

# FINAL ENVIRONMENTAL IMPACT 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**

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## 1. EXECUTIVE SUMMARY

- This initial phase of the **Environmental Investigation Process** was conducted over a period of 9 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 **Scoping- and Environmental Impact Assessment 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** have 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 and these documents were 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)** investigated the **significance** of impacts, **alternative** options and **mitigation** measures where applicable. The EIR includes amongst others 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. The Draft EIR was submitted for more than 30 days for comments and input to the Interested and Affected Parties. Two Government Departments responded with comments. See Appendix 2.
- **The Specialist Study on Biodiversity and Ecology** followed the step-by-step guidelines described in the Mpumalanga Biodiversity Sector Handbook (MBSP) as compiled by Dr. Mervyn Lötter *et al.*

- **Preferred Option: Dam Site A** is considered as the preferred option for development. By virtue of its position this site is ecologically more acceptable in terms of impact on the biodiversity of the area; less farming land is lost due to flooding and construction implications are more cost effective. By optimising the potential of Dam Site A, the applicant is confident that the land can continue to contribute sustainably to the agricultural business opportunities of the Farm.
- **Dam Management:**
  - The following control measures must be implemented to ensure that the allocations and abstraction volumes remain within the approved entitlements:
  - Measure water pumped into the dam from the rivers and canal. (daily volumes).
  - Record the water level in the dam every day.
  - Record rainfall.
  - Record evaporation.
  - Carry out a monthly water balance using this data to ascertain the inflow from the catchment.
  - Seepage from the dam should also be measured and should this prove to be greater than the natural run-off into the dam then no releases will be required.
- **Yield Analysis:**
  - The yield of the dam was assessed over a range of full supply capacities. At the preferred full supply capacity of 195 000 m<sup>3</sup>, the yield is 3.2 million m<sup>3</sup>/annum at 70% assurance. In order to compensate downstream irrigators a release of a B category **EWR** as well as an additional 1.0 million m<sup>3</sup>/annum is recommended. This decreases the yield of the dam to 2.2 million m<sup>3</sup>/annum. The latter release should take place over the months May to the end of October.

#### Ecological Water Requirement per month

Month	70 Percentile million m3	m3	m3/sec	ltr/sec
Oct	0,043	43000	0,016	16,1
Nov	0,052	52000	0,020	20,1
Dec	0,063	63000	0,024	23,5
Jan	0,059	59000	0,022	22,0
Feb	0,137	137000	0,057	56,6
Mar	0,095	95000	0,035	35,5
Apr	0,07	70000	0,027	27,0
May	0,06	60000	0,022	22,4
Jun	0,064	64000	0,025	24,7
Jul	0,054	54000	0,020	20,2
Aug	0,049	49000	0,018	18,3
Sep	0,043	43000	0,017	16,6

- **Dam Safety: Quality Control (Dam Safety)**: The dam is to be constructed in compliance with the specifications described in SABS 1200 standard specifications with specific reference to:
  - SABS 1200 AD: General (small dams).
  - SABS 1200 C: Site Clearance.
  - SABS 1200 DE: Small Earth Dams.
  - SABS 1200 DK: Gabions and Pitching.
  - SABS 1200 GA: Concrete Works (small works).
  - SABS 1200 L: Medium Pressure Pipelines.
- **Fatal Flaw**: The evaluation process did not reveal any **fatal flaws** during the investigation process.

**Conclusion and Environmental Statement**: The project satisfies the requirements of sustainable integrated environmental management. Provided the developer implements the recommendations and conditions of this report, and the mitigation measures proposed, especially in terms of biodiversity management, it is recommended that the development of the dam at **Site Option A** is approved.

## **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 m<sup>2</sup> 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 m<sup>2</sup> 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:
<b>Government Notice R983 amended as Government Notice: No: 327 of 7 April 2017 Gazette Number: 40772:</b>	12	The applicant wishes to develop an instream dam in a water course (Lows Creek). Additional to this the water surface area (6.5ha) 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.
<b>Government Notice R983 amended as Government Notice: No: 327 of 7 April 2017 Gazette Number: 40772:</b>	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.
<b>Government Notice R983 amended as Government Notice: No: 327 of 7 April 2017 Gazette Number: 40772:</b>	27	Indigenous vegetation will be cleared or flooded/affected to accommodate the dam water and the pump houses.
<b>Government Notice R984 as amended as Government Notice: No: 325 of 7 April 2017 Gazette Number: 40772:</b>	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.
<b>Government Notice R985 as amended as Government Notice: No: 324 of 7 April 2017 Gazette Number: 40772:</b>	12	Indigenous vegetation will be cleared or flooded/affected to accommodate the dam water and the pump houses.
<b>Government Notice R985 as amended as</b>	14	The applicant wishes to develop an instream dam in a water course (Lows Creek). Additional to this the water surface area (6.5ha) and the building of pump

<b>Government Notice: No: 324 of 7 April 2017 Gazette Number: 40772:</b>		houses in excess of 100sqm will be constructed to support the irrigation infrastructure and equipment requirements of the proposed project.
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**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 with a project without having assessed all the 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 Ecological 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 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 are 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

<b>Project Title</b>	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.	
<b>Name of Applicants</b>	Mr. Walter Giuricich and Mr. Riaan Kotze.	
<b>Address</b>	P. O. Box 2161 Rivonia 2128	
<b>Contact Persons</b>	Mr. Walter Giuricich and Mr. Riaan Kotze.	
<b>Telephone Number</b>	082 967 6757 (Walter) and 082 948 2257 (Riaan).	
<b>E Mail</b>	walter@ivorymacs.co.za or hak.riaan@gmail.com	
<b>Environmental Assessment Practitioner (EAP)</b>	Rhengu Environmental Services (RES)	
<b>Address</b>	P. O. Box 1046 Malelane 1320	
<b>Contact Person</b>	Ralf Kalwa	
<b>Telephone Number</b>	082 414 7088	
<b>Fax Number</b>	086 685 8003	
<b>Date of Report</b>	May 2021	
<b>Date of Inspection/s Meetings</b>	<b>Site and</b>	<ol style="list-style-type: none"> <li>1. <b><u>17 July 2020</u></b>: Inspection and site meetings with Applicants and Specialists.</li> <li>2. <b><u>15 September 2020</u></b>: Public Meeting on site with Interested and Affected Parties (I&amp;APs) and Government Officials. <b>See Minutes attached in Appendix 2.</b></li> <li>3. <b><u>1 October 2020</u></b>: On site waiting for Mr. Eugene Mazibuko to verify certain aspects. Mr. Mazibuko did not arrive.</li> <li>4. <b><u>5 February 2021</u></b>: On site meeting with Mr. Xolani Nkosi from DARDLEA to explain the various facets of the proposed project.</li> </ol>

## **6. LOCALITY INFORMATION**

<b>Name of Place and Locality.</b>	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.
<b>Region/District</b>	The property is found in the Nkomazi Region of the Onderberg, between the towns of Kaapmuiden and Lows Creek in Mpumalanga.
<b>Title Deeds</b>	See <b><u>Appendix 4.1.</u></b>
<b>Size of Proposed Development</b>	Approximately 7ha.
<b>Magisterial District</b>	Nkomazi-Mbombela District Municipalities.
<b>Nearest Towns</b>	Lows Creek.
<b>Nearest Main Road</b>	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	<input type="checkbox"/>	Rural	<input checked="" type="checkbox"/>	City	<input type="checkbox"/>	Recreational area	<input type="checkbox"/>
Commercial	<input type="checkbox"/>	Agricultural	<input checked="" type="checkbox"/>	Town	<input type="checkbox"/>	Informal Settlement	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	Staff Housing	<input type="checkbox"/>	Township	<input type="checkbox"/>	Other:	<input type="checkbox"/>
Tourism	<input type="checkbox"/>	Road	<input checked="" type="checkbox"/>	In a Building	<input type="checkbox"/>		<input type="checkbox"/>

