



CONSULTATION BASIC ASSESSMENT REPORT FOR THE PROPOSED DEVELOPMENT OF A HYDROELECTRIC POWER STATION IN JOZINI – KWAZULU NATAL

Submitted by:

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GLOSSARY

Activity [Development] – an action either planned or existing that may result in environmental impacts through pollution or resource use.

Alternative – a possible course of action, in place of another, of achieving the same desired goal of the proposed project. Alternatives can refer to any of the following but are not limited to: site alternatives, site layout alternatives, design or technology alternatives, process alternatives or a no-go alternative.

Applicant – the project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.

Bench Wetland - an area of mostly level or nearly level high ground [relative to the broad surroundings], including hilltops / crests [areas at the top of a mountain or hill flanked by down-slopes in all directions], saddles [relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction], and shelves / terraces / ledges [relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction].

Biodiversity – the diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.

Construction – means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.

Cumulative Impacts – impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities to produce a greater impact or different impacts.

Direct Impacts – impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.

Ecological Reserve – the water that is necessary to protect the water ecosystems of the water resource. It must be safeguarded and not used for other purposes. The Ecological Reserve specifies both the quantity and quality of water that must be left in the national water resource. The Ecological Reserve is determined for all major water resources in the different water management areas to ensure sustainable development.

Ecosystem – a dynamic system of plant, animal [including humans] and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.

Environment – In terms of the National Environmental Management Act [NEMA] [Act No 107 of 1998] [as amended], “*Environment*” means the surroundings within which humans exist and that are made up of:

- a) *the land, water and atmosphere of the earth;*
- b) *micro-organisms, plants and animal life;*
- c) *any part or combination of [a] or [b] and the interrelationships among and between them; and*
- d) *the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.*

Environmental Assessment– the generic term for all forms of environmental assessment for projects, plans, programmes or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.

Environmental Authorisation [EA] – an authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.

Environmental Assessment Practitioner – the individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.

Environmental Impact – a change to the environment [biophysical, social and / or economic], whether adverse or beneficial, wholly or partially, resulting from an organisation’s activities, products or services.

Environmental Impact Assessment [EIA] – the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.

Environmental Issue – a concern raised by a stakeholder, interested or affected parties about an existing or perceived environmental impact of an activity.

Environmental Management – ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management Programme – A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMPr focuses on the construction phase, operation [maintenance] phase and decommissioning phase of the proposed project.

Expansion – means the modification, extension, alteration or upgrading of a facility, structure or infrastructure at which an activity takes place in such a manner that the capacity of the facility or the footprint of the activity is increased.

Fatal Flaw – issue or conflict [real or perceived] that could result in developments being rejected or stopped.

General Waste – household water, construction rubble, garden waste and certain dry industrial and commercial waste which does not pose an immediate threat to man or the environment.

Hazardous Waste – waste that may cause ill health or increase mortality in humans, flora and fauna.

Indirect Impacts – indirect or induced changes that may occur as a result of the activity. These types of impacts include all of the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Integrated Environmental Management – a philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision-making process. The IEM philosophy [and principles] is interpreted as applying to the planning, assessment, implementation and management of any proposal [project, plan, programme or policy] or activity – at local, national and international level – that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools for a particular proposal or activity. These may include environmental assessment tools [such as strategic environmental assessment and risk assessment], environmental management tools [such as monitoring, auditing and reporting] and decision-making tools [such as multi-criteria decision support systems or advisory councils].

Interested and Affected Party – for the purposes of Chapter 5 of the NEMA and in relation to the assessment of the environmental impact of a listed activity or related activity, means an interested and affected party contemplated in Section 24[4] [a] [v], and which includes – *[a] any person, group of persons or organisation interested in or affected by such operation or activity; and [b] any organ of state that may have jurisdiction over any aspect of the operation or activity.*

Mitigate – the implementation of practical measures designed to avoid, reduce or remedy adverse impacts or enhance beneficial impacts of an action.

No-Go Option – in this instance the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.

Rehabilitation – a measure aimed at reinstating an ecosystem to its original function and state [or as close as possible to its original function and state] following activities that have disrupted those functions.

Sensitive Environment – any environment identified as being sensitive to the impacts of the development.

Significance – significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change [i.e. magnitude, intensity, duration and likelihood]. Impact significance is the value placed on the change by different affected parties [i.e. level of significance and acceptability]. It is an anthropocentric concept, which makes use of value judgements and science-based criteria [i.e. biophysical, social and economic].

Stakeholder Engagement – the process of engagement between stakeholders [the proponent, authorities and I&APs] during the planning, assessment, implementation and / or management of proposals or activities.

Sustainable Development – development which meets the needs of current generations without hindering future generations from meeting their own needs.

Watercourse – means:

- a] a river or spring;*
- b] a natural channel or depression in which water flows regularly or intermittently;*
- c] a wetland, lake or dam into which, or from which, water flows; and*
- d] any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 [Act No. 36 of 1998] and a reference to a watercourse includes, where relevant, its bed and banks.*

Wetland – means land, which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
BGIS	Biodiversity Geographic Information Systems
BID	Background Information Document
CBA	Critical Biodiversity Area
CBAR	Consultation Basic Assessment Report
CLO	Community Liaison Officer
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
KZN EDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment [refers to environmental management tool]
EIA	Early Industrial Age [refers to historical era]
EIS	Ecological Importance and Sensitivity
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
GIS	Geographic Information System
GPS	Geographical Positioning System
I&AP	Interested and Affected Parties
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
LSA	Later Stone Age
MSA	Middle Stone Age
NBSAP	National Biodiversity Strategy and Action Plans
NEMA	National Environmental Management Act [Act No. 107 of 1998] [as amended]
NEM:BA	National Environmental Management Biodiversity Act [Act No. 10 of 2004]
NEM:WA	National Environmental Management Waste Act [Act No. 36 of 1998] [as amended]
NEM:AQA	National Environmental Management Air Quality Act [Act No. 39 of 2004]
NFA	National Forests Act [Act No. 84 of 1998]
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act
NWA	National Water Act

OHSA	Occupational Health and Safety Act [Act No. 85 of 1993]
PES	Present Ecological State
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Internet System
SANBI	South African National Biodiversity Institute
SAPS	South African Police Services
VEGRAI	[Riparian] Vegetation Response Assessment Index
WMA	Water Management Agency
WUL	Water Use Licence

Executive Summary

Pongolapoort Hydro proposes to develop a 4 MEGAWATT per hour micro-hydro power station on KwaZulu-Natal Department of Water & Sanitation (DWS) land below the Pongolapoort Dam Wall on the south bank and connected to the existing DWS canal outlet pipe waterworks infrastructure. The proposed power station consists of;

- ❖ a 65m² reinforced concrete building,
- ❖ a 120m x 2.7m diameter buried steel 'penstock' pipeline,
- ❖ a 40m x 2m 'tailrace' channel into the Pongola River,
- ❖ a 220m on-site 6.6/11Kv powerline through Jozini town sub-station; and
- ❖ a 5m x 65m gravel service road.

Site Description & Location

The climate of Jozini is described as being sub-tropical. The mean annual maximum temperature is 28.6°C, with the maximum mean average occurring in January at 32.4°C. The mean annual minimum is 15.9°C with the mean minimum of 8.6°C occurring in June/July. The climate is characterised by high humidity.

The Basic Assessment Process [BA]

This BA follows the legislative process prescribed in the EIA Regulations 2014 (as amended in 2017), as this application will be lodged under the EIA Regulations 2014, (as amended in 2017).

Objective of Report

This report constitutes the cBAR, which details the environmental outcomes, impacts and residual risks of the proposed activity. The report aims to assess the key environmental issues and impacts associated with the development, and to document I&APs issues and concerns. Furthermore, it provides background information of the proposed project, a motivation and details of the proposed project, and describes the public participation undertaken to date.

The objective of this report is to provide the project's I&APs, stakeholders, commenting authorities, and the CA, with a thorough project description and BA process description. The outcome being to engender productive comment / input, based on all information generated to date and presented herein. The document concludes by proposing what is believed to be a sound and environmentally risk calculated decision. In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there

are a number of significant portions of environmental legislation that were taken into consideration during this study and are elaborated on in this report.

Regulatory Environmental Requirements

The KZN EDTEA – Umkhanyakude District region is the lead / competent authority for this BA process and the development needs to be authorised by this Department in accordance with the NEMA. The EIA Regulations under the NEMA consist of three [3] categories of activities namely: Listing Notice 1 Activities [GNR 327 of 2017] which require a BA Process, Listing Notice 2 Activities [GNR 325 of 2017] which require S&EIR process, and Listing Notice 3 Activities [GNR 324 of 2017] which requires a BA process for specific activities in identified sensitive geographical areas.

Public Participation Process [PPP]

Baboloki Geohub as the Environmental Assessment Practitioner (EAP) is undertaking the PPP for this project as professional facilitators. It is imperative to note that the study area presents a challenge in that input from the community may be heavily reliant and dependent on the information exchange between the community leaders and a further challenge will be that of jargon barriers. However, the input from the community is essential for a complete assessment of the impacts and benefits associated with the proposed development. As such as an EAP, one is reliant on the indigenous knowledge, which will optimistically be forthcoming by the community.

