

FINAL SCOPING REPORT

**LOWS CREEK DAM PROJECT: DEVELOPMENT OF AN INSTREAM STORAGE DAM
FOR IRRIGATION PURPOSES ON PORTIONS OF REMAINING EXTENT OF
ESPERADO 253 JU AND PORTIONS 1 AND 2 OF ESPERADO ANNEX 222 JU
LOWS CREEK-KAAPMUIDEN AREA, MPUMALANGA.
PROJECT REFERENCE: 1/3/1/16/1E-294**

PREPARED BY:



RHENGU ENVIRONMENTAL SERVICES

P O Box 1046

Cell: 082 414 7088

MALELANE

Fax: 086 685 8003

1320

E-mail: rhengu@mweb.co.za

PREPARED FOR:

MR. WALTER GIURICICH/RIAAN KOTZE

FOR SUBMISSION TO:



**DEPARTMENT OF AGRICULTURE, RURAL DEVELOPMENT, LAND AND
ENVIRONMENT AFFAIRS, MPUMALANGA PROVINCIAL GOVERNMENT**

JANUARY 2021

Copyright Warning

With exceptions the copyright in all text and presented information is the property of RHENGU ENVIRONMENTAL SERVICES. It is a criminal offence to reproduce and or use, without written consent, any information, technical procedure and or technique contained in this document. Criminal and civil proceedings will be taken as a matter of strict routine against any person and or institution infringing the copyright of RHENGU ENVIRONMENTAL SERVICES CC.

DOCUMENT DISTRIBUTION LIST

| ORGANISATION | CONTACT | COPIES |
|--|---|-----------|
| DARDLEA | Mr. Xolani Nkosi | 1 |
| IUCMA: Nelspruit | Mr. Thabo Rasiuba | 1 |
| SAHRA: Cape Town Office | Ms. Nokukhanya Khumalo | 1 |
| MTPA | Mr. Frans Krige | 1 |
| DAFF | Mr. Zinzile Mtotywa | 1 |
| DAFF: LUSM | Mr. Frans Mashabela | 1 |
| Nkomazi Municipality | Head Planning Division: Jan Mashele | 1 |
| Mbombela Municipality | Head Planning Division: Mr. Dumisani Mabuza | 1 |
| Applicant | Mr. Walter Giurich/Riaan Kotze | 2 |
| Kaap River Valley Major Irrigation Board | Ronel Oelofsen | 1 |
| Lows Creek Irrigation Board | Adri Claasen | 1 |
| Rhengu Environmental Services | Mr. Ralf Kalwa | 1 |
| TOTAL COPIES | | 13 |

| TABLE OF CONTENTS | PAGE |
|--|-------------|
| 1. EXECUTIVE SUMMARY | 5 |
| 2. ABBREVIATIONS | 6 |
| 3. APPLICABLE LEGISLATION | 8 |
| 4. NEEDS AND DESIRABILITY OF THE ACTIVITY | 15 |
| 5. GENERAL INFORMATION | 19 |
| 6. LOCALITY INFORMATION | 20 |
| 7. PROJECT DESCRIPTION | 21 |
| 8. DESCRIPTION OF NATURAL ENVIRONMENT | 22 |
| 9. ENVIRONMENTAL ISSUES | 25 |
| 10. PUBLIC PARTICIPATION | 26 |
| 11. DECOMMISSIONING | 28 |
| 12. MONITORING AND AUDITING | 29 |
| 13. REFERENCES | 30 |

APPENDICES: Separate Document:

APPENDIX 1: Site Maps and Photographs

APPENDIX 2: Public Participation Process

APPENDIX 3: Documentation from DARDLEA

APPENDIX 4: Supportive Documentation

4.1. Title Deeds.

4.2. Land Claim Document

4.3. Water Rights, Verification Process and Permits

4.4. Dam Safety Application

1. EXECUTIVE SUMMARY

This initial phase of the **Environmental Investigation Process** was conducted over a period of 6 months in the Lows Creek area of Nkomazi. The proposed construction of an instream-channel storage dam for irrigation purposes using the water allocated to the farms will enable the applicant to supply agricultural water to orchards during the drier months of the year and thus ensure a long-term sustainable approach to the farms business activities.

The public participation process was advertised locally and regionally in the printed media, on site and at various sites of interest including those open to the Public in the town of Lows Creek. The immediate neighbours of the property were contacted specifically via e mail and requested to attend the Site Meeting. Government officials and representatives from the irrigation boards were also invited to on-site meetings and discussions.

The **Final and Draft Scoping Reports** were made available for comment at the **Kudu Farm Gate (opposite the Lows Creek Police Station), the farm office of the applicant, the offices of Nkomazi/Mbombela Municipal Councils and to all individuals and departments that registered and or attended the Public Site Meeting.**

Comments received from various departments were included in **Appendix 2** (Issues and Responses Report) and were listed for consideration during the impact assessment phase of the project.

This **study and evaluation** to date has looked at the various aspects that could be affected by the implementation of such a proposal. Experience gleaned from similar projects in the valley was sourced for additional input.

The **evaluation process** did not reveal any fatal flaws at this stage of the Scoping Process and this document was submitted to the **Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA)** for consideration. See **Appendix 3** for the responses from DARDLEA to date.

The **Environmental Impact Assessment (EIR Phase)** will investigate the **significance** of impacts, **alternative** options and **mitigation** measures where applicable. The EIR will also include an **Environmental Management Programme (EMPr), Specialist Studies** on the terrestrial- and aquatic ecology of the designated project site; a **Heritage Impact Assessment (HIA)** and **Engineering Reports** pertaining to the **hydrology** of the area and the **design specifications** of the dam.

