APPENDIX D: Impact Assessment

ANNEXURE A: Methodology

1.1 Impact Assessment

1.1.1 Impact assessment methodology

This section outlines the methodology used to assess the significance of the potential environmental impacts associated with the various feasible and reasonable alternatives proposed for the proposed project. For each impact, the EXTENT (spatial scale), MAGNITUDE (size or degree scale) and DURATION (time scale) are described. These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. As detailed below, the assessment of impacts is by definition subjective. The first step involves the determination of Extent. The three criteria in

Table 1 aim to give an indication of how wide-spread the impact is, with "local" being set to a radius 10 km of the candidate site), and "site specific" meaning contained to the study site and its immediate surroundings. The spatial influence of an impact is determined first, and the magnitude of the impact is then determined at that scale. Certain of the impacts, for example visual may apply to more than one spatial scale.

Table 1: Assessment criteria form the evaluation of impacts

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	Regional	Beyond 5 km of the proposed activity.
	Local	Within 5 km of the proposed activity.
	Site specific	On site or within 100 m of the site boundary.
Magnitude of impact (at the indicated spatial scale)	High	Natural and/ or social functions and/ or processes are *severely* altered.
	Medium	Natural and/ or social functions and/ or processes are *notably* altered.
	Low	Natural and/ or social functions and/ or processes are *slightly* altered.
	Very Low	Natural and/ or social functions and/ or processes are *negligibly* altered.
	Zero	Natural and/ or social functions and/ or processes remain *unaltered.*
Duration of impact	Construction	Up to 2 years.
	Short Term	0-5 years (after construction).
	Medium Term	5-15 years (after construction).

Long Term	More than 15 years (after construction).

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at a significance rating is explained in **Table 2.**

Table 2: Definition of significance rating

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	• High magnitude with a regional extent and long term duration. • High magnitude with either a regional extent and medium term duration or a local extent and long term duration. • Medium magnitude with a regional extent and long term duration.
Medium	• High magnitude with a local extent and medium term duration. • High magnitude with a regional extent and short term duration or a site specific extent and long term duration. • High magnitude with either a local extent and short term duration or a site specific extent and medium term duration. • Medium magnitude with any combination of extent and duration except site specific and short term or regional and long term. • Low magnitude with a regional extent and long term duration.
Low	• High magnitude with a site specific extent and short term duration. • Medium magnitude with a site specific extent and short term duration. • Low magnitude with any combination of extent and duration except site specific and short term. • Very low magnitude with a regional extent and long term duration.
Very low	• Low magnitude with a site specific extent and short term duration. • Very low magnitude with any combination of extent and duration except regional and long term.
Neutral	• Zero magnitude with any combination of extent and duration.

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact would be determined using the rating systems outlined in

Table 3 and **Table 4** respectively. It is important to note that the significance of an impact should always be considered in conjunction with the probability of that impact occurring. Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in **Table 5**.

Table 3: Definition of probability rating

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95 % chance of the impact occurring.
Highly probable	Estimated 80 to 95 % chance of the impact occurring.
Probable	Estimated 20 to 80 % chance of the impact occurring.
Possible	Estimated 5 to 20 % chance of the impact occurring.
Unlikely	Estimated less than 5 % chance of the impact occurring.

Table 4: Definition of confidence rating

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 5: Definition of reversibility rating

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is permanent.
Long Term	The impact is reversible within 2 to 10 years after construction.
Short Term	The impact is reversible within the 2 years of construction.

1.1.2 Subjectivity in assigning significance

To facilitate informed decision-making, EIA's must endeavour to come to terms with the significance of the potential environmental impacts associated with particular development activities. Despite their attempts at providing a completely objective and impartial assessment of the environmental implications of development activities, EIA processes can never completely escape the subjectivity inherent in attempting to define significance. Recognising this, we have attempted to address potential subjectivity in the current process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above.
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail in this Scoping Report. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing toward determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the Scoping Report with a clear summary of how the assessor derived the assigned significance.
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

Please note that in certain circumstances, the significance rating provided by the Specialist sub-consultants and that determined by the EAP may differ. The reason for this is that Henwood Environmental Solutions may have described the impacts differently as required from EAP's, and have used the information provided by the specialists in order to formulate a robust and balanced assessment of significance. In this manner, Henwood Environmental Solutions take full responsibility for the assessment of impacts contained in this Scoping Report, but readers may wish to read the full specialist reports in order to gain a greater appreciation of the content and detail surrounding each impact. In situations where the impact significance differs a section has been added immediately after each impact assessment table in order to highlight and contextualise any differences between the assessments provide by the specialists, and that undertaken by Henwood Environmental Solutions.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

ANNEXURE B: Impact Assessment

Preliminary Impact Assessment

1. Consideration of Cumulative Impacts

Section 24(4) of the National Environmental Management Act requires the consideration of cumulative impacts as part of any environmental assessment process. EIA's have traditionally, however, failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires co-ordinated institutional arrangements; and
- EIA's are typically carried out on specific developments, whereas cumulative impacts may result from broader biophysical, social and economic considerations, which typically cannot be addressed at the project level.

