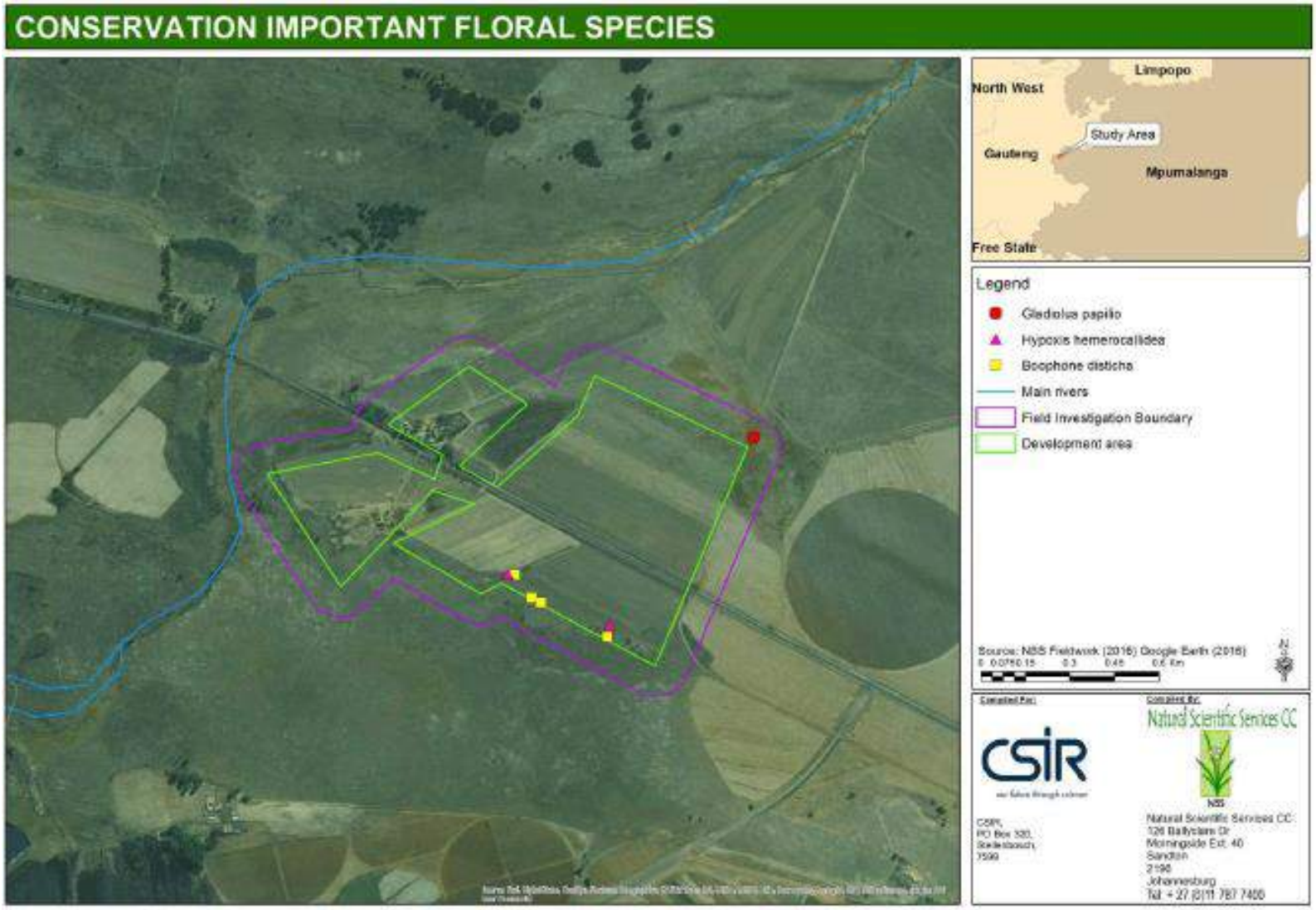


Figure 6.2: Conservation Important floral species positions

Conservation Important Fauna

Summarized in **Table 6.2** for each major animal group (taxon) is the estimated number of potentially occurring species, and the names of those species with a threatened, Near Threatened or Protected status.

Table 6.2: Summary of faunal diversity and threatened species

Taxon	Approximate No. of Species	Potential Threatened Species
Mammals	47	EN White-tailed Rat
		NT Serval
		NT Southern African Hedgehog
		NT Natal Long-fingered Bat
		PS Cape Fox
Birds	208	EN African Marsh-harrier
		EN Black Harrier
		harrier EN Yellow-billed Stork
		VU African Grass-owl
		VU Lanner Falcon
		VU Secretarybird
		VU White-bellied Korhaan
		NT Black-winged Pratincole
		NT Blue Korhaan
		NT Chestnut-banded Plover
		NT Half-collared Kingfisher
		NT Greater Flamingo
		NT Lesser Flamingo
		NT Maccoa Duck
		NT Melodious Lark
Reptile	37	NT Coppery Grass Lizard
		NT Striped Harlequin Snake
Frogs	16	PS Giant Bullfrog
Butterflies	54	EN Roodepoort Copper
		Rare Marsh Sylph
Odonata	21	None
Scorpions	3	None

Mammals

Approximately 47 mammal species are considered highly likely or likely to occur at least occasionally in or near the proposed development area, and mostly represent rodents, Carnivores, insectivores and bats. Based on observed live animals, burrows and faeces, the most common terrestrial mammals in the development area appear to include the Common Mole-rat, Yellow Mongoose and Scrub Hare (**Figure 6.3**).

Apart from various Data Deficient (DD) rodent and shrew species, the following five Conservation Important mammal species are considered highly likely or likely to at least pass through the development area (**Table 6.2**):

- The globally Endangered White-tailed Rat occurs mainly in temperate grassland areas where it requires reportedly sandy soils and inhabits burrows (such as those of Meerkats) and cracks in the ground. Intense livestock grazing is problematic for this species and, therefore, it was rated with a moderate Likelihood of Occurrence (LoO) at best.
- The nationally Near Threatened (NT) Serval typically frequents dense, grassy habitat near water, and based on NSS‟s experience, is tolerant of considerable habitat transformation. As the wetland and pasture fields appear to be highly suitable for Serval, this species was rated with a high LoO.
- The nationally NT Southern African Hedgehog tends to avoid wet ground and requires thick, dry cover for nesting, resting by day during summer, and while in torpor during winter. As the proposed development area is slightly elevated and comprises extensive (albeit pasture) grass, this species was rated with a high LoO. Rocky grassland near the southern boundary of the development area may be especially favourable for hedgehogs.
- The nationally NT Natal Long-fingered Bat is a cave-roosting bat species and is, therefore, unlikely to reside in the development area. This migratory bat species can, however, travel large distances between caves and during nightly foraging excursions Natal Long-fingered Bats are therefore expected to at least occasionally pass over or visit the area to forage. This species was, therefore, rated with a moderate LoO.
- The Cape Fox is listed as a Protected Species on the 2015 ToPS List. It preferentially inhabits mesic to arid grassland and was rated with a moderate LoO.

As all the above-mentioned CI mammal species are largely nocturnal, they were unlikely to be detected without camera- or live-trapping during our brief day-time site visit.

Common Mole-rat (*Cryptomys hottentotus*) mounds

Yellow Mongoose (*Cynictis penicillata*) burrow

Figure 6.3: Evidence of mammal species in the proposed development area

Birds

During our site visit a slightly larger-than-expected proportion of the detected bird species represented seed-eaters compared to water birds, because there was an absence of aquatic habitat within the development area. This was possibly due to a greater availability of grass seed in the pasture fields and elsewhere in late summer when the site visit was performed. Bird species that were detected most frequently in the development area included swallows, cisticolas, doves, lapwings, Amur Falcon, Cape Longclaw, Common Myna, Cape Sparrow, Hadeda Ibis and Common Fiscal. The list of significant birds can be found on **Table 6.2**.

The most significant bird findings during the site visit included a small group of Temminck‟s Courser and a pair of Marsh Owls. The owls were flushed from the identified *Agrostis-Imperata-Arundinella* Wetland, which adjoins the north-eastern corner of the proposed development area. In addition to feathers and pellets, grass “knitting” and tunnelling from the owls was observed, which suggests that the owls may represent a resident breeding pair. The Vulnerable African Grass-owl, which is ecologically similar to the Marsh Owl, has been recorded from at least four farms wherein the development area is situated. Given these reports and our Marsh Owl observations during the site visit, it is considered highly likely that African Grass-owls could forage, roost and even breed where the Marsh Owls had “knitted” and tunnelled the grass near the north-eastern corner of the development area.

The regionally VU African Grass-Owl is a habitat specialist requiring tall (at least knee-high), dense grasses and sedges in which to construct nests and roost tunnels. Suitable habitat is typically found along drainage systems, around pans, and within slope seepage zones, and the occurrence of these owls in an area is dependent on the retention of such areas. Nesting has been recorded even in small (≤4m²) patches of suitable habitat within generally unsuitable *Hyparrhenia hirta* grassland. Grass-owls hunt over a mixture of wetland, grassland, cropland and fallow fields, and have been shown through radio telemetry to forage up to 4km away from their roosts and nests. During foraging, grass-owls are able to fly over extensive areas of unsuitable habitat to reach favoured hunting areas, and it is this behaviour combined with the species‟ nesting adaptability, which could enable this species to occur in the study area.

The following additional CI bird species, which have been reported wherein the proposed development area is situated, are also regarded as having a high or moderate LoO on site.

The regionally VU Lanner Falcon inhabits a high diversity of habitats, and was recorded in this region during 2011. In southern Africa, population declines have possibly been associated, among other things, with pesticide dressings on crop seeds. Breeding Lanner Falcons usually use the abandoned nests of other raptors, corvids or herons on trees or pylons. Small birds, especially quails, doves and pigeons, make up most of this species‟ diet, and populations have reportedly benefited from hunting free-range poultry. As the proposed project would not involve free range poultry, predation of chickens by Lanner Falcons seems unlikely.

- The globally VU Secretarybird inhabits grasslands ranging from open plains to lightly wooded savanna, and is also found in agricultural areas. The species is undergoing an overall rapid decline due to various forms of anthropogenic habitat transformation and other factors, and is listed on CITES Appendix II.

- The regionally VU White-bellied Korhaan inhabits open grassland and lightly wooded savanna. It prefers taller grass than most other korhaans. Patches of taller pasture grass in the proposed development area may be suitable for this species and, therefore, it‟s potential albeit occasional presence cannot be ruled out.
- The regionally NT Black-winged Pratincole migrates from its breeding range in Eurasia to overwinter in southern Africa. Threats to this species are poorly understood. In its wintering grounds agricultural transformation of grassland and measures to control swarming pest insects such as locusts, may be negatively affecting populations.
- The globally NT Blue Korhaan is virtually endemic to South Africa, extending only marginally into western Lesotho. The total South African population has been estimated at 1 500-5 000 individuals, but this may be an underestimate. The species occurs in grassland usually above 1 500m, where populations typically inhabit short, open grassland with termite mounds and few or no trees, but also fallow cropland and pastures.
- The globally NT Melodious Lark preferentially inhabits areas where the grass is short, and there are open spaces between the grass tussocks. Wetter low-lying areas are avoided, and the species is sensitive to grazing by livestock. Although habitat conditions within the proposed development area appear to be suitable for Melodious Lark, livestock grazing could be problematic.

Reptiles

Thirty-seven reptile species are considered highly likely or likely to occur in or near the development area, which mostly represent snakes and lizards. Based on ReptileMAP‟s (2016) records from QDS 2628BA, and observed habitat conditions, within the proposed development area the most frequently encountered reptile species are likely to include Cape Gecko, Cape Skink, Variable Skink, Eastern Ground Agama, Brown House Snake, Red-lipped Snake and Spotted Grass Snake, among others.

Two CI reptile species potentially occur in the study area (**Table 6.2**):

- The globally NT Coppery Grass Lizard is endemic to Swaziland and South Africa where populations are primarily threatened by grassland transformation. Like most grass lizards, the Coppery Grass Lizard is an extreme grassland specialist. It possesses a long slender body with significantly reduced limbs, enabling it to move swiftly through grass. Populations are restricted to natural grassland areas in proximity to rocks, which provide important shelter for these lizards during veld fires. Individuals probably also shelter in the base of grass tussocks like other grass lizards. Coppery Grass Lizards have been recorded near Delmas and elsewhere. Given this, and that the rocky outcrop and associated rocky grassland along the southern side of the proposed development area appears to be suitable for this species, it was rated with a high LoO.
- The globally NT Striped Harlequin is endemic to Swaziland and South Africa, where it is very sparsely distributed, particularly outside Gauteng. It is an elusive, partially fossorial snake species, which is known to inhabit old termite mounds in grassland, and which feeds exclusively on thread snakes (*Leptotyphlops* spp.). The species is highly threatened by

transformation of its Highveld grassland habitat due to agriculture and other forms of land-use. As a few termitaria were found, and as thread snakes almost certainly occur in and around the development area, the Striped Harlequin Snake was rated with a moderate LoO.

Frogs

Sixteen frog species are considered highly likely or likely to occur in or near the proposed development area (**Table 6.2**). Only the Giant Bullfrog is formally recognized as conservation important. Giant Bullfrogs spend most of the year buried in a state of torpor, and exhibit sporadic bouts of (mainly nocturnal) activity 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 preferably emergent grassy vegetation. Bullfrog foraging appears to be concentrated around their burrows, which may be situated up to 1km from their breeding site. Given this, and that Giant Bullfrog breeding is known from a locality approximately 5km upstream along the unnamed tributary of the Koffiespruit, this species was rated with a high LoO. Although this species is unlikely to breed in the proposed development area, individuals might forage, burrow or disperse through the site.

Butterflies

During the site visit, 14 (26%) of the 54 potentially occurring butterfly species were detected **(Table 6.2**). These included common and widespread species with the exception of the Marsh Sylph. One additional CI butterfly taxon that could occur in or near the study area is the EN subspecies of the Roodepoort Copper.

The South African endemic Marsh Sylph butterfly, which is listed as nationally Rare and provincially VU, inhabits marshy wetland areas often in the headwaters of streams in open grassland at altitudes of 1 400-1 700m a.s.l., where it is limited to contiguous patches of its larval foodplants. Larval foodplants include the rushes *Juncus oxycarpus* and *Juncus exsertus*, the sedge *Schoenoplectus decipiens* and the grasses *Diplachne fusca* and *Leersia hexandra*, in particular. Adults can be seen flying in suitable habitat patches between December and March. During the site visit at least three adult individuals of this species were seen flying amidst *Leersia hexandra* in the wetland which adjoins the north eastern corner of the site (**Figure 6.4**).

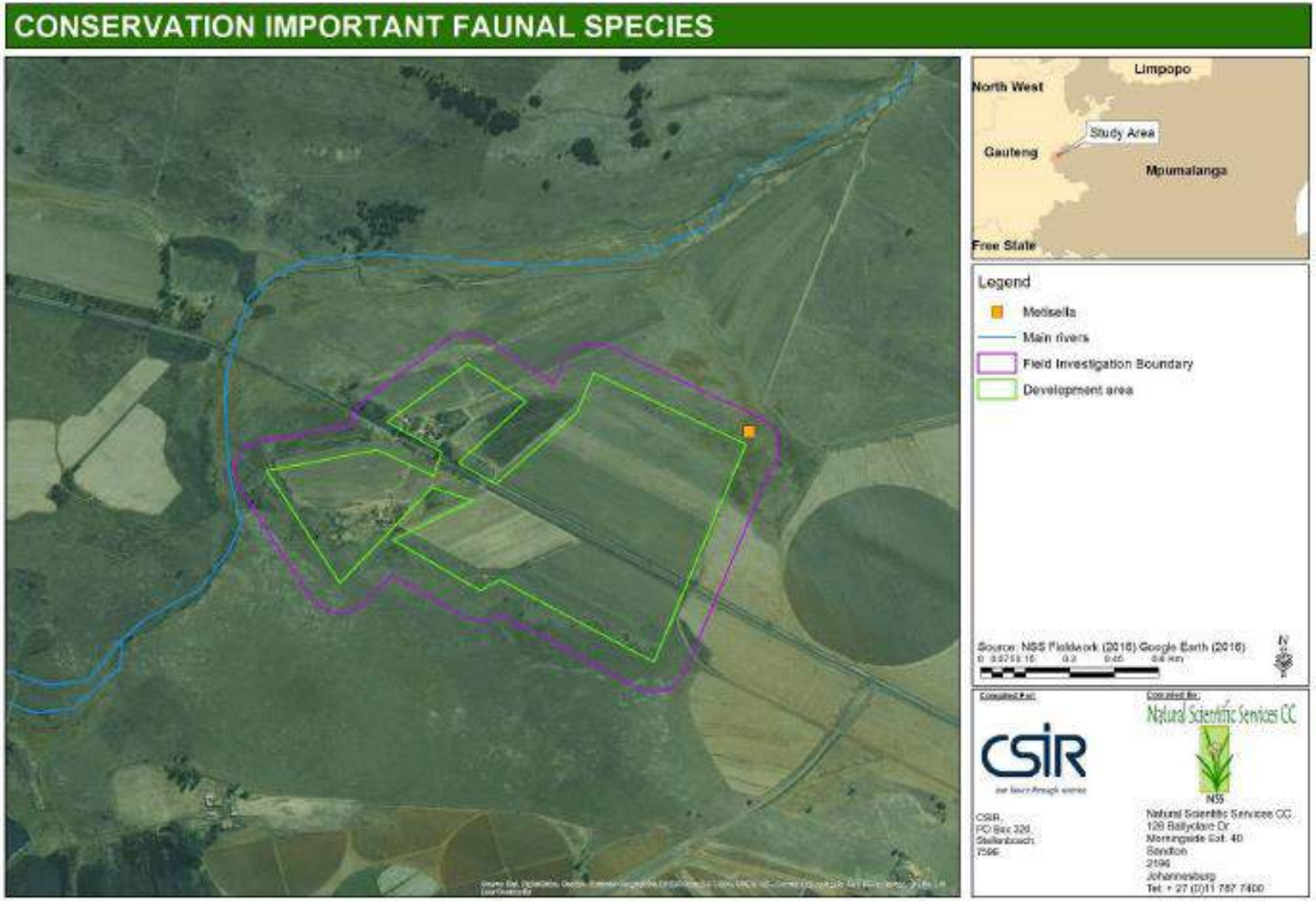


Figure 6.4: Conservation Important fauna species positions: location of observed Marsh Sylph butterflies

6.2. Freshwater and Wetland Assessment

The findings of the Freshwater and Wetland Assessment were broken up into sections.

Wetland System Characterisation

Different freshwater features where identified, these include:

- A channelled valley bottom wetland (located approximately 110 m from the proposed poultry phase 1 infrastructure, on the western border of the study area) with an associated hillslope seep wetland (located directly adjacent to the proposed poultry phase 1 infrastructure and approximately 100m from the proposed piggery phase 1 infrastructure)
- An unchannelled valley bottom wetland, which has historically been artificially canalised (located approximately 100m downgradient from the proposed waste management site).

The freshwater features identified during the assessment of the study area was categorised according to the Classification System as described in Appendix B of this report. The features identified is characterised as an Inland System falling within the Highveld Aquatic Ecoregion and the Mesic Highveld Grassland Group 3 wetland vegetation type. The results of the wetland system characterisation are summarised in **Table 6.3** below.

Table 6.3: Characterisation of Wetland System.

Wetland	Level 3: Landscape Unit	Level 4: Hydrogeomorphic (HGM) unit	Longitudinal zonation/landform/inflow drainage
Channelled Valley Bottom Wetland and Unchannelled Valley Bottom wetland, with associated Hillslope Seep	Valley Floor: The typically gently sloping, lowest surface of a valley	Channelled valley bottom wetland: A valley bottom wetland with a river channel running through it	Not applicable
		Unchannelled Valley bottom wetland: a valley bottom wetland without a river channel running through it	
	Slope: and included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, kill or valley.	Seep: a wetland area located on (gently to steeply) sloping land, which is dominated by the collivial (i.e. gravity-driven), unidirectional movement of material down-slope s of a valley but they do not, typically, extend into a valley floor.	With/without channelled outflow, dependent on their connectivity to channelled systems.

The floral community structure and composition throughout the study area, in both terrestrial and wetland ecosystems, has been transformed as a result of historical and current agricultural activities including small-scale subsistence crop cultivation and trampling and overgrazing by livestock.

Overall, floral species diversity was considered to be relatively high, although some areas of the hillslope seep feature have undergone greater levels of disturbance and were found to have lower species diversity, which is to be expected under the circumstances. Due to the extent of the freshwater feature identified within the study area, as well as the homogenous nature of the vegetation, the dominant floral species associated with the freshwater features are presented together, and not per feature. It should be noted however that the table below (**Table 6.4**) serves as an indication of the dominant species and is not a comprehensive listing of all floral species found within the study area.

Table 6.4: Flora found in freshwater/wetland area within the development site.

Terrestrial	Temporary Zone	Seasonal Zone	Permanent Zone
Commelina africana var. krebsiana	*Helichrysum kraussii*	*Eragrostis gummiflua*	*Imperata cylindrica*
Urochloa mossambicensis	*Nidorella anomala*	*Sporobulus africanus*	*Eleocharis dregeana*
Pennisetum clandestinum	*Seriphium plumosum*	*Pycreus mundtii*	
Digitaria eriantha	*Setaria sphacelata*	*Cyperus denudatus*	
Eragrostis curvula	**Cirsium vulgare*	*Hemarthria altissima*	
Hyperinia hirta	*Eragrostis gummiflua*	*Leersia hexandra*	
Aristida congesta	**Campuloclinium macrocephalum*	*Typha capensis*	
Melinis repens		*Kyllinga erecta*	
****Tagetes minuta***		*Berkaya radula*	
****Bidens pilosa***		*Aristida spp.*	
****Solanum pseudocapsicum***			
****Cirsium vulgare***			

6.3. Waste Management

In accordance with the regulations, A person who wishes to commence, undertake or conduct a waste management activity listed under “general waste” must conduct a basic assessment process set out in the Environmental Impact Assessment Regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No 107 of 1998) as part of a waste management license application contemplated in section 45 read with section 20(b) of this Act.

The Waste Management License will be undertaken in respect of the National Environmental Management: Waste Act (Act No. 36 of 1998) as amended. Parts of the legislations published under this act will be adhered to. It is also noted that a Waste Management License Application process is currently being run in parallel with this BA process.

7. IMPACT ASSESSMENT

7.1. Introduction

Impact assessment must take account of the nature, scale and duration of effects on the environment, whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase. Where necessary, the proposal for mitigation or optimisation of an impact is noted. A brief discussion of the impact and the rationale behind the assessment of its significance is provided in this Section. The EIA of the project activities is determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects.

The environmental Impact Assessment is focussed on the following phases:

- Construction Phase
- Operational Phase
- Decommissioning Phase

7.2. Impact Assessment Methodology

7.2.1. Methodology of Impact Assessment

According to the DEA IEM Series guideline on "Impact Significance" (2002), there are a number of quantitative and qualitative methods that can be used to identify the significance of impacts resulting from a development. The process of determining impact significance should ideally involve a process of determining the acceptability of a predicted impact to society. Making this process explicit and open to public comment and input would be an improvement of the EIA/BA process. The CSIR's approach to determining significance is generally as follows:

- Use of expert opinion by the specialists ("professional judgement"), based on their experience, a site visit and analysis, and use of existing guidelines and strategic planning documents and conservation mapping (e.g. SANBI biodiversity databases);
- Review of specialist assessment by all stakeholders including authorities such as nature conservation officials, as part of the report review process (i.e. if a nature conservation official disagreed with the significance rating, then we could negotiate the rating); and
- Our approach is more a qualitative approach - we do not have a formal matrix calculation of significance as is sometimes done.

7.2.2. Specialist Criteria for Impact Assessment

The following methodology has been provided by the CSIR to all specialists, for incorporation into specialist assessments:

Assessment of Potential Impacts

The assessment of impact significance is based on the following conventions:

Nature of Impact - this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"

Spatial Extent - this should indicate whether the impact will be:

- Site specific;
- Local (<2 km from site);
- Regional (within 30 km of site); or
- National.

Duration - The timeframe during which (lifetime of) the impact will be experienced:

- Temporary (less than 1 year);
- Short term (1 to 6 years);
- Medium term (6 to 15 years);
- Long term (the impact will cease after the operational life of the activity); or
- Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient).

Intensity - it should be established whether the impact is destructive or innocuous and should be described as either:

- High (severe alteration of natural systems, patterns or processes such that they temporarily or permanently cease);
- Medium (notable alteration of natural systems, patterns or processes; where the environment continues to function but in a modified manner); or
- Low (negligible or no alteration of natural systems, patterns or processes); can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making.

Probability - this considers the likelihood of the impact occurring and should be described as:

- Improbable (little or no chance of occurring);
- Probable (<50% chance of occurring);
- Highly probable (50 – 90% chance of occurring); or
- Definite (>90% chance of occurring).

Reversibility - this considers the degree to which the adverse environmental impacts are reversible or irreversible. For example, an impact will be described as low should the impact have little chance of being rectified to correct environmental impacts. On the other hand, an impact such as the nuisance factor caused by noise impacts from wind turbines can be considered to be highly reversible at the end of the project lifespan. The assessment of the reversibility of potential impacts is based on the following terms:

- High - impacts on the environment at the end of the operational life cycle are highly reversible;
- Moderate - impacts on the environment at the end of the operational life cycle are reasonably reversible;
- Low - impacts on the environment at the end of the operational life cycle are slightly reversible; or
- Non-reversible - impacts on the environment at the end of the operational life cycle are not reversible and are consequently permanent.

Irreplaceability - this reviews the extent to which an environmental resource is replaceable or irreplaceable. For example, if the proposed project will be undertaken on land that is already transformed and degraded, this will yield a low irreplaceability score; however, should a proposed development destroy unique wetland systems for example, these may be considered irreplaceable and thus be described as high. The assessment of the degree to which the impact causes irreplaceable loss of resources is based on the following terms:

- High irreplaceability of resources (this is the least favourable assessment for the environment);
- Moderate irreplaceability of resources;
- Low irreplaceability of resources; or
- Resources are replaceable (this is the most favourable assessment for the environment).

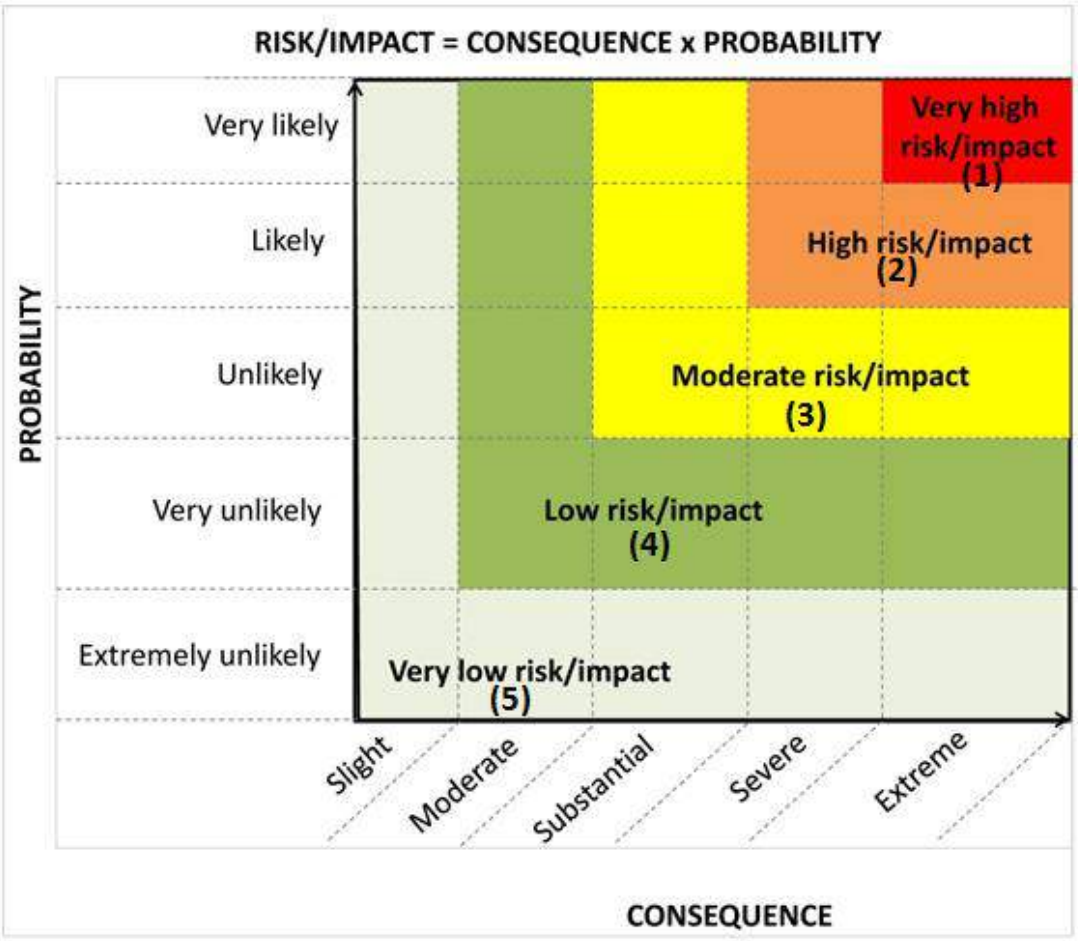


Figure 7.1: Guide to assessing risk/impact significance as a result of consequence and probability.

The status of the impacts and degree of confidence with respect to the assessment of the significance is stated as follows:

Status of the impact: A description as to whether the impact will be:

- Positive (environment overall benefits from impact);
- Negative (environment overall adversely affected); or

- Neutral (environment overall not affected).

Degree of confidence in predictions: The degree of confidence in the predictions, based on the availability of information and specialist knowledge. This should be assessed as:

- High;
- Medium; or
- Low.

Based on the above considerations, the specialist provides an overall evaluation of the significance of the potential impact, which should be described as follows:

- **Low to very low:** the impact may result in minor alterations 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;
- **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; or
- **High:** Where it could have a "no-go" implication for the project unless mitigation or re-design is practically achievable.

Furthermore, the following must be considered:

- Impacts should be described both before and after the proposed mitigation and management measures have been implemented.
- All impacts should be evaluated for the construction, operation and decommissioning phases of the project, where relevant.
- The impact evaluation should take into consideration the cumulative effects associated with this and other facilities which are either developed or in the process of being developed in the region, if relevant.

Management Actions:

- Where negative impacts are identified, mitigatory measures will be identified to avoid or reduce negative impacts. Where no mitigatory measures are possible this will be stated.
- Where positive impacts are identified, augmentation measures will be identified to potentially enhance these.
- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements will be set. This will include a programme for monitoring and reviewing the recommendations to ensure their ongoing effectiveness.

Monitoring:

Specialists should recommend monitoring requirements to assess the effectiveness of mitigation actions, indicating what actions are required, by whom, and the timing and frequency thereof.

Cumulative Impact:

Consideration is given to the extent of any accumulative impact that may occur due to the proposed development. Such impacts are evaluated with an assessment of similar developments already in the environment. Such impacts will be either positive or negative, and will be graded as being of negligible, low, medium or high impact.

Mitigation:

The objective of mitigation is to firstly avoid and minimise impacts where possible and where these cannot be completely avoided, to compensate for the negative impacts of the development on the receiving environment and to maximise re-vegetation and rehabilitation of disturbed areas. For each impact identified, appropriate mitigation measures to reduce or otherwise avoid the potentially negative impacts are suggested. All impacts are assessed without mitigation and with the mitigation measures as suggested.

Table 7.1: Description and ratings of different Impact Criteria [*Rating (Score)*]

Criteria	**Description**				
Nature (A brief written statement of the environment aspect being impacted upon by a particular activity or action.)	*Direct*	*Indirect*	*Cumulative*		
Status (The perceived effect of the impact on the affected area.)	*Negative*	*Positive*	*Neutral*		
Spatial Extent	*National (4):* The Whole of South Africa	*Regional (3):* Provincial and Parts of neighbouring provinces	*Local (2):* Within a radius of 2 km of the construction site	*Site (1):* Within the construction site	
Duration	*Permanent:* This impact is irreversible. Mitigation will not occur in such a way Or in such a time span that the impact can be considered transient.	*Long term (>15 years):* The impacts will cease after the operational life of the activity. The impact is reversible with the implementation of appropriate mitigation and management actions.	*Medium Term (6 to 15 years):* The impact is reversible with the implementation of appropriate mitigation and management actions.	*Short term (2 to 6 years):* This impact is reversible.	*Temporary (less than 2 years):* or period of the construction period. The impact is fully reversible.
Potential Impact Intensity (Negative)	*Very High/Fatal Flaw (16):* Potential to severely impact human health, or lead to loss of species	*High (8):* potential to reduce fauna/flora population or to lead to severe reduction/alteration of natural process, loss of livelihood/severe impact on quality of life, individual economic loss	*Medium (4):* Potential to reduce environmental quality; air, soil, water. Potential loss of habitat, loss of heritage, reduce amenity	*Medium-Low (2):* Nuisance	*Low (1):* Negative change, with no other consequence
Potential Impact Intensity (Positive)	*High (8):* Potential Net improvement	*Medium (4):* Potential to improve environmental	*Medium-Low(2):* Potential to lead to Economic	*Low (1):* Potential positive change- with no other	

	in human welfare	quality; air, soil, water. Improved livelihoods	Development	consequences
Reversibility	*Irreversible*	*High*	*Moderate*	*Low*
Irreplaceability of Impact Resource	*High*	*Moderate*	*Low*	*Replaceable*
Probability	*Definite (1):* >90% chance of occurring	*Highly Probable (0.5):* 50-90% chance of occurring	*Probable (0.25):* 10-25% chance of occurring	*Improbable (0.1):* Little or no chance of occurring < 10%)
Rating of Overall Impact Significance	*Fatally flawed (18-26):* The project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating	*High (10-17):* The impacts will result in major alterations to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making.	*Medium (5-9):* 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	*Low (<5):* The Impact may result in moderate alteration of the environment and can be reduced or avoided by implementing appropriate mitigation measures, and will not have an influence of decision-making.

Overall impact significance is calculated as:
Impact significance = Impact magnitude X Impact probability, where:
Impact magnitude = Potential impact intensity + Impact Duration + Impact extent

The suitability and feasibility of all the proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measures is implemented. Mitigation measures identified as necessary will be included in an EMPr.

7.3. Potential Impacts and Significance

The following sections will provide a description of the potential impacts as identified by the specialists, EAP and through the PPP as well as the assessment according to the criteria described in Table 7.1. All potential impacts associated with the proposed development through the construction, operation and decommissioning of the development life-cycle have been considered and assessed in the following sections.

Note from the CSIR: Feasibility site alternatives (i.e. location and property alternatives) do not exist for the proposed project. The No-Go alternatives will be considered.

7.3.1. Terrestrial Ecological Impacts

Table 7.2: Identified Impacts for Construction Phase of Preferred Alignment.

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Introduction & proliferation of alien spp. From the influx of vehicles, people and materials, site disturbance and lack of alien species control	High (Negative)	▪ By law, remove and dispose of Category 1b alien species on site. Mechanical removal of these species is recommended. However, the removal must be carefully performed so as to not excessively disturb the soil layer. Alien debris could be donated to a local community. All Category 2 species that remain on site must require a permit.	Medium (Negative)
▪ Unnatural wild fires from influx of people and construction activities	Low (Negative)	▪ Highlight all prohibited activities to workers through training and notices.	Low (Negative)
▪ Loss of vegetation communities and Conservation Important(CI) species from clearing of vegetation and increase in vehicle and human activity	Medium (Negative)	▪ Highlight all prohibited activities to workers through training and notices. ▪ Briefly and effectively stockpile topsoil (preferably 1-1.5m in height) to maintain the viability of the indigenous seed bank for subsequent re-vegetation of any disturbed areas. ▪ No landscaping should be performed around the facilities. A large number of poultry production facilities in South Africa have expansive lawns around their developments. This must be avoided. Natural vegetation must be allowed to recover in areas of disturbance. If recovery is slow, then a seed mix for the area (using indigenous grass species listed within this report) should be sourced and planted.	Low (Negative)

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
▪ Increase in dust and erosion from clearing of vegetation, earth moving activities, and increase in vehicle traffic	Low (Negative)	▪ Erosion protection measures must be implemented on the site to reduce erosion and sedimentation of the receiving environment. Measures could include: o Sandbags; o Sediment traps; o Bunding around soil stockpiles; o Vegetation of areas not to be developed. ▪ Adequate dust control strategies should be applied to minimise dust deposition, for example: o Periodic spraying of roads with water. o Cover trucks to prevent dust emission during transport.	Low (Negative)
▪ Environmental contamination from building rubble, chemical leaks, spills and emissions, human excrement and litter	Medium (Negative)	▪ Regularly check vehicles, machinery and equipment operating on site to ensure that none have leaks or cause spills of oil, diesel, grease or hydraulic fluid. Should a hydrocarbon or other chemical spill occur, clean up procedures must be undertaken a.s.a.p., in line with best practice: o Spills on soil should be contained by using oil absorbents and/or peat sorbs to absorb the spill. This should be cleaned and removed into adequate hazardous waste containers. All contaminated soil must be removed and placed into hazardous waste bins or should be bio-remediate. o Spills on water must be addressed by personnel on site or by pollution control contractors, using oil absorbents or oil skimmers. Oil contaminated absorbent material or skimmed-off chemicals need to be disposed of in hazardous waste bins or sealable drums. o Under no circumstances must spilled products be disposed of	Low (Negative)

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		in sewers or storm water drains, or be deliberately ignited. ○ Gloves/PPE should be worn when handling spilled petroleum products.	
▪ Disturbance of CI fauna from habitat destruction, increase in vehicle and human activity, noise and dust, environmental contamination, and unnatural fires	Medium (Negative)	▪ Highlight all prohibited activities to workers through training and notices. ▪ Commence (and preferably complete) construction during winter, when the risk of erosion, disturbing growing plants, and disturbing active (including breeding and migratory) animals, should be least. Although grass-owls can breed throughout the year, egg-laying has NOT been recorded in June, August and September ▪ Noise should also be minimised throughout construction to limit the impact on sensitive fauna such as owls, korhaans and Secretary bird. ▪ Limit construction activities to day light hours, and minimize security and other lights at night, to reduce the disturbance of nocturnal fauna including CI species such the potentially occurring Serval, hedgehog, Cape Fox and grass-owls. ▪ Check open trenches daily for trapped animals (e.g. bullfrogs, hedgehogs and snakes), which should be carefully caught and relocated according to the specifications of a relevant specialist.	Low (Negative)
Indirect impacts:			
▪ Socio-economic impact: Secondary industries may benefit from the proposed project in the form of the provision of produce and pork products. This impact is rated as positive.	Low (Positive)	▪ Ensure that local industries are utilised as suppliers, where applicable/practical.	Medium (Positive)

No-go alternative
Direct impacts: ▪ None of the impacts mentioned above will occur. ▪ The existing site will remain uncleared which will result in no clearance of indigenous vegetation and in addition, no clearance of present alien species. ▪ If the proposed project does not proceed, increased income and economic spin-off activities will not be realised. ▪ Approximately 68 will not be created during the construction phase. ▪ Customers of the proposed piggery and chicken broiler facility will not be provided with an increase of poultry and pork products on a local scale. ▪ If the proposed project does not proceed, the industries that rely on the supply of poultry and pork 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.

Table 7.3: Identified Impacts for Operational Phase of Preferred Alignment.

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Environmental contamination from chicken and pig excrement, carcases and feed, and other operational waste	Medium (Negative)	▪ Dispose of animal feed, bedding, excrement, carcasses, and all other waste using effective and environmentally-friendly methods, as planned pre-construction. Under no circumstances should carcasses or any other waste be dumped on site, or elsewhere, where this is not catered for. ▪ Implement procedures and measures (e.g. sand traps) to prohibit accidental dirty water or contamination from entering the surrounding environment. ▪ Immediately implement effective measures to rehabilitate accidentally contaminated areas.	Low (Negative)
▪ Transmission of diseases of wildlife from poultry, pigs and pets	Medium (Negative)	▪ Implement procedures and measures (e.g. sand traps) to prohibit accidental dirty water or contamination from entering the surrounding environment. ▪ Immediately implement effective measures to rehabilitate accidentally contaminated areas.	Negligible
▪ Poor/Inappropriate control of invertebrate pests such as flies, weavils, ants, termites, cockroaches, fleas, lice, mites, ticks, etc.	Medium (Negative)	▪ It is hard to overemphasize the importance of detecting pest infestations before they become a problem. Failure to do so will often result in increased cost of control, less effective or ineffective control measures and significant damage or loss. Proper detection requires frequent and careful monitoring, a knowledge of the common pests and an ability to recognize potential problems. To prevent pests, the following should be performed: ▪ Remove all trash, and sources of feed and water for pests from the	Low (Negative)

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		outside perimeter of the facilities. ▪ Moisture management, sanitation and manure removal are the keys to reducing pest problems in manure. Dry manure reduces the suitability for fly oviposition (egg laying) and larval development. It also provides a suitable habitat for beneficial predators and parasites. ▪ For fly management: Electrocution devices are available to kill flies, while other mechanical devices include traps, sticky tapes or baited traps.	
▪ Poor/Inappropriate control of vertebrate pests such as rodents, snakes mammalian carnivores, bats and raptors	Medium (Negative)	▪ It is hard to overemphasize the importance of detecting pest infestations before they become a problem. Failure to do so will often result in increased cost of control, less effective or ineffective control measures and significant damage or loss. Proper detection requires frequent and careful monitoring, a knowledge of the common pests and an ability to recognize potential problems. To prevent pests, the following should be performed: ○ Remove all trash, and sources of feed and water for pests from the outside perimeter of the facilities. ○ Keep grass and weeds mowed to 5cm or less immediately around the facilities, to prevent insect growth and hiding places for rats and mice. Plug all holes in the building (other than air inlets) larger than 1cm to prevent mice and rats from entering. Seal all foundation cracks. Check to see that fan louvers are properly working and close completely when the fan is not running. ○ In terms of rodent control: sanitation, rodent proofing and rodent killing are effective. Sanitation is removing the food, water and shelter from the rats and mice. Rodent proofing is making it more difficult for rodents to enter the building by	Low (Negative)

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		sealing or covering with wire mesh, all holes and cracks in the walls and foundations, around water pipes and drain spouts. Rodent killing is the third element of the program and a variety of methods can be used. Glue boards and traps can be used in small areas, but in larger areas (over 12,000 sq ft) baits are more practical. Rodenticides are NOT advised. ○ The most effective control for indigenous birds is screening production house air inlets and open windows with 2x2cm wire mesh.	
▪ Harvesting of CI flora from increase in human activity	Low (Negative)	▪ Highlight all prohibited activities to workers through training and notices.	Low (Negative)
▪ Unnatural wild fires to reduce risks to human and infrastructure safety, and from increase in human activity	Medium (Negative)	▪ Highlight all prohibited activities to workers through training and notices.	Low (Negative)
▪ Introduction and proliferation of alien spp. From influx of vehicles, people and materials, site disturbance, and lack of alien species control	High (Negative)	▪ Effectively remove remaining and emerging alien and invasive flora. Any alien debris could be donated to a local community.	Low (Negative)
▪ Disturbance of CI fauna from vehicle and human activity, noise and light, environmental contamination, inappropriate pest management, disease transmission, proliferation of alien species, and unnatural fires.	High (Negative)	▪ Highlight all prohibited activities to workers through training and notices. ▪ Implement measures (e.g. speed bumps) along the gravel access to control dust, erosion, sedimentation, and faunal roadkill and any sensory disturbance. ▪ Minimize lighting. Where this is not possible, lights should be hooded and orientated downwards to reduce the disturbance or attraction of fauna to lights. Fluorescent and mercury vapour lighting should be	Low (Negative)

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		avoided and sodium vapour (yellow) lights should be used wherever possible.	
Indirect impacts:			
▪ Socio-economic impact: Secondary industries may benefit from the proposed project in the form of the provision of produce and pork products. This impact is rated as positive.	Low (Positive)	▪ Ensure that local industries are utilised as suppliers, where applicable/practical.	Medium (Positive)

No-go alternative
Direct impacts: ▪ None of the impacts mentioned above will occur. ▪ The existing site will remain uncleared which will result in no clearance of indigenous vegetation and in addition, no clearance of present alien species. ▪ If the proposed project does not proceed, increased income and economic spin-off activities will not be realised. ▪ Approximately 68 will not be created during the construction phase. ▪ Customers of the proposed piggery and chicken broiler facility will not be provided with an increase of poultry and pork products on a local scale. ▪ If the proposed project does not proceed, the industries that rely on the supply of poultry and pork 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.

Table 7.4: Identified Impacts for Decommissioning Phase of Preferred Alignment.

IDENTIFIED IMPACTS- DECOMISSIONING AND CLOSURE PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Increase in dust and erosion from demolishing and rehabilitation activities	Low (Negative)	▪ Erosion protection measures must be implemented on the site to reduce erosion and sedimentation of the receiving environment, as previously described. ▪ Adequate dust control strategies should be applied to minimise dust deposition, as previously described.	Low (Negative)
▪ Environmental Contamination from building rubble, chicken and pig excrement, carcasses and feed, other operational waste, chemical leaks, spills and emissions, and litter	High (Negative)	▪ Devise effective and environmentally-friendly means of managing all waste on site, where this cannot be disposed of using an appropriate licensed facility. Leftover animal feed, excrement, carcasses, dirty water, building rubble and any other waste should be prohibited from entering the surrounding environment. ▪ Regularly check vehicles, machinery and equipment operating on site to ensure that none have leaks or cause spills of oil, diesel, grease or hydraulic fluid. Should a hydrocarbon or other chemical spill occur, clean up procedures must be undertaken a.s.a.p., in line with best practice, as previously described.	Low (Negative)
▪ Unnatural wild fires from influx of people and decommissioning activities	Low (Negative)	▪ Highlight all prohibited activities to workers through training and notices.	Low (Negative)
▪ Introduction and proliferation of alien spp. From influx of vehicles, people and materials,	High (Negative)	▪ Remove and dispose of any remaining and emerging Category 1b and Category 2 alien species on site. Again, alien debris could	Low (Negative)

IDENTIFIED IMPACTS- DECOMISSIONING AND CLOSURE PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
site disturbance, and lack of alien species control		be donated to a local community. ▪ Enable natural vegetation to recover in areas of disturbance. If recovery is slow, then a seed mix for the area (using indigenous grass species listed within this report) should be sourced and planted.	
▪ Disturbance of CI fauna from increase in vehicle and human activity, noise and dust, environmental contamination, unnatural fires, and proliferation of alien species	High (Negative)	▪ Highlight all prohibited activities to workers through training and notices. ▪ Demarcate the decommissioning site to prevent surrounding areas and biodiversity from being disturbed or destroyed. Disturbance of the wetland and rocky grassland areas, in particular, must be prohibited. ▪ Commence (and preferably complete) decommissioning during winter, when the risk of erosion, disturbing growing plants, and disturbing active (including breeding and migratory) animals, should be least. ▪ Noise should also be minimised throughout decommissioning to limit the impact on sensitive fauna such as owls, korhaans and Secretary bird. ▪ Limit decommissioning activities to day light hours, and minimize security and other lights at night, to reduce the disturbance of nocturnal fauna including CI species.	Low (Negative)
Indirect impacts:			
▪ Loss of Jobs and Income for workers	High (Negative)	▪ Ensure that workers/employees obtain agricultural training and management skills that ae marketable in order for them to be able to use their skills in finding other opportunities. ▪ Establish a relationship with local economic development and chambers of commerce and other employment initiatives in	Medium (Negative)

IDENTIFIED IMPACTS- DECOMISSIONING AND CLOSURE PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		order to create a platform that assists in helping workers transition to other employment or entrepreneurial opportunities.	

7.3.2. Freshwater Impacts

Table 7.5: Identified Impacts for Construction Phase of Preferred Alignment.

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Increased runoff entering freshwater resources, transporting with it sediment from impermeable surfaces associated with the proposed construction of poultry and piggery infrastructure and especially that of the waste management site;	Low (Negative)	▪ The boundaries of the construction areas are to remain as small as possible, be clearly defined and it should be ensured that all activities remain within defined footprint areas.	Low (Negative)
▪ Increased risk of erosion and incision of the freshwater resources as a result of higher water volumes	Low (Negative)	▪ To prevent the erosion of soils, management measures may include energy dissipating measures, soil traps, hessian curtains and storm water diversion away from areas particularly susceptible	Low (Negative)

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
entering the resources due to decreased permeable surface area;		to erosion as deemed appropriate by the consulting engineers. ▪ Adequate storm water management must be incorporated into the design of the proposed infrastructure in order to prevent erosion and the associated sedimentation of the freshwater features. In this regard special mention is made of: ▪ Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; ▪ Runoff from paved surfaces should be slowed down by the strategic placement of energy dispersing structures ▪ During the construction phases of the proposed infrastructure, erosion control measures should be installed on roadways to prevent gully formation and siltation of the freshwater resources;	
▪ Increased sedimentation and pollution of the resources as a result of the above and also as a result of disturbances to soils during construction;	Low (Negative)	▪ Implement silt traps during construction to remove sand particles from runoff. ▪ Adequate storm water management must be incorporated into the design of the proposed infrastructure in order to prevent erosion and the associated sedimentation of the freshwater features. In this regard special mention is made of: ○ Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; ○ Runoff from paved surfaces should be slowed down by the strategic placement of energy dispersing structures ○ No dumping of waste should be permitted within the freshwater features. Should any spillages or disposal of waste materials occur, such incidents must be managed according to the on-site Emergency Incident protocol;	Low (Negative)
▪ Compaction of the freshwater features soils due to indiscriminate	Low (Negative)	▪ All freshwater resource areas should be designated and clearly marked as No-Go areas and be off limits to all unauthorised	Low (Negative)

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
movement of construction vehicles within the freshwater features;		vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to prevent compaction of soils, loss of vegetation and increased erosion and to limit the ecological footprint of the infrastructure construction activities. ▪ Compacted soils should be ripped and rehabilitated with topsoil and reseeded with indigenous vegetation.	
▪ Loss of connectivity of freshwater resources as a result of road crossings through the freshwater resources habitat, resulting in altered hydrological patterns and fragmented habitats;	Low (Negative)	▪ Flow continuity may not be affected by the construction activities. ▪ All freshwater resource areas should be designated and clearly marked as No-Go areas and be off limits to all unauthorised vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to prevent compaction of soils, loss of vegetation and increased erosion and to limit the ecological footprint of the infrastructure construction activities.	Low (Negative)
▪ Possible alterations to vegetation community composition as a result of alien vegetation proliferation due to disturbances to soil profiles and clearing of indigenous vegetation in the vicinity of the freshwater resources;	Low (Negative)	▪ Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect floral communities within the freshwater resource habitat, need to be strictly managed. Existing alien species should be eradicated and controlled to prevent further spread of these species. ▪ Implement an alien vegetation control program within the freshwater features with special mention of water loving tree species.	Low (Negative)
▪ Altered topography due to earthworks associated with construction of the proposed infrastructure, resulting in areas of artificial ponding in turn leading to altered habitat.	Low (Negative)	▪ All freshwater resource areas should be designated and clearly marked as No-Go areas and be off limits to all unauthorised vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to prevent compaction of soils, loss of vegetation and increased erosion and to limit the ecological footprint of the infrastructure construction activities. ▪ Ensure that the functionality of the permanent, seasonal and	Low (Negative)

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		temporary zones of the freshwater features is maintained through provision of measures to ensure that soil wetting conditions are maintained and the freshwater features functions are reinstated.	
Indirect impacts:			
▪ Socio-economic impact: Secondary industries may benefit from the proposed project in the form of the provision of produce and pork products. This impact is rated as positive.	Low (Positive)	▪ Ensure that local industries are utilised as suppliers, where applicable/practical.	Medium (Positive)

No-go alternative
Direct impacts: ▪ None of the impacts mentioned above will occur. ▪ The existing site will remain uncleared which will result in no clearance of indigenous vegetation and in addition, no clearance of present alien species. ▪ If the proposed project does not proceed, increased income and economic spin-off activities will not be realised. ▪ Approximately 68 will not be created during the construction phase. ▪ Customers of the proposed piggery and chicken broiler facility will not be provided with an increase of poultry and pork products on a local scale. ▪ If the proposed project does not proceed, the industries that rely on the supply of poultry and pork 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.

Table 7.6: Identified Impacts for Operational Phase of Preferred Alignment.

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Increased runoff entering freshwater resources, transporting with it toxicants and sediment from impermeable surfaces associated with the proposed poultry and piggery infrastructure and especially that of the waste management site;	Low (Negative)	▪ The boundaries of the construction areas are to remain as small as possible, be clearly defined and it should be ensured that all activities remain within defined footprint areas. ▪ No dumping of waste should be permitted within the freshwater features. Should any spillages or disposal of waste materials occur, such incidents must be managed according to the on-site Emergency Incident protocol; and	Low (Negative)
▪ Increased runoff from impermeable surfaces associated with the proposed poultry and piggery infrastructure, and especially that of the waste management site, impacting on the ground water and surface water quality by transporting leachate and toxicants further into the system;	Low (Negative)	▪ All spills must be cleaned up and treated accordingly. ▪ Re-profile areas to ensure that no changes to runoff patterns occurs; ▪ Limit the footprint area of the construction activity to what is absolutely essential in order to minimise the loss of clean water runoff areas which recharge the receiving aquatic environment; ▪ With specific mention to the proposed waste management site which may impact on the water quality of the freshwater features, the following is recommended: ▪ Install geomembranes or flexible membrane liners (such as high density polyethylene (HDPE) liners) to contain or prevent waste constituents and leachate from escaping the proposed waste management site and into the ground water and surface water of the freshwater features. ▪ Groundwater monitoring should be commissioned with sampling and analysis from boreholes downgradient from the proposed waste	Low (Negative)

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		management site. This will ensure that the groundwater not be contaminated or enriched by leachate from the proposed waste management site.	
▪ Increased risk of erosion and incision of the freshwater resources as a result of higher water volumes entering the resources due to decreased permeable surface area;	Low (Negative)	▪ To prevent the erosion of soils, management measures may include energy dissipating measures, soil traps, hessian curtains and storm water diversion away from areas particularly susceptible to erosion as deemed appropriate by the consulting engineers. ▪ Adequate storm water management must be incorporated into the design of the proposed infrastructure in order to prevent erosion and the associated sedimentation of the freshwater features. In this regard special mention is made of: ○ Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; ○ Runoff from paved surfaces should be slowed down by the strategic placement of energy dispersing structures ▪ During the operational phases of the proposed infrastructure, erosion control measures should be installed on roadways to prevent gully formation and siltation of the freshwater resources.	Low (Negative)
▪ Increased sedimentation and pollution of the resources as a result of the above and also as a result of disturbances to soils during operations;	Low (Negative)	▪ Implement silt traps during construction to remove sand particles from runoff. ▪ Adequate storm water management must be incorporated into the design of the proposed infrastructure in order to prevent erosion and the associated sedimentation of the freshwater features. In this regard special mention is made of: ○ Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; ○ Runoff from paved surfaces should be slowed down by the strategic placement of energy dispersing structures	Low (Negative)

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		▪ No dumping of waste should be permitted within the freshwater features. Should any spillages or disposal of waste materials occur, such incidents must be managed according to the on-site Emergency Incident protocol; and	
▪ Possible alterations to vegetation community composition as a result of alien vegetation proliferation due to disturbances to soil profiles and clearing of indigenous vegetation in the vicinity of the freshwater resources;	Low (Negative)	▪ Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect floral communities within the freshwater resource habitat, need to be strictly managed. Existing alien species should be eradicated and controlled to prevent further spread of these species. ▪ Implement an alien vegetation control program within the freshwater features with special mention of water loving tree species.	Low (Negative)
Indirect impacts:			
▪ Socio-economic impact: Secondary industries may benefit from the proposed project in the form of the provision of produce and pork products. This impact is rated as positive.	Low (Positive)	▪ Ensure that local industries are utilised as suppliers, where applicable/practical.	Medium (Positive)

Table 7.7: Identified Impacts for Decommissioning Phase of Preferred Alignment.

IDENTIFIED IMPACTS- DECOMISSIONING AND CLOSURE PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Increased water usage during the decommissioning phase.	Low (Negative)	▪ Where possible, water conservation should be practiced. Water conservation techniques include making decommissioning personnel aware of the importance of limiting water wastage, as well as reducing water use during the cleaning of the site (such as sweeping the site before it is being washed).	Low (Negative)
Indirect impacts:			
▪ Loss of Jobs and Income for workers	High (Negative)	▪ Ensure that workers/employees obtain agricultural training and management skills that ae marketable in order for them to be able to use their skills in finding other opportunities. ▪ Establish a relationship with local economic development and chambers of commerce and other employment initiatives in order to create a platform that assists in helping workers transition to other employment or entrepreneurial opportunities.	Medium (Negative)

No-go alternative
Direct impacts: ▪ None of the impacts mentioned above will occur. ▪ The existing site will remain uncleared which will result in no clearance of indigenous vegetation and in addition, no clearance of present alien species. ▪ If the proposed project does not proceed, increased income and economic spin-off activities will not be realised. ▪ Approximately 68 will not be created during the construction phase. ▪ Customers of the proposed piggery and chicken broiler facility will not be provided with an increase of poultry and pork products on a local scale. ▪ If the proposed project does not proceed, the industries that rely on the supply of poultry and pork 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.

7.3.3. Other Impacts

7.3.3.1. Identified Impacts for Construction Phase of Preferred Alignment.

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Air Quality Impact: Emissions from construction vehicles and generation of dust as a result of earthworks, demolition, as well as the delivery and mixing of construction materials.	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 the entrance road and environmentally-friendly dust control measures (e.g. mulching and wetting) where and when dust is problematic ▪ 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 such as Korhaans and Secretary birds. ▪ Limit construction activities to day time hours.	Low (Negative)

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
▪ Potential visual intrusion of construction/demolition activities on the views of sensitive visual receptors.	Low (Negative)	▪ No specific mitigation measures are required other than standard construction site housekeeping and dust suppression. These are included below: o The contractor(s) should maintain good housekeeping on site to avoid litter and minimise waste. o Litter and rubble should be timeously removed from the construction site and disposed at a licenced waste disposal facility. o The project developer should demarcate construction boundaries and minimise areas of surface disturbance. o Appropriate plans should be in place to minimise fire hazards and dust generation. o Night lighting of the construction site should be minimised within requirements of safety and efficiency.	Low (Negative)
▪ Potential noise impact from the use of construction equipment (for the construction of the proposed infrastructure and demolition of existing infrastructure).	Low (Negative)	▪ Limit construction activities to day time hours	Low (Negative)
▪ 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.	Medium (Neutral)	▪ Construction personnel must wear proper hearing protection, which should be specified as part of the Construction Phase Risk Assessment carried out by the ▪ Ensure construction personnel are provided with adequate Personal Protective Equipment (PPE), where appropriate.	Low (Neutral)
▪ Traffic, congestion and potential for collisions during the construction	Low (Neutral)	▪ During the construction phase, suitable parking areas should be created and designated for construction trucks and vehicles.	Low (Neutral)

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
phase. This impact is rated as neutral.		▪ A construction supervisor should be appointed to co-ordinate construction traffic during the construction phase (by drawing up a traffic plan prior to construction). ▪ Road barricading should be undertaken where required and road safety signs should be adequately installed at strategic points within the construction site.	
▪ 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.	High (Neutral)	▪ 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 (Neutral)
▪ Potential health injuries to construction personnel as a result of construction work (i.e. welding fumes. This impact is rated as neutral.	Medium (Neutral)	▪ The Contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate.	Low (Neutral)
▪ Disturbance of Heritage Resources from construction activities.	Low (Negative)	▪ The buildings found on site, although old have minimal heritage value. ▪ Buildings with heritage significance or pre-1945 should not be	Negligible

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		altered in the construction of this project	
▪ Socio-economic Impact: Employment creation and skills development opportunities during the construction phase, which is expected to give rise to approximately 10 new jobs. This impact is rated as positive.	Medium (Positive)	▪ Liaise with TNPA to maximise job creation opportunities during the construction phase. ▪ 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 (Positive)
Indirect impacts:			
▪ Socio-economic impact: Secondary industries may benefit from the proposed project in the form of the provision of produce and pork products. This impact is rated as positive.	Low (Positive)	▪ Ensure that local industries are utilised as suppliers, where applicable/practical.	Medium (Positive)

7.3.4. Identified Impacts for Construction Phase of Preferred Alignment.

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Air Quality Impact: Increased odours resulting from the pig production and chicken broiler facility.	High (Negative)	▪ Ensure that excrement, carcasses, feed, and other operational waste and hazardous materials are appropriately and effectively contained and disposed of without detriment to the air quality of the receiving environment.	Medium (Negative)
▪ Air Quality Impact: Emissions from staff vehicles.	Low (Negative)	▪ 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.	Low (Negative)
▪ Potential visual intrusion of structures and buildings associated with the proposed development on existing views of sensitive visual receptors. This impact is rated as neutral.	Low (Neutral)	▪ No specific mitigation measures are recommended.	Low (Neutral)
▪ Potential impact of night lighting of the development on the nightscape of the surrounding landscape. This impact is rated as neutral.	Low (Neutral)	▪ 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: o Using light fixtures that shield the light and focus illumination on the ground (or only where light is required). o Using minimum lamp wattage within safety/security requirements.	Low (Neutral)

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		○ Avoiding elevated lights 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.	
▪ Potential noise impact from operations and road transport of products during the operational phase (i.e. increased road traffic).	Low (Negative)	▪ It is recommended that the drivers of the vehicles be discouraged from using air brakes at night. ▪ Limit the effects of noise associated disturbances from pigs and chickens 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.	Low (Negative)
▪ Atmospheric pollution due to fumes, smoke from fires (involving plant and vegetable oils or MEG). This impact is rated as neutral.	Medium (Neutral)	▪ 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.	Low (Neutral)
▪ Groundwater contamination as a result of the storage of pig waste in the proposed waste tank.	Medium (Negative)	▪ Ensure that waste storage container has a sufficient structural strength to withstand normal handling and installed on foundations stable under operating conditions. ▪ Ensure that that the pig houses and associated drains and waste 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	Low (Negative)

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		international best practice norms. ▪ Ensure that the waste storage tank is a closed system and pressure resistant. ▪ Ensure adequate treatment of the waste to avoid extreme odours and contaminations. ▪ Training must be provided continuously to all employees working with waste and all contract workers that might be exposed to waste.	
▪ Land contamination as a result of storage of chicken waste on the proposed waste storage facility	Medium (Negative)	▪ The waste storage facility must be operated within its design capacity. ▪ Ensure that the waste storage facility is free from odour or emissions at levels that ae likely to cause annoyance. ▪ Personnel should ensure careful transportation of waste from the pig facilities to the lagoon as to avoid spillage. ▪ Training must be provided continuously to all employees working with waste and all contract workers that might be exposed to waste.	Low (Negative)
▪ Disturbance of Heritage Resources from operational activities.	Low (Negative)	▪ The buildings found on site, although old have minimal heritage value. ▪ Buildings with heritage significance or pre-1945 should not be altered in the operation of this project	Negligible
▪ Potential impact on the health of operating personnel resulting in potential health injuries. This impact is rated as neutral.	Medium (Neutral)	▪ Operational personnel must wear basic PPE (e.g. gloves, goggles etc.) as necessary during the operational phase.	Low (Neutral)
▪ Minor accidents to the public and moderate accidents to	Medium (Neutral)	▪ An Emergency Plan should be compiled in order to deal with potential spillages and fires. Records of practices should be kept on	Low (Neutral)

IDENTIFIED IMPACTS- OPERATIONAL PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
operational staff (e.g. fires). This impact is rated as neutral.		site. ▪ Scheduled inspections should be implemented by operating personnel in order to assure and verify the integrity of hoses, piping and waste storage facility. ▪ 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.	Low (Negative)	▪ Undertake re-calibration of existing traffic signals if required.	Low (Negative)
▪ Improved service delivery with regards to produce and pork products. This impact is rated as positive.	Medium (Positive)	▪ 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.	High (Positive)
▪ Socio-economic Impact: Skills development opportunities and economic spin off activities will also occur during the operational phase. This impact is rated as positive.	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 goods and services are sourced from the local and regional economy as far as reasonably possible.	High (Positive)
Indirect impacts:			
▪ Socio-economic impact: Secondary industries may benefit from the proposed project in the form of the provision of produce and pork products. This impact is rated as positive.	Low (Positive)	▪ Ensure that local industries are utilised as suppliers, where applicable/practical.	Medium (Positive)

7.3.5. Identified Impacts for Decommissioning Phase of Preferred Alignment.

IDENTIFIED IMPACTS- DECOMISSIONING AND CLOSURE PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
Direct impacts:			
▪ Air Quality Impact: Emissions from decommissioning vehicles and generation of dust as a result of earthworks and demolition.	Low (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.	Low (Negative)
▪ Potential visual intrusion of decommissioning activities on the existing views of sensitive visual receptors.	Low (Negative)	▪ No specific mitigation measures are required other than standard site housekeeping and dust suppression. These are included below: o The contractor(s) should maintain good housekeeping on site to avoid litter and minimise waste. o Litter and rubble should be timeously removed from the work site and disposed at a licenced waste disposal facility. o The project developer should demarcate decommissioning boundaries and minimise areas of surface disturbance. o Appropriate plans should be in place to minimise fire hazards and dust generation. o Night lighting of the decommissioning site should be	Low (Negative)

IDENTIFIED IMPACTS- DECOMISSIONING AND CLOSURE PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		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)	
▪ Disturbance of Heritage Resources from decommissioning activities.	Low (Negative)	▪ The buildings found on site, although old have minimal heritage value. ▪ Buildings with heritage significance or pre-1945 should not be altered in the decommissioning and closure of this project	Negligible
▪ Noise generation from demolition activities (e.g. grinding, steel falling, use of angle grinders) during the decommissioning phase. This impact is rated as neutral.	Medium (Neutral)	▪ 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 (Neutral)
▪ Demolition safety injuries. This impact is rated as neutral.	High (Neutral)	▪ Ensure that a skilled and competent Contractor is appointed. The Contractor must be evaluated during the tender/appointment process in terms of safety standards. ▪ The Contractor must ensure that all decommissioning personnel are provided with adequate PPE for use where appropriate. ▪ The Contractor must undertake a Decommissioning Phase Risk Assessment. ▪ A Site Manager or Safety Supervisor should be appointed, in conjunction with the project manager, to monitor all safety aspects during the decommissioning phase. This could be the same person that is assigned to co-ordinate the	Medium (Neutral)

IDENTIFIED IMPACTS- DECOMISSIONING AND CLOSURE PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
		decommissioning traffic.	
Indirect impacts:			
▪ Loss of Jobs and Income for workers	High (Negative)	▪ Ensure that workers/employees obtain agricultural training and management skills that ae marketable in order for them to be able to use their skills in finding other opportunities. ▪ ▪ Establish a relationship with local economic development and chambers of commerce and other employment initiatives in order to create a platform that assists in helping workers transition to other employment or entrepreneurial opportunities.	Medium (Negative)

No-go alternative
Direct impacts: ▪ None of the impacts mentioned above will occur. ▪ The existing site will remain uncleared which will result in no clearance of indigenous vegetation and in addition, no clearance of present alien species. ▪ If the proposed project does not proceed, increased income and economic spin-off activities will not be realised. ▪ Approximately 68 will not be created during the construction phase. ▪ Customers of the proposed piggery and chicken broiler facility will not be provided with an increase of poultry and pork products on a local scale. ▪ If the proposed project does not proceed, the industries that rely on the supply of poultry and pork 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.