2. ABBREVIATIONS

| | |
|---------|--|
| ASAP | As Soon As Possible |
| Asl | Above sea level |
| BEE | Black Economic Empowerment |
| cm | centimetre |
| DAFF | Department of Agriculture, Forestry and Fisheries |
| DARDLEA | Department of Agriculture, Rural Development, Land and Environment Affairs |
| DWS | Department of Water and Sanitation |
| EA | Environmental Authorisation |
| EAP | Environmental Assessment Practitioner |
| ECO | Environmental Control Officer |
| EIA | Environmental Impact Assessment |
| EMPr | Environmental Management Programme |
| ER | Ecological Reserve |
| ESKOM | Electricity Supply Commission |
| EWR | Ecological Water Requirement |
| GPS | Geographical Positioning System |
| ha | Hectare |
| HIA | Heritage Impact Assessment |
| I&AP's | Interested and Affected Parties |
| IEM | Integrated Environmental Management |
| IUCMA | Inkomati Usuthu Catchment Management Agency |
| kPa | kilopascal |
| LUDS | Land Use Decision Support Tool |
| m | metre |
| mm | millimeter |
| MTPA | Mpumalanga Tourism and Parks Agency |
| m/s | metre per second |
| NA | Not Applicable |
| NHBRC | National Housing Building Regulations Council |
| OHASA | Occupational Health and Safety Act |
| OMPr | Operational Management Programme |

| | |
|-------|---|
| ONA | Other Natural Areas |
| PDI | Previously Disadvantaged Individual |
| PES | Present Ecological State |
| PPP | Public Participation Process |
| RES | Rhengu Environmental Services |
| SABS | South African Bureau of Standards |
| SAHRA | South African Heritage Resources Agency |
| sqm | square metre |

3. LEGISLATION APPLICABLE TO THE PROPOSED PROJECT

Legislation and guidelines that are being considered for the environmental impact assessment process are as follows:

3.1. Constitution of the Republic of South Africa (No.108, 1996):

The Constitution is the supreme law of South Africa, against which all other laws are measured. It sets out several fundamental environmental rights, which include:

The Environmental Clause:

Section 24 of the Constitution outlines the basic framework for all environmental policy and legislation:

It states that everyone has the right to an environment that is not harmful to their health or well-being and 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 while promoting justifiable economic- and social development.

Access to Information:

Section 32 of the Constitution provides that everyone has the right of access to any information held by the State or another juristic person and that is required for the exercise or protection of any rights.

Fair Administrative Action:

Section 33 of the Constitution provides for the right to lawful, reasonable and procedurally fair administrative action.

Enforcement of Rights and Administrative Review:

Section 38 of the Constitution guarantees the right to approach a court of law and to seek legal relief in the case where any of the rights that are entrenched in the Bill of Rights are infringed or threatened.

3.2. National Environmental Management Act (No. 107, 1998):

The National Environmental Management Act (NEMA) is South Africa's overarching environmental legislation. The Act gives meaning to the right to an environment that is not harmful to health or well-being, entrenched in Section 24 of the Constitution of the Republic of South Africa, Act 108 of 1996. The National Environmental Management Act (NEMA, Act No. 107 of 1998) establishes a set of principles which all authorities (organs of State) must consider when exercising their powers, for example, during the granting of permits. These include the following:

- Development must be sustainable.
- Pollution must be avoided or minimised and remedied.
- Waste must be avoided or minimised, reused or recycled.
- Negative impacts must be minimised.
- Responsibility for the environmental consequences of a policy, project, product or service applies throughout its life cycle.

NEMA further provides for an equitable access to natural resources, environmental protection and the formulation of environmental management frameworks. The Act is underpinned by the global concept of sustainable development.

The interpretation, administration and application of NEMA are guided by fundamental principles of sustainable development, provided in Chapter 1 of the Act. "Development must be socially, environmentally and economically sustainable" (s 2(3)) and requires the consideration of all relevant factors, which are elaborated by eight sub-principles".

These principles include:

- The polluter pays principle (s 2(4) (p)).
- The public trust doctrine (s2(4)(o)).
- The equitable access to natural resources (s 2(4)(d)).

Section 24 of the Act states that all activities that may significantly affect the environment and require authorisation by law must be assessed prior to their approval.

The Act goes on to list the requirements for an assessment. These include:

- The environment likely to be affected by the activity and viable alternatives.
- Cumulative effects and their potential significance.
- Mitigation measures including the "no go" option.

Section 28(1) states that "every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring".

If such degradation/pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution. These measures may include:

- Assessing the impact on the environment.
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks.
- Ceasing, modifying or controlling actions which cause pollution/degradation.
- Containing pollutants or preventing movement of pollutants.
- Eliminating the source of pollution.
- Remedying the effects of the pollution.

3.3. National Water Act (No. 36, 1998):

The Act details the management of South Africa's water resources in terms of utilisation and duty of care to prevent water pollution. The act further details the legislation pertaining to the pollution of water reserves (surface and ground water) and the remediation/rehabilitation thereof.

3.4. Mpumalanga Nature Conservation Act (No. 10, 1998):

An Act to consolidate and amend the laws relating to nature conservation within the Province and to provide for matters connected therewith. This Act makes provision with respect to nature conservation in the Mpumalanga Province. It provides for, among other things, protection of wildlife, hunting, fisheries, protection of endangered fauna and flora as listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the control of harmful animals, freshwater pollution and enforcement. The Mpumalanga Parks Board (now MTPA), established by section 2 of the Eastern Transvaal Parks Board Act, 1995, shall be responsible for the administration of the Act.

3.5. Conservation of Agricultural Resources Act (No. 43, 1983):

This Act provides for control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combatting of weeds and invader plants and for matters connected therewith.

3.6. National Environmental Management: Biodiversity Act (No.10, 2004):

To provide for, inter alia, the management and conservation of South Africa's biodiversity, to protect species and ecosystems. The Act also covers alien- and invasive species and genetically modified organisms that pose a threat to biodiversity.

The objectives of this Act are to within the framework of the National Environmental Management Act provide for:

- The management and conservation of biological diversity within the Republic and of the components of such biological diversity.
- The use of indigenous biological resources in a sustainable manner.
- The fair and equitable sharing among stakeholders of benefits arising.
- To give effect to ratified international agreements relating to biodiversity.
- To provide for co-operative governance in biodiversity management and conservation.
- To provide for a South African National Biodiversity Institute to assist in achieving these objectives of this act.