Key Findings and Conclusions

Overall, the results of the BA process emerge as having a “negative low” significance after mitigation.

Key findings of the specialist studies are:

The following findings require consideration due to the significant negative and positive impacts they would likely have along the proposed alignment within the study area. The specialist studies conducted identified both positive and negative impacts that would be associated with the proposed development, however sufficient mitigations and options for positive input into the area were given to ensure this project could be considered to deliver the envisaged positive input with negative impacts suitably managed within appropriate timeframes.

Heritage Impact Study

No reference to any heritage sites with significance could be found. It is recommended that obscured, subterranean sites be managed, if they are encountered. Due to the highly altered

state of the site as well as its small footprint it is recommended that it be exempt from a full HIA.

No fatal flaws were identified.

Aquatic Assessment

The proposed construction and operation of the Micro-Hydro Power Station associated with the Phongolo River, located at the base of the Jozini Dam wall in the area of Jozini, will divert water from the existing irrigation canal infrastructure located at the DWS property. The diverted water will form part or all of the ecological flow release requirement. This water will be used to power a 4 MW turbine (s), with the resulting power to be inserted into the local Eskom or Jozini Town power grip. This process will impact upon the Phongolo River and its embankment, which triggers the requirement for an Environmental Authorisation and a Water Use License Process.

The proposed development is located within an area that is owned and managed by the DWS, has been previously impacted during the construction of the Jozini Dam wall (1973), remains a clearly altered environment, is a steep valley area surrounded by dense bush and thickets, and is associated with the existing dam discharge water for both ecological flows and sluice discharges. Pongolapoort Hydro have identified this area, in alignment with the DWS, as the preferred potential development area, which will tie into existing infrastructure associated with the Jozini Dam wall and is proposed to provide power to the local Jozini Town and / or supply the Eskom local grid.

The proposed micro-hydro power station and its infrastructure has been aligned and place within the existing impacted dam wall footprint, which is currently maintained under the operational management requirements. The penstock will be connected to a tee connection on the existing outlet pipe. The power station is located on the bank at river level, downstream of the dam and water flows directly from the power station into the Phongolo River. Turbine(s) will be installed, which will generate a power output of 4MW. Power lines will reticulate power to the town of Jozini or will be connected to the ESKOM network, with an access road to be constructed from the existing service road to the proposed turbine building.

The proposed development will impact upon the embankment and within the Phongolo River, a National Fresh Water Priority Area (NFEPA), with the water to be discharged into the existing stilling basin associated with the Jozini Dam.

The Phongolo River is considered impacted, with the Jozini Dam having altering the upstream and downstream aquatic environment, with the downstream aquatic environment showing typical impoundment impacts associated with a large dam.

The construction and operation of the proposed micro-hydro power station at the base of the already impacted and operationally maintained platforms associated with the Jozini Dam is the preferred option for a development of this type. Impacts identified during the assessment

process can be mitigated with the management of pollutants and waste being a key component. Additionally, the construction and management of the tailrace must comply with this specialist report to ensure hydrologic flows within the spilling basin do not result in water quality, erosion and safety concerns.

A potential benefit of this development is the use of the ecological water flows normally released via the scour valve to generate electricity, assisting to reduce the carbon emissions for the town of Jozini. Additionally, the water source for the power station is located higher up in the water column (closer to the surface) and not at the scour valve located at the base of the dam wall. Water at the base of the dam wall is generally considered anoxic. Anoxic water generally have elevated concentrations of metals within their water column from metals liberated from the sediments. The abstraction and release of water outside of the anoxic zone is beneficial and will improve the water quality and ecological functions downstream.

Impacts associated with the construction phase can be adequately managed through standard environmental management techniques and the mitigations proposed in section 8. These measures must be incorporated into the EMPr, and must be managed through the EDTEA and DWS.

Operational management of the development must occur, to ensure that impacts associated with the utilisation of the infrastructure are prevented and delivery on the expected long-term benefits are realised for the Town of Jozini, as well as the watercourse health.

Mitigations in the form of the implementing a Management Plan and Water Monitoring Plan must occur prior to the operational readiness of the facility to mitigate any long-term impacts.

Based on the findings of this study, it is the opinion of the aquatic ecologist that the Proposed Development of a Micro-Hydro Power Station associated with the Phongolo River be considered favourably, from an aquatic ecological perspective. The mitigation measures presented in this report must be strictly adhered to, to isolate any potential development hazards and pollutants and to ensure hydrologic flow management occurs, with the proposed mitigation measures to be incorporated into the Environmental Authorisation, Water Use License and EMPr. Should this occur the specialist expects that the development will have acceptable and manageable levels of risk and impact on the watercourse, while potentially improving the water quality downstream of the Jozini Dam.

Ecological Impact Assessment

This assessment determined that much of the proposed footprint areas are currently of fairly – very low value for biodiversity. There are areas of higher biodiversity value within the southern portion of the study area. These areas potentially support some sensitive species and ecological communities. However, these are largely out of the footprint areas, and appropriate planning can ensure that they are avoided. Overall, If those areas are adequately protected,

biodiversity is unlikely to be substantially negatively affected by this development. The following recommendations are made:

- Avoid impacting on rocky and less disturbed, well-wooded areas in the southern portion of the study area. Maximise use of existing infrastructure and highly disturbed areas.
- Areas away from the infrastructure footprints should be managed appropriately and not disturbed in order to maintain the biodiversity they support.
- During construction and operation, all efforts must be made to minimise sediment input, pollution and disturbance to areas away from the infrastructure footprint area - no waste or materials of any kind must be allowed to enter the surrounding areas during construction or operation.
- Any Nationally Protected Trees on site must be left undisturbed, or will require a permit application to Department of Fisheries and Forestry for their removal.

EAP Opinion and Recommendation to CA

This BAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed development of the proposed Pongola Hydropower Station. Having duly considered the proposal, there is unlikely to be any significant negative environmental impacts, and the socio-economic benefits are evident.

The findings conclude that there are no environmental fatal flaws that could prevent the proposed development, provided that the recommended mitigation and management measures contained within the EMPr are implemented. Given the findings of the specialist studies conducted, as outlined in summary above, it is safe to say that no significant impacts have been identified by these studies. This has resulted in an impact assessment yielding an overall result of having “negative low” impact. This is attributed mostly to the short-term negative impacts, which are likely to occur during the construction phase, which can be adequately mitigated and rehabilitated to an acceptable state of environment.

It is therefore the recommendation of the EAP that the environmental authorisation is granted for the proposed development of the Pongola Hydropower Station in Jozini, KwaZulu-Natal.

The following recommendations / conditions, although not exhaustive, may be considered for inclusion in the environmental authorisation:

- ❖ The EMPr [including the Rehabilitation Plans provided in the Vegetation and Aquatic and Assessments appended to the EMPr] and conditions thereto must be adhered to;
- ❖ An ECO must be appointed and all Contractor staff to be trained on the EMPr requirements prior to commencement of activities;
- ❖ Alien vegetation and invader species within the vicinity of construction zone are to be removed and indigenous vegetation, where appropriate, to be introduced and managed;
- ❖ Monthly environmental compliance monitoring to be conducted during construction and incidents recorded and addressed accordingly;
- ❖ All mitigation measures of the specialist studies must be adhered to

- ❖ The Rehabilitation plan must be costed for in tender documents, along with the rest of the EMPr.

Way Forward

The impacts identified and assessed by way of risk ratings, have been extensively reported herein. The report at hand [i.e. cBAR] will now be made available for comment [as per the regulated timeframes] and amended post comment period to form the final BAR [i.e. fBAR].

The fBAR report will, together with a comprehensive issues trail, the final draft of the EMPr, and all annexures as referred to, will be submitted to the KZN EDTEA, for decision making. The fBAR report will thus be a culmination of scientific specialist studies' findings, public contribution via formal comment, comment made at meetings held, and the drawing of conclusions by the EAP as the environmental specialist.

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1. Basic Assessment Data

1.1. Approach to the Study

This Consultation Basic Assessment Report [cBAR] has been compiled in accordance with the stipulated requirements in Government Notice Regulation [GNR] 326 Appendix 1 of the EIA Regulations [2017 as amended in 2017], which outlines the legislative Basic Assessment [BA] process and requirements for assessment of outcomes, impacts and residual risks of the proposed development. The cBAR further incorporates the findings and recommendations of the specialist studies conducted for the project.

The proposed Pongola Hydropower Station falls in Ward 7 of the Jozini Local Municipality, within the UMkhanyakude District Municipality and therefore the Competent Authority [CA] is the Department of Economic Development, Tourism and Environmental Affairs [EDTEA], UMkhanyakude Region.

1.2. Objectives of the Study

The BA aims to achieve the following:

- ❖ Conduct a consultative process;
- ❖ Determine the policy and legislative context within which the proposed activity is undertaken and how the activity complies with and responds to the policy and legislative context;
- ❖ Identify the alternatives considered, including the activity, location, and technology alternatives;
- ❖ Describe the need and desirability of the proposed project;
- ❖ Undertake an impact and risk assessment process inclusive of cumulative impacts [where applicable]. The focus being; determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:

- the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
- the degree to which these impacts:
 - ❖ can be reversed;
 - ❖ may cause irreplaceable loss of resources; and
 - ❖ can be avoided, managed or mitigated;
 - ❖ Through a ranking of the site sensitivities and possible impacts the activity will impose on the site to:
 - identify suitable measures to avoid, manage or mitigate identified impacts; and
 - Identify residual risks that need to be managed and monitored.