7.3.6. Cumulative Impacts

Consideration must be given to the extent of any accumulative impact that may occur because of the proposed development. Such impacts are evaluated with an assessment of existing developments in the environment. These impacts will either be positive or negative, and will be graded as being of negligible, low, medium or high impacts. **Figure 7.2** highlights an example of how cumulative impacts manifest in the environment because of the impacts resulting from numerous developments of a given spatial scale.

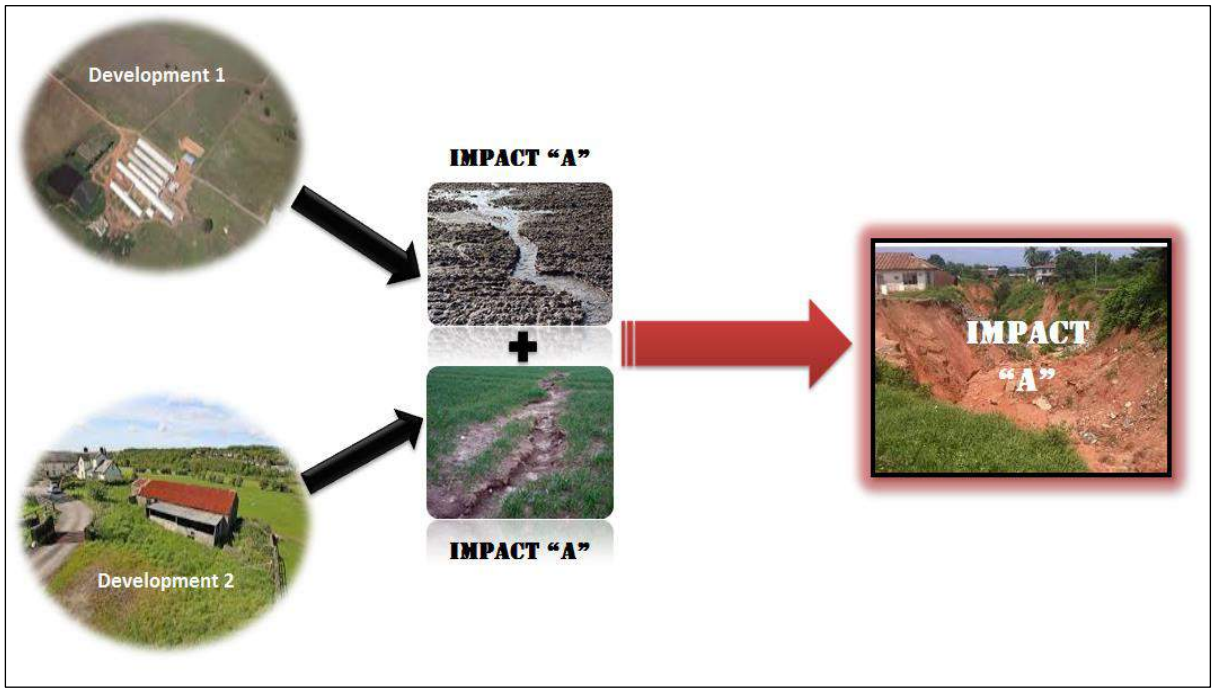


Figure 7.2: Schematic diagram indicating an example of a cumulative impact

7.3.7. Cumulative Impacts of the Preferred Alignment

IDENTIFIED IMPACTS- CONSTRUCTION PHASE			
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**PROPOSED MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
ALTERNATIVE A1 (PREFERRED ALTERNATIVE)			
▪ Impact of extra operational vehicles on the road network.	Low (Negative)	▪ Undertake –recalibration of existing traffic signals if required.	Low (Negative)
▪ Decrease in fauna and flora due to increased foot traffic during operations of the developments.	Low (Negative)	▪ Ensure that only designated footpaths are used during activity. Limit activities to during day hours for nocturnal fauna. ▪ Continue to highlight prohibited activities to workers through continuous training.	Low (Negative)
▪ Reduction of water availability because of increased abstraction from ground and surface water resources.	Medium (Negative)	▪ Water conservation should still be practices during the operational phase. ▪ Borehole abstraction devices and water tanks for storage should be inspected regularly so as to insure that there are no leakages.	Low (Negative)
▪ Increased job opportunities and boosting of local economic development in the area.	Medium (Positive)	▪ No mitigation measures are identified	Medium (Positive)
▪ Secondary industries may benefit from the proposed project in the form of the provision of produce and pork products.	Low (Positive)	▪ Ensure that local industries are utilised as suppliers, where applicable/practical.	Medium (Positive)

8. ENVIRONMENTAL IMPACT STATEMENT

8.1. Comparative Assessment of Alternatives

8.1.1. Construction Phase

IDENTIFIED IMPACTS- CONSTRUCTION PHASE		
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
• Introduction & proliferation of alien spp.	**High (Negative)**	**Medium (Negative)**
• Unnatural wild fires	**Low (Negative)**	**Low (Negative)**
• Loss of vegetation communities and Conservation Important(CI) species	**Medium (Negative)**	**Low (Negative)**
• Increase in dust and erosion	**Low (Negative)**	**Low (Negative)**
• Environmental contamination	**Medium (Negative)**	**Low (Negative)**
• Disturbance of CI fauna	**Medium (Negative)**	**Low (Negative)**
• Increased runoff entering freshwater resources	**Low (Negative)**	**Low (Negative)**
• Increased risk of erosion and incision of the freshwater resources	**Low (Negative)**	**Low (Negative)**
• Increased sedimentation and pollution of the resources	**Low (Negative)**	**Low (Negative)**
• Compaction of the freshwater features soils	**Low (Negative)**	**Low (Negative)**
• Loss of connectivity of freshwater resources	**Low (Negative)**	**Low (Negative)**
• Possible alterations to vegetation community composition;	**Low (Negative)**	**Low (Negative)**
• Altered topography	**Low (Negative)**	**Low (Negative)**
• Emissions from construction vehicles and dust from earthworks.	**Medium (Negative)**	**Low (Negative)**
• Potential visual intrusion of construction/demolition activities	**Low (Negative)**	**Low (Negative)**
• Potential noise impact from the use of construction equipment	**Low (Negative)**	**Low (Negative)**
• Noise generation from demolition and construction work	**Medium (Neutral)**	**Low (Neutral)**
• Traffic, congestion and potential for collisions	**Low (Neutral)**	**Low (Neutral)**
• Disturbance of Heritage Resources from construction activities.	**Low (Low)**	**Negligible**
• Potential impact on the safety of construction workers	**High (Neutral)**	**Medium (Neutral)**

IDENTIFIED IMPACTS- CONSTRUCTION PHASE		
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
• Potential health injuries to construction personnel	**Medium (Neutral)**	**Low (Neutral)**
• Employment creation and skills development opportunities	**Medium (Positive)**	**High (Positive)**

8.1.2. Operational Phase

IDENTIFIED IMPACTS- CONSTRUCTION PHASE		
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
• Environmental contamination from chicken and pig excrement	**Medium (Negative)**	**Low (Negative)**
• Transmission of diseases of wildlife from poultry, pigs and pets	**Medium (Negative)**	**Negligible**
• Poor/Inappropriate control of invertebrate pests.	**Medium (Negative)**	**Low (Negative)**
• Poor/Inappropriate control of vertebrate pests	**Medium (Negative)**	**Low (Negative)**
• Harvesting of CI flora from increase in human activity	**Low (Negative)**	**Low (Negative)**
• Unnatural wild fires from increase in human activity	**Medium (Negative)**	**Low (Negative)**
• Introduction and proliferation of alien spp.	**High (Negative)**	**Low (Negative)**
• Disturbance of CI fauna from human activity.	**High (Negative)**	**Low (Negative)**
• Increased runoff entering freshwater resources	**Low (Negative)**	**Low (Negative)**
• Increased runoff from impermeable surfaces	**Low (Negative)**	**Low (Negative)**
• Increased risk of erosion and incision of the freshwater resources	**Low (Negative)**	**Low (Negative)**
• Increased sedimentation and pollution of the resources	**Low (Negative)**	**Low (Negative)**
• Possible alterations to vegetation community composition	**Low (Negative)**	**Low (Negative)**
• Increased odours resulting from the pig production and chicken broiler facility.	**High (Negative)**	**Medium (Negative)**
• Emissions from staff vehicles.	**Low (Negative)**	**Low (Negative)**

IDENTIFIED IMPACTS- CONSTRUCTION PHASE		
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
• Potential visual intrusion of structures and buildings	**Low (Neutral)**	**Low (Neutral)**
• Potential impact of night lighting of the development	**Low (Neutral)**	**Low (Neutral)**
• Potential noise impact from operations and road transport	**Low (Negative)**	**Low (Negative)**
• Atmospheric pollution due to fumes, smoke from fires	**Medium (Neutral)**	**Low (Neutral)**
• Groundwater contamination as a result of the storage of pig waste	**Medium (Negative)**	**Low (Negative)**
• Land contamination as a result of storage of chicken waste	**Medium (Negative)**	**Low (Negative)**
• Disturbance of Heritage Resources from operational activities.	**Low (Low)**	**Negligible**
• Potential impact on the health of operating personnel.	**Medium (Neutral)**	**Low (Neutral)**
• Minor accidents to the public and moderate accidents to operational staff	**Medium (Neutral)**	**Low (Neutral)**
• Impact of extra operational vehicles on the road network.	**Low (Negative)**	**Low (Negative)**
• Improved service delivery with regards to produce and pork products.	**Medium (Positive)**	**High (Positive)**
• Skills development opportunities and economic spin off activities	**Medium (Positive)**	**High (Positive)**
• Secondary industries may benefit from the proposed project	**Low (Positive)**	**Medium (Positive)**

8.1.3. Decommissioning Phase

IDENTIFIED IMPACTS- CONSTRUCTION PHASE		
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
• Increase in dust and erosion from demolishing and rehabilitation activities	**Low (Negative)**	**Low (Negative)**
• Environmental Contamination	**High (Negative)**	**Low (Negative)**
• Unnatural wild fires from influx of people and decommissioning activities	**Low (Negative)**	**Low (Negative)**
• Introduction and proliferation of alien spp.	**High (Negative)**	**Low (Negative)**
• Disturbance of CI fauna from increase in	**High (Negative)**	**Low (Negative)**

IDENTIFIED IMPACTS- CONSTRUCTION PHASE		
IMPACT	**SIGNIFICANCE RATING OF IMPACT BEFORE MITIGATION**	**SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION**
vehicle and human activity		
• Loss of Jobs and Income for workers	**High (Negative)**	**Medium (Negative)**
• Increased water usage	**Low (Negative)**	**Low (Negative)**
• Emissions from decommissioning vehicles and dust from earthworks and demolition.	**Low (Negative)**	**Low (Negative)**
• Potential visual intrusion of decommissioning activities	**Low (Negative)**	**Low (Negative)**
• Noise generation from demolition activities	**Medium (Neutral)**	**Low (Neutral)**
• Disturbance of Heritage Resources from construction activities.	**Low (Low)**	**Negligible**
• Demolition safety injuries.	**High (Neutral)**	**Medium (Neutral)**
• Loss of Jobs and Income for workers	**High (Negative)**	**Medium (Negative)**

8.2. Key Findings

The proposed development of a piggery production and chicken broiler facility and its associated infrastructure will have some impact on the environment. The findings of the Freshwater Impact and Terrestrial Ecological Impact Assessment will see the loss of some fauna and flora as well as loss in water resources. Other impacts are the potential air emissions, visual and noise impacts from the construction, operations and decommissioning of the project. Furthermore, many of the impacts are medium to low in the current environment, and with the recommended mitigation measures the proposed development will have overall low impacts of the environment.

The Terrestrial Ecological Impact Study found that Conservation Important habitats and species were mainly found along the periphery of the proposed development area, which predominantly comprises pasture fields and other transformed areas. Therefore, from a biodiversity conservation perspective, the proposed project could move forward provided that our recommended pre-construction mitigation measures are pursued. It is important, however, that the planned layout of the development be revised in order to avoid all the Very High, High and Moderate-High sensitive areas as far as possible.

One such development is the Waste management facility. It is proposed that the waste management site should be shifted to a less sensitive location. Effective and environmentally-friendly means of storing, managing and disposing of excrement, bedding, feed and carcasses, among other forms of waste, is critical, and must be planned in detail. Overall the design and operations of the proposed facilities should minimize conflict with wildlife.

The Freshwater Ecological Impact Study recommends that the extent of construction activities (such as contractor laydown areas) should be kept within close vicinity of the proposed infrastructure construction area, so as to not encroach into the buffer zones of the freshwater features.

The proposed infrastructure construction area is associated with several freshwater resources and falls within close vicinity to an unchannelled valley bottom wetland and is also situated a distance away from the ecologically intact channelled valley bottom wetland. The proposed phase 1 poultry facility is however located directly next to the hillslope seep feature which is associated with the channelled valley bottom wetland.

Since freshwater features were identified within the 500m zone of regulation according to Regulation GN1199 (draft regulation GN1180) of the proposed infrastructure, either a Water Use Licence (WUL) or a General Authorisation in terms of Section 21 (c) and (i) may be required, depending on the exact locality and nature of the proposed activities. However, since some of the proposed infrastructure does encroach on the 16m buffer zone and on the 32m zone of regulation, as stipulated by the National Environmental Management Act (Act 107 of 1998), it is expected that the construction activities relating to the proposed piggery and poultry infrastructure will have some degree of impact on the freshwater resources within the regulated zone, thus a full WULA application might be required. However, this should be clarified with the relevant DWS officials.

It is also recommended that the layout area of the phase 1 poultry facility be reconsidered, as it is located directly next to a freshwater feature, which could have significant impacts on the integrity of the freshwater feature. Any leachate from the proposed waste management site should be limited, even though the closest freshwater feature is 100m from the proposed layout thereof, this might have an influence on the quality of groundwater and surface water of the entire natural environment.

The proposed piggery production and chicken broiler facilities also have positive impacts in the region's economy. The proposed development can potentially have a strong impact on local industries if they provide produces and other related products locally. The proposed development further has the opportunity for skills development and economic opportunities for its employees during its operations.

No substantial negative impacts have been identified that, in the opinion of the Environmental Assessment Practitioner, should be considered as "fatal flaws" form the environmental perspective, and thereby necessitate substantial re-design or termination of the project Based on the findings of this Basic Assessment, it is the opinion of the Environmental Assessment Practitioner that the project benefits outweigh the negative environmental impacts, and that the project will make a positive contribution to steering South Africa . Provided that the that the specified mitigation measures are applied effectively, it is proposed that the project receive environmental authorisation in terms of the EIA Regulations promulgated under the National Environmental Management Act (NEMA), (2014).

An alternative layout was compiled in order to meet the recommendations from the impact assessment in order to avoid freshwater buffer zones and high impact areas (see **APPENDIX A**). Furthermore, in order to avoid and/or manage the potential negative impacts, and enhance the benefits, an Environmental Management Programme (EMPr) has been compiled. The EMPr is a dynamic document that should be updated regularly and provide clear and implementable measures for the establishment and operation of the pig production and chicken broiler facilities.

9. CONCLUSION AND RECOMMENDATIONS

The BA has been undertaken in accordance with the EIA Regulations (2014) in terms of Section 24(5) of the National Environmental Management Act (Act No. 107 of 1998).

In order to protect the environment and ensure that Mokate Estate's Piggery Production and Chicken Broiler Facilities are constructed and operated in an environmentally responsible manner, there are a number of significant environmental legislation that have been taken into account during this study. These legislations include the following in Table 9.1 below:

Table 9.1: Applicable national legislation

APPLICABLE NATIONAL LEGISLATION
The Constitution of South Africa (No. 108 of 1996)
National Environmental Management Act (Act No. 107 of 1998) (as amended)
National Environmental Management: Waste Act (Act No. 59 of 2008) (as amended)
National Environmental Management Biodiversity Act (Act No. 10 of 2004)
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
National Environmental Management: Air Quality Act (Act No. 39 of 2004)
National Water Act (Act No. 36 of 1998) (as amended)
Conservation of Agricultural Resources Act (Act No.43 of 1983)
National Heritage Resources Act (Act No. 25 of 1999)
National Veld and Forest Act (Act No. 101 of 1998)
National Veld and Forest Act (Act No. 101 of 1998)
National Building Regulations and Building Standards Act (Act No. 103 of 1997)
Occupational Health and Safety Act (Act No. 85 of 1993)

This relevant legislation has informed the identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project.

The conclusion of this BAR including comments and concerns from I&APs are as a result of a comprehensive BA study. The public consultations process has been inclusive, and every effort has been made to include representatives of all stakeholders within the process.

The project is envisaged to have a "negative low" significant rating post application of mitigation measures proposed by the relevant specialists.

9.1. Assumptions, Uncertainties or Gaps in Knowledge

The BA process followed the legislated process required and as governed and specified by the EIA Regulations (2014). However, when undertaking scientific or specialist studies, challenges and limitations are sometimes encountered. For this specific Basic Assessment, the following challenges were encountered:

- All information provided by Mokate Estates to the EAP was correct and valid at the time it was provided.
- The EAP does not accept any responsibility in the event that additional information comes to light at a later stage of the process.
- The scope of this investigation is limited to assessing the potential environmental impacts associated with the Piggery Production and Chicken Broiler Facility.

9.1.1. Freshwater Assessment

It is important to note that certain plant species, which were not detected during our site visit, are not necessarily absent. Possible reasons for not detecting species include:

- The inconspicuous nature of certain species due to their small size, short flowering time, rarity, etc.
- The small, fragmented nature of the site and disturbances from farming activities on site.
- The short duration of fieldwork and the timing of the fieldwork (during Late Summer).
- Some plant species, which are small, have short flowering times, rare or otherwise difficult to detect may not have been detected even though they were potentially present on site.
- Vegetation mapping was based on the brief in-field survey as well as aerial imagery. Positioning of the vegetation units may not be exact due to potential georefrencing errors displayed in Google Earth, GPS accuracy in field as well as the age of the aerial image.

The following assumptions and limitations are applicable to the freshwater assessment report:

- The freshwater assessment is confined to the study area as well as areas of relevance immediately adjacent to the project footprint up to 500m from the project footprint which were assessed on a desktop level in accordance with Regulation GN 1199. The general surroundings were however considered in the desktop assessment undertaken for the project;
- The freshwater feature delineations as presented in the specialist study are regarded as a best estimate of the freshwater feature boundaries based on the site conditions at the time of the assessment;
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. It is, however, expected that the study area has been accurately assessed and considered, based on the field observations undertaken and the consideration of existing studies and monitoring data in terms of the wetland ecology; and
- The freshwater features were delineated according to “DWAF, 2008: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones”. The delineation as presented is considered the best estimate of the functional boundary based on the site conditions present at the time of assessment. Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required, the freshwater features will need to be surveyed and pegged according to surveying principles.

9.1.2. Terrestrial Assessment

- The study's site visit was limited to a few day time hours and, therefore, not all potentially occurring (especially nocturnal) species were likely to be detected.
- The site visit was performed in late summer (i.e. March), when many animal species become less active or prepare to migrate.
- Some species, which are uncommon, small, migratory, secretive or otherwise difficult to detect may not have been detected even though they were potentially present.
- As the list of potentially occurring bird species was derived from the latest online list of bird species for pentad 2600_2830 from the SABAP 2 (2016), some additional bird species that are not listed could occur in the area.
- As the list of potentially occurring butterfly species was obtained from LepiMAP‟s (2016) online list of recorded butterfly species from QDS 2628BA, some additional butterfly species that are not listed may occur in the area.

9.2. Recommendations

The proposed project can move forward, provided that the recommendations within the EMPr are pursued. One of the more important recommendations is to revise the planned layout of the development to avoid all the very high, high and moderate-high sensitive areas as far as possible. The proposed waste management site should be moved to a less sensitive location.

9.2.1. Recommendations to the CA

The project, in the EAP's opinion, does not pose a detrimental impact on the receiving environment and inhabitants and can be mitigated significantly. Therefore, the EAP recommends that the proposed development be granted authorisation.

The Applicant should be bound to stringent conditions to maintain compliance and a responsible execution of the project.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this BA study are included within the EMPr (refer to Appendix E).

The EMPr must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for the construction phase of the project is considered to be vital in achieving the appropriate environmental management standards as detailed for this project.
In addition, the following key conditions should be included as part of the authorisation:

1) The development is not negated from complying with any other statutory requirements that is applicable to the undertaking of the activity. Relevant key legislation that must be complied with by the proponent includes inter alia:
    a. Provisions of the National Environmental Management Waste Act (Act No. 59 of 2008) (as amended);
    b. Provisions of the National Water Act, 1998 (Act No. 36 of 1998) (as amended);
    c. Provisions of the National Forest Act (Act No. 84 of 1998);

d. Provisions of the National Heritage Resources Act, 1999 (Act No. 25 of 1999.

2) The Developer must appoint a suitable experienced (independent) Environmental Control Officer (ECO) for the construction phase of the development. The ECO will be responsible for ensuring that the mitigation/ rehabilitation measures and recommendations are implemented and to ensure compliance with the provisions of the EMPr.
3) A rehabilitation plan must be complied with.
4) All necessary permits, licences and approvals must be obtained prior to the commencement of construction.

9.2.2. Recommendations to the Applicant

The applicant must adhere to the recommendations provided by the specialist and the EAP. The EMPr summarises these recommendations. The Applicant must take full responsibility for the execution of the project in a manner that does not negatively impact on the environment by ensuring that responsible decisions are made.

9.3. Declaration by the EAP

The following is hereby affirmed by the EAP to be included in this report:

- The correctness of the information provided in the reports;
- The inclusion of all comments and inputs from stakeholders and I&APs;
- The inclusion of all inputs and recommendations from the specialist reports where relevant, and
- Any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by interest and affected parties.

Signed: Rirhandzu Marivate Cand. Sci. Nat.

Basic Assessment for the development of a 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.

APPENDICES

CSIR

our future through science

August 2016

The following appendixes must be attached as appropriate (this list is inclusive, but not exhaustive). It is required that if more than one item is enclosed that a table of contents is included in the appendix:

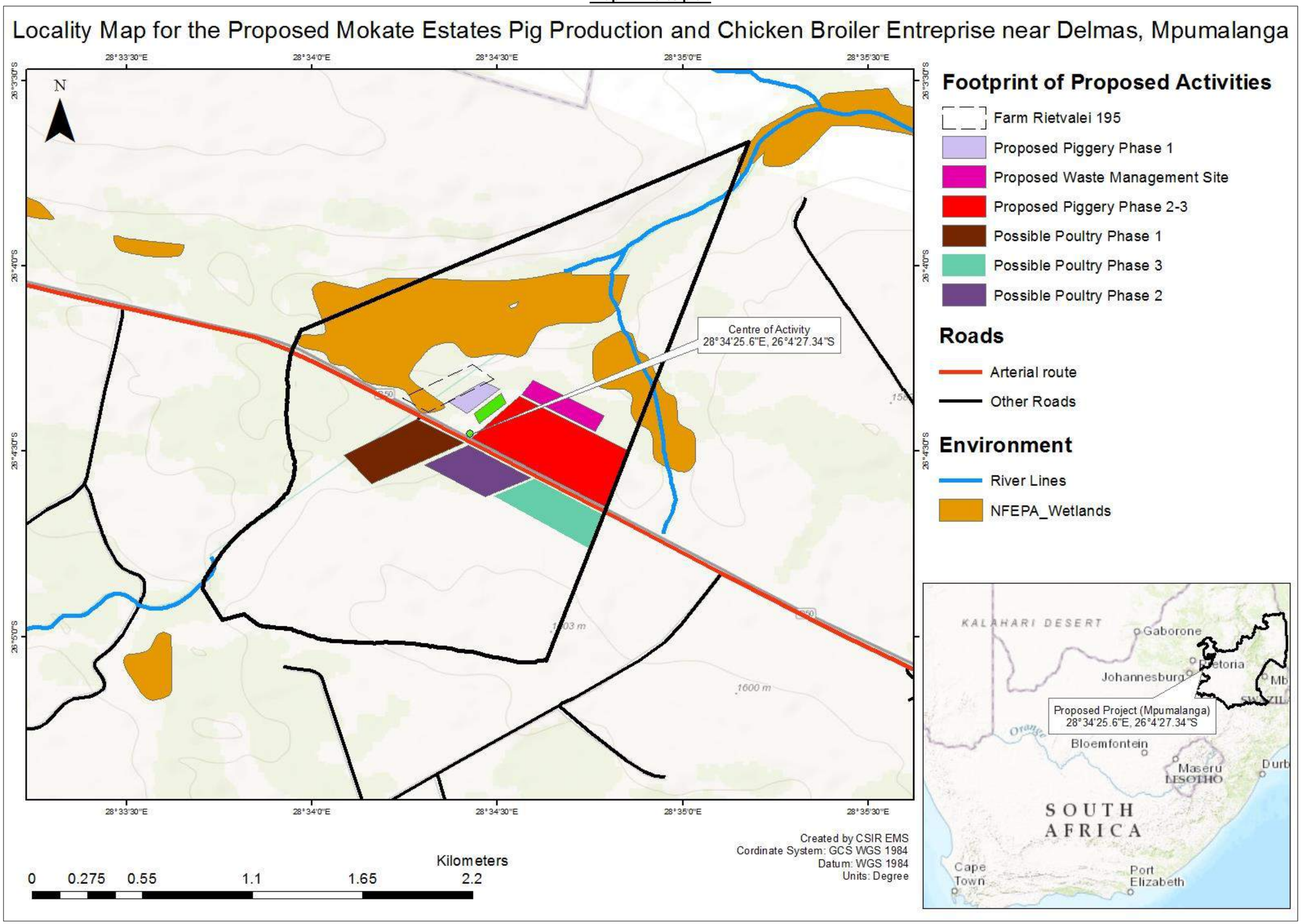
APPENDIX A:	Site plan(s)
APPENDIX B:	Site photographs
APPENDIX C:	Maps and facility illustration(s)
APPENDIX D:	Public Participation information • D1: Proof of site notice • D2: Written Notices to Neighbouring Landowners and I&APs • D3: Proof of newspaper advertisements • D4: Comments and Responses Report
APPENDIX E:	Environmental Management Programme
APPENDIX F:	Specialist Studies • F1: Freshwater Impact Assessment • F2: Terrestrial Ecology Impact Assessment
APPENDIX G:	Other items: • G1: Waste License application • G2: Comments from SAHRA • G3: Exemption Letter from Heritage Specialist
APPENDIX H:	CVs of Project Team: • H1: Minnelise Levendal (Project Leader) • H2: Rirhandzu Marivate (Project Manager)

BASIC ASSESSMENT REPORT

APPENDIX A: SITE LAYOUT PLANS

contents

Map A.1: Site plan

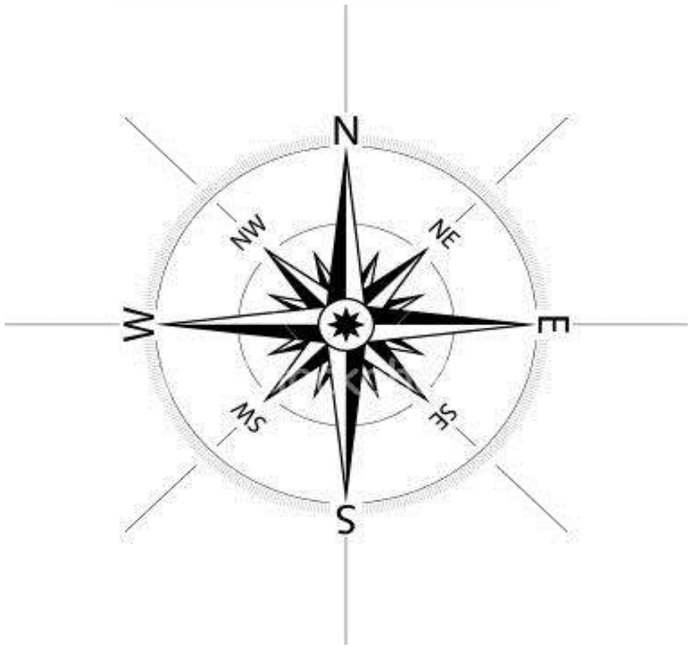


BASIC ASSESSMENT REPORT

APPENDIX B: PHOTOGRAPHS

contents

Annexure B.1: Site photographs

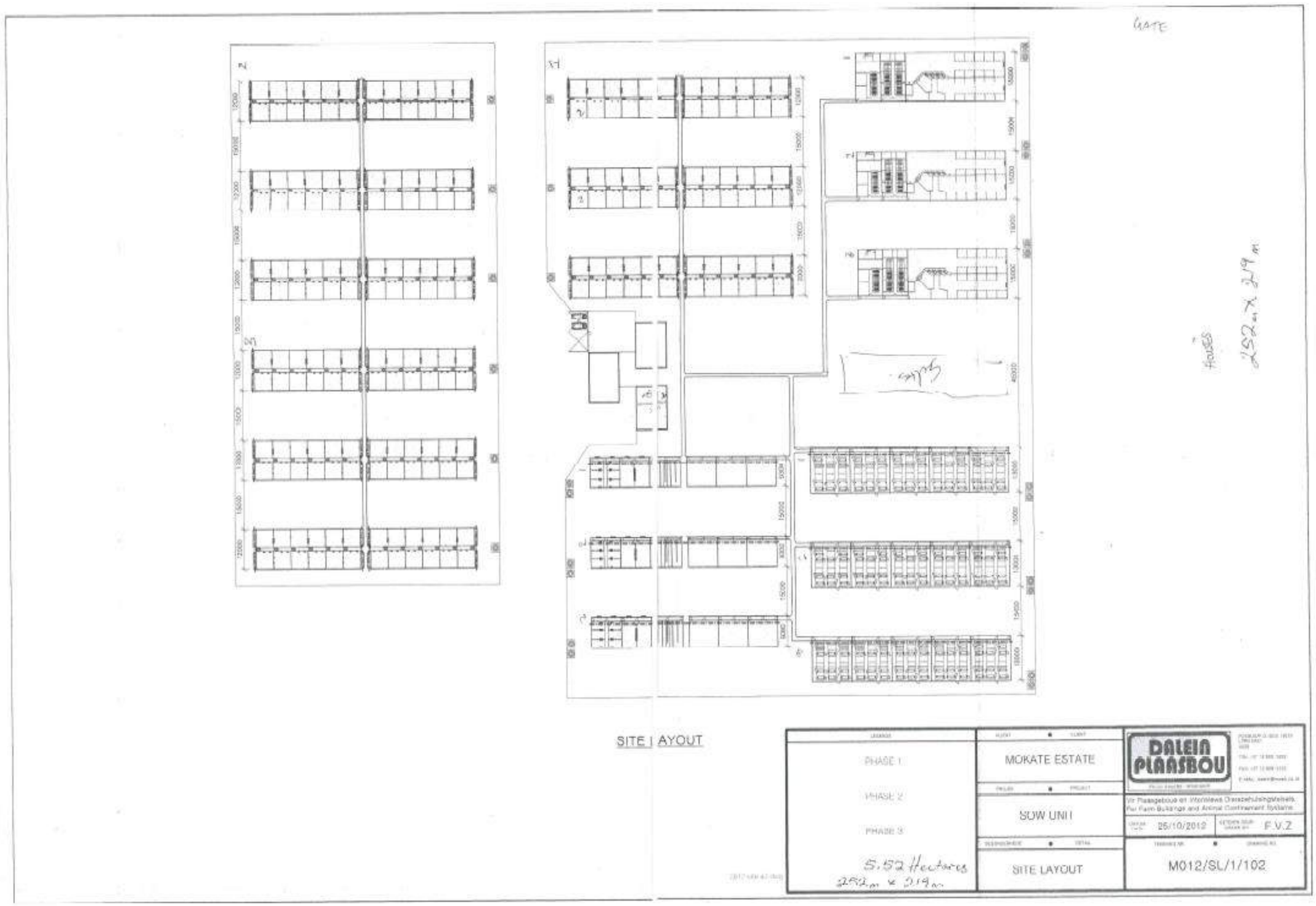


BASIC ASSESSMENT REPORT

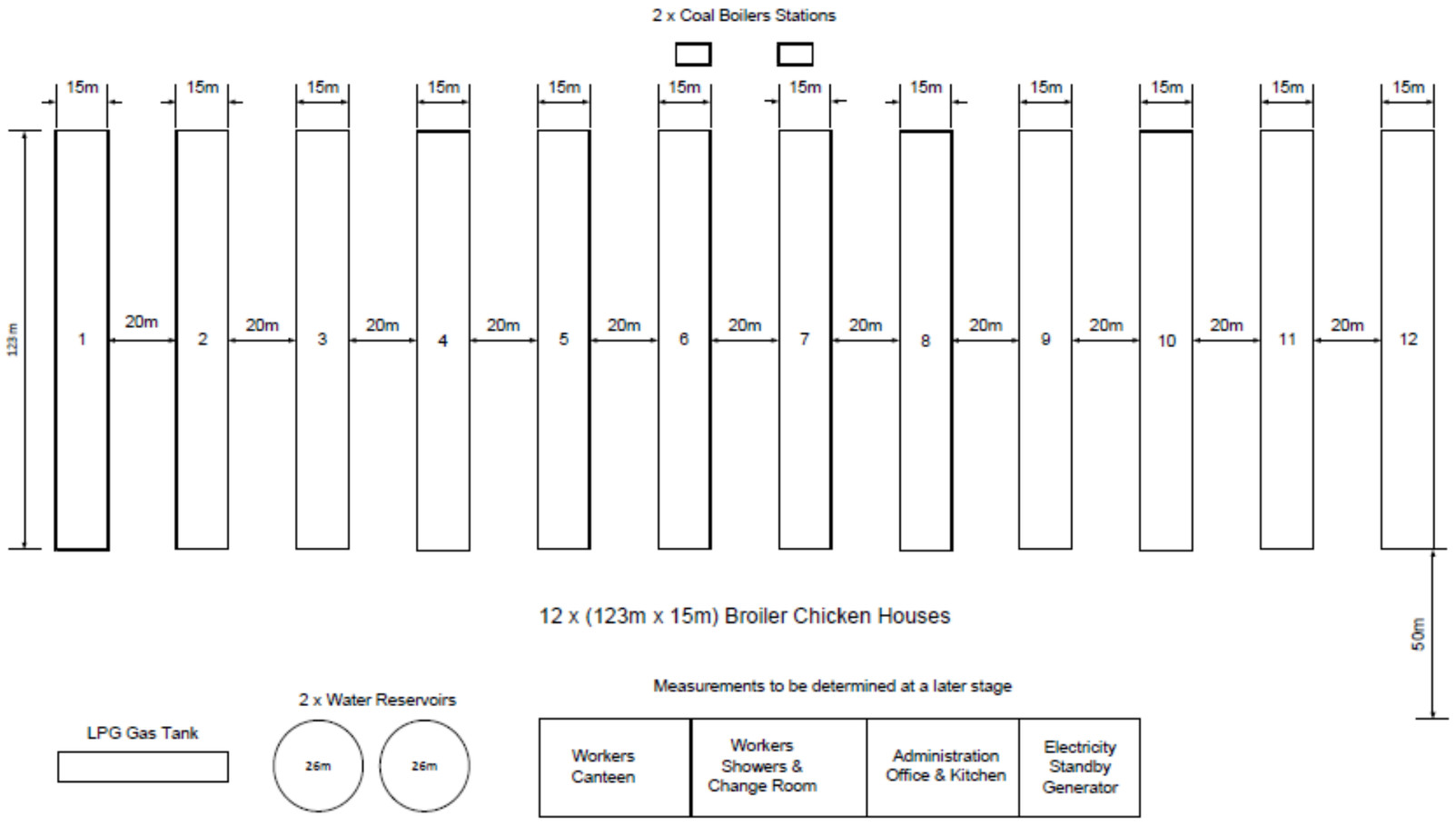
APPENDIX C: FACILITY ILLUSTRATIONS

contents

Annexure C(i) PIG PRODUCTION FACILITY



Annexure C(ii) CHICKEN BROILER FACILITY



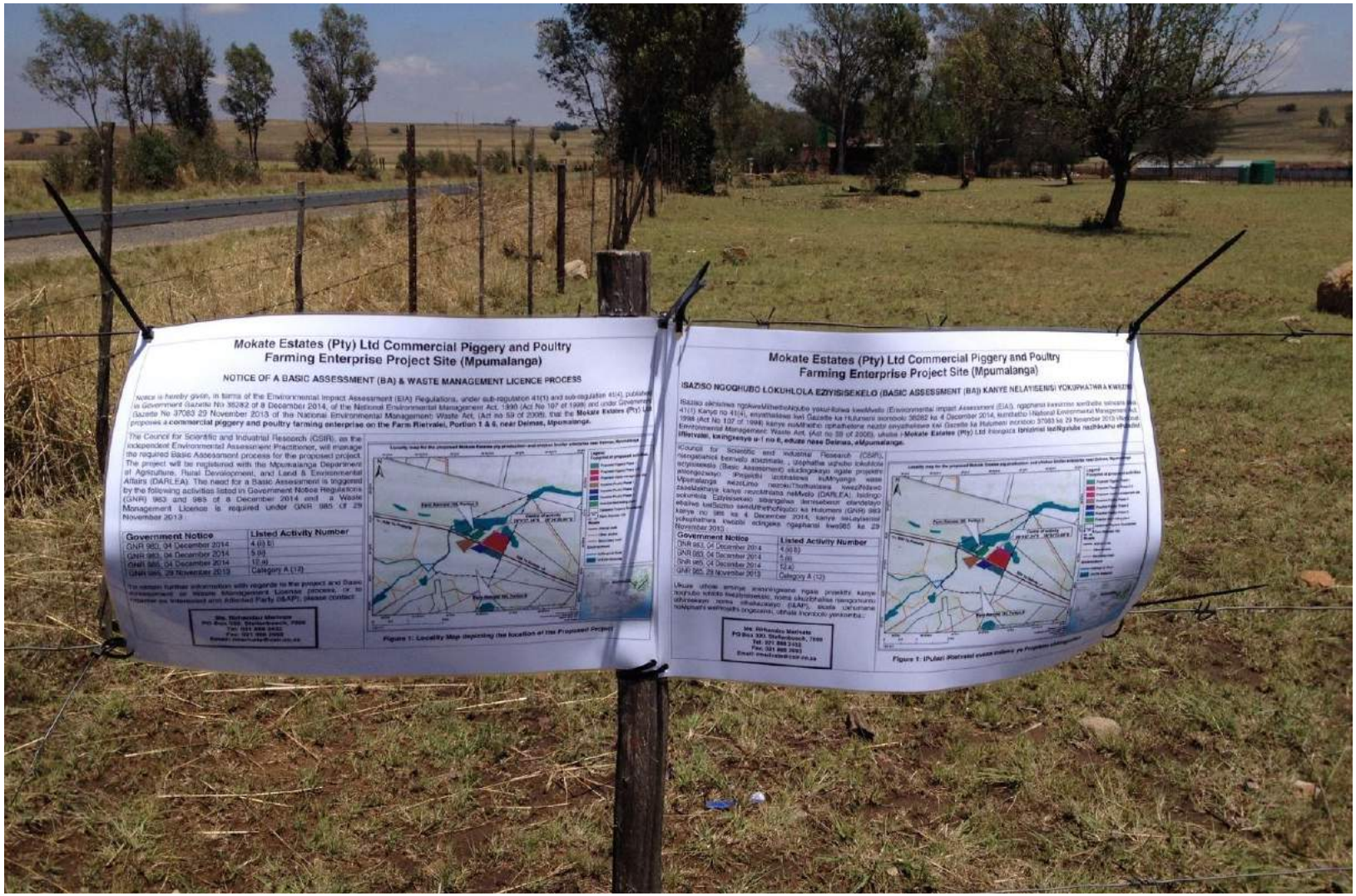
BASIC ASSESSMENT REPORT

APPENDIX D: PUBLIC PARTICIPATION

contents

Annexure D.1: Proof of Site Notice

Site Notices (English and IsiZulu) places at the fence next to the gate of the proposed site



Contents of the site notice (English) placed at the gate to the proposed site

Mokate Estates (Pty) Ltd Commercial Piggery and Poultry Farming Enterprise Project Site (Mpumalanga)

NOTICE OF A BASIC ASSESSMENT (BA) & WASTE MANAGEMENT LICENCE 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 38282 of 8 December 2014, of the National Environmental Management Act, 1998 (Act No 107 of 1998) and under Government Gazette No 37083 29 November 2013 of the National Environmental Management: Waste Act, (Act no 59 of 2008), that the **Mokate Estates (Pty) Ltd** proposes a **commercial piggery and poultry farming enterprise on the Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.**

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 Mpumalanga Department of Agriculture, Rural Development, and Land & Environmental Affairs (DARLEA). The need for a Basic Assessment is triggered by the following activities listed in Government Notice Regulations (GNR) 983 and 985 of 8 December 2014 and a Waste Management Licence is required under GNR 921 of 29 November 2013 :

Government Notice	Listed Activity Number
GNR 983, 04 December 2014	4.(ii) b)
GNR 983, 04 December 2014	5.(ii)
GNR 985, 04 December 2014	12.a)
GNR 921, 29 November 2013	Category A (12)

To obtain further information with regards to the project and Basic Assessment or Waste Management License 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

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CELEBRATING 70 Years Ideas that work

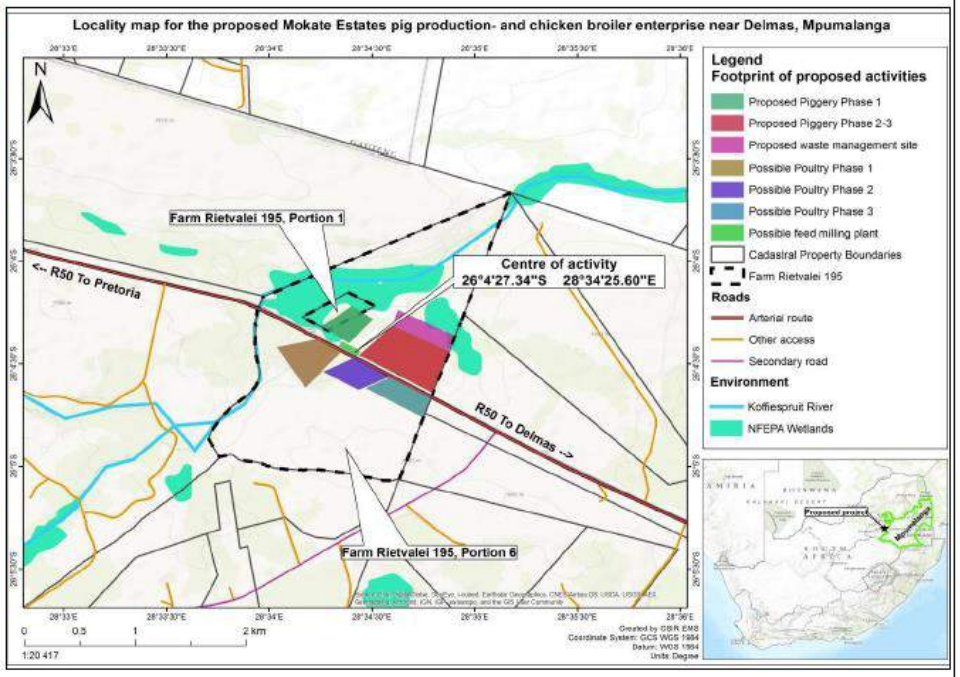

Figure 1: Locality Map depicting the location of the Proposed Project

Annexure D.2: Written Notices to Neighbouring Landowners and I&APs

Letter 1 to I&Aps- release of BID (21 April 2016)

CSIR Consulting Services
PO Box 320
Stellenbosch
7599
South Africa
Tel: +27 21 888 2432
Fax: +27 21 888 2693
Email: rmarivate@csir.co.za

April 2016

Dear Interested and/or Affected Party

PROPOSED COMMERCIAL PIGGERY AND POULTRY FARMING ENTERPRISE ON THE FARM RIETVALEI, PORTION 1&6 IN BAPSFONTEIN, NEAR DELMAS, MPUMALANGA (CSIR REFERENCE NO: CSIR/CAS/EMS/IR/2016/0001/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. Mokate Estates (Pty) Ltd has been identified as an eligible client for this service and is proposing to construct a piggery and chicken broiler production farm, and associated infrastructure, on approximately 8 ha of the 372 hectare farm. The plan is to have 372 pigs ready for slaughter per week, and have 480600 broiler chickens per cycle.

In terms of Government Notice Regulations (GNR) 983, 984 and 985 of 4 December 2014 of the National Environmental Management Act (Act 107 of 1998) published in Government Gazette 38282 on 4 December 2014, Environmental Authorisation from the Competent Authority, in this case Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARALEA), is required prior to the undertaking of any activity triggered within GNR 983, 984 and/or 985. The need for a Basic Assessment process is required by the inclusion of the activities listed within GNR 983: Activity 4 and 5 and within GNR 985: Activity 12. Additionally, in accordance with the National Environmental Management: Waste Act (Act 59 of 2008), the project will require a Waste Management License for waste generated. 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 December 2014, 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 **24 May 2016** 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. Should you require further information in Zulu, please do not hesitate to contact the CSIR and we will assist.

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/

Letter 2 to I&AP's- release of Draft Basic Assessment Report for comment (8 September 2016)

CSIR Environmental Management Services
PO Box 320
Stellenbosch
7599
South Africa
Tel: +27 21 888 2432
Fax: +27 21 888 2693
Email: rmarivate@csir.co.za

8 September 2016

Dear Interested and/or Affected Party

Notice of Release of Draft Basic Assessment Report for comment

Basic Assessment for the development of a 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on Portion 1 & 6 on Farm Rietvalei, near Delmas, Mpumalanga.

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. **Mokate Estates (Pty) Ltd** has been identified as an eligible client for this service and is proposing to construct a piggery and chicken broiler production farm, and associated infrastructure, on approximately 8 ha of the 372 hectare farm. The plan is to have 372 pigs ready for slaughter per week, and have 480600 broiler chickens per cycle.

In terms of Government Notice Regulations (GNR) 983, 984 and 985 of 4 December 2014 of the National Environmental Management Act (Act 107 of 1998) published in Government Gazette 38282 on 4 December 2014, Environmental Authorisation from the Competent Authority, in this case Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA), is required prior to the undertaking of any activity triggered within GNR 983, 984 and/or 985. Additionally, in accordance with the National Environmental Management: Waste Act (Act 59 of 2008), the project will require a Waste Management License for waste generated. 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 December 2014, as a registered Interested and Affected Party (I&AP) on the project database, you are hereby notified of the release of the Draft BA Report to all I&APs for a 30-day review period, which will extend from 8th **September to 8th October 2016** (excluding public holidays). Please submit any comments on the Draft BA Report to the CSIR Project Manager at the contact details provided above by 8th **October 2016.**
A hard copy pf the Draft BA Report is available for public viewing at the Delmas Library (corner Sarel Cilliers & Van Riebeeck Street). The Draft BA Report can also be downloaded from the following website: http://www.csir.co.za/ems/specialneeds/.

The next step in the BA Process will entail compiling the Final BA Report and including all comments received from I&APs during the 30-day review of the Draft BA Report. Once finalised, the Final BA Report will be submitted to DARDALEA for decision making. As a registered I&AP on the project database, you will be notified in writing of the submission of the Final BA Report, as well as the outcome of the decision making process.

Should you have any queries or require additional information please do not hesitate to contact the undersigned using the contact details provided above.

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 e-mail delivery: Project announcement(19 April 2016)

Recipients: 19 Response Pending: 17, Undelivered: 2

Undelivered: 2

makgophola@mpg.gov.za Undeliverable

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Undeliverable	19/04/2016 14:29

BC: makgophola@mpg.gov.za

mkhalogwile@nel.mpu.gov.za Undeliverable

Transferred	19/04/2016 14:29
Undeliverable	19/04/2016 14:32

BC: mkhalogwile@nel.mpu.gov.za

Response Pending: 17

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busisiwem@victorkhanyelm.gov.za Transferred

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Delivered	19/04/2016 14:32

BC: busisiwem@victorkhanyelm.gov.za

GumaF@dwa.gov.za Transferred

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BC: GumaF@dwa.gov.za

Harold.Skhosana@drdlr.gov.za Transferred

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info@birdlife.org.za Transferred

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info@sapork.com Transferred

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Delivered	19/04/2016 14:32

BC: info@sapork.com

mandwandwe@landbank.co.za Transferred

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mashuduma@daff.gov.za Transferred

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MatisoM@dwa.gov.za Transferred

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Delivered	19/04/2016 14:32

BC: MatisoM@dwa.gov.za

ncamisile.nkabinde@drdlr.gov.za Transferred

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BC: ncamisile.nkabinde@drdlr.gov.za

nkhumalo@sahra.org.za Transferred

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BC: nkhumalo@sahra.org.za

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BC: palesam@victorkhanyelm.gov.za

sapa@sapoultry.co.za Transferred

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BC: sapa@sapoultry.co.za

sectech@victorkhanyelm.gov.za Transferred

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BC: sectech@victorkhanyelm.gov.za

thokob@daff.gov.za Transferred

Transferred	19/04/2016 14:29
Delivered	21/04/2016 23:44

BC: thokob@daff.gov.za

tspeba@supergrand.co.za Transferred

Transferred	19/04/2016 14:29
Delivered	19/04/2016 14:31

BC: tspeba@supergrand.co.za

ULecuona@arc.agric.za Transferred

Transferred	19/04/2016 14:29
Delivered	19/04/2016 14:29

BC: ULecuona@arc.agric.za

Postal List: Project Announcement (including letter 1, comment form and BID)-21 April 2016 and for release of the Draft Basic Assessment Report (8 September 2016)

21.04.16

Name & Signature of person responsible for post: _____

Normal Post (Mokate Estates 20 April 2016)

18 items – ~~**Registered Post** (Hawequas Sports BA 20 April 2016)~~ Rirhandzu Marivate 021 8882 432

Project Number: EMS0076/ 021SE

Victor Khanye Local Municipality Mvenselwa Mahlangu PO Box 6 Delmas 2210	Victor Khanye Local Municipality Khaya Segone PO Box 6 Delmas 2210	Department of Water Affairs F Guma Private Bag X11259 Nelspruit 1200
Victor Kanye Local Municipality Floyd Mashele PO Box 6 Delmas 2210	Victor Khanye Local Municipality Thembi Mduli PO Box 6 Delmas 2210	Department of Water Affairs M Matiso Private Bag X11259 Nelspruit 1200
Department of Agriculture, Conservation and the Environment Mmantoa Kgaphola Private Bag X11219 Nelspruit 1200	Department of Agriculture, Conservation and the Environment Maureen Sithole Private Bag X11219 Nelspruit 1200	Department of Rural Development & Land Reform Harold Skhosana Hitex Building 1, First Floor 23 Corners Rhodes & Botha Street Witbank 1035
Birdlife Hanneline Smit-Robinson Private Bag X5000 Parklands Johannesburg 2121	Department of Rural Development and Land Reform Bonginkosi Zulu Private Bag X833 Pretoria 0001	Department of Agriculture, Forestry and Fisheries Mashudu Marubini Private Bag X138 Pretoria 0001
AgriLand Thoko Buthelezi Private Bag X120 Pretoria 0001	SAHRA Nokukhanya Khumalo PO Box 4637 Cape Town 8000	Agricultural Research Council Una-Lou Lecuona Private Bag X2 Irene 0062
South African Poultry Association Kevin Lovell Honeydew 2040	South African Pork Association Myles Van Deventer PO Box 36207 Menlo Park 0102	Land and Agricultural Development Bank of South Africa Muzi Ndwandwe PO Box 375 Tshwane 0001

Annexure D.3: Proof of Newspaper advertisement tear sheet

Contents of the Newspaper Advertisement placed in Streek Nuus on 18 December 2015

Notice of Basic Assessment for the proposed commercial piggery and poultry farming enterprise on the Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.

CSIR Reference No: CSIR/CAS/EMS/IR/2016/0001/A

Notice is given of a Basic Assessment (BA) process being undertaken on behalf of **Mokate Estates (Pty) Ltd** (the Project Applicant) for the **Proposed commercial piggery and poultry farming enterprise on the Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.**

In terms of the NEMA EIA Regulations published in Government Notice Regulation (GNR) 983 and 985 on 4 December 2014 Government Gazette No 38282, and NEM:WA Regulation published in GNR 921 on 29 November 2013 Government Gazette No 37083, a BA process is required as the project triggers the following listed activities: *GNR 983 Activity 4.(ii).b), GNR 983 Activity 5.(ii), GNR 983 Activity 12.(iii).a), GNR 985 Activity 12.a) and GNR 921 Activity 14.(iii).b)*. 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 cite 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 **5 February 2016** to do so (30 days from the date of this publication - including weekends, but excluding public holidays).

CSIR

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Newspaper Advertisement placed in Streek News on 18 December 2015

Streek News: 18 December 2015 | 11

gemeenskapnuus/community news

Liedjiefees by Witties

VROEËR vanjaar het die onderwysers van Laerskool Witpoort 'n pragtige Liedjiefees Konsert op die planke gebring. Die was 'n energieke aanbieding wat die talent van die kinders ten beste uitgebring het. Ouers en besoekers praat nog steeds oor die twee aande en die kinders kan nie wag om weer deel te wees van so 'n pragtige produksie nie!
Fotokrediet: Laurette van der Vyver.


Die liedjiefees was 'n reuse sukses.


Superhelde het ook 'n plek in die konsert.


Pragtige Minnie muis.


Ons dans, dans, dans.


Hierdie ballerinas kan dans.


Hier gaan ons branderplank ry.

Father desperate to find daughter

DEATH is likely the only thing that will stop a man's search for his daughter – whom he hasn't seen for 16 years.

Johan Dippenaar last saw his daughter in 1999 when she was only a few years old.

By his own admission, he was involved in substance abuse. After he was hospitalised as a result of a serious motorcycle accident he and the mother of his child parted ways.

Johan relocated to Cape Town, cleaned up his act and has since married. At the risk of opening up old wounds, his wife Meaghan has convinced him to search for his former girlfriend and their daughter, who should now be in her teens.

After an article appeared in the Benoni City Times at the beginning of this month (December), information has been received that mother and daughter could possibly be living in the Cullinan area.

Should Mom and daughter wish to contact Johan they may do so through the Benoni City Times on 011 425 0164.

Notice of Basic Assessment for the proposed commercial piggery and poultry farming enterprise on the Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.

CSIR Reference No: CSIR/CAS/EMS/IR/2016/0001/A

Notice is given of a Basic Assessment (BA) process being undertaken on behalf of **Makale Estates (Pty) Ltd** (the Project Applicant) for the **Proposed commercial piggery and poultry farming enterprise on the Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.**

In terms of the NEMA EIA Regulations published in Government Notice Regulation (GNR) 983 and 985 on 4 December 2014 Government Gazette No 38282, and NEMWA Regulation published in GNR 921 on 29 November 2013 Government Gazette No 37083, a BA process is required as the project triggers the following listed activities: GNR 983 Activity 4 (i)(ii), GNR 983 Activity 5 (ii), GNR 983 Activity 12 (ii)(a), GNR 985 Activity 12 (a) and GNR 921 Activity 14 (a)(ii). 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 cite 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 **5 February 2016** to do so (30 days from the date of this publication - including weekends, but excluding public holidays).

CSIR

INVITATION TO THE PUBLIC PARTICIPATION PROCESS FOR THE DEVELOPMENT OF THE RESOURCE MANAGEMENT PLAN (RMP): BRONKHORSTSPRUIT DAM

Engineerex (Pty) Ltd has been appointed by the Department of Water and Sanitation (DWS) to undertake the development of a Resource Management Plan (RMP) including its associated Business Plan (BP) for Bronkhorstspruit Dam. A RMP is a plan which provide guidance on how the dam can be utilised and managed for recreational purposes, in ways which promote community participation and beneficiation, environmental sustainability and unlock the socio-economic potential of the water resource.

The dam is located within Ward 102 in the jurisdiction of Region 7 of City of Tshwane Metropolitan Municipality in Gauteng Province.

OPPORTUNITY TO PARTICIPATE: All Interested and Affected Parties (I&APs) are invited to a Public Meeting where the Draft RMP for Bronkhorstspruit Dam will be presented.

The Public Meeting will be held as follows:

Date	Time	Venue
28 January 2016	16:00 – 18:00	Die Draai Resort **Physical Address:** **14 Cathie Street**, Bronkhorstspruit | 1020 (25°47'54.79"S and 28°43'55.07"E)

PUBLIC REVIEW:

A copy of the Draft RMP document will be available for review and comments at the following places: **Bronkhorstspruit Dam Nature Reserve, Dam Control Officer (near the dam wall), Bronkhorstspruit Public Library** and with the **Ward Councillor** as from 17 December 2015 until 12 February 2016. Should you have any comments/inputs you may forward them to the contact details below:

Mr Kabedi Mashilo: Engineerex (Pty) Ltd.
P.O. Box 12107, Die Hoewes, 0163
Tel: 012 667 1085
Fax: 086 605 6697
Email: kabedi@engineerex.co.za

water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

engineerex

Annexure D.4. Communication from I&AP's and Competent Authority

Acknowledgement of receipt of application by DARDLEA (dated 16th September 2016)

agriculture, rural development, land & environmental affairs
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

Building No. 6, No. 7 Government Boulevard, Riverside Park, 1200, Mpumalanga Province
Private Bag X 11219, 1200
Tel: +27 (013) 766 6067/8, Fax: +27 (013) 766 8295, Int Tel: +27 (13) 766 6067/8, Int Fax: +27 (13) 766 8295

Litiko Letekulima, Kutfutfukiswa Kwetindzawo Tasemakhaya, Temvelo | Departement van Landbou, Landelike Ontwikkeling | umNyango weZelimo UkuThuthukiswa kweeNdawo zemaKhaya

Enquiries: Selape Lentswana, Cnr Rosemead & Ryan Str, Klipfontein Witbank, 1035, Tel: 013 692 6300/5848
Email: lsmatawane@mpg.gov.za
Reference: 1/3/1/16/1N-69

Rirhandzu Marivate
Council for Scientific and Industrial Research
PO Box 320
Stellenbosch
7600

Fax: 021 888 2473
Tel: 021 888 2432

Dear Sir/Madam,

APPLICATION FOR ENVIRONMENTAL AUTHORISATION: THE PROPOSED MOKATE ESTATES (PTY) LTD COMMERCIAL PIG AND POULTRY FARMING ENTERPRISE WITHIN VICTOR KHANYE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE.

The Department confirms having received the application form for environmental authorisation of the abovementioned project on 09th September 2016. The application is hereby accepted, and you may proceed with the Basic Assessment Process required in terms of the Environmental Impact Assessment Regulations, 2014.

The application has been assigned the reference number **1/3/1/16/1N-69**. Kindly quote this reference number in any future correspondence in respect of the application and in all methods of notification used during the public participation process.

The responsible officer is **Selape Lentswana** and all correspondence must be directed to: The Deputy Director, Environmental Impact Management, Nkangala District Office, marked for the attention of the responsible officer.

Please note that in terms of the provisions of Regulation 67, this application will lapse if the applicant fails for a period of 6 months to comply with a requirement of the EIA Regulations, 2014, or if reasons for failure to comply are not communicated in writing to and accepted by this Department.

Please draw the applicant's attention to the fact that the activity may not commence prior to an environmental authorisation being granted by the Department.

Yours faithfully

Date: 16 September 2016.

Ms. Charity Mthimunye

Acting Deputy Director

MPUMALANGA
THE PLACE OF THE RISING SUN

Acknowledgement of receipt of Draft Basic Assessment Report by DARDLEA (dated 14th November 2016)

Note: the commenting period starting from the 9th of September to 10 October 2016

agriculture, rural development, land & environmental affairs
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

Building No. 6, No. 7 Government Boulevard, Riverside Park, 1200, Mpumalanga Province
Private Bag X 11219, 1200
Tel: +27 (013) 766 6067/8, Fax: +27 (013) 766 8295, Int Tel: +27 (13) 766 6067/8, Int Fax +27 (13) 766 8295

Litiko Letekulima, Kutfutfukiswa Kwetindzawo Tasemakhaya, Temhlaba Netesimondzawo | Departement van Landbou, Landelike Ontwikkeling, Grond en Omgewing Sake | umNyango weZolimo Ukuthuthukiswa kweeNdawo zamaKhaya, iNarha neeNdaba zeBhoduluko

Enquiries: Lentswana Selape ,Cnr Rosemead & Ryan Str, Klipfontein Witbank, 1035, Tel: 013 692 7934
Email: lsmatawane@mpg.gov.za
Reference: 1/3/1/16/1N-69

Rirhandzu Marivate
Council for Scientific and Industrial Research
PO Box 320
Stellenbosch
7600

Fax: 021 888 2473
Tel: 021 888 2432

Dear Sir/Madam,

APPLICATION FOR ENVIRONMENTAL AUTHORISATION: THE PROPOSED MOKATE ESTATES (PTY) LTD COMMERCIAL PIG AND POULTRY FARMING ENTERPRISE WITHIN VICTOR KHANYE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE.

The Department confirms having received the Draft Basic Assessment Report which was submitted by you in respect of the above mentioned project on the 09th September 2016.The department will consider the report within 30 working days of the date of this letter.

Please draw the applicant's attention to the fact that the activity may not commence prior to an environmental authorisation being granted by the Department.

Yours faithfully,

Mthimunye CN
Acting Deputy Director
Environmental Impact Management

Date: 14th November 2016

MPUMALANGA
THE PLACE OF THE RISING SUN

Annexure D.5: Comments and Responses Report

(Comments received following the project announcement and prior release of this Draft Basic Assessment)

ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
SANCO intends to raise and objection to the project (***via E-mail***)	Nkyanyiso Xaba, South Africa National Civic Organisation (SANCO)	21/12/2015	Thank you for showing interest in the project. Not that the Basic Assessment Report will be released and you are welcome to make comments on the document.

(Comments received following the project announcement and prior release of this Draft Basic Assessment)

No issues were raised on the draft Basic Assessment Report after its release within the 30 day commenting period afforded to the public and no comments were received passed the commenting period.

Annexure D.6: Copy of I&APs Register

First Name	Surname	Company/ Organisation	Position	Postal Address	Physical Address	Phone	Cell	Email
NATIONAL								
Hanneline	Smit-Robinson	Birdlife		Private Bag X5000, Parklands 2121, Johannesburg	Isdell House, 17 Hume Road, Dunkeld West, 2196, Johannesburg	0117891122		info@birdlife.org.za
Bonginkosi	Zulu	Department of Rural Development and Land Reform		Private Bag X833 Pretoria 0001	184 Jeff Masemola Street Pretoria 0001	012 312 9351		ncamisile.nkabinde@drdlr.gov.za
Mashudu	Marubini	Department of Agriculture, Forestry and Fisheries		Private Bag X138 Pretoria 0001	20 Steve Biko (Formerly Beatrix) Street Arcadia Pretoria 0002	(012) 319 7619		mashuduma@daff.gov.za
Thoko	Buthelezi	AgriLand	AgriLand and Liaison Officer	Department of Agriculture, Forestry and Fisheries, Private Bag X120, Pretoria 0001	Delpen Building, cnr Annie Botha and Union Street, Office 270			thokob@daff.gov.za
Nokukhanya	Khumalo	SAHRA		P.O. Box 4637 CAPE TOWN 8000	The Chief Executive Officer 111 Harrington Street CAPE TOWN 8001	0214624502		nkhumalo@sahra.org.za
PROVINCIAL								
Mmantoa	Kgaphola	Provincial Coordinator Agriculture		Private Bag x 11219, Nelspruit, 1200	Building 6, Floor 1&2, no 7 Government Boulevard, Nelspruit, 1200	0137666020	082 441 1550	makgophola@mpg.gov.za

First Name	Surname	Company/ Organisation	Position	Postal Address	Physical Address	Phone	Cell	Email
Maureen	Sithole	Department of Agriculture, conservation and the Environment		Private Bag x 11219, Nelspruit, 1200				mkhalogwile@nel.mpu.gov.za
F	Guma	Department of Water Affairs	Chief Director: Mpumalanga	Private Bag X11259 NELSPRUIT 1200		0137597310	0810309070	GumaF@dwa.gov.za
M	Matiso	Department of Water Affairs	Director: Water Sector Support	Private Bag X11259 NELSPRUIT 1200				MatisoM@dwa.gov.za
Harold	Skhosana	Department of Rural Development & Land Reform	Director: nkangala District		Hitex Building 1, First Floor 23 Corners Rhodes & Botha Street Witbank 1035	0136560848		Harold.Skhosana@drdlr.gov.za
LOCAL								
Mvenselwa	Mahlangu	Victor Khanye Local Municipality	Municipal Manager	PO Box 6, Delmas, 2210	Cnr Samuel and Van Der Wald Street, Delmas	0136656005		palesam@victorkhanyelm.gov.za/ munma@delmas.munic.co.za
Khaya	Segone	Victor Khanye Local Municipality	Councillor	PO Box 6, Delmas, 2210	Cnr Samuel and Van Der Wald Street, Delmas	013 665 6000	0835978949	
Floyd	Mashele	Victor Khanye Local Municipality	Technical Services	PO Box 6, Delmas, 2210	Cnr Samuel and Van Der Wald Street, Delmas	0136655754		sectech@victorkhanyelm.gov.za
Thembi	Mdluli	Victor Khanye Local Municipality	Community & Social Services	PO Box 6, Delmas, 2210	Cnr Samuel and Van Der Wald Street, Delmas	0136656012		busisiwem@victorkhanyelm.gov.za

First Name	Surname	Company/ Organisation	Position	Postal Address	Physical Address	Phone	Cell	Email
Dr LB	Cele	Nkalanga District Municipality	District Director			0139472557		lcele@mpg.gov.za
LANDOWNER, APPLICANT & NEIGHOBOUR(S)								
Thamsanqa	Mokate	Mokate Estates	Applicant/Client		212 Cornwell Street, Ext. 7A, Kwa-Thema, Spring, Gauteng		073 507 7824	mokate.estates@hotmail.com
Riaan	Winter		Land Owner	P.O. Box 34, Bospoort, Lichtenburg, North West, 2730			08232663 39	riaan.winter@gmail.com / bertus@treeline.co.za
Gys	Taute	Bapsfontein Community Forum	Contact Person				08325369 06	gystaute@gmail.com
OTHERS								
Una-Lou	Lecuona	ARC		Private Bag X2, Irene, 0062	Old Olifantsfontein Road, Irene	0124279700		ULecuona@arc.agric.za
Kevin	Lovell	South African Poultry Association	CEO	PO Box 1202, Honeydew, 2040, South Africa	Wild Fig Business Park, Block C, 1494 Cranberry Street, Honeydew Ext 19, 2170	0117959920		sapa@sapoultry.co.za
Seeland	Peba	Super Grand Agric Feed	Chairman		Portion 4 of farm 509JR. Onverwacht, Bronkhorstspruit,1020	0139333686		tspeba@supergrand.co.za
Muzi	Ndwandwe	LandBank	Relationship Manager				012 432 0480/ 086 529 5495	mandwandwe@landbank.co.za

First Name	Surname	Company/ Organisation	Position	Postal Address	Physical Address	Phone	Cell	Email
		South African Pork Association					0123613920	info@sapork.com
B	Moduka	Mpumalanga Heritage Resources Authority			1st and 2nd floor, Building 5 Government Complex, 7 Government Boulevard, Riverside Park, Nelspruit, 1200	013 766 5196		bmoduka@mpg.gov.za

Basic Assessment for the development of a 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.