In terms of the proposed development the following cumulative impacts have specifically been identified:

- Changes to hydrology.
- Loss of Biodiversity
- Loss of topsoil and sedimentation

2. Construction phase impacts

The construction phase impacts are those impacts on the biophysical and socio-economic environment that would occur during the construction[1] phase of the proposed project. They are inherently temporary in duration but may have longer lasting effects. The construction phase impacts could potentially include:

The bio-physical issues identified include:

- Changes to Hydrology
- Loss of Biodiversity Pollution
- Loss of surface and ground water quality
- Loss or gain of soil
- Loss of terrestrial animals
- Loss of terrestrial plants
- Alien infestation

[1] In this regard construction should be interpreted as those activities associated with the clearing and development of the dam.

The socio-economic impacts identified include:

- Dam failure causing damage to property and loss of life
- Landuse
- Visual
- Degradation Heritage
- Potential Socio-economic Loss (Safety Dam Management)

2.1 Assessment of construction phase impacts

A summary of the construction phase impacts (assessed within the SR) is provided below:

Table 1: Summary of Construction and Operation phase impacts

IMPACT	Without mitigations (positive & negative)			With mitigation (positive & negative)		
	HIGH	MODERATE	LOW	HIGH	MODERATE	LOW
Pollution of air quality (2.1.1)		✖				✖
Loss of surface and ground water quality (2.1.2)		✖				✖
Loss or gain of soil (2.1.3)		✖				✖
General Pollution (2.1.4)		✖				✖
Loss of terrestrial animals (2.1.5)		✖				✖
Loss of terrestrial plants (2.1.6)		✖				✖
Alien infestation (2.1.7)		✖				✖
Degradation (2.1.8)		✖				✖
Heritage (2.1.9)		✖				✖
Visual "Sense of Place" (2.1.10		✖				✖
Land Use (2.1.11)			+	+		
Potential Socio-economic Loss (Safety Dam Management) (2.1.12)	✖					✖
General Safety (2.1.13)		✖				✖

A summary of the integrated construction and operation phase impacts:

Table 2: Summary of integrated construction and operation phase impacts for the dam

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Site specific/ Local**	**Site specific/ Local**
Magnitude	**High (-)**	**Medium Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Highly Probable**	**Highly Probable**
Confidence	**Certain**	
Reversibility	**Short Term**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.1 Pollution of air quality

Since neighbours are particularly sensitive, given the general natural ambiance and utilisation of the surrounding area for agriculture and possible tourism, this impact is considered of *medium* significance prior to mitigation.

Construction activities, construction vehicles and construction personnel on site would cause an increase in noise in the area, which may impact negatively on adjoining landowners and users. In addition to this the operation of construction machinery is likely to result in the increased production of windblown dust. However, provided that noise abatement/control and normal dust control measures (e.g. watering, suspending dust generating activities during high wind conditions, re-vegetating/ stabilising disturbed surfaces as soon as possible) are implemented, the significance of this potential impact is considered low.

Impacts of noise generation during construction in general could be mitigated by ensuring that all regulations relating to noise generation are observed and by restricting work to hours outside of game viewing activities. This potential impact could be readily managed by effective implementation of an EMPr. The significance of this impact would be *reduced from medium to low* by the implementation of these mitigation measures.

Mitigation

- Construction work during evening and night-time periods (6.30 pm to 6.30 am) and on Sundays/Public Holidays will be undertaken in accordance with “best practice” noise management.
- Construction work may not take place during game drive times.

- Use of the quietest plant and equipment that can practically and reasonably undertake the work wherever possible.
- Maintain equipment in order to keep it in good working order.
- Adjacent landholders will be notified prior to any atypical noise events outside of daylight hours.
- Operators of construction equipment will be made aware of the potential noise problems and of techniques to minimise noise emission through a continuous process of operator education.
- Best available work practices will be employed on-site to minimise occupational noise levels.
- High efficiency mufflers will be fitted to appropriate construction equipment.
- Reversing alarms within construction areas cannot be avoided for safety reasons.
- Large rocks and concrete blocks will be placed in dump trucks not dropped.
- To prevent a startle response from fauna at the start of impact piling (if required), observations will be made of an area (350 m radius initially and 150 m after first day) around the pile before commencement of impact piling on any day or after an extended time when piling has stopped.
- If large fauna is observed within the area, then commencement of impact piling will be delayed until they clear the area. Alternatively, a soft start to piling will be considered.
- Air pollution caused during construction can be limited by using dust suppression methods such as water spraying.
- Trucks that comply with the relevant legislation should be used and these delivery vehicles should be restricted in terms of the speed that they travel.
- Building material and sand should be covered during transport to and from the site

Table 3: Pollution of air quality

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**

Significance	**Medium (-)**	**Low (-)**
Probability	**Probable**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.2 Surface and ground water quality

During the construction phase the possibility of surface or ground water being polluted is high, but proper implementation of mitigation measures may result in impact being reduced. The impact can be regarded to be of low significance if mitigation is properly followed.