3.7. National Environmental Management: Protected Areas Act (No. 57, 2003) as amended by the National Environmental Management: Protected Areas Amendment Act (No 31 of 2004):

To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for inter-governmental co-operation and public consultation in matters concerning protected areas and for matters in connection therewith.

3.8. National Environment Conservation Act (No 73, 1989):

The purpose of the Act is to provide for the effective protection and controlled utilisation of the environment and for matters incidental thereto. It embodies the concept of control of activities which may have detrimental effects on the environment which may be:

- Land use and transformation.
- Water use and disposal.
- Resource removal, including natural living resources.
- Resource renewal and,
- Agricultural processes.

The Act also provides for the control of Environmental Pollution through:

- Prohibition of littering.
- Removal of litter.
- Waste management.

In addition to the above the Act provides for the regulations regarding waste management such as:

- The classification of different types of waste and the handling, storage, transport and disposal of waste.
- Reduction of waste.
- Utilisation of waste by way of recovery, re-use or processing of waste.
- Location, planning and design of disposal sites and the site used for waste disposal.
- Administrative arrangements for the effective disposal of waste.
- Dissemination of information to the public on effective waste disposal.
- Control over the import and export of waste, etc.

3.9. National Heritage Resources Act (No. 25, 1999):

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (Act No. 25 of 1999). The enforcing authority for this act is the South African National Heritage Resources Agency (SAHRA). In terms of the Act, historically important features such as graves, trees, archaeology and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection.

In terms of Section 38 of the National Heritage Resources Act, SAHRA can call for a Heritage Impact Assessment (HIA) where certain categories of development are proposed. The Act also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is deemed adequate, a separate HIA is not required.

According to the National Heritage Resources Act (Section 38(8)), such an assessment must meet the requirements of the relevant heritage authority. The following requires the approval of SAHRA:

- Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised.
- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length.
- Any development or other activity which will change the character of a site - exceeding 5 000 m² in extent; or involving three or more erven or divisions thereof which have been consolidated within the past five years.
- The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority.
- The re-zoning of a site exceeding 10 000 m² in extent.
- 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.

3.10. Occupational Health and Safety Act (No. 85, 1993):

To provide 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; to establish an advisory council for occupational health and safety and to provide for matters connected therewith.

3.11. Promotion of Access to Information Act (No 2, 2000):

To give effect to the constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights and to provide for matters connected therewith.

3.12. National Environment Management: Waste Act, 2008 (No 59 of 2008):

To reform 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.
- To provide for matters connected therewith.

Section 24 of the National Environmental Management Act (1998) requires that activities that require authorisation or permission by law which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorising, permitting, or otherwise allowing the implementation of an activity. The EIA process is the tool used to apply for authorisation from the regulating authority for the relevant activities identified that may impact on the environment.

3.13. National Forests Act, 1998 (Act No. 84 of 1998):

No person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.

3.14. ACTIVITY NUMBER LISTED UNDER NEMA

This assessment considered the following listed activities:

| Indicate the number and date of the relevant notice: | Activity No (s) (in terms of the relevant notice): | Describe each listed activity as per the detailed project description: |
|---|--|--|
| Government Notice R983 amended as Government Notice: No: 327 of 7 April 2017 Gazette Number: 40772: | 12 | The applicant wishes to develop an instream dam in a water course (Lows Creek). Additional to this the water surface area and the building of pump houses in excess of 100sqm will be constructed to support the irrigation infrastructure and equipment requirements of the proposed project. |
| Government Notice R983 amended as Government Notice: No: 327 of 7 April 2017 Gazette Number: 40772: | 19 | Infilling (more than 10 cubic metres) will be required to stabilise the all-weather road access during the construction of the pump houses and dam of foundations. This will take place within 32m of a water course. |
| Government Notice R983 amended as Government Notice: No: 327 of 7 April 2017 Gazette Number: 40772: | 27 | Indigenous vegetation will be cleared or flooded/affected to accommodate the dam water and the pump houses. |
| Government Notice R984 as amended as Government Notice: No: 325 of 7 April 2017 Gazette Number: 40772: | 16 | All options under consideration will require approximately the following dimensions: Construct an irrigation storage dam: 11.4m high; 245m long, covering an area greater than 6.5ha and will have a storage capacity of 193 000 cubic metres. Maximum full supply water depth will be 8m. |
| Government Notice R985 as amended as Government Notice: No: 324 of 7 April 2017 Gazette Number: 40772: | 12 | Indigenous vegetation will be cleared or flooded/affected to accommodate the dam water and the pump houses. |
| Government Notice R985 as amended as Government Notice: No: 324 | 14 | The applicant wishes to develop an instream dam in a water course (Lows Creek). Additional to this the water surface area and the building of pump houses in excess of 100sqm will be constructed to support the irrigation infrastructure and equipment |

| | | |
|--|--|---------------------------------------|
| of 7 April 2017 Gazette Number: 40772: | | requirements of the proposed project. |
|--|--|---------------------------------------|

Note: A **Water Use Licence Application** (WULA) will be submitted to the Inkomati Usuthu Catchment Management Agency (IUCMA) as part of the requirements of the National Water Act. The WULA process has been initiated and is running concurrently with the EIA process.

4. NEEDS AND DESIRABILITY OF THE PROPOSED ACTIVITY: DEVELOPMENT OF AN INSTREAM IRRIGATION/STORAGE DAM FOR CROP PRODUCTION.