APPENDIX E: Environmental Management Programme

1 INTRODUCTION

This Environmental Management Programme (EMPr) is prepared as part of the requirements of the Environmental Impact Assessment (EIA) Regulations (2014, as amended), promulgated under the National Environmental Management Act (NEMA)(Act 107 of 1998, as amended). The EMPr is to be submitted to the Mpumalanga Department of (DARDLEA) as part of the Application for Environmental Authorisation for the proposed Construction of a Piggery Production and Chicken Broiler Facilities in Farm Rietvalei, portion 1 & 6, in Bapsfontein near Delmas, Mpumalanga. The project Applicant is Mokate Estates (Pty) Ltd.

The Basic Assessment was conducted in order to assess the potential impacts the development might have on the environment. These impacts were assessed in detail and as far as possible, mitigation recommendations are presented within the EMPr in order to ensure informed decision-making and improved sustainable development. These recommendations also include specific management measures applicable to individual natural resources and infrastructure activities as well as general management measures which apply to the proposed infrastructure construction area as a whole.

This EMPr review period, is being made available, as part of the Final Basic Assessment Report (BAR). this EMPr is intended as a "live" document and should continue to be updated regularly, as needed.

1.1 Project Description

Mokate Estates (Pty) Ltd is proposing to establish a start-up enterprise comprising of a commercial pig production facility and chicken broiler near Delmas, Mpumalanga. The start-up enterprise plans to build 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on a 328 hectare farm. The start-up plans to produce pigs for slaughter in commercial quantities of 372 pigs per week and an initial 480 600 broiler chickens per cycle. The agricultural development triggers listed activities in terms of GNR 983 and 985 OF December 2014, promulgated under the National Environmental Management Act (Act 107 of 1998).

The development would Mokates Estates to farm pigs and chickens commercially in support of his livelihood. Mokate obtained funding from The LandBank and private German Funders. For the proposed development to succeed, a number of criteria need to be met. These criteria include obtaining an environmental authorisation.

A detailed description of the proposed project is included in Section B of the Final BAR. A description of the affected environment is provided in Section C of the Final BAR, as well as the relevant specialist studies in Appendix D of the Final BAR. Refer to Appendix A of this EMPr for the proposed layout of the project.

1.1.1 Authors of the Draft EMPr

This EMPr has been compiled by the Environmental Assessment Practitioner and the various specialists on the team (as indicated in Table 1). The details and expertise of the EAP and the specialists are provided in Appendices F and H of the Final BAR, respectively.

Table 1: EIA Team

ENVIRONMENTAL ASSESSMENT PRACTITIONER			
Name	**Organisation**	**Role**	**Qualification/Expertise**
Rirhandzu Marivate	CSIR	Project Manager	BSc (Honours) Ecology, Environment and Conservation.
Minnelise Levendal	CSIR	Project Leader	MSc Environmental Science
Paul Lochner	CSIR	Reviewer	BSc Civil Engineering MPhil Environmental Science
SPECIALIST TEAM			
Name	**Organisation**	**Role/Specialist Study**	**Qualification/Expertise**
Susan Abell	NSS	Vegetation and General Ecology Specialist	MSc Resource Conservation Biology (Pr Nat. Sci.- Ecology & Environmental Science)
Caroline Lotter	NSS	Faunal Specialist	PhD Zoology (Pr. Nat. Sci-Zoology)
Christel Pretorius	SAS	Aquatic Specialist	BSc (Honours) Environmental Science
Stephen Van Staden	SAS	Aquatic Specialist	BSc (Honours) Zoology MSc Environmental Science Pr. Nat. Sci. Ecology & Environmental Science

2 THE APPROACH TO THE EMPR

2.1 Compliance with Relevant Legislation

In terms of legal requirement, a crucial objective of the EMPr is to satisfy the requirements of National Environmental Management Act (NEMA) EIA Regulations published in GNR 983, 984 and 985 on the 4 December 2014 Government Gazette Number 38282, and NEM:WA Regulations published in GNR 921 on the 29 November 2013 Government Gazette No 3708. These regulations regulate and prescribe the content of the EMPr and specify the type of supporting information that must accompany the submission of the report to the authorities. An overview of where the requirements are addressed in this EMPr is presented in Table 2.

Table 2. Compliance with Section 33 of the EIA Regulations 2014 and Section 24N of the National Environmental Management Act (Act No. 107 of 1998).

Requirements of Section 24N of NEMA	Where is it included in this EMPr?
2) The environmental management programme must contain- a) information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of: (i) planning and design; (ii) pre-construction and construction activities; (iii) the operation or undertaking of the activity in question; (iv) the rehabilitation of the environment; and (v) closure, if applicable.	Section 4 of 7 and the columns detailing the impact description, mitigation and management objectives, and mitigation and management actions.
b) details of- (i) the person who prepared the environmental management programme; and (ii) the expertise of that person to prepare an environmental management programme;	Appendix H of the Draft BA Report to which this EMPr is attached.
c) a detailed description of the aspects of the activity that are covered by the environmental management programme;	Section 1
d) information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);	Columns in Section 4 to 7 of the EMPr regarding the monitoring responsibility, including the requirements for monitoring and reporting on compliance and the responsible parties noted in Section 3.
e) information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance;	The columns detailing the mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 7 of this EMPr.
f) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and	Sections 4 to 7 of this EMPr, as applicable to the post-construction, rehabilitation phase and the decommissioning phase.
g) a description of the manner in which it intends to- (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of	The columns detailing the mitigation and management objectives, mitigation and management actions, and the

Requirements of Section 24N of NEMA	Where is it included in this EMPr?
pollutants; and (iii) comply with any prescribed environmental management standards or practices.	monitoring methodology, frequency and responsibility in Sections 4 to 7 of this EMPr.
3) The environmental management programme must, where appropriate- a) set out time periods within which the measures contemplated in the environmental management programme must be implemented; b) contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation which may occur inside and outside the boundaries of the operations in question; and c) develop 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.	The columns detailing the mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 7 of this EMPr.
5) The Minister, the Minister responsible for mineral resources or an MEC may call for additional information and may direct that the environmental management programme in question must be adjusted in such a way as the Minister, the Minister responsible for mineral resources or the MEC may require.	Not applicable at this stage.
6) The Minister, the Minister responsible for mineral resources or an MEC may at any time after he or she has approved an application for an environmental authorisation approve an amended environmental management programme.	Not applicable at this stage.
7) The holder and any person issued with an environmental authorisation- a) must at all times give effect to the general objectives of integrated environmental management laid down in section 23; b) must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment; c) must manage all environmental impacts (i) in accordance with his or her approved environmental management programme, where appropriate; and (ii) as an integral part of the prospecting or mining, exploration or production operation, unless the Minister responsible for mineral resources directs otherwise; d) must monitor and audit compliance with the requirements of the environmental management programme; e) must, as far as is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and	Throughout the EMPr

Requirements of Section 24N of NEMA	Where is it included in this EMPr?
f) is responsible for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation as a result of his or her operations to which such right, permit or environmental authorisation relates.	
8) Notwithstanding the Companies Act, 2008 (Act No. 71 of 2008), or the Close Corporations Act, 1984 (Act No. 69 of 1984), the directors of a company or members of a close corporation are jointly and severally liable for any negative impact on the environment, whether advertently or inadvertently caused by the company or close corporation which they represent, including damage, degradation or pollution.	Section 3 details the responsibility of the Project Applicant.

2.2 Content of EMPr

A typical EMP takes the planning and design, construction, operational and decommissioning phases of a project into account. The EMP is compiled as part of the Basic Assessment (BA) process and is an annexure to the project report.

The EMPr is based mainly on the finding and recommendations of the BA process. The EMPr, is however considered the 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, construction, operation and decommissioning phases consist of the following components:

- ***Impact:*** The potential positive or negative impact of the development that needs to be enhances, 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.

Aim of Environmental Management

The overall goal for environmental management for Mokate Estates proposed Piggery Production and Chicken Broiler Facility project is to construct and operate the project in a manner that

1) Minimises the ecological footprint of the project on the local environment
2) Facilitated harmonious co-existence between the project and other land uses in the area; and
3) Contributes to the environmental baseline and understanding of environmental impacts of piggeries and chicken broilers in the South African Context.

3 ROLES AND RESPONSIBILITIES

For the purpose of the EMP, the generic roles that need to be defined are those of the:

- Project Developer
- Environmental Control Officer
- Operations Manager

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 Project Developer

The Project Developer (Mokate Estates) is the owner of the project and as such is responsible for ensuring the conditions of the Environmental Authorisation issues in terms of NEMA (should the project receive EA) are fully satisfied, as well as ensuring that any other necessary permits or licences are obtained and complied with. It is expected that the project Developer will appoint the Environmental Control Officer (ECO) and the Operations Manager.

Mokate Estates will also be responsible for commissioning the compilation of a Restoration Plan when the production ceases.

3.2 Environmental Control Officer

The ECO will be responsible for overseeing the implementation of the EMPr during the Construction of all the Phases and Operations of the pig production and chicken broiler facilities, including for the monitoring environmental impacts, record-keeping and updating of the EMPr as and when necessarily.

During the Construction Phase, the ECO will be responsible for the following:

- Meeting the site with the Farm Manager prior to the commencement of the construction to confirm the procedure and designated activity zones;
- Monitoring of site activities during construction to ensure adherence to the specifications contained in the EMPr, using a monitoring checklist that is to be prepared by the ECO at the start of the construction phase;
- Preparation of the monitoring report as needed; and
- Conducting an environmental inspection on completion of the Construction Phase

During Operations the ECO will be responsible for:

- Overseeing the implementation of the EMPr for the operation phase;

- Ensuring the necessary environmental monitoring takes place as specified in the EMPr;
- Update the EMPr and ensure that records are kept of all monitoring activities and results.

During Rehabilitation and Restoration Phase, the ECO will be responsible for:

- Ensuring the activities outlined in the Restoration Plan is undertaken.

At the time of preparing this draft EMPr, the ECO appointment is still to be made by the Community Trust. The appointment is dependent upon the project proceedings to the Construction phase.

3.3 Construction Manager (Lead Contractor or Engineering Consultant)

The lead contractor will be responsible for the following:

- Overall construction programme, project delivery and quality control for the construction of the Piggery Production and Chicken Broiler Facilities.
- Overseeing compliance with the Health, Safety and Environmental Responsibilities specific to the project construction.
- Promoting total job safety and environmental awareness by employees, contractors and sub-contractors and stress to all employees and contractors and sub-contractors the importance that the project proponent attaches to safety and the environment.
- Ensuring that each subcontractor employ an Environmental Officer (or have a designated Environmental Officer function) to monitor and report on the daily activities on-site during the construction period.
- Ensuring that safe, environmentally acceptable working methods and practices are implemented and that sufficient plant and equipment is made available, is properly operated and maintained in order to facilitate proper access and enable any operation to be carried out safely.
- Meeting on site with the EHS Manager prior to the commencement of construction activities to confirm the construction procedure and designated activity zones.
- Ensuring that all appointed contractors and sub-contractors are aware of this EMPr and their responsibilities in relation to the programme.
- Ensuring that all appointed contractors and sub-contractors repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in the EMPr, to the satisfaction of the EHS Manager.

At the time of preparing this EMPr, the appointment of a lead contractor has not been made and will depend on the project proceeding to the construction phase.

3.4 Operations Manager

The Operations Manager will be responsible for the following:

- Operation of the Piggery Production and Chicken Broiler Facilities.
- Required maintenance of the facilities.
- Overall compliance with the EMPr and Environmental Authorisation.

Ensuring that the specified environmental monitoring programmes during operations are undertaken effectively and that the findings are analysed and applied.

4 MANAGEMENT ACTIONS FOR THE PLANNING AND DESIGN PHASE

The aim of managing tasks associated with the planning and design phase of the piggery production and chicken broiler facilities is to ensure that potential environmental impacts identified during the Basic Assessment (BA) Process are effectively used to inform project design. This promotes the use of pre-emptive measures that serve to minimise the potential environmental impacts that may otherwise require mitigation at a later stage in the process. The potential impacts resulting from development of the preferred sites during planning and design phase of the activity are provided below.

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. Alien Vegetation Management					
4.1. Removal of alien invasive vegetation from the proposed project area.	Ensure the correct removal of alien invasive vegetation from the proposed project area and prevent the establishment and spread of alien invasive plants due to the project activities.	4.1.1. Ensure compliance with relevant Environmental Specifications for the control and removal of alien invasive plant species. 4.1.2. Appoint a specialist or contact relevant authorities to seek guidance on the removal of the alien vegetation on site.	Appoint a suitable specialist/ Contractor or contact the relevant authorities to seek guidance on the removal of the planted alien invasive species.	Once-off during the design phase.	Project Developer
B. Indigenous Vegetation Management					
4.2. Loss of Indigenous and Conservation Important Species from clearing of vegetation and increase in vehicle and human activity.	Ensure that the planted indigenous species are safely removed and relocated. Stockpile topsoil (preferably 1-1.5m in height) to maintain viability of the indigenous seed bank for subsequent re-vegetation of any disturbed areas.	4.2.1. Obtain the relevant pre-requisite permits from the relevant Authorities prior to the removal of the indigenous species. Once these permits are obtained, search and rescue must be undertaken.	Appoint a suitable Search and Rescue Specialist/ Contractor to undertake translocation.	Once-off prior to construction.	Contractor or Specialist
4.3. Loss of habitat through clearing	Minimise the disturbance footprint and spill over / edge effects on surrounding habitat.	4.3.1. Restrict all habitat loss and disturbances from construction activities to within the proposed and agreed upon site layout.	Revise the planned layout of the facility and all associated infrastructure to avoid all High sensitive areas as	Once-off during the design phase.	Contractor or Specialist

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			far as possible. Clearly demarcate or fence in the construction site. Specimens that are situated in the construction footprint, according to the advice of an appropriate specialist. Identify and mark large trees both on the ground and digitally to facilitate the incorporation of as many large trees into the final project layout as possible. Wherever possible endeavour to conserve large trees in situ.		
4.4. Mortality of fauna in surrounding areas	To reduce mortality rates and continued displacement of fauna in surrounding areas	4.4.1. Adhere to law and best practice guidelines regarding the displacement and relocation of CI fauna 4.4.2. Appropriately deal with fauna encountered on site. 4.4.3. Time construction activities to minimise faunal mortality 4.4.4. Limit indiscriminate killing, persecution or hunting of fauna.	• Prior to construction commission a suitably qualified ecologist to remove and relocate species to suitable surrounding habitats. E.g. All termitaria within the project footprint should be carefully searched for Striped Harlequin Snakes. Grass should also be	Weekly	Project Developer and Specialist

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			searched for grass lizards and these searches should continue into the night for hedgehogs. • Construction activities should be timed to start (and preferably end) during winter, when activity levels and the presence of breeding and migratory species are lowest. Bullfrogs are, however a concern in this regard as overwintering individuals may be unearthed during construction activities. • Ensure policies and procedures are in place regarding the handling and removal of fauna encountered on site. • Ensure that staff are trained and properly equipped to safely handle		

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			fauna (particularly snakes and bullfrogs) or that the services of a trained professional are readily available on call. • Construction activities should be timed to start (and preferably end) during winter, when activity levels and the presence of breeding and migratory species are lowest. Bullfrogs are, however a concern in this regard as overwintering individuals may be unearthed during construction activities. • Check open trenches for trapped animals (e.g. bullfrogs, hedgehogs and snakes), which should be carefully caught and relocated according to the specifications of a relevant		

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			specialist. • Prohibit the introduction of domestic animals such as dogs and cats. • Educate staff on prohibited actions involving the utilisation of wildlife (i.e. poaching / harvesting) through training and notices. • Routinely walk fence lines to remove snares.		
C. Design of Piggery Production and Chicken Broiler Facility					
4.5. Impact on and disturbance to existing infrastructure (roads, stormwater pipelines) during construction.	Reduce unnecessary impacts on existing service infrastructure surrounding the proposed site and avoid potential planning impacts within the area.	4.5.1. Consult with the relevant municipal departments during the detailed engineering phase to discuss the impact of the proposed project on existing service infrastructure. 4.5.2. Ensure that all Building Plans and associated documents have been approved by Municipality prior to construction. 4.5.3. Assess the risks of excavation work by reviewing cable and pipe routings.	Ensure that this is taken into consideration during the design phase.	Once-off during the design phase.	Project Developer
4.6. Risks of accidents and hazards during the	Reduce potential accidents and hazards during the construction	4.6.1. Compile an Emergency Response Action Plan (ERAP)	Ensure that the recommendations	Once-off during the design phase.	Project Developer

construction and operational phases.	and operational phases. The design must comply with all applicable legislative requirements, specifically as prescribed in the Occupational Health and Safety Act (Act 85 of 1993) under the Construction Regulations.		prior to the commissioning of the proposed project.	from the Emergency Response Action Plan (ERAP) are taken into consideration during the design phase.		
4.7. Environmental Contamination	Reduce any environmental contamination	4.7.1.	Ensure that excrement, carcasses, feed, and other operational waste and hazardous materials are appropriately and effectively contained and disposed of without detriment to the environment.	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.		

5 MANAGEMENT PLAN FOR CONSTRUCTION PHASE

The overall goal of the construction phase is to undertake all relevant construction activities in a wat that ensures proper management of environmental aspects and impacts; and to minimise disruption to other land use activities in the area, traffic and farming activities that occur elsewhere in and around the farm.
The potential impacts resulting from development of the preferred sites during the construction phase of the activity are provided below.

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. Alien Vegetation Management					
5.1. Removal of alien invasive vegetation from the proposed project area.	Ensure the correct removal of alien invasive vegetation from the proposed project area and prevent the establishment and spread of alien invasive plants due to the project activities.	5.1.1. The planted alien invasive vegetation should be removed immediately (in line with relevant municipal and provincial procedures, guidelines and recommendations) and disposed of at a licenced waste disposal facility.	Monitor the removal of the alien invasive vegetation.	During the removal process	ECO
5.2. Increased Risk of Alien Plant Invasion	Reduce the establishment and spread of alien invasive plants due to the project activities.	5.2.1. Ensure compliance with relevant Environmental Specifications for the control and removal of these species.	Monitor the presence of alien invasive plants during the construction phase.	Weekly	ECO
		5.2.2. All stockpiled material must be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods.			
B. Indigenous Vegetation Management					
5.3. Loss of Planted Indigenous Species	Ensure that the planted indigenous species are safely removed and relocated.	5.3.1. Search and rescue must be undertaken and, where possible, these species must be relocated to a suitable nursery or relocated to an alternate location within the site.	Appoint a suitable Search and Rescue Specialist/ Contractor to undertake translocation.	Once-off prior to construction.	Contractor or Specialist
5.4. Loss of CI or medicinally important plant species	To minimise loss of CI or medicinally important plant	5.4.1. Adhere to law and best practice guidelines regarding the displacement of CI and	Guidance from a suitably qualified vegetation	During construction.	Contractor or Specialist

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
	species in accordance with law and best practice and encourage rehabilitation	medicinally important floral species.	specialist or horticulturist regarding the collection, propagation/storage and transplantation of plants is advised.		
5.5. Mortality of fauna in surrounding areas	To reduce mortality rates and continued displacement of fauna in surrounding areas	5.5.1. Adhere to law and best practice guidelines regarding the displacement and relocation of CI fauna 5.5.2. Appropriately deal with fauna encountered on site. 5.5.3. Time construction activities to minimise faunal mortality 5.5.4. Limit indiscriminate killing, persecution or hunting of fauna.	• Prior to construction commission a suitably qualified ecologist to remove and relocate species to suitable surrounding habitats. E.g. All termitaria within the project footprint should be carefully searched for Striped Harlequin Snakes. Grass should also be searched for grass lizards and these searches should continue into the night for hedgehogs. • Construction activities should be timed to start (and preferably end) during winter, when activity levels and the presence of breeding and migratory species are lowest. Bullfrogs are, however a concern in this regard as overwintering individuals may be	Weekly	Project Developer and Specialist

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			unearthed during construction activities. • Ensure policies and procedures are in place regarding the handling and removal of fauna encountered on site. • Ensure that staff are trained and properly equipped to safely handle fauna (particularly snakes and bullfrogs) or that the services of a trained professional are readily available on call. • Construction activities should be timed to start (and preferably end) during winter, when activity levels and the presence of breeding and migratory species are lowest. Bullfrogs are, however a concern in this regard as overwintering individuals may be unearthed during construction activities. • Check open trenches for trapped animals (e.g. bullfrogs,		

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			hedgehogs and snakes), which should be carefully caught and relocated according to the specifications of a relevant specialist. • Prohibit the introduction of domestic animals such as dogs and cats. • Educate staff on prohibited actions involving the utilisation of wildlife (i.e. poaching / harvesting) through training and notices. • Routinely walk fence lines to remove snares.		
5.6. Sensory disturbance of faunal communities	Minimise sensory disturbance surrounding faunal communities	5.6.1. Appropriately time construction activities to minimise sensory disturbance to fauna.	Commence (and preferably complete) construction during winter, when the risk of disturbing active (including breeding and migratory) animals, should be least.	Daily	Project Developer EHS Manager
5.7.		5.7.1. Limit disturbances caused by noise	Noise should also be minimised throughout construction to limit the impact on sensitive fauna such as owls and large terrestrial birds such as korhaans and	Daily	Project Developer EHS Manager

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			Secretarybirds.		
5.8.		5.8.1. Limit disturbances caused by light	Limit construction activities to day time hours and Minimize or eliminate security and construction lighting, to reduce the disturbance of nocturnal fauna.	Daily	Project Developer EHS Manager
C. Noise Impacts					
5.9. Potential noise impact from piling operations during the construction phase.	Prevent unnecessary impacts on the surrounding environment by ensuring that the piling noise is mitigated.	5.9.1. All operations should be conducted during daytime only (i.e. 06:00 – 22:00, as defined in South African National Standards (SANS) 10103).	Construction times to be monitored and managed (as well as included in the tender contract).	Daily	Contractor and EHS Manager
D. Visual Impacts					
5.10. 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.	5.10.1. The Contractor should maintain good housekeeping on site to avoid litter and minimise waste. Ensure that rubble and litter are appropriately stored and regularly removed from site to a licenced waste disposal facility. 5.10.2. Dust generation must be kept at a minimum. 5.10.3. Night lighting of construction sites must be minimised within requirements of safety and efficiency.	Rubble/litter/waste removal and disposal to be monitored throughout construction. Complaints about night lights should be investigated and documented in a register.	Weekly or bi-weekly	Contractor and ECO

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
E. Traffic Impacts					
5.11. Impact of construction vehicles on the Maydon Wharf road network and parking of construction vehicles on public roads when not in use.	Prevent unnecessary impacts on the surrounding road network by supplying parking for construction vehicles on site.	5.11.1. Accommodate all construction vehicles on site during the construction phase.	Monitor that no construction vehicles park on the outlying roads Record and report non-compliance.	Daily during construction.	Contractor and EHS Manager
F. Safety, Health and Environment					
5.12. 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).	Reduce the potential noise impacts on the construction workers.	5.12.1. Construction personnel must wear proper hearing protection, which should be specified as part of the Construction Phase Risk Assessment carried out by the Contractor. 5.12.2. The Contractor must ensure that all construction personnel are provided with adequate Personal Protective Equipment (PPE) for use where appropriate.	Inspections to be carried out during the construction phase to enforce the use of hearing protection by construction personnel. This must also be written into the safety requirements of the Contract.	Throughout the construction phase (i.e. weekly).	ECO and Contractor
5.13. Potential health injuries to construction personnel as a result of construction work (i.e. welding fumes, dust and smoke etc.).	Prevent respiratory illnesses caused to the construction personnel.	5.13.1. The Contractor must ensure that all construction personnel are provided with adequate PPE (such as dust masks) for use where appropriate.	Inspections to be carried out during the construction phase to enforce the use of respiratory protection by construction personnel. This must also be written into the safety requirements of the Contract.	Throughout the construction phase (i.e. weekly).	ECO and Contractor
5.14. Heavy traffic, congestion and potential for collisions	Prevention of injuries, fatalities, and damage to equipment and	5.14.1. During the construction phase, suitable parking areas	Monitor activities and record and report non-	Throughout the construction phase.	Project Developer, ECO and Contractor

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
during the construction phase.	vehicles during the construction phase.	should be created and designated for construction trucks and vehicles.	compliance by undertaking inspections.		
		5.14.2. A construction supervisor should be appointed to co-ordinate construction traffic during the construction phase.			
		5.14.3. Road barricading should be undertaken where required and road safety signs should be adequately installed at strategic points within the construction site.			
		5.14.4. Road worthy vehicles (i.e. stop and indicator lights) and only licenced vehicle drivers should be used. Vehicle maintenance and driver competency should be monitored. The Contractors must ensure that construction vehicles are roadworthy, properly serviced and maintained.	Perform random checks of driver licenses and conduct random visual inspections of construction vehicles for roadworthiness.	Random visual inspection of vehicles weekly by the Contractor.	Project Developer and Contractor
5.15. Potential impact on the safety of construction workers due to construction activities (such as welding, cutting, use of hot metals, working at heights, lifting of heavy items etc.).	Prevention of injuries to and fatalities of construction personnel during the construction phase.	5.15.1. Ensure that skilled, licenced and competent Contractors, riggers and crane operators are appointed during the construction phase, along with the use of certified equipment and scaffolding. 5.15.2. The Contractor must ensure	Monitor activities and record and report non-compliance by undertaking inspections.	Throughout the construction phase (i.e. weekly).	Project Developer , ECO and Contractor

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		that all construction personnel are provided with adequate PPE for use where appropriate. 5.15.3. The Contractor must prescribe, to construction personnel. 5.15.4. A Construction Site Manager or Safety Supervisor should be appointed, in conjunction with the engineering project manager, to monitor all safety aspects during the construction phase. 5.15.5. Ensure that roads are not closed during construction, which may restrict access for emergency services.			
5.16. Pollution of water and ground as a result of spillages, generation of building rubble and waste scrap material.	Prevent unnecessary pollution impacts on the surrounding environment.	5.16.1. The construction site should be cleaned regularly and all construction waste (i.e. concrete, steel, rubble, packaging material etc.) must be removed from site and disposed at a licenced waste disposal facility by an approved waste Contractor. Waste disposal slips or waybills should be kept on file for auditing purposes as proof of disposal.	Monitor activities and record and report non-compliance by undertaking inspections.	Throughout the construction phase.	Project Developer, ECO and Contractor

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		5.16.2. All liquid wastes (i.e. used oil, paints, lubricating compounds and grease etc.) must be removed from site and disposed at a licenced hazardous waste disposal facility by an approved waste Contractor. Waste disposal slips or waybills should be kept on file for auditing purposes as proof of disposal.			
G. Heritage Resources (Archaeology and Palaeontology)					
5.17. Impact on Archaeology and Palaeontology	Prevent damage and destruction to buildings, artefacts and materials of heritage significance.	5.17.1. Carry out general monitoring of excavations for potential fossil heritage, artefacts and material of heritage importance.	Monitor excavations and construction activities for archaeological and palaeontological materials.	Daily during excavation work.	Contractor and ECO
		5.17.2. All work must cease immediately, if any human remains and/or other archaeological, palaeontological and historical material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist and to the Mpumalanga Heritage/SAHRA (or the South African Police Services), so that a systematic and professional investigation	Monitor excavations and construction activities for archaeological and palaeontological materials and report the finds accordingly. Mpumalanga Heritage /SAHRA and the identified palaeontologist/ archaeologist if any heritage features are uncovered.	As required/necessary during construction.	Contractor and ECO

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		can be undertaken. Sufficient time should be allowed to remove/collect such material before construction re-commences.			
H. Water Conservation					
5.18. Impact on the regional water balance as a result of increased water usage.	Reduce water usage during construction.	5.18.1. Water conservation to be practiced in line with Energy Saving Policies as follows: • Cleaning methods utilised for cleaning vehicles, floors, etc. should aim to minimise water use (e.g. sweep before wash-down). • Ensure that regular audits of water systems are conducted to identify possible water leakages.	Monitor via site audits and record non-compliance and incidents.	Monthly	EHS Manager and ECO
		5.18.2. Carry out environmental awareness training with a discussion on water usage and conservation.	Conduct training for all construction personnel.	• Once-off during construction and ensure that all new staff are inducted.	EHS Manager, ECO and Contractor
I. Spill Contingency, Management and Handling of Chemicals/Dangerous Goods					
5.19. Potential spillage of effluent (from portable sanitation facilities for construction personnel).	Reduce the spillage of domestic effluent and the impact thereof on the environment.	5.19.1. Ensure that normal sewage management practices are implemented during construction such as regularly emptying toilets and ensuring safe transport and disposal of sewage.	Monitor via site audits and record non-compliance and incidents (including incidents that nearly occur).	Monthly	EHS Manager and ECO

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		5.19.2. Ensure that all domestic effluent/waste water is disposed safely at an appropriate, licenced facility by an appointed (suitable) service provider. Ensure that no discharge of waste water to the land surface is permitted. Proof of disposal (i.e. waybills) must be kept on file.	Monitor via site audits and record non-compliance and incidents. EHS Manager to audit disposal slips.	Monthly	EHS Manager and ECO
		5.19.3. Carry out environmental awareness training to ensure that all personnel on-site are aware of environmental requirements and only make use of the provided facilities for sanitation purposes.	Conduct training for all construction personnel.	• Once-off during construction and ensure that all new staff are inducted.	EHS Manager, ECO and Contractor
		5.19.4. Ensure that sufficient toilet facilities are provided on site (one facility for every 10 persons working on the site).	Monitor via site audits and record non-compliance and incidents.	Monthly	EHS Manager and ECO
		5.19.5. Ensure that the toilet/sanitation facilities are maintained in a clean, orderly and sanitary condition.	Monitor via site audits and record non-compliance and incidents.	Daily	EHS Manager and Contractor
		5.19.6. Ensure that the toilet/sanitation facilities are regularly serviced and emptied.	Monitor via site audits and record non-compliance and incidents.	Monthly	EHS Manager and ECO
		5.19.7. Ensure that the site camp and	Monitor via site audits and	Monthly	EHS Manager and

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		toilet/sanitation facilities are placed outside areas susceptible to flooding and beyond 32 m of the estuary.	record non-compliance and incidents.		ECO
5.20. Contamination of soil, the marine environment and groundwater through spillage of concrete and cement.	To control concrete and cement batching activities in order to prevent spillages and concomitant contamination of soil, groundwater and the marine environment.	5.20.1. If any concrete mixing takes placed on site, this must be carried out on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface).	Monitor the handling and storage of sand, stone and cement as instructed.	Daily	Project Developer, Contractor and EHS Manager
		5.20.2. Concrete mixing areas must be fitted with a containment facility for the collection of cement-laden water. This facility must be impervious to prevent soil and groundwater contamination.			
		5.20.3. Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains.			
		5.20.4. A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted.			
		5.20.5. Hardened concrete from the washout facility or concrete mixer can either be reused or			

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		disposed of at an appropriate licenced disposal facility.			
		5.20.6. Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site. Sand and aggregates containing cement must be kept damp to prevent the generation of dust.			
		5.20.7. Any excess sand, stone and cement must be removed from site at the completion of the construction period and disposed at a registered disposal facility.			
J. Waste Water Management					
5.21. Pollution caused by spillage or discharge of construction waste water into the surrounding environment.	Reduce construction waste water discharge into the environment and the resulting impact.	5.21.1. Implement proper construction site management actions such as the installation of containment structures, good on-site housekeeping (regular sweeping of roadways and work areas, reporting systems and environmental awareness training), and spillage management.	Monitor via site audits and record non-compliance and incidents.	Monthly	EHS Manager
		5.21.2. Ensure that adequate containment structures are provided for the storage of	Monitor the bunding and containment structures.	Weekly	EHS Manager

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		dangerous goods and hazardous materials on site. Appropriate bund areas must be provided for the storage of these materials. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground and stormwater system.			
K. Stormwater Management					
5.22. 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.	5.22.1. The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase.	Compile Method Statement	Once off (and thereafter updated as required).	Contractor
		5.22.2. Provide secure storage for oil, chemicals and other waste materials in order to prevent contamination of stormwater runoff.	Monitor the bunding and containment structures.	Weekly	EHS Manager
		5.22.3. Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.	Monitor via site audits and record non-compliance and incidents (i.e. by implementing walk through inspections).	Weekly	Contractor, EHS Manager and ECO
L. Waste Management					
5.23. Pollution of the surrounding environment as a result of the handling, temporary storage and	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of general and	5.23.1. General waste and hazardous waste should be stored temporarily on site in suitable (and correctly labelled) waste	Inspection of the temporary waste storage area.	Daily	EHS Manager

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
disposal of solid waste (general and hazardous).	hazardous waste.	collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate.			
		5.23.2. 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.			
		5.23.3. Ensure that general waste and hazardous waste are removed from the site on a regular basis and disposed of at an appropriate, licenced 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.	Monitor via site audits and record non-compliance and incidents. EHS Manager to monitor and audit disposal slips.	Monthly	EHS Manager
		5.23.4. Ensure that the construction site is kept clean at all times and that construction personnel are made aware of correct waste disposal	Conduct training for all construction personnel.	• Once-off during construction and ensure that all new staff are inducted.	EHS Manager, ECO and Contractor

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		methods.			
		5.23.5. 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.	Monitor waste generation and collection throughout the construction phase.	Daily	EHS Manager and Contractor
		5.23.6. No solid waste may be burned or buried on site.	Monitor via site audits and record non-compliance and incidents.	Daily	EHS Manager
		5.23.7. Segregation of hazardous waste from general waste to be in place.	On-site inspection of waste segregation.	Weekly	EHS Manager
M. Air Quality Management					
5.24. Air Quality Impact: 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.	5.24.1. 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.	• Monitor dust suppression mechanisms and record non-compliances. • Maintain an incidents/ complaints register, in which any complaints from the public must be logged. The date, time, nature of complaint, name of complainant and corrective actions must be logged for all complaints. Complaints must be investigated	• Weekly • During complaints/incidents	EHS Manager, ECO and Contractor

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			and, if appropriate, acted upon.		
		5.24.2. Implement traffic control measures on the construction site to limit vehicle-entrained dust from unpaved roads. Ensure that construction vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour.	Monitor traffic control measures and report non-compliances.	Weekly	EHS Manager and Contractor
N. Socio-Economic Management					
5.25. Employment creation and skills development opportunities during the construction phase.	Maximise local employment and local business opportunities to promote and improve the local economy.	5.25.1. Enhance the use of local labour and local skills as far as reasonably possible.	Maximise local employment for unskilled labour and provincial/ national skilled labour.	During the construction phase.	Contractor and ECO
		5.25.2. Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained.			
		5.25.3. 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.			
		5.25.4. Ensure that goods and services are sourced from the local and regional economy as			

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		far as reasonably possible.			
O. Environmental Awareness and Site Camp Establishment					
5.26. Increased energy consumption during the construction phase.	Reduce energy consumption where possible.	5.26.1. Encourage the use of energy saving equipment at the construction camp site (such as low voltage lights and low pressure taps) and promote recycling. Construction personnel must be made aware of energy conservation practices as part of the environmental awareness training programme.	• Contractor to monitor energy usage via site investigations. • Conduct training for all construction personnel.	• Monthly • Once off training and ensure that all new staff are inducted.	• Contractor • EHS Manager, ECO and Contractor
5.27. Inappropriate behaviour of civil contractors and sub-contractors during the construction phase.	Prevent unnecessary impacts on the surrounding environment by ensuring that contractors are aware of the requirements of the EMPr.	5.27.1. Designate smoking areas where the fire hazard could be regarded as insignificant.	Adhoc checks to ensure workers are smoking only in designated areas.	Daily	Contractor and EHS Manager
		5.27.2. Educate workers on the dangers of open and/or unattended fires.	Ensure fire safety requirements are well understood and respected by workers (by providing basic fire safety training).	On-going	Contractor and EHS Manager
		5.27.3. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on site for the duration of the construction phase.			
		5.27.4. Fire-fighting equipment must be made available at various appropriate locations on the construction site.			
5.28. Inappropriate planning of site camp establishment.	Ensure that environmental issues are taken into	5.28.1. Ensure that the site establishment is designed and	Monitor compliance and record non-compliance and	Before construction	EHS Manager

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
	consideration in the planning for site establishment.	carried out in line with the requirements of relevant specifications and the landowner (TNPA).	incidents.		

General Recommendation:

Implementation of a construction phase Environmental Management Programme

A construction phase Environmental Management Programme should be compiled and implemented, such that it clearly addresses all the above mentioned activities, as well as appropriate locations for construction camps, vehicle storage and parking areas, ablution facilities and waste management, such that these do not impact on sensitive or otherwise important terrestrial or wetland areas.

6 MANAGEMENT PLAN OF OPERATIONAL PHASE

The objective for managing the operational phase of the solar PV project is to ensure that the daily operations do not have unforeseen impacts on the environment; to ensure that all potential impacts are monitored and that the necessary corrective action are undertaken in a timeous manner. The potential impacts resulting from development of the preferred sites during the operational phase of the activity are provided below.

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. Alien Vegetation Management					
6.1. Potential re-establishment of alien plants on site.	Ensure the correct removal of alien invasive vegetation from the proposed project area and prevent the establishment and spread of alien invasive plants.	6.1.1. Alien invasive vegetation should be removed immediately (in line with relevant municipal and provincial procedures, guidelines and recommendations) and disposed of at a licenced waste disposal facility.	Monitor the removal of the alien invasive vegetation.	During the removal process.	EHS Manager

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
B. Noise Impacts					
6.2. Potential noise impact from 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.	6.2.1. All drivers of the vehicles should receive training regarding the use of air brakes.	Training of drivers that are contracted.	During induction of drivers to site rules.	Project Developer
C. Visual Impacts					
6.3. 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.	6.3.1. Outside and security lights must use light fixtures that shield the light and focus illumination onto specific areas as required. 6.3.2. Elevated lights should be avoided, or carefully shielded to minimise glare.	Complaints referring to lighting at night should be documented, investigated and resolved.	When complaints are received.	Project Developer
D. Traffic Impacts					
6.4. Impact of extra parked vehicles during the operational phase.	Prevent unnecessary or excessive heavy vehicles.	6.4.1. Implement good logistics planning during the operational phase.	Compile a scheduled loading time programme to minimise potential delay in loading.	Permanent over the lifespan of development.	Project Developer
E. Safety, Health and Environment					
6.5. Pollution of water and the ground as a result of potential spills of the stored product.	Prevent unnecessary pollution impacts on the surrounding environment.	6.5.1. Scheduled inspections should be implemented in order to assure and verify the integrity of hoses, piping and storage tanks.	Carry out thorough inspections of piping, loading hoses, and bunding for leaks, using a checklist.	Daily	Project Developer
		6.5.2. The operating personnel should undergo proper training to prevent overfilling incidents.	Proof of attendance to training sessions to be kept on file on site.	Once off (and thereafter as required for new operating personnel).	Project Developer
		6.5.3. Ensure that excrement, carcasses, feed, and other operational waste and hazardous materials are	• Adhere to best practice pig husbandry, chicken rearing and waste disposal norms.	• Throughout Operation	Project Developer

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		appropriately and effectively contained and disposed of without detriment to the environment.	• Ensure that if vehicles, equipment or visiting personnel are to be decontaminated make sure this is done in a designated area that can effectively contain excess disinfectants / biocides / surfactants.		
6.6. Atmospheric pollution due to fumes, smoke from fires.	Prevent unnecessary air pollution impacts as a result of the operational procedures.	6.6.1. Portable fire extinguishers and fire water hydrants (i.e. appropriate fire-fighting equipment) should be provided.	• Assurance of functionality of fire extinguishers via inspections and certification by an accredited fire service company. • Comply with the permit to work system.	• Annually	Project Developer
6.7. 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.	6.7.1. Operational personnel must wear basic PPE (e.g. gloves, goggles etc.) as necessary during the operational phase.	• Medical investigations or surveillance to be undertaken for the operating personnel. • Keep a register of the medical records for the operating personnel.	• Once-off for every operating person. • Once every five years for the life of the installation.	Project Developer
6.8. 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.	6.8.1. Portable fire extinguishers and fire water hydrants (i.e. appropriate fire-fighting equipment) should be provided at the site as required. Mobile fire-fighting equipment should be provided at the berths as a	• Draw up a schedule for inspections and maintenance. • Assurance of functionality of fire extinguishers via inspections and certification by an	• Once initially and revise as reliability of equipment is assessed. • Annually • Annually	Project Developer

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		safety precaution during the vessel offloading process.	accredited fire service company. • Draw up a schedule of safety audits.		
6.9. Increase in pest invertebrates	Highly localized pest invertebrate control that does not affect non-target populations or taxa	6.9.1. Detect and control pest infestations before they become a problem through frequent and careful cleaning, monitoring and control.	• Rinse floors regularly • Provide sufficient ventilation and airflow to keep the pig house (floors, bedding, fodder) as dry as possible. • Check to see that fan louvers are properly working and close completely when the fan is not running. • Properly screed concrete floors to effectively seal all cracks and limit the pooling of effluent on site. • Use appropriately sloped and slated floors to facilitate drainage • Clean up excess fodder regularly from under troughs and feed bins • Effectively drain storm water from around pig houses • Keep areas surrounding pig houses free of spilled manure and litter • Remove all trash, and sources of feed and water	As necessary	EHS Manager and Project Developer

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			for pests from the outside perimeter of the facilities. • Keep grass and weeds mowed to 5cm or less immediately around the facilities, to prevent insect growth • Maintain a high capacity slurry dam and manage it properly. • Regularly empty slurry dam to prevent the accumulation of floating solids for extended periods of time (crust left on top of slurry soon become major breeding ground for flies) • Electrocution devices are available to kill flies, while other mechanical devices include traps, sticky tapes or baited traps.		
		6.9.2. Detect pest infestations before they become a problem through frequent and careful monitoring.	• Manage and prevent access to fodder, especially feed wastage around the houses, feeders. • Control rodents through effective sanitation, rodent proofing and killing. • Glue boards and traps can be used in small areas, but in larger areas (over 12,000 sq ft) baits are more practical.	As necessary	EHS Manager and Project Developer

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			• Rodenticides are not advised. • The most effective control for indigenous birds is screening production house air inlets and open windows with 2x2cm wire mesh.		
F. Water Conservation					
6.10. Impact on the regional water balance as a result of increased water usage.	Reduce water usage during operations.	6.10.1. Water conservation to be practiced in line with Energy Saving Policies as follows: • Cleaning methods utilised for cleaning vehicles, floors, etc. should aim to minimise water use (e.g. sweep before wash-down). • Ensure that regular audits of water systems are conducted to identify possible water leakages.	Record water usage, conduct audits and record non-compliance and incidents.	Monthly	Project Developer
G. Spill Contingency, Management and Handling of Chemicals/Dangerous Goods					
6.11. Potential spillage of domestic effluent from the sewer as a result of the operation.	Reduce the spillage of domestic effluent and the impact thereof on the environment.	6.11.1. A maintenance plan for the management of the sewer pipes in cases of emergency should be developed.	Compile sewer maintenance plan.	Once off (and thereafter updated as required during the operational phase).	Project Developer

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
H. Stormwater Management					
6.12. Increased stormwater discharge into the surrounding environment.	Reduce the impact of increased stormwater discharge to the environment.	6.12.1. A suitable stormwater/ surface water quality monitoring programme should be established and implemented.	Implement surface water quality monitoring programme, based on consultation with the landowner.	As agreed during the operational phase.	Project Developer
		6.12.2. Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.	Undertake regular inspections of the stormwater infrastructure (i.e. by implementing walk through inspections).	Weekly/Monthly	Project Developer and EHS Manager
I. Waste Management					
6.13. 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.	6.13.1. Sufficient waste collection bins and skips (or similar) should be provided. Waste collection bins and skips should be covered with suitable material and correctly labelled.	Monitor waste generation and collection throughout the operational phase.	Weekly	EHS Manager
		6.13.2. Segregation of hazardous waste from general waste to be in place.	On-site inspection of waste segregation.	Weekly	EHS Manager
		6.13.3. Ensure that the is kept clean at all times and that operational personnel are made aware of correct waste disposal methods.	• Conduct training for all operational personnel.	• Once-off during operations and ensure that all new staff are inducted.	EHS Manager
		6.13.4. No solid waste may be burned or buried on site.	Monitor via site audits and record non-compliance and incidents.	Daily	EHS Manager
		6.13.5. Waste amounts shall be recorded on a monthly basis.	Waste amounts to be documented.	Monthly	EHS Manager/ Project Developer

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
J. Air Quality Management					
6.14. Emissions from staff vehicles and road tankers.	Reduce odours during the operational phase.	6.14.1. Ensure that the proposed project is operated in such a manner whereby potential odours are minimised.	• Monitor via site audits and record non-compliance and incidents. • Complaints about odours should be investigated and documented in a register.	• Daily • When complaints are made.	EHS Manager
K. Socio-Economic Management					
6.15. Employment creation and skills development opportunities during the operational phase.	Maximise local employment and local business opportunities to promote and improve the local economy.	6.15.1. Enhance the use of local labour and local skills as far as reasonably possible. 6.15.2. Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained. 6.15.3. Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.	Maximise local employment for unskilled labour and provincial/ national skilled labour.	During the operational phase.	Project Developer
6.16. Increase in pork and chicken in the local area.	Maximise positive impacts through ensuring produce is sold to local markets	6.16.1. Ensure that the proposed project has secured local buyers.	Seek out local markets & secure formal trade agreements.	Monthly	Project developer
L. Environmental Awareness and Site Management					
6.17. Increased energy consumption during the operational phase.	Reduce energy consumption where possible.	6.17.1. Encourage the use of energy saving equipment (such as low voltage lights and low pressure	• Monitor energy usage via site investigations. • Conduct training for all	• Monthly	EHS Manager

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		taps) and promote recycling. Operational personnel must be made aware of energy conservation practices as part of the environmental awareness training programme.	operational personnel.		
6.18. Inappropriate behaviour of site staff during the operational phase.	Prevent unnecessary impacts on the surrounding environment by ensuring that staff are aware of the requirements of the EMPr.	6.18.1. Designate smoking areas where the fire hazard could be regarded as insignificant.	Adhoc checks to ensure workers are smoking only in designated areas.	Daily	EHS Manager
		6.18.2. Educate workers on the dangers of open and/or unattended fires.	Ensure fire safety requirements are well understood and respected by workers (by providing basic fire safety training).	On-going	EHS Manager
		6.18.3. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on site for the duration of the operational phase.			
		6.18.4. Fire-fighting equipment must be made available at various appropriate locations.			

7 MANAGEMENT PLAN FOR THE DECOMISSIONING PHASE

The infrastructure and equipment will only be decommissioned once it has reached the end of its economic life. The potential impacts resulting from development of the preferred sites during the decomisi9oning phase of the activity are provided below.

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. Visual Impacts					
7.1. 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.	7.1.1. Ensure that rubble and litter are appropriately stored and regularly removed from site to a licenced waste disposal facility. 7.1.2. Dust generation must be kept at a minimum. 7.1.3. Night lighting of work (decommissioning) sites must be minimized within requirements of safety and efficiency.	Rubble/litter/waste removal and disposal to be monitored throughout decommissioning. Complaints about night lights should be investigated and documented in a register.	Weekly or bi-weekly	Contractor and ECO
B. Safety, Health and Environment					
7.2. Noise generation from demolition activities (e.g. grinding, steel falling, use of angle grinders) during the decommissioning phase.	Reduce the potential noise impacts on the decommissioning personnel.	7.2.1. Decommissioning personnel must wear proper hearing protection, which should be specified as part of the Decommissioning Phase Risk Assessment carried out by the Contractor. 7.2.2. The Contractor must ensure that all decommissioning personnel are provided with adequate PPE for use where appropriate.	Inspections to be carried out during the decommissioning phase to enforce the use of hearing protection by decommissioning personnel. A checklist should be generated in this regard to ensure adherence to the safety requirements. This must also be written into the safety requirements of the Contract.	Throughout the decommissioning phase.	ECO and Contractor
7.3. Potential health injuries to	Prevent respiratory illnesses	7.3.1. The Contractor must ensure that	Inspections to be carried out	Throughout the	ECO and

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
demolition staff during the decommissioning phase.	caused to the decommissioning personnel.	all decommissioning personnel are provided with adequate PPE (such as dust masks) for use where appropriate.	during the decommissioning phase to enforce the use of respiratory protection by decommissioning personnel. This must also be written into the safety requirements of the Contract.	decommissioning phase.	Contractor
7.4. Heavy traffic, congestion and potential for collisions.	Prevention of injuries, fatalities, and damage to equipment and vehicles during the decommissioning phase.	7.4.1. Suitable parking areas should be created and designated for trucks and vehicles. 7.4.2. A supervisor should be appointed to co-ordinate the traffic during the decommissioning phase. 7.4.3. Road barricading should be undertaken where required and road safety signs should be adequately installed at strategic points within the site.	Monitor activities and record and report non-compliance by undertaking inspections.	Throughout the decommissioning phase.	Project Developer, ECO and Contractor
7.5. Pollution of the surrounding water and ground as a result of spillages, generation of building rubble and waste scrap material.	Prevent unnecessary pollution impacts on the surrounding environment.	7.5.1. The site should be cleaned regularly and all demolition waste (i.e. concrete, steel, rubble, packaging material etc.) must be removed from site and disposed at a licenced waste disposal facility by an approved Contractor. Waste disposal slips or waybills should be kept on file for auditing purposes as proof of disposal. 7.5.2. All liquid wastes (i.e. used oil, paints, lubricating compounds	Monitor activities and record and report non-compliance by undertaking inspections.	Throughout the decommissioning phase.	Project Developer, ECO and Contractor

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		and grease etc.) must be removed from site and disposed at a licenced hazardous waste disposal facility by an approved waste Contractor. Waste disposal slips or waybills should be kept on file for auditing purposes as proof of disposal.			
C. Water Conservation					
7.6. Increased water usage during the decommissioning phase.	Reduce water usage during decommissioning processes.	7.6.1. Water conservation to be practiced in line with Energy Saving Policies as follows: • Cleaning methods utilised for cleaning vehicles, floors, etc. should aim to minimise water use (e.g. sweep before wash-down). • Ensure that regular audits of water systems are conducted to identify possible water leakages.	Monitor via site audits and record non-compliance and incidents.	Monthly	EHS Manager and ECO
		7.6.2. Carry out environmental awareness training with a discussion on water usage and conservation.	Conduct training for all decommissioning personnel.	• As and when necessary during decommissioning and ensure that all new staff are inducted.	EHS Manager, ECO and Contractor
D. Spill Contingency, Management and Handling of Chemicals/Dangerous Goods					
7.7. Potential spillage of effluent to the surrounding environment (from	Reduce the spillage of domestic effluent and the impact thereof on the environment.	7.7.1. Ensure that normal sewage management practices are implemented during	EHS Manager to monitor via site audits and record non-compliance and incidents	Monthly	EHS Manager and ECO

Impact	Management Objectives	Management Actions		Monitoring		
				Methodology	Frequency	Responsibility
portable sanitation facilities for decommissioning personnel).			decommissioning such as regularly emptying toilets and ensuring safe transport and disposal of sewage.	(including incidents that nearly occur).		
		7.7.2.	Ensure that the toilet/sanitation facilities are maintained in a clean, orderly and sanitary condition.	Monitor via site audits and record non-compliance and incidents.	Daily	EHS Manager and Contractor
		7.7.3.	Ensure that the toilet/sanitation facilities are regularly serviced and emptied.	Monitor via site audits and record non-compliance and incidents.	Monthly	EHS Manager and ECO
		7.7.4.	Ensure that the decommissioning site camp and toilet/sanitation facilities are placed outside areas susceptible to flooding and beyond 32 m of the estuary.	Monitor via site audits and record non-compliance and incidents.	Monthly	EHS Manager and ECO
E. Stormwater Management						
7.8. 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.	7.8.1.	The appointed Contractor should compile a Method Statement for Stormwater Management during the decommissioning phase.	Compile Method Statement and take into account the Stormwater Management measures at the site.	Once off (and thereafter updated as required).	Contractor
		7.8.2.	Provide secure storage for oil, chemicals and other waste materials in order to prevent contamination of stormwater runoff.	Monitor the bunding and containment structures.	Weekly	EHS Manager
F. Waste Management						
7.9. Pollution of the surrounding environment as a result of the handling, temporary storage and	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of general and hazardous	7.9.1.	Carry out management actions for the decommissioning phase.	Carry out monitoring for the decommissioning phase.	Carry out monitoring for the decommissioning phase.	Project Developer and EHS Manager

Impact	Management Objectives	Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
disposal of solid waste.	waste.				
G. Air Quality Management					
7.10. Air Quality Impact: Emissions from decommissioning vehicles and generation of dust as a result of earthworks and demolition	Reduce dust emissions during decommissioning activities.	7.10.1. Carry out management actions for the decommissioning phase.	Carry out monitoring for the decommissioning phase.	Carry out monitoring for the decommissioning phase.	Project Developer and EHS Manager
H. Fauna and Flora					
7.11. Introduction and proliferation of alien species	Minimize introduction and effective control of alien species	7.11.1. By law, remove and dispose of Category 1b alien species on site. All Category 2 species that remain on site must require a permit.	Mechanical removal of these species is recommended. However, the removal must be carefully performed so as to not excessively disturb the soil layer.	Throughout the decommissioning phase.	Project Developer and EHS Manager
7.12. Sensory disturbances on Fauna	Minimise sensory disturbance surrounding faunal communities during decommissioning	7.12.1. Appropriately time demolition / rehabilitation activities to minimise sensory disturbance to 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.	Project Developer and EHS Manager

8 SITE REHABILITATION

It will be necessary to completely remove all infrastructure associated with the piggery production and chicken broiler facilities, and once that is achieve, rehabilitation of the site will be required. It is recommended that the developer take into account the appropriate land use requirements at the time. It is also important to note that in a period of 20-25 years, land uses in the area may change significantly, given the proximity of the site to Delmas, and neighbouring Gauteng. Consultation with the local authority is encouraged as the rehabilitation should meet the requirements set out by the local authorities in accordance with any relevant legislation.

9 CONCLUSION

It is anticipated that in the piggery production and chicken broiler facility is constructed, operated and decommissioned in accordance with the recommendations made herein, the project is unlikely to have significant adverse environmental impacts.

Basic Assessment for the development of a 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.

APPENDIX F: SPECIALIST REPORTS

Basic Assessment for the development of a 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.

APPENDIX F1: Freshwater Impact Assessment

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FRESHWATER ECOLOGICAL ASSESSMENT FOR THE MOKATE PIG PRODUCTION AND CHICKEN BROILER FACILITY ON THE FARM RIETVALEI PORTION 1 AND 6 NEAR DELMAS, MPUMALANGA

Prepared for

Council for Scientific and Industrial Research (CSIR)
Environmental Management Services

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Prepared by: **Scientific Aquatic Services**
Report author: **C. Pretorius**
Report reviewer: **S. van Staden (Pr. Sci. Nat)**
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Date: **March 2016**

Scientific Aquatic Services CC
CC Reg No 2003/078943/23
Vat Reg. No. 4020235273
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
E-mail: admin@sasenvironmental.co.za

EXECUTIVE SUMMARY

Based on the findings of this study, it is the opinion of the ecologists that the project is regarded as having low levels of impact on the surrounding freshwater resources identified, even if less than desirable mitigation of impacts occurs. With strict implementation of mitigation measures throughout all phases of the proposed project, impacts can be reduced to very low significance levels and the proposed project should, from a freshwater resource point of view, be authorised for development.

MANAGEMENT SUMMARY

Scientific Aquatic Services (SAS) was appointed to conduct a freshwater ecological assessment as part of the environmental assessment and authorisation Process for the proposed development of a 5.5 ha piggery as well as a 2.5 ha chicken broiler facility on Portions 1 and 6 of the farm Rietvalei, near Delmas, Mpumalanga, henceforth collectively referred to as the "study area"

The purpose of this report is to assess the freshwater resources within the study area to provide supplementary, detailed information to guide the activities associated with the study area in the vicinity of the freshwater resources to ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements and the provision of ecological services in the local area. The study also aimed to identify and quantify any impacts on the freshwater resources associated with the study area, based on the proposed infrastructure layout provided by the proponent, and to present a set of mitigatory measures which could be employed to minimise impacts on the receiving aquatic environment.
The assessment took the following approach:

- A desktop study was conducted, in which freshwater resources and other points of interest were identified for on-site investigation, and relevant national and provincial databases were consulted. The results of the desktop study are contained in Section 3 of this report;
- A field assessment took place in March 2016, in order to ground-truth the identified freshwater resources within the study area. The following freshwater features was identified:
  - A channelled valley bottom wetland feature (located approximately 110 m from the proposed poultry phase 1 infrastructure, on the western border of the study area) was identified with an associated hillslope seep wetland (located directly adjacent to the proposed poultry phase 1 infrastructure and approximately 100m from the proposed piggery phase 1 infrastructure)
  - An unchannelled valley bottom wetland, which has historically been artificially cannelised (located approximately 100m downgradient from the proposed waste management site, on the eastern side of the study area)
- The detailed results of the field assessment are contained in Section 4 of this report and are summarised in the table below.

Table A: Summary of the results of the field assessment.

Freshwater Resource	Present Ecological State (PES) Category	Ecological function and service provision	Ecological Importance & Sensitivity (EIS)	Recommended Ecological Class (REC)
Channelled Valley Bottom wetland & Unchannelled Valley Bottom wetland	B	Intermediate	B	B
Hillslope Seep wetland	B/C			

Following the assessment of the freshwater resources, an impact assessment was performed to ascertain the significance of perceived impacts on the receiving environment, should the proposed piggery and poultry infrastructure construction proceed.

Based on the findings of this study, it is the opinion of the ecologists that the project is regarded as having low levels of impact on the surrounding freshwater resources identified, even if less than desirable mitigation of impacts occurs. With strict implementation of mitigation measures throughout all phases of the proposed project, impacts can be reduced to very low significance levels and the proposed project should, from a freshwater resource conservation perspective, be authorised for development.

The results of the impact assessment are summarised in the table below:

Impact 1: Loss of habitat and ecological structure	**Pre-mitigation**	**Post-mitigation**
Construction	Low	Very Low
Operations	Low	Very Low
Impact 2: Changes to the ecological and sociocultural service provision	**Pre-mitigation**	**Post-mitigation**
Construction	Low	Very Low
Operations	Low	Very Low
Impact 3: Impacts on hydrological function	**Pre-mitigation**	**Post-mitigation**
Construction	Very Low	Very Low
Operations	Low	Very Low
Impact 4: Impacts on water quality	**Pre-mitigation**	**Post-mitigation**
Construction	Very Low	Very Low
Operations	Very Low	Low
Impact 1: Loss of habitat and ecological structure	**Pre-mitigation**	**Post-mitigation**
Construction	Low	Very Low
Operations	Low	Very Low
Impact 2: Changes to the ecological and sociocultural service provision	**Pre-mitigation**	**Post-mitigation**
Construction	Low	Very Low
Operations	Low	Very Low
Impact 3: Impacts on hydrological function	**Pre-mitigation**	**Post-mitigation**
Construction	Very Low	Very Low
Operations	Low	Very Low
Impact 4: Impacts on water quality	**Pre-mitigation**	**Post-mitigation**
Construction	Very Low	Very Low
Operations	Very Low	Low

Mitigation measures were developed to manage the perceived impacts on the freshwater resources, as outlined in Section 5 of this report. The following mitigation measures are considered particularly important:

- The boundaries of the construction areas are to remain as small as possible, be clearly defined and it should be ensured that all activities remain within defined footprint areas;
- Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect floral communities within the freshwater resource habitat, need to be strictly managed. Existing alien species should be eradicated and controlled to prevent further spread of these species;
- All freshwater resource areas should be designated and clearly marked as No-Go areas and be off limits to all unauthorised vehicles and personnel;
- Compacted soils should be ripped and rehabilitated with topsoil and reseeded with indigenous vegetation;
- Implement silt traps during construction to remove sand particles from runoff;
- All spills must be cleaned up and treated accordingly;
- Reprofile areas to ensure that no changes to runoff patterns occurs;
- Ensure that the functionality of the permanent, seasonal and temporary zones of the freshwater features is maintained through provision of measures to ensure that soil wetting conditions are maintained and the freshwater features functions are reinstated.
- Limit the footprint area of the construction activity to what is absolutely essential in order to minimise the loss of clean water runoff areas which recharge the receiving aquatic environment;
- Adequate storm water management must be incorporated into the design of the proposed infrastructure in order to prevent erosion and the associated sedimentation of the freshwater features. In this regard special mention is made of:
  - Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed;
  - Runoff from paved surfaces should be slowed down by the strategic placement of energy dispersing structures
- During the construction and operational phases of the proposed infrastructure, erosion control measures should be installed on roadways to prevent gully formation and siltation of the freshwater resources;
- With specific mention to the proposed waste management site which may impact on the water quality of the freshwater features, the following is recommended:
  - Install geomembranes or flexible membrane liners (such as high density polyethylene (HDPE) liners) to contain or prevent waste constituents and leachate from escaping the proposed waste management site and into the ground water and surface water of the freshwater features; and
  - Groundwater monitoring should be commissioned with sampling and analysis from boreholes downgradient from the proposed waste management site. This will ensure that the groundwater not be contaminated or enriched by leachate from the proposed waste management site.
- No dumping of waste should be permitted within the freshwater features. Should any spillages or disposal of waste materials occur, such incidents must be managed according to the on-site Emergency Incident protocol; and
- Implement an alien vegetation control program within the freshwater features with special mention of water loving tree species.

It is also recommended that the layout area of the phase 1 poultry facility be reconsidered, as it is located directly adjacent to a freshwater feature, which could have significant impacts on the integrity thereof. Specific mention is also made to ensure that any leachate from the proposed waste management site be limited, even though the closest freshwater feature is 100m from the proposed position thereof, this might have an influence on the groundwater regime as well as the associated receiving surface water resources.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
CWAC	Coordinated Waterbird Counts
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	Ecological Class
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ES	Ecological Sensitivity
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
GIS	Geographic Information Feature
GN	General Notice
GPS	Global Positioning Feature
HGM	Hydro-geomorphic
IHI	Index of Habitat Integrity
MBSP	Mpumalanga Biodiversity Sector Plan
NAEHMP	National Aquatic Ecosystem Health Monitoring Programme
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act
PES	Present Ecological State
REC	Recommended Ecological Category
RHP	River Health Program
SAIAB	South African Institute of Aquatic Biodiversity
SANBI	Southern African National Biodiversity Institute
SANParks	South African National Parks
SAS	Scientific Aquatic Services
SQ	Sub-quaternary
SQR	Sub-quaternary Reach
subWMA	Sub Water Management Area
WMA	Water Management Area
WRC	Water Research Commission

1 INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a freshwater ecological assessment as part of the environmental assessment and authorisation process for the proposed development of a 5.5 ha piggery as well as a 2.5 ha chicken broiler facility on Portions 1 and 6 of the farm Rietvalei, near Delmas, Mpumalanga, henceforth collectively referred to as the "study area" (Figure 1 and 2). The R50 traverses the central portion of the study area, with the chicken broiler facilities located to the south, and all other infrastructure related areas to the north of the R50. The study area is situated approximately 12 km north west from the town of Delmas, and 5 km northwest from the N12 highway, R50 intersection. The study area is further located approximately 500m south from the Gauteng Province border.

The ecological assessment was confined to the study area and did not include an ecological assessment of surrounding properties. The surrounding area was however considered as part of the desktop assessment, and water resource features located further from the proposed footprint still located within the 500m boundary of applicability of General Notice (GN) no 1199 as it related to the National Water Act were also considered.

The purpose of this report is to define the ecology of the study area in terms of freshwater aspects as well as mapping of the resources and defining areas of increased Ecological Importance and Sensitivity (EIS), and to define the Present Ecological State (PES) of the study area in the vicinity of the proposed infrastructure construction area. In addition, this report aims to define the socio-cultural and ecological service provision of the freshwater resources as well as the Recommended Ecological Category (REC) for each freshwater system. It is the objective of this study to provide detailed information to guide the activities associated with the proposed infrastructure construction area in the vicinity of the freshwater resources to ensure that the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements and the provision of ecological services in the local area.

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

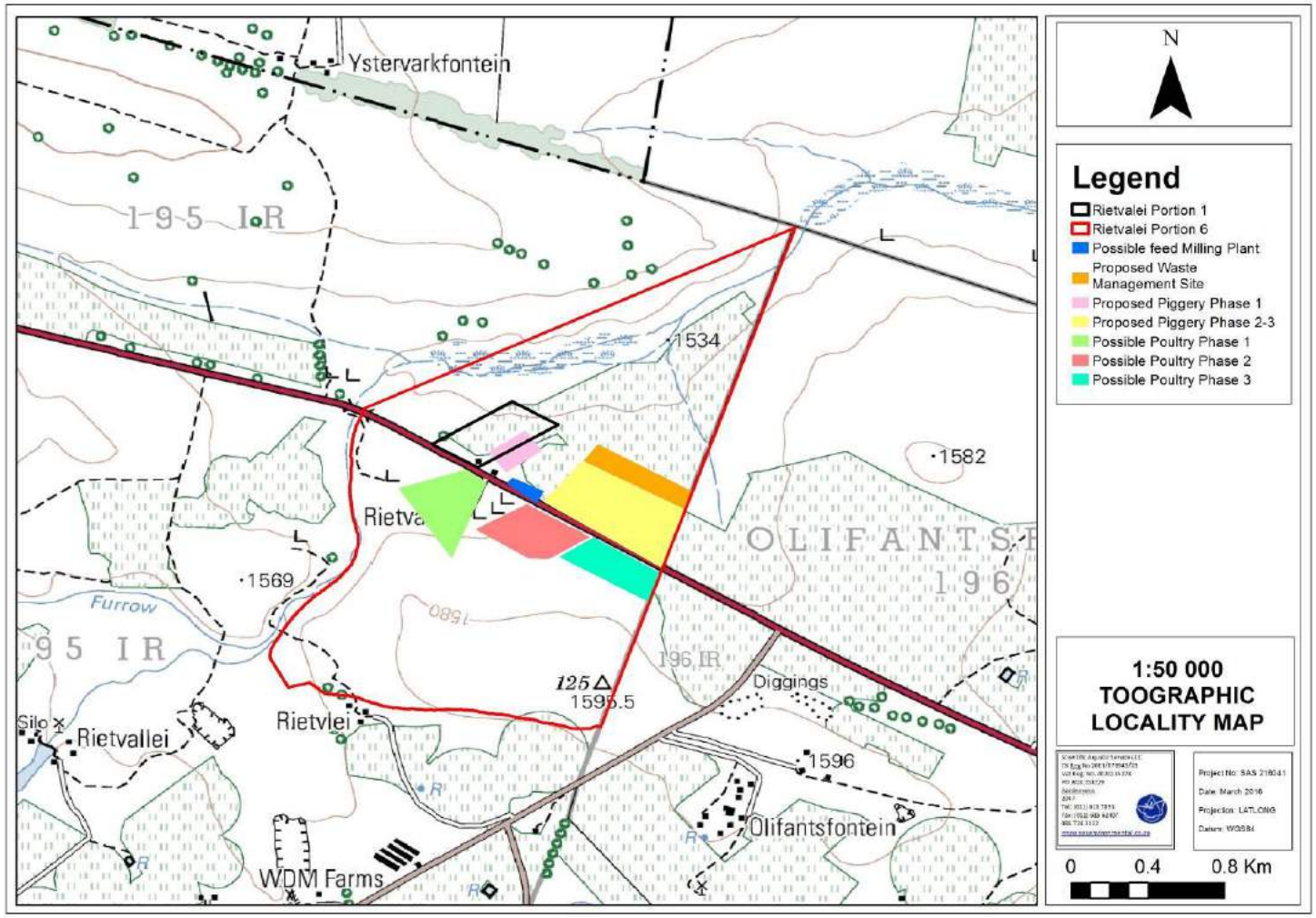

Figure 1: The farm portions and proposed infrastructure areas depicted on a 1:50 000 topographical map.