Due to the relatively pristine environment as well as the fact that the stream within which construction is to take place feeds into the Crocodile River, it is important to ensure that basic ecosystem functions are not allowed to deteriorate any further.

The most significant impact that is likely to occur as a result of the construction activities during the construction of the dam, will be sediment deposition into the active channel, thus altering the hydrological, physic-chemical and biotic characteristics of the system. Mitigation must be implemented to minimise sediment loss into the river.

During construction, pollutants may find their way into the river. Typical sources of pollution include oils and fuels from construction vehicles and construction materials such as cement, detergents, paints and other chemicals. Careful management and education of all construction staff, together with the implementation of an appropriate EMPr at this site, would curtail the risk of pollution spills. This potential impact is considered to be of low significance with mitigation measures implemented.

Mitigation

- All personal washing operations will take place at a location where waste water can be disposed of in an acceptable manner. Facilities not feeding into a formal drain should ensure that biodegradable soaps are used.

- Dry chemical toilets must be made available at the construction camp and must be cleaned and serviced regularly. All chemical toilets must be placed above the 1:100-year flood line or at least 100 m away from any water course or wet area.
- All maintenance and repair work of construction vehicles will be carried out within an area designated for this purpose, equipped with the necessary pollution containment measures.
- The ground under the servicing and refuelling areas must be protected against pollution caused by spills and/or tank overfills.
- In the event of a breakdown or emergency repair, any accidental spillage must be cleaned up or removed immediately.
- The Site Environmental Officer must ensure that reasonable precautions are taken to prevent the pollution of the ground and water resources on and adjacent to the sites during the construction phase.
- The contractor must maintain good housekeeping practices that ensure that all work sites are kept tidy and litter free, ensuring no runoff of refuse into surrounding watercourses.
- No spills may be hosed down into the river, or into the surrounding natural environment. All contaminated soil is to be excavated to the depth of contaminant penetration, placed in 200 litre drums and removed to an appropriate registered landfill site.
- Cement must not be mixed directly on the ground. Areas where cement and concrete are handled should be bunded/covered with impermeable sheeting and suitable methods developed to contain any excess water containing waste. Water and slurry from concrete mixing operations must be contained to prevent pollution of the ground surrounding the mixing points.
- Tar and oil based products (if used) should be applied to the manufacturers specifications. Care should be taken to identify pollution timely and suitable methods of decontamination should be used.

Table 4: Surface and groundwater quality

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Low (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Moderate (-)**	**Low (-)**
Probability	**Highly Unlikely**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.3 Loss or gain of soil

Due to the slope of the river banks in the vicinity of the dam, the impact is of high significance but may be reduced to low, should mitigation be practiced.

Where possible, construction activities should be scheduled to occur outside of the rainy period, thereby reducing the volume of runoff during construction. If this is not possible then extra precaution needs to be taken to reduce this impact.

Mitigation

- Vehicular activity in the immediate area surrounding the dam must be kept to a minimum so as to avoid the formation of ruts and possible resultant erosion.
- Roads used for access and egress to the dam should be properly planned and be placed in sympathy to the sites contours. These roads should have the necessary balusters and gabions in place so as to minimise stormwater runoff and the resultant erosion.
- Erosion protection measures should include, but not be limited to:
- The use of groundcover or grass

- Hard landscaping e.g. gabions.
- Excavated spoil (sub soils) will be stockpiled separately to topsoil and vegetation.
- Excavated material will be stockpiled outside watercourses, and/or behind containment structures so as to prevent siltation of any land or surface water or blockage of any existing drainage channels.
- Regular gaps and spaces in the topsoil, subsoil and vegetation stockpile will be provided for fauna movement.
- The distances between gaps in stockpiles will be reduced at approaches to stream crossing.
- Any excavations will be left open for the minimum time practicable.
- Ramps will be installed in the terrestrial excavations to allow the easy egress of fauna.
- Sand/gravel should be removed only during low flows and from above the low-flow water level.
- Pooled water in excavations will be monitored and managed to reduce the potential for wall instability, biting insect breeding areas and contamination.
- Quantities should be strictly limited so that gravel recruitment and accumulation rates are sufficient to avoid extended impacts on channel morphology and instream habitat.
- In areas of high fauna density, additional ramps, branches, hessian sacks or similar devices to enable small fauna to exit the trench may be used.
- Temporary sediment, siltation and erosion control devices will be reinstated when no longer required.
- Excavations will be constructed to an approved standard to minimise the potential for wall collapse or subsidence.
- Catchment areas to excavations will be managed to minimise the pooling of water.