- **Introduction:** Development proposals should always follow an **integrated approach** to project planning.
- With this in mind, the project must make economic sense, whilst at the same time environmental damage and impact must be kept to a minimum and or mitigated fully.
- Finally, the needs and aspirations of society must be met with the view to producing the best long-term product for the community (internal- and external community) at large.
- Developers risk and spend significant sums of hard-earned money to ensure the financial viability of each proposed project. Due to this they are obliged to thoroughly investigate and plan before budgeting funds towards a specific project – it is ultimately not in their interest to commence a project without having assessed all risks involved. They, along with society, are keen to see that the project is a long-term sustainable success.
- **Strategic Regional Initiatives:** The project site is located in a historical farming area. Due to its location at the end of the water catchment area many farmers have traditionally established and grown short-term fruit and vegetable crops such as tomatoes, cabbage, beans, brinjals and butternuts. In the 1980's sugarcane was established and widely cultivated in the area.
- The sugarcane has been removed gradually due to water scarcity, increased input costs, distance from the mill and low returns achieved.
- As a result of this many farmers investigated and experimented with crops which would generate better returns, use less water and be able to be processed locally and exported. The most successful experimental crop identified was macadamias and the area has seen such large plantings of macadamias that a processing plant was established in the Low's Creek area for the intake, processing and export of macadamia kernel and macadamia products.
- With the continued growth within the local Nkomazi region, particularly through the establishment of the Maputo Corridor initiative, export- and economic activities have increased substantially due to the location and ease of exporting through the Port of Maputo.
- The local Nkomazi- and Mbombela Municipal Councils are supportive of developments associated with the Maputo Corridor and the expansion of agriculture and sustainable land use envisaged by this project proposal under investigation compliments the regional vision that the authorities have for this area.
- **The Proposed Construction of the New Dam:** Developing the storage dam will ensure that Portions 1 and 2 of Esperado Annex 222 JU and the Rem. Extent of Esperado 253 JU will continue to **maintain and expand its orchards** and remain fully operational during times of low water availability or drought. Growing, processing, sales and exporting of macadamia and other products will thus continue as per the economic vision described above. This approach will also ensure **more job security** for the staff on the farms especially during drought events.
- **Do we need a new Irrigation Dam?:** The properties extract water, as per existing allocations, from the Shiyalongubo Canal System including the Kaap River. This water is abstracted into small holding dams on each property and is used to irrigate the crops on a day-to-day basis. These dams have **insufficient capacity** to store water for long periods of time or to store water that has been allocated to the properties as part of the entitlement process.

- **What are the benefits of having a new dam?** Normal summer rainfall events ensures that less water is used for irrigation. Water is also available in abundance from the Kaap River and Shiyalongubo Canal System during this period. The availability of water is not guaranteed during drier months especially during a drought spell. As a result, the water allocated to the properties as part of its entitlement is not fully utilised throughout the year resulting in crop- and job losses.
- The proposed dam will permit the properties to store their allocated water for use in the drier months which will ensure an all-year-round supply of water for agriculture. This will enable the property owners and managers to irrigate during the drier winter months and prevent loss of production and orchards due to severe water shortages such as was the case during the **2016/2017** drought.
- **Will the dam affect the neighbours negatively?** No. Water storage will be achieved using the water that each property is entitled to. The dam is located between the two properties who will have access to the dam and as the Shiyalongubo Canal System is non-riparian to the Kaap River there will be little change in water flows. The Environmental Water Requirement (EWR) of the Lows Creek will be maintained.
- **Will the new dam be beneficial to the community at large?** Yes. It will prevent job losses, both permanent and those on contract, in the farming community as the properties will be able to function sustainably during times of drought and water scarcity.
- **What are the economic benefits of the new dam?** Storing the water will ensure that the irrigation of orchards during periods of low water availability, or severe droughts, will continue and this will prevent orchards being abandoned or scaled back which could result in a loss of income or job opportunities both on the properties as well as in the local fruit processing facility.
- **What is the development cost of the new dam?** The estimated development cost is in the region of R6.5million which is a substantial investment to ensure the long-term agricultural objective and benefit of the properties.
- **Neighbouring Land Uses and Compatibility:** The project area is surrounded by agriculture and a variety of similar crops are presently being farmed which includes macadamia, papaya and vegetable production. To date no objections to the project proposal (development of an in-stream dam for irrigation purposes) have been submitted by any of the neighbours.
- **Financial Viability and Agricultural Potential of the Properties:** The properties have been farmed for many years producing crops for local markets and more recently crops for the export market. A financial analysis by the Project Team has emphasised water shortages, during periods of low water availability (winter) and during droughts, as inhibiting agricultural growth and preventing continued sustainability of the agricultural crops of the properties in the long term. Developing the dam will promote financial stability for the agricultural projects on the properties.
- **Land Claims:** The Tonetti area was subjected to various land claim assessments by the Land Claims Commissioner in the past few years and combined with a recession in the agricultural sector many property owners were, until recently, reluctant to expand or diversify their enterprises under prevailing uncertain conditions.
- The project area is owned by the applicants and no claims exist on the properties.
- No objections to the proposed improvement of the infrastructure have been lodged with the EAP. **(See Appendix 4.2.)**
- **Industry Growth:** The Ivory Macadamias processing facility in Low's Creek has joined forces with Global Macadamias and established a new processing plant in Alkmaar (Nelspruit) and is currently considering expanding the current facility at Low's Creek due to the forecasted growth of the macadamia industry.