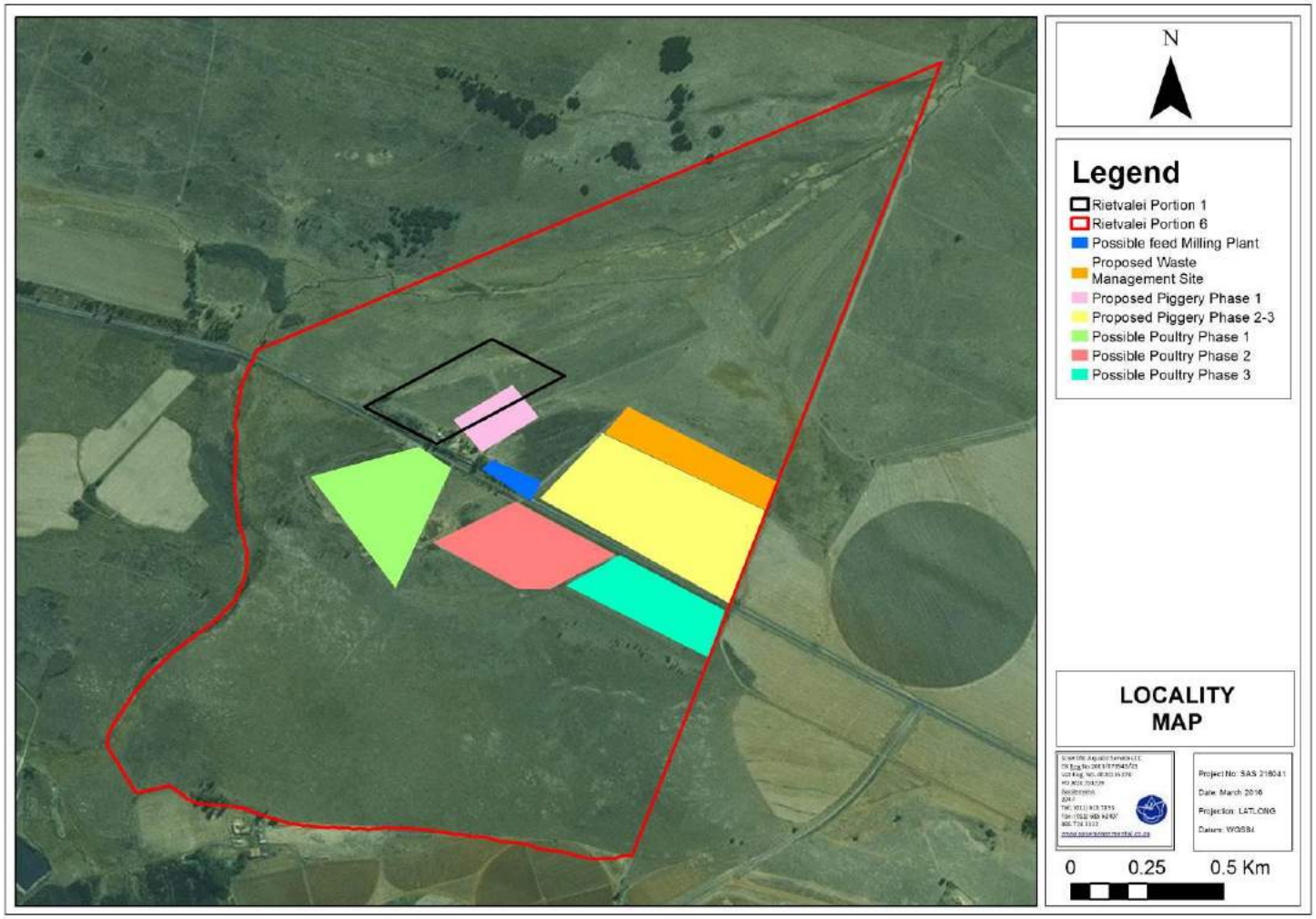

Figure 2: Digital Satellite image depicting the location of the study area in relation to surrounding areas

1.2 Project Scope

Specific outcomes in terms of this report are as follows:

- Delineate the freshwater features' temporary zones according to the Department of Water Affairs and Forestry (DWAF[1]) 2005 and 2008: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones";
- Classification of freshwater features according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa as defined by Ollis *et al*., 2013;
- Define the services provided by the freshwater features, according to the method of Kotze *et al* (2009) in which services to the ecology of the area will be defined and services to the people of the area will be defined;
- Determine the Present Ecological State (PES) as well as the Ecological Importance and Sensitivity (EIS) of the freshwater features;
- To allocate a Recommended Ecological Category (REC) to the freshwater features;
- Desktop delineate and provide impact statements where deemed necessary to all water resource features located further from the proposed footprint still located within the 500m boundary of applicability of GN 1199 as it related to the National Water Act;
- To assess impacts that the proposed development might have on the area, and
- Recommendations on management and mitigation measures (including opportunities and constraints) with regards to the development and operation of the proposed development in order to improve, manage and mitigate impacts on the freshwater ecology of the area will be provided.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The freshwater assessment is confined to the study area as well as areas of relevance immediately adjacent to the project footprint up to 500m from the project footprint which were assessed on a desktop level in accordance with Regulation GN 1199. The general surroundings were however considered in the desktop assessment undertaken for the project;

[1] The Department of Water and Sanitation (DWS) was previously known as the Department of Water Affairs (DWA) and the Department of Water Affairs and Forestry (DWAF). For referencing purposes, the name of the Department under which documentation was published, is used.

- The freshwater feature delineations as presented in this report are regarded as a best estimate of the freshwater feature boundaries based on the site conditions at the time of the assessment;
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. It is, however, expected that the study area has been accurately assessed and considered, based on the field observations undertaken and the consideration of existing studies and monitoring data in terms of the wetland ecology; and
- The freshwater features were delineated according to "DWAF, 2008: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". The delineation as presented is considered the best estimate of the functional boundary based on the site conditions present at the time of assessment. Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required, the freshwater features will need to be surveyed and pegged according to surveying principles.

1.4 Legislative requirements

The following legislative requirements were considered during the assessment:

- National Environmental Management Act (NEMA, Act 107 of 1998)
- National Water Act (NWA; Act 36 of 1998)
- General Notice (GN) 1199 as published in the Government Gazette 32805 of 2009 as it relates to the NWA, 1998 (Act 36 of 1998). It should be noted that at the time of this report, this notice is under review and was published in the Government Gazette 39548 on 27th November 2015 for public comment;

The details of each of the above, as they pertain to this study, are presented in Appendix A of this report.

1.5 Indemnity and Terms of use of this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and

SAS CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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2 ASSESSMENT APPROACH

2.1 Wetland Site Selection and Field Verification

During the desktop phase, use was made of aerial photographs, digital satellite imagery, and available provincial and national wetland databases to identify points of interest prior to the field survey. Details of the relevant databases which were consulted are contained in Section 3 of this report. Points of interest were defined taking the following into consideration:

- Ensuring a geographic spread of points to ensure that conditions in all areas were addressed; and
- Ensuring that features displaying a diversity of digital signatures were identified in order to allow for field verification. In this regard specific mention is made of the following:
  - Riparian and/or wetland vegetation: a distinct increase in density as well as tree size near drainage lines;
  - Hue: with drainage lines and outcrops displaying soils of varying chroma created by varying vegetation cover and soil conditions identified; and
  - Texture: with areas displaying various textures, created by varying vegetation cover and soil conditions being identified.

A single site visit was undertaken during March 2016. The presence of any freshwater characteristics as defined by the DWAF (2008) was noted and the freshwater features delineated accordingly. Factors influencing the habitat integrity of the freshwater features identified during the field survey were noted, and the functioning, environmental and socio-cultural services provided by the freshwater features were determined.

In addition to the delineation of the freshwater features a detailed assessment of the systems were undertaken in order to define the following important aspects of the freshwater ecology:

- Characterisation and classification of the freshwater features according to the method of Ollis *et. al,* (2013);
- Determine the Present Ecological State (PES) according to the Wetland IHI method by DWAF (2007) as well as the WetHealth method described by MacFarlane *et al.,* (2008);
- Ecoservice provision of the freshwater features by means of the application of the WET Ecoservices Tool according to the method of Kotze *et al.* (2009); and
- Ecological Importance and Sensitivity (EIS) assessment according to the method of DWA (1999).

A detailed explanation of the method of assessment related to the freshwater features assessment is provided in Appendix B of this report and for the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of this report.

2.2 Sensitivity Mapping

All the ecological features of the study area were considered and sensitive areas were delineated with the use of a Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps. The sensitivity map should guide the design and layout of the proposed infrastructures.

2.3 Impact Assessment and recommendations

Following the completion of the assessment, an impact assessment was conducted (please refer to Appendix B for the method of approach) and recommendations were developed to address and mitigate impacts associated with the proposed activities. These recommendations also include general management measures which apply to the proposed development as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the operation from planning, through construction, operation and closure through to after care and maintenance. The detailed mitigation measures are outlined in Section 5 of this report, whilst the general management measures which are considered to be best practice mitigation applicable to a project of this nature, are outlined in Appendix D.

3 RESULTS OF THE DESKTOP ANALYSIS

The following sections (Sections 3.1 – 3.3) contain data accessed as part of the desktop assessment. It is important to note that although all data sources used provide useful and often verifiable, high quality data, the various databases used do not always provide an entirely accurate indication of the study area's actual site characteristics. This information is however considered to be useful as background information to the study. Thus, this data was used as a guideline to inform the assessment and areas where increased conservation importance is indicated were focused on.

3.1 Aquatic ecoregions

When assessing the aquatic ecology of any area, it is important to know which aquatic ecoregion the study area is located within. This knowledge allows for improved interpretation of data to be made, since reference information and representative species lists are often available on this level of assessment, which aids in guiding the assessment.

Table 1: Aquatic Ecoregion and Quaternary Catchment applicable to the study area.

Footprint Area	Catchment	Quaternary Catchment	Aquatic Ecoregion
Study Area	Olifants - North	B20B	Highveld

Table 2: Main attributes of the Highveld Aquatic Ecoregion (Kleynhans et al., 2005)

MAIN ATTRIBUTES	HIGHVELD
Terrain Morphology: Broad division (dominant types in bold) (Primary)	**Plains; Low Relief**; **Plains; Moderate Relief;** Lowlands; Hills and Mountains: Moderate and High Relief; Open Hills; Lowlands; Mountains: Moderate to High Relief; Closed Hills; Mountains: Moderate and High Relief (limited)
Vegetation types (dominant types in bold) (Primary)	Mixed Bushveld limited)**;** Rocky Highveld Grassland; **Dry Sandy Highveld Grassland**; Dry Clay Highveld Grassland; **Moist Cool Highveld Grassland**; Moist Cold Highveld Grassland; North Eastern Mountain Grassland; Moist Sandy Highveld Grassland; Wet Cold Highveld Grassland (limited); Moist Clay Highveld Grassland; Clay Highveld Grassland: Patches Afromontane Forest (very limited)
Altitude (m a.m.s.l) (modifying)	1100-2100, 2100-2300 (very limited)
MAP (mm) (Secondary)	400 to 1000
Coefficient of Variation (% of annual precipitation)	<20 to 35
Rainfall concentration index	45 to 65
Rainfall seasonality	Early to late summer
Mean annual temp. (°C)	12 to 20
Mean daily max. temp. (°C): February	20 to 32
Mean daily max. temp. (°C): July	14 to 22
Mean daily min. temp. (°C): February	10 to 18
Mean daily min temp. (°C): July	-2 to 4
Median annual simulated runoff (mm) for quaternary catchment	5 to >250

Table 3: Summary of the ecological status of the quaternary catchment B20B (DWS, 2012)

SQ* REACH	SQR** NAME	PES ASSESSED BY EXPERTS?(IF TRUE = Y)	PES CATEGORY MEDIAN	MEAN EI*** CLASS	MEAN ES† CLASS	STREAM ORDER	DEFAULT EC# (BASED ON MEDIAN PES AND HIGHEST OF EI OR ES MEANS)
B20B-01283	N/A	Y	B	Moderate	High	2	B
B20B-01253	N/A	Y	C	Moderate	Moderate	1	C
B20B-01303	N/A	Y	C	Moderate	Moderate	1	C

***SQ = Sub-quaternary**
****SQR = Sub-Quaternary Reach**
*****EI = Ecological Importance**
†ES = Ecological Sensitivity
#EC = Ecological Class

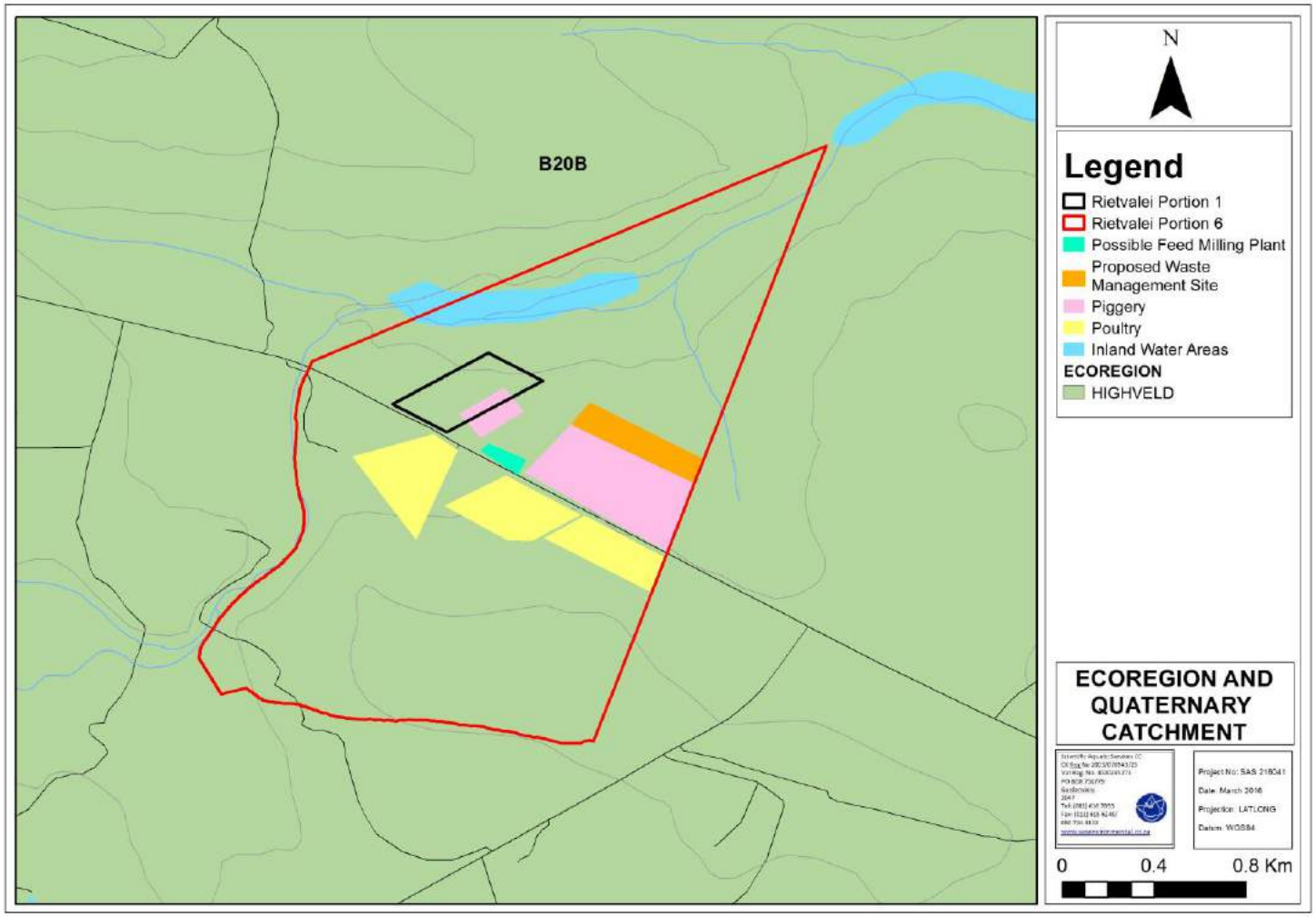


Figure 3: The Aquatic Ecoregion and quaternary catchment associated with the study area.

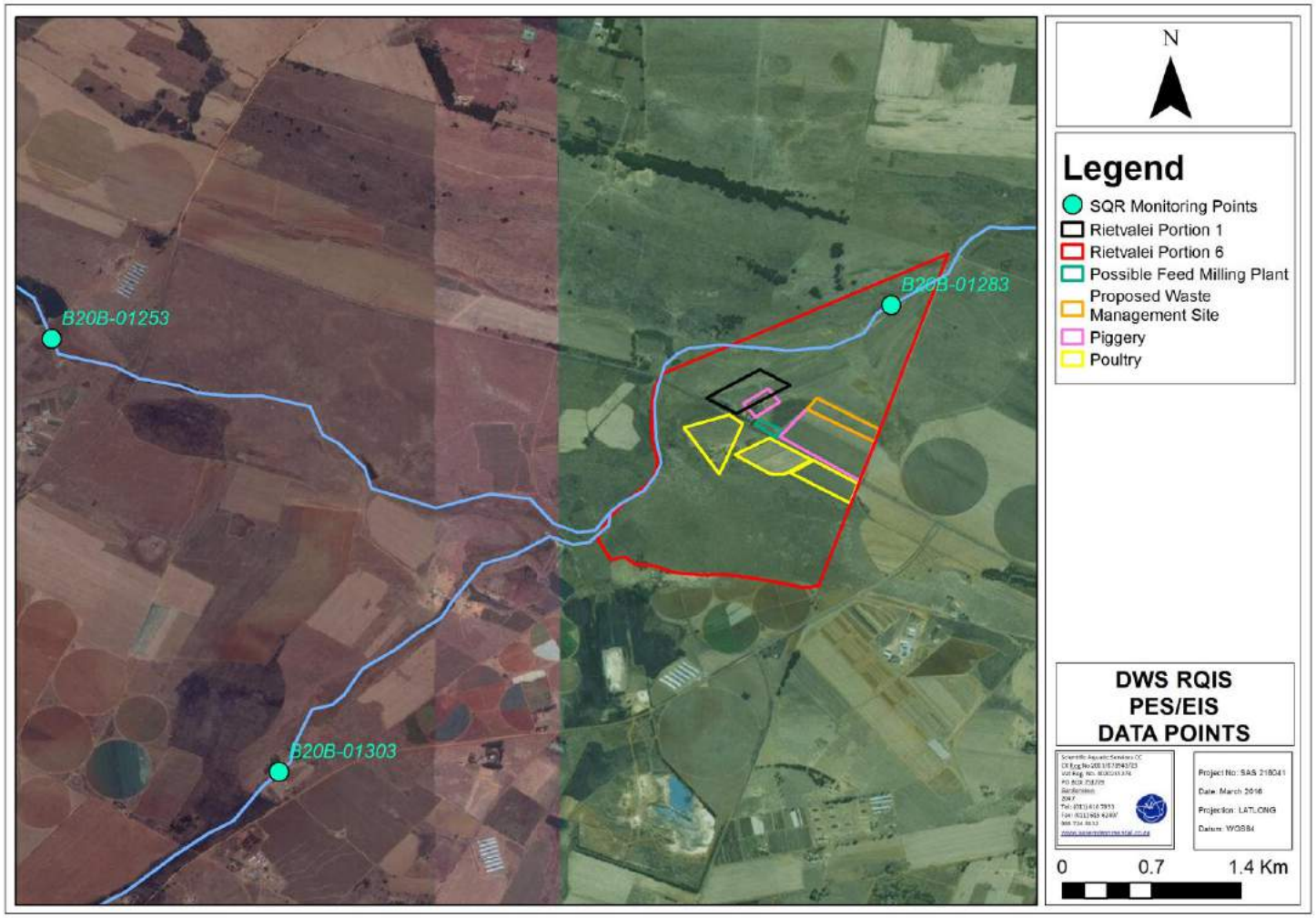


Figure 4: Aplicable sub-quaternary catchment reaches within the Highveld ecoregion indicating the PES/EIS monitoring points.

3.2 National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The National Freshwater Ecosystem Priority Areas (NFEPA) database (2011) was consulted to define the aquatic ecology of any wetland and riverine systems that are located within or in close proximity to the study area that may be of ecological importance. Aspects applicable to the study area are summarised in the table below:

Table 4: Aspects applicable to the study area according to the NFEPA database (2011).

	WMA	SubWMA	FEPA-CODE	NFEPA Wetlands								Wetveg	NFEPA Rivers		
				HGM Unit	Crane NB	Frog NB	CWAC NB	Nat/Art	Wetcon	Rank	Wet-FEPA		NFEPA River	RIVCON	FEPA-CODE
Study area	Olifants	Upper Olifants	0=Not important	Channelled Valley Bottom Wetlands	None	None	None	Natural	AB = Natural or Good, C =Moderately modified	4 = wetlands in A or B condition and associated with 3 other wetlands; 5= wetlands within a sub-quaternary catchment identified as containing impacted working for wetland sites	None	Mesic Highveld Grassland Group 4 (Critically endangered)	Koffiespruit Tributary	AB = Unmodified/ Natural or Largely natural with few modifications; Z= Not intact	0

WMA =Water Management Area; HGM = Hydrogeomorphic; CWAC = Coordinated Waterbirds Counts; FEPA = Freshwater Ecosystem Priority Area

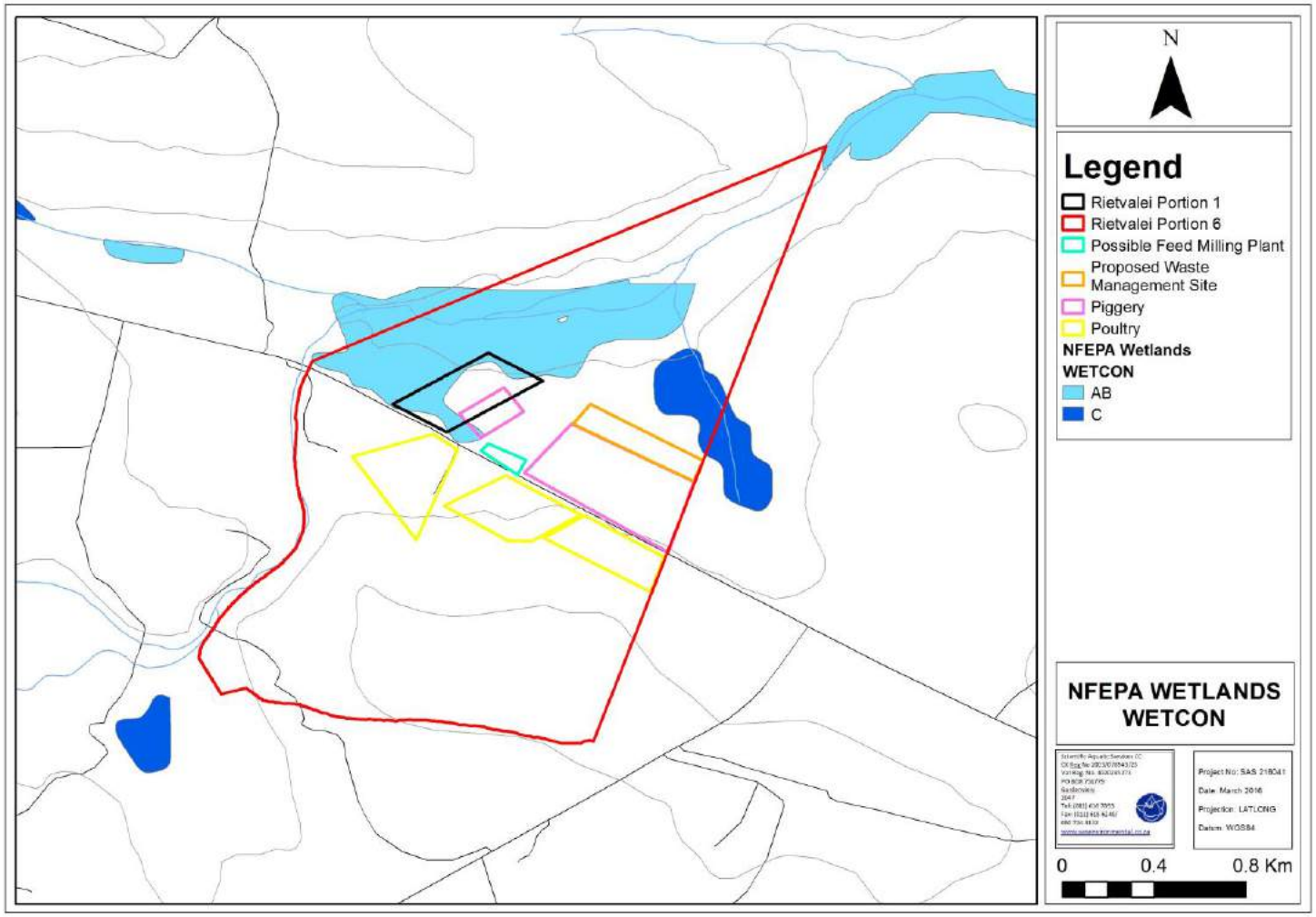


Figure 5: Condition of the wetlands associated with the study area according to NFEPA (2011). (AB = Percentage natural land cover ≥ 75%; C = Percentage natural land cover 25-75%)

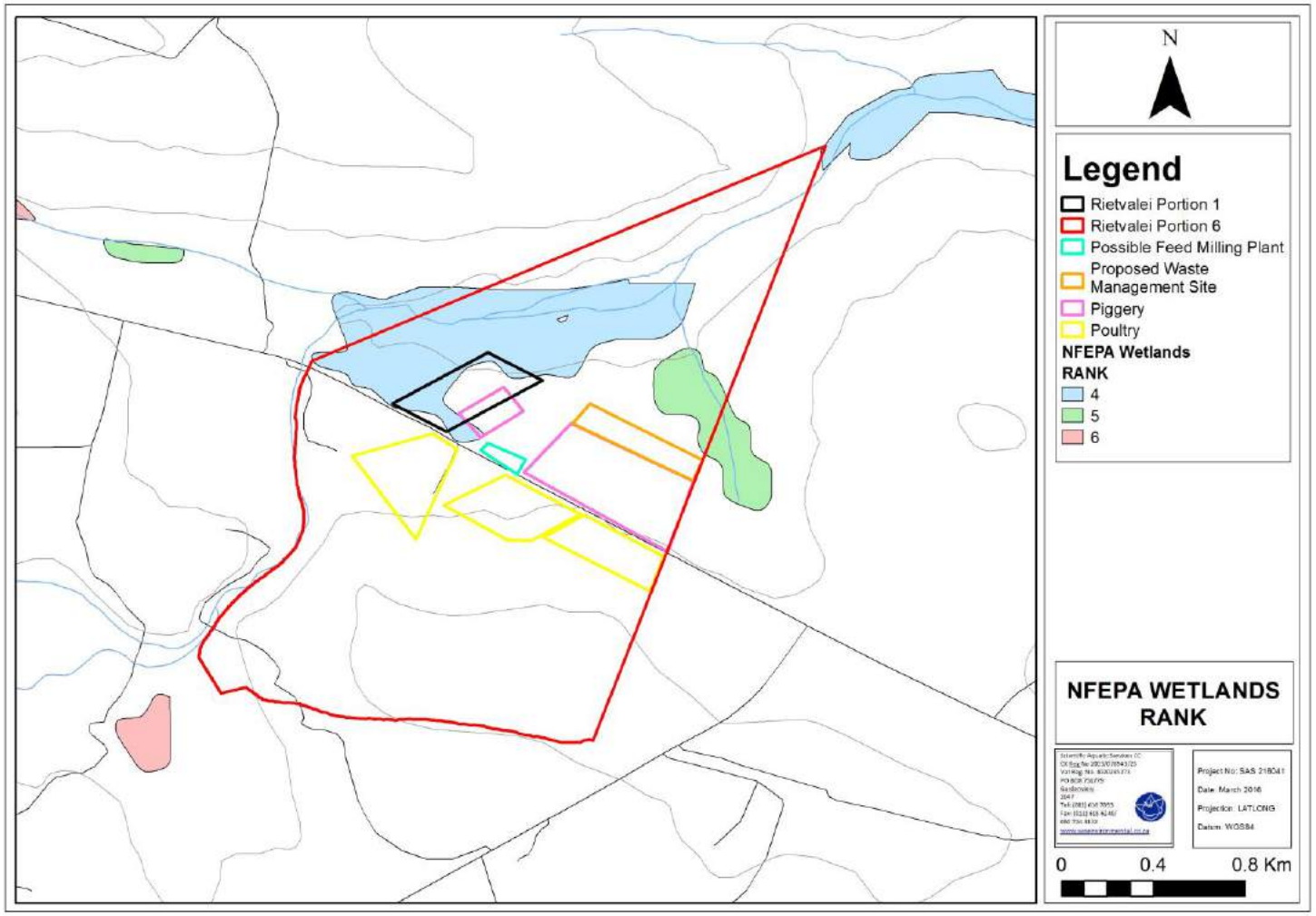


Figure 6: Rank of the wetlands associated with the study area according to NFEPA (2011). (4 = Wetlands in C condition and associated with more than three other wetlands; 5 = Wetlands within a sub-quaternary catchment identified as containing impacted Working for Wetland sites; 6 = Any other wetlands)

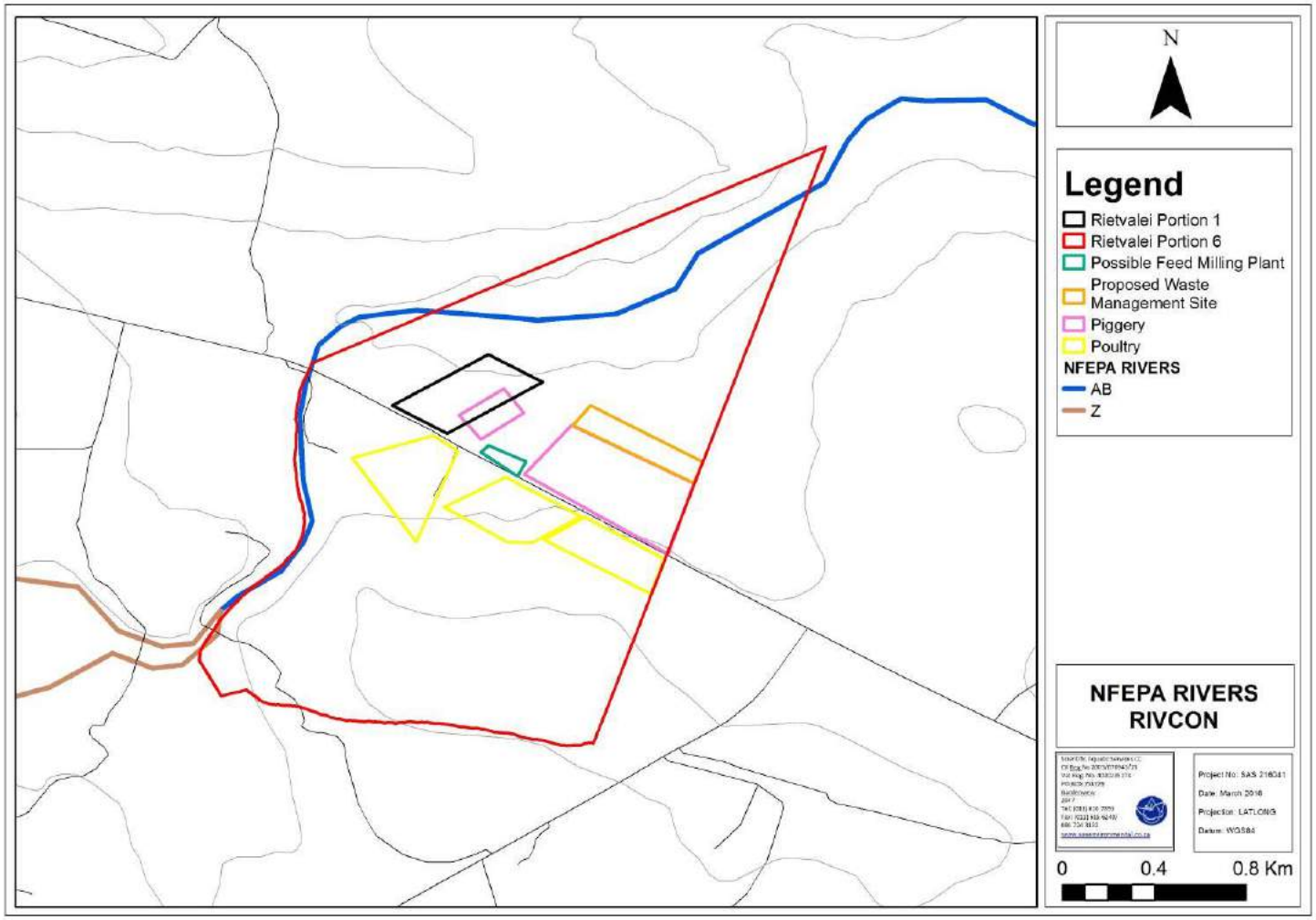


Figure 7: Condition of the Rivers associated with the study area according to NFEPA (2011). (AB = Unmodified, natural or largely natural with few modifications; Z = Tributary condition modeled as not intact, according to natural land cover)

3.3 Importance According to the Mpumalanga Biodiversity Sector Plan (2014)

The purpose of the Mpumalanga Biodiversity Sector Plan (MBSP, 2014) is to ensure that the most adequate and up to date spatial biodiversity information is utilised to inform land-use and development planning, environmental assessments and authorisations, natural resource management and conservation action. The MBSP aims to illustrate terrestrial and aquatic biodiversity on a fine scale and to define areas that are important for conserving biodiversity patterns and ecological processes, classified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs).

It is important to note that the MBSP was developed to update and improve the previous provincial systematic biodiversity plan known as the Mpumalanga Biodiversity Conservation Plan (MBCP, 2006) and thus the MBSP should be used as the official reference to define priority areas to be taken into account in land-use planning and decision making for the Mpumalanga Province.

The table below indicate the subcategories associated with the study area according to the MBSP Aquatic database.

Table 5: MBSP subcategories associated with the study area

Sub category	Description
ESA Wetland	• All non-FEPA wetland; • Still support hydrological function of rivers, water tables and freshwater biodiversity; • Provide a host of ecosystem services
ONA's	Areas that have not been identified as priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions
Heavily modified	Areas that are modified to such an extent that any valuable biological and ecological functions have been lost

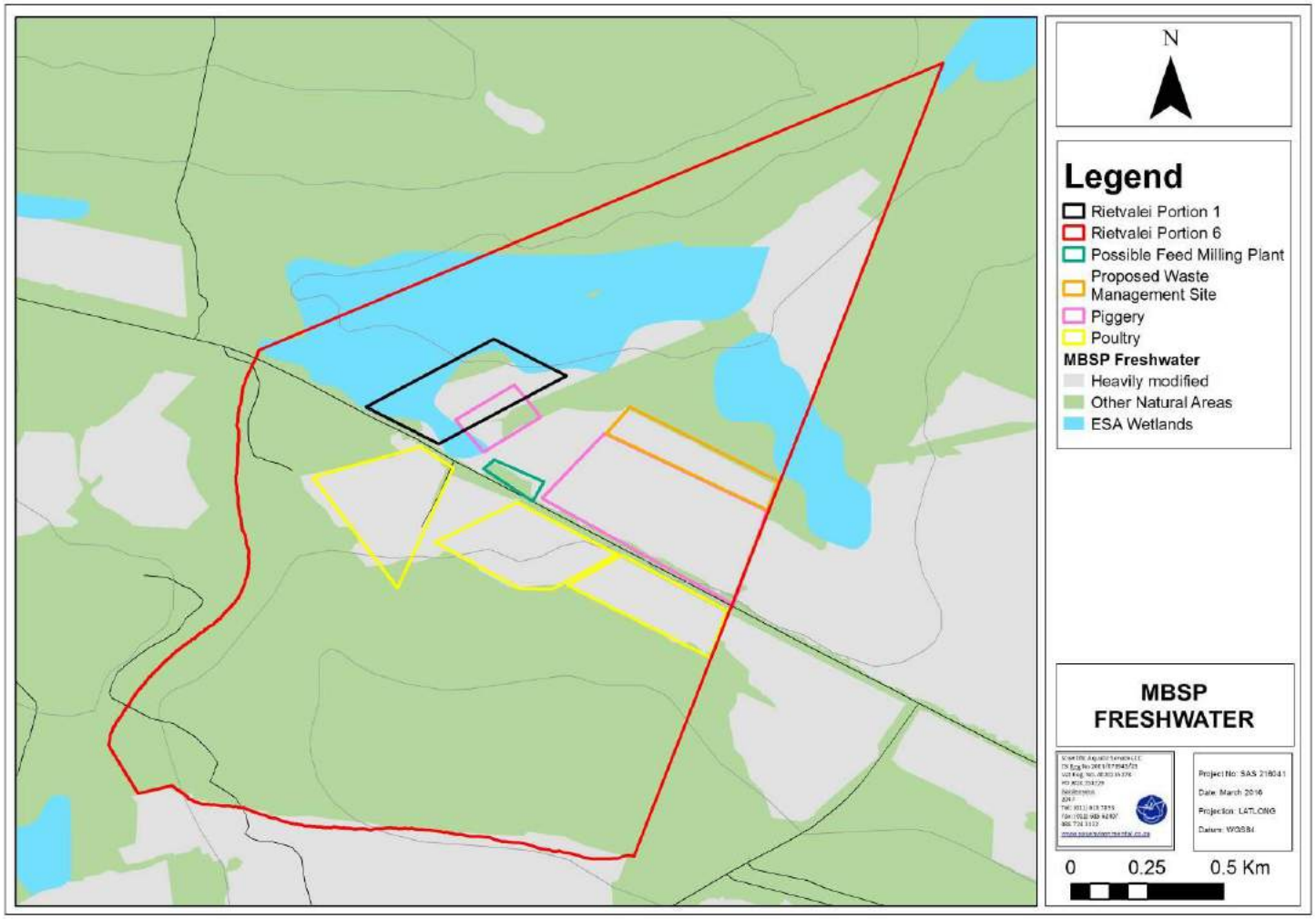


Figure 8: MBSP Freshwater Biodiversity Assessment of the study area

4 RESULTS: WETLAND ASSESSMENT

4.1 Wetland System Characterisation

In preparation for the field survey, aerial photographs, digital satellite imagery as well as provincial and national wetland databases (as outlined in Section 3 of this report) were used to identify areas of interest on a desktop level (refer to section 2.1). Thereafter, the identified points of interest and any additional freshwater resources noted during the field survey were also assessed. Although all possible measures were undertaken to ensure all freshwater resources were assessed and delineated, some smaller seasonal features may have been overlooked within the study area.

The emphasis of this report is on those systems which are perceived to have an increased likelihood of being impacted to varying degrees by the proposed piggery and poultry infrastructure construction. Features located outside of these key focus areas, i.e. those within the perceived zone of influence of the proposed infrastructure development were delineated using digital satellite imagery, with limited field verification. However, when field verification of freshwater resources delineated using desktop techniques took place, delineations proved to be accurate in most instances. Nonetheless, the potential impacts of activities such as subsistence agriculture, erosion and clearing of natural vegetation within the greater catchment were taken into consideration during the assessment.

The different freshwater features identified within the study area include:

- A channelled valley bottom wetland (located approximately 110 m from the proposed poultry phase 1 infrastructure, on the western border of the study area) with an associated hillslope seep wetland (located directly adjacent to the proposed poultry phase 1 infrastructure and approximately 100m from the proposed piggery phase 1 infrastructure)
- An unchannelled valley bottom wetland, which has historically been artificially canalised (located approximately 100m downgradient from the proposed waste management site)

Figure 9 illustrates the locality of these features in relation to the study area.

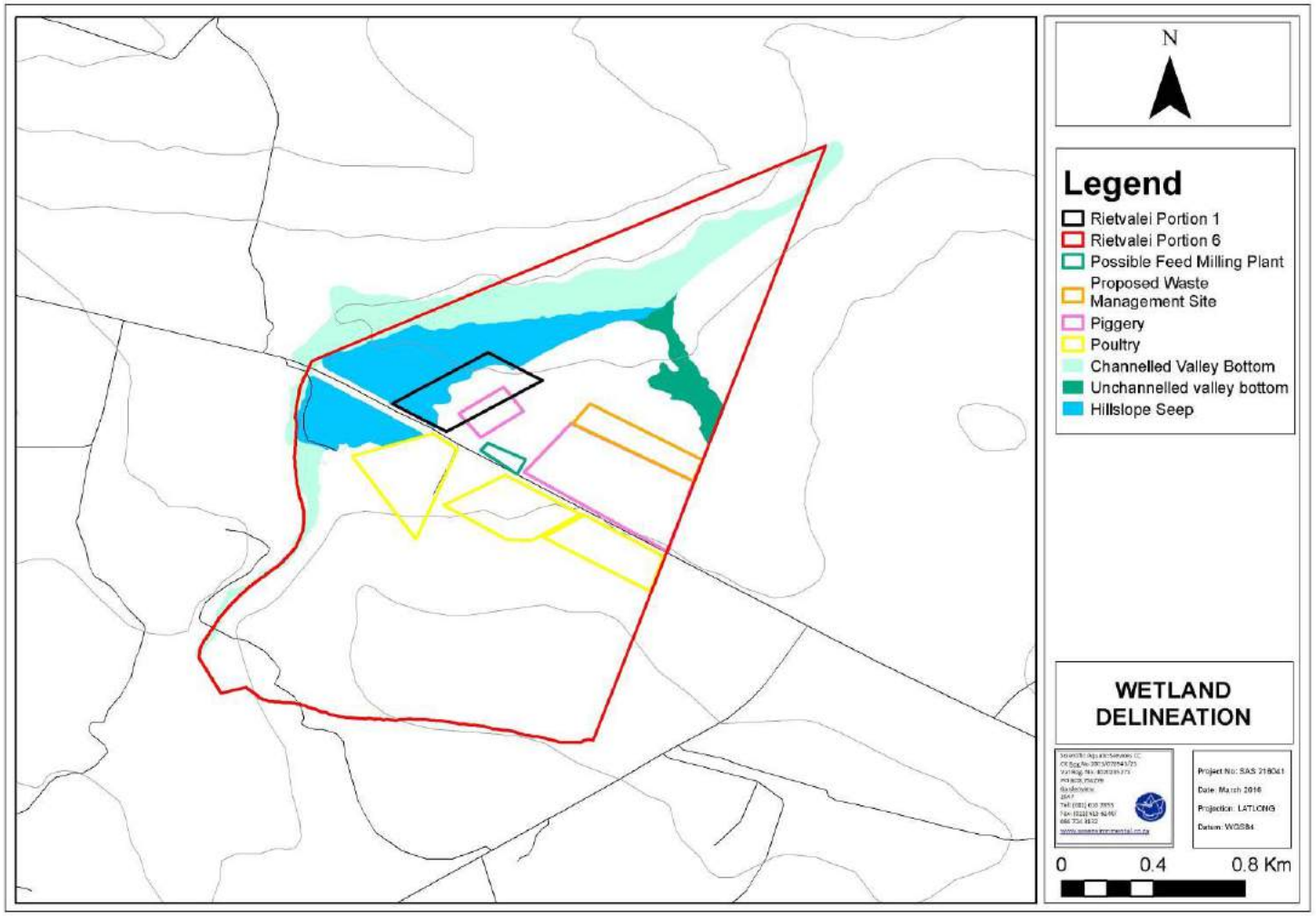


Figure 9: Map indicating the locality of the freshwater features identified within the study area

The freshwater features identified during the assessment of the study area was categorised according to the Classification System (Ollis *et. al*, 2013) as described in Appendix B of this report. The features identified is characterised as an Inland System falling within the Highveld Aquatic Ecoregion and the Mesic Highveld Grassland Group 3 wetland vegetation type. The results of the wetland system characterisation are summarised in the table below.

Table 6: Classification of the wetland system located west of the study area.

Wetland	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit	Longitudinal zonation / landform / Inflow drainage
Channelled Valley Bottom Wetland and Unchannelled Valley Bottom wetland, with associated Hillslope Seep;	**Valley floor:** The typically gently sloping, lowest surface of a valley	**Channelled valley bottom wetland:** A valley bottom wetland with a river channel running through it.	Not applicable
		Unchannelled Valley bottom wetland: a valley-bottom wetland without a river channel running through it.	
	Slope: an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.	**Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley but they do not, typically, extend into a valley floor.	With/without channelled outflow, dependent on their connectivity to channelled systems

4.2 Vegetation community considerations

The floral community structure and composition throughout the study area, in both terrestrial and wetland ecosystems, has been transformed as a result of historical and current agricultural activities including small-scale subsistence crop cultivation and trampling and overgrazing by livestock.

Overall, floral species diversity was considered to be relatively high, although some areas of the hillslope seep feature have undergone greater levels of disturbance and were found to have a lower species diversity, which is to be expected under the circumstances. Due to the extent of the freshwater feature identified within the study area, as well as the homogenous nature of the vegetation, the dominant floral species associated with the freshwater features are presented together, and not per feature. It should be noted however that the table below serves as an indication of the dominant species and is not a comprehensive listing of all floral species found within the study area.

Table 7: Dominant floral species identified within the wetland ecosystems in the study area. Alien floral species are indicated with an asterisk.

Terrestrial	Temporary Zone	Seasonal Zone	Permanent Zone
Commelina africana var. *krebsiana*	*Helichrysum kraussii*	*Eragrostis gummiflua*	*Imperata cylindrica*
Urochloa mossambicensis	*Nidorella anomala*	*Sporobulus africanus*	*Eleocharis dregeana*
Pennisetum clandestinum	**Seriphium plumosum*	*Pycreus mundtii*	
Digitaria eriantha	*Setaria sphacelata*	*Cyperus denudatus*	
Eragrostis curvula	**Cirsium vulgare*	*Hemarthria altissima*	
Hyperinia hirta	*Eragrostis gummiflua*	*Leersia hexandra*	
Aristida congesta	**Campuloclinium macrocephalum*	*Typha capensis*	
Melinis repens		*Kyllinga erecta*	
**Tagetes minuta*		*Berkaya radula*	
**Bidens pilosa*		*Aristida spp.*	
**Solanum pseudocapsicum*			
**Cirsium vulgare*			

4.3 Results of Field Assessment

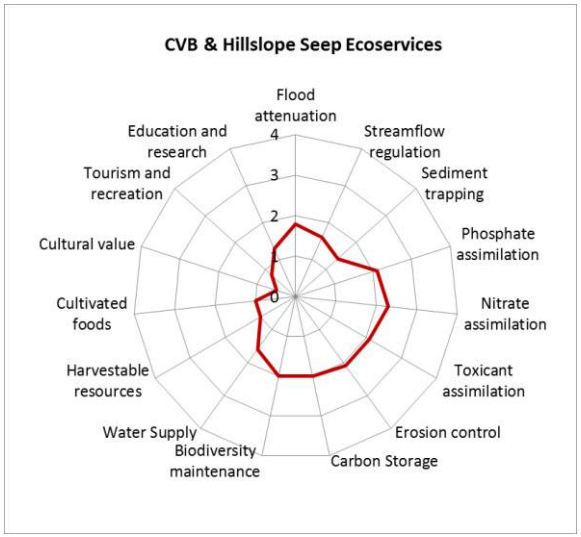
The table below summarises the findings of the field verification in terms of the following relevant aspects pertaining to wetland ecology:

- Wetland hydrology;
- Wetland geomorphology and sediment balance;

- Water quality;
- Wetland biota;
- Wetland ecological and socio-cultural service provision;
- Wetland PES; and
- Wetland EIS

The PES and EIS categories of the identified freshwater features are conceptually illustrated in Figures 10 and 11.

Table 8: Summary of results of the assessment of the freshwater feature identified within the study areas

<table>
<tr><td colspan="2">Resource: Channelled Valley Bottom wetland and associated Hillslope Seep Wetland</td><td colspan="2" rowspan="2">  </td></tr>
<tr><td colspan="2">Ecological & socio-cultural service provision graph:
 
</td></tr>
<tr><td>Feature HGM Unit Description</td><td>Channelled Valley Bottom Wetland (CVB)
Unchannelled Valley Bottom Wetland (UCVB)
Hillslope Seep Wetland</td><td>Photograph notes</td><td>The photographs show the south-west and north-west views of the freshwater resource in the study area.
Close to the origin of the fountain, creating the channelled valley bottom wetland (left). The photograph on the right indicates the extent and the gradient of the hillslope seep which is connected to the channelled valley bottom wetland.</td></tr>
<tr><td>PES discussion</td><td>CVB & UCVB PES Category: B
Ecological state is moderately modified primarily due to some exotic vegetation invasions at the edge of the channel. Hydrology may as a result be marginally altered. Some erosion as a result of trampling by livestock was apparent, but not deemed to be significant in this feature.
Hillslope Seep PES Category: B/C
Modifiers include grazing and trampling by livestock; expected increased sediment loads from gentle slope of the wetland. Even though the wetland is ecologically intact, the agricultural activities impacts on this feature.</td><td colspan="2">Watercourse characteristics:
a) Hydraulic regime
The hydraulic regime seems to be largely intact as the channel running through the wetland facilitates the movement of water through the wetland whilst diffuse surface flow through the associated hillslope seep and runoff from the road (the R50 road which traverses through the channelled valley bottom wetland), contributes to water inputs to the wetland.</td></tr>
<tr><td>Ecoservice provision</td><td>Intermediate: Considered of high importance in terms of phosphate, nitrate and toxicant assimilation, and erosion control. Not considered to have cultural values or importance for tourism or recreational activities.</td><td colspan="2">b) Water quality
Due to relatively remote location of this freshwater system within a fenced off area, and the distance from anthropogenic activities, water quality is likely to be relatively unimpacted in terms of pollutants, however runoff from agricultural activities within the hillslope seep area may impact on the water quality to some extent.</td></tr>
</table>

<table>
<tr><td>EIS discussion</td><td colspan="2">EIS Category: B
The ecological integrity of this freshwater system, particularly the relatively intact floral habitat (especially that of the CVB) as well as intermediate ecological service provision, contributed to the overall EIS score which placed it in an EIS Category B. Whilst this freshwater system is not deemed to be important on a provincial scale, it is considered to be of conservation value on a local scale, and this should be afforded a commensurate level of protection.</td><td>c) Geomorphology and sediment balance

Characterised by relatively uniform topography, little evidence of trampling within the channelled valley bottom wetland area although some cattle paths are present. However, more extensive grazing and trampling was evident within the hillslope seep wetland. The surrounding terrestrial areas are covered with vegetation and thus sediment balance is unlikely to be significantly disturbed.</td></tr>
<tr><td>REC Category</td><td colspan="2">B
This freshwater system is considered overall to be ecologically intact, but surrounding impacts does influence the system. This management class will prevent any further degradation whilst enhancing the PES of the wetland.</td><td>d) Habitat and biota

Habitat is deemed to be predominantly intact, although some isolated loss of vegetation has occurred within the hillslope seep wetland area, mainly due to livestock grazing and trampling. As a result, it is deemed likely that these freshwater features may be utilised by a number of small mammals and avifauna dependent on wetland habitats for breeding and foraging.</td></tr>
<tr><td>Impact significance prior to mitigation</td><td>L</td><td rowspan="2">Due to the location of the channelled valley bottom wetland both in terms of distance and being separated from the proposed infrastructure by the hillslope seep wetland, it is highly unlikely that it would be impacted. However, the hillslope seep wetland will be impacted on as some of the construction activities of the proposed phase 1 poultry infrastructure will impact on it, but might be very low impacts if mitigation measures are adhered to. Possible runoff and leachate from the proposed waste management site may impact on the unchannelled valley bottom wetland, but the application of the mitigation measures will ensure that possible impacts will be very low.</td><td rowspan="2">Business case, Conclusion and Mitigation Requirements:
Even though the hillslope seep has a lowered ecological integrity when compared to the ecologically intact channelled valley bottom wetland and the unchannelled valley bottom wetland, it does still contribute to the provincial conservation targets. Thus, with careful planning of the placement of the piggery and poultry infrastructure and the strict enforcement of the measures stipulated in Appendix C of this report will aid in reducing the impact significance on these freshwater resource to very low levels during construction.</td></tr>
<tr><td>Impact significance post mitigation</td><td>VL</td></tr>
</table>

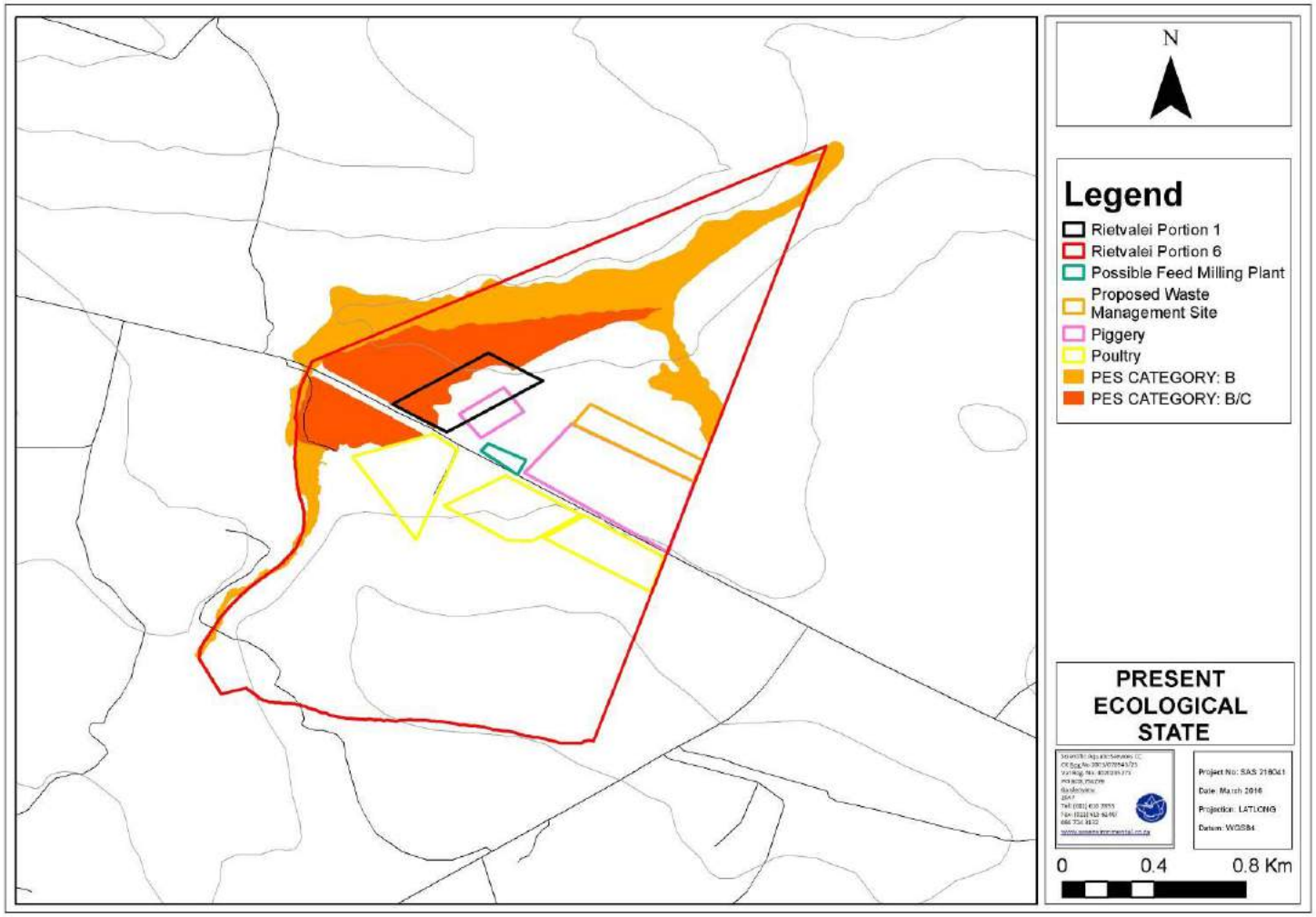


Figure 10: Conceptual illustration of the PES categories of the assessed freshwater features

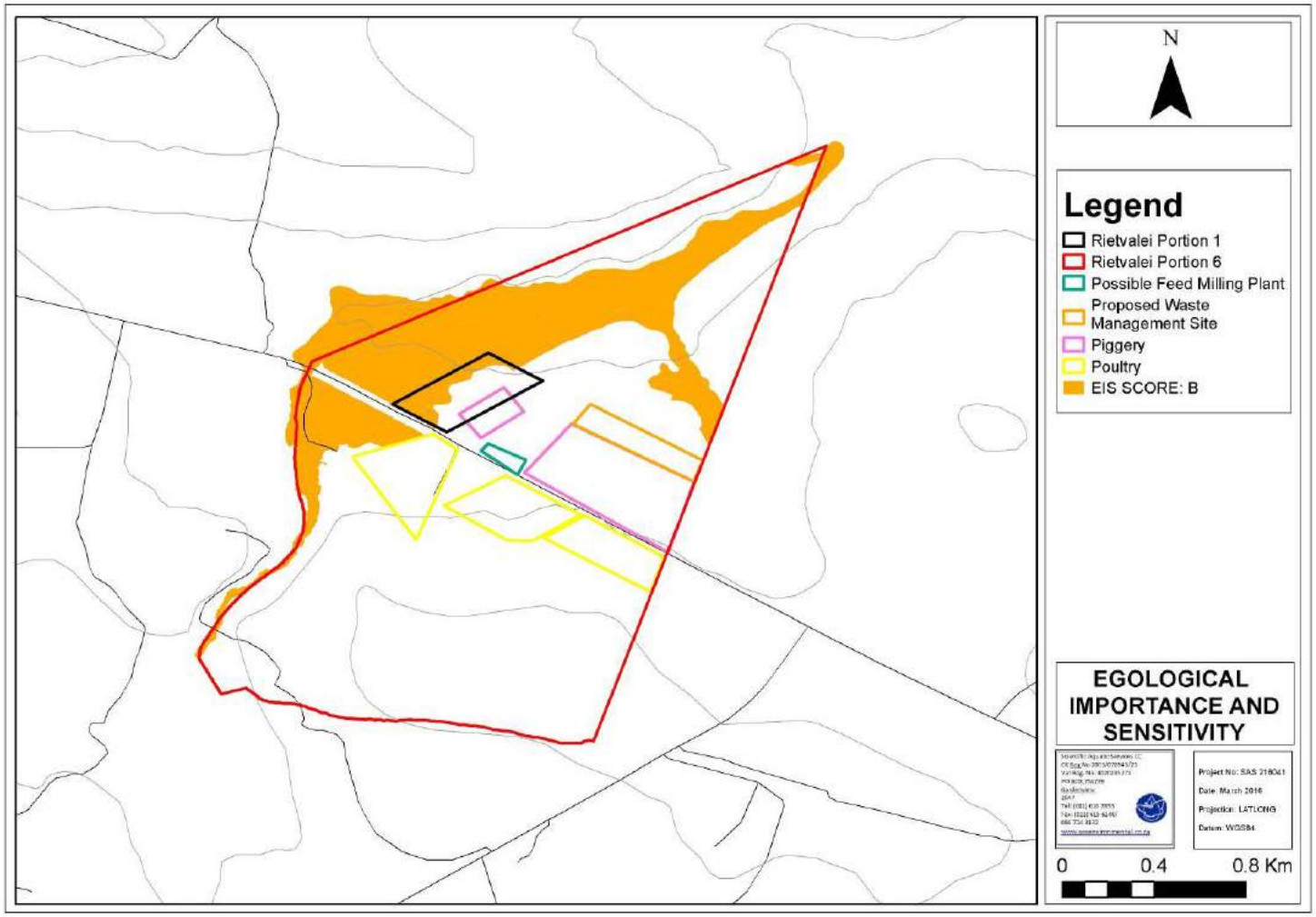


Figure 11: Conceptual illustration of the EIS categories of the assessed freshwater features

4.4 Delineation and Sensitivity Mapping

Prior to the site visit, points of interest were identified during the desktop phase of the study, and verified during the field survey according to the guidelines advocated by DWAF (2005 and 2008). The wetland delineations as presented in this report are regarded as a best estimate of the temporary zone boundaries based on the site conditions present at the time; however, use was made of historical and current digital satellite imagery to further aid in the delineation of the wetland resources.

During the assessment, the following indicators were used to ascertain the boundaries of the temporary zones of the freshwater features:

- Terrain units were used to determine in which parts of the landscape wetland features would most likely occur in, as channelled valley bottom wetlands are easily distinguishable, and the extent of its associated wetland area, in this case an associated hillslope seepage wetland, can often readily be determined.
- The soil form indicator (Figure 12) was used to determine the presence of soils that are associated with prolonged and frequent saturation, as well as variation in the depth of the saturated soil zone within 50cm of the soil surface. This indicator was used to identify gleyed soils where the soil is a greyish/greenish/bluish colour due to the leaching out of iron. Whilst mottling was not extensive, it was present in the temporary zone. These factors were utilised to aid in determining the location of the freshwater zones and their boundaries.
- The vegetation indicator was used where possible in the identification of the wetland boundary through the identification of the distribution of both facultative and obligate wetland vegetation associated with soils that are frequently saturated. Changes in vegetation density and levels of greening were also considered during the delineation process, particularly in instances such as in the hillslope seep wetland where terrestrial species are more abundant.
- Additionally, debris deposited by the channelled valley bottom wetland was also used as a guide to determine the boundary of the temporary zone of this feature (Figure 13).

Figure 12: Representative photograph of soil samples taken within the wetland habitats. A= Auger sample of hillslope seep wetland located south of the R50 road; B = Auger sample of hillslope seep wetland located north of R50 road

Figure 13: Representative photograph of the debris drift line, that was used in conjunction with other indicators, to determine the boundary of the temporary zone of the channelled valley bottom wetland

The freshwater features associated with the study area are largely intact and are therefore important in terms of biodiversity value as they provide possible habitat and migratory corridors for a diversity of faunal and floral species. The freshwater resources also have significant downstream importance for biodiversity maintenance and other basic ecosystem services and any detrimental impact on these systems will be of high significance, both locally and downstream. Therefore, it is important to determine the extent of the buffer zone around a freshwater feature which will aid in the protection of these features.

According to Macfarlane *et al.* (2015), the definition of a buffer zone is variable, depending on the purpose of the buffer zone, however in summary, it is considered to be “a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another”. The National Environmental Management Act (Act 107 of 1998)

stipulates that no activity can take place within 32m of a watercourse without the relevant authorisation. In addition, the National Water Act (Act 36 of 1998) states that no diversion, alteration of bed and banks or impeding of flow in watercourses (which includes wetlands) may occur without obtaining a water use licence authorising the proponent to do so. Thus, a 32m regulated zone is prescribed to all the wetlands as stipulated by the National Environmental Management Act (Act 107 of 1998). However, in order to ascertain whether this may be considered a reasonable buffer for the freshwater features located within the study area, the Water Research Commission's (WRC) Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries (MacFarlane *et al*., 2015) was applied to the channelled valley bottom wetland and its associated hillslope seep wetland. This calculated a buffer of 16m during construction and the operational phase for these freshwater features. However, 16m has been deemded not sufficient to ensure protection from the possible impacts, specifically from the proposed waste management site, on the freshwater features. Therfore, it's the opinion of the ecologist that a 45m, which was calculated by the above mentioned buffer tool on a desktop basis, be applied.

These buffer zones are deemed sufficient to maintain the Present Ecological State, limit any further impact that the proposed infrastructure construction could have and ultimately support the REC. The freshwater features and their associated buffer zones are conceptually presented in Figure 14 below.

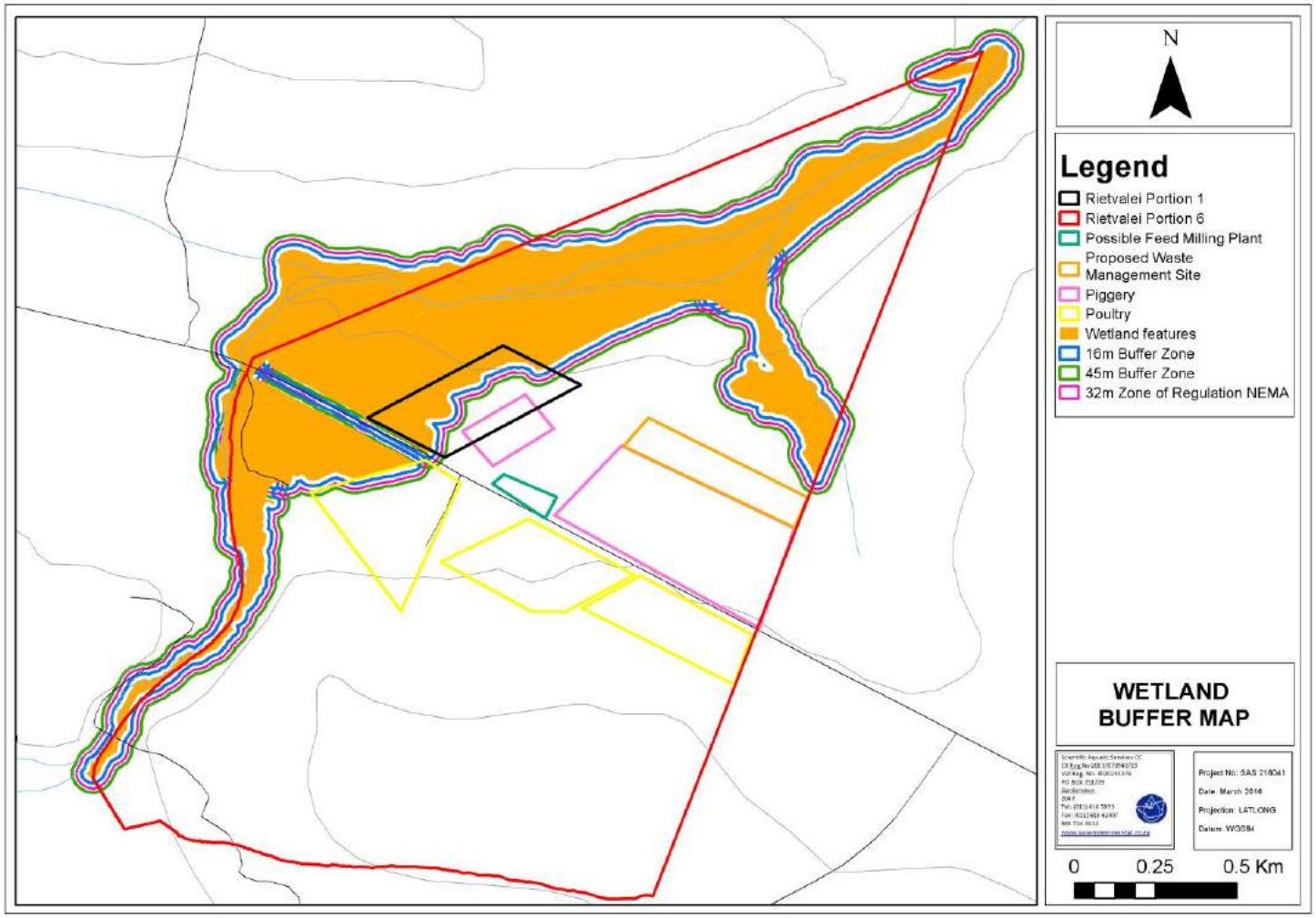


Figure 14: Conceptual presentation of the freshwater features within the study area, buffer zones and associated 32m zone of regulation as stipulated by NEMA.