Table 5: Loss or gain of soil

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Highly Unlikely**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.4 General Pollution

As above, construction activities have the ability to pollute the soil and watercourse, given the proximity of the activities to the watercourse.

Due to the relatively pristine environment as well as the fact that all streams wherein construction is to take place feed into the Crocodile River, it is important to ensure that basic ecosystem functions are not allowed to deteriorate any further.

During construction, pollutants may find their way into the river. Typical sources of pollution include oils and fuels from construction vehicles and construction materials such as cement, detergents, paints and other chemicals. Careful management and education of all construction staff, together with the implementation of an appropriate EMPr at this site, would curtail the risk of pollution spills. This potential impact is considered to be of low significance with mitigation measures implemented. Furthermore:

- Construction of the dam during the wet season can cause an increase in suspended solids and turbidity to the water to downstream users.
- Sedimentation from earthmoving activities within the riverbed.
- Sedimentation resulting from the erosion of access roads.
- Sedimentation from stockpiling too close to the watercourse.
- Contractors and labourers can go fishing.

Mitigation

- All personal washing operations will take place at a location where waste water can be disposed of in an acceptable manner. Facilities not feeding into a formal drain should ensure that biodegradable soaps are used.
- Dry chemical toilets must be made available at the construction camp and must be cleaned and serviced regularly. All chemical toilets must be placed above the 1:100 year flood line or at least 100 m away from any water course or wet area.
- All maintenance and repair work of construction vehicles will be carried out within an area designated for this purpose, equipped with the necessary pollution containment measures.
- The ground under the servicing and refuelling areas must be protected against pollution caused by spills and/or tank overfills.
- In the event of a breakdown or emergency repair, any accidental spillage must be cleaned up or removed immediately.
- The Site Environmental Officer must ensure that reasonable precautions are taken to prevent the pollution of the ground and water resources on and adjacent to the sites during the construction phase.
- The contractor must maintain good housekeeping practices that ensure that all work sites are kept tidy and litter free, ensuring no runoff of refuse into surrounding watercourses.
- No spills may be hosed down into the river, or into the surrounding natural environment. All contaminated soil is to be excavated to the depth of contaminant penetration, placed in 200 litre drums and removed to an appropriate registered landfill site.
- Cement must not be mixed directly on the ground. Areas where cement and concrete are handled should be bunded/covered with impermeable sheeting and suitable methods developed to contain any excess water containing waste. Water and slurry from concrete mixing operations must be contained to prevent pollution of the ground surrounding the mixing points.

- Tar and oil based products (if used) should be applied to the manufacturers specifications. Care should be taken to identify pollution timely and suitable methods of decontamination should be used.
- Refuse must be placed in the designated skips / bins which must be regularly emptied. These should remain within demarcated areas and should be designed to prevent refuse from being blown out by wind.
- In addition to the waste facilities within the construction site, provision must be made for waste receptacles to be placed at intervals along the work front.
- Littering on site or within the watercourse is forbidden and the site shall be cleared of litter at the end of each working day.
- Recycling is to be encouraged by providing separate receptacles for different types of waste and making sure that all staff is aware of their uses.

Table 6: General Pollution

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Highly Unlikely**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.5 Loss of terrestrial animals

Various construction activities as well as maintenance carried out on the dam during the operation phase may impact on the terrestrial fauna surrounding the dam. Through actions such as clearing, the wall and immediate site in preparation for construction as well as during maintenance small animals and potentially birds may be harmed. Poaching may occur whilst staff move from the construction site to their accommodation. Further to this vehicular movement to and from the dam has the potential of harming animals.

Mitigation

- Disturbance will generally be restricted to designated work areas.
- Physical barriers will be installed around significant vegetation areas in order to restrict unauthorised access and avoid disturbance.
- Removal of vegetation is only acceptable if access to infrastructure is impeded. Maintenance work must endeavour to not remove vegetation which is obstructive but does not prevent or inhibit access to the existing infrastructure.
- When clearing and excavation works are essential, then this work will occur progressively to minimise the length of time the ground is exposed, or excavations left open.
- Clearing and disturbance in riverine and wetland/water body areas will be minimised so as to meet environmental requirements.
- Removed vegetation will be respread/reused on the site.
- Bush and habitat surrounding construction areas will be managed to prohibit any unauthorised disturbance so as to maintain the area's habitat values as much as possible.
- Where practicable, dead trees, stumps and hollow branches will be salvaged from the terrestrial areas to be cleared and relocated to the surrounding undisturbed areas to create compensatory shelter.
- Where practicable, the timing of clearing operations will be selected to minimise impacts on breeding species and watercourse functionality.
- Hollow bearing trees will be felled in a manner which reduces potential for fauna mortality. Felled trees will be inspected after felling and fauna (if identified and readily accessible) will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved over-night to allow animals to move of their own accord.
- A landscape plan which covers all areas disturbed during construction but not covered by built structures will be prepared and implemented
- Rehabilitate any disturbance to riverbanks to pre-construction conditions.