1.3. Details of the Project Proponent

The Applicant for the proposed project is Phongola Hydro. The details of the Applicant are as follows:

TABLE 1: APPLICANT DETAILS

Trading name:	Phongola Hydro		
Contact person:	Mr Ian MacDonald		
Physical address:			
Postal code:		Cell:	082 228 4535
Telephone:		Fax:	015 516 1187
E-mail:	immac@mweb.co.za		

1.4. Details of the Environmental Assessments Practitioner

The environmental team of Baboloki Geohub & Project Managers [hereafter referred to as Baboloki Geohub] are appointed as the Environmental Assessment Practitioner [EAP] by the Mr Ian Macdonald of Phongola Hydro. Baboloki Geohub is therefore undertaking the appropriate environmental studies for this proposed project.

Baboloki Geohub has been involved in and / or managed several environmental assessments in South Africa to date. A specialist area of focus is on assessment of linear developments

[national and provincial roads, pipelines and power lines], bulk infrastructure and supply [e.g. wastewater treatment works, pipelines, landfills], electricity generation and transmission. For the detailed experience of the EAP, refer to Appendix F of this cBAR.

TABLE 2: EAP DETAILS

Trading name	Baboloki Geohub
Contact person:	Miss K Zhandire
Telephone:	079 962 1987
E-mail:	babolokigeohub@gmail.com
Academic Qualifications:	MSc International Environmental Management
Professional affiliation(s)	International Association of Impact Assessment South Africa (IAIASa) Institute for Waste Management of Southern Africa (IWMSA)

1.5. Structure of the Report

This report has been structured to comply with the format required by the National Environmental Management Act [NEMA] [Act No. 107 of 1998] [as amended]. The contents are as follows:

TABLE 3: REPORT STRUCTURE

Chapter No. & Title	Content
Chapter 1 Basic Assessment Data	This chapter includes the approach to the study and details of the project proponent and EAP.
Chapter 2 Project Context and Motivation	Contextualises the study area and provides a motivation and need for the proposed development.
Chapter 3 Technical Data	Includes a detailed description of the proposed activities.
Chapter 4 Environmental Legislative Context	Includes an explanation on all applicable legislation and the relevant listed activities applied for.

Chapter 5 The Study	A description of the biophysical and social environment. Consideration of alternatives [design / layout and no-go] for the project. Overview of the public participation process conducted to date. This section also highlights the key findings of the specialist studies conducted and other environmental considerations. Includes the impact assessment methodology. The impacts identified are rated and a significance score obtained.
Chapter 6 Study Findings and Conclusions	Conclusions and recommendations of the Environmental Impact Assessment. Declaration of independence by the EAP.

2. Project Context and Motivation

2.1. Background

Baboloki Geohub was appointed by Phongola Hydro to provide Professional Environmental Services for the development of the Phongola Hydropower Project. The proposed power station consists of a 65m² reinforced concrete building, a 120m x 2.7m diameter buried steel ‘penstock’ pipeline, a 40m x 2m ‘tailrace’ channel into the Pongola River, a 220m on-site 6.6/11Kv powerline through Jozini town sub-station and a 5m x 65m gravel service road.

An investigation by Ninham Shand Consulting Services (Appendix D) has indicated that the development will generate power from the assured continuous flow of 5m³/s that is presently released into the river. The releases are made in satisfaction of environmental instream flow requirements and abstractions for irrigation from the river.

2.2. Property Descriptions

The proposed activity is situated on the following property which is land owned by the Department of Water and Sanitation. The 21 digit surveyor-general code is provided in Table 4 below.

TABLE 4: SURVEYOR-GENERAL 21 DIGIT SITE [ERF / FARM / PORTION] REFERENCE NUMBERS

Infrastructure	21 Digit Code & Farm Name and Number
----------------	--------------------------------------

65m² reinforced concrete building	N0HV00000001583600000 Farm Number 15836 Reserve Number 16
120m x 2.7m diameter buried steel 'penstock' pipeline	
40m x 2m 'tailrace' channel	
220m on-site 6.6/11Kv powerline	
5m x 65m gravel service road	

2.2.1. Coordinates

TABLE 5: COORDINATES

Latitude/Longitude	Degrees	Minutes	Seconds
South	27	25	11.00
East	32	04	22.5

2.2.2. Access / Directions

From Jozini town, drive 1.1km south east towards the Mall, and take the first left turn into a gravel road after crossing over the canal where the water treatment works is on the left. Continue on the small gravel road keeping left until reaching an access controlled gate, all the while with the canal on the left side until reaching the dam wall site. The project is located in that area on KwaZulu-Natal Department of Water & Sanitation (DWS) land below the Pongolapoort Dam Wall on the south bank of the Pongola River.

2.2.3. Size of the activity

TABLE 6: SIZE OF THE ACTIVITY PER FEATURE

Infrastructure	Dimensions
reinforced concrete building	65m²
buried steel 'penstock' pipeline	120m x 2.7m diameter
'tailrace' channel	40m x 2m
on-site 6.6/11Kv powerline	220m
gravel service road	5m x 65m

2.3. Project Motivation and Need and Desirability

Currently, just over one-third of the world's hydro potential is developed. Realistic hydro potential is greatest in Asia, followed by South America and then Africa. Africa's hydro potential is not evenly spread throughout the continent and varies from enormous hydro potential in countries such as the Democratic Republic of the Congo to water scarce countries such as South Africa, (*Eskom Fact Sheet, November 2017*).

Energy experts say South Africa has moderate hydroelectric potential, and that the establishment of small hydroelectric projects around the country could help provide a sustainable future energy supply. The US department of energy estimates that there are 6 000 to 8 000 potential sites in South Africa suitable for small hydro-utilisation below 100 megawatts, with the provinces of KwaZulu-Natal and the Eastern Cape offering the best prospects, (*SouthAfrica.info reporter, 2004*).

There is a New Integrated Resource Plan from the Department of Energy (DoE), who control the renewable energy sector. All applications to produce renewable energy after EIA and WULA approvals go through DoE who have a programme called the Renewable Energy Independent Power Producer Programme (REIPPP) who manage the approval of the project, facilitate the sale of the electricity to Eskom who are mandated by law to buy the electricity. South Africa is part of the United Nations Carbon Diminishing Mechanism, to reduce carbon emissions in the world. South Africa agreed to reduce carbon emissions by a certain amount by a certain date. The proposed hydropower is part of the plan. The DoE have an amount of Mega Watts over the next 20 years to become renewable and every year they call a bid window with variable amounts of energy allocations across different renewable energy sources like hydropower, solar, etc.

TABLE 7: PROPOSED PROJECT NEED, DESIRABILITY AND BENEFITS

Project Need	
1. Was the relevant provincial planning department involved in the application?	Yes

Hydropower project has long been envisaged for Jozini (PGDS, August 2011), and electricity is one of the basic services the Jozini Municipality has committed to extend (IDP, 2017/18 – 2021-22) as the town ranks as the third lowest in the province in terms of access to electricity.

2. Does the proposed land use fall within the relevant provincial planning framework? Yes
3. If the answer to questions 1 and / or 2 was NO, please provide further motivation / Explanation

Desirability

1. Does the proposed land use / development fit the surrounding area? Yes
Due to the fact that the site is currently unoccupied, and the proposed project will be minimal in size and the highly disturbed nature of the area it can be stated that the proposed development fits the surrounding area.
2. Does the proposed land use / development conform to the relevant structure plans, SDF and planning visions for the area? Yes
3. Will the benefits of the proposed land use / development outweigh the negative impacts of it? Yes
4. If the answer to any of the questions 1-3 was NO, please provide further motivation /Explanation – **Not Applicable**
5. Will the proposed land use / development impact on the sense of place? NO
6. Will the proposed land use / development set a precedent? NO
7. Will any person’s rights be affected by the proposed land use / development? NO
8. Will the proposed land use / development compromise the “urban edge”? NO
9. If the answer to any of the question 5-8 was YES, please provide further motivation / explanation. **Not Applicable**

Benefits

1. Will the land use / development have any benefits for society in general? Yes
2. **Explain. By building this power plant away from central nodes, the electricity supply would stabilise as less transmission losses would occur. This is due to the fact that the area of generation would be supplied with energy from the hydropower station.**

Furthermore, as there is a possibility of job opportunities being created during the development phase of the project.

3. Will the land use / development have any benefits for the local communities where it will be located? Yes

Employment during the construction of the Hydro power plant will be sourced from local communities, thus partially alleviating the unemployment rate for a short period of time and developing skills.

2.3.1. Socio-Economic Value of the Activity

Anticipated CAPEX value of the project on completion	
What is the expected annual turnover to be generated by or as a result of the project?	
New skilled employment opportunities created in the construction phase of the project	
New skilled employment opportunities created in the operational phase of the project	
New un-skilled employment opportunities created in the construction phase of the project	
New un-skilled employment opportunities created in the operational phase of the project	
What is the expected value of the employment opportunities during the operational and construction phase?	