5 IMPACT ASSESSMENT

The impact tables below serve to summarise the significance of the perceived impacts on the freshwater biodiversity of the study area. The tables present the impact assessment according to the method described in Appendix C of this report, and also indicate the mitigation measures required to minimise the impacts. In addition, an assessment of the significance of the perceived impacts is presented, taking into consideration the available mitigating measures assuming that they are fully implemented. Both essential and recommended mitigatory measures have been presented for the study.

5.1 Impacts Analyses

5.1.1 Mitigation hierarchy and considerations given to application of mitigation measures

Following the assessment of the freshwater resources within the study area, the mitigation hierarchy was applied as defined by the DMR (2013). The points below summarise the considerations undertaken:

- Increased runoff entering freshwater resources, transporting with it toxicants and sediment from impermeable surfaces associated with the proposed poultry and piggery infrastructure and especially that of the waste management site;
- Increased runoff from impermeable surfaces associated with the proposed poultry and piggery infrastructure, and especially that of the waste management site, impacting on the ground water and surface water quality by transporting leachate and toxicants further into the system;
- Increased risk of erosion and incision of the freshwater resources as a result of higher water volumes entering the resources due to decreased permeable surface area;
- Increased sedimentation and pollution of the resources as a result of the above and also as a result of disturbances to soils during construction;
- Compaction of the freshwater features soils due to indiscriminate movement of construction vehicles within the freshwater features;
- Loss of connectivity of freshwater resources as a result of road crossings through the freshwater resources habitat, resulting in altered hydrological patterns and fragmented habitats;

- Possible alterations to vegetation community composition as a result of alien vegetation proliferation due to disturbances to soil profiles and clearing of indigenous vegetation in the vicinity of the freshwater resources; and
- Altered topography due to earthworks associated with construction of the proposed infrastructure, resulting in areas of artificial ponding in turn leading to altered habitat.

5.1.2 Freshwater resource impact discussion

Four aspects of freshwater ecology are considered when assessing the impacts of the proposed poultry and piggery infrastructure construction: loss of habitat and ecological structure, changes to ecological and sociocultural service provision, hydrological function and sediment balance, and water quality of the freshwater features.

Since most of the freshwater features identified within the study area are approximately 100m or more away from any proposed poultry or piggery infrastructure, with the exception of the proposed phase 1 poultry infrastructure which is located directly next to a portion of the hillslope seep wetland, all impact magnitudes which might possibly occur, has been deemed as “low” during the construction phase and operational phase when no mitigation measures are applied, to “very low” during both phases when the recommended mitigation measures are applied. Some degree of habitat loss, changes to the ecological and sociocultural service provision, and changes to the hydrological function of the freshwater features will have already occurred by the time operations commence, since the proposed infrastructure will be constructed on agricultural fields.

Furthermore, it should be noted that the influence that the proposed phase 1 poultry facility construction activities will have on the hillslope seep relates primarily to the proposed location and the construction activities associated with it. Possible loss of habitat is expected from the construction of this facility. Careful planning of the location of this facility and transport activities associated with the construction thereof, will however reduce the severity of the impact it might have.

Due to the distance of the unchannelled valley bottom from the proposed waste management site (approximately 100m), the waste management site will only have “low” (without mitigation measures) to “very low” (with mitigation measures) impacts on the freshwater features. Possible impacts of the proposed management site relate to the quality of groundwater which could possibly move into the freshwater system, thus possible leachate from this proposed waste management should be prevented and adequate

monitoring of the groundwater is required. The results of the impact assessment are summarised in the table below.

Table 9: A summary of the results obtained from the assessment of the freshwater resources ecological impacts for the proposed poultry and piggery infrastructure construction.

Impact 1: Loss of habitat and ecological structure	**Pre-mitigation**	**Post-mitigation**
Construction	Low	Very Low
Operations	Low	Very Low
Impact 2: Changes to the ecological and sociocultural service provision	**Pre-mitigation**	**Post-mitigation**
Construction	Low	Very Low
Operations	Low	Very Low
Impact 3: Impacts on hydrological function	**Pre-mitigation**	**Post-mitigation**
Construction	Very Low	Very Low
Operations	Low	Very Low
Impact 4: Impacts on water quality	**Pre-mitigation**	**Post-mitigation**
Construction	Very Low	Very Low
Operations	Very Low	Low

From the table it is evident that for the duration of the construction phase as well as the operational phase, prior to mitigation, most impacts are considered to be of “low” to “very low” levels. However, should mitigatory measures be implemented as recommended, most impacts will be reduced to a very-low level, with the exception of the impacts on water quality of the freshwater features, which would be of “low” level.

Based on the findings of the freshwater ecological assessment, several recommendations are made to minimise the impact on the freshwater ecology of the area, should the proposed poultry and piggery infrastructure construction proceed:

- The boundaries of the construction areas are to remain as small as possible, be clearly defined and it should be ensured that all activities remain within defined footprint areas;
- Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect floral communities within the freshwater resource habitat, need to be strictly managed. Existing alien species should be eradicated and controlled to prevent further spread of these species;
- All freshwater resource areas should be designated and clearly marked as No-Go areas and be off limits to all unauthorised vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to prevent compaction of soils,

loss of vegetation and increased erosion and to limit the ecological footprint of the infrastructure construction activities;

- To prevent the erosion of soils, management measures may include energy dissipating measures, soil traps, hessian curtains and storm water diversion away from areas particularly susceptible to erosion as deemed appropriate by the consulting engineers;
- Compacted soils should be ripped and rehabilitated with topsoil and reseeded with indigenous vegetation;
- Implement silt traps during construction to remove sand particles from runoff;
- Flow continuity may not be affected by the construction activities;
- All spills must be cleaned up and treated accordingly;
- Reprofile areas to ensure that no changes to runoff patterns occurs;
- Ensure that the functionality of the permanent, seasonal and temporary zones of the freshwater features is maintained through provision of measures to ensure that soil wetting conditions are maintained and the freshwater features functions are reinstated.
- Limit the footprint area of the construction activity to what is absolutely essential in order to minimise the loss of clean water runoff areas which recharge the receiving aquatic environment;
- Adequate storm water management must be incorporated into the design of the proposed infrastructure in order to prevent erosion and the associated sedimentation of the freshwater features. In this regard special mention is made of:
  - Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed;
  - Runoff from paved surfaces should be slowed down by the strategic placement of energy dispersing structures
- During the construction and operational phases of the proposed infrastructure, erosion control measures should be installed on roadways to prevent gully formation and siltation of the freshwater resources;
- With specific mention to the proposed waste management site which may impact on the water quality of the freshwater features, the following is recommended:
  - Install geomembranes or flexible membrane liners (such as high density polyethylene (HDPE) liners) to contain or prevent waste constituents and leachate from escaping the proposed waste management site and into the ground water and surface water of the freshwater features; and

- Groundwater monitoring should be commissioned with sampling and analysis from boreholes downgradient from the proposed waste management site. This will ensure that the groundwater not be contaminated or enriched by leachate from the proposed waste management site.

- No dumping of waste should be permitted within the freshwater features. Should any spillages or disposal of waste materials occur, such incidents must be managed according to the on-site Emergency Incident protocol; and
- Implement an alien vegetation control program within the freshwater features with special mention of water loving tree species.

6 CONCLUSION

Scientific Aquatic Services (SAS) was appointed to conduct a freshwater ecological assessment as part of the Basic Assessment Process for the development of a pig production facility as well as a chicken broiler facility on Portions 1 and 6 of the farm Rietvalei, near Delmas, Mpumalanga

The background information available from national and provincial databases indicates that the proposed piggery and poultry infrastructure is associated with several freshwater resources. The proposed infrastructure construction area falls within close vicinity to an unchannelled valley bottom wetland and is also situated a distance away from the ecologically intact channelled valley bottom wetland. The proposed phase 1 poultry facility is however located directly next to the hillslope seep feature which is associated with the channelled valley bottom wetland.

Since freshwater features were identified within the 500m zone of regulation according to Regulation GN1199 (draft regulation GN1180) of the proposed infrastructure, either a Water Use Licence (WUL) or a General Authorisation in terms of Section 21 (c) and (i) may be required, depending on the exact locality and nature of the proposed activities. However, since some of the proposed infrastructure does encroach on the 16m buffer zone and on the recommended 45m buffer zone, as calculated by the Water Research Commission's (WRC) Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries (MacFarlane *et al.,* 2015), and on the 32m zone of regulation, as stipulated by the National Environmental Management Act (Act 107 of 1998), it is expected that the construction activities relating to the proposed piggery and poultry infrastructure will have some degree of impact on the freshwater resources within the regulated zone, thus a full

WULA application might be required. However, this should be clarified with the relevant DWS officials.

It is also recommended that the layout area of the phase 1 poultry facility be reconsidered, as it is located directly next to a freshwater feature, which could have significant impacts on the integrity thereof. Specific mention is also made to ensure that any leachate from the proposed waste management site be limited, even though the closest freshwater feature is 100m from the proposed layout thereof, this might have an influence on the quality of groundwater and surface water of the entire natural environment.

From a freshwater resource conservation perspective, it is recommended that the extent of construction activities (such as contractor laydown areas) should be kept within close vicinity of the proposed infrastructure construction area, so as to not encroach into the buffer zones of the freshwater features. These impacts were assessed in detail in the impact assessment (refer to Appendix C for the detailed impact assessment) and as far as possible mitigatory recommendations are presented in line with the mitigation hierarchy in order to ensure informed decision making and improved sustainable development in the study area. These recommendations also include specific management measures applicable to individual freshwater resources and infrastructure activities as well as general management measures which apply to the proposed infrastructure construction area as a whole.

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APPENDIX A: Legislation

LEGISLATIVE REQUIREMENTS

National Environmental Management Act (Act 107 of 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations (GNR 982) as amended in 2014, states that prior to any development taking place within a wetland or riparian zone of influence, an environmental authorisation process needs to be followed should any activities be triggered as listed in the EIA Regulations (2014). This could follow either the Basic Assessment Report (BAR) process (GNR 983) or the Environmental Impact Assessment (EIA) (GNR 984) process depending on the scale of the impact. Provincial regulations as set out in GNR 985 must also be considered.

National Water Act (NWA; Act 36 of 1998)

The National Water Act (NWA) (Act 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i).

However, according to General Notice 1199 as published in the Government Gazette No. 32805 of 2009, it must be noted that as defined by the Replacement General Authorisation in terms of Section 39 of the National Water Act, on account of the extremely sensitive nature of wetlands and estuaries, the section 21(c) and (i) water use General Authorisation does not apply to:

- Any development within a distance of 500 meters upstream or downstream from the boundary of any wetland; and
- Any estuary or any water resource within a distance of 500 meters upstream from the salt mixing zone of any estuary.

General Notice (GN) 1199 as published in the Government Gazette 32805 of 2009 as it relates to the NWA, 1998 (Act 36 of 1998)

Wetlands are extremely sensitive environments and as such, the Section 21 (c) and (i) water use General Authorisation does not apply to any wetland or any water resource within a distance of 500 meters upstream or downstream from the boundary of any wetland. This notice is, at the time of this report, under review and the proposed replacement General Notice 1180 was published in the Government Gazette No. 39458 on 27th November 2015 for public comment.

APPENDIX B: Freshwater Assessment Methodology

Method of Assessment

FRESHWATER RESOURCE ASSESSMENT APPROACH

Literature Review

A desktop study was compiled with all relevant information as presented by the South African National Biodiversity Institutes (SANBI's) Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org). Wetland specific information resources taken into consideration during the desktop assessment of the subject property included:

- National Freshwater Ecosystem Priority Areas (NFEPAs, 2011)
  - NFEPA water management area (WMA)
  - FEPA (sub)WMA % area
  - Sub water catchment area FEPAs
  - Water management area FEPAs
  - Fish sanctuaries
  - Wetland ecosystem types
- Mpumalanga Biodiversity Sector Plan (MBSP), 2014

National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), Department of Water Affairs (DWA), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland features present within the subject property.

Classification System for Wetlands and other Aquatic Ecosystems in South Africa (2013)

All wetland or riparian features encountered within the study area were assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems, hereafter referred to as the "Classification System" (Ollis *et. al*., 2013). A summary on Levels 1 to 4 of the classification system are presented in the tables below.

Table 1: Classification System for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	LEVEL 2: REGIONAL SETTING	LEVEL 3: LANDSCAPE UNIT
Inland Systems	DWA Level 1 Ecoregions OR NFEPA WetVeg Groups OR Other special framework	Valley Floor
		Slope
		Plain
		Bench (Hilltop / Saddle / Shelf)

Table 2: Hydrogeomorphic (HGM) Units for the Inland System, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
River	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional	Active channel
		Riparian zone
	Upper foothills	Active channel
		Riparian zone
	Lower foothills	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone

FUNCTIONAL UNIT		
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
	Rejuvenated foothills	Active channel
		Riparian zone
	Upland floodplain	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
Floodplain wetland	Floodplain depression	(not applicable)
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

Level 1: Inland systems

From the classification system, Inland Systems are defined as **aquatic ecosystems that have no existing connection to the ocean[2]** (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but **which are inundated or saturated with water, either permanently or periodically.** It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

Level 2: Ecoregions & NFEPA Wetland Vegetation Groups

For Inland Systems, the regional spatial framework that has been included in Level 2 of the classification system is that of the DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et. al.,* 2005). There is a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland. DWA Ecoregions have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

[2] Most rivers are indirectly connected to the ocean via an estuary at the downstream end, but where marine exchange (i.e. the presence of seawater) or tidal fluctuations are detectable in a river channel that is permanently or periodically connected to the ocean, it is defined as part of the estuary.

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford, 2006) groups' vegetation types across the country, according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups. It is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

Level 3: Landscape Setting

At Level 3 of the classification system for Inland Systems, a distinction is made between four Landscape Units (Table 1) on the basis of the landscape setting (i.e. topographical position) within which an HGM Unit is situated, as follows (Ollis *et. al.,* 2013):

- **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley;
- **Valley floor:** The base of a valley, situated between two distinct valley side-slopes;
- **Plain:** an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land; and
- **Bench (hilltop/saddle/shelf):** an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

Level 4: Hydrogeomorphic Units

Seven primary HGM Types are recognised for Inland Systems at Level 4A of the classification system (Table 2), on the basis of hydrology and geomorphology (Ollis *et. al*., 2013), namely:

- **River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
- **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it;
- **Unchannelled valley-bottom wetland:** a valley-bottom wetland without a river channel running through it;
- **Floodplain wetland:** the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank;

- **Depression:** a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates;
- **Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat; and
- **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the classification system to try and ensure consistency with the wetland classification terms currently in common usage in South Africa. Similar terminology (but excluding categories for "channel", "flat" and "valleyhead seep") is used, for example, in the recently developed tools produced as part of the Wetland Management Series including WET-Health (Macfarlane *et. al*., 2008), WET-IHI (DWAF, 2007) and WET-EcoServices (Kotze *et. al*., 2009).

Riparian Vegetation Response Assessment Index (VEGRAI)

Riparian vegetation is described in the NWA (Act No 36 of 1998) as follows: 'riparian habitat' includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

VEGRAI is designed for qualitative assessment of the response of riparian vegetation to impacts in such a way that qualitative ratings translate into quantitative and defensible results[3]. Results are defensible because their generation can be traced through an outlined process (a suite of rules that convert assessor estimates into ratings and convert multiple ratings into an Ecological Category).

Table 3: Descriptions of the A-F ecological categories.

Ecological category	Description	Score (% of total)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitat and biota may have taken place but the ecosystem functions are essentially unchanged.	80-89
C	Moderately modified. Loss and change of natural habitat have occurred, but the basic ecosystem functions are still predominately unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has	40-59

[3] Kleynhans et al, 2007

Ecological category	Description	Score (% of total)
	occurred.	
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Critically modified. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible	0-19

Wet-Ecoservices (2009)

"The importance of a water resource, in ecological, social or economic terms, acts as a modifying or motivating determinant in the selection of the management class" (DWA, 1999). The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze *et al.* (2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the service is provided:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate trapping;
- Nitrate removal;
- Toxicant removal;
- Erosion control;
- Carbon storage;
- Maintenance of biodiversity;
- Water supply for human use;
- Natural resources;
- Cultivated foods;
- Cultural significance;
- Tourism and recreation; and
- Education and research.

The characteristics were used to quantitatively determine the value, and by extension sensitivity, of the wetlands. Each characteristic was scored to give the likelihood that the service is being provided. The scores for each service were then averaged to give an overall score to the wetland.

Table 4: Classes for determining the likely extent to which a benefit is being supplied.

Score	Rating of the likely extent to which the benefit is being supplied
<0.5	Low
0.6-1.2	Moderately low
1.3-2	Intermediate
2.1-3	Moderately high
>3	High

Index of Habitat Integrity (IHI)

To assess the PES of the riparian / wetland feature, the Index of Habitat Integrity (IHI) for South African floodplain and channelled valley bottom wetland types (DWAF Resource Quality Services, 2007) was used.

The WETLAND-IHI is a tool developed for use in the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP), formerly known as the River Health Programme (RHP). The WETLAND-IHI has been developed to allow the NAEHMP to include floodplain and channelled valley bottom wetland types to be assessed. The output scores from the WETLAND-IHI model are presented in A-F ecological categories (table below), and provide a score of the PES of the habitat integrity of the riparian system being examined.

Table 5: Descriptions of the A-F ecological categories (after Kleynhans, 1996, 1999).

Ecological Category	PES (% Score)	Description
A	90-100%	Unmodified, natural.
B	80-90%	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	60-80%	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	40-60%	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. 20-40% Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
E	20-40%	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	0-20%	Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances, the basic ecosystem functions have been destroyed and the changes are irreversible.

WET-Health

Healthy wetlands are known to provide important habitats for wildlife and to deliver a range of important goods and services to society. Management of these systems is therefore essential if these attributes are to be retained within an ever changing landscape. The primary purpose of this assessment is to evaluate the eco-physical health of wetlands, and in so doing to promote their conservation and wise management.

Level of Evaluation

Two levels of assessment are provided by WET-Health:

- Level 1: Desktop evaluation, with limited field verification. This is generally applicable to situations where a large number of wetlands need to be assessed at a very low resolution; or
- Level 2: On-site evaluation. This involves structured sampling and data collection in a single wetland and its surrounding catchment.

Framework for the Assessment

A set of three modules has been synthesised from the set of processes, interactions and interventions that take place in wetland systems and their catchments: hydrology (water inputs, distribution and retention, and outputs), geomorphology (sediment inputs, retention and outputs) and vegetation (transformation and presence of introduced alien species).

Units of Assessment

Central to WET-Health is the characterisation of HGM Units, which have been defined based on geomorphic setting (e.g. hillslope or valley-bottom; whether drainage is open or closed), water source (surface water dominated or sub-surface water dominated) and pattern of water flow through the wetland unit (diffusely or channelled) as described under the Classification System for Wetlands and other Aquatic Ecosystems above.

Quantification of Present State of a wetland

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present State score. This takes the form of assessing the spatial *extent* of the impact of individual activities and then separately assessing the *intensity* of the impact of each activity in the affected area. The extent and intensity are then combined to determine an overall *magnitude* of impact. The impact scores, and Present State categories are provided in the table below.

Table 6: Impact scores and categories of Present State used by WET-Health for describing the integrity of wetlands.

Impact category	Description	Impact score range	Present State category
None	Unmodified, natural	0-0.9	A
Small	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	B
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2-3.9	C
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D
Serious	The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognisable.	6-7.9	E
Critical	Modifications have reached a critical level and the ecosystem processes have been completely modified with an almost complete loss of natural habitat and biota.	8-10	F

Assessing the Anticipated Trajectory of Change

As is the case with the Present State, future threats to the state of the wetland may arise from activities in the catchment upstream of the unit or within the wetland itself or from processes downstream of the wetland. In each of the individual sections for hydrology, geomorphology and vegetation, five potential situations exist depending upon the direction and likely extent of change (table below).

Table 7: Trajectory of Change classes and scores used to evaluate likely future changes to the present state of the wetland.

Change Class	Description	HGM change score	Symbol
Substantial improvement	State is likely to improve substantially over the next 5 years	2	↑↑
Slight improvement	State is likely to improve slightly over the next 5 years	1	↑
Remain stable	State is likely to remain stable over the next 5 years	0	→
Slight deterioration	State is likely to deteriorate slightly over the next 5 years	-1	↓
Substantial deterioration	State is expected to deteriorate substantially over the next 5 years	-2	↓↓

Overall health of the wetland

Once all HGM Units have been assessed, a summary of health for the wetland as a whole needs to be calculated. This is achieved by calculating a combined score for each component by area-weighting the scores calculated for each HGM Unit. Recording the health assessments for the

hydrology, geomorphology and vegetation components provide a summary of impacts, Present State, Trajectory of Change and Health for individual HGM Units and for the entire wetland.

Ecological Importance and Sensitivity (EIS)

The method used for the EIS determination was adapted from the method as provided by DWA (1999) for wetlands. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed.

A series of determinants for the EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The mean of the determinants is used to assign the EIS category as listed in the table below.

Table 8: Descriptions of the EIS Categories.

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

Recommended Ecological Category (REC)

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability, but carries a higher risk of ecosystem failure" (DWA, 1999).

The REC (table below) was determined based on the results obtained from the PES, reference conditions and EIS of the resource (sections above), and is followed by realistic recommendations, mitigation, and rehabilitation measures to achieve the desired REC.

A wetland may receive the same class for the PES as the REC if the wetland is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the wetland feature.

Table 9: Description of REC classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

Wetland Delineation

For the purposes of this investigation, a wetland is defined in the National Water Act (1998) as "land which is transitional between terrestrial and aquatic systems where the water table is at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil".

The wetland zone delineation took place according to the method presented in the DWAF (2005) document "A practical field procedure for identification and delineation of wetlands and riparian areas. An updated draft version of this report is also available and was therefore also considered during the wetland delineation (DWAF, 2008). The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The position in the landscape, which will help identify those parts of the landscape where wetlands are more likely to occur;
- The type of soil form (i.e. the type of soil according to a standard soil classification system), since wetlands are associated with certain soil types;
- The presence of wetland vegetation species; and
- The presence of redoxymorphic soil feature, which are morphological signatures that appear in soils with prolonged periods of saturation.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWAF, 2005 and 2008).

Riparian and wetland zones can be divided into three zones (DWAF, 2005). The permanent zone of wetness is nearly always saturated. The seasonal zone is saturated for a significant periods of wetness (at least three months of saturation per annum) and the temporary zone surrounds the seasonal zone and is only saturated for a short period of saturation (typically less than three months of saturation per annum), but is saturated for a sufficient period, under normal circumstances, to allow for the formation of hydromorphic soils and the growth of wetland vegetation. The object of this study was to identify the outer boundary of the temporary zone and then to identify a suitable buffer zone around the wetland area.

Ecological Impact Assessment Methodology

In order for the Environmental Assessment Practitioner (EAP) to allow for sufficient consideration of all environmental impacts, impacts are assessed using a common, defensible method of assessing

significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

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

- An activity is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation.
- An environmental aspect is an 'element of an organizations activities, products and services which can interact with the environment'[4]. The interaction of an aspect with the environment may result in an impact.
- Environmental risks/impacts are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- Receptors can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- Resources include components of the biophysical environment.
- Frequency of activity refers to how often the proposed activity will take place.
- Frequency of impact refers to the frequency with which a stressor (aspect) will impact on the receptor.
- Severity refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- Spatial extent refers to the geographical scale of the impact.
- Duration refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the table below. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary[5].

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

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act (No. 108 of 1997) in instances of uncertainty or lack of information,

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

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

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

Table 10: Criteria for assessing significance of impacts.

LIKELIHOOD DESCRIPTORS

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

CONSEQUENCE DESCRIPTORS

Severity of impact	**RATING**
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function Largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	**RATING**
Activity specific/ < 5 ha impacted / Linear features affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Linear features affected > 100m and <1000m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected > 1000m and < 3000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected > 3000m and <10 000 m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 10 000m	5
Duration of impact	**RATING**
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5

Table 11: Significance rating matrix

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

Table 12: Positive/Negative Mitigation Ratings

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very high	126-150	Improve current management	Maintain current management
High	101-125	Improve current management	Maintain current management
Medium-high	76-100	Improve current management	Maintain current management
Medium-low	51-75	Maintain current management	Improve current management
Low	26-50	Maintain current management	Improve current management
Very low	1-25	Maintain current management	Improve current management

APPENDIX C: Impact Analysis and Mitigation Measures

General management and good housekeeping practices

The following essential mitigation measures are considered to be standard best practice measures applicable to development of this nature, and must be implemented during all phases of the proposed poultry and piggery infrastructure, in conjunction with those stipulated in the individual tables in the following sections which define the mitigatory measures specific to the minimisation of impacts on freshwater resources.

Development and operational footprint

- Wetland resource sensitivity maps have been developed for the study area, indicating the freshwater features, their relevant buffer zones and regulatory zones in accordance with the National Environmental Management Act (Act 107 of 1998). It is recommended that these sensitivity maps be considered during all phases of the development and with special mention of the planning of infrastructure layout, to aid in the conservation of the freshwater features habitat and environmental resources within the study area;
- All development footprint areas should remain as small as possible and should not encroach onto surrounding more sensitive areas. It must be ensured that the freshwater resources, and their associated buffer zones are off-limits to construction vehicles and personnel;
- The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas;
- Planning of temporary roads and access routes should take the site sensitivity plan into consideration, and wherever possible, existing roads should be utilised. If additional roads are required, then wherever feasible such roads should be constructed a distance from the more sensitive freshwater features and not directly adjacent thereto. If crossings are required they should cross the system at right angles, as far as possible to minimise impacts in the receiving environment, and any areas where bank failure is observed due to the effects of such crossings should be immediately repaired by reducing the gradient of the banks to a 1:3 slope and where needed necessary, installing support structures. This should only be necessary if existing access roads are not utilised;
- All areas of increased ecological sensitivity should be marked as such and be off limits to all unauthorised construction and maintenance vehicles and personnel;
- The duration of possible impacts on the freshwater system should be minimised as far as possible by ensuring that the duration of time in which possible flow alteration and sedimentation will take place is minimised;
- Appropriate sanitary facilities must be provided for the life of the construction and all waste removed to an appropriate waste facility;
- All hazardous chemicals should be stored on bunded surfaces and no storage of such chemicals should be permitted within the freshwater features buffer zones;
- No informal fires should be permitted in or near the construction areas;
- Ensuring that an adequate number of rubbish and “spill” bins are provided will also prevent litter and ensure the proper disposal of waste and spills; and
- Edge effects of activities, particularly erosion and alien/weed control need to be strictly managed.

Vehicle access

- All areas of increased ecological sensitivity should be marked as such and kept off limits to all unauthorised construction and maintenance vehicles as well as personnel;
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; and
- All spills, should they occur, should be immediately cleaned up and treated accordingly.

Alien plant species

- Proliferation of alien and invasive species is expected within any disturbed areas particularly as there is a degree of alien and invasive species within the study area at present. These species should be eradicated and controlled to prevent their spread beyond the project footprint. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled;
- Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational, closure/decommissioning and rehabilitation/ maintenance phases; and
- Species specific and area specific eradication recommendations:
  - Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used;
  - Footprint areas should be kept as small as possible when removing alien plant species*;*
  - No vehicles should be allowed to drive through designated sensitive drainage line and riparian areas during the eradication of alien and weed species.

Freshwater habitat

- Ensure that as far as possible all infrastructure is placed outside the freshwater features and their respective buffer zones. If these measures cannot be adhered to, strict mitigation measures, will be required to minimize the impact on the receiving watercourses. Such measures include those stipulated in Section 5 of this report;
- Permit only essential construction personnel within 32m of the freshwater feature habitat, if absolutely necessary that they enter the regulatory zone;
- Limit the footprint area of the construction activities to what is only essential in order to minimise environmental damage;
- During the construction phase, no vehicles should be allowed to indiscriminately drive through the freshwater features; and
- Implement effective waste management in order to prevent construction related waste from entering the freshwater features.

Soils

- To prevent the erosion of soils, management measures may include berms, soil traps, hessian curtains and stormwater diversion away from areas particularly susceptible to erosion;
- Install erosion berms during construction to prevent gully formation. Berms every 50m should be installed where any disturbed soils have a slope of less than 2%, every 25m where the track slopes between 2% and 10%, every 20m where the track slopes between 10% and 15% and every 10m where the track slope is greater than 15%;
- Sheet runoff from access roads should be slowed down by the strategic placement of berms and sandbags;
- Maintain topsoil stockpiles below 5 meters in height;
- As far as possible, all construction activities should occur in the low flow season, during the drier winter months;
- All soils compacted as a result of construction activities falling outside of the project footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas; and

- Monitor all areas for erosion and incision, particularly any freshwater feature crossings. Any areas where erosion is occurring excessively quickly should be rehabilitated as quickly as possible and in conjunction with other role players in the catchment.

Rehabilitation

- All soils compacted as a result of construction activities falling outside of the project footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all construction and rehabilitation phases to prevent loss of floral habitat;
- Rehabilitate all freshwater habitat areas affected by the poultry and piggery infrastructure construction operations to ensure that the ecology of these areas is re-instated during all phases.
- Edge effects of activities including erosion and alien/ weed control need to be strictly managed in these areas;
- As far as possible, all rehabilitation activities should occur in the low flow season, during the drier winter months.
- As much vegetation growth as possible should be promoted within the proposed construction area in order to protect soils;
- All alien vegetation in the freshwater features should be removed from rehabilitated areas and reseeded with indigenous grasses as specified by a suitably qualified specialist (ecologist);
- All areas affected by the poultry and piggery infrastructure construction should be rehabilitated upon completion of the infrastructure construction;
- Vegetation cover within the freshwater resources should be monitored to ensure that sufficient vegetation is present to bind the bankside soils and prevent bankside erosion and incision; and
- It is recommended that a detailed rehabilitation plan be developed by a suitably qualified ecologist during the operations phase in order to address specific rehabilitation requirements.

Impact Ratings on wetland and riparian ecology

The tables below present the impact ratings of the various activities to take place during the construction and operational phases on the freshwater features habitats and ecological service provision, and hydrology and sediment budgets of these features. Essential and recommended mitigation measures for each phase are also presented.

IMPACT 1: LOSS OF FRESHWATER HABITAT AND ECOLOGICAL STRUCTURE

Aspects and activities register

Pre-Construction	Construction	Operational
Potential poor layout planning and design leading to overall loss of habitat during the construction phase	Site clearing and the removal of freshwater feature habitat	Disturbance of soils and on-going erosion as part of maintenance activities
Possible poor design of infrastructure leading to changes to the freshwater features habitat during the construction phase	Compaction of soils due to construction activities	Ineffective rehabilitation may lead to habitat transformation and alien vegetation encroachment
Increased anthropogenic activity within the freshwater feature areas	Site clearing and the disturbance of soils	Discharging stormwater, leading to incision of soils and loss of vegetation cover within the freshwater feature area
	Movement of construction vehicles as well as access road construction within the freshwater feature zones	Increased runoff potential as a result of impermeable surfaces
	Dumping waste and construction material within the freshwater features, leading to proliferation of alien vegetation species	

Unmanaged	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	3	2	3	1	2	5	6	30 (Low)
Operational phase	2	2	2	1	5	4	8	32 (Low)

Essential mitigation measures for construction phase:

- As much indigenous vegetation growth should be promoted within the freshwater features to protect soils;
- Ensure that vegetation clearing and indiscriminate vehicle driving does not occur within demarcated areas;
- Minimize construction footprints prior to commencement of the construction and control the edge effects from construction activities; and
- Implement alien vegetation control program and ensure establishment of indigenous species within areas previously dominated by alien vegetation.

Recommended mitigation measures for construction phase:

- Ensure that all activities impacting on the freshwater features are managed according to the relevant DWS Licensing regulations; and
- As far as possible, all construction activities should occur in the low flow season, during the drier winter months.

Essential mitigation measures for operational phase:

- Any area where active erosion is observed must be immediately rehabilitated in such a way as to ensure that the hydrology of the area is re-instated to conditions which are as natural as possible.

Recommended mitigation measures for operational phase:

- N/A

Managed	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	2	2	2	1	2	4	5	20 (Very low)
Operational phase	1	2	1	1	5	3	7	21 (Very low)

Probable latent impacts:

- Erosion and incision of the wetland and the river may occur if not effectively rehabilitated and managed.

IMPACT 2: CHANGES TO THE FRESHWATER FEATURES ECOLOGICAL AND SOCIOCULTURAL SERVICE PROVISION

Pre-Construction	Construction	Operational
Potential poor planning leading to unnecessary placement of infrastructure within sensitive freshwater resource areas	Site clearing and further removal of vegetation impacting on the biodiversity maintenance of the freshwater features	Insufficient aftercare and maintenance leading to ongoing erosion and increased sedimentation due to poor management
Possible poor design of the proposed infrastructure leading to the loss of ecosystem services provision	Draining water from the features for construction purposes, resulting in loss of streamflow regulation services	Increased water runoff into wetland areas due to unvegetated areas overlooked after construction
	Alteration of natural hydrological regime, impacting on flood attenuation and streamflow regulation capabilities	Waste dumping leading to contamination of the soils and water within the wetland habitat, thus rendering the area less important in terms of biodiversity maintenance
	Loss of phosphate, nitrate and toxicant removal abilities due to vegetation clearing	Increased runoff velocity due to impermeable surfaces
	Inability to support biodiversity as a result of changes to water quality, increased sedimentation and alteration of natural hydrological regimes	
	Loss of vegetation resulting in a loss of breeding and foraging habitat and overall biodiversity	

Unmanaged	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	3	2	3	1	2	5	6	30 (Low)
Operational phase	2	2	2	1	5	4	8	32 (Low)

Essential mitigation measures for the construction phase:

- During construction use techniques which support the hydrology and sediment control functions of the freshwater features;
- As much vegetation growth should be promoted within the freshwater features to protect soils; and
- Limit excavations to a limited extent to ensure that drainage patterns within the features returns to normal as soon as possible after construction.

Recommended mitigation measures for the construction phase:

- Restrict construction to the drier winter months if possible to avoid sedimentation of the wetland feature and to minimize the severity of disturbance of the features and hydraulic function.

Essential mitigation measures for the operational phase:

- Monitor the freshwater features for erosion and incision; and
- Implement an alien vegetation control program within the freshwater features and ensure establishment of indigenous species within areas previously dominated by alien vegetation.

Recommended mitigation measures for the operational phase:

- N/A

	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	2	2	2	1	2	4	5	20 (Very low)
Operational phase	1	2	1	1	5	3	7	21 (Very low)

Probable latent impacts:

- Reduced biodiversity support; and
- Reduced functioning of nutrient cycling.

IMPACT 3: IMPACTS ON THE FRESHWATER FEATURES HYDROLOGICAL FUNCTION

Pre-Construction	Construction	Operational
Possible poor planning with regards to the placement of infrastructure within the freshwater features that could result in change of the sediment regime	Site clearing and further removal of vegetation resulting in increased runoff which leads to erosion and alteration of the geomorphology of the freshwater features	Vegetation trampling during maintenance activities
	Excavations leading to canalization of the freshwater features and its surrounding areas	Indiscriminate driving within the freshwater features, resulting in soil compaction
	Movement of construction vehicles within the freshwater features, resulting in soil compaction	Increased water inputs to the freshwater features as a result of runoff from impermeable surfaces within the study area
	Topsoil stockpiling adjacent to the freshwater features and runoff from stockpiles leading to sedimentation of the system	
	Streamflow diversion and draining water from the freshwater resources resulting in the alteration of hydrological zones	

	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	3	2	2	1	2	5	5	25 (Very low)
Operational phase	2	2	1	1	5	4	7	28 (Low)

Essential mitigation measures for the construction phase:

- Any construction-related waste must not be placed in the vicinity of the freshwater features;
- As much vegetation growth should be promoted within the freshwater features to protect soils;
- Limit the footprint area of the construction activity to what is absolutely essential in order to minimize environmental damage; and
- Upon completion of the construction phase the disturbed area should be rehabilitated through reprofiling and revegetation.

Recommended mitigation measures for the construction phase:

- Desilt the freshwater features areas affected by construction activities;
- Dumped soil must be removed and the area must be levelled to avoid sedimentation of the features from runoff;
- Soils compacted during construction activities should be ripped and reprofiled and reseeded with indigenous vegetation; and
- As far as possible, all construction activities should occur in the low flow season, during the drier summer months.

Essential mitigation measures for the operational phase:

- Vehicles should not be driven indiscriminately within the freshwater features during maintenance activities to prevent soil compaction.

Recommended mitigation measures for the operational phase:

- N/A

	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	2	2	1	1	2	5	4	20 (Very low)
Operational phase	1	2	1	1	5	3	7	21 (Very low)

Probable latent impacts:

- Sedimentation of the system may lead to altered habitat and vegetation structure; and
- Some changes to the hydrology of the system may occur altering instream habitats on a localised scale.

IMPACT 4: IMPACT ON THE FRESHWATER FEATURES WATER QUALITY

Pre-Construction	Construction	Operational
Proposed infrastructure poses a high risk of spillage, leackage and contamination of the receiving environment	Earthworks in the vicinity of the freshwater features leading to increased runoff and erosion and increased sediment inputs, potential smothering wetland flora and altering surface water quality	There is potential for failure of the waste management site once construction is complete and the system is operational; however if the site is well designed and maintained, it will pose far less risk than the status quo
	Topsoil stockpiling adjacent to the freshwater features and runoff from stockpiles leading to sedimentation of the system	Sabotage and blockage of the site may occur which can lead to spilling of treated effluent from the manholes
	Potential dumping of hazardous and non-hazardous waste into the freshwater features	

Unmanaged	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	3	1	3	1	2	4	6	24 (Very low)
Operational phase	4	1	4	1	5	5	10	50 (Low)

Essential mitigation measures for the construction phase:

- Runoff from stockpiles, earthwork activities and dumping of hazardous materials should be prevented in order to mitigate impacts on the freshwater features sediment budget.

Recommended mitigation measures for the construction phase:

- Desilt any freshwater features affected by construction activities, and
- As far as possible, all construction activities should occur in the low flow season, during the drier winter months, in order to decrease the potential for erosion and sedimentation caused by rainfall.

Essential mitigation measures for the operational phase:

- Regular monitoring of the structural integrity of the waste management site must take place; and
- Any leachate must be immediately resolved in line with the emergency response plan

Recommended mitigation measures for the operational phase:

- Ongoing monitoring of the freshwater feature for erosion and incision.

Managed	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	2	1	2	1	2	3	5	15 (Very Low)
Operational phase	3	1	3	1	5	4	9	36 (Low)

Probable latent impacts:

- None expected

APPENDIX D: Freshwater Assessment Results

PRESENT ECOLOGICAL STATE (PES), ECOSERVICES AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) RESULTS

Table 13: Presentation of the results of the WET-Health assessments applied to the hillslope seep wetland

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
1	72	100	1,0	2	1,6	-2	3,1	-2
Area weighted impact scores*			1,0	2,0	1,6	-2,0	3,1	-2,0
PES Category (See Table 5.29)			B	↑↑	B	↓↓	C	↓↓

Table 14: Presentation of the results of the WET-IHI assessment applied to the Channeled Valley Bottom Wetland

OVERALL PRESENT ECOLOGICAL STATE (PES) SCORE					
	Ranking	Weighting	Score	*Confidence Rating*	PES Category
DRIVING PROCESSES:		**100**	**0,6**		
Hydrology	1	100	0,7	*3,5*	**B**
Geomorphology	2	80	0,7	*3,2*	**B**
Water Quality	3	30	0,5	*3,6*	**A/B**
WETLAND LANDUSE ACTIVITIES:		**80**	**0,7**	***3,5***	
Vegetation Alteration Score	1	100	0,7	*3,5*	**B**
Weighting needs to consider the sensitivity of the type of wetland *(e.g.: nutrient poor wetlands will be more sensitive to nutrient loading)*					
OVERALL SCORE:			**0,7**	***Confidence Rating***	
	PES %		**86,7**		
	PES Category:		**B**	***1,6***	

Table 15: Presentation of the results of the Ecoservices assessments applied to the wetland features

Ecosystem service	CVB & Seep
Flood attenuation	1,8
Streamflow regulation	1,6
Sediment trapping	1,4
Phosphate assimilation	2,1
Nitrate assimilation	2,3
Toxicant assimilation	2,1
Erosion control	2,1
Carbon Storage	2
Biodiversity maintenance	2
Water Supply	1,6
Harvestable resources	1
Cultivated foods	1
Cultural value	0,5
Tourism and recreation	0,8
Education and research	1,3
SUM	**23,6**
Average score	**1,6**

Table 16: Presentation of the results of the EIS assessments applied to the wetland features

Determinant	Score: CVB & Seep
PRIMARY DETERMINANTS	
1. Rare & Endangered Species	1
2. Populations of Unique Species	1
3. Species/taxon Richness	3
4. Diversity of Habitat Types or Features	2
5. Migration route/breeding and feeding site for wetland species	3
6. PES as determined by WET-Health assessment	3
7. Importance in terms of function and service provision	2
MODIFYING DETERMINANTS	
8. Protected Status according to NFEPA Wetveg	3
9. Ecological Integrity	3
TOTAL	21
MEAN	2,33
OVERALL EIS	**B**

APPENDIX E: Declaration and Specialists CV's

Declaration

Declaration that the specialist is independent in a form as may be specified by the competent authority

I, Stephen van Staden, declare that -

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

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing member, Ecologist, Aquatic Ecologist
Date of Birth	13 July 1979
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO)
Member of the Gauteng Wetland Forum

EDUCATION

Qualifications

MSc (Environmental Management) (University of Johannesburg)	2002
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2000
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	1999

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe
Eastern Africa – Tanzania
West Africa – Ghana, Liberia, Angola, Guinea Bissau
Central Africa – Democratic Republic of the Congo

SELECTED PROJECT EXAMPLES

Development compliance studies

- Project co-leader for the development of the EMP for the use of the Wanderers stadium for the Ubuntu village for the World Summit on Sustainable Development (WSSD).
- Environmental Control Officer for Eskom for the construction of an 86Km 400KV power line in the Rustenburg Region.
- Numerous Environmental Impact Assessment (EIA) and EIA exemption applications for township developments and as part of the Development Facilitation Act requirements.
- EIA for the extension of mining rights for a Platinum mine in the Rustenburg area by Lonmin Platinum.
- EIA Exemption application for a proposed biodiesel refinery in Chamdor.
- Compilation of an EIA as part of the Bankable Feasibility Study process for proposed mining of a gold deposit in the Lofa province, Liberia.
- EIA for the development of a Chrome Recovery Plant at the Two Rivers Platinum Mine in the Limpopo province, South Africa.
- Compilation of an EIA as part of the Bankable Feasibility Study process for the Mooihoek Chrome Mine in the Limpopo province, South Africa.
- Mine Closure Plan for the Vlakfontein Nickel Mine in the North West Province.

Specialist studies and project management

- Development of a zero discharge strategy and associated risk, gap and cost benefit analyses for the Lonmin Platinum group.
- Development of a computerised water balance monitoring and management tool for the management of

Lonmin Platinum process and purchased water.
- The compilation of the annual water monitoring and management program for the Lonmin Platinum group of mines.
- Analyses of ground water for potable use on a small diamond mine in the North West Province.
- Project management and overview of various soil and land capability studies for residential, industrial and mining developments.
- The design of a stream diversion of a tributary of the Olifants River for a proposed opencast coal mine.
- Waste rock dump design for a gold mine in the North West province.
- Numerous wetland delineation and function studies in the North West, Gauteng and Mpumalanga Kwa-Zulu Natal provinces, South Africa.
- Hartebeespoort Dam Littoral and Shoreline PES and rehabilitation plan.
- Development of rehabilitation principles and guidelines for the Crocodile West Marico Catchment, DWAF North West.

Aquatic and water quality monitoring and compliance reporting
- Development of the Resource quality Objective framework for Water Use licensing in the Crocodile West Marico Water management Area.
- Development of the Resource Quality Objectives for the Local Authorities in the Upper Crocodile West Marico Water management Area.
- Development of the 2010 State of the Rivers Report for the City of Johannesburg.
- Development of an annual report detailing the results of the Lonmin Platinum groups water monitoring program.
- Development of an annual report detailing the results of the Everest Platinum Mine water monitoring program.
- Initiation and management of a physical, chemical and biological monitoring program, President Steyn Gold Mine Welkom.
- Aquatic biomonitoring programs for several Xstrata Alloys Mines and Smelters.
- Aquatic biomonitoring programs for several Anglo Platinum Mines.
- Aquatic biomonitoring programs for African Rainbow Minerals Mines.
- Aquatic biomonitoring programs for several Assmang Chrome Operations.
- Aquatic biomonitoring programs for Petra Diamonds.
- Aquatic biomonitoring programs for several coal mining operations.
- Aquatic biomonitoring programs for several Gold mining operations.
- Aquatic biomonitoring programs for several mining operations for various minerals including iron ore, and small platinum and chrome mining operations.
- Aquatic biomonitoring program for the Valpre bottled water plant (Coca Cola South Africa).
- Aquatic biomonitoring program for industrial clients in the paper production and energy generation industries.
- Aquatic biomonitoring programs for the City of Tshwane for all their Waste Water Treatment Works.
- Baseline aquatic ecological assessments for numerous mining developments.
- Baseline aquatic ecological assessments for numerous residential commercial and industrial developments.
- Baseline aquatic ecological assessments in southern, central and west Africa.
- Lalini Dam assessment with focus on aquatic fish community analysis.
- Musami Dam assessment with focus on the FRAI and MIRAI aquatic community assessment indices.

Wetland delineation and wetland function assessment
- Wetland biodiversity studies for three copper mines on the copper belt in the Democratic Republic of the Congo.
- Wetland biodiversity studies for proposed mining projects in Guinea Bissau, Liberia and Angola in West Africa.
- Terrestrial and wetland biodiversity studies for developments in the mining industry.
- Terrestrial and wetland biodiversity studies for developments in the residential commercial and industrial sectors.
- Development of wetland riparian resource protection measures for the Hartbeespoort Dam as part of the Harties Metsi A Me integrated biological remediation program.
- Priority wetland mammal species studies for numerous residential, commercial, industrial and mining developments throughout South Africa.

Terrestrial ecological studies and biodiversity studies
- Development of a biodiversity offset plan for Xstrata Alloys Rustenburg Operations.
- Biodiversity Action plans for numerous mining operations of Anglo Platinum throughout South Africa in line with the NEMBA requirements.
- Biodiversity Action plans for numerous mining operations of Assmang Chrome throughout South Africa in

line with the NEMBA requirements.
- Biodiversity Action plans for numerous mining operations of Xstrata Alloys and Mining throughout South Africa in line with the NEMBA requirements.
- Biodiversity Action plan for the Nkomati Nickel and Chrome Mine Joint Venture.
- Terrestrial and wetland biodiversity studies for three copper mines on the copperbelt in the Democratic Republic of the Congo.
- Terrestrial and wetland biodiversity studies for proposed mining projects in Guinea Bissau, Liberia and Angola in West Africa.
- Numerous terrestrial ecological assessments for proposed platinum and coal mining projects.
- Numerous terrestrial ecological assessments for proposed residential and commercial property developments throughout most of South Africa.
- Specialist Giant bullfrog (*Pyxicephalus adspersus*) studies for several proposed residential and commercial development projects in Gauteng, South Africa.
- Specialist Marsh sylph (*Metisella meninx*) studies for several proposed residential and commercial development projects in Gauteng, South Africa.
- Project management of several Red Data Listed (RDL) bird studies with special mention of African grass owl (*Tyto capensis*).
- Project management of several studies for RDL Scorpions, spiders and beetles for proposed residential and commercial development projects in Gauteng, South Africa.
- Specialist assessments of terrestrial ecosystems for the potential occurrence of RDL spiders and owls.
- Project management and site specific assessment on numerous terrestrial ecological surveys including numerous studies in the Johannesburg-Pretoria area, Witbank area, and the Vredefort dome complex.
- Biodiversity assessments of estuarine areas in the Kwa-Zulu Natal and Eastern Cape provinces.
  Impact assessment of a spill event on a commercial maize farm including soil impact assessments.

Fisheries management studies
- Tamryn Manor (Pty.) Ltd. still water fishery initiation, enhancement and management.
- Verlorenkloof Estate fishery management strategising, fishery enhancement, financial planning and stocking strategy.
- Mooifontein fishery management strategising, fishery enhancement and stocking programs.
- Wickams retreat management strategising.
- Gregg Brackenridge management strategising and stream recalibration design and stocking strategy.
- Eljira Farm baseline fishery study compared against DWAF 1996 aquaculture and aquatic ecosystem guidelines.

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTEL PRETORIUS

PERSONAL DETAILS

Position in Company	Junior Wetland Ecologist
Date of Birth	22 March 1990
Nationality	South African
Languages	English, Afrikaans
Joined SAS	January 2016

EDUCATION

Qualifications

BSc (Hons) Environmental Sciences (North West University)	2012
BSc Environmental and Biological Sciences (North West University)	2011

COUNTRIES OF WORK EXPERIENCE

South Africa – KwaZulu Natal, Northern Cape

SELECTED PROJECT EXAMPLES

Wetland Assessments

- Baseline freshwater assessment as part of the environmental assessment and authorisation process for the proposed National Route 3 (N3) Van Reenen Village Caltex Interchange, KwaZulu Natal
- Basic assessment for the proposed construction of supporting electrical infrastructure for the Victoria West Wind Farm, Victoria West, Northern Cape Province

Basic Assessment for the development of a 5.5 ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, near Delmas, Mpumalanga.

APPENDIX F2: Terrestrial Ecology Impact Assessment

CSIR
our future through science

PIG & CHICKEN PRODUCTION FACILITY NEAR DELMAS

ECOSCAN REPORT

Compiled By:

Natural Scientific Services

126 Ballyclare Drive
Morningside
Sandton
2196
Johannesburg

Tel: (011) 787-7400
Fax: (011) 784-7599

Compiled For:

CSIR (Council for Scientific and Industrial Research)
CAS - EMS unit

11 Jan Celliers Street
Stellenbosch
7600

Tel: (021) 888 2432
Fax: (021) 888 2473

NSS Ref No: 2248
Date: May 2016

All pictures taken on site

PIG & CHICKEN PRODUCTION FACILITY NEAR DELMAS

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

126 Ballyclare Drive
Morningside Extension 40
Sandton, Johannesburg
Tel: (011) 787-7400
Fax: (011) 784-7599

Ref No: 2248
Date: May 2016

EXECUTIVE SUMMARY

Natural Scientific Services CC was approached by the Council for Scientific and Industrial Research to perform a terrestrial ecoscan (a brief floral and faunal assessment) for a proposed pig production facility and a Broiler Chicken facility on the farm Rietvallei 195 near Delmas, Mpumalanga. Desktop research and findings from our site visit indicated that the proposed development area comprises mainly cultivated pasture fields, livestock camps and farm buildings and other infrastructure. A patch of wetland, which adjoins the north-eastern corner of the proposed development area, is regarded as the most significant local biodiversity feature, as it was found to provide habitat for the rare Marsh Sylph butterfly, Marsh Owls, and potentially the Vulnerable African Grass-owl. Of additional biodiversity conservation importance is the rocky outcrop and associated rocky grassland along the southern boundary of the development area, where Conservation Important (CI) species such as the Near Threatened Coppery Grass Lizard may occur.

Without mitigation, the most significant potential impacts of the proposed project on biodiversity include:

- Disturbance of the wetland, rocky outcrop and rocky grassland areas and their associated CI species due to increased vehicle traffic, human activity, noise, dust, alien plant proliferation, unnatural wild fires, and environmental contamination.
- Environmental contamination from poor waste management and accidental spills. In 2008 a spillage of effluent from a local piggery severely impacted aquatic conditions, Giant Bullfrogs and other amphibians in the nearby Koffiespruit (Louis Van Oudtshoorn, pers. comm.).
- The introduction of alien flora with the influx of vehicles, people, construction and operation materials, and their proliferation in the absence of their effective control.

To mitigate these impacts, the following key measures are recommended:

- Revise the planned layout of the facilities and all associated infrastructure to avoid all Very High, High and Moderate-High sensitive areas as far as possible.
- Modify the design and operations of the facilities to minimize conflict with local wildlife.
- Devise effective and environmentally-friendly means of managing all waste on site, where this cannot be disposed of using an appropriate licensed facility.
- Commence (and preferably complete) construction / decommissioning during winter, when the risk of erosion, disturbing growing plants, and disturbing active (including breeding and migratory) animals, should be least.
- Demarcate the construction / decommissioning site to prevent surrounding areas and biodiversity from being disturbed or destroyed. Disturbance of the wetland and rocky grassland areas must be prohibited.
- Highlight all prohibited activities to workers through training and notices.
- No landscaping should be performed around the facilities.
- Effectively remove alien and invasive flora (especially Category 1b species) on site, using preferably mechanical methods.
- Use appropriate methods to control invertebrate and vertebrate pests.

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
AL	Alien
ARC	Agricultural Research Council
B	Breeding
CI	Conservation Important
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSIR	Council for Scientific and Industrial Research
D	Declining population trend
DD	Data Deficient
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
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)
EI	Ecological Importance
EIA	Environmental Impact Assessment
EN	Endangered
End	Endemic
ES	Ecological Sensitivity
FEPA	Freshwater Ecosystem Priority Area
GG	Government Gazette
GN	Government Notice
IA	Impact Assessment
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature and Natural Resources, based in Gland, Switzerland
LC	Least Concern
LoO	Likelihood of Occurrence of a taxon in an area
MBG	Mining and Biodiversity Guideline
MBSP	Mpumalanga Biodiversity Sector Plan
MTPA	Mpumalanga Tourism and Parks Agency
NB	Non-breeding
NBI	National Botanical Institute
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMA	National Environmental Management Act (Act 107 of 1998)
NEPAD	New Partnership for Africa's Development
NFEPA	National Freshwater Ecosystem Priority Areas project
NSBA	National Spatial Biodiversity Assessment
NSS	Natural Scientific Services CC
NT	Near Threatened
PES	Present Ecological State
Pr.Nat.Sci.	Professional Natural Scientist, registered with the South African Council for Natural

ACRONYM	DESCRIPTION
	Scientific Professions
PS	Protected Species
QDS	Quarter Degree Square – the basic unit used by the Surveyor General for creation of 1:50 000 topographical maps
S	Stable population trend
SABAP1&2	First and second Southern African Bird Atlas Projects, managed by the ADU
SANBI	South African National Biodiversity Institute
SASS5	South African Scoring System Version 5 for assessing aquatic invertebrate diversity
Sp.	Species (singular)
Spp.	Species (plural)
Subsp.	Subspecies
ToPS	Threatened or Protected Species
U	Unknown population trend
UJ	University of Johannesburg
UP	University of Pretoria
Vag	Vagrant
VU	Vulnerable
WITS	University of the Witwatersrand
WMA	Water Management Area
WRC	Water Research Commission

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. Introduction

Natural Scientific Services CC (NSS) was approached by the Council for Scientific and Industrial Research (CSIR) to perform a terrestrial ecoscan (a brief floral and faunal assessment) for a proposed pig production facility and a Broiler Chicken facility on a farm near Delmas, Mpumalanga. This report presents the findings of the ecoscan, together with a brief description of potential impacts of the proposed project on biodiversity, with recommended measures to mitigate these.

2. Project Description

The proposed development includes a 5.5ha pig production facility and a potential 2.5ha Broiler Chicken facility on Portion 6 of the farm Rietvallei 195, which straddles the R50 near Delmas, Mpumalanga (**Figure 3-1**). The project is being undertaken by CSIR as part of a "Special Needs Skills and Development Programme." The start-up enterprise, proposed by Mokate Estates (Pty), will produce 372 pigs per week, and an initial 480 600 Broiler Chickens per cycle, for slaughter. According to the CSIR, the project "will initially provide full-time employment to 10 people from the surrounding local communities of Delmas in Mpumalanga, Kwa-Thema (Springs) and Daveyton (Benoni) in Gauteng."

3. Terms of Reference

As agreed with CSIR, our desktop investigations, and field surveys on 7 March 2016 (in and within 100m around the proposed development area; **Figure 3-1**), were performed according to the methodologies described under **Appendix 13.1**, and this report includes:

- A broad description of the biophysical attributes of the study area (of relevance to the ecoscan).
- A list of applicable legislation, guidelines and standards to be considered in project planning (including e.g. whether permits may be required for the removal of certain species).
- A broad determination of the national and provincial conservation importance of local biodiversity.
- A broad assessment of the observed vegetation types and floral communities, including their structure, condition, and dominant species composition.
- Discussions on observed or potentially occurring CI (Conservation Important: Red Data, endemic, or medicinal) species.
- A list of potential impacts of the proposed project on biodiversity, and a list of recommended measures to mitigate these.
- Motivation for any recommended additional specialist biodiversity work.

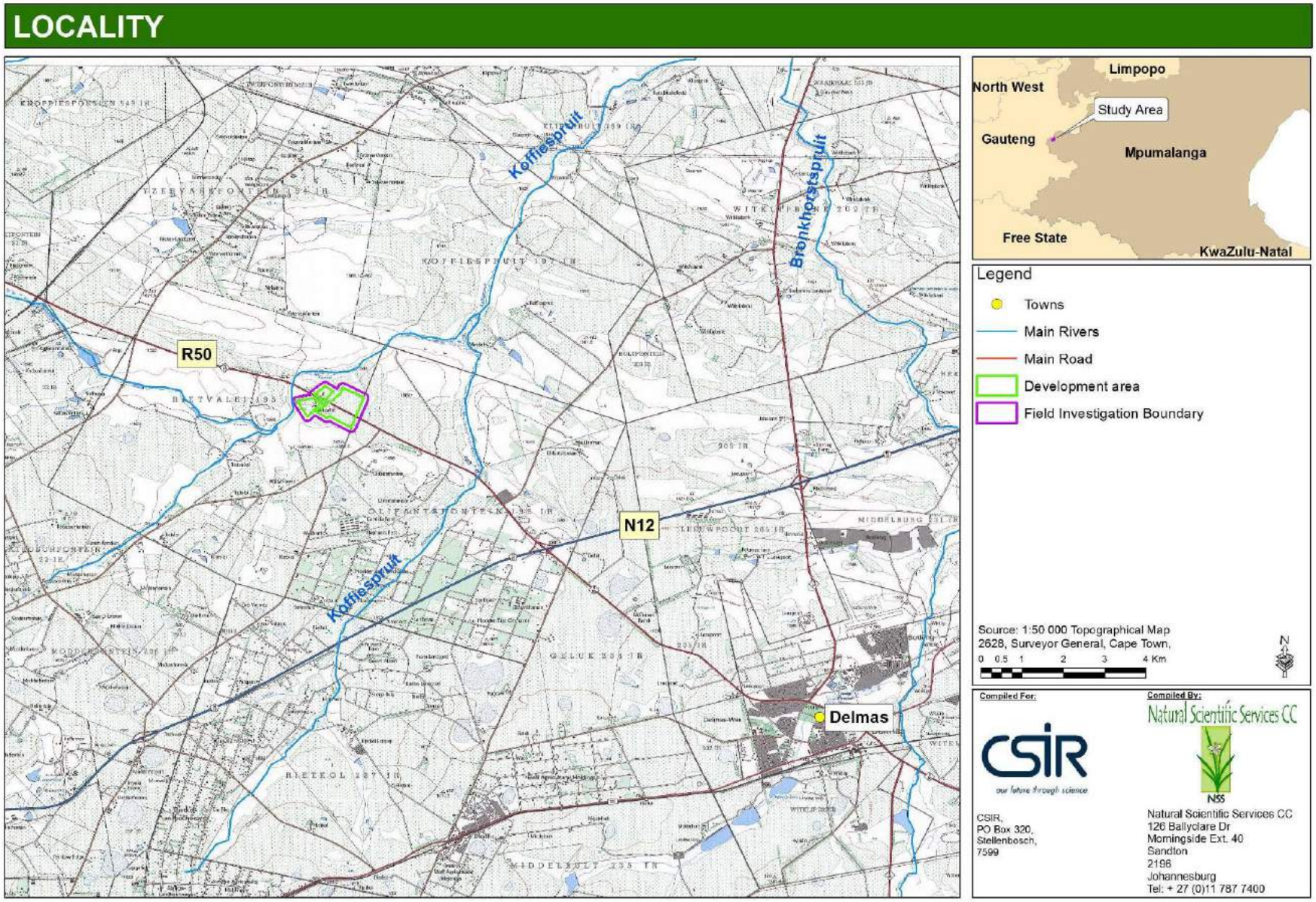

Figure 3-1 Site Location

4. NSS Team

All aspects of the ecoscan were performed by NSS (**Table 4-1**). 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, zoological and aquatic science fields.
- The senior wetland team member is acknowledged by the Department of Water and Sanitation (DWS) as a competent wetland delineator.
- The aquatics specialist is accredited with the DWS to perform the SASS5 macro-invertebrate monitoring method in South Africa.

Table 4-1 NSS project team

PROJECT ASPECT	SPECIALIST	QUALIFICATIONS
Vegetation and General Ecology	Susan Abell	M.Sc. – Resource Conservation Biology (WITS). Pr. Nat.Sci. Registered – Ecology & Environmental Science.
Fauna	Dr Caroline Lötter	Ph.D. – Zoology (UP). Pr. Nat.Sci. Registered – Zoology.
GIS Component	Tim Blignaut	M.Sc. – Geography (UJ) – in progress.

5. 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.

5.1. 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.

5.2. International Policies & Guidelines

- IFC Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management (IFC 2012).

5.3. Regional Agreements

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

5.4. 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).
- National Environmental Management: Protected Areas Act (Act 57 of 2003).
- National Environmental Management: Air Quality Act (Act 39 of 2004).
- National Environmental Management: Biodiversity Act (NEM:BA; Act 10 of 2004):
    - Threatened or Protected Species (ToPS) list and Regulations (2007).
    - National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of NEM:BA (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 (ToPS) list and Regulations (2015).

5.5. National Policies, Guidelines & Programmes

- National Aquatic Ecosystem Health Monitoring Program and River Health Program.
- South African Water Quality Guidelines (DWAF 1996).
- National Spatial Biodiversity Assessment (Driver *et al*. 2004) to identify Priority Areas and Threatened Ecosystems.
- National Biodiversity Strategy and Action Plan (DEAT 2005).
- National Water Resource Strategy (DWA 2004).
- National Protected Areas Expansion Strategy (DEA 2010).
- National Freshwater Ecosystem Priority Areas (FEPAs; Driver *et al*. 2011).
- Mining and Biodiversity Guideline (MBG; DEA *et al*. 2013).
- National Water Resource Strategy. Second Edition. (DWA 2013).

5.6. Provincial Legislation, Policies & Guidelines

- Mpumalanga Parks Board Act (Act 6 of 1995).
- Mpumalanga Nature Conservation Act (Act 10 of 1998).
- Mpumalanga Tourism and Parks Agency (MTPA) Act (Act 5 of 2005).
- MTPA Guidelines for Biodiversity Assessments (MTPA).
- Mpumalanga Biodiversity Sector Plan (MTPA 2013).

6. Study Region

6.1. Land-use

Currently the development area comprises mainly cultivated pasture fields, pockets of grassland, and farms buildings and other infrastructure, as can be seen in recent satellite imagery (Bing 2016; Google Earth 2016; **Figure 6-1**). The surrounding region mostly comprises farms of a similar nature, with the nearest large infrastructural developments representing poultry production facilities situated approximately 1.5-2km south of the development area.

6.2. Climate

The regional climate features temperate to warm wet summers and very dry winters. Mean annual precipitation for the regional vegetation type ranges between 570 mm and 730 mm. The incidence of frost ranges from 10 to 40 days (Mucina & Rutherford 2006).

Shown in **Figure 6-2** is the monthly amount of rainfall measured at Springs between 1 March 2015 and 18 March 2016 (data obtained from AccuWeather 2016). This approximate rainfall data indicates that during the 12-month period preceding our site visit, the region had received a slightly-below annual average amount of roughly 500mm rain.

Shown in **Figure 6-3** is the hourly air temperature measured at Springs on 7 March 2016. This approximate temperate data indicate that weather conditions were hot during the site visit. The daily minimum temperature was 16^0C at 7am, and increased to a maximum of 30^0C at 2pm (Weatherspark 2016).