## **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** were 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 between 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 maps attached in the appendices (Volume 1). 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	
<b>Geology</b>	<ul style="list-style-type: none"> <li>Veld Type: SVI 3 Granite Lowveld: Mucina and Rutherford (2006).</li> <li>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.</li> <li>Archaean granite and gneiss weather into sandy soils in the uplands and clayey soils with high sodium content in the lowlands.</li> </ul>						
<b>Climate</b>	<ul style="list-style-type: none"> <li>Summer rainfall with dry winters.</li> <li>The annual average for rainfall in the area is around 630 mm.</li> <li>Generally, a frost-free region.</li> <li>Mean annual maximum and minimum temperatures for Skukuza are 39.5°C and -0.1°C for January and June, respectively.</li> </ul>						
<b>Soil Description</b>	<b>Depth</b>	<b>Texture</b>			<b>Dominant Soil Forms</b>		
	Not Applicable	Valley Bottom: Sandy/Loam Midslopes: Coarse. Sandy/Coarse Gravel.			Not Applicable.		
<b>Stability</b>	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.						

<b>Flora Description</b>	<ul style="list-style-type: none"> <li>As per the classification by Mucina and Rutherford (2006) the farms fall within the Granite Lowveld Veld Type.</li> <li><b>Tree species</b> 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>.</li> <li><b>Shrub species</b> 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>.</li> <li><b>Woody Climbers</b> include: <i>Sphedamnocarpus pruniensis</i>.</li> <li><b>Herbaceous climbers</b> include: <i>Rhynchosia totta</i>.</li> <li><b>Grasses and other Graminoids</b> 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>;</li> </ul>
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	<p><i>Heteropogon contortus</i>; <i>Leptochloa eleusine</i>; <i>Perotis patens</i>; <i>Schmidtia pappophoroides</i>; <i>Sehima galpinii</i>; <i>Tricholaena monachne</i> and <i>Urochloa mosambicensis</i>.</p> <ul style="list-style-type: none"> <li>• <b>Herbs</b> 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>.</li> <li>• <b>Note:</b> Scientific names are quoted as per the article referenced.</li> <li>• A <b>detailed Biodiversity Study</b> of all Terrestrial- and Aquatic aspects was completed (<b>See Appendix 4.5.3</b>).</li> </ul>
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<b>Conservation Status</b>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>
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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, not during site visits to date. The Specialist Ecologist that has been appointed for the project has assessed 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 was commissioned to assess the potential presence of historical sites and artefacts. **See Appendix 4.5.6.**
- No artefacts have been observed during the farming activities which have occurred on the property 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:

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

## **9.2. Ranking of Environmental Issues Identified**

To identify the significant issues, these were ranked as per the four different criteria outlined in the Environmental Impact Assessment Guideline Document for assessing impacts in Environmental Impact Reports.

The environmental elements (issues/impacts) are evaluated according to the following criteria:

1. **Intensity** – 4 Categories were distinguished:

Positive (+), Negative (-), No Impact (0), and Uncertain (U).

The positive- and negative categories were further divided to distinguish between low-, medium-, and significant impacts.

Scores were awarded as follows:

**Low = 1, Medium = 2, and Significant = 3.**

**Issues/Impacts** were ranked in order of importance as:

- |  |                   |
|--|-------------------|
| 1. Critical Issues/Impacts with scores               | ≥ -5,             |
| 2. Important Issues/Impacts with scores              | < - 5 to - 1, and |
| 3. Operational/Management Issues/Impacts with scores | ≥ 0.              |

2. **Duration** - Is the impact – **Short-**, **Medium** term, or **Permanent**.

3. **Probability** of impact – **Improbable (I)**; **Probable (?)**; **Definite (D)**,

4. **Extent** – Is the effect **Local**; **Regional**; **National**; or **International**.

5. **NA** - Not Applicable.

### 9.3. Environmental Screening

KEY OF SYMBOLS TO BE USED IN TABLE			
<b>Intensity</b> of impact/issue:	Significant Impact	Medium Impact	Low Impact
Positive (+)	+ 3	+ 2	+ 1
Negative (-)	- 3	- 2	- 1
Impact uncertain (U)	U		
No envisaged impact (0)	0		
<b>Duration</b> of impact/issue	Short Term = S	Medium Term = M	Permanent = P
<b>Probability</b> of impact/issue	Improbable = I	Probable = ?	Definite = D
<b>Extent</b> of impact/issue	Local = L	Regional = R	National / Int. = N
NA: Not Applicable	TABLE FOR IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS		
ENVIRONMENTAL ELEMENT	DEVELOPMENT PHASE	OPERATIONAL PHASE	TOTAL SCORE
<b>ENVIRONMENTAL ASPECTS: GENERAL</b>			
Specialist Study on Terrestrial/Aquatic Ecology.	-1,P,D,L	0,P,D,L	-1
Water Rights and Abstraction Quota.	0,P,D,L	0,P,D,L	0
EWR: Ecological Water Requirement.	-1,P,D,L	0,P,D,L	-1
Maintenance of the flow.	0,P,D,L	0,P,D,L	0
<b>ECONOMIC ASPECTS:</b>			
Job Creation and Stability.	+1,M,D,L	+1,P,D,L	+2
Economic Sustainability.	0,M,D,L	+1,P,D,L	+1
Dam Safety and Water Use Licence.	0,P,D,L	0,P,D,L	0
<b>SOCIAL ASPECTS</b>			
Cultural Artefacts.	0,S,D,L	0,P,D,L	0
Job Creation and Stability.	+1,M,D,L	+1,P,D,L	+2
Land Claim.	0,S,D,L	0,P,D,L	0
Needs and Desirability of Project.	+1,M,D,L	+2,P,D,L	+3

## **9.4. Issues Identified**

### **9.4.1 Critical Issues**

No **Critical Issues** were identified during the screening process.

### **9.4.2 Important Issues**

- Specialist Study on Terrestrial/Aquatic Ecology.
- EWR: Ecological Water Requirement.

### **9.4.3. Operational/Management Issues**

- Water Rights and Abstraction Quota.
- Dam Safety and Water Use Licence.
- Cultural Artefacts.
- Land Claim.
- Maintenance of the flow.

### **9.4.4. Positive Impacts**

- Job Creation and Stability.
- Needs and Desirability of Project.
- Economic Sustainability.