- Material stockpiles associated with the dam wall construction shall be located further than 32m from the edge of the watercourse and on a disturbed site or another site approved by the ECO.
- Designate a temporary waste storage area, enclose it in a fence that cannot be breached by fauna, and provide sufficient scavenger proof dust bins with black bags inside the construction camp.
- The site will be kept tidy at all times. All waste shall be picked up daily.
- Drivers shall adhere to the relevant speed limit(s) at all times and restrict their movements to the roads and construction footprint.

Table 7: Loss of terrestrial animals

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Highly Unlikely**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.6 Loss of terrestrial plants

Various construction activities as well as maintenance carried out on the dam during the operation phase may impact on the terrestrial flora in and surrounding the dam. Through actions such as clearing, the wall and immediate site in preparation for construction as well as during maintenance plants and trees may be harmed. Further to this vehicular movement around the dam has the potential of harming vegetation.

Mitigation

- No clearing of protected vegetation will occur until appropriate permits have been obtained.
- All clearing boundaries will be illustrated on construction drawings and clearly marked in the field.
- No unnecessary clearing of vegetation may occur, i.e. The current development footprint may not be exceeded.
- Mechanical clearing to be implemented (rather than chemical).
- Clearing will be limited to the minimum area practicable. The following are examples of how this can be achieved:
    - Having defined limits on the clearing plan;
    - Delineation of disturbance areas and "no go" areas; and
    - Implementing access control
- Clearing in riparian vegetation will be kept to a minimum required to safely gain access to those sections of the bridge that need to be maintained and access road to meet other environmental requirements (e.g. erosion control, spoil storage).
- It is understood that foundations are to be used as is. However, where sections of the bridge to be maintained occur within flowing wet watercourses, containment dam will be constructed to isolate work areas.
- Blade clearing of trees will occur to retain the root mass.
- Cleared vegetation will be removed as merchantable logs, stockpiled onsite or chipped and stored for use as mulch during site landscaping and rehabilitation works and/or in surrounding vegetated areas susceptible to erosion to the greatest extent practicable. Some hollow logs will be stockpiled for use during rehabilitation.
- Where practicable, vegetation and soil stockpiles will be located outside watercourses behind the flood line, and away from undisturbed trees or fence lines.
- Vegetation and soil stockpiles will be protected against soil loss through wind or water erosion.
- Water trucks will be used (particularly in hot and windy conditions) on access roads and on the site to reduce dust generation.
- Vehicle speeds will be restricted on unsealed areas.

Table 8: Loss of terrestrial plants

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Highly Unlikely**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.7 Alien infestation

Various construction activities as well as maintenance carried out on the dam during the operation phase may result in an increase in alien plant infestation. The disturbance created by clearing activities within plant communities creates favourable habitat for alien invasive species to flourish. There is an ongoing threat for invasion because alien plants have effective dispersal mechanisms, such as birds. Cleared patches can become invaded and act as sources to colonize other vulnerable areas. Furthermore, alien plants can also be introduced by importing foreign contaminated material for construction or rehabilitation.

Mitigation

- According to the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared alien invasive plants species must be destroyed.
- The contractor shall search for weed, invader and exotic plant species on all disturbed sites every two weeks during construction
- The contractor shall collect and destroy all seeds of weed, invader and alien plant species found to occur on the disturbed and rehabilitated sites.

- The contractor shall immediately remove weed, invader and exotic plant species upon being identified on all areas that are disturbed by construction activities including stockpiles.

Table 9: Alien infestation

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Highly Unlikely**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.8 Degradation

Open and denuded sites, as a result of flood damage and other construction activities (borrowing of soil etc...), surrounding the dam are prone to further degradation. Recently rehabilitated sites are also vulnerable to degradation via erosion.

Mitigation

- Rehabilitate disturbed sites associated with the construction of the proposed dam. Control erosion on disturbed sites by applying the following three basic principles:
    - Step 1. Identify the source of the storm water run-off, the transfer zone and the sink (where the sediment is deposited on land or into a watercourse).
    - Step 2. Control storm water run-off at the source to effectively divert it away from the erosion or prevent a concentrated flow. This is not always possible.

    - Step 3. Impede or slow down storm water run-off through the transfer zone to encourage deposition (of suspended solids) and infiltration (of run-off) before it reaches the sink.