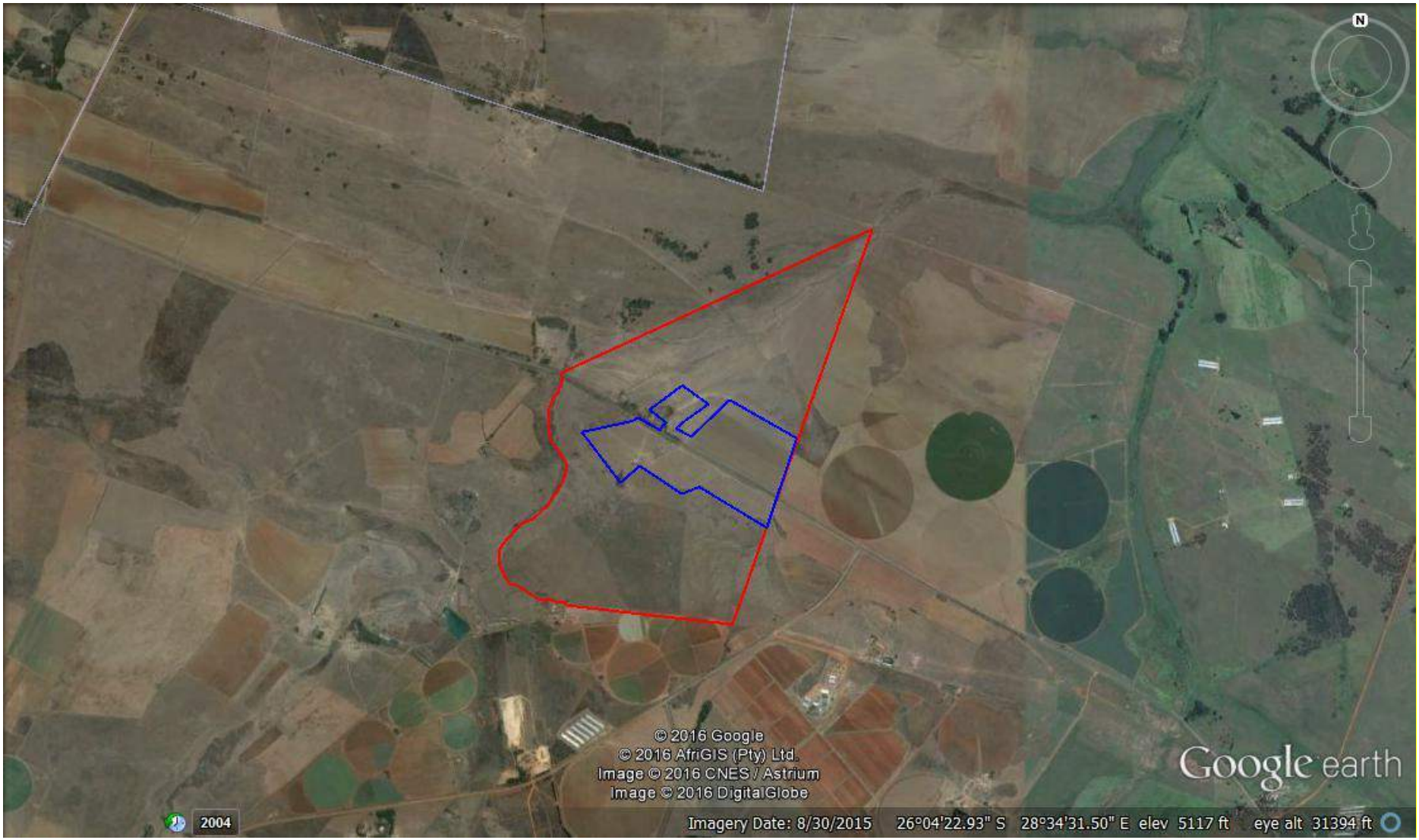

Figure 6-1 2015 satellite imagery from Google Earth (2016), showing land-use in and around the farm (red boundary) and development zone (blue boundary)

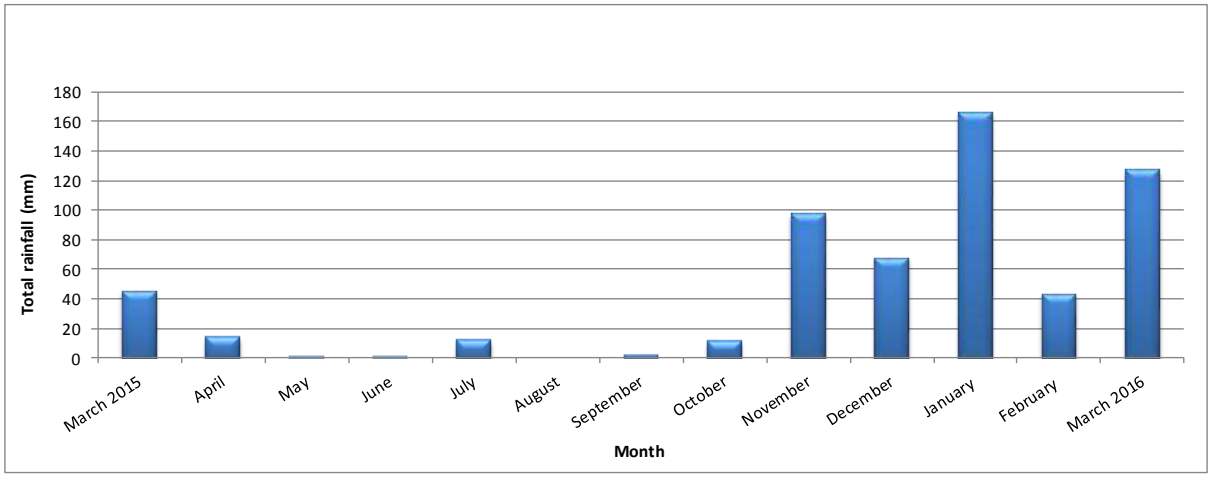

Figure 6-2 Monthly rainfall measured at Springs between 1 March 2015 and 18 March 2016 (AccuWeather 2016)

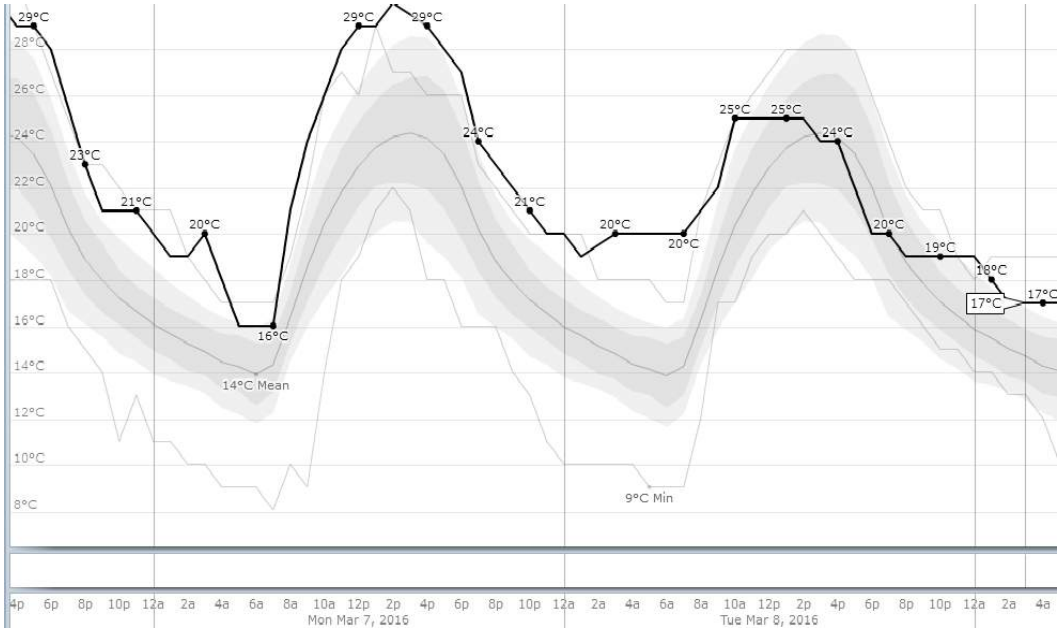

Figure 6-3 Air temperature measured at Springs on 7 March 2016 (Weatherspark 2016)

6.3. 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, the development area is situated in a single land type referred to as Ba3 (**Figure 6-4**). This land type features variable landscapes with extensive undulating plains with elevated ridges. The quartzite ridges support soils of various quality but especially shallow Glenrosa and Mispah forms. Within the development area the elevation ranges from approximately 1 551m to 1 578m a.s.l., and hard pan ferricrete is widespread,

which limits commercial crop cultivation, and likely explains why livestock farming and pasture fields have instead been practiced.

6.4. Regional Vegetation

The development area is situated in the Grassland Biome within the Gm 11 Rand Highveld Grassland vegetation type (**Figure 6-4**), defined by Mucina & Rutherford (2006). Rand Highveld Grassland represents a wiry, sour and species-rich type of grassland on plains that are interspersed with low, sour shrubland on rocky slopes and outcrops.

Most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon,* and *Elionurus*. There is typically a high diversity of herbs, many of which belong to the Asteraceae. Rocky hills and ridges support sparse woody clumps with *Protea caffra* subsp. *caffra*, *Protea welwitschii, Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Searsia* (especially *S. magalismontana*) is most prominent.

Almost 50% of Rand Highveld Grassland has been transformed by cultivation, plantations, urbanization, dam-building, and alien plant invasion. Only 1% is statutorily conserved and, therefore, this vegetation type is listed as Endangered by Mucina & Rutherford (2006). Dominant, biogeographically important, and endemic taxa within the Rand Highveld Grassland vegetation type are listed in **Table 6-1**.

Table 6-1 Rand Highveld Grassland flora

GROWTH FORM	DOMINANT TAXA
Low Shrubs:	*Anthospermum rigidum* subsp. *pumilum, Indigofera comosa, Searsia magalismontana, Seriphium plumosum*
Succulent Shrub:	*Lopholaena coriifolia*
Geoxylic Suffrutex:	*Elephantorrhiza elephantina*
Graminoids (grasses):	*Ctenium concinnum, Cynodon dactylon, Digitaria monodactyla, Diheteropogon amplectens, Eragrostis chloromelas, Heteropogon contortus, Loudetia simplex, Monocymbium ceresiiforme, Panicum natalense, Schizachyrium sanguineum, Setaria sphacelata, Themeda triandra, Trachypogon spicatus, Tristachya biseriata, Tristachya rehmannii*
Geophytic Herbs:	*Boophone disticha, Cheilanthes hirta, Haemanthus humilis* subsp. *humilis, Hypoxis rigidula* var. *pilosissima, Ledebouria ovatifolia, Oxalis corniculata.*
Succulent Herb:	*Aloe greatheadii* var. *davyana*
Herbs:	*Acanthospermum australe, Justicia anagalloides, Pollichia campestris*
	BIOGRAPHICALLY IMPORTANT TAXA
Geophytic Herbs:	*Agapanthus inapertus* subsp. *pendulus, Eucomis vandermerwei*
Succulent Herb:	*Huernia insigniflora*
Low Shrub:	*Melhania randii*

	ENDEMIC TAXA
Herbs:	*Melanospermum rudolfii, Polygala spicata*
Succulent Herbs:	*Anacampseros subnuda* subsp. *lubersii, Frithia humilis*
Succulent Shrubs:	*Crassula arborescens,* subsp. *undulatifolia, Delosperma purpureum*
Small Trees:	*Encephalartos lanatus, Encephalartos middelburgensis*

6.5. Hydrology

The unnamed tributary that flows adjacent to the development area joins the Koffiespruit approximately 2.5km downstream. Presented in **Table 6-2** is a summary of the Present Ecological State (PES), Ecological Importance (EI), Ecological Sensitivity (ES) and current impacts on the Koffiespruit and its unnamed tributary, as provided by the DWS (2014). The (desktop-determined) PES of the Koffiespruit and its tributary is largely natural (a B category) with only few modifications. A small change in natural habitats and biota has occurred, but ecosystem functions appear to be predominately unchanged. Water quality, and instream and riparian habitats have been impacted by water abstraction and damming. The EI of the Koffiespruit and its tributary is moderate as the local sub-quaternary catchment coincides with the Endangered Rand Highveld Grassland vegetation type (Mucina & Rutherford 2006), with wetland and riparian habitats, as well as locality records for two Protected and two endemic species. The Koffiespruit and its tributary have a high ES since small streams are typically more sensitive to changes in water levels and flow conditions compared to large rivers. The Koffiespruit and its unnamed tributary are classified as Endangered, Upper Foothill systems, and are not protected (Driver *et al*. 2011; Nel & Driver 2012). The Koffiespruit flows in a north easterly direction and eventually joins the Bronkhorstspruit.

Table 6-2 Summary of the Ecostatus and impacts of the Koffiespruit and its tributary

QUATERNARY CATCHMENT	WATER RESOURCE	PRESENT ECOLOGICAL STATE (PES)	ECOLOGICAL IMPORTANCE (EI)	ECOLOGICAL SENSITIVITY (ES)	CURRENT IMPACTS
B20B	Tributary of the Koffiespruit	**B Largely natural**	**Moderate**	**High**	Dams and abstraction

The proposed development area is situated within the Level 1 (Highveld) Ecoregion 11 and Level 2 Eco-region 11.03, and the Bronkhorstspruit B20B quaternary catchment in the Upper Olifants Water Management Area (WMA) 4 (**Figure 6-5**). The Bronkhorstspruit quaternary catchment drains an area of approximately 574km^2, and the Bronkhorstspruit flows for approximately 77km before its confluence with the Wilge River, which flows for 120km before it reaches the upper Olifants River, upstream from the Loskop Dam.

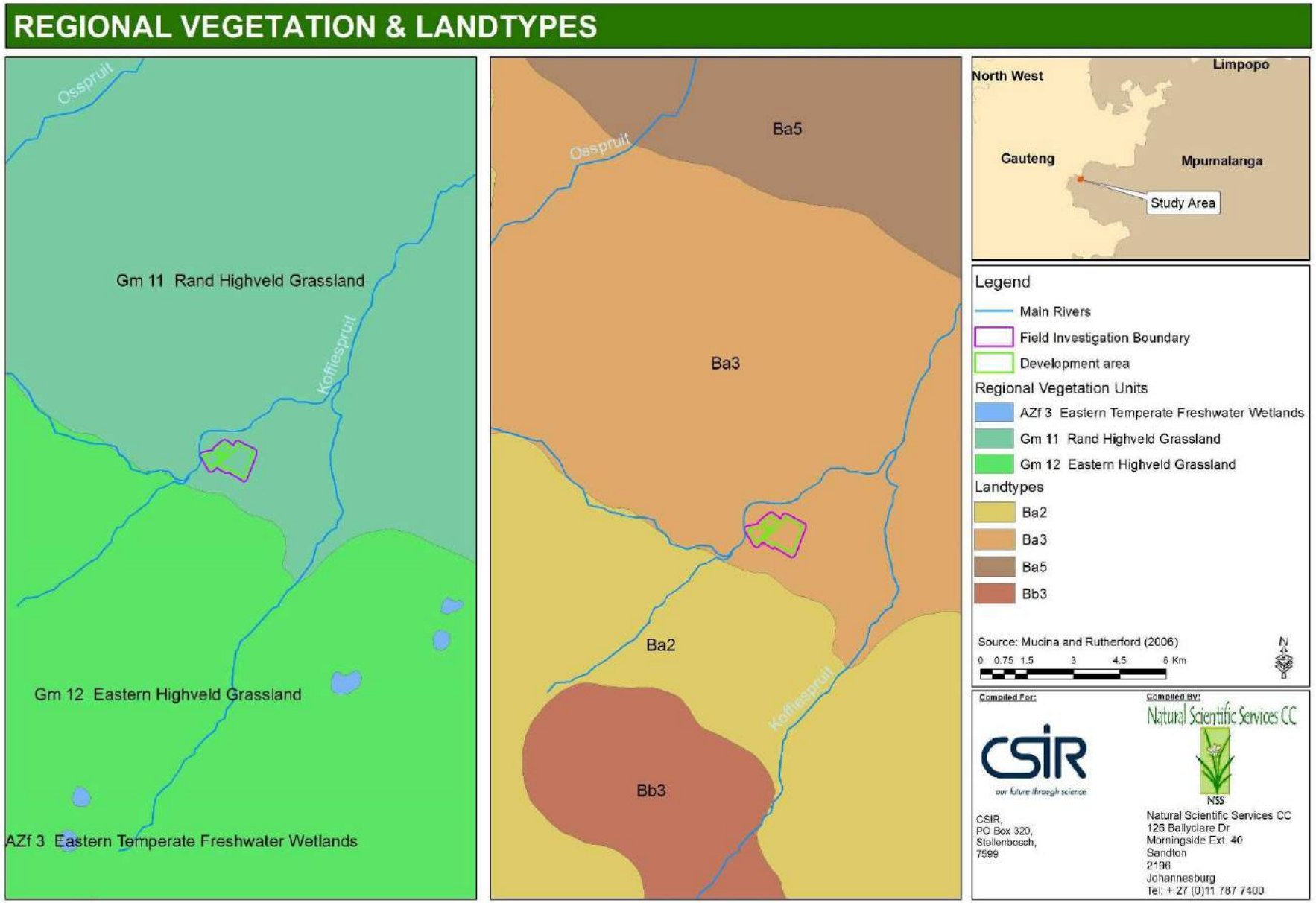

Figure 6-4 Regional vegetation and land types

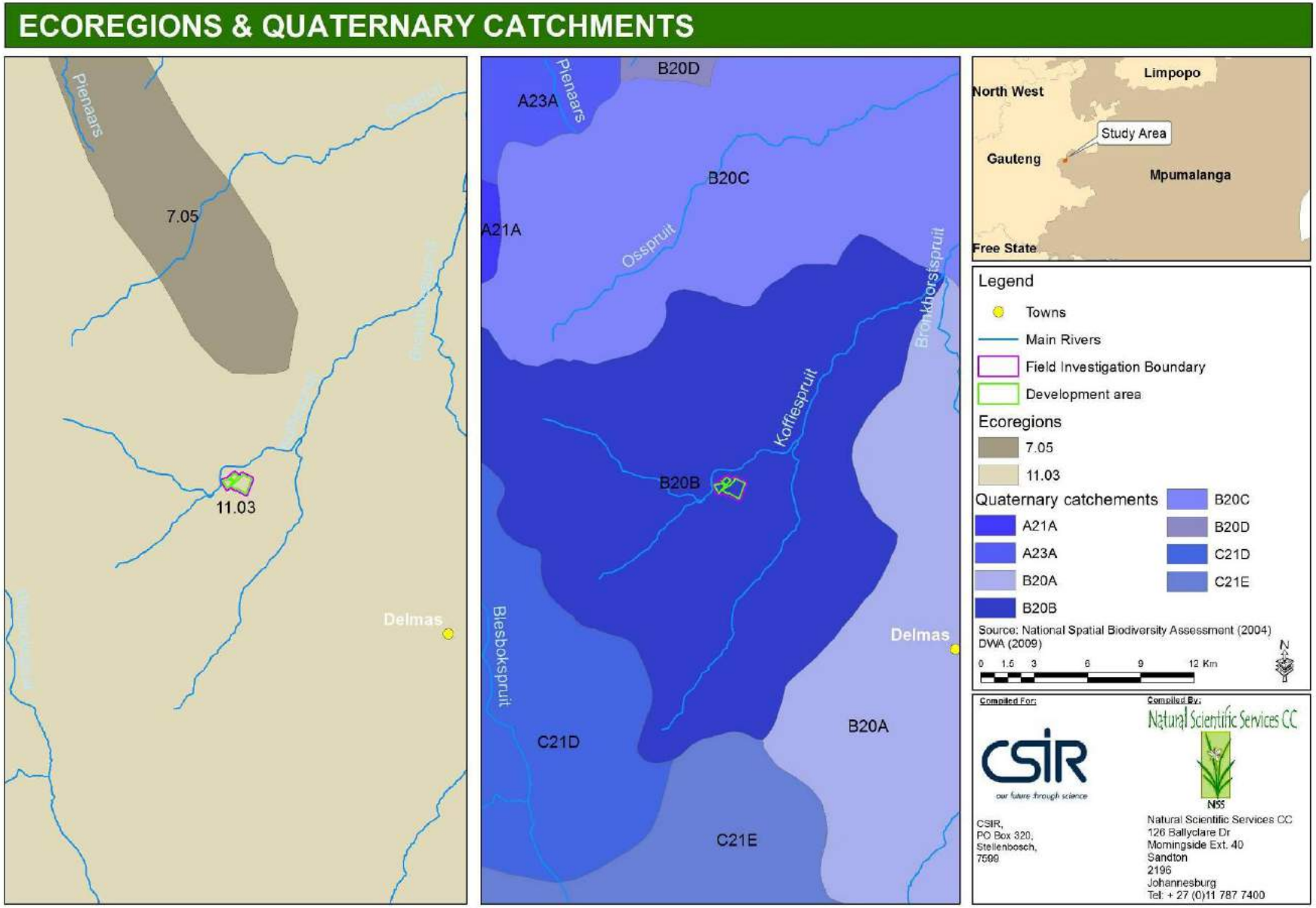

Figure 6-5 Ecoregions and quaternary catchments

The Bronkhorstspruit catchment falls within the jurisdiction of the Department of Water and Sanitation (DWS) which manages the water quality of the Olifants River and all the tributaries impacting the water quality of the river and dams on the River, such as the Witbank and Loskop Dams. In recent times there have been serious pollution problems on the tributaries of the Olifants River, the Olifants River itself and the dams on the river, resulting in fish kills and associated loss of wildlife; such as a serious decline in the crocodile numbers in the Loskop Dam.

The Olifants River catchment, covering an area of approximately 54 570 km^2, is of considerable economic importance as a significant number of mining, industrial and agricultural activities (including intensive irrigation schemes) are concentrated within it. It is critical that any pollution from the proposed pig and poultry production facilities is tightly controlled to prevent contributing further to the problems and challenges faced by the Olifants River.

6.6. Conservation Important Biodiversity Features

As inferred in the preceding legislation section of this report, a number of biodiversity features in the region, which are of recognized national or provincial conservation importance, require consideration.

6.6.1. Terrestrial Priority Areas & Threatened Ecosystems

The Terrestrial Component (Rouget *et al.* 2004) of the National Spatial Biodiversity Assessment integrated data on species, habitats and ecological processes to identify areas of greatest terrestrial biodiversity significance. This resulted in the identification of nine spatial terrestrial Priority Areas, which represent high concentrations of biodiversity features and/or areas where there are few options for meeting biodiversity targets. The proposed development is situated in the Moist Grasslands Priority Area (**Figure 6-6**). Of the nine terrestrial Priority Areas identified during the NSBA, Moist Grasslands were identified as being the most threatened by socioeconomic development and, consequently, have the highest priority ranking in terms of biodiversity conservation (NBI 2004).

A list of Threatened Ecosystems within each terrestrial Priority Area was gazetted on 9 December 2011 under the NEM:BA (Act 10 of 2004). The Threatened Ecosystems occupy 9.5% of South Africa, and were selected according to six criteria which included: (1) irreversible habitat loss; (2) ecosystem degradation; (3) rate of habitat loss; (4) limited habitat extent and imminent threat; (5) threatened plant species associations; and (6) threatened animal species associations. The proposed development area is situated in the Rand Highveld Grassland (Endangered vegetation type and) Threatened Ecosystem (**Figure 6-6**), of which only 1% is formally protected (Mucina & Rutherford 2006).

6.6.2. Water Resources

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."*

6.6.3. 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.

A top ranked wetland FEPA is situated on the unnamed tributary of the Koffiespruit approximately 4km upstream of the proposed development area. Other wetland and riverine areas in the vicinity of the development area are "unclassified" under NFEPA (**Figure 6-7**). However, the current "unclassified" status of wetlands and streams under the NFEPA does not mean they are not conservation important. Indeed, according to the more recent Mpumalanga Highveld Wetlands project (SANBI 2014), FEPAs have since been identified on a tributary of the Koffiespruit, which are situated approximately 0.5-1.5km upstream of the proposed development site.

The NFEPA guidelines state that FEPAs (including wetland clusters) should be regarded as ecologically important and as generally sensitive to changes in water quality and quantity, owing to their role in protecting freshwater ecosystems and supporting sustainable use of water resources. FEPAs that are in a good condition should remain so, and FEPAs that are not in a good condition should be rehabilitated to their best attainable ecological condition. Land-use practices or activities that will lead to deterioration in the current condition of a FEPA are considered unacceptable, and land-use practices or activities that will make rehabilitation of a FEPA difficult or impossible are also considered unacceptable.

6.6.4. Mpumalanga Sector Plan

The Mpumalanga Biodiversity Sector Plan (MBSP) is the outcome of systematic conservation planning by the Mpumalanga Tourism and Parks Agency (MTPA 2013) for improved conservation of biodiversity in this province.

The entire proposed development area has been classified by the MBSP as "Modified," with the exception of three small patches of rocky grassland in the south, which have been classified as "Other Natural Areas," but which have less conservation priority relative to identified provincial Critical Biodiversity and Ecological Support areas.

6.6.5. Mining and Biodiversity Guideline

The Mining and Biodiversity Guideline (MBG) interprets the best available biodiversity knowledge and science in terms of the implications and risks for mining in a practical and user-friendly guideline for integrating relevant biodiversity information into decision making. Although the proposed development is not related to mining, the Guideline nonetheless provides a usefull indication of the relative sensitivity of biodiversity in a given area.

According to the Guideline atlas, a large portion of the proposed development area has been classified as having the "Highest Importance" for biodiversity (**Figure 6-10**). Areas of Highest Biodiversity Importance include Ramsar sites, Critically Endangered and Endangered Ecosystems (in this case, the Endangered Rand Highveld Grassland Threatened Ecosystem), river and wetland FEPAs and a 1km buffer around these (in this case, the nearest upstream FEPA and its 1km buffer), and Critical Biodiversity Areas from provincial spatial biodiversity plans. The MBG stipulates that in areas of Highest Importance for Biodiversity:

"*Environmental screening, EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licences, and environmental authorisations*."

This biodiversity assessment provides confirmation that a large part of the proposed development area has been transformed by agricultural activities and limited vegetation typical of Rand Highveld Grassland remains. Potential impacts of the proposed development on local water resources, especially those downstream of the development area, are, however, a concern.

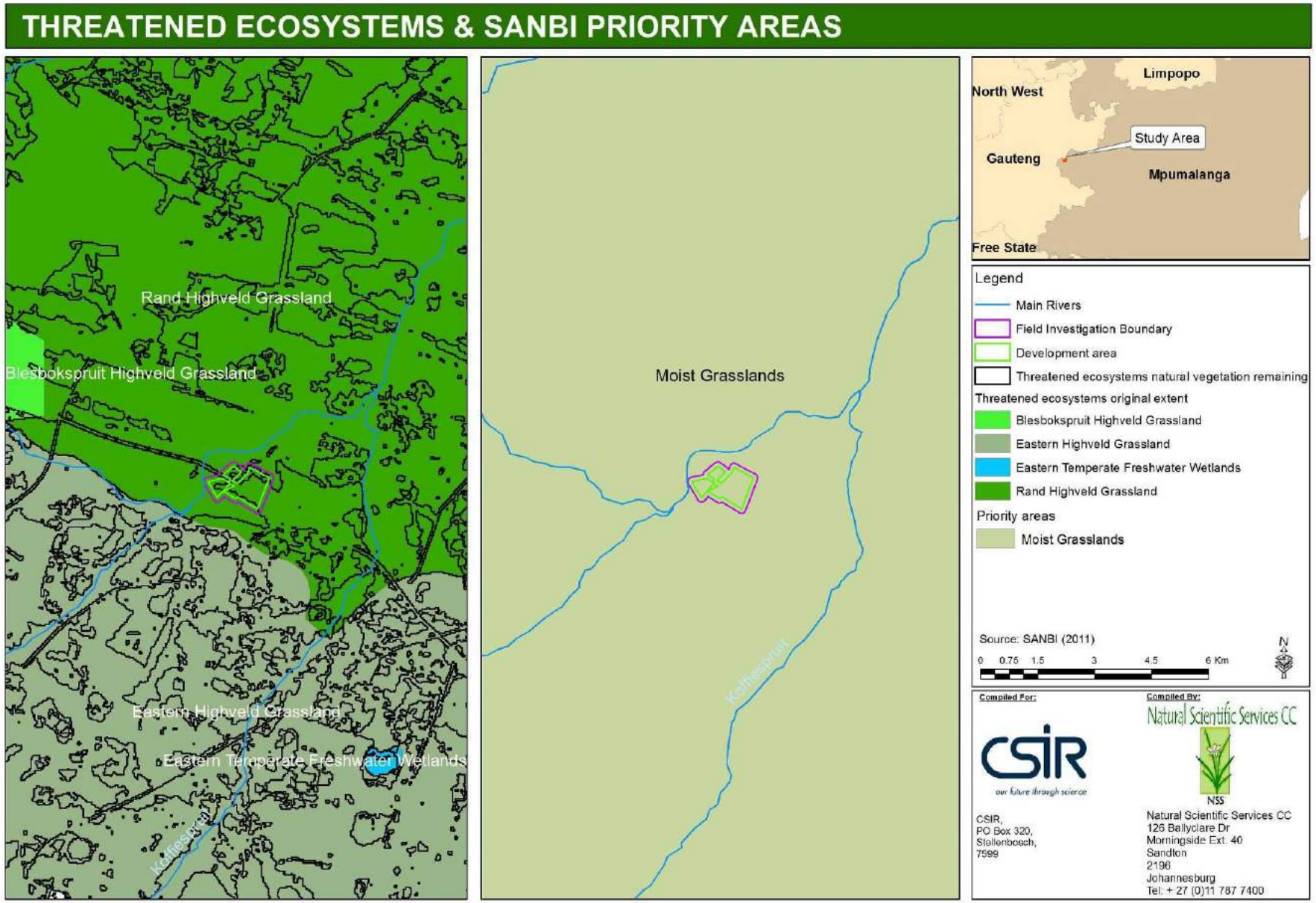

Figure 6-6 Terrestrial Priority Areas and Threatened Ecosystems

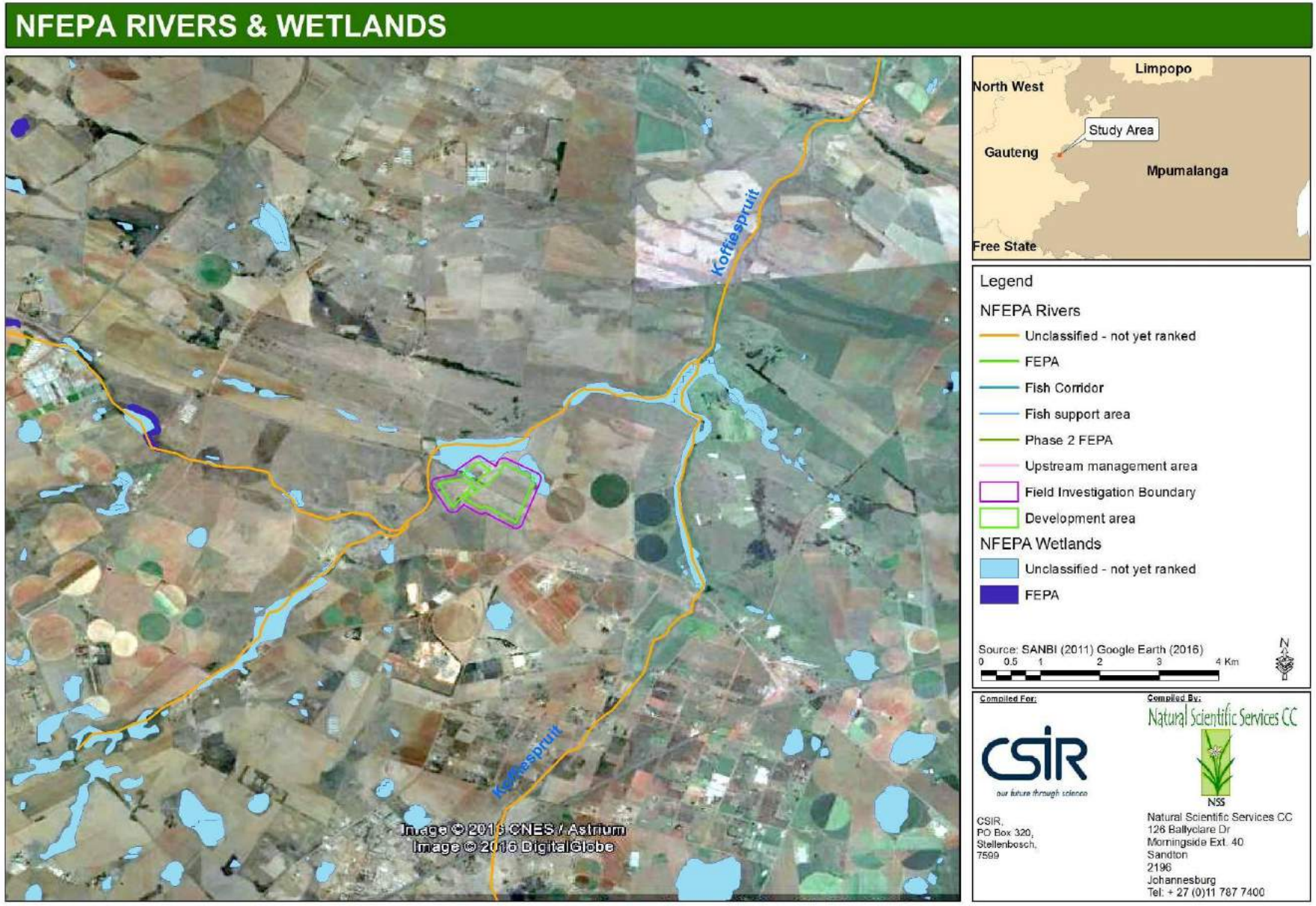

Figure 6-7 Freshwater Ecosystem Priority Areas

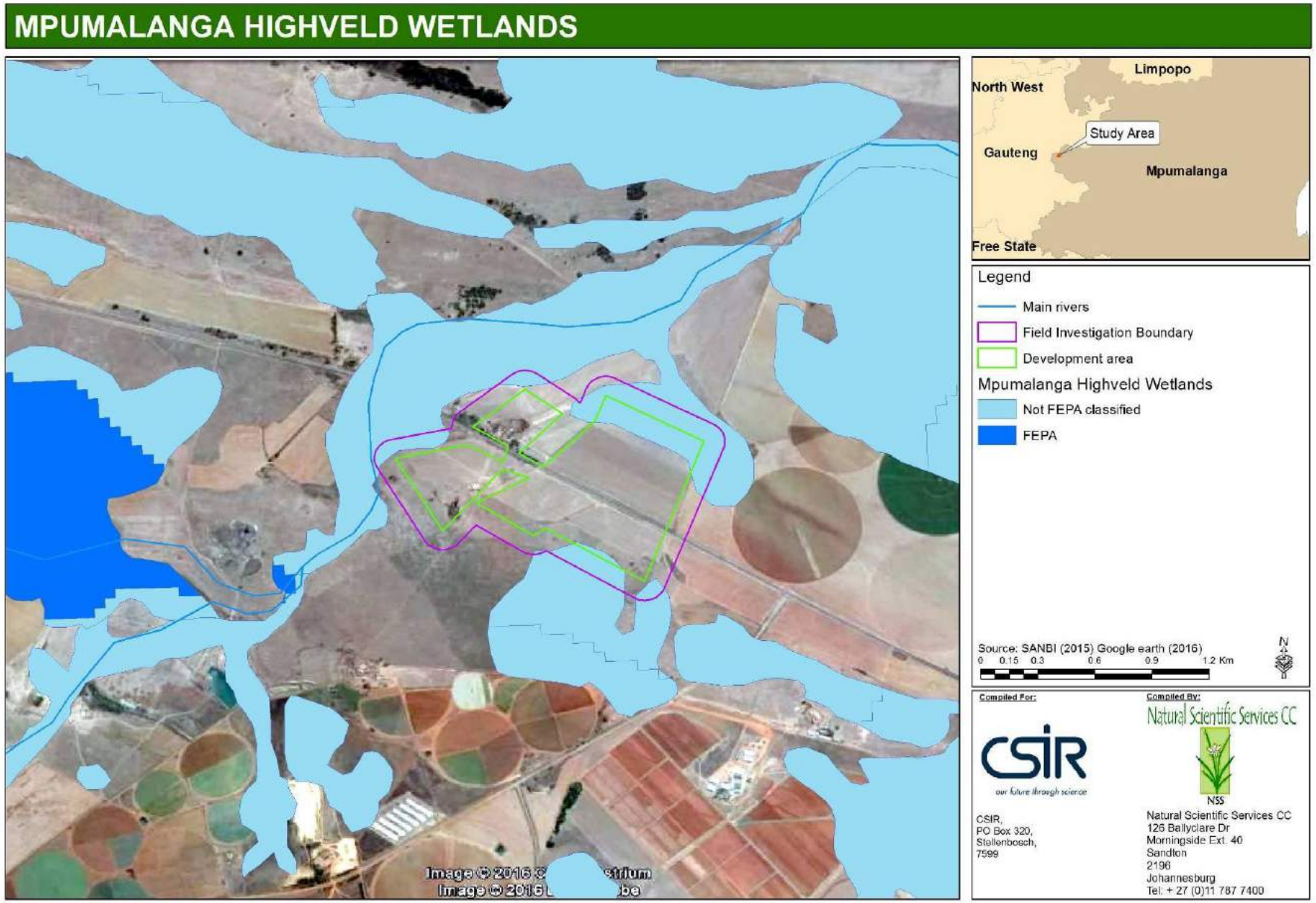

Figure 6-8 Mpumalanga Highveld Wetlands Project

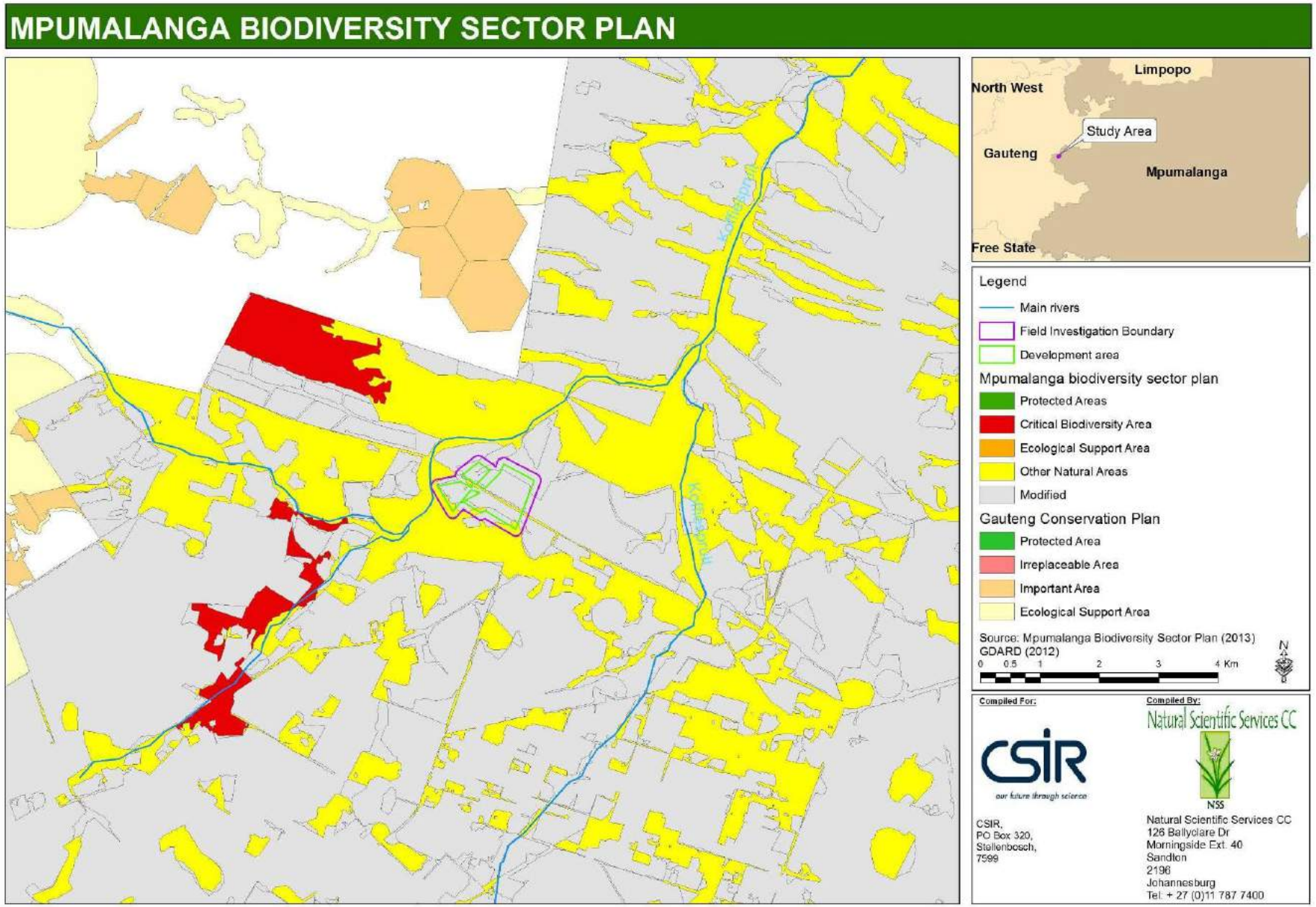

Figure 6-9 Mpumalanga Sector Plan

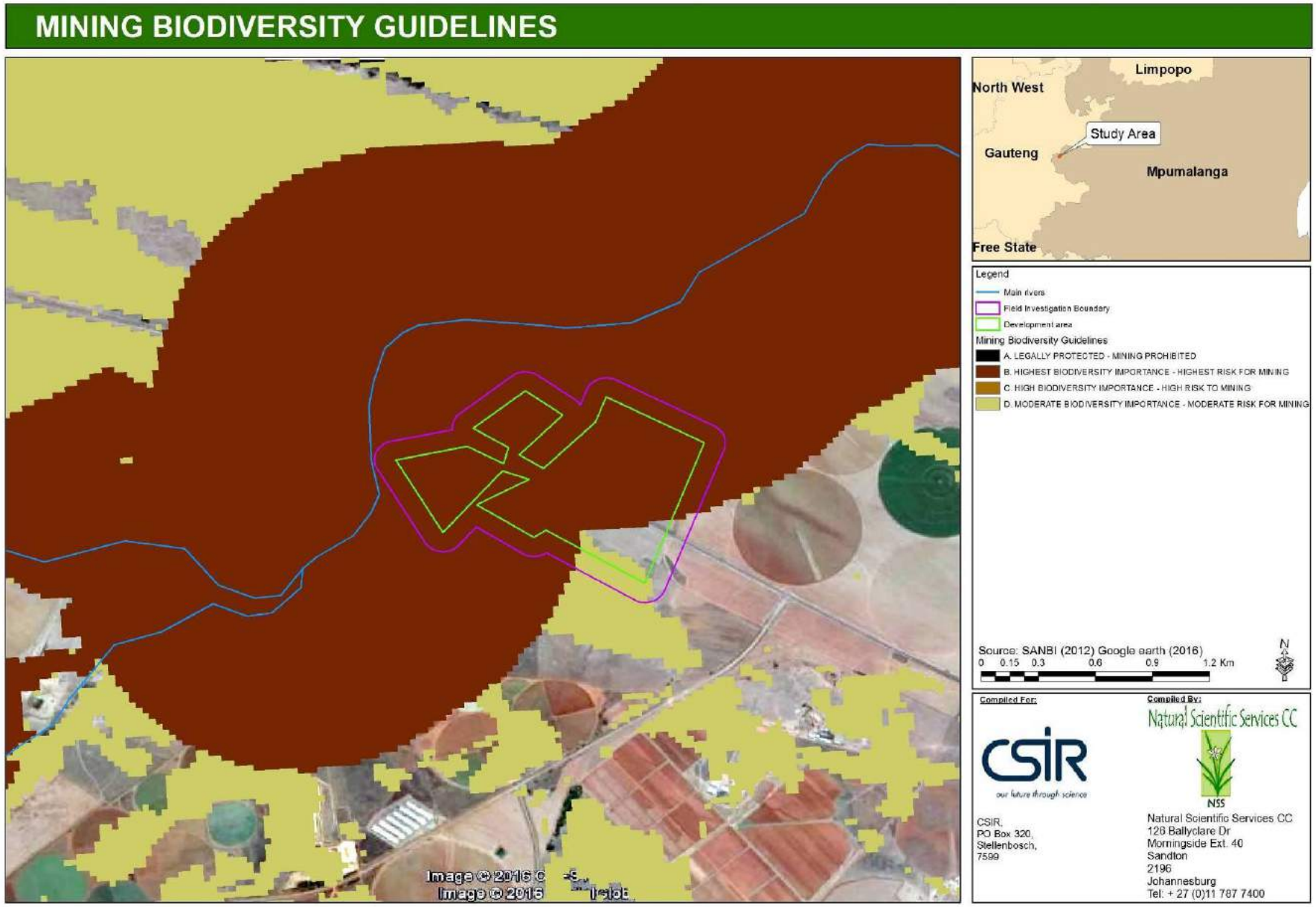

Figure 6-10 Mining and Biodiversity Guideline

7. Methodology

The ecological scan involved desktop research and field surveys, which were performed on 7 March 2016 in the site and within 100m around the proposed development area.

7.1. Vegetation & Floral Communities

As this is an ecological scan for a 71 hectare site, largely transformed through agricultural activities, detailed sampling for vegetation communities was not conducted. In addition, the field investigation included an additional 100m buffer around the site (total study area – 123 hectares) for surveying purposes and investigating possible edge effects.

Although the site was largely disturbed and transformed, sampling methods such as Braun-Blanquet cover-abundance approach (Mueller-Dombois & Ellenberg, 1974) was, however, used as a basis to form broader habitat units but not analysed using TWINSPAN. The vegetation component therefore included:

- A desktop assessment of the vegetation within the region and potential community structure based on the information obtained from:
  - SANBI's[1] Plants of South Africa (POSA) 2628BA
  - Mucina & Rutherford's (2006) vegetation map of southern Africa.
  - The current Mpumalanga Sector Plan.
  - CI plant species records in the study region obtained through POSA
- A one day field investigation, which entailed walking transects and sampling points (as shown in **Figure 7-1**):
  - Noting species, habitats and cover abundance. Plant taxa were identified to species level (some cases, *cf* would be used if identification was limiting – *cf* means 'confer' or 'looks like'). Scientific names follow POSA (Accessed, March 2016).
  - Recording any observed alien and invasive plant species on site was also conducted. The identification of declared weeds and invader species as promulgated under: the NEMBA August 2014 regulations (GG37885); and the amended regulations (Regulation 15) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).
- Reporting including vegetation community descriptions, mapping of broad habitat types / vegetation communities and CI species analysis. For CI floral species, Likelihood of Occurrence (LO) rating is assigned to each species based on the availability of suitable habitat using the following scale: Present; Highly likely; Possible; Unlikely or No Habitat available

[1] The South African National Biodiversity Institute

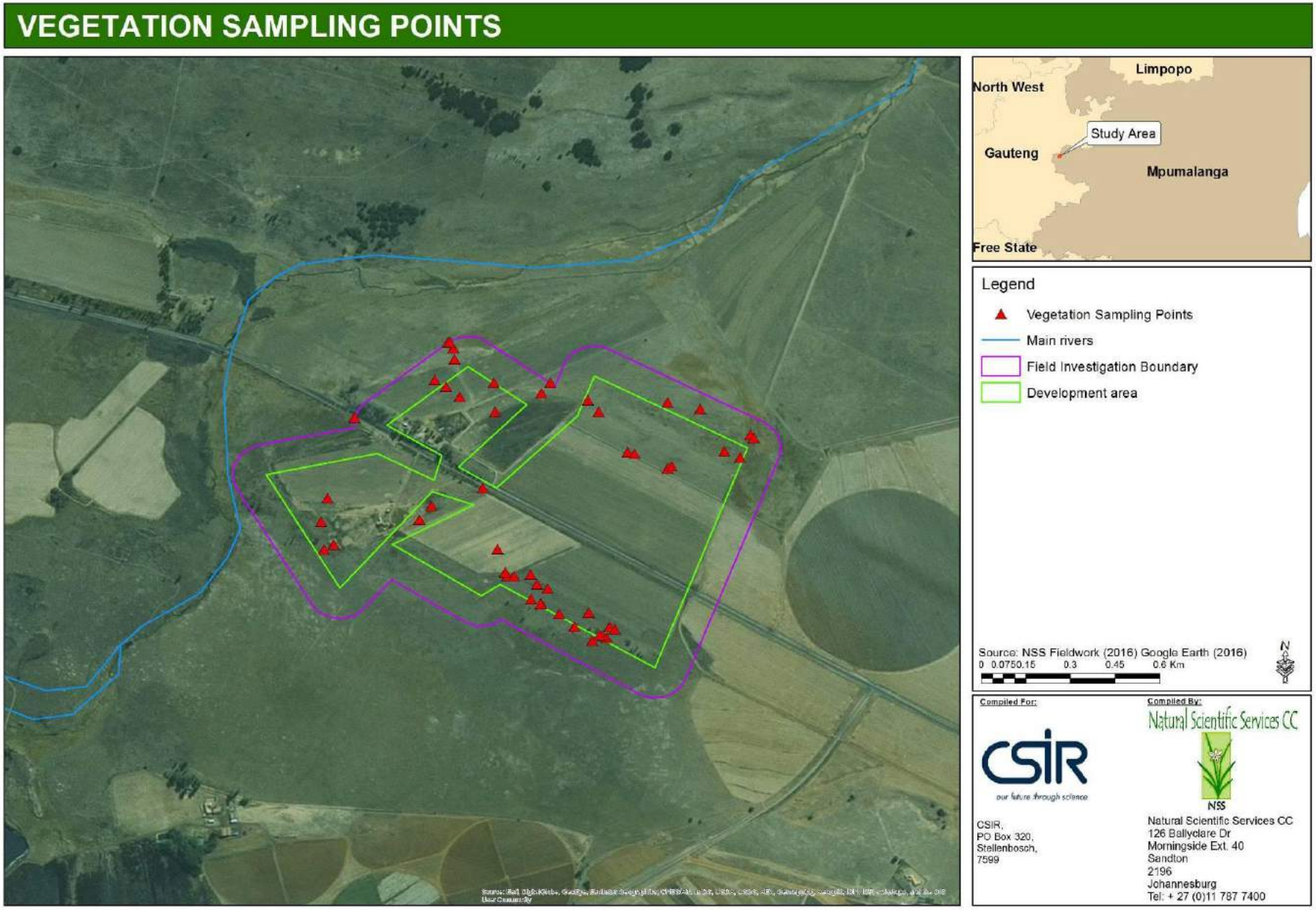

Figure 7-1 Main vegetation sampling points

7.1.1. Limitations

It is important to note that certain plant species, which were not detected during our site visit, are not necessarily absent. Possible reasons for not detecting species include:

- The inconspicuous nature of certain species due to their small size, short flowering time, rarity, etc.
- The small, fragmented nature of the site and disturbances from farming activities on site.
- The short duration of fieldwork and the timing of the fieldwork (during Late Summer).
- Some plant species, which are small, have short flowering times, rare or otherwise difficult to detect may not have been detected even though they were potentially present on site.
- Vegetation mapping was based on the brief in-field survey as well as aerial imagery. Positioning of the vegetation units may not be exact due to potential georefrencing errors displayed in Google Earth, GPS accuracy in field as well as the age of the aerial image.

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 (2016).
- Birds, using the latest online list of bird species from the second Southern African Bird Atlas Project (SABAP 2) for pentad 2600_2830, which included records of bird species that were observed in QDS 2628BA during the first SABAP (SABAP 1). Bird species were classified according to a modified version of Newman's (2002) 12 bird categories, which are described under **Appendix 13.2.**
- Reptiles, using the published species distribution maps in Bates *et al*. (2014), and online species distribution data from ReptileMAP (2016).
- Frogs, using the published species distribution maps in Minter *et al*. (2004), and online species distribution data from FrogMAP (2016).
- Butterflies, using LepiMAP's (2016) online list of recorded butterfly species from QDS 2628BA, and supplemental information published in Mecenero *et al*. (2013).
- Odonata, using the published distribution maps in Samways (2008). Currently, OdonataMAP has no records from QDS 2628BA.
- Scorpions, using the published species distribution maps in Leeming (2003). Currently, ScopionMAP cannot be used to generate geographic species lists.

The lists were refined based on our field observations, where the Likelihood of Occurrence (LoO) of each species was rated using the following scale:

1 Present: the species, or signs of its presence, was observed on or adjacent to the site by NSS, or in the region by SABAP observers.

2 High: the species is highly likely to occur, based on available distribution data, and observed habitats.
3 Moderate: the species may occur, based on available distribution data, and observed habitats and disturbances.

7.2.2. Fieldwork

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

7.2.3. Conservation Status of Species

In the appended faunal lists:

- The global Red List status of species is provided, as determined by the IUCN.
- The status of species under the National Environmental Management: Biodiversity Act (NEM:BA 2004) is given, as indicated for mammals, birds, reptiles and scorpions in the 2015 list of Threatened or Protected Species (ToPS), and as indicated for frogs and butterflies in the 2007 ToPS list.
- The regional or national Red Data status is provided for:
  - Mammals as stated in Friedmann & Daly (2004).
  - Birds as stated in Taylor *et al.* (2015).
  - Reptiles as stated in Bates *et al.* (2014).
  - Frogs as stated in Minter *et al.* (2004) and Measey (2011).
  - Butterflies as stated in Mecenero *et al*. (2013).
  - Dragonflies and damselflies (i.e. odonata) as stated in Samways (2006).

An atlas and Red Data book for South African scorpion species has not yet been published. Species with a threatened status in Mpumalanga (MTPA pers. comm.) are mentioned in text. Due to spatio-temporal variation in human disturbances, the conservation status of some species differs between the IUCN, the relevant national Red Data assessment publication, the NEM:BA, and the MTPA. *Unless otherwise stated, the most threatened status of a species is provided in text, whether this is at a global or other spatial scale.*

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.
- The site visit was performed in late summer (i.e. March), when many animal species become less active or prepare to migrate.
- Some species, which are uncommon, small, migratory, secretive or otherwise difficult to detect may not have been detected even though they were potentially present.

- As the list of potentially occurring bird species was derived from the latest online list of bird species for pentad 2600_2830 from the SABAP 2 (2016), some additional bird species that are not listed could occur in the area.
- As the list of potentially occurring butterfly species was obtained from LepiMAP's (2016) online list of recorded butterfly species from QDS 2628BA, some additional butterfly species that are not listed may occur in the area.

7.3. 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 7-1**);
- Impact duration (**Table 7-2**);
- Potential impact intensity (**Table 7-3**);
- Impact reversibility (high, moderate, low or irreversible);
- Irreplaceability of the impacted resource (high, moderate, low or replaceable);
- Impact probability (**Table 7-4**);
- Our confidence in the ratings (high, moderate or low);

Overall impact significance (**Table 7-5**) is calculated as:

Impact significance = Impact magnitude x Impact probability

where:

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

Table 7-1 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 7-2 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 stop at the end of the construction period*	1

DURATION DESCRIPTION	SCORE
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 palaeontological resource on site caused by construction activities is permanent and would be irreversible.*	5

Table 7-3 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[2] (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[3], 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 7-4 Rating of impsct 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

[2]*Note that a loss of species is a global issue and is differentiated from a loss of "floral/faunal" populations.*
[3]*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 7-5 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. Terrestrial Biodiversity Results

8.1. Vegetation Communities / Habitats

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 with 2628BA. This QDG is under sampled as species recorded do not exceed 67 species (Date extracted April 2016). For the purpose of comparative analysis, the 2628B set of QDGs was used. This yielded 155 species of 41 families. The dominant families being, POACEAE, APOCYNACEAE, and ASTERACEAE (**Table 8-1**), with the herbs representing 23.23%, graminoids representing 19.35% and geophytes representing over 15.48% of the total species listed for the area (**Table 8-1**).

In terms of the site, structural representation was following the trend presented within the larger region (2628B QDGs), with forbs (herbs) and graminoids being the most dominant – typical of grassland habitats **(Table 8-1**).

Table 8-1 Top ten dominant families and most dominant growth forms obtained from the POSA website for the QDS 2628B and on Site

IMPORTANT FAMILIES	No. OF SPP	GROWTH FORMS	% TOTAL SPP	ON SITE
POACEAE	30	Herb	23.23	42.11
APOCYNACEAE	15	Graminoid	19.35	29.47
ASTERACEAE	14	Geophyte	15.48	6.32
IRIDACEAE	10	Bryophyte	7.74	-
RICCIACEAE	9	Succulent	13.56	2.11
CYPERACEAE	8	Cyperoid	5.16	5.26
FABACEAE	8	Dwarf shrub	5.16	2.11

IMPORTANT FAMILIES	No. OF SPP	GROWTH FORMS	% TOTAL SPP	ON SITE
HYACINTHACEAE	5	Helophyte	3.87	1.05
AMARYLLIDACEAE	4	Hydrophyte	3.87	
ASPHODELACEAE	4	Parasite	1.29	
		Shrubs*		7.37
		Trees*		4.21

*mainly dominated by alien species

8.1.1. Vegetation Communities

From the field investigations the study area was predominantly flat to slightly undulating with very homogenous vegetation structure. The majority of the site was transformed through agricultural practices with 30% being pasture fields and over 20% being past fields (**Table 8-5, Figure 8-2, Figure 8-3**). Therefore only slight variations in vegetation structure could be seen with the following habitat groups being defined (Error! Reference source not found.):

- Natural Grassland habitat pockets
  - *Agrostis – Imperata - Arundinella Wetland*
  - *Seriphium - Gnidia Rocky Outcrops*
  - *Seriphium - Eragrostis Rocky Grassland*
  - *Seriphium - Gomphocarpus Disturbed Grassland (this unit is showing signs of wetness)*
- Transformed (Habitat In Recovery)
  - *Verbena - Imperata* Grassland (Signs of Wetness)
  - *Cynodon - Datura* Disturbed Areas
  - *Gomphrocarpus* Dominated Past Fields
  - *Verbena - Cynodon* Past Fields
- Transformed
  - Road and associated Reserve
  - Stockpile Areas
  - Alien Bushclumps
  - Transformed: Pasture Fields
  - Homestead and livestock camps

Table 8-2 Broad Habitat/Vegetation communities

Vegetation Community	Conservation Significance	Area - Ha	Area -%
Grassland Habitats			
Agrostis - Imperata - Arundinella Wetland	High	3.27	2.649732
Seriphium - Gnidia Rocky Outcrops	High	3.32	2.694244
Seriphium - Eragrostis Rocky Grassland	Moderate-High	18.72	15.1904
Seriphium - Gomphocarpus Disturbed Grassland (signs of wetness)	Moderate	14.51	11.77689
Transformed: In Recovery			
Verbena - Imperata Grassland (Signs of Wetness)	Moderate-Low	1.18	0.954818

Vegetation Community	Conservation Significance	Area - Ha	Area -%
Cynodon - Datura Disturbed Areas	Low	3.44	2.793194
Gomphrocarpus Dominated Past Fields	Low	5.01	4.062606
Verbena - Cynodon Past Fields	Low	25.90	21.01357
Transformed			
Road and associated Reserve	Low	4.61	3.739772
Stockpile Areas	Low	1.07	0.869875
Alien Bushclumps	Low	1.67	1.356628
Transformed: Pasture Fields	Low	38.00	30.83458
Homestead and Livestock Camps	Low	2.54	2.063695

As mentioned, species variations within the different natural to semi natural habitats were slight and therefore species recorded within the sampling area were grouped as within **Table 8-3.** Alien species were particularly dominant in the recovery grasslands and included a number of Category 1 Invasive species (refer to **Section 0** below),

Table 8-3 Plant species identified within the different habitats

Plant species identified within Transformed Areas (In Recovery)	
Aristida congesta Roem. & Schult. subsp. congesta	*Helichrysum rugulosum Less.*
Aristida junciformis Trin. & Rupr. subsp. junciformis	*Hyparrhenia hirta (L.) Stapf*
Berkheya radula (Harv.) De Wild.	*Hypochaeris radicata L.**
Chloris virgata Sw.	*Imperata cylindrica (L.) Raeusch.*
Conyza podocephala DC.	*Paspalum dilatatum Poir.**
Cynodon dactylon (L.) Pers.	*Plantago lanceolata L.*
Cyperus esculentus L. var. esculentus	*Populus cf.alba x canescens **
Eleusine coracana (L.) Gaertn. subsp. africana (Kenn.-O'Byrne) Hilu & de Wet	*Seriphium plumosum L.*
Eragrostis gummiflua Nees	*Solanum sisymbriifolium Lam.**
Eragrostis lehmanniana Nees var. lehmanniana	*Urochloa panicoides P.Beauv.*
Eragrostis sp.	*Verbena brasiliensis Vell. **
Gomphocarpus fruticosus (L.) Aiton f. subsp. fruticosus	*Xanthium spinosum L.**
Helichrysum nudifolium (L.) Less. var. nudifolium	
Plant species identified within the Wetland Areas	
Afrosciadium (Peucedanum) magalismontanum (Sond.) P.J.D.Winter	*Kyllinga cf erecta*
Agrostis lachnantha Nees var. lachnantha	*Oenothera rosea L'Hor. ex Aiton**
Andropogon eucomus Nees	*Paspalum dilatatum Poir.**
Arundinella nepalensis Trin.	*Persicaria spp*
Campuloclinium macrocephalum (Less.) DC.	*Plantago lanceolata L.*
*Conyza bonariensis (L.) Cronquist **	*Setaria sphacelata (Schumach.) var. sericea (Stapf) Clayton*
Cyperus sp.	*Stipagrostis uniplumis (Licht.) De Winter var. uniplumis*
Imperata cylindrica (L.) Raeusch.	*Tagetes minuta L.**
Leersia hexandra	*Verbena brasiliensis Vell **
Plant species identified within the higher lying areas	
Acrotome hispida Benth.	*Hypoxis iridifolia Baker*
Bulbostylis burchellii (Ficalho & Hiern) C.B.Clarke	*Vigna vexillata (L.) A.Rich. var. vexillata*
Commelina africana L. var. africana	*Hypoxis rigidula Baker var. rigidula*
Cyperus esculentus L. var. esculentus	*Oldenlandia herbacea (L.) Roxb. var. herbacea*

Cyperus rupestris	*Eragrostis lehmanniana Nees var. lehmanniana*
Dianthus mooiensis F.N.Williams subsp. kirkii (Burtt Davy) S.S.Hooper	*Panicum natalense Hochst.*
Eragrostis curvula (Schrad.) Nees	*Perotis patens Gand.*
Eragrostis gummiflua Nees	*Pollichia campestris Aiton*
Felicia muricata (Thunb.) Nees subsp. muricata	*Richardia brasiliensis Gomes**
Gnidia sp.	*Seriphium plumosum L.*
Hyparrhenia hirta (L.) Stapf	*Urochloa panicoides P.Beauv.*
Hypoxis hemerocallidea Fisch., C.A.Mey. & Avo-Lall.	*Zornia milneana Mohlenbr.*
Schizachyrium sanguineum	*Helichrysum rugulosum Less.*
Sporobolus spp	*Pentanisia angustifolia (Hochst.) Hochst.*
Tephrosia lupinifolia DC.	*Nidorella Parinari capensis Harv. subsp. capensis hottentotica DC.*
Vernonia oligocephala (DC.) H.Rob.	*Tephrosia capensis (Jacq.) Pers. var. capensis*

*Alien species

Agrostis - Imperata - Arundinella Wetland

Agrostis - Imperata - Arundinella Wetland

Seriphium - Gnidia Rocky Outcrops

Seriphium - Eragrostis Rocky Grassland

Figure 8-1 Photographs of the more natural habitats within and surrounding the study area

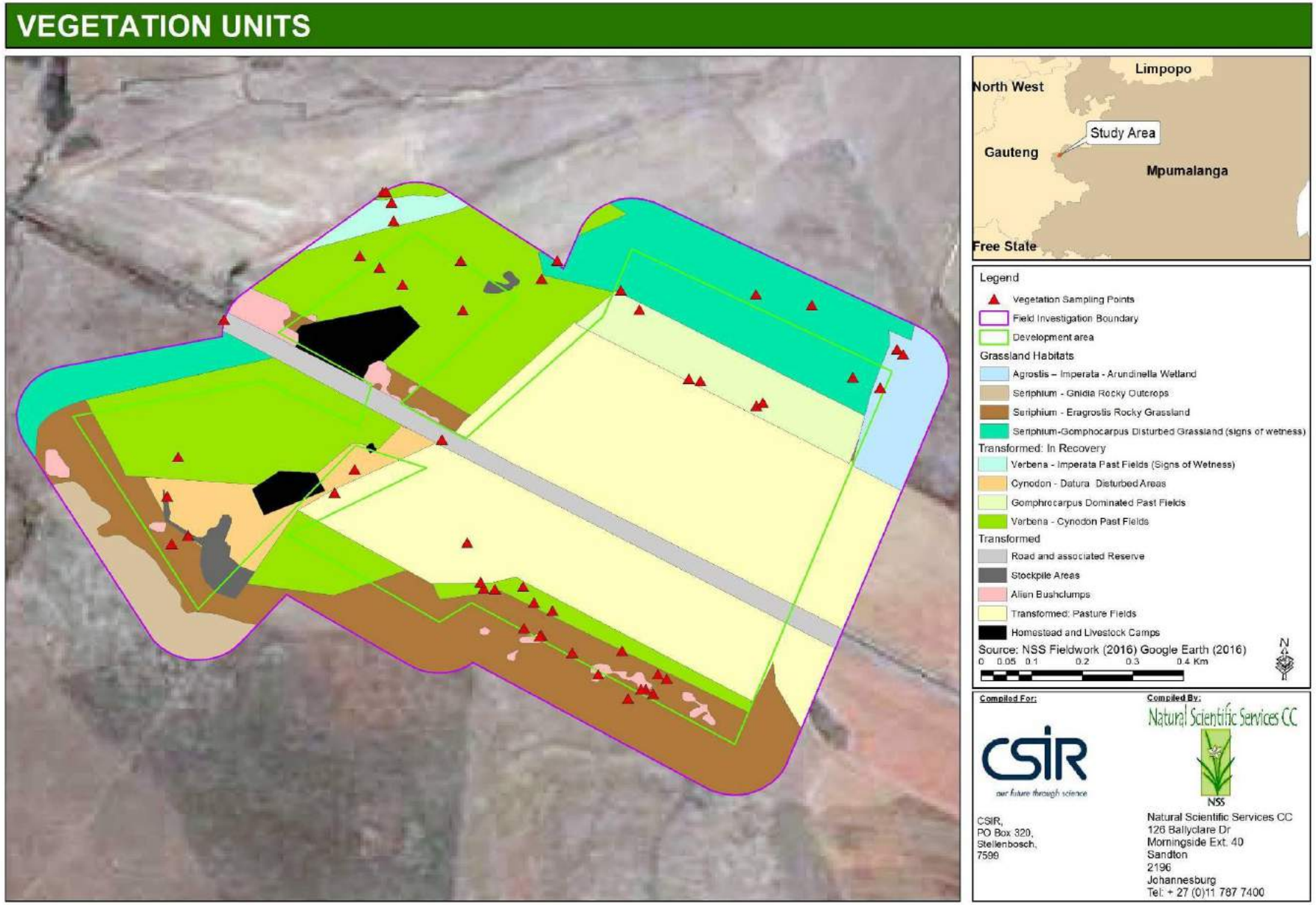

Figure 8-2 Vegetation Communities within the Study Area

Transformed – Homestead and Livestock Camps

Cynodon - Datura Disturbed Areas

Gomphrocarpus Dominated Past Fields

Verbena - Imperata Grassland

Pasture Fields

Alien Bushclumps

Figure 8-3 Photographs of transformed habitats within the bounds of the study area

Dianthus mooiensis

Helichrysum rugulosum

Gomphocarpus fruticosus

Chironia spp

Figure 8-4 Examples of indigenous plant species on site

8.1.2. 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. The current site has been affected within the past and present by agricultural practices and those pockets that remain 'semi-natural' are limited in terms of habitat heterogeneity. Although considered a brief Eco 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 Nature Conservation Ordinance (12 of 1983) 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 April 2016), there are 273 Red Data listed species (Table 7-4) within Mpumalanga Province (including Data Deficient species) of which 11 species are Critically Endangered (CR), 29 are Endangered (EN) and 75 are Vulnerable (VU).

Table 7-4 Numbers of conservation important plant species per Red Data category within South Africa and Mpumalanga (date accessed: April 2016)

THREAT STATUS	SOUTH AFRICA	MPUMALANGA	2628B
EX (Extinct)	28	1	0
EW (Extinct in the wild)	7	0	0
CR PE (Critically Endangered, Possibly Extinct)	57	1	0
CR (Critically Endangered)	332	11	0
EN (Endangered)	716	29	0
VU (Vulnerable)	1 217	75	2
NT (Near Threatened)	402	35	3
Critically Rare (known to occur only at a single site)	153	2	0
Rare (Limited population but not exposed to any direct or potential threat)	1 212	43	0
Declining (not threatened but processes are causing a continuing decline in the population)	47	22	3
LC (Least Concern)	13 856	3799	112
DDD (Data Deficient - Insufficient Information)	348	20	0
DDT (Data Deficient - Taxonomically Problematic)	904	34	1
Total spp (including those not evaluated)	**23 399**	**5226**	**155**

**Date accessed – April 2016 (although POSA's last update was recorded in 2012)

From the POSA website (QDS 2628B) 9 CI species has been recorded in the greater region. This includes two Vulnerable species, and three Near Threatened species. In terms of field sampling, the majority of these species were either within their flowering period or containing their leaves and spent flowers during surveying. Species such as *Nerine gracilis*, however, would not have been detected during our survey time. There was a low possibility of these species occurring on site, with a higher potential for them to occur within the surrounding areas (**Table 8-4**). The Declining *Boophone disticha* and the Declining *Hypoxis hemerocallidea* were, however, identified on Site (**Figure 8-6).** These are also considered Protected species under the Nature Conservation Ordinance, 12 of 1983. Another Protected species found within the wetland habitat was *Gladiolus papilio* (**Figure 8-6**). Protected Species may not be cut, disturbed, damaged, destroyed without obtaining a permit from Mpumalanga Province or a delegated authority.