**9.5. Impacts/Issues: (This Section must be read in conjunction with the contents of the Environmental Management Programme: Appendix 5).**

Important Issues	Discussion/Mitigation/Recommended Management Approach
<p><b>1. Specialist Study on Terrestrial/Aquatic Ecology.</b></p>	<ul style="list-style-type: none"> <li>• See <b>Appendix 4.5.3</b> for detail on all aspects of the biodiversity associated with the Project Area.</li> <li>• The potential impact of the project on the biodiversity of the study area is assessed under one broad impact, namely:</li> <li>• <b>Impeding or diverting the flow of water in a watercourse: The construction of a dam covering 6.5 ha with a storage capacity of 193 000 cubic metres in the channel of the Low’s Creek river.</b></li> <li>• The potential impacts of the project on the biodiversity of the study area are assessed under the following broad categories, namely:</li> <li>• <b>Impact 1: The dam basin – clearing vegetation, manipulating soil layers, construction of coffer dam walls (operating and rehabilitation) and the dam wall:</b></li> <li>• <b>Nature of impact:</b> This impact refers to the loss of untransformed habitat attributes and cleared areas, furthering the risks for erosion and siltation.</li> <li>• During clearing of riverine vegetation in the dam basin and whilst sourcing soil for the dam wall construction, the original riparian corridor of the Low’s Creek River will be affected permanently. Disturbing the soil layers during construction of the coffer- and the final dam walls will result in areas of bare, loose soil, which will pose an erosion and siltation threat.</li> <li>• <b>Mitigation:</b> Levelling, shaping and landscaping of the site should follow natural drainage patterns as far as possible i.e., drainage towards the river. This must ensure that surface water flow velocities and run-off are minimised allowing for a gradual drainage into the river.</li> <li>• Clearing for the dam site should take place during the dry period, i.e., winter. However, as unpredicted high rainfall can occur during any month of the year, all measures should be taken to prevent exposed soils from being washed into the downstream tributary and or the main stream. ECO to monitor and advise.</li> <li>• The remaining peripheral riparian woodland in the dam basin should be left intact in order to maintain the denser riparian corridor which is utilised by the riparian animals.</li> </ul>

- **Impact 2: Removing or inundating the riparian zone in the dam basin and affecting the link in the up- and down-stream riparian corridor:**
- **Nature of impact:** This impact refers to the permanent loss of untransformed habitat, especially the interruption of the riparian corridor and the influence extending into the adjacent terrestrial land.
- During clearing of the dam basin, the riverine vegetation will be removed and the entire area drowned during the filling phase of the dam. Downstream riparian zones will be influenced by the change in flows due to the dam releases and the upstream riparian zone will be vulnerable to further agricultural development.
- **Mitigation:** Little mitigation is possible when the riparian zone is submerged during the filling of the proposed dam. The following aspects must however be implemented:
- **Buffer Zone:** Create a buffer zone around the full, high-water mark and replant some of the key riparian tree species from the basin onto the dam margin border. Currently there are intact riparian zones upstream and downstream of the proposed dam basin along the riverbanks of the Low's Creek. Usually, a riparian buffer would have been recommended for these riparian vegetation zones, however as the land has historically been developed right up to the edge of the riparian zone (up to the fence around the riparian area), no additional natural buffer is currently feasible.
- Therefore, existing riparian zones upstream and downstream of the dam basin should be protected and excluded from any further development in order to maintain the integrity of these intact sections of the riparian corridor. In order to re-establish the link between the riparian corridors upstream and downstream of the dam basin, a riparian buffer should be established along the **new marginal zone** around the dam.
- As the new marginal zone will either be covered with current orchards, or the original terrestrial vegetation, it is proposed that a buffer of 25m wide around the high-level mark of the dam should be established as a buffer for the aquatic environment. (**Why 25m?** The proposed 25 m width is representative of the current average width of the intact riparian zone upstream of the proposed dam position).
- The areas adjacent to the high-level mark of the dam should thus be left intact and if possible, the new perimeter should be augmented with vegetation removed from the dam basin.
- All remaining peripheral woodland in the dam basin should also be left intact in order to create some kind of new riparian zone. This buffer will hopefully represent a denser band of vegetation in time due to the increased availability of water and consequently create a denser vegetation corridor which can be utilised by riparian faunal species.



- **Impact 3. River flow – downstream flows (See Appendix 4.5.5. for detail):**
- **Nature of impact:** Changes in temporal and spatial characteristics of flow can have an impact on downstream habitat attributes such as an increase in duration of low flow season (or none-flow events), resulting in low availability of certain habitat types or availability of water at the start of the breeding, flowering or growing season of the riverine biota (aquatic and riparian).
- **Mitigation:** An Ecological Water Requirements (EWR) must be implemented and managed by releasing water from the dam to mimic natural flow as closely as possible. An EWR report for the Low's Creek project was prepared by IWR Water Resources (2020) and it is attached as **Appendix 4.5.5.** to the EIR.
- The Ecological Water Requirements (EWR) of the Kaap River have been determined (DWA, 2010) and published in the Government Gazette. Whilst there is no specific EWR for the Low's Creek, it can be estimated using the Hughes Desktop model (Hughes and Hannart, 2002).
- By incorporating the ecological parameters from the PES report (Deacon 2021), the EWR of the Low's Creek was estimated for a **category B river.** The rule curve for this EWR is attached in the **Appendix 4.5.5.**
- The rule curve expresses the EWR as a function of the natural flow from which a time series EWR can be determined.
- While there is a significant amount of irrigation water available within the Low's Creek catchment, the water for this irrigation is supplied from the Shiyalongubu Dam, located on a tributary of the Lomati River. The yield of the Low's Creek Dam was assessed over a range of full supply capacities. **At the preferred full supply capacity of 195 000 m<sup>3</sup>, the yield is 3.2 million m<sup>3</sup>/annum at 70% assurance.**
- However, the low flow downstream of the dam will decrease significantly due to this development. An analysis of the irrigation water requirements versus supply shows that the irrigation requirements are largely met during the summer, but shortages occur in winter. The Low's Creek Dam will reduce the assurance of supply of downstream users by about 5 percentage points (from 63% to 58%).
- Therefore, in order to compensate downstream irrigators, a release of a B category EWR as well as an additional **1.0 million m<sup>3</sup>/annum** is recommended. This mitigation measure will result in water being released from the Low's Creek Dam in the months of **May through to the end of October.** This measure will decrease the yield of the dam to **2.2 million m<sup>3</sup>/annum.**
- The construction of the dam wall should take place and be completed during the low flow period. There are times when the river naturally ceases to flow. When flow in the river resumes, measures must be taken to manage the weir or outlet structures to mimic natural variations in physical habitat upstream.

- **Impact 4. River flow – water quality:**

- **Nature of impact:** Damming changes the physical-chemical aspects of the dammed water (in the coffer walls and dam basin) and therefore, the water released from the dam **could have an adverse impact** on the downstream reaches as listed below:
  - Damming alters water temperature and chemistry;
  - It alters nutrient regimes due to additional nutrient input;
  - Eutrophication occurs due to the enrichment of water with nutrients (nitrates and phosphates);
  - It increases total dissolved solids (TDS) (salinity is the quantity of total dissolved inorganic solids, or salts, present in water) due to evaporation losses from dams;
  - Water quality changes with suspended solids due to siltation;
  - Hazardous substances associated with construction activities may impact upon water quality.
- **Mitigation:** Due to the size of the dam and the through flow of water, the chemistry of the water will not pose a significant threat. Nutrients and TDS will thus not reach levels that will affect the overall water quality and resultant eutrophication.
  - Hazardous substances associated with construction activities will be mitigated by adhering to the best practice guidelines for these substances. Eco to monitor.
  - Design the dams in accordance with the requirements of the Ecological Reserve/EWR of the river.
  - In particular, a mechanism for the delivery of continual maintenance flows to the downstream system is critical. Several sluices/outlets must release water from different levels in the thermocline, thereby mixing the water being released to a more acceptable water quality and temperature.