- The financial model for these properties based on crop production is dependent on a reliable supply of irrigation water. To this end the proposal makes economic sense as crop production is a long-term project and will ensure that production is not stifled during drought events. This security of water supply also provides the landowners an opportunity to remain financially competitive in an ever changing and diverse business market.
- **Social Commitment and Job Creation:** Several business sectors and community members will benefit if this project is successful. The property owners and their families will benefit financially in the long term. In the short to medium term however the development node will require substantial capital (approximately R6.5million) to construct the dam and install services (pump houses, irrigation pipework and electrical connections)
- The Nkomazi region and outlying rural areas have been classified as one of the poorest in South Africa. Conservative estimates list unemployment figures in the region of 30%, HIV infections just under 40% and many job seeking immigrants from neighbouring countries migrate to this area and add to the challenges faced by rural communities.
- The Covid 19 Pandemic has also resulted in additional job losses across the various industries and associated businesses.
- A construction company will be tasked with building the dam and associated infrastructure – this will provide work opportunities (an estimated 15 persons) for both skilled and unskilled labour (machinery operators, bricklayers and general labour). Unskilled labour will earn in the region of R3500/month.
- The opportunities listed above do not include the addition to subsidiary services such as vehicle maintenance; retail needs; medical facilities and building material. This development will as a result, benefit businesses in Lows Creek, Barberton and Mbombela.
- **Location:** Is this the correct location for the project? Four alternatives were assessed during this survey and all options were evaluated during the course of this investigation. Please refer to the Project Maps in the appendices for more detail.
- The preferred option does not affect neighbouring properties (flooding into neighbouring properties) and makes economic sense in terms of storage capacity versus development costs.
- The project site is fixed and the proponents do not own similar land elsewhere. In terms of compatibility of land uses this development will fit in with current agricultural developments in the area and surrounding farms. The location is thus regarded as ideal. The project site is surrounded in all wind directions with similar land uses.
- **Environmental (Ecological) Implications/Limitations:** An initial assessment of the prevailing fauna and flora has not revealed any threats to species/habitat or highlighted any critical limitations to the development which can be of ecological significance or which cannot be mitigated to ensure sustainability of the environment.
- **Detailed studies** were however commissioned to ensure that impacts on the environment are clearly understood and the results will be included in the specialist reports on biodiversity in the **Environmental Impact Assessment Report**.
- **Positive Impacts:** Job creation and the prevention of job losses is regarded as a significant impact which will spill over into the well-being of several families in the local community.
- Additionally, the financial viability of the project will translate into further economic growth for the investors and the local Mbombela and Nkomazi area, albeit in the medium to long term. The growth in agricultural production together with the improvement in the sustainability of the properties will result in higher incomes and ensure food/crop security.

- **Access Road**: The access to the Project Area from the R38 Provincial tar road is functional and does not require any changes or upgrading. Construction vehicles and equipment will have unhindered access to the project site.
- **Timing**: Is this the right time to implement such a development? The recent drought (2015-2018) has highlighted the fact that crop producers must anticipate drought events to remain sustainably competitive. Access to reliable water for irrigation within the framework of allocated entitlements is possible on the properties and the applicant is planning ahead in anticipation of unavoidable drought-cycles occurring in the future.
- **Integrated Environmental Management**: The objective of integrated environmental management is to balance all interests towards sustainability. For many the word “sustainability” remains a ‘unicorn’ of environmental management – i.e., a myth that is often poorly defined and/or understood.
- As participants in environmental management, we can at best evaluate the project for its inherent advantages and disadvantages. With the help and input of the Public, Specialists and Project Consultants we endeavour to draw a clearer picture with which we all can associate and hopefully agree to, as well as support.
- **We raise the following questions, which include but are not limited to:** Is the proposed activity/development harmful to the environment? Did we ensure that all perceived impacts were mitigated adequately in favour of maintaining the environmental integrity? Will the local/regional/national community benefit from this development or is the development an improvement on an old or outdated concept? Did we ensure that the general public participated in this project from the day of advertisement till submission of documentation? Did we ensure that the economics of the activity were in place prior to project implementation? Is the project feasible? What are the alternatives? Have we considered the various Government role players with regards to sharing information and/or authorisation requirements of this project?
- The list goes on however the team associated with this proposal is confident that we have addressed all the issues to date and can answer in the positive to the questions listed above. In some cases, we have suggested measures of mitigation to soften the impact towards a degree of sustainability.
- **Need and Desirability of the Proposed Project**: In conclusion, it is the opinion of the EAP that the cumulative effect of the factors listed above will result in a positive contribution in the fields of economic benefit and social upliftment in the region with little, or at most manageable, impacts in the environmental arena.

5. GENERAL INFORMATION

| | |
|--|--|
| Project Title | Environmental Impact Assessment: Lows Creek Dam Project: Development of an instream storage dam for irrigation purposes on Portions 1 and 2 of Esperado Annex 222 JU and the Rem. Extent of Esperado 253 JU: Lows Creek Area. |
| Name of Applicants | Mr. Walter Giuricich and Mr. Riaan Kotze. |
| Address | P. O. Box 2161 Rivonia 2128 |
| Contact Persons | Mr. Walter Giuricich and Mr. Riaan Kotze. |
| Telephone Number | 082 967 6757 (Walter) and 082 948 2257 (Riaan). |
| E Mail | walter@ivorymacs.co.za or hak.riaan@gmail.com |
| Environmental Assessment Practitioner (EAP) | Rhengu Environmental Services (RES) |
| Address | P. O. Box 1046 Malelane 1320 |
| Contact Person | Ralf Kalwa |
| Telephone Number | 082 414 7088 |
| Fax Number | 086 685 8003 |
| Date of Report | January 2021 |
| Date of Inspection/s Meetings | Site and 1. 17 July 2020 : Inspection and site meetings with Applicants and Specialists. 2. 15 September 2020 : Public Meeting on site with Interested and Affected Parties (I&APs) and Government Officials. See Minutes attached in Appendix 2. 3. 1 October 2020 : On site waiting for Mr. Eugene Mazibuko to verify certain aspects. Mr. Mazibuko did not arrive. |

6. LOCALITY INFORMATION

| | |
|-------------------------------------|--|
| Name of Place and Locality. | The development site is found on Portions 1 and 2 of Esperado Annex 222 JU and the Rem. Extent of Esperado 253 JU: Lows Creek, Mpumalanga Province. The project site is located approximately 4km west of the R38 Provincial tar road between Lows Creek and Kaapmuiden. The property is bordered in all wind directions by farms practicing agricultural land uses. |
| Region/District | The property is found in the Nkomazi Region of the Onderberg, between the towns of Kaapmuiden and Lows Creek in Mpumalanga. |
| Title Deeds | See Appendix 4.1. |
| Size of Proposed Development | Approximately 7ha. |
| Magisterial District | Nkomazi-Mbombela District Municipalities. |
| Nearest Towns | Lows Creek. |
| Nearest Main Road | R38 Provincial road. The farm is well serviced by all weather gravel roads. |

Type of area where the proposed development will take place (mark all applicable blocks).

| | | | | | | | |
|------------|--|---------------|-------------------------------------|---------------|--|---------------------|--|
| CBD | | Rural | <input checked="" type="checkbox"/> | City | | Recreational area | |
| Commercial | | Agricultural | <input checked="" type="checkbox"/> | Town | | Informal Settlement | |
| Industrial | | Staff Housing | | Township | | Other: | |
| Tourism | | Road | <input checked="" type="checkbox"/> | In a Building | | | |