Table 8-4 Summary of potential CI floral species

Family	Species	Threat status	Flowering Times	Habitat	LoO
AMARYLLIDACEAE	*Nerine gracilis* R.A.Dyer	VU	Spring	Undulating grasslands in damp areas	Possible within the wetlands off site
AMARYLLIDACEAE	*Crinum bulbispermum* (Burm.f.) Milne-Redh. & Schweick.	Declining	Spring - Summer	Grows along stream banks and in swampy grasslands that usually dry out during the winter months when these plants are dormant.	Possible within the wetlands off site
APIACEAE	*Alepidea peduncularis* A.Rich.	DDT	Summer (December-March)	Montane grasslands; Rocky areas in sourveld grassland, quartzite rocks.	Possible to the west of site
APOCYNACEAE	*Stenostelma umbelluliferum* (Schltr.) S.P.Bester & Nicholas	NT	September - March, peaking in October - January. (can flower to April.)	Deep black turf, mainly near drainage lines on vertic soils with high clay content in grassland or savanna, at altitudes between 1 050 and 1 280 m.	Possible within the wetlands off site
ASPHODELACEAE	*Kniphofia typhoides* Codd	NT	February - March	Low lying wetlands and seasonally wet areas in climax Themeda triandra grasslands on heavy black clay soils, tends to disappear from degraded grasslands.	Possible within the wetlands off site
ASTERACEAE	*Callilepis leptophylla* Harv.	Declining	Spring	Grassland or open woodland, often on rocky outcrops or rocky hill slopes.	Possible
HYPOXIDACEAE	*Hypoxis hemerocallidea* Fisch., C.A.Mey. & Avé-Lall.	Declining	Summer	Open grassland and woodland	Yes
IRIDACEAE	*Gladiolus robertsoniae* F.Bolus	NT	Spring - Summer	Moist highveld grasslands, found in wet, rocky sites, mostly dolerite outcrops, wedged in rock crevices.	Possible to the west of site
MESEMBRYANTHEMACEAE	*Khadia beswickii* (L.Bolus) N.E.Br.	VU	Summer & Autumn	Rocky spots with shallow soil	Possible to the west of site

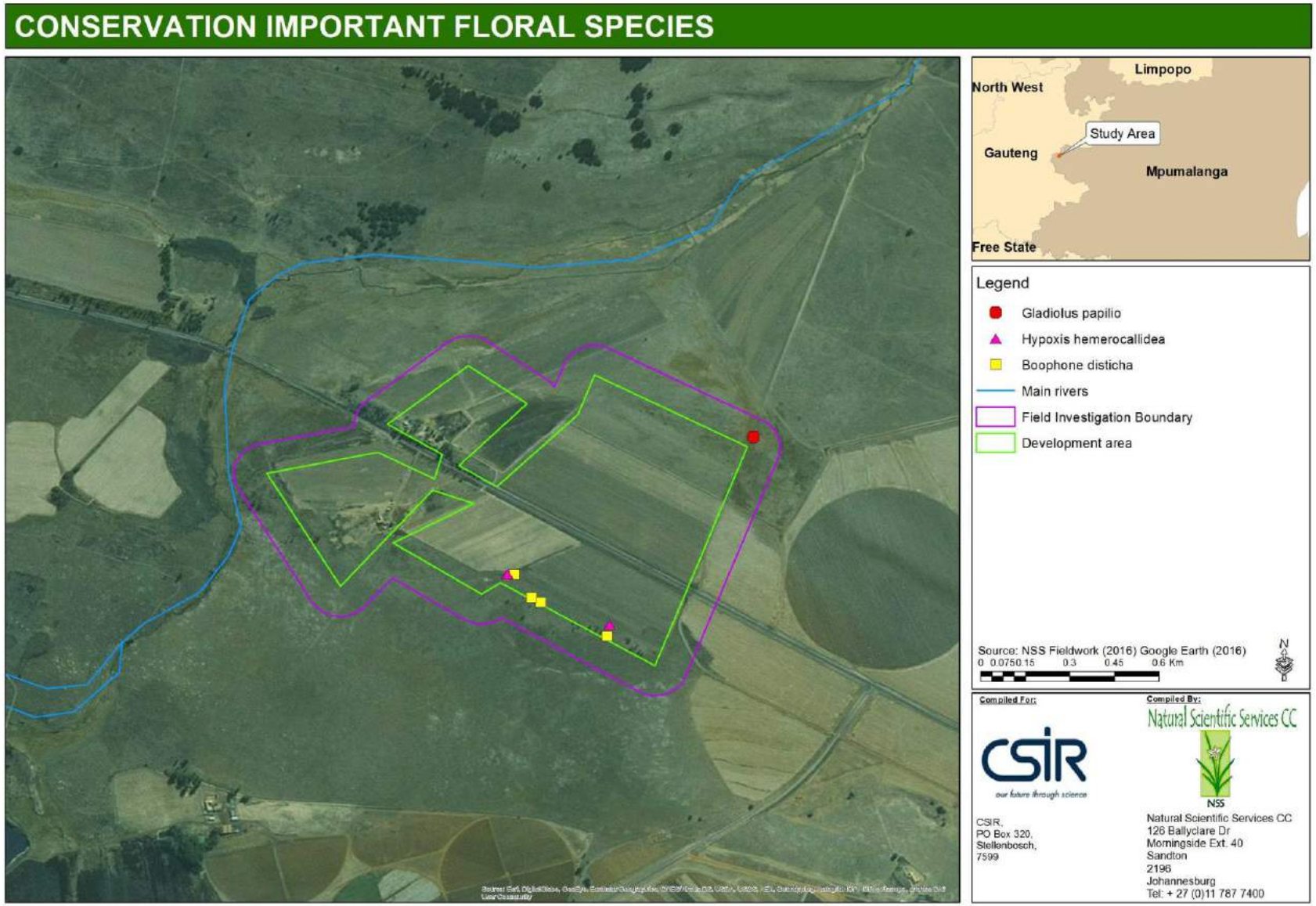

Figure 8-5 CI Floral species positions

Boophone disticha

Gladiolus papilio

Figure 8-6 Photographs of Conservation Important plant species on Site

8.1.3. Alien Invasives Plant

Alien, especially invasive[4] plant species are a major threat to the ecological functioning of natural systems and to the productive use of land. Due to the disturbances and transformation that the study area has experienced over the years, a number of alien species were present. In the brief scan of the site, over 24 species were recorded.

Within the more natural less transformed *Agrostis – Imperata - Arundinella Wetland* and *Seriphium - Gomphocarpus Disturbed Grassland* areas, species such as the Category 1b *Verbena brasiliensis* and *Verbena bonariensis* were recorded. *Verbena* in some areas dominated the vegetation cover, displacing the indigenous component.

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
Invasive species controlled by activity

Other species included:

- *Conyza bonariensis* (weed)
- *Oenothera rosea* (weed)
- *Cirsium vulgare* (Category 1b)
- *Cosmos bipinnatus* (weed)
- *Pennisetum clandestinum* (1b in wetlands)
- *Paspalum dilatatum* (weed)

[4] 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):

Xanthium strumarium

Morus alba

Verbena brasiliensis

Datura ferox

Extensive stands of Campuloclinium macrocephalum

Populus x canescens

Figure 8-7 Photographs of Alien species on Site

Within the drier upper lying areas such as the *Seriphium - Gnidia Rocky Outcrops* and the *Seriphium - Eragrostis Rocky Grassland,* the Category 1b *Campuloclinium macrocephalum* is expanding and starting to dominate certain areas. Other species witin these drier vegetation communities include:

- *Richardia brasiliensis Gomes*
- *Eucalyptus camaldulensis Dehnh.*
- *Gomphrena celosioides Mart.*
- *Hypochaeris radicata L.*
- *Tagetes minuta L.*

Within the more transformed areas (past farming and fallow fields), Category 1b species such as *Datura stramonium* and *Datura ferox* dominated. Other species included:

- *Richardia brasiliensis Gomes*
- *Gomphrena celosioides Mart.*
- *Populus x canescens*
- *Xanthium spinosum L.*
- *Prunus persica (L.) Batsch*
- *Schkuhria pinnata (Lam.)*
- *Solanum sisymbriifolium*
- *Chenopodium album L.*

8.2. Fauna

Provided in **Appendices 13.4-13.10** is the name and conservation status of each mammal, bird, reptile, frog, butterfly, odonata (dragonfly and damselfly) and scorpion species that was recorded, or is considered highly likely or likely to occur in or near the development area. Summarized in **Table 8-5** for each major animal group (taxon) is the estimated number of potentially occurring species, and the names of those species with a threatened, Near Threatened or Protected status.

Table 8-5 Summary of potential local faunal diversity and threatened species

TAXON	APPROXIMATE No. OF SPECIES	POTENTIAL THREATENED SPECIES
Mammals	47	EN White-tailed Rat NT Serval NT Southern African Hedgehog NT Natal Long-fingered Bat PS Cape Fox
Birds	208	EN African Marsh-harrier EN Black Harrier EN Yellow-billed Stork VU African Grass-owl VU Lanner Falcon VU Secretarybird VU White-bellied Korhaan NT Black-winged Pratincole NT Blue Korhaan NT Chestnut-banded Plover NT Half-collared Kingfisher NT Greater Flamingo NT Lesser Flamingo NT Maccoa Duck NT Melodious Lark
Reptiles	37	NT Coppery Grass Lizard NT Striped Harlequin Snake
Frogs	16	PS Giant Bullfrog
Butterflies	54	EN Roodepoort Copper Rare Marsh Sylph
Odonata	21	None
Scorpions	3	None

8.2.1. Mammals

Approximately 47 mammal species are considered highly likely or likely to occur at least occasionally in or near the proposed development area, and mostly represent rodents, Carnivores, insectivores and bats (**Appendix 13.4**). Based on observed live animals, burrows and faeces, the most common terrestrial mammals in the development area appear to include the Common Mole-rat, Yellow Mongoose and Scrub Hare (**Figure 8-8**).

Apart from various Data Deficient (DD) rodent and shrew species, the following five Conservation Important mammal species are considered highly likely or likely to at least pass through the development area (**Table 8-5**):

- The globally Endangered White-tailed Rat occurs mainly in temperate grassland areas where it requires reportedly sandy soils and inhabits burrows (such as those of Meerkats) and cracks in the ground (Stuart & Stuart 2007). Intense livestock grazing is problematic for this species (Friedmann & Daly 2004) and, therefore, it was rated with a moderate Likelihood of Occurrence (LoO) at best.
- The nationally Near Threatened (NT) Serval typically frequents dense, grassy habitat near water (Stuart & Stuart 2007), and based on NSS's experience, is tolerant of considerable habitat transformation. As the wetland and pasture fields appear to be highly suitable for Serval, this species was rated with a high LoO.
- The nationally NT Southern African Hedgehog tends to avoid wet ground and requires thick, dry cover for nesting, resting by day during summer, and while in torpor during winter (Stuart & Stuart 2007). As the proposed development area is slightly elevated and comprises extensive (albeit pasture) grass, this species was rated with a high LoO. Rocky grassland near the southern boundary of the development area may be especially favourable for hedgehogs.
- The nationally NT Natal Long-fingered Bat is a cave-roosting bat species and is, therefore, unlikely to reside in the development area. This migratory bat species can, however, travel large distances between caves and during nightly foraging excursions (Monadjem *et al.* 2010). Natal Long-fingered Bats are therefore expected to at least occasionally pass over or visit the area to forage. This species was, therefore, rated with a moderate LoO.
- The Cape Fox is listed as a Protected Species on the 2015 ToPS List. It preferentially inhabits mesic to arid grassland (Stuart & Stuart 2007), and was rated with a moderate LoO.

As all the above-mentioned CI mammal species are largely nocturnal, they were unlikely to be detected without camera- or live-trapping during our brief day-time site visit.

Common Mole-rat (*Cryptomys hottentotus*) mounds

Yellow Mongoose (*Cynictis penicillata*) burrow

Figure 8-8 Evidence of mammal species in the proposed development area

8.2.2. Birds

The latest online list of bird species from the SABAP 2 for pentad 2600_2830, which also contains records of bird species that were observed in QDS 2628BA during the SABAP 1, includes 207 bird species (**Appendix 13.5**). Although the list is extensive, some additional species, which have not yet been detected by SABAP observers in the region, could occur.

The SABAP data, which are depicted in **Figure 8-9**, indicate that aerial and arboreal "insect-eating" birds (in categories 8, 9 and 10) and water birds (categories 1, 2 and 3), respectively, comprise 39% and 32% (collectively more than two thirds) of the region's recorded bird species. "Seed-eaters" (category 12), "terrestrial" birds (categories 4 and 7) and "large predatory" birds (categories 5 and 6), respectively, comprise 12%, 9% and 6% of the regional recorded bird species richness.

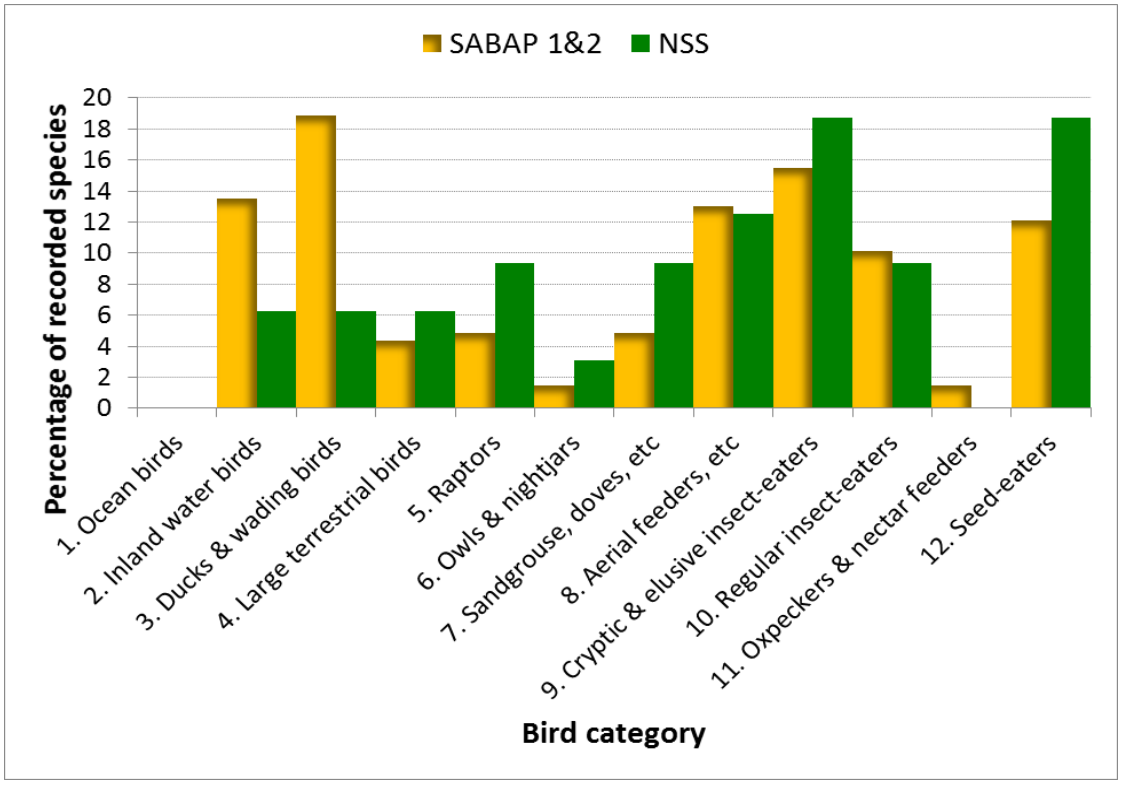

Figure 8-9 Percentage of bird species in each of twelve categories, which has been recorded in the study region by SABAP observers, or in the study area by NSS

During our site visit a similar pattern in bird diversity was observed except that very few waterbirds were encountered. This was to be expected, given the absence of aquatic habitat in and within 100m of the proposed development area. A slightly larger-than-expected proportion of the detected bird species represented seed-eaters. This was possibly due to a greater availability of grass seed in the pasture fields and elsewhere in late summer when the site visit was performed. Bird species that were detected most frequently in the development area included swallows, cisticolas, doves, lapwings, Amur Falcon, Cape Longclaw, Common Myna, Cape Sparrow, Hadeda Ibis and Common Fiscal (**Figure 8-10**).

Marsh Owl (*Asio capensis*) tunnel

Marsh Owl (*Asio capensis*) feather

Marsh Owl (*Asio capensis*) pellets

Figure 8-10 Evidence of Marsh Owls near the proposed development area

The most significant bird findings during the site visit included a small group of Temminck's Courser (which has not yet been recorded in the region by SABAP 1 or 2 observers; SABAP 2 2016), and a pair of Marsh Owls. The owls were flushed from the identified *Agrostis-Imperata-Arundinella* Wetland, which adjoins the north-eastern corner of the proposed development area. In addition to feathers and pellets, grass "knitting" and tunnelling from the owls was observed, which suggests that the owls may represent a resident breeding pair.

The Vulnerable African Grass-owl, which is ecologically similar to the Marsh Owl, has been recorded from at least four farms within the QDS 2628BA wherein the development area is situated (Mpumalanga Tourism and Parks Agency [MTPA], pers. comm.). Given these reports and our Marsh Owl observations during the site visit, it is considered highly likely that African Grass-owls could forage, roost and even breed where the Marsh Owls had "knitted" and tunnelled the grass near the north-eastern corner of the development area.

- The regionally VU African Grass-Owl is a habitat specialist requiring tall (at least knee-high), dense grasses and sedges in which to construct nests and roost tunnels. Suitable habitat is typically found along drainage systems, around pans, and within slope seepage zones, and the occurrence of these owls in an area is dependent on the retention of such

areas. Nesting has been recorded even in small (≤4m²) patches of suitable habitat within generally unsuitable *Hyparrhenia hirta* grassland (Geoff Lockwood pers. comm.). Grass-owls hunt over a mixture of wetland, grassland, cropland and fallow fields, and have been shown through radio telemetry to forage up to 4km away from their roosts and nests (Geoff Lockwood pers. comm.). During foraging, grass-owls are able to fly over extensive areas of unsuitable habitat to reach favoured hunting areas, and it is this behaviour combined with the species' nesting adaptability, which could enable this species to occur in the study area.

The following additional CI bird species, which have been reported from QDS 2628BA and/or pentad 2600_2830 wherein the proposed development area is situated, are also regarded as having a high or moderate LoO on site.

- The regionally VU Lanner Falcon inhabits a high diversity of habitats, and was recorded in pentad 2600_2830 by SABAP observers during 2011. In southern Africa, population declines have possibly been associated, among other things, with pesticide dressings on crop seeds (BirdLife 2016). Breeding Lanner Falcons usually use the abandoned nests of other raptors, corvids or herons on trees or pylons. Small birds, especially quails, doves and pigeons, make up most of this species' diet, and populations have reportedly benefited from hunting free-range poultry (BirdLife 2016). As the proposed project would not involve free range poultry, predation of chickens by Lanner Falcons seems unlikely.
- The globally VU Secretarybird inhabits grasslands ranging from open plains to lightly wooded savanna, and is also found in agricultural areas. The species is undergoing an overall rapid decline due to various forms of anthropogenic habitat transformation and other factors, and is listed on CITES Appendix II (BirdLife 2016). Although there is no SABAP record of Secretarybirds from the study region, according to the MTPA (pers. comm.), this species has been recorded on the farm Witklip 229 IR in QDS 2628BA.
- The regionally VU White-bellied Korhaan inhabits open grassland and lightly wooded savanna. It prefers taller grass than most other korhaans (Geoff Lockwood pers. comm.). Although this species was recorded in QDS 2628BA during the SABAP 1, it has not yet been recorded in pentad 2600_2830 during the SABAP 2. Patches of taller pasture grass in the proposed development area may be suitable for this species and, therefore, it's potential albeit occasional presence cannot be ruled out.
- The regionally NT Black-winged Pratincole migrates from its breeding range in Eurasia to overwinter in southern Africa. Threats to this species are poorly understood. In its wintering grounds agricultural transformation of grassland and measures to control swarming pest insects such as locusts, may be negatively affecting populations (BirdLife 2016). Black-winged Pratincoles have been recorded by SABAP observers in pentad 2600_2830 as recently as February 2016.
- The globally NT Blue Korhaan is virtually endemic to South Africa, extending only marginally into western Lesotho. The total South African population has been estimated at 1 500-5 000 individuals, but this may be an underestimate (BirdLife 2016). The species occurs in grassland usually above 1 500m, where populations typically inhabit short, open grassland with termite mounds and few or no trees, but also fallow cropland and pastures

(BirdLife 2016). The species has not yet been recorded in pentad 2600_2830 during the SABAP 2, but was recorded in QDS 2628BA during the SABAP 1.

- The globally NT Melodious Lark preferentially inhabits areas where the grass is short, and there are open spaces between the grass tussocks. Wetter low-lying areas are avoided, and the species is sensitive to grazing by livestock (BirdLife 2016). Melodious Lark was recorded in pentad 2600_2830 by SABAP 2 observers during 2009. Although habitat conditions within the proposed development area appear to be suitable for Melodious Lark, livestock grazing could be problematic.

The following CI waterbird species, which were recorded during the SABAP 1 in QDS 2628BA, but which have not yet been recorded in pentad 2600_2830 during the SABAP 2, are considered unlikely to occur on site due to the lack of aquatic habitat in or within 100m of the proposed development area:

- The regionally EN African Marsh-harrier.
- The regionally EN Black Harrier.
- The regionally EN Yellow-billed Stork.
- The globally NT Chestnut-banded Plover - which has been recorded in the nearby town of Delmas (MTPA pers. comm.)
- The regionally NT Greater Flamingo – which has been recorded on the farm Rietkol 237 IR in QDS 2628BA (MTPA pers. comm.).
- The regionally NT Half-collared Kingfisher.
- The globally NT Lesser Flamingo.
- The globally NT Maccoa Duck.

8.2.3. Reptiles

Thirty-seven reptile species are considered highly likely or likely to occur in or near the development area, which mostly represent snakes and lizards (**Appendix 13.6**). Based on ReptileMAP's (2016) records from QDS 2628BA, and observed habitat conditions, within the proposed development area the most frequently encountered reptile species are likely to include Cape Gecko, Cape Skink, Variable Skink, Eastern Ground Agama, Brown House Snake, Red-lipped Snake and Spotted Grass Snake, among others. Regionally-occurring water-associated reptile species, such as the Marsh Terrapin and Nile Monitor, are considered unlikely to occur due to the lack of aquatic habitat on site. The rocky outcrop and associated rocky grassland along the southern side of the development area is likely to provide important habitat for many of the potentially occurring reptile species, especially the geckos, skinks, agamas and certain snakes. Termitaria in particular, and animal burrows, which were both limited in the development area, also represent important habitat for many of the potentially occurring reptile species.

Two CI reptile species potentially occur in the study area (**Table 8-5**):

- The globally NT Coppery Grass Lizard is endemic to Swaziland and South Africa where populations are primarily threatened by grassland transformation. Like most grass lizards,

the Coppery Grass Lizard is an extreme grassland specialist. It possesses a long slender body with significantly reduced limbs, enabling it to move swiftly through grass. Populations are restricted to natural grassland areas in proximity to rocks, which provide important shelter for these lizards during veld fires. Individuals probably also shelter in the base of grass tussocks like other grass lizards (Bates *et al.* 2014). According to the MTPA (pers. comm.), Coppery Grass Lizards have been recorded near Delmas and elsewhere in the QDS 2628BA. Given this, and that the rocky outcrop and associated rocky grassland along the southern side of the proposed development area appears to be suitable for this species, it was rated with a high LoO.

- The globally NT Striped Harlequin is endemic to Swaziland and South Africa, where it is very sparsely distributed, particularly outside Gauteng. It is an illusive, partially fossorial snake species, which is known to inhabit old termite mounds in grassland, and which feeds exclusively on thread snakes (*Leptotyphlops* spp.). The species is highly threatened by transformation of its Highveld grassland habitat due to agriculture and other forms of land-use Bates *et al.* 2014). As a few termitaria were found, and as thread snakes almost certainly occur in and around the development area, the Striped Harlequin Snake was rated with a moderate LoO.

8.2.4. Frogs

Sixteen frog species are considered highly likely or likely to occur in or near the proposed development area (**Appendix 13.7**). Common Platanna, Quecketti's River Frog and Cape River Frog are likely to be common within the Koffiespruit and its unnamed tributary, but might not occur on site where suitable perennial aquatic habitat is absent. Boettger's Caco, Bubbling Kassina, and the Tremolo and Natal sand frogs might occur on site if heavy rain creates small, emphemeral breeding pools for these species. The Guttural, Raucous and Red toads, which almost certainly breed in farm dams along the Koffiespruit and its unnamed tributary, and which are capable of moving large distances overland in search of food, burrow sites and alternative breeding areas, are also likely to frequent the proposed development area. The Striped Stream Frog, Snoring Puddle Frog and Giant Bullfrog, which are undergoing noticeable population declines in Gauteng (Vincent Carruthers pers. comm.), could also occur in the study area.

Only the Giant Bullfrog is formally recognized as conservation important (**Table 8-5**):

- Giant Bullfrogs spend most of the year buried in a state of torpor, and exhibit sporadic bouts of (mainly nocturnal) activity 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 preferably emergent grassy vegetation. Bullfrog foraging appears to be concentrated around their burrows, which may be situated up to 1km from their breeding site (Yetman 2012). Given this, and that Giant Bullfrog breeding is known from a locality approximately 5km upstream along the unnamed tributary of the Koffiespruit (Yetman unpubl. data), this species was rated with a high LoO. Although this species is unlikely to breed in the proposed development area, individuals might forage, burrow or disperse through the site. The Giant Bullfrog was assessed as Near Threatened by Minter *et al.* (2004), and is listed as a Protected Species on the 2007 ToPS List under NEM:BA (Act

10 of 2004). As the Giant Bullfrog is not globally threatened, Measey (2011) did not assess it. Amphibians are not mentioned in the 2015 ToPS List, which preceded the latest conservation assessment of South African amphibians in November 2015. Until the results of this assessment have been published, the status of the Giant Bullfrog, as determined by Minter *et al.* (2004) and as indicated in the 2007 ToPS List, is assumed to remain valid.

8.2.5. Butterflies

An estimated 54 butterfly species and subspecies potentially occur in or near the proposed development area (**Appendix 13.8**). Almost half (43%) of the potentially occurring species belong to the family Lycaenidae, which includes the Blues, Coppers, Hairtails, Woolly Legs and their relatives. Most of the other recorded butterfly species belong to the families Nymphalidae (which includes the Acraeas, Pansies, Charaxes and their relatives) and Hesperidae (which includes the Skipper, Sandman, Sylph and related butterfly species). During the site visit, 14 (26%) of the 54 potentially occurring butterfly species were detected. These included common and widespread species with the exception of the Marsh Sylph (**Figure 8-11**). One additional CI butterfly taxon that could occur in or near the study area is the EN subspecies of the Roodepoort Copper.

Mocker Bronze
(*Cacyreus virilis*)

Brown-veined White
(*Belenois aurota aurota*)

African Monarch
(*Danaus chrysippus orientis*)
caterpillar

Broad-bordered Grass Yellow
(*Eurema brigitta brigitta*)

Sooty Blue
(*Zizeeria knysna*)

Marsh Sylph
(*Metisella meninx*)

Marsh Acraea
(*Hyalites rahira rahira*)

Yellow Pansy
(*Junonia hierta cebrene*)

Figure 8-11 Evidence of butterfly species in or near the proposed development area

- The South African endemic Marsh Sylph butterfly, which is listed as nationally Rare (Mecenero *et al.* 2013) and provincially VU (MTPA pers. comm. 2014), inhabits marshy wetland areas often in the headwaters of streams in open grassland at altitudes of 1 400-1 700m a.s.l., where it is limited to contiguous patches of its larval foodplants. Larval foodplants include the rushes *Juncus oxycarpus* and *Juncus exsertus*, the sedge *Schoenoplectus decipiens* and the grasses *Diplachne fusca* and *Leersia hexandra*, in particular. Adults can be seen flying in suitable habitat patches between December and March. During the site visit at least three adult individuals of this species were seen flying amidst *Leersia hexandra* in the wetland which adjoins the north eastern corner of the site (**Figure 8-12**).
- The Roodepoort Copper comprises two subspecies. The globally EN subspecies *Aloeides dentatis dentatis* is largely endemic to Gauteng, and inhabits fairly flat, rocky Highveld grassland above 1 500m a.s.l., along or below ridges (Mecenero *et al.* 2013). The subspecies has a very restricted range wherein it is known from approximately five locations, three of which are in protected areas. The global population is estimated to be under 1 000 individuals. The globally Least Concern subspecies *Aloeides dentatis maseruna* has a much wider distribution range, predominately over the Free State and extending slightly into adjoining provinces, where it inhabits flat grassland on or near hills and ridges (Mecenero *et al.* 2013). As such, either subspecies could occur, especially in association with the rocky outcrop and associated rocky grassland along the southern side of the proposed development area.

8.2.6. Odonata

Twenty-one odonata (dragonfly and damselfly) species were rated with a high or moderate LoO in the study area, most of which have a Biotic score of 3 or less (**Appendix 13.9**). 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." Due to the lack of significant aquatic habitat in or within 100m of the proposed development area, most of the listed odonatan species are unlikely to reside on site. Listed species with a Biotic score of 4 include the Mountain Malachite and Saphire Bluet. The Friendly Hawker has a Biotic score of 5, but none of the listed odonatan species has a known threatened or protected status (Samways 2006).

8.2.7. Scorpions

Three scorpion species are considered highly likely or likely to occur in the study area (**Appendix 13.10**), where the rocky outcrop and associated rocky grassland along the southern side of the proposed development area provides the most suitable habitat for these species. *Pseudolychas pegleri* and *Uroplectes triangulifer* make simple scrapes under rocks and surface debris, and are known to venture into homes and even industrial areas (Leeming 2003). *Opistophthalmus pugnax* constructs burrows under rocks and surface debris and rarely enters houses. This species is common on rocky outcrops and ridges in and around Gauteng, but was rated with a moderate LoO in the study area. None of the three scorpion species has a threatened or protected status.

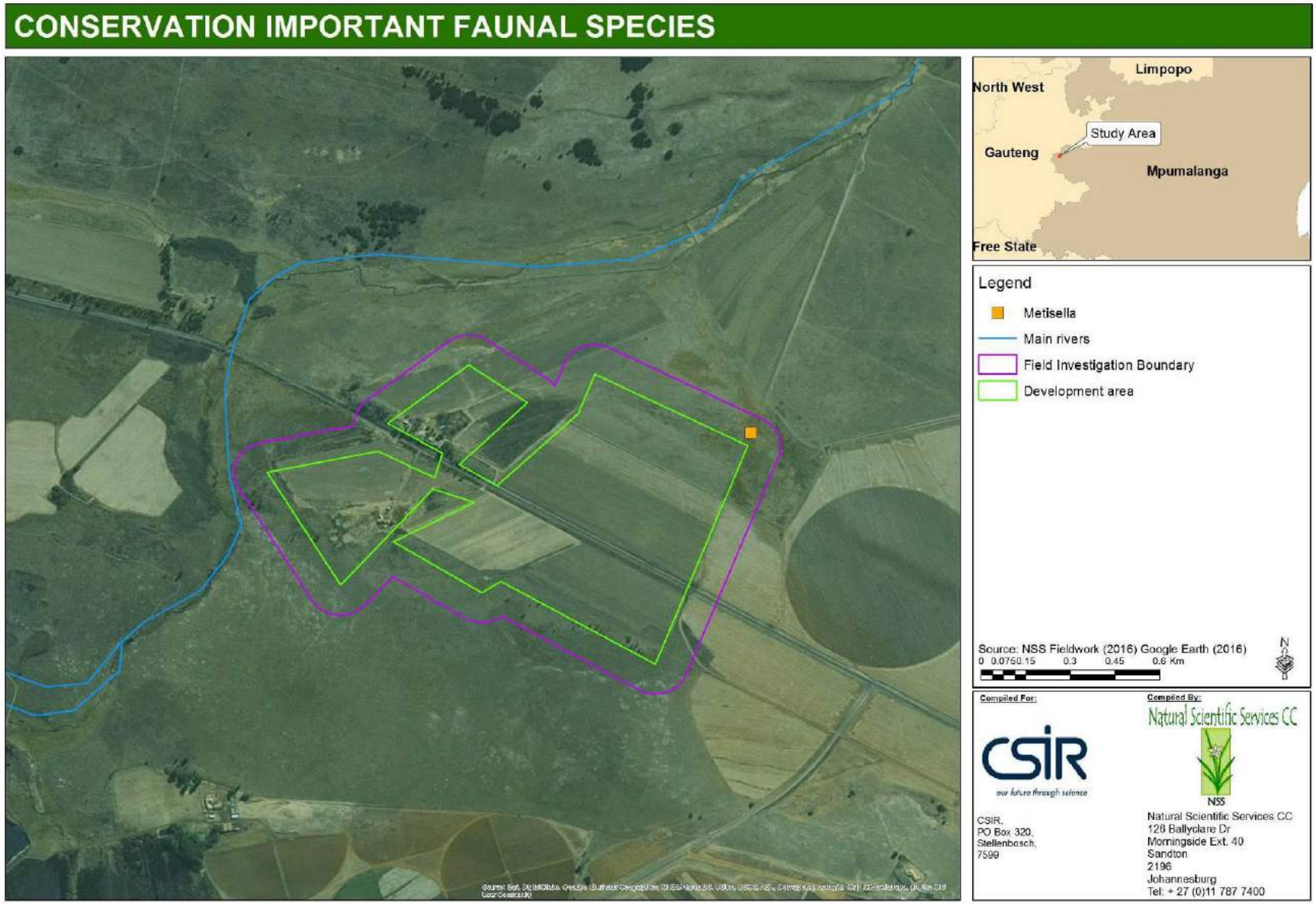

Figure 8-12 Location of the observed Marsh Sylph butterflies

9. Areas of Conservation Concern

Based on relevant national and provincial biodiversity conservation planning initiatives, results from our terrestrial floral and faunal ecoscan and those of the wetland assessment by SAS (2016), a map to depict areas of terrestrial and wetland biodiversity conservation concern was compiled (**Figure 9-1**), where:

- **Very High** rated areas include:
  - The wetlands delineated by SAS (2016), which have a "Good / Largely Natural" (B-category) Present Ecological State, and which are connected to Freshwater Ecosystem Priority Areas at a regional scale. Apart from providing important habitat for observed and potentially occurring Conservation Important (CI) and other species, wetlands provide important ecosystem services and require protection under multiple pieces of legislation, particularly the National Water Act (Act 36 of 1998).
- **High** rated areas include:
  - The *Agrostis-Imperata-Arundinella* Wetland which adjoins the north-eastern corner of the proposed development area, where at least three individuals of the provincially Vulnerable (VU) Marsh Sylph, and a pair of Marsh Owls, were observed, and which is highly suitable for the regionally VU African Grass-owl, which is known to occur on several farms in QDS 2628BA (MTPA pers.comm.).
  - The *Seriphium-Gnidia* Rocky Outcrop along the south-western boundary of the proposed development area, which is representative of the Endangered (EN) Rand Highveld Grassland vegetation type and Threatened Ecosystem, and which could possibly be utilized by CI species such as the globally EN subspecies of the Roodepoort Copper, and the nationally Near Threatened (NT) Southern African Hedgehog, and Coppery Grass Lizard, which is known to occur on farms in the QDS 2628BA (MTPA pers. comm.) wherein the proposed development area is situated.
  - The 16m wetland buffer indicated by SAS (2016).
- **Moderate-High** rated areas include:
  - The patches of *Seriphium-Eragrostis* Rocky Grassland, mainly along the southern boundary of the proposed development area, which is representative of the EN Rand Highveld Grassland vegetation type and Threatened Ecosystem, and which could possibly be utilized by CI species such as the EN Roodepoort Copper subspecies, and the NT Southern African Hedgehog, and Coppery Grass Lizard.
  - The 32m wetland buffer indicated by SAS (2016), in accordance with NEMA.
  - A recommended 50m buffer around the *Agrostis-Imperata-Arundinella* Wetland to protect this habitat and its associated CI species, such as the observed Marsh Sylph butterflies, from deleterious "edge effects" relating to potential waste, dust, noise, light and other impacts from the development.

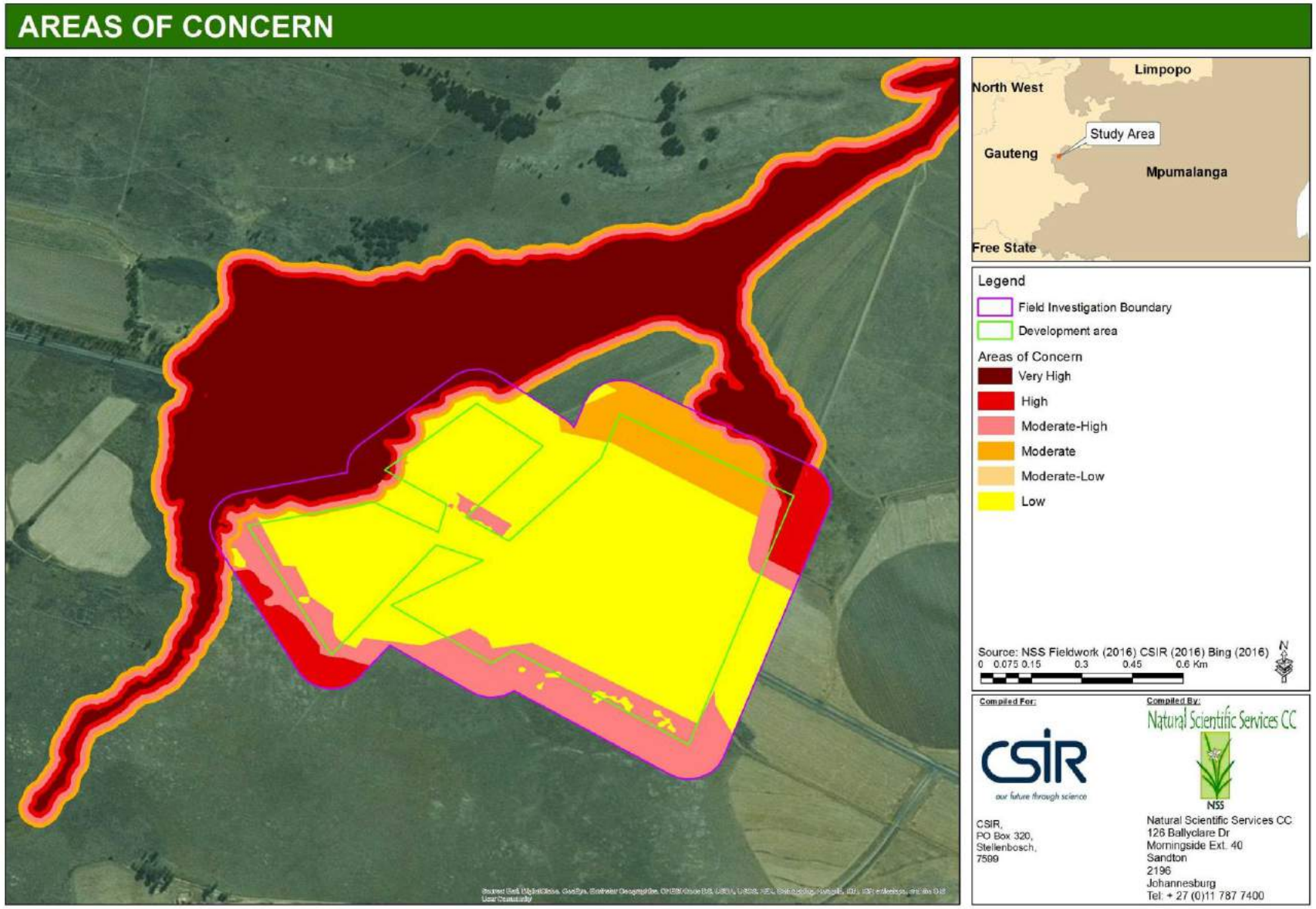

Figure 9-1 Areas of Conservation Concern

- **Moderate** rated areas include:
  - The patches of *Seriphium-Gomphocarpus* Disturbed Grassland (with signs of wetness), which adjoin the northern and western boundaries of the the proposed development area.
  - The 45m wetland buffer indicated by SAS (2016).
- **Moderate-Low** rated areas include:
  - The *Verbena-Imperata* Pasture Fields, near the northern corner of the proposed development area.
- **Low** rated areas include all remaining transformed areas including:
  - Alien bush clumps.
  - Roads, buildings and livestock camps.
  - Stockpiles.
  - Heavily transformed pasture fields.

The identified Areas of Conservation Concern should guide the proposed development where:

- Disturbances should preferentially occur in Low and Moderate – Low sensitive areas.
- **Very High** and **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.
- **Moderate-Low** sensitive areas may be disturbed with minimal or no mitigation.
- **Low** sensitive areas should be rehabilitated if not developed.

10. Impacts & Mitigation

Potential impacts of the proposed project on biodiversity are summarized in **Table 10-1**, and briefly discussed below, followed by recommended measures to mitigate these during relevant phases of the development.

10.1. Potential Impacts

Biodiversity is likely to experience impacts from the same types of activities during construction, operation and decommissioning. These activities include increased vehicle traffic and human activity, introduction of machines and materials, earth-moving activities (e.g. ground excavation, deposition, levelling and compaction), construction and destruction of infrastructure, intentional and accidental introduction of alien species, and production of (and possible environmental contamination from) waste, ranging from building rubble to animal excrement, bedding, feed and carcasses. Except for direct loss of habitat and species during construction, most activities will have potential indirect impacts on biodiversity.

10.1.1. Direct Impacts

Loss of Vegetation Communities and CI species

Construction of infrastructure will result in the direct loss of patches of *Seriphium-Eragrostis* Rocky Grassland, mainly along the southern boundary of the proposed development area. This unit is representative of the EN Rand Highveld Grassland vegetation type. It could also possibly be utilized by CI species such as the EN Roodepoort Copper subspecies, and the NT Southern African Hedgehog, and Coppery Grass Lizard. CI floral species in this unit include the Declining *Boophone disticha* and *Hypoxis hemerocallidea*.

The development will border and in some areas encoach on the wetland habitat (*Agrostis-Imperata-Arundinella* Wetland), which supports the rare Marsh Sylph butterfly (identified during the fieldwork) and potentially, the Vulnerable African Grass-owl. The development may also encroach on the rocky grassland (*Seriphium-Gnidia* Rocky Outcrop), which is representative of the Endangered Rand Highveld Grassland vegetation type supporting multiple Declining *Boophone disticha* and potentially other CI species.

10.1.2. Indirect Impacts

Change in vegetation structure and species composition through the introduction and proliferation of alien plant and animal species

Alien plant and animal species, in addition to those that are already on site, are likely to be introduced with the influx of vehicles, people and material during all phases of the project, especially during construction. During operation, poultry and pigs will be introduced, and alien flora could be unintentionally introduced with animal bedding, material and feed. Landscaping and rehabilitation efforts could also introduce alien flora. Without effective control, existing and introduced alien species will proliferate especially where the site has been subject to disturbance. Alien species will steadily out-compete native species and alter native ecosystems and processes.

Change in vegetation structure and species composition through unnatural wild fires

Wild (or veld) fires could occur accidentally with increased human activity during all phases of the project, and burns might be prevented or deliberately ignited to reduce risks to human and infrastructure safety during operation. If burning is completely prohibited in the surrounding areas, this is likely to have an adverse impact on vegetation structure, floral diversity and veld condition. If burns occur in the same area annually (or more frequently), and/or during growth and breeding times, this is also likely to have an adverse impact on vegetation structure, floral diversity and veld condition, as well as species including potentially occurring CI taxa such as the Coppery Grass Lizard, hedgehog, and the ground-nesting African Grass-owl and korhaans.

Increase in dust and erosion

Dust and erosion are likely to increase, especially during construction and decommissioning, with clearing of vegetation and existing infrastructure, earth-moving activities, and an increase in vehicle traffic. Dust and erosion might be problematic during operation if there is frequent personnel, delivery and waste removal vehicle (especially truck) traffic on dirt roads in the development footprint. Excessive dust can be problematic for plant growth, and grazing and browsing fauna. Erosion of topsoil could rapidly expose underlying ferricrete, which greatly limits plant growth. In addition, excessive dust and erosion could cause sedimentation of the nearby unnamed tributary of the Koffiespruit.

Environmental contamination

Environmental contamination is probable or highly probable during all phases of the project. During construction and decommissioning, contamination could be caused by building rubble, chemical spills, and machine and vehicle leaks and emissions. During operation, chicken and pig excrement, bedding, feed and carcasses, and other operational waste could cause considerable environmental contamination if not carefully stored, managed and disposed of.

Proliferation and inappropriate control of invertebrate and vertebrate pests

Various alien and indigenous invertebrate and vertebrate animal species could become pests during the operation. Invertebrate pests could include flies, weavils, ants, termites, cockroaches, fleas, lice, mites and ticks. Vertebrate pests could include rodents, snakes, mammalian Carnivores, bats and raptors, among others. Without effective control, pests such as House Flies (*Musca* spp.) and alien rats (*Rattus* spp.) could adversely affect native species, and facilitate the spread of human and animal diseases. On the other hand, inappropriate pest control could affect non-target taxa and disrupt food webs. For example, use of rodenticides could have a detrimental impact on potentially occurring African Grass-owls and other native predators.

Disturbance of Conservation Important fauna

Apart from possible habitat loss and mortality during construction, fauna including the observed Marsh Sylph butterflies and other potentially occurring CI species could be disturbed during all phases of the project by increased vehicle traffic and human activity, noise, dust, alien species, environmental contamination, and unnatural fires. In addition, during operation, inappropriate pest management and transmission of diseases and parasites from the production animals could also affect indigenous fauna including CI species.

Table 10-1 Impact assessment

POTENTIAL IMPACTS	STATUS	WITHOUT MITIGATION												WITH MITIGATION		
		EXTENT		DURATION		INTENSITY		REVERSIBILITY	IRREPLACEABILITY	PROBABILITY		SIGNIFICANCE		SIGNIFICANCE		CONFIDENCE
CONSTRUCTION																
Introduction & proliferation of alien spp.																
from influx of vehicles, people and materials, site disturbance, and lack of alien species control	Negative	Local (<2km from site)	2	Permanent	5	Medium	4	Moderate reversibility	Low irreplaceability	Definite (>90% chance)	1	**High**	**11,00**	**Medium**	**7**	High 3
Unnatural wild fires																
from influx of people and construction activities	Negative	Local (<2km from site)	2	Temporary (<2 years)	1	Medium-low	2	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0,5	**Low**	**2,50**	**Low**	**2**	High 3
Loss of vegetation communities and CI species																
from clearing of vegetation, and increase in vehicle and human activity	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Low reversibility	Moderate irreplaceability	Probable (25-50% chance)	0,5	**Medium**	**7,00**	**Low**	**2**	High 3
Increase in dust and erosion																
from clearing of vegetation, earth-moving activities, and increase in vehicle traffic	Negative	Local (<2km from site)	2	Temporary (<2 years)	1	Medium	4	Low reversibility	High irreplaceability	Probable (25-50% chance)	0,5	**Low**	**3,50**	**Low**	**2**	High 3
Environmental contamination																
from building rubble, chemical leaks, spills and emissions, human excrement and litter	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**	**Low**	**1**	High 3
Disturbance of CI fauna																
from habitat destruction, increase in vehicle and human activity, noise and dust, environmental contamination, and unnatural fires	Negative	Local (<2km from site)	2	Temporary (<2 years)	1	High	8	Moderate reversibility	Moderate irreplaceability	Highly probable (50-90% chance)	0,75	**Medium**	**8,25**	**Low**	**4**	High 3
OPERATION																
Environmental contamination																
from chicken and pig excrement, carcasses and feed, and other operational waste	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0,5	**Medium**	**7,00**	**Low**	**2**	High 3
Transmission of diseases to wildlife																
from poultry, pigs and pets	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**	**Negligible**	**1**	High 3
Poor / Inappropriate control of invertebrate pests																
such as flies, weavils, ants, termites, cockroaches, fleas, lice, mites, ticks, etc.	Neutral	Local (<2km from site)	2	Long term (>15 years)	4	Medium-low	2	High reversibility	Low irreplaceability	Highly probable (50-90% chance)	0,75	**Medium**	**6,00**	**Low**	**5**	High 3
Poor / Inappropriate control of vertebrate pests																
such as rodents, snakes, mammalian Carnivores, bats and raptors	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0,5	**Medium**	**7,00**	**Low**	**2**	High 3
Harvesting of CI flora																
from increase in human activity	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Low reversibility	High irreplaceability	Low probability (10-25% chance)	0,25	**Low**	**3,50**	**Low**	**2**	High 3
Unnatural wild fires																
to reduce risks to human and infrastructure safety, and from increase in human activity	Negative	Local (<2km from site)	2	Long term (>15 years)	4	Medium	4	Low reversibility	High irreplaceability	Probable (25-50% chance)	0,5	**Medium**	**5,00**	**Low**	**2**	High 3

POTENTIAL IMPACTS	STATUS	WITHOUT MITIGATION												WITH MITIGATION			
		EXTENT		DURATION		INTENSITY		REVERSIBILITY	IRREPLACEABILITY	PROBABILITY		SIGNIFICANCE		SIGNIFICANCE		CONFIDENCE	
Introduction & proliferation of alien spp.																	
from influx of vehicles, people and materials, site disturbance, and lack of alien species control	Negative	Local (<2km from site)	2	Permanent	5	Medium	4	Moderate reversibility	Low irreplaceability	Definite (>90% chance)	1	**High**	**11,00**	**Low**	**4**	High	3
Disturbance of CI fauna																	
from vehicle and human activity, noise and light, environmental contamination, inappropriate pest management, disease transmission, proliferation of alien species, and unnatural fires	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Low reversibility	Low irreplaceability	Highly probable (50-90% chance)	0,75	**High**	**10,50**	**Low**	**3**	High	3
DECOMMISSIONING																	
Increase in dust and erosion																	
from demolishing and rehabilitation activities	Negative	Local (<2km from site)	2	Temporary (<2 years)	1	Medium	4	Low reversibility	High irreplaceability	Probable (25-50% chance)	0,5	**Low**	**3,50**	**Low**	**3**	High	3
Environmental contamination																	
from building rubble, chicken and pig excrement, carcasses and feed, other operational waste, chemical leaks, spills and emissions, and litter	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**	**Low**	**3**	High	3
Unnatural wild fires																	
from influx of people and decommissioning activities	Negative	Local (<2km from site)	2	Temporary (<2 years)	1	Medium-low	2	Moderate reversibility	Moderate irreplaceability	Probable (25-50% chance)	0,5	**Low**	**2,50**	**Low**	**2**	High	3
Introduction & proliferation of alien spp.																	
from influx of vehicles, people and materials, site disturbance, and lack of alien species control	Negative	Local (<2km from site)	2	Permanent	5	Medium	4	Moderate reversibility	Low irreplaceability	Definite (>90% chance)	1	**High**	**11,00**	**Low**	**4**	High	3
Disturbance of CI fauna																	
from increase in vehicle and human activity, noise and dust, environmental contamination, unnatural fires, and proliferation of alien species	Negative	Local (<2km from site)	2	Long term (>15 years)	4	High	8	Low reversibility	Low irreplaceability	Highly probable (50-90% chance)	0,75	**High**	**10,50**	**Low**	**4**	High	3

10.2. Recommended Mitigation

10.2.1. Pre-construction

- Revise the planned layout of the facilities and all associated infrastructure to avoid all Very High, High and Moderate-High sensitive areas as far as possible.
- Modify the design and operations of the facilities to minimize conflict with local wildlife (e.g. rodents, snakes, small Carnivores and bats). The design of the facility should prohibit the free movement of wildlife, especially rodents and snakes, into and out of the facilty, without inflicting injury or death to animals. Effective and environmentally-friendly means of disposing of animal carcasses from standard operations and following mass mortality events must be devised.
- Modify the design of the facilities and all associated infrastructure (such as access roads and parking areas) to ensure effective management of storm water and potential contamination from the facilities. Dirty water, animal feed, excrement, carcasses, and any other waste should be prohibited from entering the surrounding environment.
- Devise effective and environmentally-friendly means of managing all waste on site, where this cannot be disposed of using an appropriate licensed facility. Waste recycling should be incorporated into the facility's operations as far as possible.
- Permits should be obtained to relocate all CI floral species within the infrastructure footprint to the surrounding natural areas.
- Demarcate the construction site to prevent surrounding areas and biodiversity from being disturbed or destroyed. Disturbance of the wetland and rocky grassland areas, in particular, must be prohibited.
- Search for CI species specimens immediately prior to construction. These include the CI plant specimens that were identified during our site visit, and potentially occurring roosting or nesting grass-owls and hedgehogs, among others. If termitaria are found within the project footprint they should be carefully searched for Striped Harlequin Snakes. All encountered CI species specimens should be relocated to a safer area in the vicinity under the supervision of an appropriately qualified specialist.

10.2.2. Construction

- Highlight all prohibited activities to workers through training and notices.
- Commence (and preferably complete) construction during winter, when the risk of erosion, disturbing growing plants, and disturbing active (including breeding and migratory) animals, should be least. Although grass-owls can breed throughout the year, egg-laying has NOT been recorded in June, August and September.
- Noise should also be minimised throughout construction to limit the impact on sensitive fauna such as owls, korhaans and Secretarybird.
- Limit construction activities to day light hours, and minimize security and other lights at night, to reduce the disturbance of nocturnal fauna including CI species such the potentially occurring Serval, hedgehog, Cape Fox and grass-owls.

- Erosion protection measures must be implemented on the site to reduce erosion and sedimentation of the receiving environment. Measures could include:
    - Sandbags;
    - Sediment traps;
    - Bunding around soil stockpiles;
    - Vegetation of areas not to be developed.
- Adequate dust control strategies should be applied to minimise dust deposition, for example:
    - Periodic spraying of roads with water.
    - Cover trucks to prevent dust emission during transport.
- Regularly check vehicles, machinery and equipment operating on site to ensure that none have leaks or cause spills of oil, diesel, grease or hydraulic fluid. Should a hydrocarbon or other chemical spill occur, clean up procedures must be undertaken a.s.a.p., in line with best practice:
    - Spills on soil should be contained by using oil absorbents and/or peat sorbs to absorb the spill. This should be cleaned and removed into adequate hazardous waste containers. All contaminated soil must be removed and placed into hazardous waste bins or should be bio-remediate.
    - Spills on water must be addressed by personnel on site or by pollution control contractors, using oil absorbents or oil skimmers. Oil contaminated absorbent material or skimmed-off chemicals need to be disposed of in hazardous waste bins or sealable drums.
    - Under no circumstances must spilled products be disposed of in sewers or storm water drains, or be deliberately ignited.
    - Gloves/PPE should be worn when handling spilled petroleum products.
- Check open trenches daily for trapped animals (e.g. bullfrogs, hedgehogs and snakes), which should be carefully caught and relocated according to the specifications of a relevant specialist.
- By law, remove and dispose of Category 1b alien species on site. Mechanical removal of these species is recommended. However, the removal must be carefully performed so as to not excessively disturb the soil layer. Alien debris could be donated to a local community. All Category 2 species that remain on site must require a permit.
- Briefly and effectively stockpile topsoil (preferably 1-1.5m in height) to maintain the viability of the indigenous seed bank for subsequent re-vegetation of any disturbed areas.
- No landscaping should be performed around the facilities. A large number of poultry production facilities in South Africa have expansive lawns around their developments. This must be avoided. Natural vegetation must be allowed to recover in areas of disturbance. If recovery is slow, then a seed mix for the area (using indigenous grass species listed within this report) should be sourced and planted.

10.2.3. Operation

- Highlight all prohibited activities to workers through training and notices.
- Effectively remove remaining and emerging alien and invasive flora. Any alien debris could be donated to a local community.
- It is hard to overemphasize the importance of detecting pest infestations before they become a problem. Failure to do so will often result in increased cost of control, less effective or ineffective control measures and significant damage or loss. Proper detection requires frequent and careful monitoring, a knowledge of the common pests and an ability to recognize potential problems. To prevent pests, the following should be performed:
    - Remove all trash, and sources of feed and water for pests from the outside perimeter of the facilities.
    - Keep grass and weeds mowed to 5cm or less immediately around the facilities, to prevent insect growth and hiding places for rats and mice. Plug all holes in the building (other than air inlets) larger than 1cm to prevent mice and rats from entering. Seal all foundation cracks. Check to see that fan louvers are properly working and close completely when the fan is not running.
    - Moisture management, sanitation and manure removal are the keys to reducing pest problems in manure. Dry manure reduces the suitability for fly oviposition (egg laying) and larval development. It also provides a suitable habitat for beneficial predators and parasites.
    - For fly management: Electrocution devices are available to kill flies, while other mechanical devices include traps, sticky tapes or baited traps.
    - In terms of rodent control: sanitation, rodent proofing and rodent killing are effective. Sanitation is removing the food, water and shelter from the rats and mice. Rodent proofing is making it more difficult for rodents to enter the building by sealing or covering with wire mesh, all holes and cracks in the walls and foundations, around water pipes and drain spouts. Rodent killing is the third element of the program and a variety of methods can be used. Glue boards and traps can be used in small areas, but in larger areas (over 12,000 sq ft) baits are more practical. Rodenticides are NOT advised.
    - The most effective control for indigenous birds is screening production house air inlets and open windows with 2x2cm wire mesh.
- Implement measures (e.g. speed bumps) along the gravel access to control dust, erosion, sedimentation, and faunal roadkill and any sensory disturbance.
- Minimize lighting. Where this is not possible, lights should be hooded and orientated downwards to reduce the disturbance or attraction of fauna to lights. Fluorescent and mercury vapour lighting should be avoided and sodium vapour (yellow) lights should be used wherever possible.
- Dispose of animal feed, bedding, excrement, carcasses, and all other waste using effective and environmentally-friendly methods, as planned pre-construction. Under no

circumstances should carcasses or any other waste be dumped on site, or elsewhere, where this is not catered for.

- Implement procedures and measures (e.g. sand traps) to prohibit accidental dirty water or contamination from entering the surrounding environment.
- Immediately implement effective measures to rehabilitate accidentally contaminated areas.

10.2.4. De-commissioning

- Demarcate the decommissioning site to prevent surrounding areas and biodiversity from being disturbed or destroyed. Disturbance of the wetland and rocky grassland areas, in particular, must be prohibited.
- Devise effective and environmentally-friendly means of managing all waste on site, where this cannot be disposed of using an appropriate licensed facility. Leftover animal feed, excrement, carcasses, dirty water, building rubble and any other waste should be prohibited from entering the surrounding environment.
- Highlight all prohibited activities to workers through training and notices.
- Commence (and preferably complete) decommissioning during winter, when the risk of erosion, disturbing growing plants, and disturbing active (including breeding and migratory) animals, should be least.
- Noise should also be minimised throughout decommissioning to limit the impact on sensitive fauna such as owls, korhaans and Secretarybird.
- Limit decommissioning activities to day light hours, and minimize security and other lights at night, to reduce the disturbance of nocturnal fauna including CI species.
- Erosion protection measures must be implemented on the site to reduce erosion and sedimentation of the receiving environment, as previously described.
- Adequate dust control strategies should be applied to minimise dust deposition, as previously described.
- Regularly check vehicles, machinery and equipment operating on site to ensure that none have leaks or cause spills of oil, diesel, grease or hydraulic fluid. Should a hydrocarbon or other chemical spill occur, clean up procedures must be undertaken a.s.a.p., in line with best practice, as previously described.
- Remove and dispose of any remaining and emerging Category 1b and Category 2 alien species on site. Again, alien debris could be donated to a local community.
- Enable natural vegetation to recover in areas of disturbance. If recovery is slow, then a seed mix for the area (using indigenous grass species listed within this report) should be sourced and planted.

11. Way Forward

Conservation Important habitats and species were mainly found along the periphery of the proposed development area, which predominantly comprises pasture fields and other transformed areas. Therefore, from a biodiversity conservation perspective, the proposed project could move forward provided that our recommended pre-construction mitigation measures are pursued. Most important in this regard, is our recommendation to revise the planned layout of the development to avoid all the Very High, High and Moderate-High sensitive areas as far as possible. Ideally, the proposed waste management site should be shifted to a less sensitive location. Effective and environmentally-friendly means of storing, managing and disposing of excrement, bedding, feed and carcasses, among other forms of waste, is critical, and must be planned in detail. The design and operations of the proposed facilities should minimize conflict with wildlife.

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13. Appendices

13.1. The ecoscan methodology agreed between CSIR and NSS

An ecological scan will be undertaken as opposed to a detailed biodiversity assessment due to the current disturbance on the site (majority of the area is currently farmed). The scan will include:

- An initial desktop review of available literature including:
  - Updated information from Mpumalanga Conservation Departments (e.g. any further C-Plan Data);
  - Recent Red Data Floral and Faunal Listings [IUCN, SABAP, SARCA Threatened Species Programme (TSP) in collaboration with the SANBI etc – this data is from 2012];
  - Any recent assessments within the region (if obtainable).

- A field visit investigating the following:
  - A day field visit of the site (**Figure 1**) at the mid-late summer identifying the vegetation communities (if present, depending on the disturbance level) using approved vegetation sampling methods;
  - A listing of the common/dominant plant and faunal species within the vegetation/habitat units identified;
  - Any additional information will be recorded for any other features that may have ecological significance within the study area and the surrounds (yellow boundary) - GPS points will be documented;
  - Photographic recordings will be taken of the site and the different vegetation communities and species therein.

13.2. POSA list for QDS 2628BA

Family	Alien	Species	Threat status
AMARANTHACEAE	*	*Amaranthus hybridus L. subsp. hybridus var. erythrostachys Moq.**	Not Evaluated
AMARYLLIDACEAE		*Crinum bulbispermum (Burm.f.) Milne-Redh. & Schweick.*	Declining
APOCYNACEAE		*Asclepias gibba (E.Mey.) Schltr. var. gibba*	LC
APOCYNACEAE		*Brachystelma barberae Harv. ex Hook.f.*	LC
APOCYNACEAE		*Cordylogyne globosa E.Mey.*	LC
APOCYNACEAE		*Gomphocarpus fruticosus (L.) Aiton f. subsp. fruticosus*	LC
APOCYNACEAE		*Huernia stapelioides Schltr.*	LC
APOCYNACEAE		*Schizoglossum periglossoides Schltr.*	LC
ASPHODELACEAE		*Chortolirion angolense (Baker) A.Berger*	LC
ASPHODELACEAE		*Kniphofia typhoides Codd*	NT
ASTERACEAE	*	*Aster squamatus (Spreng.) Hieron.*	Not Evaluated
ASTERACEAE		*Berkheya pinnatifida (Thunb.) Thell. subsp. ingrata (Bolus) Roessler*	LC
ASTERACEAE	*	*Cirsium vulgare (Savi) Ten.*	Not Evaluated
ASTERACEAE	*	*Conyza bonariensis (L.) Cronquist*	Not Evaluated
ASTERACEAE		*Dimorphotheca caulescens Harv.*	LC
ASTERACEAE		*Geigeria aspera Harv. var. aspera*	LC
ASTERACEAE		*Haplocarpha scaposa Harv.*	LC
ASTERACEAE	*	*Pseudognaphalium luteo-album (L.) Hilliard & B.L.Burtt*	
ASTERACEAE		*Senecio erubescens Aiton var. erubescens*	LC
ASTERACEAE		*Senecio inornatus DC.*	LC
ASTERACEAE		*Senecio madagascariensis Poir.*	LC
ASTERACEAE		*Senecio othonniflorus DC.*	LC
BRYACEAE		*Bryum argenteum Hedw.*	
CHENOPODIACEAE	*	*Chenopodium album L.*	Not Evaluated
CONVOLVULACEAE	*	*Cuscuta campestris Yunck.*	Not Evaluated
CONVOLVULACEAE		*Ipomoea crassipes Hook. var. crassipes*	LC
CYPERACEAE	*	*Carex acutiformis Ehrh.*	Not Evaluated
FABACEAE		*Eriosema nutans Schinz*	LC
FABACEAE		*Indigofera evansiana Burtt Davy*	LC
FABACEAE		*Tephrosia semiglabra Sond.*	LC
FABACEAE		*Trifolium africanum Ser. var. africanum*	LC
HYACINTHACEAE		*Ledebouria cooperi (Hook.f.) Jessop*	LC
HYACINTHACEAE		*Ledebouria ovatifolia (Baker) Jessop*	LC
HYACINTHACEAE		*Ledebouria revoluta (L.f.) Jessop*	LC
IRIDACEAE		*Babiana bainesii Baker*	LC
IRIDACEAE		*Gladiolus elliotii Baker*	LC

Family	Alien	Species	Threat status
IRIDACEAE		*Gladiolus sericeovillosus Hook.f. subsp. calvatus (Baker) Goldblatt*	LC
IRIDACEAE		*Moraea pallida (Baker) Goldblatt*	LC
LAMIACEAE		*Acrotome hispida Benth.*	LC
LAMIACEAE	*	*Salvia reflexa Hornem.*	Not Evaluated
LEMNACEAE		*Wolffia arrhiza (L.) Horkel ex Wimm.*	LC
LINACEAE		*Linum thunbergii Eckl. & Zeyh.*	LC
MALVACEAE	*	*Hibiscus sabdariffa L.*	Not Evaluated
MALVACEAE	*	*Hibiscus trionum L.*	
POACEAE	*	*Agrostis avenacea C.C.Gmel.*	Not Evaluated
POACEAE		*Agrostis lachnantha Nees var. lachnantha*	LC
POACEAE		*Alloteropsis semialata (R.Br.) Hitchc. subsp. eckloniana (Nees) Gibbs Russ.*	LC
POACEAE		*Andropogon eucomus Nees*	LC
POACEAE		*Diandrochloa namaquensis (Nees) De Winter*	LC
POACEAE		*Eragrostis curvula (Schrad.) Nees*	LC
POACEAE		*Eragrostis gummiflua Nees*	LC
POACEAE		*Eragrostis micrantha Hack.*	LC
POACEAE		*Eragrostis planiculmis Nees*	LC
POACEAE	*	*Eragrostis tef (Zuccagni) Trotter*	Not Evaluated
POACEAE		*Fingerhuthia sesleriiformis Nees*	LC
POACEAE		*Hyparrhenia hirta (L.) Stapf*	LC
POACEAE		*Ischaemum fasciculatum Brongn.*	LC
POACEAE		*Panicum stapfianum Fourc.*	LC
POACEAE	*	*Paspalum dilatatum Poir.*	Not Evaluated
POACEAE		*Paspalum distichum L.*	LC
POLYGONACEAE	*	*Persicaria limbata (Meisn.) H.Hara*	Not Evaluated
POLYGONACEAE	*	*Rumex crispus L.*	Not Evaluated
RICCIACEAE		*Riccia albovestita O.H.Volk*	
RICCIACEAE		*Riccia angolensis Steph.*	
RICCIACEAE		*Riccia stricta (Lindenb.) Perold*	
RUBIACEAE		*Galium capense Thunb. subsp. garipense (Sond.) Puff var. garipense*	LC
SCROPHULARIACEAE		*Veronica anagallis-aquatica L.*	LC

13.3. Newman's (2002) modified bird categories

CATEGORY	DESCRIPTION
1. Ocean birds	Albatrosses, gannets/boobies, gulls, penguins, petrels, prions, shearwaters, skimmer, skuas, subAntartctic birds, terns, & tropic-/frigatebirds.
2. Inland water birds	Pelicans, cormorants, herons, egrets, storks, hamerkop, flamingos, spoonbill, ibises & finfoot.
3. Ducks & wading birds	Ducks, geese, grebes, coot, gallinules, crakes, flufftails, snipes, plovers, lapwings, waders, jacanas, oystercatchers, curlews, avocet & stilts.
4. Large terrestrial birds	Thicknees, pratincoles, coursers, korhaans, bustards, cranes, quail, francolins, spurfowl, buttonquail, guineafowl, ostrich & secretarybird.
5. Raptors	Vultures, kites, eagles, buzzards, sparrowhawks, hawks, harriers, falcons & kestrels.
6. Owls & nightjars	Owls & nightjars.
7. Sandgrouse, doves, etc	Sandgrouse, doves, pigeons, parrots, lovebirds, trogon, turacos & go-away birds (louries), cuckoos & coucals.
8. Aerial feeders, etc	Swallows, martins, swifts, mousebirds, bee-eaters, kingfishers, rollers, hoopoes, hornbills, barbets, woodpeckers, wryneck & honeyguides.
9. Cryptic & elusive insect-eaters	Larks, finchlarks, pipits, wagtails, drongos, black flycatcher, cuckooshrikes, crows, orioles, bulbuls, tits, babblers, thrushes, chats & robins.
10. Regular insect-eaters	Warblers, apalises, titbabblers, eremomelas, carmoropteras, grassbird, cisticolas, prinias, flycatchers, batises, shrikes, boubous, tchagras, helmetshrikes & starlings.
11. Oxpeckers & nectar feeders	Sunbirds, oxpeckers, white-eyes & queleas.
12. Seedeaters	Sparrows, weavers, widow birds, bishops, finches, firefinches, waxbills, manikins, whydahs, canaries, siskins & buntings.