- **Impact 5. Erosion and Siltation:**
- **Nature of impact:** Any clearing of vegetation or disturbing the soil layers will subject these areas to erosion and sedimentation impacts due to the lack of cover.
- **Mitigation:** It is important that all work within a water resource should be completed during the **dry season**, when flows are at their lowest. This significance of the impact can be reduced to low when construction takes place during the dry season and/or when sedimentation ponds are used to settle out the suspended solids.
- During vegetation **clearing** of the dam basin, bank protection (e.g., planting) will also be required to reduce sediment input. This will stabilise the problem area and maintain the present condition of the riparian wetland or secondly, attempt to reclaim the riparian wetland area that has been lost.
- **Protect the Bare Areas:** Use a variety of methods, such as planting herbaceous or woody plants, placing hay bales, clay, gabions/reno mattresses filled with rock, or if lined with a geo-textile, cover with soil, or even just pack loose rock against head-cut faces. Draft and implement a maintenance plan which optimises macrophyte/riparian plant species development. ECO to monitor and advise.
- Where the dam is **constructed**, adequate erosion and sedimentation control measures must be put in place to prevent downstream impacts during both the construction- and operational phases. A stormwater management and erosion-control plan must be put in place for both the construction- and operational phases.
- **Add Vegetation:** During construction, the process may include maintaining a vegetated buffer area until just prior to establishing the dam embankment (this buffer will reduce erosion and sedimentation), and/or constructing a retention swale prior to any clearing 'upstream', or any other method deemed appropriate by the Dam Designer.
- Complete rehabilitation of all work areas will be required to return the site to its former condition. All areas that were cleared or disturbed during construction activities must be rehabilitated to an appropriately vegetated state. Care must be taken to ensure that these rehabilitated areas blend in with the immediate environment.
- **Buffer Zone:** During the **operational** phase a buffer zone (e.g., riparian vegetation) should be established to prevent entry of additional sediment into the water course/impoundment. This will stabilise the problem areas and maintain the present condition of existing riparian woodland or attempt to reclaim the riparian area that has been lost.
- **Releasing Water:** The release of bottom water with high silt loads will be detrimental to downstream fish and must be avoided. Whenever possible, one should strive to mix the water being released from the sluice and dam overflow and/or the flow through the fish ladder when the bottom sluice is in operation. This will mix the bottom water with top layer flows and thus dilute the water. Water quality will thus improve.
- These measures will prevent the degradation of the downstream river and riparian zone and ensure compliance with the Ecological Reserve, associated water use allocation and all applicable Water Use License conditions.

- **Impact 6. Impacts of the Dam Wall: See Appendix 4.5.4.**
- **Nature of impact:** The disruption of migratory routes affects the lifecycle of migratory aquatic species as dam barriers prevent brood stock from reaching their spawning grounds during the breeding season, resulting in a failure of recruitment and eventual extinction of the stock above the dam.
- **Mitigation:** Low's Creek is a semi-permanent stream that would provide valuable breeding and refuge habitat for fish species found within the river reach. In order to mitigate for the disruption of migratory routes (aquatic environment) caused by the building of the dam, it is recommended that a **fish way or fish ladder** be incorporated into the dam wall or spillway.
- The implementation of natural bypass or rock-ramp types of fish passes are usually the preferred design over formal fish way structures.
- Broadly described, a rock ramp fish pass is a series of rocks and boulders of various sizes that is embedded into a stable foundation material (concrete) in such a way that the turbulence created by the natural flow path through the boulders creates pooled areas of various sizes, depths and hydraulic conditions.
- In the case of the Low's Creek Dam site, a fish way channel that simulates a natural bypass channel and rock-ramp type of fish way has been proposed for the site. The site conditions and the nature of the development tends to suit this style. Two alternative alignments were explored, and both of them are considered viable from an ecological perspective. The preferred alignment will therefore largely be based on site conditions and engineering aspects.
- A slope of 1:15-1:25 (or higher) is recommended, where the channel will be more likely to have lower water velocities and therefore, lower turbulence levels. The water will also tend to pool more readily, which will reduce the incidences of supercritical flow conditions.
- Given that the design criteria and the alignment route are taken into consideration, it is believed that the proposed fish way channel will adequately cater for the migratory requirements of the target fish species.
- It is recommended that once the basic channel has been excavated, that the channel be surveyed and the profile modelled in order to offer an optimal design with modifications presented in areas that are shown to not function adequately.
- The overflow from the dam into the river should be close to the edge of the embankment and sculptured in such a way that most of the fish can continue to find their way up the embankment to find the fish way entrance.

- **Impact 7. The introduction and spread of alien vegetation.**
- **Nature of impact:** One of the main threats to the biodiversity of the area is considered to be the introduction and spread of alien vegetation.
- **Mitigation:** The control methods of alien invasive plants can broadly be classified into three categories: mechanical, chemical or biological.
- Mechanical control methods involve the physical destruction or total removal of plants (e.g., felling, strip-barking; ringbarking, hand-pulling and mowing).
- Chemical control of invasive alien plants includes the foliar spraying of herbicides to kill targeted plants and
- Biological control or bio-control methods involves the release of natural enemies that will reduce plant health and reduce population vigour to a level comparable to that of the natural vegetation.
- It is often necessary to use a combination of at least two of these methods to control or remove invasive alien plants. With repeated follow-up, mechanical and chemical control methods tend to be short-term activities suitable for smaller plant invasions that can result in the complete removal of the target species. After the implementation of the methods, it is important to evaluate the effectiveness of the methods and to monitor the cleared areas on a regular basis to identify emergent seedlings and to remove those immediately. ECO to monitor and advise.

## 2. EWR: Ecological Water Requirement.

- **See Appendix 4.5.5. for detail in this regard.**
- It is entrenched in the National Water Act that the rivers in South Africa will allow the ecology of the landscape to continue functioning in a sustainable manner, i.e., allow sufficient water to flow through the system to ensure that all ecological processes continue unhindered and that the ecosystem remains functional.
- Each river and stream have thus been allocated an ecological water requirement to achieve the objective above.
- For the Lows Creek system to abide by this requirement water allocation will have to be managed and the yield for the proposed dam cannot exceed **2.2 million m<sup>3</sup>/annum.**
- Water meters will be installed to measure abstraction and releases quotas. The local Irrigation Board will be tasked to monitor the quantities of water uses.