3. TECHNICAL DATA

The development will generate power from the continuous flow of 5 m³/s that is presently released into the river. The releases are made in satisfaction of environmental instream flow requirements and abstractions for irrigation from the river.

The penstock is connected to a tee connection on the existing outlet pipe which conveys water to the right bank canal downstream of the dam. The power station is located on the right bank at river level, downstream of the dam and water flows directly from the power station into the river. A turbine of approximately 4MW per hour will be installed, which, based on long-term flow records, will generate a long-term weighted average power output

of approximately 4MW. Power lines, approximately 4km long, will reticulate power to the town of Jozini or will be connected to the ESKOM network.

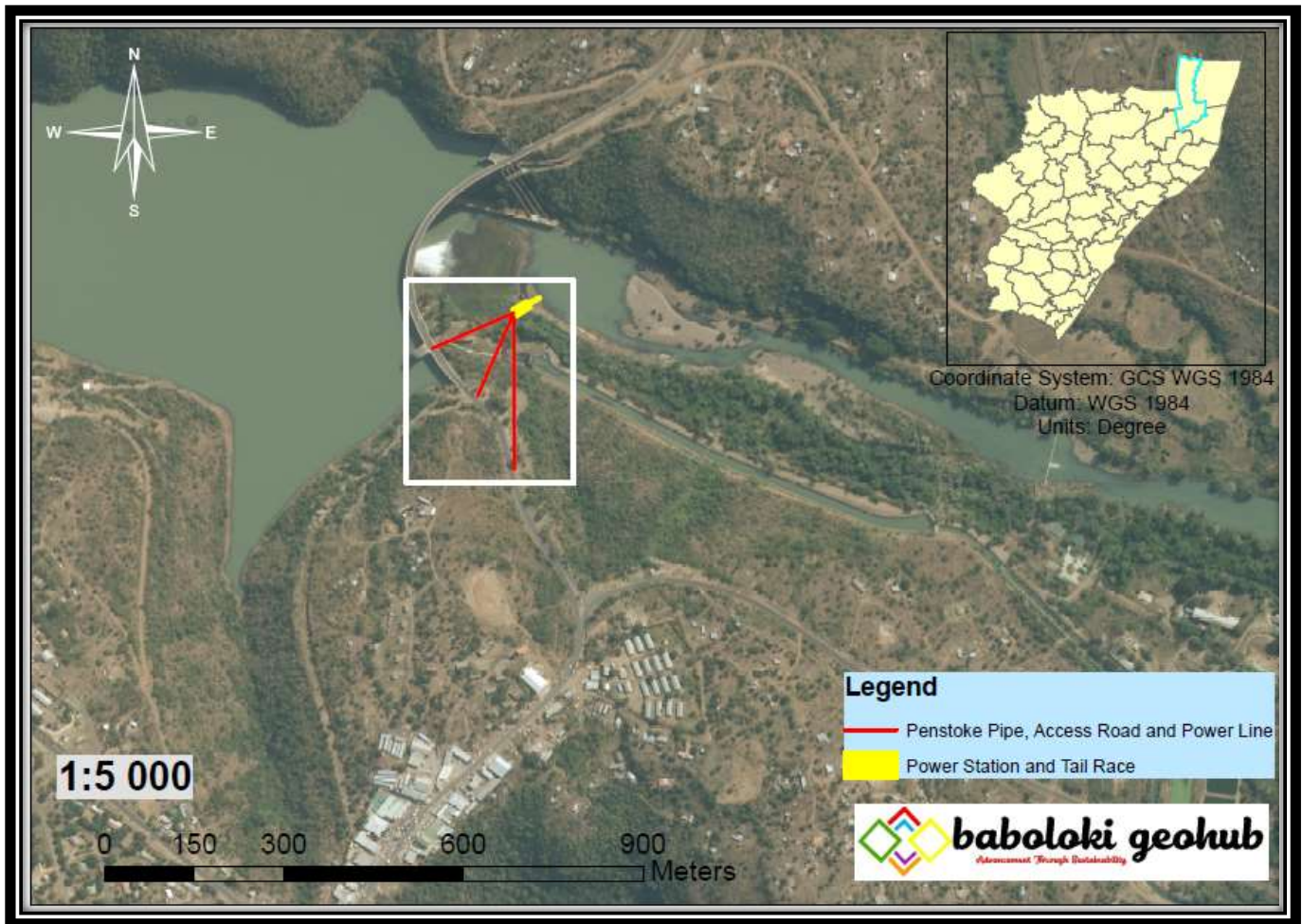


FIGURE 1: THE PROPOSED PHONGOLA HYDROPOWER STATION LOCALITY MAP

3.1. DESIGN FLOODS

Based on a catchment area of 7 831km² and a mean annual precipitation of 867mm, the mean annual runoff for the dam was determined to be 3 364 million m³/annum. The peak flood inflows into the dam were determined for the 1994 Dam Safety Inspection Report and are given as follows:

TABLE 8: ESTIMATES OF FLOOD INFLOW PEAKS INTO PONGOLAPOORT DAM

Peak Flood inflow (m³/s) for return period		
1:200 years	RMF	PMF
9 100 – 13 000	15 600	7 390 – 53 000

Outflows from the dam may be expected to be significantly less, due to the flood absorption capability of the dam. For the purposes of this study a peak outflow of 6 000 m³/s has been assumed in order to estimate the appropriate level for the design of the power station walls.

4. ENVIRONMENTAL LEGISLATIVE CONTEXT

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

4.1. The Constitution of South Africa

Section 24 of the Constitution of South Africa [No. 108 of 1996] states that

“...everyone has the right – ... [a] to an environment that is not harmful to their health or well-being; and ... [b] to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that ... [c] secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”

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

4.2. National Legislation and Regulations

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

4.3. National Environmental Management Act [Act No. 107 of 1998]

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

The principles of the Act are the following:

- Environmental management must place people and their needs at the forefront of its concern;
- Development must be socially, environmentally and economically sustainable;
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated;
- Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person;
- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued;
- Responsibility for the environmental health and safety consequences of a policy, programme, project or activity exists throughout its life cycle.
- The participation of all interested and affected parties in environmental governance must be promoted;
- Decisions must take into account the interests needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge including traditional and ordinary knowledge;
- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness;
- The social, economic and environmental impacts of activities including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment;
- The right of workers to refuse work that is harmful to human health or the environment;
- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law;
- There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment;

- The environment is held in public trust for the people, the beneficial use of the environment resources must serve the public interest and the environment must be protected as the people’s common heritage;
- The cost of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment; and
- The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.

4.3.1. EIA Regulations [2014] [as amended in 2017]

On April 7th 2017, the Minister of Environmental Affairs, Bomo Edith Edna Molewa, made amendments to the EIA Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24[5] and 44 of the NEMA, 1998 [Act No. 107 of 1998], as well as to Listing Notice 1 of 2014, published under Government Notice No. 983 in Gazette No. 38282 on 4 December 2014, as well as Listing Notice 2 of 2014, published under Government Notice No. 984 in Gazette No. 38282 on 4 December 2014, and Listing Notice 3 of 2014, published under Government Notice No. 985 in Gazette No. 38282 on 4 December 2014 in terms of sections 24[2], 24[5], 24D and 44, read with section 47A[1][b] of the NEMA, 1998 [Act No. 107 of 1998]. For ease of reading, the 2017 Amendments of the EIA Regulations, 2014 are published in full, inclusive of amendments made thereto. These amendments commenced on the date that these regulations were published in the Gazette, 07 April 2017.

The nature of the proposed project includes activities listed in the following Listing Notice – GNR 327 [Listing Notice 1] of the EIA Regulations [2014 as amended in 2017] – refer to

Table 9 below.

TABLE 9: LISTED ACTIVITIES OF THE EIA REGULATIONS [2014 AS AMENDED IN 2017]

Relevant notice	Activity No[s]	Description [Verbatim and as per applicability to proposed development]
Government Notice Regulation No. [GNR] 327 of 2017	19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from [(i)] a watercourse; [(ii) the seashore; or (iii)the littoral active zone, an estuary or a distance of 100

Relevant notice	Activity No[s]	Description [Verbatim and as per applicability to proposed development]
		<p>metres inland of the high-water mark of the sea or estuary, whichever distance is the greater—] but excluding where such infilling, depositing, dredging, excavation, removal or moving—</p> <ul style="list-style-type: none"> a) will occur behind a development setback; b) is for maintenance purposes undertaken in accordance with a maintenance management plan; [or] c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies. <p>The project will consist of infrastructure which will require the excavation in the Phongola River of material exceeding 10m³.</p>

4.3.2. National Water Act [Act No. 36 of 1998] [as amended]

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

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

A water use must be licenced unless it [a] is listed in Schedule 1, [b] is an existing lawful use, [c] is permissible under a general authorisation [GA], or [d] if a responsible authority waives the need for a licence. If none of these are relevant a so-called water use licence [WUL] must be applied for and obtained prior to the commencement of such listed activity. In terms of

such a WUL, the Minister may choose to limit the amount of water, which a responsible authority [e.g. CMA, water board, municipality] may allocate. In making regulations and determining items such as GAs, the Minister may differentiate between different water resources, classes of water resources, and geographical areas.