- Areas that have been eroded to a hard 'plinthic' type horizon will need to be covered with material and a topsoil to facilitate plant growth Bulk shape the areas where material is introduced to mimic or blend in with the surrounding, natural topography. Do not fine shape or rake because an uneven surface will impede surface water run-off and facilitate infiltration.

- Compacted areas, such as temporary access roads, will be ripped or loosened by hand, perpendicular to the prevailing slope/gradient

- Topsoil (150mm) shall be returned to the source areas during rehabilitation of the disturbed sites.

- Ensure storm water run-off is adequately controlled on disturbed sites before rehabilitating them (ripping, replacing the topsoil and mulching/brush packing), i.e. cut-off berms

- Vegetation stockpiles or locally harvested grasses must be used as mulch for the rehabilitation of denuded areas, i.e. on temporary access roads, filling erosion gullies or brush packing to stabilize topsoil on dam walls Ensure branches are flush with the ground and placed perpendicular to the direction of the run-off when brush packing

- The applicant shall monitor all rehabilitated sites during every rainfall season following the completion of reconstruction or decommissioning for signs of erosion

- If erosion is found to occur during the aforesaid monitoring, the applicant shall immediately correct (the 'source') and repair (the 'symptom') the erosion using method(s) that are an improvement on the mitigations proposed in this EMPr or on the unsuccessful mitigations originally used on site

- The rehabilitated sites shall be monitored at least twice during the summer rainfall season for two years following the completion of reconstruction or decommissioning for the recruitment of weed, invader and alien plant species

- The applicant shall immediately uproot, cut or debark weed, invader and exotic plant species upon being identified.

- The applicant shall collect and destroy all seeds of weed, invader and alien plant species occurring within the rehabilitated sites

Table 10: Degradation

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Highly Unlikely**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.9 Heritage

There is a possibility that something may be unearthed during the construction period. Should this happen, all construction activities should cease immediately and may only continue after an archaeologist has investigated the findings. The impact is however considered to be of low significance prior to mitigation.

Mitigation

- Should any material of cultural or archaeological significance be encountered during construction, all activities must cease immediately and SAHRA must be informed accordingly.
- Artefacts can only be moved once a permit is obtained from SAHRA

2.1.10 Visual – "sense of place

Construction/repair and operation of the dam may impact negatively on the visual character of the area

It is important to highlight that the only receptors (people who will be able to view the dam) will be the owners of the farm who will also receive the functional benefit of the infrastructure. It is important to contextualise this because there will not be any unwilling receptors (the dam will not be imposed on anyone).

Mitigation

The appearance of the dam and surrounds (within reason) is possible to mitigate.

- In terms of infrastructure, it is recommended that the current access road be used so that the unnecessary clearing of vegetation is avoided. This implies making use of already disturbed sites rather than pristine areas wherever possible and avoiding large specimens and dense established areas.
- The dam must be maintained in a neat and visually acceptable state throughout the operational life of the structures.
- Good practice requires that the mitigation of visual impacts as listed above be implemented and maintained on an ongoing basis.

Table 11: Visual – "sense of place

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Short term**	**Short term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Probable**	**Probable**
Confidence	**Sure**	
Reversibility	**Reversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.11 Land Use

The proposed land use is compatible with the current land use, namely the use of the land for irrigation of agriculture. The dam is directly linked to the successful operation of the properties as a farming entity.

The proposed activity is in line with current activities as carried out within the farm and surrounding area.

Mitigation to be implemented:

No mitigation is required as the development falls within the prescribed land use for the area.

Table 12: Land Use

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Regional**	**Regional**
Magnitude	**Low (+)**	**High (+)**
Duration	**Long term**	**Long term**
Significance	**Low (+)**	**Moderate (+)**
Probability	**Highly Probable**	**Highly Probable**
Confidence	**Sure**	
Reversibility	**Long term**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.12 Potential Socio-economic loss (Dam safety management)

Dams, no matter their size and orientation pose a potential safety risk. The Dam will trigger dam safety regulations according to the National Water Act and as such it holds a potential danger to human life and property. Moreover, dam can prevent water from reaching downstream water users or 'servicing' the aquatic and riparian ecology.

Mitigation

- The dam must be operated and maintained in a responsible manner. Basically, this requires that the owner, or the person appointed by the owner, must visit and inspect the dam on a regular basis (at least weekly). Maintenance work must be done regularly. In the case of unsafe conditions, emergency procedures and safety measures must be taken, and the Department informed thereof.

Table 13: Potential Socio-economic loss (Dam safety management)

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Regional**	**Regional**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**High (-)**	**Low (-)**
Probability	**Probable**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

2.1.13 General Safety

During the construction phase, the possibility of injuries to construction staff and/or motorists/guests and surrounding land owners is of medium significance without any mitigation measures.

Activities during the construction phase which could lead to injuries to staff or the public are:

- Movement of construction vehicles to and from the site
- Handling of equipment and material
- The significance of this potential impact is considered to be low if the proposed mitigation measures are implemented.