### **Ecological Water Requirement per month**

Month	70 Percentile million m3	m3	m3/sec	ltr/sec
Oct	0,043	43000	0,016	16,1
Nov	0,052	52000	0,020	20,1
Dec	0,063	63000	0,024	23,5
Jan	0,059	59000	0,022	22,0
Feb	0,137	137000	0,057	56,6
Mar	0,095	95000	0,035	35,5
Apr	0,07	70000	0,027	27,0
May	0,06	60000	0,022	22,4
Jun	0,064	64000	0,025	24,7
Jul	0,054	54000	0,020	20,2
Aug	0,049	49000	0,018	18,3
Sep	0,043	43000	0,017	16,6

Operational Issues	Discussion/Mitigation/Recommended Management Approach
<p><b>1. Water Rights and Abstraction Quota.</b></p>	<ul style="list-style-type: none"> <li>• <b><u>See Appendix 4.5.5: Hydrological Report for detail:</u></b></li> <li>• <b><u>Water Allocations:</u></b> The farms have access to the following allocations:</li> <li>• <b><u>Esperado Farms (Pty) Ltd:</u></b> <ul style="list-style-type: none"> <li>• Lower Kaap Irrigation Board: 30.17ha @ 7 000m<sup>3</sup> / annum = 211 190m<sup>3</sup> / annum</li> <li>• Lows Creek Irrigation Board (Shiyalongubu System): 68ha @ 6 600m<sup>3</sup> / annum = 448 810m<sup>3</sup> / annum</li> <li>• Total IUCMA existing lawful water use = <b>660 000 m<sup>3</sup> / annum.</b></li> </ul> </li> <li>• <b><u>Te Kort Beleggings (Pty) Ltd:</u></b> <ul style="list-style-type: none"> <li>• Lower Kaap Irrigation Board: 70ha @ 6 600m<sup>3</sup> / annum = 462 000m<sup>3</sup> / annum</li> <li>• Lows Creek Irrigation Board (Shiyalongubu System): 55ha @ 6 600m<sup>3</sup> / annum = 363 000 m<sup>3</sup> / annum</li> <li>• Total IUCMA existing lawful water use = <b>825 000 m<sup>3</sup> / annum.</b></li> </ul> </li> <li>• These allocations have been confirmed by the IUCMA, Low's Creek Irrigation Board and the Lower Kaap Irrigation Board.</li> <li>• No additional water will be sourced. The applicant must remain within the allocated entitlements.</li> <li>• Measuring devices will be installed upstream and downstream of the proposed dam. The local Irrigation Board will monitor these measurements.</li> <li>• <b><u>Mitigation:</u></b> <ul style="list-style-type: none"> <li>• The following control measures must be implemented to ensure that the allocations and abstraction volumes remain within the approved entitlements:</li> <li>• Measure water pumped into the dam from the rivers and canal. (daily volumes).</li> <li>• Record the water level in the dam every day.</li> <li>• Record rainfall.</li> <li>• Record evaporation.</li> <li>• Carry out a monthly water balance using this data to ascertain the inflow from the catchment.</li> <li>• Seepage from the dam should also be measured and should this prove to be greater than the natural run-off into the dam then no releases will be required.</li> </ul> </li> <li>• <b><u>Yield Analysis: Appendix 4.5.5:</u></b> <ul style="list-style-type: none"> <li>• The yield of the dam was assessed over a range of full supply capacities. At the preferred full supply capacity of <b>195 000 m<sup>3</sup>, the yield is 3.2 million m<sup>3</sup>/annum at 70% assurance.</b> However, the low flow downstream of the dam will decrease significantly due to this development. In order to compensate downstream irrigators a release of a B category EWR as well as an additional 1.0 million m<sup>3</sup>/annum is recommended. This decreases the yield of the</li> </ul> </li> </ul>

	dam to 2.2 million m <sup>3</sup> /annum. The latter release should take place over the months May to the end of October.
2.Dam Safety and Water Use Licence.	<ul style="list-style-type: none"> <li>• See <b><u>Appendix 4.4 and 4.5.1.: Application and Dam Design Report for detail</u></b>: As part of mitigation the following aspects must be implemented:</li> <li>• <b><u>Mitigation: Accredited Company</u></b>: The dam design must be undertaken by an accredited engineering company and the design must satisfy various dam safety regulations and requirements. This process is well managed and controlled by the various officials in the Department of Water and Sanitation, represented by IUCMA in this case.</li> <li>• <b><u>Water Use Licence Application</u></b>: Several on-site meetings have been held by these stakeholders and a WULA process was initiated concurrently with the EIA process. The outcome of the EIA will inform the IUCMA as to the impacts of the storage dam on the ecology of the area and social long-term benefits of the development. IUCMA will then confirm that all safety requirements are met and issue a decision accordingly. This process is currently ongoing and on track.</li> <li>• <b><u>The Design Report has confirmed the following</u></b>: <ul style="list-style-type: none"> <li>• The proposed dam will store 1.89 million m<sup>3</sup> of water. The purpose of the proposed dam is not to undertake any additional irrigation development, requiring excess water above the legally allocated volume of water attached to the existing water rights of the properties of Esperado Farms (Pty) Ltd and Te Kort Beleggings (Pty) Ltd. The objective is to stabilise the water supply so that it can be used in times of shortage.</li> <li>• <b><u>Motivation</u></b>: During drought periods the farms experience water shortages that have negative impacts on crop production and results in a loss of job opportunities. By establishing additional storage capacity on the property, farm management will be able to mitigate these impacts.</li> <li>• No additional water will be sourced. All water will be used and stored as per the allocated entitlements registered to the farm.</li> </ul> </li> <li>• <b><u>Key Dam Design Features</u></b>: <ul style="list-style-type: none"> <li>• <b><u>Spillway</u></b>: The proposed Lows Creek Dam is a relatively small dam in a relatively large catchment. The dam will be filled predominantly from natural run-off from within the dam's catchment area as well as releases from the Shiyalongubo System.</li> <li>• Flood attenuation will not have a marked effect on the design outflow peaks. A 61m wide concrete Labyrinth spillway is proposed on the right bank. A smaller outlet pipe will be provided through the concrete spillway to allow for releases when the dam is not overtopping.</li> <li>• The water velocity through the spillway section, will be 2.12m/s. The spillway will be excavated onto competent rock. This will provide erosion protection. The spillway return will likely be eroded and will stabilise at rock level. Some grouting/dental concrete may be required should the rock be friable. This will be confirmed during construction.</li> </ul> </li> </ul>



- This dam will likely spill frequently due to the small capacity of the dam and the high mean annual runoff in the catchment.
- A **fish way/ladder** will be installed along the spillway as described in the Specialist Study (**Appendix 4.5.4**).
- **Quality Control (Dam Safety)**: The dam is to be constructed in compliance with the specifications described in SABS 1200 standard specifications with specific reference to:
  - These engineering aspects are:
    - Excavation of the cut-off trench to moderately weathered rock, to minimise seepage through the foundations.
    - Treatment and preparation of cut-off trench floor, to minimise seepage between the rock and clay core interface.
    - Compaction of clay core to 98% Proctor, at OMC +2%. Particularly the moisture content will require good control by the contractor.
  - Formwork and concrete works for the spillway and outlet pipe.
  - There is ample construction material inside and outside the dam basin, with clays and gravel available to result in an economical cross section.
  - The above can only be achieved with good cooperation between Contractor (Owner), Project Engineer and the Engineering Geologist.
- In addition to the above, the dam is to be constructed in compliance with the specifications laid out in **SABS 1200 standard specifications**. The following **standard specifications** will be applicable:
  - **SABS 1200AD**: General (small dams)
  - **SABS 1200C**: Site Clearance
  - **SABS 1200DE**: Small Earth Dams
  - **SABS 1200DK**: Gabions and Pitching
  - **SABS 1200GA**: Concrete Works (small works)
  - **SABS 1200L**: Medium Pressure Pipelines
- Proper permanent site supervision by the contractor will be indispensable, while laboratory facilities on site are certainly desirable.

### 3.Cultural Artefacts.

See **Appendix 4.5.6.** for detail on the Heritage aspects of the project area.