7. PROJECT DESCRIPTION

Current Status and Infrastructure:

- **Infrastructure:** The farms are **well serviced** with several homesteads, pump houses; storerooms, garages, staff housing and various access roads and service lines which include potable/irrigation water and power supply (Eskom).
- The properties are **game fenced** for security purposes.
- **Access** to the proposed dam site is in place. No new roads will be developed.
- **Road Access** for purposes of marketing and product sales is in place and functional.
- **No Property Alternatives:** The land earmarked for development is fixed and is part and parcel of existing farming operations. By virtue of its position, it links into all existing agricultural land uses.
- **Sustainability:** By optimising the potential of the proposed portion of the farm the applicant is confident that the dam can continue to contribute sustainably to the agricultural business opportunities in- and around Lows Creek and Mbombela/Nkomazi and the surrounding Maputo Corridor area. No other property is available to be considered for an alternative.
- **Alternatives:** RES has however identified **four dam site locations** on the farm for the development of a dam and these **alternatives** will be assessed during the evaluation process.
- **Expertise:** All existing farming operations will remain the same. The farmer has access to all applicable expertise, experience, equipment and logistics to accommodate- and manage the operations of a dam.

Planned/Proposed Activity:

- The applicant wishes to develop an irrigation storage dam on the Lows Creek near the confluence with the Kaap River.
- It is proposed to construct the dam on the Farms: Portions of Remaining Extent of Esperado 253 JU and Portions 1 and 2 of Esperado Annex 222JU. GPS Latitude: 25° 35' 30.6" Longitude: 31° 18' 32.2".
- 4 options for dam sites are being considered with the preferred site illustrated on the map attached. Following on site evaluations it was found that the other alternatives would flood into neighbouring properties.
- Dimensions of the proposed dam: Category 2 Dam: Wall Height 11.4m; Wall Length 245m; Cover an area of 6.5 ha and have a storage capacity of 193 000 cubic metres. Maximum full supply water depth will be 8 metres.
- Development costs are in the region of R6.5 million (Dam construction, pump house and pipelines).
- The development of this storage facility will allow the applicant/farmer to manage the water supply to the orchards in a sustainable manner reducing the risk of poor supply versus demand especially during the dry seasons.
- The water will be stored as per the existing entitlements registered against the farms.
- No new water will be used for this process.

8. DESCRIPTION OF NATURAL ENVIRONMENT (Mucina and Rutherford, 2006)

| Topography | Mountain | Midslope | Flats | Valley Bottom | Wetland | River | Other |
|-------------------------|--|--|-------|---------------|----------------------------|-------|-------|
| | | X | X | X | X | X | |
| Geology | <ul style="list-style-type: none"> Veld Type: SVI 3 Granite Lowveld: Mucina and Rutherford (2006). From north to south, the Swazian Goudplaats Gneiss, Makhutswi Gneiss and Nelspruit Suite (granite gneiss and migmatite) and further south, the younger Mpuluzi Granite (Randian) form the major basement geology of the area. Archaean granite and gneiss weather into sandy soils in the uplands and clayey soils with high sodium content in the lowlands. | | | | | | |
| Climate | <ul style="list-style-type: none"> Summer rainfall with dry winters. The annual average for rainfall in the area is around 630 mm. Generally, a frost-free region. Mean annual maximum and minimum temperatures for Skukuza are 39.5°C and -0.1°C for January and June, respectively. | | | | | | |
| Soil Description | Depth | Texture | | | Dominant Soil Forms | | |
| | Not Applicable | Valley Bottom: Sandy/Loam Midslopes: Coarse. Sandy/Coarse Gravel. | | | Not Applicable. | | |
| Stability | Buildings, e.g., pump houses, homesteads, workshops etc.; have been developed on these soils using normal construction methods and processes. Soils are considered as stable. | | | | | | |

| | |
|--------------------------|---|
| Flora Description | <ul style="list-style-type: none"> As per the classification by Mucina and Rutherford (2006) the farms fall within the Granite Lowveld Veld Type. Tree species that <u>normally dominate</u> this veld type under natural conditions include: <i>Sclerocarya birrea</i>; <i>Ficus sansibarica</i>; <i>Trichilia emetica</i>; <i>Peltophorum africanum</i>; <i>Terminalia sericea</i>; <i>Acacia nigrescens</i>; <i>Acacia nilotica</i>; <i>Albizia harveyi</i>; <i>Combretum apiculatum</i>; <i>Combretum imberbe</i>; <i>Combretum zeyheri</i>; <i>Ficus stuhlmannii</i>; <i>Pterocarpus rotundifolius</i>; <i>Acacia exuvialis</i>; <i>Acacia gerrardii</i>; <i>Bolusanthus speciosus</i>; <i>Cassia abbreviata</i>; <i>Combretum collinum</i>; <i>Dalbergia melanoxylon</i>; <i>Gymnosporia glaucophylla</i>; <i>Lanea schweinfurthii</i>; <i>Pavetta schumanniana</i>; <i>Plectroniella armata</i> and <i>Terminalia prunioides</i>. Shrub species in this vegetation type include: <i>Combretum hereroense</i>; <i>Dichrostachys cinerea</i>; <i>Euclea divinorum</i>; <i>Strychnos madagascariensis</i>; <i>Gardenia volkensii</i>; <i>Hibiscus micranthus</i>; <i>Tephrosia polystachya</i>; <i>Abutilon austro-africanum</i>; <i>Agathisanthemum bojeri</i>; <i>Aptosimum lineare</i>; <i>Baleria elegans</i>; <i>Clerodendrum ternatum</i>; <i>Commiphora africana</i>; <i>Gossypium herbaceum</i> and <i>Pavonia burchellii</i>. Woody Climbers include: <i>Sphedamnocarpus pruniensis</i>. Herbaceous climbers include: <i>Rhynchosia totta</i>. Grasses and other Graminoids include: <i>Brachiaria nigropedata</i>; <i>Digitaria eriantha</i>; <i>Eragrostis rigidior</i>; <i>Melinis repens</i>; <i>Panicum maximum</i>; <i>Pogonarthria squarrosa</i>; <i>Aristida congesta</i>; <i>Bulbostylis hispidula</i>; <i>Chloris mosambicensis</i>; <i>Enneapogon cenchroides</i>; <i>Heteropogon contortus</i>; <i>Leptochloa eleusine</i>; <i>Perotis patens</i>; <i>Schmidtia pappophoroides</i>; <i>Sehima galpinii</i>; <i>Tricholaena monachne</i> |
|--------------------------|---|