Mitigation

Emergency Response.

- The contractor will prepare a detailed emergency response plan prior to work commencing. The plan will include consideration of the following:
    - Information identifying the obligations under the relevant legislation.
    - Development of a response, investigation, command, control and recovery for both natural disasters and other disasters/emergencies and incidents.
    - Response procedures in the event of a fire, chemical release, spill, accident, explosion, equipment failure, bomb threat, natural disaster (including severe storm, bushfire and flood events) or any other likely emergency.
    - Communication arrangements and contact details.
    - Roles and responsibilities of responsible personnel.
    - Emergency controls and alarms.
    - Evacuation procedures.
    - Emergency response equipment.
    - Training requirements.
    - Site access and security.

Fire Management

- Minimise fire risk through evaluation processes and management of those risks.
    - Restrict high-risk activities in accordance with local fire bans or in times of high fire danger.
    - Maintain a plan for rapid and co-ordinated response to the outbreak of fire through an established fire response plan in conjunction with the local fire brigade.
    - Develop evacuation procedures and hazard reduction.
    - Undertake fire safety awareness training as part of site inductions.
    - Conduct fire safety awareness training as part of site inductions.
    - Conduct regular fire drills and record exercises as actions generated.
    - Conduct periodic fire equipment audits.
    - Consult with all relevant fire management authorities.

Incidents and Complaints

- All incidents and complaints will be managed through the auditing process and reported to the appropriate authority as required.
- All incidents and complaints will be documented in an incidents/complaints register. The complaints form will document at least the following information:
    - Time, date and nature of complaint.
    - Type of communication (telephone, letter, email, visit).
    - Name, contact address and contact number (if provided).
    - Response and investigation undertaken as a result of the complaint.
    - Action taken and signature of person investigating complaint.
- Each complaint will be investigated as soon as practicable and, where appropriate, corrective action taken to remedy the cause of the complaint.

Table 14: General Safety

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Long Term**	**Long Term**
Significance	**Medium (-)**	**Low (-)**
Probability	**Probable**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Irreversible**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

3. Decommissioning Phase Impacts on the Biophysical and Social Environment

A limited number of potential long-term (operational) impacts were identified during the investigative phases.

Potential bio-physical impacts:

The socio-economic impacts identified include:

- Erosion and Siltation
- Potential Environmental Harm and Socio-economic Loss (Safety Dam Closure)

3.1 Assessment of decommissioning phase impacts

A summary of the operation phase impacts (assessed within the draft BAR) is provided below.

Table 15: Summary of decommissioning impacts

	Without mitigations			With mitigation		
	HIGH	**MODERATE**	**LOW**	**HIGH**	**MODERATE**	**LOW**
Erosion and Siltation (3.1.1)		✘				✘
Potential Environmental Harm and Socio-economic Loss (Safety Dam Closure) (3.1.2)	✘	✘				✘

3.1.1 Erosion and Siltation

Erosion and siltation can be caused by various activities during the operational phase of the proposed dam if not properly managed. These activities include:

- The operation of the dam –
    - Increased run-off on the exposed areas of the rehabilitated bank prior to vegetation recolonizing the worked areas.

During the Operational phase the significance of this impact is viewed as MODERATE but may be mitigated to LOW as vegetation cleared during construction will re-establish in a relatively short period providing natural stabilisation of the terrain against erosion.

Mitigation

- Vehicular activity in the immediate area surrounding the bridge must be kept to a minimum so as to avoid the formation of ruts and possible resultant erosion.

- Roads used for access and egress to the bridge should be properly planned and be placed in sympathy to the sites contours. These roads should have the necessary balusters and gabions in place so as to minimise stormwater runoff and the resultant erosion.
- Erosion protection measures should include, but not be limited to:
    - The use of groundcover or grass
    - Hard landscaping e.g. gabions.

Table 16: Erosion and Siltation

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Local**	**Local**
Magnitude	**Medium (-)**	**Low (-)**
Duration	**Short term**	**Short term**
Significance	**Moderate (-)**	**Low (-)**
Probability	**Probable**	**Unlikely**
Confidence	**Sure**	
Reversibility	**Short Term**	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

3.1.2 Potential Environmental Harm and Socio-economic Loss (Safety Dam Closure)

Should the dam no longer be required, the abandonment of these structures would lead to a potential decrease in the dam's quality, which in turn could endanger resource quality, human life and/or property

Mitigation

- The applicant, upon intending to abandon the dam, shall comply with the conditions and requirements prescribed in regulation 38 and 39 of the Dam Safety Regulations, including, but not necessarily limited to, an application to the Director-General for a license to decommission said dam containing the information prescribed in regulation 39

- The Applicant (license holder) shall comply with the conditions and requirements specified in the license to decommission said dam