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

As the proposed development involves water use as well as the crossing of watercourses, a WUL application has been submitted to the DWS for and non-consumptive water uses. The NWA, as applicable to the proposed development [see comment in brackets after each item], defines the identified water uses, which are potentially applicable under Section 21 as follows:

The following water uses of Section 21 of the NWA are being applied for the WUL:

- *[c] altering the bed, banks and characteristics of a watercourse*
- *& [i] impeding and diverting the flow of water from a watercourse;*

4.3.3. National Environmental Management: Biodiversity Act [Act No. 10 of 2004]

The project must comply with the National Environmental Management: Biodiversity Act [Act No. 10 of 2004] [NEM: BA] in providing the cooperative governance in biodiversity management and conservation.

NEM: BA provides for the Minister to publish a notice in the Government Gazette that issues norms and standards, and indicators for monitoring progress for the achievement of any of the objectives of the Act.

The NEM: BA also provides for:

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

Ezemvelo KZN Wildlife's Terrestrial Systematic Conservation Assessment shows irreplaceable Critical Biodiversity Areas that have very high conservation value, which the study area traverses. For further detail, refer to Chapter 5 of this cBAR.

4.3.4. National Spatial Biodiversity Assessments [2004, 2011]

This informs the policies, plans and day-to-day activities of a wide range of sectors both public and private. A spatial biodiversity assessment can take place at different spatial scales, from global to local.

It involves mapping information about biodiversity features such as species, habitats and ecological processes, protected areas and current and future patterns of land and resource use. It provides a national context for assessments at the sub national scale and points to broad priority areas where further investigation, planning and action are warranted.

It identifies three key strategies for conserving South Africa's biodiversity existence from the assessment, namely:

- Pursuing opportunities to link biodiversity and socio-economic development in priority geographic areas;
- Focusing on emergency action on threaten ecosystem, to prevent further loss of ecosystem functioning; and
- Expanding of the protected area network.

4.3.5. National Biodiversity Strategy and Action Plans [2005]

The National Biodiversity Strategy and Action Plans [NBSAP] aims to conserve and manage terrestrial and aquatic biodiversity to ensure sustainable and equitable benefits to the people of South Africa, now and in the future.

In South Africa, terrestrial, inland water, coastal and marine ecosystems and their associated species are widely used for commercial, semi-commercial and subsistence purposes through both formal and informal markets.

While some of this use is well managed and / or is at levels within the capacity of the resource for renewal, much is thought to be unsustainable. "Use" in this case refers to direct use, such as collecting, harvesting, hunting, fishing, etc. for human consumption and production, as well as more indirect use such as ecotourism.

4.3.6. National Environmental Management: Protected Areas Act [Act No. 57 of 2003]

Protected areas are a fundamental tool for achieving biodiversity objectives and protecting essential natural heritage areas and ecosystems services, since these often provide greater security for conservation-worthy land than the agreements or land use limitations provided for in the National Environmental Management: Biodiversity Act.

The National Environmental Management: Protected Areas Act [Act No. 57 of 2003] [NEM:PAA] creates a legal framework and management system for all protected areas in South Africa as well as establishing the South African National Parks [SANParks] as a

statutory board. Each conservation area will have its own set of land use restrictions or regulations that stem either from generic restrictions under NEM: PAA, or customized regulations for individual protected areas.

4.3.7. KZN Nature Conservation Ordinance [Ordinance No. 15 of 1974]

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation.

In KwaZulu-Natal, the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from Ezemvelo KZN Wildlife to remove or destroy any plants listed in the Ordinance.

No red data species were identified to be impacted by the proposed development. There have been a number of protected species identified.

If, protected plant species are to be disturbed, the Applicant must pursue the necessary permit / licencing requirements from the Department of Agriculture, Forestry and Fisheries [DAFF] and Ezemvelo KZN Wildlife [EKZNW] prior to clearing of vegetation.

4.3.8. National Environmental Management: Waste Act [Act No. 59 of 2008] [as amended]

The National Environmental Management Waste Act [Act No. 59 of 2008] [NEM:WA] – the ‘Waste Act’ reforms the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licencing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

The objectives of this Act are:

- a) *“to protect health, well-being and the environment by providing reasonable measures for*
 -
 - i. minimising the consumption of natural resources;*
 - ii. avoiding and minimising the generation of waste;*
 - iii. reducing, re-using, recycling and recovering waste;*

- iv. *treating and safely disposing of waste as a last resort;*
 - v. *preventing pollution and ecological degradation;*
 - vi. *securing ecologically sustainable development while promoting justifiable economic and social development;*
 - vii. *promoting and ensuring the effective delivery of waste services;*
 - viii. *remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and*
 - ix. *achieving integrated waste management reporting and planning;*
- b) *to ensure that people are aware of the impact of waste on their health, well-being and the environment;*
- c) *to provide for compliance with the measures set out in paragraph [a]; and*
- d) *generally to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being.”*

The NEM: WA has been considered, however, no activities have been identified for the proposed development. Construction waste will be disposed of at a registered landfill and not dumped illegally.

4.3.9. National Heritage Resources Act [Act No. 25 of 1999]

In terms of Section 38 of the National Heritage Resources Act [NHRA] [subject to the provisions of subsections [7], [8] and [9] of the Act], any person who intends to undertake a development categorised as:

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

- Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

4.3.10. National Forests Act [Act No. 84 of 1998]

According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that;

'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.

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

In terms of the NFA and Government Notice 1339 of 6 August 1976 [promulgated under the Forest Act, 1984 [Act No. 122 of 1984] for protected tree species], the removal, relocation or pruning of any protected plants will require a licence.

4.3.11. Occupational Health and Safety Act [Act No. 85 of 1993]

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

4.3.12. Sustainable Development

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

Therefore, Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

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

4.3.13. National Environmental Management: Air Quality Act [Act No. 39 of 2004]

The NEMA Air Quality Management Act [NEM: AQA] states the following as its primary objective:

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

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

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

And whereas minimisation of pollution through vigorous control, cleaner technologies and cleaner production practices is key to ensuring that air quality is improved, and

whereas additional legislation is necessary to strengthen the Government's strategies for the protection of the environment and, more specifically, the enhancement of the quality of ambient air, in order to secure an environment that is not harmful to the health or well-being of people."

4.3.14. Hazardous Substance Act [Act No. 15 of 1973] and Regulations

The object of the Act is *inter alia* to

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

In terms of the Act, substances are divided into schedules, based on their relative degree of toxicity, and the Act provides for the control of importation, manufacture, sale, use, operation, application, modification, disposal and dumping of substances in each schedule. Pollution control in South Africa is affected through numerous national statutes, provincial ordinances and local authority by-laws. Only the more significant legislation pertaining to the regulation of water, air, noise and waste pollution is dealt with in this section.

4.4. Climate Change Consideration

The proposed project is concerned mainly with the development of infrastructure on disturbed and highly modified land. As the project is not anticipated to have major environmental impacts, an impact or contribution to climate change is not considered applicable.

5. THE STUDY

5.1. Project Alternatives

In terms of the EIA Regulations [2014 as amended in 2017], feasible alternatives are required to be considered as part of the environmental investigations. In addition, the obligation that alternatives are investigated is also a requirement of Section 24[4] of the NEMA [Act No. 107 of 1998] [as amended].

An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;
- the operational aspects of the activity; and
- the option of not implementing the activity.

5.2. Site and Type of Activity Alternatives

Route alternatives have been investigated in the specialist assessments with the emphasis on retention of activities within already impacted road or services servitudes and following routes that achieve the generation of electricity from a renewable resource.

The project involves the development of hydro- power infrastructure where the infrastructure will be located next to the existing canal, flanges and watercourse to maximise on the harnessing of the water energy for the generation of electricity, therefore, no off-site or other site-specific alternatives have been investigated.

No-Go option are not envisaged, as this is a priority to the municipality to ensure service delivery to the town of Jozini which is considered at the end of the electricity grid and highly susceptible to power cuts. The No-Go option has been discussed within this document

5.3. Layout and Design Alternatives

A layout plan has been produced for the development indicating infrastructure positioning and pipeline alignments, illustrated via an alignment map and supporting coordinates table in the design report/feasibility study attached in **Appendix C4**.

For the purposes of this BA, alternatives have been considered for the design of the hydro-power plant. These alternative designs are explained below.

5.3.1. Design Alternative Considerations

In selecting alternatives suitable for the proposed abstraction point, pipeline and water treatment works, the following design goals were considered:

- Constructability;
- Durability and sustainability;
- Economy; and
- Aesthetics.

The preferred infrastructure had to adequately meet all of the above motioned design goals. The criteria, upon which the design of the infrastructure is based, encumber numerous factors such as:

- Surrounding topography;
- Geology;
- Construction costs associated with dimensions of the infrastructure;
- Environmental sensitivities;
- Impact to watercourses;
- Consideration of future maintenance of the structure;
- Socio-economic need; and
- Hydrology / Aquatics.