| | |
|--|---|
| | <p>and <i>Urochloa mosambicensis</i>.</p> <ul style="list-style-type: none"> • Herbs include: <i>Achyranthes aspersa</i>; <i>Aspilia mosambicensis</i>; <i>Becium filamentosum</i>; <i>Chamaecrista absus</i>; <i>Commelina benghalensis</i>; <i>Commelina erecta</i>; <i>Cucumis africanus</i>; <i>Evolvulus alsinoides</i>; <i>Heliotropium strigosum</i>; <i>Hermbstaedtia odorata</i>; <i>Hibiscus praeteritus</i>; <i>Indigofera filipes</i>; <i>Indigofera sanguinea</i>; <i>Kohautia virgata</i>; <i>Kyphocarpa angustifolia</i>; <i>Leucas glabrata</i>; <i>Ocimum gratissimum</i>; <i>Phyllanthus maderaspatensis</i>; <i>Pupalia lappacea</i>; <i>Vahlia capensis</i>; <i>Waltheria indica</i>; <i>Orbea rogersii</i> and <i>Stapelia leendertziae</i>. • Note: Scientific names are quoted as per the article referenced. • A detailed Biodiversity Study of all Terrestrial- and Aquatic aspects has been commissioned. |
|--|---|

| | |
|----------------------------|--|
| Conservation Status | <ul style="list-style-type: none"> • This veld type is classified as vulnerable. 17% is statutorily conserved in the Kruger National Park. About 20% of this vegetation type has been transformed mainly by cultivation and settlement development. |
|----------------------------|--|

Has the applicant proof of sufficient water for the proposed development?

| | |
|-----|----|
| Yes | No |
| X | |

Comments:

Water rights are available for agriculture and no additional water will be stored. Water use is regulated, and the applicants will abide by the water entitlements allocated to the farms. **See Appendix 4.3 for copies of water rights documents.**

Are there any known Red Data biota on or near the proposed development?

| | |
|-----|----|
| Yes | No |
| | X |

Comments:

- No rare biota was observed during the site visits or during any other visits to the site.
- The Specialist Ecologist that has been appointed for the project will assess this aspect in more detail as part of the Biodiversity- and Ecology Specialist Study.

Are there any known rare bird breeding sites on or near the proposed development?

| | |
|-----|----|
| Yes | No |
| | X |

Comments:

No breeding sites were discovered at or near the project site. The Specialist Study will however assess this aspect in more detail.

Are there any known archaeological, cultural- or historical sites on or near the proposed development?

| | |
|-----|----|
| Yes | No |
| | X |

- A Heritage- and Culture Specialist has been commissioned to assess the potential presence of historical sites and artefacts.
- No artefacts have been observed during the farming activities which have occurred on the property (game farming) for decades.
- Should any artefacts or a find be discovered during construction/development, the proponent must engage the services of an accredited archaeologist to deal with the find.
- Should the application be approved, it is recommended that an Environmental Control Officer (ECO) oversee the implementation of the development phase and the handling of finds will be addressed as per the conditions listed in the Environmental Management Programme (EMPr).

What general precautionary measures will be taken if an archaeological, cultural- or historical site is discovered?

- Should any artefact, or historical site be discovered during the removal of vegetation and or installation of irrigation systems as well as in future, all works must cease with immediate effect.
- The find must be reported to the Project Manager for the development and the ECO for the project. These representatives will initiate an Action Plan in conjunction with SAHRA to address the management and handling of the find.

9. ENVIRONMENTAL ISSUES

This chapter describes the **issues, queries, concerns and opinions** identified:

- during the **public participation process, i.e., focus group meetings**;
- by **authorities and the applicant/management authority** during consultation- and pre-application meetings and telephonic discussions;
- by the **EAP** based on previous experience in the area.

9.1. Key Issues: See Issues and Responses Report in Appendix 2.

- The response to the on-site and newspaper advertisements was promising. The call for potential Interested and Affected Parties to attend the on-site meeting attracted interest from various neighbours, members from the Irrigation Boards and IUCMA.
- The EAP also had to make a **special effort** to engage the local councils in the form of Mr. Jan Mashele and Mr. Dumisani Mabuza to ensure that these important role-players were kept abreast of the progress of all aspects of the project.
- The following key **issues/impacts** are listed for consideration:

| | |
|-------------------------------------|--|
| Environmental Aspects | <ul style="list-style-type: none"> • Specialist Study on terrestrial/aquatic ecology and biodiversity. • Water rights and abstraction quota/measurement. • EWR: Ecological Water Requirement. • Maintenance of the flow. |
| Economic-Operational Aspects | <ul style="list-style-type: none"> • Job creation and stability. • Economic sustainability. • Dam Safety and Water Use Licence Application. |
| Social Aspects | <ul style="list-style-type: none"> • Cultural artefacts. • Land claim. • Needs and Desirability of Project. • Job creation and stability. |

10. PUBLIC PARTICIPATION

10.1. Legislation: As per applicable environmental legislation the applicant must submit an application to the local Departments of Environmental- and Water Affairs to obtain authorisation and permission to develop the proposed dam.

10.2. Advertisements (Printed Media): A newspaper advertisement (The Lowvelder: Local- and Regional newspaper) was placed in the printed press on **16 July 2020** inviting public participation and involvement.