- A specialist study on the cultural importance of the project area was undertaken by Christine Rowe.
- The survey revealed no archaeological or historical structures/artefacts of significance in the dam area.
- It is not believed that any archaeological or historical features will be impacted upon by the dam development.
- Archaeological material or graves are not always visible during a field survey and therefore some significant material may only be revealed during construction activities of the proposed dam development.
- **Mitigation Nr. 1:** It is recommended that the owner be made aware that distinct archaeological material or human remains may only be revealed during the debushing or construction activities. Based on the survey and the findings in this report, Adansonia Heritage Consultants state **that there are no compelling reasons which may prevent the proposed dam development to continue**, but it is recommended that earthmoving activities be monitored by a qualified archaeologist and that an assessment be undertaken should any archaeological material be found.
- The specialist study was submitted to SAHRA and their comments to date are included in **Appendix 2.**
- **Mitigation Nr. 2: No artefacts** have been observed during the farming activities which have occurred on the property for decades.
- The developer has farmed this site for several years and has not **unearthed/located** any grave sites; historical sites or artefacts which are of historical importance.
- However, should any artefacts or a find be incidentally discovered during trenching/construction activities, the proponent **must engage the services of an accredited archaeologist** to deal with the find.
- It is recommended that an **Environmental Control Officer (ECO)** oversee the implementation of the development phase and the handling procedure of any finds is described in the Environmental Management Programme (EMPr).
- Should any artefact, or historical site be **incidentally** discovered during excavations for foundations 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 and the developer to address the management and handling of the find.**

<p><b>4.Land Claim.</b></p>	<ul style="list-style-type: none"> <li>• See <b>Appendix 4.2.</b> for detail on the Land Claim process in the project area.</li> <li>• As per the contents of the letter from the Lands Claim Commissioner, the proposed project area has been exempted from any land claims.</li> <li>• The applicant is free to expand his farming activity. No objections to the proposed improvement of the infrastructure have been lodged with the EAP.</li> <li>• <b>No mitigation measures</b> are applicable.</li> </ul>
<p><b>5.Maintenance of the flow.</b></p>	<ul style="list-style-type: none"> <li>• <b>Mitigation: The following mechanisms must be implemented:</b></li> <li>• <b>Maintaining the EWR:</b> Construction of the Lows Creek Dam will occur in the months from April to November. It is not expected that river diversion will be a major issue in this time. A large 400mm diameter outlet pipe will be able to manage the flow in the stream.</li> <li>• Provision will also be made to release the EWR from the outlet pipe, should the dam not be overflowing. Provision will also be made for a smaller outlet pipe to be installed through the spillway concrete, at a higher level. The EWR can also be released at this point when the dam is not overflowing.</li> <li>• No additional water will be sourced. The applicant must remain within the allocated entitlements.</li> <li>• <b>Water Meters:</b> Measuring devices will be installed upstream and downstream of the proposed dam. The local Irrigation Board will monitor these measurements.</li> </ul>

Positive Issues	Discussion/Mitigation/Recommended Management Approach
<p><b>1.Job Creation and Stability.</b></p>	<ul style="list-style-type: none"> <li>• <b><u>Social Commitment and Job Creation:</u></b> 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)</li> <li>• 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.</li> <li>• The Covid 19 Pandemic has also resulted in additional job losses across the various industries and associated businesses.</li> <li>• 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).</li> <li>• Unskilled labour will earn in the region of R3500/month.</li> <li>• The opportunities listed above do not include the cumulative impact on 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.</li> <li>• Job creation, i.e., 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.</li> <li>• Furthermore, the financial viability of the project will translate into economic growth for the investors and the local Nkomazi area as a whole, albeit in the medium to long term.</li> <li>• The growth in agricultural production together with the improvement in the sustainability of the farm will result in higher incomes and ensure food/crop security.</li> </ul>

<p><b>2.Needs and Desirability of Project.</b></p>	<ul style="list-style-type: none"> <li>• <b><u>Strategic Regional Initiatives:</u></b> 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.</li> <li>• The sugarcane has been removed gradually due to water scarcity, increased input costs, distance from the mill and low returns achieved.</li> <li>• As a result of this many farmers investigated and experimented with crops which would generate <b>better returns, use less water</b> 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.</li> <li>• 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.</li> <li>• 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.</li> <li>• <b><u>The Proposed Construction of the New Dam:</u></b> 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 <b>maintain and expand its orchards</b> 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 <b>more job security</b> for the staff on the farms especially during drought events.</li> <li>• <b><u>Do we need a new Irrigation Dam?:</u></b> 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 <b>insufficient capacity</b> 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.</li> <li>• <b><u>What are the benefits of having a new dam?</u></b> 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.</li> </ul>
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- 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 Ecological 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.
- **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. 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 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.
- **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

	<p>food/crop security.</p> <ul style="list-style-type: none"> <li>• <b><u>Access Road</u></b>: 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.</li> <li>• <b><u>Timing: Is this the right time to implement such a development?</u></b> 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.</li> <li>• <b><u>Integrated Environmental Management</u></b>: 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.</li> <li>• 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.</li> <li>• <b><u>We raise the following questions, which include but are not limited to:</u></b> 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?</li> <li>• 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.</li> <li>• <b><u>Need and Desirability of the Proposed Project</u></b>: 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.</li> </ul>
<p><b>3.Economic Sustainability.</b></p>	<ul style="list-style-type: none"> <li>• <b><u>Economics of the Development:</u></b></li> <li>• The Onderberg 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 (and the drought), farmers were until recently reluctant to expand their enterprises under prevailing uncertain conditions.</li> <li>• The project area has been given the all clear from the Land Claims Commissioner and the time is ripe to capitalise on the economic opportunity for this farm.</li> </ul>



- The project site has been farmed for many years producing crops for both the internal- and indirectly the export market.
- **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.
- **Inherent Costs:** 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.
- The proponent has secured the funds to implement this proposal which will ensure a sustainable long-term product for the applicant and the staff on the farm.

## **9.6. Description of Options, Alternatives and Monitoring Requirements**

### **9.6.1. Site Alternatives:**

**Site Location Alternatives:** The land earmarked for development is fixed and is part and parcel of existing farming enterprises. The farmer has not acquired a new farm. The proposed development is required to ensure a sustainable supply of irrigation water for the existing farming operations during drought conditions. Four alternative dam sites were evaluated during this study- and assessment process. **See Appendix 1** for maps of the various options.

**Dam Site A** is considered as the preferred option for development. By virtue of its position this site is ecologically more acceptable in terms of impact on the biodiversity of the area; less farming land is lost due to flooding and construction implications are more cost effective. The alternative dam sites, although similar, **did flood into neighbouring properties** which made them less feasible.

By optimising the potential of Dam Site A, the applicant is confident that the land can continue to contribute sustainably to the agricultural business opportunities of Farm.

**Access** to the site is in place and no new roads will be required.

**The No Go Option** will affect economic growth and negate economic opportunity in the area. The developer has ownership of a property within the borders of the agricultural business sector in the Lows Creek area and has expressed the wish to formalise the operations (build an instream irrigation dam) to support his business enterprise. The farming activity is already in place on the applicants' farm.

This application is for an improvement to the farming operations especially during drought conditions. A no go approach would remove these options out of the economic- and social equation in the area. No known environmental reasons were identified which could make this a "No Go" option.

**Indirect Impact:** Irrigation needs during times of drought will not be met with water shortages having an impact on the quality of the agricultural product resulting in crop losses and downscaling of operations which will include job losses.