13.4. Mammal list for the study area

ORDER & SCIENTIFIC NAME	COMMON NAME	STATUS FRIEDMANN & DALY (2004)	STATUS IUCN (2013.1)	NEM:BA ToPS LIST (2015)	LoO
CARNIVORA	**Carnivores**				
Aonyx capensis	Cape Clawless Otter	LC	LC (S)	-	3
Atilax paludinosus	Water Mongoose	LC	LC (D)	-	3
Canis mesomelas	Black-backed Jackal	LC	LC (S)	-	2
Cynictis penicillata	Yellow Mongoose	LC	LC (S)	-	1
Galerella sanguinea	Slender Mongoose	LC	LC (S)	-	2
Genetta genetta	Small-spotted Genet	LC	LC (S)	-	2
Ichneumia albicauda	White-tailed Mongoose	LC	LC (S)	-	2
Ictonyx striatus	Striped Polecat	LC	LC (S)	-	2
Leptailurus serval	Serval	**NT**	LC (S)	**PS**	2
Poecilogale albinucha	African Weasel	**DD**	LC (U)	-	2
Proteles cristatus	Aardwolf	LC	LC (S)	-	3
Suricata suricatta	Suricate	LC	LC (U)	-	3
Vulpes chama	Cape Fox	LC	LC (S)	**PS**	3
CHIROPTERA	**Bats**				
Miniopterus natalensis	Natal Long-fingered Bat	**NT**	LC (U)	-	3
Myotis welwitschii	Welwitsch's Myotis	LC	LC (U)	-	3
Neoromicia capensis	Cape Serotine	LC	LC (S)	-	2
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC (U)	-	3
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC (U)	-	3
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC (U)	-	2
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC (U)	-	3
EULIPOTYPHLA	**Hedgehog & shrews**				
Atelerix frontalis	Southern African Hedgehog	**NT**	LC (S)	-	2
Crocidura cyanea	Reddish-grey Musk Shrew	**DD**	LC (S)	-	2
Crocidura mariquensis	Swamp Musk Shrew	**DD**	LC (U)	-	3
Myosorex varius	Forest Shrew	**DD**	LC (S)	-	3
Suncus infinitesimus	Least Dwarf Shrew	**DD**	LC (U)	-	2
Suncus varilla	Lesser Dwarf Shrew	**DD**	LC (U)	-	2
LAGOMORPHA	**Hares & rabbits**				
Lepus capensis	Cape Hare	LC	LC (D)	-	3

ORDER & SCIENTIFIC NAME	COMMON NAME	FRIEDMANN & DALY (2004)	STATUS IUCN (2013.1)	NEM:BA ToPS LIST (2015)	LoO
Lepus saxatilis	Scrub Hare	LC	LC (D)	-	1
Pronolagus randensis	Jameson's Red Rock Rabbit	LC	LC (U)	-	3
MACROSCELIDEA	**Elephant-shrews**				
Elephantulus myurus	Rock Elephant-shrew	LC	LC (S)	-	2
RODENTIA	**Rodents**				
Aethomys ineptus	Tete Veld Rat	LC	LC (U)	-	3
Aethomys namaquensis	Namaqua Rock Mouse	LC	LC (S)	-	2
Cryptomys hottentotus	Common Mole-rat	LC	LC (S)	-	1
Graphiurus platyops	Rock Dormouse	**DD**	LC (U)	-	3
Hystrix africaeaustralis	Porcupine	LC	LC (S)	-	2
Mastomys coucha	Multimammate Mouse	LC	LC (S)	-	2
Mystromys albicaudatus	White-tailed Rat	**EN**	**EN (D)**	-	3
Otomys irroratus	Vlei Rat	LC	LC (S)	-	2
Pedetes capensis	Springhare	LC	LC (U)	-	3
Rhabdomys pumilio	Striped Mouse	LC	LC (S)	-	2
Saccostomus campestris	Pouched Mouse	LC	LC (S)	-	3
Steatomys krebsii	Krebs's Fat Mouse	LC	LC (S)	-	3
Tatera brantsii	Highveld Gerbil	LC	LC (U)	-	2
Xerus inauris	Cape Ground Squirrel	LC	LC (S)	-	2
RUMINANTIA	**Even-toed ungulates**				
Raphicerus campestris	Steenbok	LC	LC (S)	-	3
Sylvicapra grimmia	Common Duiker	LC	LC (S)	-	2
SUIFORMES	**Pigs & hogs**				
Potamochoerus larvatus	Bushpig	LC	LC (S)	-	3

Status: D = Declining; DD = Data Deficient; EN = Endangered; LC = Least Concern; NT = Near Threatened; PS = Protected Species; S = Stable; U = Unkno VU = Vulnerable

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

Sources: Friedmann & Daly (2004); Stuart & Stuart (2007); Monadjem *et al.* (2010); IUCN (2013); ToPS List (2015); MammalMAP (2016)

13.5. SABAP (2016) bird list for pentad 2600_2830

CATEGORY & SCIENTIFIC NAME	COMMON NAME	STATUS IUCN (2013.1)	STATUS TAYLOR ET AL. (2015)	NEM:BA ToPS LIST (2015)	SABAP	NSS
1. Ocean birds						
2. Inland water birds						
Anhinga rufa	African Darter	LC (D)	LC	-	1	
Ardea cinerea	Grey Heron	LC (U)	LC	-	1	
Ardea goliath	Goliath Heron	LC (S)	LC	-	1	
Ardea melanocephala	Black-headed Heron	LC (I)	LC	-	1	
Ardea purpurea	Purple Heron	LC (D)	LC	-	1	
Ardeola ralloides	Squacco Heron	LC (D)	LC	-	1	
Bostrychia hagedash	Hadeda Ibis	LC (I)	LC	-	1	1
Bubulcus ibis	Cattle Egret	LC (I)	LC	-	1	1
Egretta alba	Great Egret	LC (U)	LC	-	1	
Chlidonias hybrida	Whiskered Tern	LC (S)	LC	-	1	
Chlidonias leucopterus	White-winged Tern	LC (S)	LC (NB)	-	1	
Ciconia ciconia	White Stork	LC (I)	LC (NB)	-	1	
Egretta ardesiaca	Black Heron	LC (S)	LC	-	1	
Egretta garzetta	Little Egret	LC (I)	LC	-	1	
Glareola nordmanni	Black-winged Pratincole	**NT (D)**	**NT (NB)**	**-**	1	
Ixobrychus minutus	Little Bittern	LC (D)	LC	-	1	
Larus cirrocephalus	Grey-headed Gull	LC (S)	LC	-	1	
Egretta intermedia	Yellow-billed Egret	LC (D)	LC	-	1	
Mycteria ibis	Yellow-billed Stork	LC (D)	**EN**	**-**	1	
Nycticorax nycticorax	Black-crowned Night-heron	LC (D)	LC	-	1	
Phalacrocorax africanus	Reed Cormorant	LC (D)	LC	-	1	
Phalacrocorax carbo	White-breasted Cormorant	LC (I)	LC	-	1	
Phoenicopterus minor	Lesser Flamingo	**NT (D)**	**NT**	**-**	1	
Phoenicopterus ruber	Greater Flamingo	LC (I)	**NT**	**-**	1	
Platalea alba	African Spoonbill	LC (S)	LC	-	1	
Plegadis falcinellus	Glossy Ibis	LC (D)	LC	-	1	
Scopus umbretta	Hamerkop	LC (S)	LC	-	1	
Threskiornis aethiopicus	African Sacred Ibis	LC (D)	LC	-	1	
3. Ducks & wading birds						

CATEGORY & SCIENTIFIC NAME	COMMON NAME	STATUS IUCN (2013.1)	STATUS TAYLOR ET AL. (2015)	NEM:BA ToPS LIST (2015)	SABAP	NSS
Actitis hypoleucos	Common Sandpiper	LC (D)	LC (NB)	-	1	
Actophilornis africanus	African Jacana	LC (S)	LC	-	1	
Alopochen aegyptiacus	Egyptian Goose	LC (D)	LC	-	1	
Amaurornis flavirostris	Black Crake	LC (U)	LC	-	1	
Anas capensis	Cape Teal	LC (I)	LC	-	1	
Anas erythrorhyncha	Red-billed Teal	LC (D)	LC	-	1	
Anas hottentota	Hottentot Teal	LC (D)	LC	-	1	
Anas smithii	Cape Shoveler	LC (I)	LC	-	1	
Anas sparsa	African Black Duck	LC (D)	LC	-	1	
Anas undulata	Yellow-billed Duck	LC (S)	LC	-	1	
Calidris ferruginea	Curlew Sandpiper	LC (I)	LC (NB)	-	1	
Calidris minuta	Little Stint	LC (D)	LC (NB)	-	1	
Charadrius pecuarius	Kittlitz's Plover	LC (U)	LC	-	1	
Charadrius tricollaris	Three-banded Plover	LC (U)	LC	-	1	
Dendrocygna bicolor	Fulvous Duck	LC (D)	LC	-	1	
Dendrocygna viduata	White-faced Duck	LC (I)	LC	-	1	
Fulica cristata	Red-knobbed Coot	LC (D)	LC	-	1	
Gallinago nigripennis	African Snipe	LC (U)	LC	-	1	
Gallinula chloropus	Common Moorhen	LC (U)	LC	-	1	
Himantopus himantopus	Black-winged Stilt	LC (I)	LC	-	1	
Netta erythrophthalma	Southern Pochard	LC (D)	LC	-	1	
Oxyura maccoa	Maccoa Duck	**NT (D)**	**NT**	-	1	
Philomachus pugnax	Ruff	LC (D)	LC (NB)	-	1	
Plectropterus gambensis	Spur-winged Goose	LC (I)	LC	-	1	
Podiceps cristatus	Great Crested Grebe	LC (U)	LC	-	1	
Porphyrio madagascariensis	African Purple Swamphen	LC (U)	LC	-	1	
Rallus caerulescens	African Rail	LC (U)	LC	-	1	
Recurvirostra avosetta	Pied Avocet	LC (U)	LC	-	1	
Sarkidiornis melanotos	Comb Duck	LC (D)	LC	-	1	
Sarothrura rufa	Red-chested Flufftail	LC (D)	LC	-	1	
Tachybaptus ruficollis	Little Grebe	LC (D)	LC	-	1	
Tadorna cana	South African Shelduck	LC (I)	LC	-	1	
Thalassornis leuconotus	White-backed Duck	LC (D)	LC	-	1	

CATEGORY & SCIENTIFIC NAME	COMMON NAME	STATUS IUCN (2013.1)	STATUS TAYLOR ET AL. (2015)	NEM:BA ToPS LIST (2015)	SABAP	NSS
Tringa glareola	Wood Sandpiper	LC (S)	LC (NB)	-	1	
Tringa nebularia	Common Greenshank	LC (S)	LC (NB)	-	1	
Tringa stagnatilis	Marsh Sandpiper	LC (D)	LC (NB)	-	1	
Vanellus armatus	Blacksmith Lapwing	LC (I)	LC	-	1	1
Vanellus coronatus	Crowned Lapwing	LC (I)	LC	-	1	1
Vanellus senegallus	African Wattled Lapwing	LC (S)	LC	-	1	
4. Large terrestrial birds						
Afrotis afraoides	Northern Black Korhaan	-	LC	-	1	
Burhinus capensis	Spotted Thick-knee	LC (S)	LC	-	1	
Coturnix coturnix	Common Quail	LC (D)	LC	-	1	
Cursorius temminckii	Temminck's Courser	LC (S)	LC	-		1
Eupodotis caerulescens	Blue Korhaan	**NT (S)**	LC	-	1	
Eupodotis senegalensis	White-bellied Korhaan	LC (D)	**VU**	**-**	1	
Scleroptila levaillantoides	Orange River Francolin	LC (S)	LC	-	1	
Pternistis swainsonii	Swainson's Spurfowl	LC (S)	LC	-	1	
Numida meleagris	Helmeted Guineafowl	LC (S)	LC	-	1	1
Struthio camelus	Common Ostrich	LC (D)	LC	-	1	
5. Raptors						
Buteo vulpinus	Steppe Buzzard	LC (I)	LC (NB)	-	1	1
Circus maurus	Black Harrier	**VU (S)**	**EN**	**-**	1	
Circus pygargus	Montagu's Harrier	LC (D)	LC (NB)	-	1	
Circus ranivorus	African Marsh-harrier	LC (D)	**EN**	-	1	
Elanus caeruleus	Black-shouldered Kite	LC (S)	LC	-	1	1
Falco amurensis	Amur Falcon	LC (S)	LC (NB)	-	1	1
Falco biarmicus	Lanner Falcon	LC (I)	**VU**	**-**	1	
Falco naumanni	Lesser Kestrel	LC (S)	LC	**-**	1	
Falco rupicoloides	Greater Kestrel	LC (S)	LC	-	1	
Falco rupicolus	Rock Kestrel	-	LC	-	1	
6. Owls & nightjars						
Asio capensis	Marsh Owl	LC (S)	LC	-	1	1
Bubo africanus	Spotted Eagle-owl	LC (S)	LC	-	1	
Tyto alba	Barn Owl	LC (S)	LC	-	1	
7. Sandgrouse, doves etc						

CATEGORY & SCIENTIFIC NAME	COMMON NAME	IUCN (2013.1)	STATUS TAYLOR ET AL. (2015)	NEM:BA ToPS LIST (2015)	SABAP	NSS
Centropus burchellii	Burchell's Coucal	LC (S)	LC	-	1	
Centropus superciliosus	White-browed Coucal	LC (S)	LC	-	1	
Chrysococcyx caprius	Dideric Cuckoo	LC (S)	LC (B)	-	1	1
Columba guinea	Speckled Pigeon	LC (S)	LC	-	1	
Columba livia	Rock Dove	LC (D)	**AL**	**-**	1	
Cuculus solitarius	Red-chested Cuckoo	LC (S)	LC (B)	-	1	
Oena capensis	Namaqua Dove	LC (I)	LC	-	1	
Streptopelia capicola	Cape Turtle Dove	LC (I)	LC	-	1	1
Streptopelia semitorquata	Red-eyed Dove	LC (I)	LC	-	1	
Streptopelia senegalensis	Laughing Dove	LC (S)	LC	-	1	1
8. Aerial feeders, etc						
Alcedo cristata	Malachite Kingfisher	LC (S)	LC	-	1	
Alcedo semitorquata	Half-collared Kingfisher	LC (D)	**NT**	**-**	1	
Apus affinis	Little Swift	LC (I)	LC	-	1	
Apus barbatus	African Black Swift	LC (S)	LC	-	1	
Apus caffer	White-rumped Swift	LC (I)	LC (B)	-	1	1
Apus horus	Horus Swift	LC (I)	LC	-	1	
Ceryle rudis	Pied Kingfisher	LC (U)	LC	-	1	
Colius striatus	Speckled Mousebird	LC (I)	LC	-	1	
Coracias caudatus	Lilac-breasted Roller	LC (S)	LC	-	1	
Cypsiurus parvus	Palm Swift	LC (I)	LC	-	1	
Delichon urbicum	Common House-martin	LC (D)	LC	-	1	
Hirundo albigularis	White-throated Swallow	LC (I)	LC	-	1	
Hirundo cucullata	Greater Striped-swallow	LC (I)	LC	-	1	
Hirundo fuligula	Rock Martin	LC (S)	LC	-	1	
Hirundo rustica	Barn Swallow	LC (D)	LC (NB)	-	1	1
Hirundo semirufa	Red-breasted Swallow	LC (I)	LC	-	1	
Hirundo spilodera	South African Cliff-swallow	LC (I)	LC (B, N-End)	-	1	1
Jynx ruficollis	Red-throated Wryneck	LC (I)	LC	-	1	
Lybius torquatus	Black-collared Barbet	LC (D)	LC	-	1	
Phoeniculus purpureus	Green Wood-hoopoe	LC (D)	LC	-	1	
Riparia cincta	Banded Martin	LC (I)	LC	-	1	
Riparia paludicola	Brown-throated Martin	LC (D)	LC	-	1	1

CATEGORY & SCIENTIFIC NAME	COMMON NAME	STATUS IUCN (2013.1)	STATUS TAYLOR ET AL. (2015)	NEM:BA ToPS LIST (2015)	SABAP	NSS
Tachymarptis melba	Alpine Swift	LC (S)	LC (B)	-	1	
Tockus nasutus	African Grey Hornbill	LC (S)	LC	-	1	
Trachyphonus vaillantii	Crested Barbet	LC (D)	LC	-	1	
Upupa africana	African Hoopoe	-	LC	-	1	
Urocolius indicus	Red-faced Mousebird	LC (U)	LC	-	1	
9. Cryptic & elusive insect-eaters						
Acrocephalus arundinaceus	Great Reed-warbler	LC (D)	LC (NB)	-	1	
Acrocephalus baeticatus	African Reed-warbler	-	LC (B)	-	1	
Acrocephalus gracilirostris	Lesser Swamp-warbler	LC (S)	LC	-	1	
Acrocephalus schoenobaenus	Sedge Warbler	LC (D)	LC (NB)	-	1	
Anthus cinnamomeus	African Pipit	LC (S)	LC	-	1	1
Anthus leucophrys	Plain-backed Pipit	LC (S)	LC	-	1	
Anthus vaalensis	Buffy Pipit	LC (I)	LC	-	1	
Bradypterus baboecala	Little Rush-warbler	LC (S)	LC	-	1	
Calandrella cinerea	Red-capped Lark	LC (I)	LC	-	1	
Certhilauda brevirostris	Agulhas Long-billed Lark	**-**	**NT (End)**	**-**	1	
Chersomanes albofasciata	Spike-heeled Lark	LC (D)	LC	-	1	
Cisticola aridulus	Desert Cisticola	LC (I)	LC	-	1	
Cisticola ayresii	Wing-snapping Cisticola	LC (D)	LC	-	1	
Cisticola fulvicapilla	Neddicky	LC (S)	LC	-	1	
Cisticola juncidis	Zitting Cisticola	LC (I)	LC	-	1	1
Cisticola lais	Wailing Cisticola	LC (S)	LC	-	1	
Cisticola textrix	Cloud Cisticola	LC (D)	LC (N-End)	-	1	1
Cisticola tinniens	Le Vaillant's Cisticola	LC (S)	LC	-	1	
Eremopterix leucotis	Chestnut-backed Sparrowlark	LC (S)	LC	-	1	
Macronyx capensis	Cape Longclaw	LC (S)	LC	-	1	1
Mirafra africana	Rufous-naped Lark	LC (D)	LC	-	1	
Mirafra apiata	Cape Clapper Lark	LC (D)	LC (N-End)	-	1	
Mirafra cheniana	Melodious Lark	**NT (D)**	LC (End)	**-**	1	
Mirafra fasciolata	Eastern Clapper Lark	-	LC	-	1	
Motacilla capensis	Cape Wagtail	LC (S)	LC	-	1	1
Phylloscopus trochilus	Willow Warbler	LC (D)	LC (NB)	-	1	
Prinia flavicans	Black-chested Prinia	LC (S)	LC	-	1	

CATEGORY & SCIENTIFIC NAME	COMMON NAME	STATUS IUCN (2013.1)	STATUS TAYLOR ET AL. (2015)	NEM:BA ToPS LIST (2015)	SABAP	NSS
Prinia subflava	Tawny-flanked Prinia	LC (S)	LC	-	1	
Pycnonotus tricolor	Dark-capped Bulbul	-	LC	-	1	1
Sphenoeacus afer	Cape Grassbird	LC (D)	LC (N-End)	-	1	
Spizocorys conirostris	Pink-billed Lark	LC (D)	LC	-	1	
Sylvia borin	Garden Warbler	LC (D)	LC	-	1	
10. Regular insect-eaters						
Acridotheres tristis	Common Myna	LC (I)	**AL**	**-**	1	1
Cercomela familiaris	Familiar Chat	LC (S)	LC	-	1	
Corvus albus	Pied Crow	LC (S)	LC	-	1	
Corvus capensis	Cape Crow	LC (I)	LC	-	1	
Cossypha caffra	Cape Robin-chat	LC (S)	LC	-	1	
Creatophora cinerea	Wattled Starling	LC (S)	LC	-	1	
Dicrurus adsimilis	Fork-tailed Drongo	LC (S)	LC	-	1	
Lamprotornis nitens	Cape Glossy Starling	LC (S)	LC	-	1	1
Laniarius ferrugineus	Southern Boubou	LC (S)	LC	-	1	
Lanius collaris	Common Fiscal	LC (I)	LC	-	1	1
Lanius minor	Lesser Grey Shrike	LC (D)	LC (NB)	-	1	
Muscicapa striata	Spotted Flycatcher	LC (D)	LC (NB)	-	1	
Myrmecocichla formicivora	Anteating Chat	LC (S)	LC	-	1	
Oenanthe pileata	Capped Wheatear	LC (S)	LC (B)	-	1	
Saxicola torquatus	African Stonechat	LC (S)	LC	-	1	
Sigelus silens	Fiscal Flycatcher	LC (S)	LC (N-End)	-	1	
Spreo bicolor	Pied Starling	LC (S)	LC (N-End)	-	1	
Telophorus zeylonus	Bokmakierie	LC (S)	LC	-	1	
Terpsiphone viridis	African Paradise-flycatcher	LC (S)	LC	-	1	
Turdus olivaceus	Olive Thrush	LC (U)	LC	-	1	
Turdus smithi	Karoo Thrush	-	LC (N-End)	-	1	
11. Oxpeckers & nectar feeders						
Chalcomitra amethystina	Amethyst Sunbird	LC (S)	LC	-	1	
Zosterops virens	Cape White-eye	-	LC (N-End)	-	1	
Zosterops pallidus	Orange River White-eye	LC (U)	LC	-	1	
12. Seed-eaters						
Amadina erythrocephala	Red-headed Finch	LC (S)	LC	-	1	

CATEGORY & SCIENTIFIC NAME	COMMON NAME	STATUS IUCN (2013.1)	STATUS TAYLOR ET AL. (2015)	STATUS NEM:BA ToPS LIST (2015)	SABAP	NSS
Amandava subflava	Orange-breasted Waxbill	LC (S)	LC	-	1	
Anomalospiza imberbis	Cuckoo Finch	LC (S)	LC	-	1	
Crithagra atrogularis	Black-throated Canary	LC (S)	LC	-	1	
Crithagra flaviventris	Yellow Canary	LC (S)	LC	-	1	
Crithagra mozambicus	Yellow-fronted Canary	LC (D)	LC	-	1	
Emberiza tahapisi	Cinnamon-breasted Bunting	LC (S)	LC	-	1	
Estrilda astrild	Common Waxbill	LC (S)	LC	-	1	
Euplectes afer	Yellow-crowned Bishop	LC (S)	LC	-	1	
Euplectes albonotatus	White-winged Widowbird	LC (S)	LC	-	1	
Euplectes ardens	Red-collared Widowbird	LC (S)	LC	-	1	
Euplectes axillaris	Fan-tailed Widowbird	LC (S)	LC	-	1	
Euplectes capensis	Yellow Bishop	LC (S)	LC	-	1	
Euplectes orix	Southern Red Bishop	LC (S)	LC	-	1	1
Euplectes progne	Long-tailed Widowbird	LC (S)	LC	-	1	1
Ortygospiza atricollis	African Quailfinch	LC (S)	LC	-	1	1
Passer diffusus	Southern Greyheaded Sparrow	LC (S)	LC	-	1	
Passer domesticus	House Sparrow	LC (D)	**AL**	**-**	1	
Passer griseus	Northern Grey-headed Sparrow	LC (S)	LC	-	1	
Passer melanurus	Cape Sparrow	LC (S)	LC	-	1	1
Ploceus capensis	Cape Weaver	LC (S)	LC (N-End)	-	1	
Ploceus velatus	Southern Masked-weaver	LC (S)	LC	-	1	1
Quelea quelea	Red-billed Quelea	LC (S)	LC	-	1	1
Serinus canicollis	Cape Canary	LC (S)	LC	-	1	
Vidua macroura	Pin-tailed Whydah	LC (S)	LC	-	1	

Status: AL = Alien; B = Breeding; D = Declining; EN = Endangered; End = Endemic; I = Increasing; LC = Least Concern; NB = Non-breeding; N-End = Near-Endemic; NT = N
Vag = Vagrant; VU = Vulnerable
Likelihood of Occurrence (LoO): 1 = Present
Sources: Newman (2002); IUCN (2013); Taylor *et al.*(2015); ToPS List (2015); SABAP 1&2 (2016)

13.6. Reptile list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	STATUS			
		BATES ET AL. (2014)	IUCN (2014.3)	NEM:BA ToPS LIST (2015)	LoO
GEKKONIDAE	**Geckos**				
Lygodactylus ocellatus ocellatus	Spotted Dwarf Gecko	1LC		-	3
Pachydactylus affinis	Transvaal Gecko	1LC	-	-	3
Pachydactylus capensis	Cape Gecko	2LC	-	-	2
LACERTIDAE	**Typical lizards**				
Nucras lalandii	Delalande's Sandveld Lizard	1LC		-	3
CORDYLIDAE	**Girdled lizards & relatives**				
Chamaesaura aenea	Coppery Grass Lizard	**1NT**	-	-	2
GERRHOSAURIDAE	**Plated lizards & relatives**				
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	2LC	-	-	2
SCINCIDAE	**Skinks**				
Afroablepharus wahlbergii	Wahlberg's Snake-eyed Skink	2LC	-	-	3
Trachylepis capensis	Cape Skink	2LC	-	-	2
Trachylepis punctatissima	Speckled Rock Skink	2LC	LC (S)	-	3
Trachylepis varia	Variable Skink	2LC	-	-	2
CHAMAELEONIDAE	**Chamaeleons**				
Chamaeleo dilepis	Common Flap-neck Chameleon	2LC	LC (S)	-	2
AGAMIDAE	**Agamas**				
Agama aculeata distanti	Eastern Ground Agama	1LC	-	-	2
Agama atra	Southern Rock Agama	1LC	-	-	3
TYPHLOPIDAE	**Blind snakes**				
Afrotyphlops bibronii	Bibron's Blind Snake	1LC	-	-	2
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	2LC	-	-	2
LEPTOTYPHLOPIDAE	**Thread snakes**				
Leptotyphlops scutifrons	Peter's Thread Snake	1LC	-	-	2
VIPERIDAE	**Adders**				
Bitis arietans	Puff Adder	2LC	-	-	2
Causus rhombeatus	Rhombic Night Adder	2LC	-	-	3
LAMPROPHIIDAE	**Advanced snakes**				
Aparallactus capensis	Black-headed Centipede-eater	2LC	LC (S)	-	2
Atractaspis bibronii	Bibron's Stiletto Snake	2LC	-	-	3

FAMILY & SCIENTIFIC NAME	COMMON NAME	STATUS		NEM:BA ToPS LIST (2015)	LoO
		BATES ET AL. (2014)	IUCN (2014.3)		
Homoroselaps dorsalis	Striped Harlequin Snake	**1NT**	**NT**	-	3
Boaedon capensis	Brown House Snake	2LC	-	-	2
Lamprophis aurora	Aurora Snake	1LC	LC (D)	-	2
Lycodonomorphus inornatus	Olive Ground Snake	1LC	LC (U)	-	3
Lycodonomorphus rufulus	Brown Water Snake	1LC	-	-	3
Lycophidion capense capense	Cape Wolf Snake	2LC	-	-	2
Psammophis brevirostris	Short-snouted Grass Snake	1LC	-	-	2
Psammophis crucifer	Cross-marked Grass Snake	1LC	-	-	2
Psammophis trinasalis	Kalahari Sand Snake	2LC	-	-	3
Psammophylax rhombeatus rhombeatus	Spotted Grass Snake	2LC	-	-	2
Psammophylax tritaeniatus	Striped Grass Snake	2LC	LC (S)	-	2
Duberria lutrix lutrix	South African Slug-eater	1LC	LC (S)	-	3
Pseudaspis cana	Mole Snake	2LC	-	-	2
ELAPIDAE	**Cobras & relatives**				
Hemachatus haemachatus	Rinkhals	1LC	LC (S)	-	2
COLUBRIDAE	**Typical snakes**				
Crotaphopeltis hotamboeia	Red-lipped Snake	2LC	-	-	2
Dasypeltis scabra	Rhombic Egg-eater	2LC	LC (U)	-	2

Status: 1 = Global; 2 = Regional; D = Declining; LC = Least Concern; NT = Near Threatened; PS = Protected Species; S = Stable; U = Unknown population trend

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

Sources: Bates *et al*. (2014); IUCN (2014); ToPS List (2015); ReptileMAP (2016)

13.7. Frog list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	STATUS MINTER ET AL. (2004)	STATUS NEM:BA ToPS LIST (2007)	STATUS MEASEY (2011)	STATUS IUCN (2013.1)	LoO
BUFONIDAE	**True toads**					
Amietophrynus gutturalis	Guttural Toad	LC	-	-	LC (I)	2
Amietophrynus rangeri	Raucous Toad	LC	-	-	LC (D)	2
Schismaderma carens	Red Toad	LC	-	-	LC (U)	2
HYPEROLIIDAE	**Leaf-folding & reed frogs**					
Kassina senegalensis	Bubbling Kassina	LC	-	-	LC (U)	2
Semnodactylus wealii	Rattling Frog	LC	-	-	LC (U)	3
PHRYNOBATRACHIDAE	**Puddle frogs**					
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	-	-	LC (S)	3
PIPIDAE	**Platannas (African clawed frogs)**					
Xenopus laevis	Common Platanna	LC	-	-	LC (I)	2
PTYCHADENIDAE	**Grass frogs**					
Ptychadena porosissima	Striped Grass Frog	LC	-	-	LC (U)	3
PYXICEPHALIDAE	**River, stream, moss & sand frogs**					
Amietia quecketti	Queckett's River Frog	LC	-	-	LC (S)	2
Amietia fuscigula	Cape River Frog	LC	-	-	LC (S)	2
Cacosternum boettgeri	Boettger's Caco	LC	-	-	LC (U)	2
Pyxicephalus adspersus	Giant Bullfrog	**NT**	**PS**	-	LC (D)	2
Strongylopus fasciatus	Striped Stream Frog	LC	-	-	LC (U)	2
Strongylopus grayii	Clicking Stream Frog	LC	-	-	LC (U)	3
Tomopterna cryptotis	Tremolo Sand Frog	LC	-	-	LC (S)	2
Tomopterna natalensis	Natal Sand Frog	LC	-	-	LC (U)	2

Status: D = Declining; I = Increasing; LC = Least Concern; NT = Near Threatened; PS = Protected Species; S = Stable; U = Unknown population trend; * Status assigned to species

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

Sources: Minter *et al.* (2004); ToPS List (2007); Du Preez & Carruthers (2009); Measey (2011); IUCN (2013); FrogMAP (2016)

13.8. Butterfly list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	STATUS NEM:BA ToPS LIST (2007)	STATUS MECENERO ET AL. (2013)	STATUS IUCN (2014.3)	LoO
HESPERIDAE	**Skippers & relatives**				
Gegenes niso niso	Common Hottentot Skipper	-	1LC	-	3
Kedestes barberae barberae	Barber's Ranger	-	1LC	-	3
Kedetes nerva nerva	Scarce Ranger	-	1LC (End)	-	3
Metisella malgacha malgacha	Grassveld Sylph	-	1LC (End)	-	3
Metisella meninx	Marsh Sylph	-	1LC (Rare)	-	1
Spialia asteroidia	Star Sandman	-	1LC	-	2
Spialia diomus ferax	Common Sandman	-	1LC	-	2
Spialia mafa mafa	Mafa Sandman	-	1LC	-	2
Tsitana tsita	Dismal Sylph	-	1LC	-	3
PAPILIONIDAE	**Swallowtails & relatives**				
Papilio demodocus demodocus	Citrus Swallowtail	-	1LC	-	1
PIERIDAE	**Whites, Yellows & relatives**				
Belenois aurota	Brown-veined White	-	1LC	-	1
Belenois creona severina	African Common White	-	1LC	-	3
Catopsilia florella	African Migrant	-	1LC	-	1
Colias electo electo	African Clouded Yellow	-	1LC	-	2
Eurema brigitta brigitta	Broad-bordered Grass Yellow	-	1LC	-	1
Mylothris agathina agathina	Common Dotted Border	-	1LC	-	3
Pontia helice helice	Common Meadow White	-	1LC	-	1
NYMPHALIDAE	**Acraeas, Browns, Charaxes & relatives**				
Acraea neobule neobule	Wondering Donkey Acraea	-	1LC	-	3
Catacroptera cloanthe cloanthe	Pirate	-	1LC	-	2
Danaus chrysippus orientis	African Monarch	-	1LC	-	1
Hypolimnas misippus	Common Diadem	-	1LC	-	1
Junonia hierta cebrene	Yellow Pansy	-	1LC	-	1
Junonia oenone oenone	Blue Pansy	-	1LC	-	2
Junonia orithya madagascariensis	Eyed Pansy	-	1LC	-	1
Paternympha narycia	Spotted-eye Brown	-	1LC	-	2
Stygionympha wichgrafi wichgrafi	Wichgraf's Hillside Brown	-	1LC	-	2
Telchinia anacreon	Orange Acraea	-	1LC	-	3

FAMILY & SCIENTIFIC NAME	COMMON NAME	STATUS			
		NEM:BA ToPS LIST (2007)	MECENERO ET AL. (2013)	IUCN (2014.3)	LoO
Telchinia rahira rahira	Marsh Acraea	-	1LC	-	1
Vanessa cardui	Painted Lady	-	1LC	-	1
LYCAENIDAE	**Blues, Coppers, Opals & relatives**				
Actizera lucida	Rayed Blue	-	1LC	-	2
Aloeides aranda	Aranda Copper	-	1LC	-	3
Aloeides dentatis dentatis	Roodepoort Copper	-	1EN (End)	-	3
Aloeides dentatis maseruna	Roodepoort Copper	-	1LC (End)	-	3
Aloeides henningi	Henning's Copper	-	1LC (End)	-	2
Aloeides molomo molomo	Molomo Copper	-	1LC (End)	-	3
Aloeides trimeni trimeni	Trimen's Copper	-	1LC	-	3
Cacyreus marshallii	Common Geranium Bronze	-	1LC	-	3
Cacyreus virilis	Mocker Bronze	-	1LC	-	1
Chilades trochylus	Grass Jewel	-	1LC	-	2
Cupidopsis cissus cissus	Common Meadow Blue	-	1LC	-	2
Cupidopsis jobates jobates	Tailed Meadow Blue	-	1LC	-	3
Eicochrysops messapus mahallakoaena	Cupreous Blue	-	1LC	-	2
Lampides boeticus	Pea Blue	-	1LC	-	2
Lepidochrysops ignota	Zulu Blue	-	1LC (End)	-	3
Lepidochrysops ortygia	Koppie Blue	-	1LC (End)	-	3
Lepidochrysops patricia	Patricia Blue	-	1LC	-	3
Lepidochrysops tantalus	King Blue	-	1LC (End)	-	3
Leptotes pirithous pirithous	Common Zebra Blue	-	1LC	-	2
Lycaena clarki	Eastern Sorrel Copper	-	1LC (End)	-	3
Oraidium barberae	Dwarf Blue	-	1LC	-	2
Tarucus sybaris linearis	Dotted Blue	-	1LC	-	2
Thestor basutus basutus	Basotho Skolly	-	1LC	-	3
Zizeeria knysna knysna	Sooty Blue	-	1LC	-	1
Zizula hylax	Gaika Blue	-	1LC	-	2

Status: 1 = Global; EN = Endangered; End = Endemic; LC = Least Concern; Rare = Not common
Likelihood of Occurrence (LoO): 1 = Present; 2 = High; 3 = Moderate
Sources: ToPS List (2007); Mecenero *et al*. (2013); IUCN (2014); LepiMAP (2016)

13.9. Odonata list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	BIOTIC INDEX	STATUS SAMWAYS (2006)	STATUS IUCN (2014.3)	LoO
SYNLESTIDAE	**Malachites**				
Chlorolestes fasciatus	Mountain Malachite	4	-	LC (S)	3
LESTIDAE	**Spreadwings**				
Lestes pallidus	Pale Spreadwing	2	-	LC (U)	3
Lestes plagiatus	Highland Spreadwing	2	-	LC (U)	3
PROTONEURIDAE	**Threadtails**				
Elattoneura glauca	Common Threadtail	1	-	LC (U)	2
COENAGRIONIDAE	**Citrils, Sprites & relatives**				
Pseudagrion citricola	Yellow-faced Sprite	3	-	LC (S)	3
Pseudagrion salisburyense	Slate Sprite	1	-	LC (U)	2
Ischnura senegalensis	Marsh Bluetail	0	-	LC (S)	2
Africallagma glaucum	Swamp Bluet	1	-	LC (U)	2
Africallagma sapphirinum	Sapphire Bluet	4	-	LC (I)	3
AESHNIDAE	**Hawkers, Emperors & relatives**				
Aeshna minuscula	Friendly Hawker	5	-	LC (U)	3
Anax ephippiger	Vagrant Emperor	2	-	LC (U)	3
Anax imperator	Blue Emperor	1	-	LC (S)	3
LIBELLULIDAE	**Skimmers, Dropwings & relatives**				
Orthetrum caffrum	Two-striped Skimmer	3	-	LC (U)	3
Orthetrum trinacria	Long Skimmer	1	-	LC (U)	3
Palpopleura jucunda	Yellow-veined Widow	2	-	LC (U)	3
Crocothemis erythraea	Broad Scarlet	0	-	LC (I)	2
Sympetrum fonscolombii	Nomad	0	-	LC (S)	2
Trithemis arteriosa	Red-veined Dropwing	0	-	LC (S)	2
Trithemis dorsalis	Round-hook Dropwing	0	-	LC (U)	3
Trithemis stictica	Jaunty Dropwing	1	-	LC (U)	3
Pantala flavescens	Pantala	0	-	LC (S)	2

Status: I = Increasing; LC = Least Concern; S = Stable; U = Unknown population trend
Likelihood of Occurrence (LoO): 2 = High; 3 = Moderate
Sources: Samways (2006); Samways (2008)

13.10. Scorpion list for the study area

FAMILY & SCIENTIFIC NAME	COMMON NAME	STATUS		LoO
		IUCN (2014.3)	NEM:BA ToPS LIST (2015)	
BUTHIDAE	**Thick-tailed scorpions & relatives**			
Pseudolychas pegleri		-	-	2
Uroplectes triangulifer		-	-	2
SCORPIONIDAE	**Burrowing scorpions & relatives**			
Opistophthalmus pugnax		-	-	3

Status: PS = Protected Species

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

Sources: Leeming (2003); IUCN (2014); ToPS List (2015)

BASIC ASSESSMENT REPORT

APPENDIX G: OTHER ITEMS

contents

Annexure G.1: Comments from SAHRA

Initial Letter

Development of Pig production and Chicken Broiler Facility in Bapsfontein, Mpumalanga

Our Ref: 9674

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: Nokukhanya Khumalo
Tel: 021 462 4502
Email: nkhumalo@sahra.org.za
CaseID: 9674

Date: Wednesday July 20, 2016
Page No: 1

Response to NID (Notification of Intent to Develop)

In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999)

Attention: Mr Thamsanqa Mokate
Mokate Estates (Pty) Ltd
212 Cornwell Street, Extension 7A, Kwa-Thema, Springs, 1575

Basic Assessment for the Proposed development of a 5.5ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, Bapsfontein near Delmas, Mpumalanga. (SG Code: T01R00000000019500001 & T01R00000000019500006; co-ordinates: 26° 4' 27.34" S; 28° 34' 25.60"E)

In terms of the National Heritage Resources Act, no 25 of 1999, heritage resources, including archaeological or palaeontological sites over 100 years old, graves older than 60 years, structures older than 60 years are protected. They may not be disturbed without a permit from the relevant heritage resources authority. This means that before such sites are disturbed by development it is incumbent on the developer to ensure that a Heritage Impact Assessment is done. This must include the archaeological component (Phase 1) any other applicable heritage components. Appropriate (Phase 2) mitigation, which involves recording, sampling and dating sites that are to be destroyed, must be done as required.

Mokate Estates (Pty) Ltd is proposing to establish a 5.5hectare pig production facility and a 2.5 hectare chicken broiler facility located on Portions 1 and 6 of the farm Rietvalei near the town of Delmas, in Delmas Local Municipality of the Mpumalanga Province. CSIR has been appointed by Mokate Estates (Pty) Ltd to conduct a basic assessment process in support of an Environmental Authorisation for listed activities in the Environmental Impact Assessment regulation of 2014, Government Regulations GNR 983, 984 and 985 in terms of the National Environmental Management Act 107 of 1998, as amended.

SAHRA requires that an archaeologist is contacted to assess the potential for heritage to occur within the proposed development area by either conduct a desktop assessment or a field based Heritage Impact Assessment.

SAHRA exempts you from conducting a Palaeontological Impact Assessment as the proposed development area is located in an area where the potential for uncovering fossiliferous rock is negligible.

Should you have any further queries, please contact the designated official using the case number quoted

Development of Pig production and Chicken Broiler Facility in Bapsfontein, Mpumalanga

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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: Nokukhanya Khumalo
Tel: 021 462 4502
Email: nkhumalo@sahra.org.za
CaseID: 9674

Date: Wednesday July 20, 2016
Page No: 2

above in the case header.

Yours faithfully

Nokukhanya Khumalo
Heritage Officer
South African Heritage Resources Agency

John Gribble
Manager: Maritime and Underwater Cultural Heritage Unit / Acting Manager: Archaeology, Palaeontology and Meteorites Unit
South African Heritage Resources Agency

ADMIN:
Direct URL to case: http://www.sahra.org.za/node/364255
(, Ref:)

Final Decision Letter

Development of Pig production and Chicken Broiler Facility in Bapsfontein, Mpumalanga

Our Ref: 9674

an agency of the
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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: Nokukhanya Khumalo
Tel: 021 462 4502
Email: nkhumalo@sahra.org.za
CaseID: 9674

Date: Thursday August 25, 2016
Page No: 1

Final Comment

In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999)

Attention: Mr Thamsanqa Mokate
Mokate Estates (Pty) Ltd
212 Cornwell Street, Extension 7A, Kwa-Thema, Springs, 1575

Basic Assessment for the Proposed development of a 5.5ha pig production facility and a 2.5 ha chicken broiler facility on Farm Rietvalei, Portion 1 & 6, Bapsfontein near Delmas, Mpumalanga. (SG Code: T01R00000000019500001 & T01R00000000019500006; co-ordinates: 26° 4' 27.34" S; 28° 34' 25.60"E)

Orton, J. August 2016. Letter of Exemption from Further Heritage Studies: Proposed Piggery and Chicken Broiler Facility near Delmas, Mpumalanga

Mr Orton was appointed by the Council for Scientific and Industrial Research (CSIR) to conduct a desktop assessment or write a letter of exemption from further studies as was requested by SAHRA in the Interim Comment dated 20/07/2016. He subsequently appointed Mr Van der Walt, who is a Southern African Iron Age specialist to conduct a field assessment of the proposed chicken broiler and piggery facility located in Mpumalanga Province.

The letter motivates that the closest archaeological features (Stone walled sites) that were identified in previous heritage surveys, were located 30 km away. Identified from the field survey were 3 stone tools part of wider of background scatter considered of low significance, and 4 long stone mounds created from stones removed from ploughing activities. The farm stead has a number of builders that were identified as older than 60 years, this includes the farm house listed as having low significance and the house will not be disturbed by the proposed development. No graves were identified within the study area. The author has no objections to the proposed chicken broiler facility and piggery, and recommends that the development go ahead without further heritage studies.

Final Comment

SAHRA Archaeology, Palaeontology and Meteorites Unit has no objections to the proposed development and accepts the letter of exemption and the recommendation for no further heritage studies on the following conditions:

Development of Pig production and Chicken Broiler Facility in Bapsfontein, Mpumalanga

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Date: Thursday August 25, 2016
Page No: 2

- If any newly discovered heritage resources during construction and operation phases of the proposed development, prove to be of archaeological or palaeontological significance a Phase 2 rescue operation might be necessary, and a permit will be needed before mitigation is carried out. You may contact SAHRA APM Unit for further details: (Nokukhanya Khumalo/John Gribble 021 202 8652). If any unmarked human burials are uncovered then please contact the SAHRA BGG Unit (Itumeleng Masiteng/Mimi Seetelo 012 320 8490). A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the developer. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer.

- The above conditions should be included into the EMPr for the project for implementation during construction, operation and decommissioning of the facility.

- Please upload the Basic Assessment report to the case, and once the Environmental Authorisation is granted please upload the ROD to the case as well.

Should you have any further queries, please contact the designated official using the case number quoted above in the case header.

Yours faithfully

Nokukhanya Khumalo
Heritage Officer
South African Heritage Resources Agency

Development of Pig production and Chicken Broiler Facility in Bapsfontein, Mpumalanga

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www.sahra.org.za

Enquiries: Nokukhanya Khumalo
Tel: 021 462 4502
Email: nkhumalo@sahra.org.za
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Date: Thursday August 25, 2016
Page No: 3

John Gribble
Manager: Maritime and Underwater Cultural Heritage Unit / Acting Manager: Archaeology, Palaeontology and Meteorites Unit
South African Heritage Resources Agency

ADMIN:
Direct URL to case: http://www.sahra.org.za/node/364255
(, 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.

Annexure G.2: Exemption Letter from Heritage Specialist

ASHA Consulting (Pty) Ltd
6A Scarborough Road
Muizenberg
7945

12 August 2016

Rirhandzu Marivate
Council for Scientific and Industrial Research
By email: RMarivate@csir.co.za

Dear Rirhandzu

LETTER OF EXEMPTION FROM FURTHER HERITAGE STUDIES:
PROPOSED PIGGERY AND CHICKEN BROILER FACILITY NEAR DELMAS, MPUMALANGA
SAHRA Case ID: 9674

Based on a field inspection and basic background research it is believed that the proposed development does not require any further assessment of impacts to any heritage resources. No significant impacts are expected at the site. The following text and images provide the basis for this recommendation.

Development proposal

It is proposed to develop a pig and chicken farming operation on the site. The development would include three phases of development of the piggery and three phases for the poultry facility as well as a feed milling plant and a waste management facility (Figure 1).

Methodology

The South African Heritage Resources Agency (SAHRA) did not require any assessment of impacts to palaeontology but did request either a desktop or field-based assessment of the possible impacts to other heritage resources. It was elected to conducted fieldwork because this gives a far more conclusive outcome. Jaco van der Walt (an archaeologist with Iron Age experience) examined the site on 10th August 2016 (Figure 2). He also compiled a brief desktop review. Historical mapping and aerial photography were obtained from the Chief Surveyor General in Cape Town and consulted to determine the age of structures on the farm.

Desktop review

A number of other reports (Table 1) were consulted, although only two of them examined land reasonably close to the present study area (5-7 km away). The only other reports from the general vicinity were from projects around 32 km to the northeast. The review showed that Iron Age stone-walled sites, cemeteries and historical structures (including railway infrastructure) could be expected in the area. Published sources show that Stone Age archaeology is known from the broader area but tends to be located in rock shelters (Bornman

ASHA Consulting (Pty) Ltd
Reg. no.: 2013/220482/07 | Directors: Jayson Orton & Carol Orton
6A Scarborough Road, Muizenberg, 7945 | T: 021 788 8425 | C: 083 272 3225
Jayson@asha-consulting.co.za | Carol@asha-consulting.co.za | www.asha-consulting.co.za

1995; Delius 2007; Keenan-Smith 1961; Schoonraad in Barnard 1975). Iron Age settlement in the area appears to have been limited with just one Late Iron Age site known near Bronkhorstspruit (Bergh 1999).

Table 1: Reports consulted in the desktop review.

Author	Project Name	Findings
Van der Walt, J. 2007	Archaeological impact assessment Wachtenbietjeskop Eco – Estate. Located on portion 79 of the farm Wachtenbietjeskop 506 JR, Bronkhorstspruit Gauteng Province.	Stone walled sites, a historical structure as well as a cemetery.
Van der Walt, J. 2008	Archaeological Impact Assessment For The Proposed Bronkhorstspruit Primary School, Riamar Park, Gauteng Province.	No heritage sites were found.
Van der Walt, J. 2016	Archaeological Impact Assessment For The Proposed Bronkhorstspruit siding. Bronkhorstspruit, Gauteng Province.	Historical railway structures and features.
Coetzee, F. P. 2008	Cultural Heritage Survey of the Proposed Riverwalk Township Development on the Remainder of the Farm Roodepoort 504JR, Gauteng Province	No sites of heritage significance were recorded.
Kusel, U. 2009	Phase I Cultural Heritage Resources Impact Assessment Of Remainder Of Portion 4 Of The Farm Roodepoort 504 Jr Bronkhorstspruit Gauteng Province (37.2 hectare).	Structures of low significance
Du Piesanie, J. 2014	NID for the Proposed Oakleaf Opencast Coal Mine, Gauteng.	Structures and a cemetery as well as a potential paleontological site.

One major military battle has been fought in the area some distance to the northwest near Bronkhorstspruit (Duxbury 1981). This was during the First Anglo-Boer War. A concentration camp and minor skirmish site from the Second Anglo-Boer War also occur in the area (Bergh 1999).

Fieldwork findings

Figures 3 and 4 show typical views of the fields in which the proposed development would be constructed. The only archaeological material encountered was four stone artefacts that are likely to be part of the broader background scatter and, because of their very low density, are considered to be of very low significance (Figures 5 & 6). Four long stone mounds of between 5 m and 10 m long were found in one area but these are certain to represent stones removed from the ploughed agricultural lands (Figure 7).

A number of buildings are present on the farm. They are located in two clusters, one to the north and one to the south of the R50 road. Examination of a 1945 aerial photograph shows that at least some were present already at that time (Figure 8). Figures 9 to 12 show the cluster located some 250 m to the southwest of the road. Only one was present in 1945 but is now in very poor condition. It has minimal heritage value. Another small brick ruin located between this complex and the road is modern. The cluster to the north of the road is the main farm complex. The main house, at least, was present in 1945 and appears to be the only structure that retains some heritage value, albeit relatively little (Figure 13). Another modern house also exists in this area (Figure 14). None of these buildings is proposed to be altered as part of the present project.

ASHA Consulting (Pty) Ltd
Reg. no.: 2013/220482/07 | Directors: Jayson Orton & Carol Orton
6A Scarborough Road, Muizenberg, 7945 | T: 021 788 8425 | C: 083 272 3225
Jayson@asha-consulting.co.za | Carol@asha-consulting.co.za | www.asha-consulting.co.za

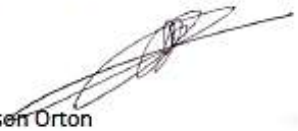
The cultural landscape is also a heritage resource. In this area it is characterised by agricultural lands, tree lines and plantations and scattered farmsteads. The proposed activities are in keeping with the general agricultural land use and will thus not result in significant impacts. The tree lines and plantations have dominated the site in 1945, although the trees to the south of the road have been steadily removed over the years (Figures 8 & 15 to 18). Impacts to the remaining trees are not expected because the development footprint falls solely within agricultural lands. Figure 19 shows that various furrows were excavated over the years to direct water from the nearby stream into the agricultural lands.

No graves were seen on the site although many do occur on farms in the area. Figure 19 shows that none were known on the present farm in 1965.

Recommendation

On the basis of the above review it can be stated with confidence that no significant impacts to heritage resources will occur should the proposed development be allowed to proceed. It is thus recommended that the project be authorised without the need for further heritage studies.

Yours sincerely



Jayson Orton

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Jayson@asha-consulting.co.za | Carol@asha-consulting.co.za | www.asha-consulting.co.za

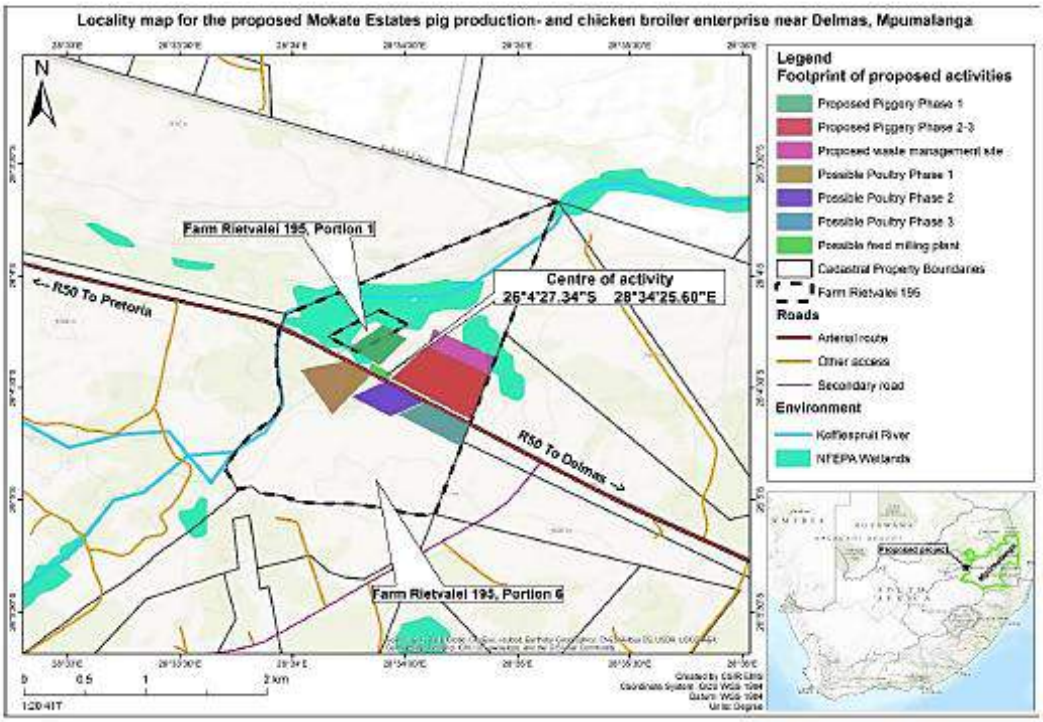

Figure 1: Map of the site showing the proposed development layout (supplied by CSIR).

Figure 2: Aerial view of the farm showing Portion 1 (orange polygon), Portion 6 (red polygon), the development footprints (blue polygons) and the walk paths of the survey (black lines).

Figure 3: View across the fields in the south-eastern Part of the study area.

Figure 4: View across the fields in the north-western part of the study area.

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Jayson@asha-consulting.co.za | Carol@asha-consulting.co.za | www.asha-consulting.co.za

Figures 5 & 6: Stone artefacts found on site. Scale bars in cm.

Figure 7: Collections of stone removed from agricultural lands during ploughing.

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Jayson@asha-consulting.co.za | Carol@asha-consulting.co.za | www.asha-consulting.co.za

Figure 8: Aerial views of the study area from 1945 (left; Strip 5, no. 328) and 2016 (right; Google Earth). At least some of the current structures were present in 1945 (arrowed).

Figures 9 to 12: Buildings to the south of the R50 road. Only the large shed at upper left seems to have been present in 1945.

ASHA Consulting (Pty) Ltd
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Figure 13: The main house that predates 1945.

Figure 14: A modern house.

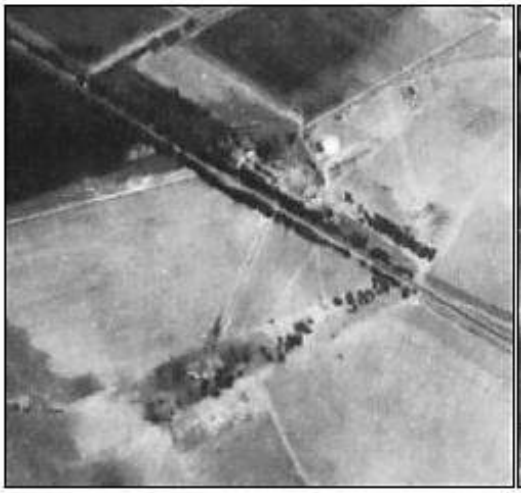

Figure 15: Aerial photograph from 1953.
Job 303, strip 3, no. 542.

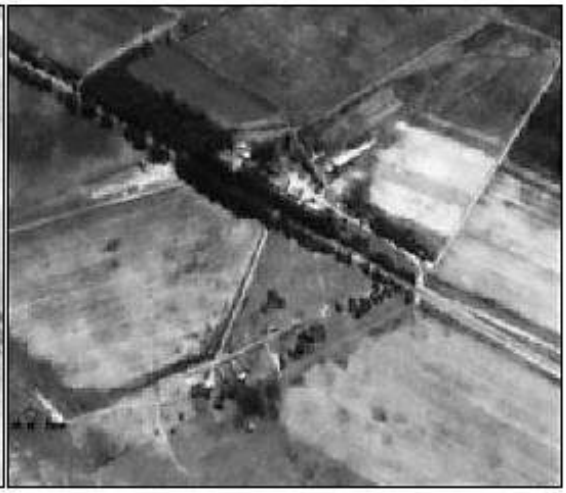

Figure 16: Aerial photograph from 1958.
Job 412, strip 3, no. 2179.

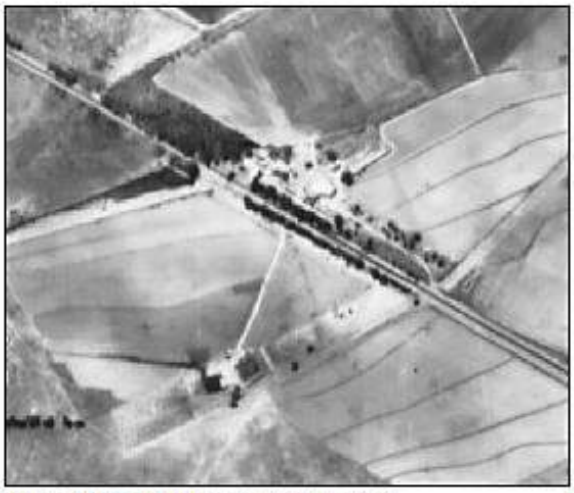

Figure 17: Aerial photograph from 1969.
Job 653, strip 3, no. 9435

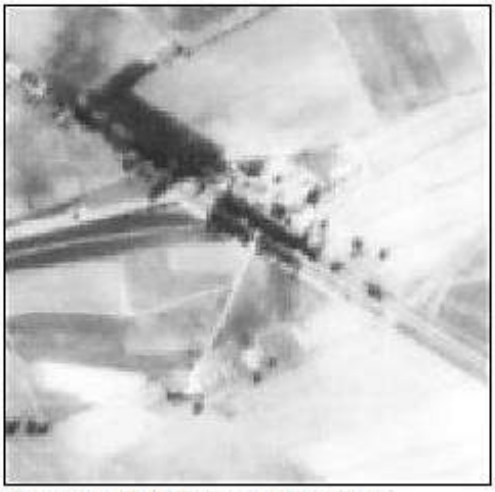

Figure 18: Aerial photograph from 1976.
Job 775, strip 1, no. 256.

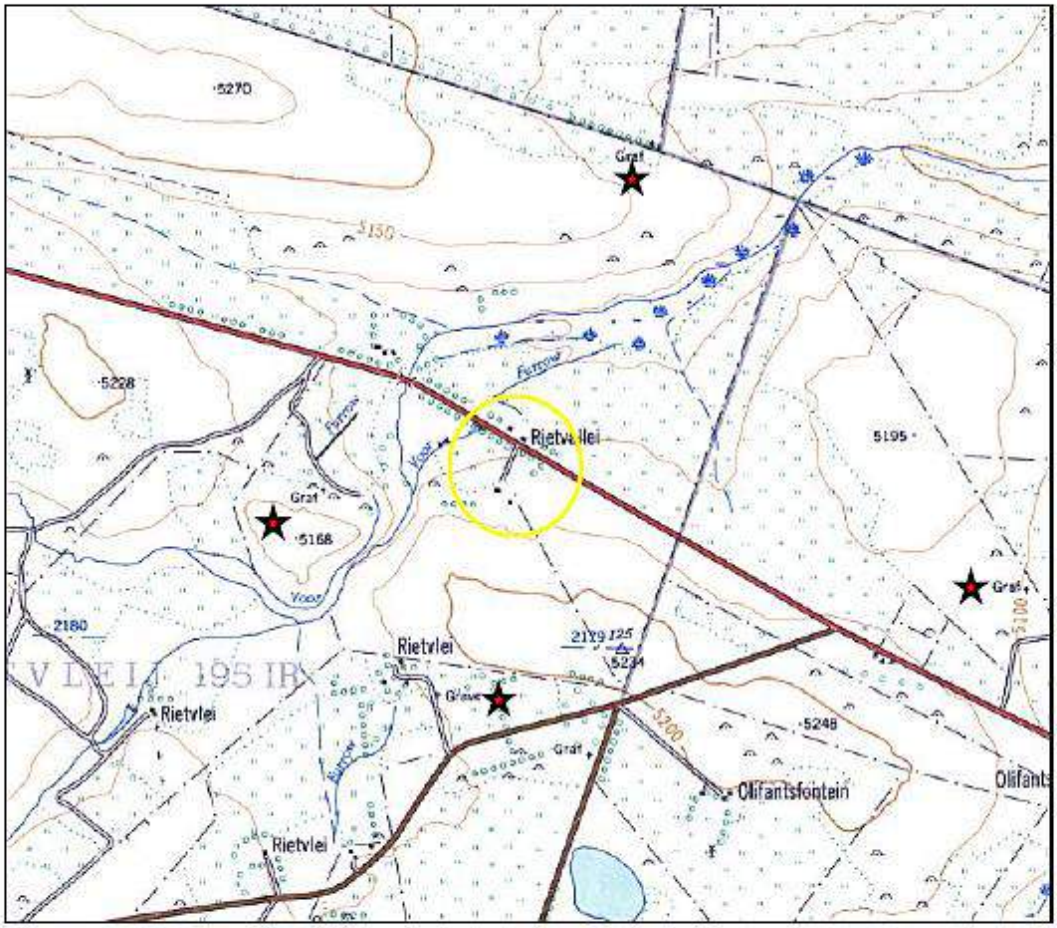

Figure 19: 1:50 000 topographic map from 1965 showing the study area (yellow circle) and surrounds. Graves are marked by stars.

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Jayson@asha-consulting.co.za | Carol@asha-consulting.co.za | www.asha-consulting.co.za

Annexure G.3: Comments from SANCO

Rirhandzu Marivate - CSIR/CAS/EMS/IR/2016/0001/A

From: Sanco Delmas <sanco.delmas@gmail.com>
To: <rmarivate@csir.co.za>
Date: 21/12/2015 14:00
Subject: CSIR/CAS/EMS/IR/2016/0001/A

Greetings

The South African National Civic Organisation wish to register both as an affected and interested party on the above-mentioned projects.

Kindly note that SANCO intends to raise an objection to the project.

For more information kindly contact sender.

Regards

Nkanyiso Xaba
Secretary
SANCO NKANGALA REGION
+2771 281 3875

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BASIC ASSESSMENT REPORT

APPENDIX H: CURRICULUM VITAE of the PROJECT TEAM

contents

Annexure H.1: Minnelise Levendal (Project Leader)

CSIR
Jan Cilliers Street
PO Box 320
Stellenbosch 7600
South Africa

Phone: +27 21 888 2400
Fax: +27 21 888 2693
Email: mlevendal@csir.co.za

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*	Basic Assessment Process for the proposed erection of 10 wind monitoring masts in SA	Project Manager	Department of Energy through SANERI; GEF

Completion Date	Project description	Role	Client
Authorisations granted during 2010)	as part of the national wind atlas project		
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

August 2016

Annexure H.2: Rirhandzu Marivate (Project Manager)

PO Box 320
Stellenbosch
7599
South Africa

Office : +27 21 888 2432
Cell : +27 76 183 0642
Fax : +27 21 888 2473
Email : rmarivate@csir.co.za

Position in Firm:	Junior Environmental Assessment Practitioner
Full Name:	Marivate, Rirhandzu Anna
Specialisation:	Environmental & Ecological Science
Professional Registration:	Cand. Sci. Nat. Environmental Sciences – Registration 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 focused on investigating ecological knowledge of stakeholder on the provisioning of freshwater resources and its impacts on the management of the Berg river in the Western Cape, South Africa.

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. 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).

EXPERIENCE

Completion Date	Project description	Role	Client
2014 (in progress)	**Special Needs and Skills Development Programme:** Programme management and conduction of Basic Assessment for disadvantaged communities/businesses/enterprises	Project Manager; Stakeholder engagement & Project Support	National Department of Environmental Affairs (DEA)
2013- 2014	**Monitoring and Evaluation for the National Strategy for Sustainable Development**	Stakeholder engagement, Research, Report Writing	National Department of Environmental Affairs (DEA)
2013-2015	**Strategic Environmental Assessment (SEA)** for wind and solar PV energy in South Africa	Data Management	National Department of Environmental Affairs (DEA)

Completion Date	Project description	Role	Client
2014 (in progress)	**Strategic Environmental Assessment (SEA)** for Electricity Grid Infrastructure (EGI)	Stakeholder engagement	National Department of Environmental Affairs (DEA)
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)
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)
2015-2016	**Development of 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

EMPLOYMENT RECORD

- **2014** CSIR Environmental Management Services (EMS) Environmental Assessment Practitioner (EAP) Intern
- **2011-2012** UCT Environmental & Geographical Science Department (K Vickery) Teaching Assistant
- **2010** WITS School of Animal Plant & Environmental Sciences (Prof K Balkwill) Teaching Assistant
- **2009** ESKOM Generation Environmental Management (D Herbst) Environmental Officer-Vacational Intern
- **2009** WITS School of Geosciences (Dr G Drennan) Teaching Assistant
- **2009** WITS School of Geosciences (Dr M Evans) Field Assistant
- **2008** WITS School of Animal Plant & Environmental Sciences (T Gardiner) Field Assistant
- **2008** WITS School of Animal Plant & Environmental Sciences (Dr W Twine) Environmental Control 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

- 2015 Practical Adaptation for vulnerable communities by Adaptation Network, Kirstenbosch Botanical Gardens, Cape Town, August 2016.
- 2015 International Association for Impact Assessors South Africa (IAIAsa) National Annual Conference, August 2016, Drakensberg.
- 2015 Sharpening the Tool: New Techniques & Methods in Environmental Impact Assessments, SE Solutions, Stellenbosch, Western Cape

- 2014 Activate Change Drivers Leadership and Community Development Training March to October 2014, 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, Western Cape
- 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

August 2016