When selecting an appropriate design for infrastructure required, several factors need to be considered. To begin with, the need for such a structure must be demonstrated from a socio-economic perspective, notwithstanding the considerations given to the guidelines for assessing and demonstrating the needs and desirability of the project and development as a whole [General Notice 891 [DEA, 2014]]. The location must ensure that the proposed structure adds value by creating key linkages for as many communities as possible, and specifically, for the target communities. In this way, the aspect of safety is also addressed, as the structures are designed taking into consideration safety design requirements. Once a location is identified that is suitable to address the needs of the target communities, structural and environmental factors must be considered. These factors include: [i] the use of existing structures and infrastructure, [this case]; [ii] identifying hydrological, geological and ecological constraints and ensuring the design is according to engineering best practice guidelines and principles; [iii] carrying out an assessment of various options to ensure a cost-effective solution is obtained; and [iv] implementing best practice procedures during detailed design and construction.

Engineering requirements can be addressed in a number of ways. It is a basic principle of best practice to consider a range of options to address any river engineering problem or need and to carry out an options appraisal. Without considering a range of options it is not possible to determine if the chosen approach represents the most suitable option [i.e. the option that minimises ecological harm at a cost that is not disproportionately expensive].

With the above taken into consideration, the following design alternatives were considered.

5.3.2. No-go Alternative

The no-go alternative will result in no new impact to the receiving environment, however the objectives of the Phongola Hydro to achieve the provision of much needed electricity from the renewable and clean source that is the Jozini Dam and Phongola River to the already disadvantaged communities will not be achieved.

The no-go alternative will see the status *quo* of area remain. This will not be ideal as the area does not have adequate electricity, and the supply is erratic due to the lack of capacity and the location of the town therefore the existing infrastructure is unable to supply the right amount of electricity needed to supply the area. Additionally, the development of the Phongola Micro-hydro Power Station is identified in the SDF as a priority project for the provision of electricity. Should the status *quo* remain, the direct and indirect socio-economic benefits will not be realised.

The development of the Phongola micro-hydro power station is a non-consumptive way of using water, therefore whether it is developed or not there is no impact on the amount of water and downstream water users will not be affected anyhow. It is therefore beneficial to develop the micro-hydro power station in order to maximise on the energy of the water from the Jozini Dam.

6. Description of the Study Area

6.1. Biophysical Environment

6.1.1. Climate

The climate of Jozini is described as being sub-tropical. The mean annual maximum temperature is 28.6°C, with the maximum mean average occurring in January at 32.4°C. The mean annual minimum is 15.9°C with the mean minimum of 8.6°C occurring in June/July. The climate is characterised by high humidity. The rainfall recording station at the Mzinyeni Pan is regarded as the most representative of the broader study area and was used to determine the average irrigation requirement value for the different crops in the previous application process. The 30 year mean annual rainfall at Mzinyeni Pan is 584 mm. The rainfall pattern can typically be of heavy downpours followed by long dry spells. The only long term evaporation data available is that for Makhathini Agricultural Research Station where the average annual recorded evaporation is 1,983 mm.

6.1.2. Vegetation

The study area sits within a generally steeply sloped topography, with altitude ranging between 80-150masl. The area falls within the Savanna Biome, and is broadly defined as Southern Lebombo Bushveld (Mucina & Rutherford, 2006), although it is close (ca. 500m) to the transition to Eastern Maputaland Clay Bushveld (Figure 2). This vegetation type's conservation status is Least Concern, and it is statutorily protected in iSimangaliso Wetland Park, Ubombo Mountain and Phongolapoort Nature Reserves within KwaZulu-Natal. Southern Lebombo Bushveld is found in a band from Komatipoort, Mpumalanga in the north, through part of Swaziland, and extending to just north of Hluhluwe, KwaZulu-Natal in the south. It occurs primarily between 100-600masl (at higher altitudes it is replaced by Lebombo Summit Sourveld). It is typically open woodland, dominated by *Vachelia*, *Senegalia* and *Combretum* spp, with the grass *Themeda triandra* dominant on undisturbed sites. On shallow soils and steep / rocky slopes, *Aloe marlothi*, *Euphorbia confinalis* and *Olea europea* may be common.

Much of the site is moderately to highly impacted, as a result of previous and existing activities and infrastructure, including the construction and operation of the Pongolapoort Dam wall, together with related pipework, irrigation canal and municipal water treatment works, and existing access road. The southern bank has been platformed and reinforced in the past, with dump rock beds, and has very little soil available for substantial plant colonisation. As a result, the northern half of the study area, which would house the bulk of the planned infrastructure layout, is highly transformed, and holds little biodiversity value. Vegetation cover is mostly secondary and disturbed, and is dominated by opportunistic, pioneer species, and supports a high alien invasive plant component including *Chomolaena odorata*, *Ageratina adenophorum*, *Parthenium hysterophorus* and *Ricinus communis* among others. Some large trees (*Vachellia xanthophloea*, *Trichillia* sp etc) are present, and may have been planted previously.

In the southern half of the study area, there is more woody vegetation, but this too is fairly degraded. There are some small rocky areas remaining, particularly in the south-west of the site, which may harbour vegetation of slightly higher value, and possible small numbers of some important species. These, and areas of better quality woodland, should be excluded from further disturbance during the construction and operation phases of this development.

6.1.3. Heritage

This area is home to all three of the known phases of the Stone Age, namely: The Early- (2.5 million –250 000 years ago), Middle- (250 000 – 20 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoekhoen cultural groups. Early to Middle Stone Age sites are uncommon in this area, however rock-art sites and Late Stone Age sites are much better known.

During the Middle Stone Age, 200 000 years ago, modern man or *Homo sapiens* emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods. This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

The Middle Stone Age (MSA), as defined by Goodwin and Van Riet Lowe (1929), was viewed as a switch in technology from core tools to flake tools, and was thought to represent an intermediate technology between the Earlier and Later Stone Age (LSA). Triangular flakes with convergent dorsal scars and faceted butts distinguished the MSA, and radial and discoidal types, along with single and double platform examples, dominated cores. The 'type fossil' was considered to be the worked flake point. Due to both the relatively long time span encompassed by the MSA (c. 250 000-20 000BP) and the high degree of regional variation, it has proved difficult to include all MSA assemblages within Goodwin and Van Riet Lowe's criteria. More recent attempts have been made to revise the definition of the MSA (Klein 1970; Beaumont & Vogel 1972; Volman 1984) and to establish a cultural sequence but with limited success. As a result identifying and understanding the end of the MSA is still difficult.

Disagreement concerning the MSA/LSA transition in south-ern Africa centres on four issues: 1) the definition of what constitutes final MSA technology; 2) the existence of a transitional MSA/LSA industry; 3) the dating of the MSA/LSA transition; and 4) the existence of an Early LSA (ELSA) which represents a distinct industry that is not part of the earliest recognized LSA, the Robberg (Clark, 1997).

1985 excavation at Umhlatuzana rock shelter in Natal by Kaplan yielded a long and detailed sequence of stone artefacts, which covered the time range from the Middle Stone Age (MSA) to the Later Stone Age (LSA), including the MSA/LSA transition, and early LSA microlithic bladelet assemblages. The change from the MSA to the beginning of the LSA took place between 35 000 and 25 000 BP. Robberg-like assemblages recovered from Umhlatuzana are the first to be positively identified in Natal. Pre-dating 18 000 BP and postdating 12 000 BP, they show that assemblages of this nature were produced earlier and later in Natal than elsewhere in the country. Changes in the Umhlatuzana stone artefact assemblages were not the result of the introduction from elsewhere of new types of tools, but took place locally, as the result of a single evolving cultural tradition in a trajectory of cultural and social change (Kaplan, 1986).

Recent research by Wadley on the Middle Stone Age of Sibudu Cave north of Durban indicated that distinctions between the Middle Stone Age and the Late Stone Age based on backed blades could be misleading (Wadley, 2005). Although research on MSA sites is limited, this research illustrates the potential value of investigating Stone Age sites in KZN closer.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades.

A large representation of Rock-Art sites is located in this area. During 1981 Mazel completed a survey of the Drakensberg and Southern Natal and documented over 400 rock art sites with more than 20 000 paintings (Mazel, 1981). The occurrence of these sites is however

subject to very specific environmental parameters, none of which are present in the study area.

6.2. Public Participation Process

Public participation is a process that is designed to enable all interested and affected parties [I&APs] to voice their opinion and / or concerns which enables the practitioner to evaluate all aspects of the proposed development, with the objective of improving the project by maximising its benefits while minimising its adverse effects.

I&APs include all interested stakeholders, technical specialists, and the various relevant organs of state who work together to produce better decisions.

The primary aims of the public participation process are:

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

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

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

- The identification of stakeholders is a key deliverable at the outset, and it is noted that there are different categories of stakeholders that must be engaged, from the different

levels and categories of government, to the communities of wards of residential dwellings which surround the proposed development;

- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The convening of focused meetings with stakeholders during the BA process; this included engaging with community leaders forming part of the Traditional Council including the Induna. The continued engagement of public leaders to whom the public generally turn for information, keeping such individuals well informed about process and progress;
- The fielding of queries from I&APs and others, and providing appropriate information;
- The convening of specific stakeholder groupings / forums as the need arises;
- The preparation of reports based on information gathered throughout the BA via the PPP and feeding that into the relevant decision-makers;
- The PPP includes distribution of pamphlets or Background Information Documents [BIDs] and other information packs; and
- Where appropriate site visits may be organised, as well as targeted coverage by the media.

Specifically, the proposed Phongola Micro-hydro Power station, BA PPP has entailed the following activities as outlined in the Sections below.