### **9.6.2. Demand Alternatives:**

#### **1. Power Supply:**

**Eskom Supply:** Eskom remains the only viable and practical option for an agricultural activity of this nature. The electricity will be required to pump water and run pumps to the various orchards. Eskom supply is in place and a pump house is functional and in working order. An additional pump house will be developed as per irrigation needs.

**Solar Power:** Solar power (panels and energisers) have been installed to electrify certain boundary- and installation/facility fences. These units provide security and controlled access to the various sites on the farm.

#### **2. Water Supply:**

Water supply will be made available from the farm dams, canal and bore holes as per the water allocation and entitlements existing in the name of the applicant.

### **9.6.3. Scheduling Phases/Alternatives:**

#### **1. Time of Year (Season):**

To ensure a safe working environment and to reduce the potential impact to the surrounding natural environment, it remains imperative that the dam is constructed during the period April to October. This period is relatively dry and will allow for unhindered construction operations.

#### **2. Time of Week:**

It is recommended to keep the construction period as short as possible. Work will be limited to normal working hours daily (07h00-17h00) from Monday through to Saturday.

### **9.6.4. Monitoring Requirements: Alternative Methods:**

- **Measuring Mitigation:** Environmental performance monitoring should be designed to ensure that mitigation measures are implemented. The monitoring programme should clearly indicate the linkages between impacts, indicators to be measured, measurement methods and definition of thresholds that will signal the need for corrective actions.
- **ECO:** The applicant must appoint an independent ECO that will have the responsibility of monitoring and reporting on compliance with the conditions of the Environmental Authorisation (EA), as well as monitoring and reporting on the implementation of the approved EMPr.
- **Monitoring Programme:** A monitoring programme for the biodiversity associated with the project, would ideally be to record the reaction of the biota to changes in the environment due to the impacts of the project.
- **Aspect 1: Dam buffer and riparian corridor:** It is vital to monitor the effectiveness of the maintenance plan which optimises the riparian plant species development and riparian habitat restoration (to ensure that the integrity of the wildlife corridor is retained and links between habitat types are enhanced). The restoration of the dam buffer area should be monitored throughout the duration of construction activities to ensure that the effectiveness of the final buffer zone areas are maintained, and that management measures are implemented appropriately. Regular inspections during the operational phase should also be undertaken to ensure that functions are not undermined by inappropriate activities.
- **Aspect 2: Vegetation clearing or disturbing soil:** Establish an effective record keeping system for each area where soil is disturbed for whatever purposes. The monitoring will evaluate whether the erosion and sedimentation control techniques that are employed throughout the site preparation activities are effective in minimising erosion of exposed areas and sedimentation of site surface water.
- **Aspect 3: Water quality:** It is recommended that the SASS5 method be implemented as part of the Biomonitoring Programme, specifically for the reaction of the sensitive species to water quality above and below the dam. During the initial survey of the water courses, five sites were surveyed. Monitoring surveys (annually) are suggested as follows:
  - One wet season survey at the established sites.
  - One dry season survey when the impacts of reduced surface water and water quality issues become evident.

- **Aspect 4: The dam wall as a physical barrier for fish distribution:** Fish way monitoring should be designed to provide data not only on the effectiveness of the fish way in terms of the internal hydraulics at various flows, but also data on the migratory behaviour and swimming ability of the aquatic biota for which it was designed. (Note: In this context the word “fish” is used for all migratory aquatic biota, including crustaceans (prawns and crabs) and eels). It is important to establish what species and size range are present downstream of the barrier weir that could potentially use the fish way. It is recommended that the FRAI methodology be implemented at sites upstream and downstream of the dam as part of the Biomonitoring Programme.
- **Aspect 5: Ecological water requirements for the Low’s Creek and Kaap River:** The low flow downstream of the dam will decrease significantly due to this development. In order to compensate downstream irrigators a release of a B category EWR as well as an additional 1.0 million m<sup>3</sup>/annum is recommended. The release should take place over the months May to the end of October. Reserve flows have been established and these flows should be implemented and monitored by a responsible body (the Irrigation Board) to maintain the B category EWR for the river.
- It is recommended that flow-gauges (incorporating data loggers, gauge plates) be installed in the river. Audit reporting and record keeping (i.e., water abstracted from the river and water released from the dam on a daily basis) by the Orchard Manager in consultation with the Irrigation Board (or their successor) is necessary. This is to ensure proper operation and maintenance.
- **Aspect 6: Existing riparian vegetation:** The intact riparian vegetation, upstream and downstream of the dam, should be monitored to establish the impact of the dam and EWR releases on the system, as well as impacts stemming from the agricultural activities associated with the dam operation. It is suggested that a VEGRAI monitoring programme should be implemented.
- **Aspect 7: Exotic and alien invasive plants:** To anticipate and evaluate imminent or potential risks to the project area regarding exotic- and alien invasive plants, as well as pathways of invasion, a monitoring programme should be developed in order to create effective mechanisms to manage or mitigate these. Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. It is important to evaluate the effectiveness of control methods and to monitor the cleared areas on a regular basis to identify emergent seedlings and to remove those immediately.

## **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 were submitted for comments as per the registered list of Interested and Affected Parties. **Hard Copies** were made available at **Public Venues** and electronic copies 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. Additional expertise was involved to determine the ecological water requirements of the rivers and the design of the fish way. Contents and outcomes of these studies are included in the appendices to the EIR and were shared with I&APs with the submission of the **Environmental Impact Reports**. Additional information is included in the **engineering design reports**.

**10.10. Impacts:** Issues and Impacts were determined by RES, the specialists involved in the research 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 **Scoping and Environmental Impact Assessment 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**. Two Government Departments commented on the Draft EIR. **See Appendix 2.**

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. RECOMMENDATIONS AND CONCLUSIONS:**

**1. Experience and Knowledge:** The applicant and his family have more than **30 years of experience of crop farming** in the Lowveld area and have expressed their intention to ensure a sustainable supply of water to their crop during times of water shortage and environmental stress by developing an instream storage dam. The applicant has access to the funds, equipment, trained staff and knowledge to undertake this dam construction project.

**2. Preferred Option:** **Dam Site A** is considered as the preferred option for development. By virtue of its position this site is ecologically more acceptable in terms of impact on the biodiversity of the area; less farming land is lost due to flooding and construction implications are more cost effective. By optimising the potential of Dam Site A, the applicant is confident that the land can continue to contribute sustainably to the agricultural business opportunities of the Farm.