10.3. Advertisements on Site and Town: Site Notices were placed at the entrance/access to the site on the Lows Creek-Kaapmuiden Tar Road, near the site on the farm and at public facilities (shops) in Lows Creek Town. **See Appendix 2** for copies of Notices, Advertisements and Newspaper clippings.

10.4. Neighbours: Advertisements and invitations were also submitted to direct neighbours of the property.

10.5. Government Departments: The Department of Agriculture, South African Heritage Resources Agency; the Department of Rural Development, Land and Environmental Affairs; the Inkomati Usuthu Catchment Management Agency (IUCMA); the Department of Agriculture, Forestry and Fisheries; Mpumalanga Tourism and Parks Agency and the Municipalities of Mbombela/Nkomazi were all informed of the project and invited to participate.

10.6. Public Information Meeting: An information/public meeting was held on site on **15 September 2020 at 10h00**. Persons that may be affected and or interested in the proposed project were invited to register their interest with the EAP and requested to attend the Public Meeting.

10.7. Focus Group Meetings: Where applicable, on-going consultation will be formalised through focus group meetings with each neighbour and or official department as per request and or as the need arises.

10.8. Reports/Copies of Information: Copies of all **Reports** generated will be submitted for comments as per the registered list of Interested and Affected Parties. **Hard Copies** will be made available at **Public Venues** and electronic copies will be submitted as requested via post.

10.9. Specialist Studies Completed: Ms Christine Rowe (Heritage Specialist) has completed an archaeological evaluation of the Project Site and Dr. Andrew Deacon (Biodiversity Specialist) has undertaken various aquatic- and terrestrial surveys. Contents and outcomes of these studies will be shared with I&APs with the submission of the **Environmental Impact Reports**. Additional reports will include an assessment of the **ecological water requirement and engineering design reports**.

10.10. Impacts: Issues and Impacts were determined by RES and complimented by those raised during discussions with neighbours and officials from the various departments. Many of these were also gleaned from similar projects in the Onderberg valley and from previous experience obtained on projects recently completed in the area.

10.11. Minutes: See **Appendix 2** for a comprehensive set of minutes and the Issues and Responses Report.

10.12. Reports: The **Final- and Draft Scoping Reports** were made available for public- and official comment and input. No changes to the contents of the reports were submitted to the EAP. See Departmental correspondence in **Appendix 3**.

Any **social benefits** that will result from this proposed development?

| | |
|-----|----|
| Yes | No |
| X | |

Comments:

- **Job Security:** The development process will result in significant job security and business opportunities during various stages of the process.
- Development labour and expertise will be required to construct the dam and install additional service lines associated with irrigation requirements.
- This phase will require input from both informal- and formal sectors of the agricultural industry.
- The advent of the proposed project will necessitate the employment of skilled- and unskilled labour and expertise.
- Job opportunities will include but not be limited to maintenance positions on the irrigation systems and general farming operations.
- Unskilled labour will earn in the region of R 3500.00 per person per month.
- The opportunities above do not include subsidiary services such as an increase in maintenance of vehicles, retail needs and medical facilities. This development will thus benefit the businesses in Lows Creek-Kaapmuiden and Mbombela.

11. DECOMMISSIONING PHASE

The applicant accepts responsibility for the Cradle to Grave principle. It is unlikely that the proposed development will be decommissioned in the foreseeable future however elements of the site may require a change in land use or must undergo a process of decommissioning in some form or another. For this event, several **objectives** are submitted for the record and consideration.

11.1. Decommissioning Objectives

The applicant/developer remains responsible for the life cycle of the project and all the decommissioning activities in the project area. The infrastructure will undergo a full and comprehensive decommissioning programme. This programme must be described in a **decommissioning plan**.

It is recommended that an **Independent Environmental Assessment Practitioner (EAP)** is appointed at the time **to compile a detailed decommissioning plan** to address all the aspects of the decommissioning process prevalent at the time.

11.2. Decommissioning Approach (Under guidance of an EAP)

Essentially the following approach must be implemented:

11.2.1. Removable concrete structures

- All foreign material such as gravel and concrete (Pump Houses?) must be broken up and removed to a designated gravel pit, which will be identified by the local Municipality for purposes of rehabilitation.
- All roads, buildings and service infra-structure must be demolished and removed off site.
- All service lines, where applicable (electrical- and water supply) must be removed and trenches rehabilitated.
- The lie of the land must be returned to fit in with the adjoining land surface.

11.2.2. Reinstatement

- All foreign material must be removed and disposed of at a borrow pit earmarked for rehabilitation.
- The disturbed area must be levelled off and contoured to fit in with the rest of the landscape.
- The disturbed area must be ripped, and fertilised to enhance re-vegetation.
- The exposed soil must be brush packed with brush and grass material from the area, to serve as a seed bank for re-vegetation.
- The reinstated area must be irrigated once a week to promote the re-vegetation process.
- These aspects will require on site monitoring, as the occurrence of natural rainfall will determine the frequency of irrigation required.

12. MONITORING AND AUDITING

It is recommended, that in the event that this proposal/application is approved, that the developer/applicant appoint an independent **Environmental Control Officer (ECO)** to oversee the implementation of the **Environmental Management Programme (EMPr)** and **monitor compliance** of the **Environmental Impact Assessment (EIA)** and the **Environmental Authorisation (EA)**.

Furthermore, if the proposal is approved, the ECO must ensure that all the **conditions** as set out in the **Environmental Authorisation** issued by the DARDLEA, are met and implemented as stipulated.

The ECO must submit a monthly Audit Report during the development phase to the applicant and DARDLEA for record- and implementation purposes.

The **role of the ECO** and independent audit teams are well defined within the framework of the **Integrated Environmental Management (IEM)**.

13. REFERENCES

Department of Environmental Affairs and Tourism, 1998. *Guideline Document, EIA Regulations, implementation of sections 21, 22 & 26 of the Environment Conservation Act*. Government Printer, Pretoria.

Gertenbach W P D, 1980. *Rainfall Patterns in the Kruger National Park*. Koedoe 23, National Parks Board, Pp 35 – 43.

Mucina L. and Rutherford M.C., 2006. *The Vegetation of South Africa, Lesotho and Swaziland*.