6.2.1. Authority Consultation

The competent authority which is the KZN EDTEA is required to provide an environmental authorisation [EA] [whether positive or negative] for the project. The KZN EDTEA has been consulted from the outset of this study, and has been engaged throughout the project process.

Authority consultation included the following activities:

- Pre-application consultation in the form of a meeting with Miss Happy Shandu of the KZN EDTEA on the 19th October 2018.
- Submission of an application for environmental authorisation in terms of Section 26 of the EIA Regulations [2017] will be done
- Approval of the application documentation by KZN EDTEA.

6.2.2. Consultation with Other Relevant Stakeholders

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

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

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

The identified stakeholders of this project include:

LOCAL AND TRADITIONAL AUTHORITIES	
<ul style="list-style-type: none"> • Umkhanyakude District Municipality <ul style="list-style-type: none"> • Jozini Local Municipality • Local Ward Councillors • Traditional Authorities • Ingonyama Trust Board • Phongola Water Users Association 	
PROVINCIAL AUTHORITY	
Mrs. Bernadette Pawandiwa	Amafa KwaZulu-Natal
Mrs. Felicia Mdamba	KwaZulu-Natal Department of Economic Development and Environmental Affairs-UMkhanyakude District
Mr. Ayanda Goba/ Ms. Thobisa Dlepu	KwaZulu-Natal Department of Agriculture, Forestry and Fisheries
Mr. Blake MacKenzie	Department of Transport
Ms. Jenny Longmore	Ezemvelo KZN Wildlife
STATE DEPARTMENTS	
Ms. Lwandle Sibango	National Department of Water and Sanitation

6.2.3. Site Notification

The EIA Regulations [2017] require that a site notice be fixed at a place conspicuous to the public at the boundary or on the fence of the site where the activity is proposed to occur. In addition, at points of access or high through traffic. The purpose of this is to notify the public of the project and to invite the public to register as stakeholders and inform them of the PP Process.

Baboloki Geohub erected a number of notices in English and Zulu on 19th October 2018 at various high traffic locations around Jozini [refer to Appendix D4].

6.2.4. Identification of Interested and Affected Parties

I&APs were identified and continue to be identified throughout the BA process primarily from responses received from the notices mentioned above. A number of stakeholders were also identified in the focus group meeting held with the Ward Councillor and a focus group.

E-mails were sent to key stakeholders and other known I&APs, informing them of the application for the project, the availability of the cBAR for review and indicating how they may become involved in the project.

Additionally, hard copies of the cBAR will be made available at the offices of the local Councillor.

The contact details of all identified I&APs are updated on the project database, which is included in Appendix D3. This database will be updated on an on-going basis throughout the BA process.

6.2.5. Briefing Paper

A briefing paper or BID for the proposed project was compiled in English and Zulu [refer to Appendix D1] and distributed to key stakeholders on 23rd November 2018.

The aim of this document is to provide a brief outline of the application and the nature of the development. It is also aimed at providing preliminary details regarding the BA process, and explains how I&APs could become involved in the project.

The briefing paper was distributed to all identified I&APs and stakeholders, together with a registration / comment sheet inviting I&APs to submit details of any issues, concerns or inputs they might have with regards to the project. BIDs were also distributed *via* email to relevant Departments. Refer to Appendix D6.

6.2.6. Focus Group Meeting

Following consultation with KZN EDTEA, the EAP convened a Focus Group Meeting with the local representatives affected by the proposed project on the 26th January 2019.

Meeting minutes and attendance registers will be available in the Final BAR.

6.2.7. Advertising

In compliance with the EIA Regulations [2017], notification of the commencement of the BA process for the project was advertised in a local newspaper in Zulu in the Isolezwe newspaper on 27th November 2018.

I&APs have been requested to register their interest in the project and become involved in the BA process. The primary aim of the advertisement is to ensure that the widest group of I&APs possible is informed and invited to provide input, through questions and comments on the project.

6.2.8. Issues Trail

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

6.2.9. Public Review of the draft Consultation BAR

All registered I&APs will be notified of the availability of the report through the local ward councillor.

The cBAR will be made available for authority and public review for a total of 30 days from 28th January 2019 to 25th February 2019.

The report will be made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Ward 7 Councillor; and
- Electronically upon request from the EAP

6.2.10. Final Consultation BAR

The final stage in the BA process entails the capturing of responses and comments from I&APs on the cBAR in order to refine the BAR, and ensure that all issues of significance are addressed.

The final BAR [i.e. fBAR] will be the product of all comments and studies, before being submitted to KZN EDTEA for review and decision-making.

6.2.11. PPP Summary

TABLE 10: SUMMARY OF PUBLIC PARTICIPATION PROCESS THUS FAR

Activity	Description	Reference
Newspaper advertisement	Isolezwe 27th November 2018	Appendix D2

Activity	Description	Reference
Public Meetings/Focus Group Meeting	A public meeting was held on the 26 th January 2019. Minutes of the meeting and registers will be available in the Final BAR.	N/A
Comments and Responses Trail	Comments, issues of concern and suggestions received from stakeholders thus far have been captured in a Comment and Response Report.	N/A
Distribution of a BID	BIDs were distributed electronically on 23 rd November 2018 and by hand 26 th January 2019 to I&APs	Appendix D6
Identify stakeholders	Stakeholders were identified and a database of all I&APs was compiled.	Appendix D3
Erection of site notices	Site notices were erected on the project alignment and at central points on the 19 th October 2018.	Appendix D4
Competent Authority Engagement	KZN EDTEA pre-application meeting engagement 19th October 2018.	Appendix D5
Release of final Reports	The final Basic Assessment Report will be the product of all comments and studies, before being submitted to KZN EDTEA for review and decision-making.	N/A

6.3. Summary of Key Specialist Findings

6.3.1. Desktop Biodiversity Assessment

This assessment was conducted by **Mr James Harvey of Harvey Ecological**. For the full report, refer to Appendix C1.

6.3.1.1. Methodology

The following methods were used:

- Desktop information relating to the fauna groups assessed was collated from literature, databases, previous studies and other sources, and high level strategic plans relating to biodiversity were interrogated.
- The site was investigated using google-earth, to assess potential for sensitive biodiversity.
- Photographs provided by the EAP and by the aquatic specialist were examined, to assess the diversity and quality of vegetation and faunal habitats available.

- All rare and threatened species or sensitive communities occurring or potentially occurring were identified (see next section) and the importance of the study area for these species was evaluated.

6.3.1.2. Study Findings

Rare and Threatened Species

A number of sensitive plant species are known from the broader area (Table 1). All of these will be absent from the primary footprint area for the power station, given the transformed nature of this area. It is possible that a small number may persist in low numbers in the rockier portions in the southern study area.

In addition, it is possible that some of the following trees that are protected under the National Forests Act (Act No.84 of 1998) could be present in the southern half of the site. If present, these should be left undisturbed, or would require permit application for their removal.

Balanites maughamii maughamii Green Thorn

Boscia albitrunca Shepherd's Tree

Breonadia salicina Matumi

Cleistanthus schlechteri var. *schlechteri* False Tamboti

Combretum imberbe Leadwood

Eleaodendron transvaalense Bushveld Saffron

Philentoptera violacea Apple-Leaf

Pterocarpus angolensis Wild Teak

Sclerocarya birea caffra Marula

Sideroxylon inerme inerme White Milkwood

Warburgia salutaris Pepper-bark Tree

The study area does not fall within any threatened ecosystems. The closest of these are Lowland Riverine Forest (FOa1), >6km east of the site, and Lebombo Summit Sourveld (SVI17) ca. 8.5km north-west of the site (Figure 4)(GN1002 2012).

The study site does not fall within or very close to any Important Bird and Biodiversity Areas (IBAs). The closest IBA is Phongolo Nature Reserve (SA055), which surrounds Pongolapoort Dam, and is 8km west of the study site.

Approximately eighty-five species of mammal are known to occur or likely to occur within the region (Child et al. 2016, Skinner & Chimimba 2005, Monadjem et al. 2010). Only a small portion of these are expected to be present within the study site however. The community is expected to consist primarily of a small number of rodents, shrews and small carnivores, and a number of species of bats. Very few species are expected to occur within the degraded main footprint areas.

Seven species of conservation importance are known to occur in the broader region (Child et al. 2016 2004; Monadjem et al. 2010). Most of these will either be rare or absent from the site, given the lack of suitable habitat. Two bats may feed over the Phongola River, but are unlikely to be affected by this development.

Several rare and threatened bird species have been recorded within the pentad that includes the site (Harrison et al. 1996, SABAP2 2018, Taylor et al. 2015) (Table 5). However, the bulk of these species are primarily associated with protected areas in the surrounding area, and the Lebombo Mountains – these species may travel over the site, it is likely there will be little to no utilisation of the site by them.

Two Red Data reptile species are known from the area (Bates et al. 2014; IUCN 2018). The KwaZulu-Natal Hinge-backed Tortoise may occur within the study area, but is likely absent from most of the footprint area. Nile Crocodiles occur in the Phongola River, but are likely absent or irregular immediately below the Phongolapoort Dam wall. Two other species in the region are localised endemics to the Lebombo Mountains. These species may occur in very rocky portions in the south of the study site, but will be absent elsewhere, including the main footprint area.