**3. The Specialist Study on Biodiversity and Ecology** followed the step-by-step guidelines described in the Mpumalanga Biodiversity Sector Handbook (MBSP) as compiled by Dr. Mervyn Lötter *et al.*:

- **Step 2.3** lists compromises and solutions that minimise impacts on biodiversity and conflicts in land-use, which are supported by the following five steps (**also refer to the EMP**):
- **Step 2.3.1 Retain natural habitat and connectivity in CBAs and ESAs:** The avoidance of environmentally sensitive areas identified during the Sensitivity Mapping exercise is regarded as the single most effective possible mitigation measure for mitigating impacts on the ecology of the project area.
- The riparian corridor will be inundated by the dam water and the riparian link will thus be affected. The increased moisture from the higher water levels in the dam will enhance plant growth and probably create a secondary riparian zone which will link the original upstream and downstream riparian corridors.
- The project should protect this riparian corridor by incorporating a rehabilitated buffer around the periphery of the dam high level mark.
- By establishing a 25m buffer around the dam high level mark, the new perimeter could be rehabilitated with vegetation removed and replanted from the dam basin.
- This measure of mitigation is consistent with the desired management objectives for riparian corridors and could prevent fragmentation.
- A fish-way over the dam wall will allow passage for fish and create a link between the downstream and upstream reaches.
- In order to maintain the aquatic link, the EWR must be implemented and managed by releasing water from the dam to mimic natural flow as closely as possible. Several sluices (in conjunction with the fish way) must release water from different levels in the thermocline therefore mixing the water being released.
- **Step 2.3.2: Apply the mitigation hierarchy:** The mitigation hierarchy deals with negative impacts on biodiversity and consists of four activities:
- **Avoid and Prevent:** Consider options in land-use location, siting, scale, layout, technology and phasing to avoid impacts on biodiversity, ecosystem services and people. This is the best option but not always possible.
- Identify the best practicable environmental options by avoiding loss of biodiversity and disturbance to ecosystems, especially in CBAs.
- Four options for dam locations were proposed, but all four were in the same river reach and none of them having a lower predicted impact on the system.

- **Minimise**: Consider alternatives in land-use location, siting, scale, layout, technology and phasing to minimise impacts on biodiversity, ecosystem services and people.
- The surrounding area is completely transformed by agriculture; thus, the dam location will be restricted to the riverine system with little opportunity to scale down or move the footprint.
- **Minimise unavoidable impacts**: Manage and mitigate impacts where possible, such as clearing of vegetation, erosion of soil, siltation of the river, release of flows, creating a fish passage and control alien vegetation.
- **Rehabilitate**: If impacts have been unavoidable, take measures to return impacted areas to a condition similar to the pre-impact or natural state — although this is important and necessary, rehabilitation can never replicate the diversity and complexity of an un-impacted natural site.
- Due to the fact that the dam is constructed in established orchards, rehabilitation will be straightforward and could be completed in a short period after construction. Replanting the new riparian zone will form part of this process.
- **Offset**: As a last resort, compensate for remaining unavoidable negative impacts on biodiversity. When every other effort has been made to minimise or rehabilitate impacts to a degree of ‘no net loss’ of biodiversity against biodiversity targets, offsets can compensate for unavoidable negative impacts.
- Unfortunately, due to the level of development on the farming property, there is no untransformed land left to set aside as an offset area.
- **Step 2.3.3 Secure priority biodiversity in CBAs and ESAs through biodiversity stewardship**:
  - Set aside land of high biodiversity importance for conservation through biodiversity stewardship options. Where biodiversity losses are unavoidable, set aside another piece of land of equivalent or greater biodiversity importance for conservation:
  - Unfortunately, due to the level of development on the farming property, there is no untransformed land left to set aside land of high biodiversity importance for conservation. The remaining riverine and riparian corridors should be left intact and protected from further development. Should the riparian zone around the dam re-establish and the corridor regained, this zone should be managed and protected in order to link the downstream Kaap River environment with the catchment upstream of the Low’s Creek Dam.
- **Step 2.3.4 Remedy degradation and fragmentation through rehabilitation**:
  - Design project layouts and select locations that minimise loss and fragmentation of remaining natural habitat and maintain spatial components of ecological processes, especially in ecological corridors, buffers around rivers and wetlands, CBAs and ESAs. Activities that are proposed for CBAs must be consistent with the desired management objectives for these features and should not result in fragmentation.
  - The project should re-establish the riparian corridor between the upstream and downstream riparian zones by establishing a rehabilitated buffer of 25 m around the periphery of the dam high level mark. This measure of mitigation is consistent with the desired management objectives for riparian corridors and should not result in fragmentation.

- **Step 2.3.5 Promote long-term persistence of taxa of special concern:**
- Ecological Water Requirement releases and a fish way in the dam wall will improve the chances of survival for the Southern barred minnow (*Opsaridium peringueyi*) (Conservation status for Mpumalanga – Vulnerable).
- The Nile crocodile (*Crocodylus niloticus*) (Regional: Vulnerable, 2014) and Hippopotamus (*Hippopotamus amphibius*) (IUCN Vulnerable) will be able to settle in the dam.
- Four bird species of special concern will utilise the riparian corridor once it is rehabilitated, and five species will be able to utilise inundated and dead trees in the dam as perching and nesting sites.

#### **4. Additional key issues include:**

- The applicant has access to **adequate water** as per entitlements and lawful water use;
- The soils at the dam site are **suited for development purposes**;
- No **new water crossings** are required as the applicant will make use of existing roads and causeways to the dam site.

#### **5. Heritage Aspects:**

- It is recommended that an Environmental Control Officer (ECO) oversee the implementation of the development phase and the handling procedure of any finds is described in the Environmental Management Programme (EMPr).
- Should any artefact, or historical site be incidentally discovered during excavations for foundations 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 and the developer to address the management and handling of the find.

#### **6. Dam Management:**

- The following control measures must be implemented to ensure that the allocations and abstraction volumes remain within the approved entitlements:
- Measure water pumped into the dam from the rivers and canal. (daily volumes).
- Record the water level in the dam every day.
- Record rainfall.
- Record evaporation.
- Carry out a monthly water balance using this data to ascertain the inflow from the catchment.
- Seepage from the dam should also be measured and should this prove to be greater than the natural run-off into the dam then no releases will be required.
- **Yield Analysis:**
- The yield of the dam was assessed over a range of full supply capacities. At the preferred full supply capacity of 195 000 m<sup>3</sup>, the yield is 3.2 million m<sup>3</sup>/annum at 70% assurance. In order to compensate downstream irrigators a release of a B category EWR as well as an additional 1.0 million m<sup>3</sup>/annum is recommended. This decreases the yield of the dam to 2.2 million m<sup>3</sup>/annum. The latter release should take place over the months May to the end of October.

**Ecological Water Requirement per month to be maintained.**

Month	70 Percentile million m3	m3	m3/sec	ltr/sec
Oct	0,043	43000	0,016	16,1
Nov	0,052	52000	0,020	20,1
Dec	0,063	63000	0,024	23,5
Jan	0,059	59000	0,022	22,0
Feb	0,137	137000	0,057	56,6
Mar	0,095	95000	0,035	35,5
Apr	0,07	70000	0,027	27,0
May	0,06	60000	0,022	22,4
Jun	0,064	64000	0,025	24,7
Jul	0,054	54000	0,020	20,2
Aug	0,049	49000	0,018	18,3
Sep	0,043	43000	0,017	16,6

**7. Dam Safety: Quality Control (Dam Safety):** The dam is to be constructed in compliance with the specifications described in SABS 1200 standard specifications with specific reference to:

- SABS 1200 AD: General (small dams).
- SABS 1200 C: Site Clearance.
- SABS 1200 DE: Small Earth Dams.
- SABS 1200 DK: Gabions and Pitching.
- SABS 1200 GA: Concrete Works (small works).
- SABS 1200 L: Medium Pressure Pipelines.

**8. Fatal Flaw:** The evaluation process did not reveal any **fatal flaws** during the investigation process.

**Conclusion and Environmental Statement:** The project satisfies the requirements of sustainable integrated environmental management. Provided the developer implements the recommendations and conditions of this report, and the mitigation measures proposed, especially in terms of biodiversity management, it is recommended that the development of the dam at **Site Option A** is approved.

#### **14. 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*.