Table 17: Economic (Job Creation & Capital Investment)

	Preferred Layout	
	Without mitigation	**With mitigation**
Extent	**Regional**	**Regional**
Magnitude	**Low (+)**	**High (+)**
Duration	**Long term**	**Long term**
Significance	**High (-)**	**Low (-)**
Probability	**Highly Probable**	**Highly Probable**
Confidence	**Sure**	
Reversibility	**Irreversible**	

- **Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

4. Final Conclusions and Recommendations

The essence of all EIA processes is aimed at ensuring informed decision-making and environmental accountability. Furthermore, it assists in achieving environmentally sound and sustainable development. In terms of NEMA (No 107 of 1998), the commitment to sustainable development is evident in the provision that "development must be socially, environmentally and economically sustainable and requires the consideration of all relevant factors. In addition, the preventative principle is required to be applied, i.e. that the disturbance of ecosystems and loss of biological diversity are to be "…avoided, or … minimised and remedied" and "disturbance of the landscape and the nation's cultural heritage is avoided and where it cannot be altogether avoided is minimised and remedied". Therefore, negative impacts on the environment and on people's environmental rights in terms of the Constitution (Act 108 of 1996)) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of "reasonable measures". "Reasonable measures" implies 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, or, in so far as such harm to the environment is authorised by law and cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment".

4.1 Conclusions

The preceding chapters provide a detailed assessment of the anticipated environmental impacts on specific components of the biophysical and social environments associated with the proposed construction and operation of the dam. This Draft Scoping has provided a comprehensive assessment of the potential environmental impacts, identified by the EIA team and I&AP's, associated with the proposed project. This investigation has not identified any potential impacts on the biophysical or social environments that are so severe as to suggest that the proposed activity should not proceed. The design has taken cognisance of the various environmental considerations and accordingly, incorporates remedial measures aimed at curtailing the significance of the potential negative environmental impacts associated with the proposed development, as well as enhancing the potential positive environmental (including Socio-economic) impacts.

The significance of the potential environmental (biophysical and social) impacts associated with the proposed dam are summarised in Table 18.

It should be noted that the impacts have been assessed with a reasonable amount of confidence, i.e. in terms of the defined confidence ratings presented in **Error! Reference source not found.**.

From Table 18 it is apparent that there is no long term or operational phase impacts of significant concern. The negative impacts associated with the operational phase are likely to be of low significance, particularly if the proposed mitigation measures are implemented. Moreover, there are a number of potential positive impacts associated with the proposed development, viz., compliance with landuse for the area, the creation of positive construction and operational phase impacts on employment opportunities and increased economic activity.

With regards to the short term or construction phase impacts, the significance of the construction phase impacts is likely to be curtailed by the relatively short duration of the construction phase. Moreover, many of the construction phase impacts could be mitigated by the effective implementation of the mitigation measures outlined above. If these measures were put into practice the significance of all construction phase impacts would be reduced to low. While the probability of the construction phase impacts occurring is relatively high without mitigation, the effective implementation of the mitigation measures will reduce the probability of the impacts occurring.

Table 18: Summary of the significance and probability of the potential positive and negative impacts associated with the proposed dam.

Construction and Operation Phase

IMPACT	**Without mitigations (positive & negative)**			**With mitigation (positive & negative)**		
	HIGH	**MODERATE**	**LOW**	**HIGH**	**MODERATE**	**LOW**
Pollution of air quality (2.1.1)		x				x
Loss of surface and ground water quality (2.1.2)		x				x
Loss or gain of soil (2.1.3)		x				x
General Pollution (2.1.4)		x				x
Loss of terrestrial animals (2.1.5)		x				x

IMPACT	Without mitigations (positive & negative)			With mitigation (positive & negative)		
	HIGH	MODERATE	LOW	HIGH	MODERATE	LOW
Loss of terrestrial plants (2.1.6)		x				x
Alien infestation (2.1.7)		x				x
Degradation (2.1.8)		x				x
Heritage (2.1.9)						
Visual "Sense of Place" (2.1.10						
Land Use (2.1.11)			+	+		
Potential Socio-economic Loss (Safety Dam Management) (2.1.12)	x					x
General Safety (2.1.13)						

Decommissioning Phase

	Without mitigations			With mitigation		
	HIGH	MODERATE	LOW	HIGH	MODERATE	LOW
Erosion and Siltation (3.1.1)		x				x
Potential Environmental Harm and Socio-economic Loss (Safety Dam Closure) (3.1.2)	x	x				x

It is felt that the proposed construction of the dam will have an overall positive impact on the natural and socio-economic environment and should the necessary mitigation measures be implemented there are no impacts envisaged of high significance or any fatal flaws.

In this regard the EAP sees no reason as to why the proposed activity (construction of a dam on the Farm Strathmore 214 JU) may not be authorised.