6.3.1.3. Conclusion

This assessment determined that much of the proposed footprint areas are currently of fairly – very low value for biodiversity. There are areas of higher biodiversity value within the southern portion of the study area. These areas potentially support some sensitive species and ecological communities. However, these are largely out of the footprint areas, and appropriate planning can ensure that they are avoided. Overall, if those areas are adequately protected, biodiversity is unlikely to be substantially negatively affected by this development.

6.3.2. Heritage Impact Assessment

The Heritage Impact Assessment [HIA] was conducted by G&A Heritage Management. The full report is attached to this cBAR as Appendix C3.

6.3.2.1. Methodology

This study defines the heritage component of the BA process being undertaken for the Proposed Phongola Micro-Hydro Power station. It is described as a first phase [HIA]. This report attempts to evaluate both the accumulated heritage knowledge of the area as well as information derived from direct physical observations.

6.3.2.2. Study Findings

No sites of heritage significance could be identified. The following findings are applicable to the study area:

TABLE 11: HISTORIC SIGNIFICANCE

NO	CRITERIA	SIGNIFICANCE RATING
1	Are any of the identified sites or buildings associated with a historical person or group? No	N/A
2	Are any of the buildings or identified sites associated with a historical event? No	N/A

3	Are any of the identified sites or buildings associated with a religious, economic social or political or educational activity? No	N/A
4	Are any of the identified sites or buildings of archaeological significance? No	N/A
5	Are any of the identified buildings or structures older than 60 years? No	N/A

TABLE 12: ARCHITECTURAL SIGNIFICANCE

NO	CRITERIA	SIGNIFICANCE RATING
1	<i>Are any of the buildings or structures an important example of a building type?</i> No	N/A
2	<i>Are any of the buildings outstanding examples of a particular style or period?</i> No	N/A
3	<i>Do any of the buildings contain fine architectural details and reflect exceptional craftsmanship?</i> No	N/A
4	<i>Are any of the buildings an example of an industrial, engineering or technological development?</i> No	N/A
5	<i>What is the state of the architectural and structural integrity of the building?</i> No	N/A
6	<i>Is the building's current and future use in sympathy with its original use (for which the building was designed)?</i> N/A	-
7	<i>Were the alterations done in sympathy with the original design?</i> N/A	-
8	<i>Were the additions and constructions done in sympathy with the original design?</i> N/A	-
9	<i>Are any of the buildings or structures the work of a major architect, engineer or builder?</i> No	N/A

TABLE 13: SPATIAL SIGNIFICANCE

NO	CRITERIA	SIGNIFICANCE RATING
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1	<i>Can any of the identified buildings or structures be considered a landmark in the town or city?</i> No	-
2	<i>Do any of the buildings contribute to the character of the neighbourhood?</i> No	-
3	<i>Do any of the buildings contribute to the character of the square or streetscape?</i> No	-
4	<i>Do any of the buildings form part of an important group of buildings?</i> No	-

TABLE 14: CULTURAL LANDSCAPE

LANDSCAPE TYPE	DESCRIPTION	OCCURRENCE STILL POSSIBLE?	IDENTIFIED ON SITE?
Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Barberton Greenstones	Yes, sub-surface	No
Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes, sub- surface	No
Historic Built Environment	<ul style="list-style-type: none"> – Historical townscapes/streetscapes – Historical structures; i.e. older than 60 years – Formal public spaces – Formally declared urban conservation areas – Places associated with social identity/displacement 	No	No
Historic Farmland	<p>These possess distinctive patterns of settlement and historical features such as:</p> <ul style="list-style-type: none"> – Historical farm yards – Historical farm workers villages/settlements – Irrigation furrows – Tree alignments and groupings – Historical routes and pathways – Distinctive types of planting – Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting. 	No	No
Historic rural town	<ul style="list-style-type: none"> – Historic mission settlements – Historic townscapes 	No	No
Pristine natural landscape	<ul style="list-style-type: none"> – Historical patterns of access to a natural amenity – Formally proclaimed nature reserves – Evidence of pre-colonial occupation 	No	No

	<ul style="list-style-type: none"> - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Historical structures/settlements older than 60 years - Pre-colonial or historical burial sites - Geological sites of cultural significance. 		
Relic Landscape	<ul style="list-style-type: none"> - Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement, 	No	No
Burial grounds and grave sites	<ul style="list-style-type: none"> - Pre-colonial burials (marked or unmarked, known or unknown) - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years) - Associated burial goods (older than 100 years) - Burial architecture (older than 60 years) 	Yes	No
Associated Landscapes	<ul style="list-style-type: none"> - Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes - Sites associated with displacement & contestation - Sites of political conflict/struggle - Sites associated with an historic event/person - Sites associated with public memory 	No	No
Historical Farmyard	<ul style="list-style-type: none"> - Setting of the yard and its context - Composition of structures - Historical/architectural value of individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology 	No	No
Historic institutions	<ul style="list-style-type: none"> - Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases 	No	No
Scenic visual	<ul style="list-style-type: none"> - Scenic routes 	No	No
Amenity landscape	<ul style="list-style-type: none"> - View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors 	No	No

6.3.2.3. Conclusion

The Proposed Development of a 4 Megawatt per hour Micro-Hydro Power Station in the Jozini Local Municipality, within the Umkhanyakude District of the KwaZulu–Natal Province was investigated through archival studies. The site did not have references to any heritage sites of significance. It is recommended that obscured, subterranean sites be managed, if they are encountered.

Due to the high state of alteration as well as the small footprint of the proposed development it is recommended that it be exempt from a full HIA. Provided the recommendations in this report is followed there is no reason, from a heritage point of view, why this development cannot continue.

6.3.3. Aquatic Assessment

This assessment was conducted by **Mr. Jonathan Bailey**. For the full report, refer to Appendix C2.

6.3.3.1. Methodology

The site was visually assessed during a field assessment conducted at the end of November 2018. The following investigations were undertaken:

- Initial Desktop Assessment;
- In-field water quality readings were taken for the *Phongolo River*;
- Bio-assessment using the South African Scoring System (SASS), version 5 was undertaken by a DWS Accredited SASS practitioner on the *Phongolo River*;
- An Integrated Habitat Assessment System (IHAS) was conducted in alignment with the SASS5 sampling;
- An Intermediate Habitat Integrity Assessment (IHIA) was conducted for the *Phongolo River* and its immediate area; and
- Site observations, existing impacts and potential risks were recorded, and potential mitigation measures were provided.

An aquatic assessment report and DWS risk assessment matrix indicating the PES and supporting

ecological status of the watercourses along with existing and potential impacts and options for mitigation have been compiled, to provide information to the Competent Authorities (EDTEA & DWS) for decision making purposes.

6.3.3.2. Study findings

Water Quality

The assessment of water quality variables is important for the interpretation of results obtained during biological investigations, as aquatic organisms are influenced by the environment in which they live. A YSI Professional Plus Water Quality Instrument was used in-field for the analysis and recording of the water quality parameters required for biomonitoring interpretation. While these results are deemed accurate for in-field for comparative biomonitoring assessments, they are not the equivalent of results from a SANAS accredited laboratory. The water quality constituents measured in-field are presented in Table 15 below.

TABLE 15: IN SITU WATER QUALITY RESULTS.

	<i>Phongolo River - Dam</i>	<i>Phongolo River - Stilling basin</i>	<i>Phongolo River - Downstream</i>	<i>Phongolo River - Irrigation Canal</i>
Temperature (°C)	24.4	20.6	20.8	22.3
pH	8.50	8.32	8.39	8.31
Dissolved Oxygen (mg / l)	9.12	10.11	9.92	10.49
Dissolved Oxygen (%)	109.2	112.6	110.9	120.8
Conductivity (mS / m)	34.8	34.5	34.4	34.6
ORP (mV)	161.5	170.9	169	169.8
Clarity (cm)	N/A	N/A	92	N/A
Colour	Light green	Clear	Clear	Light green

The in-situ water quality water quality results indicated fairly consistent readings for all sites, with the Temperature and Dissolved Oxygen results being more closely scrutinized. The temperatures indicate that water released from the dam scour valves are cooler waters,

while the irrigation canal, which is the potential source of water for the power station, remains warmer and similar to the dam / source inputs.

Additionally, the Dissolved Oxygen showed higher than expected readings at all areas, which is reassuring to the downstream biota. Conductivity and ORP4 have remained similar at all the sample sites.

Integrated Habitat Assessment System version 2 (IHAS v2)

Integrated Habitat Assessment System (McMillan, 1999) data sheets assist in the recording and evaluation of the structure of the surrounding physical habitat that influences the quality of the water resources and the condition of the resident aquatic community. The IHAS records information about the biotopes sampled during the macroinvertebrate assessment (SASS) and are presented for information purposes at Appendix A of the Aquatic Report.

The Phongolo River sample site was located downstream of the dam wall and had good habitat available for sampling. A good mix of Stones In Current (SIC), Stones Out Of Current (SOOC), with bedrock was available. Good Gravel and Mud, with limited Sand was available for sampling (GSM) and Vegetation biotopes were available for sampling. The SASS5 Biotope Score (71 %) confirmed this IHAS assessment.

SASS5 Results

The Phongolo River SASS sampling site was located downstream of the proposed development and the Jozinin Dam wall and showed a good abundance and variety of macroinvertebrates, indicative of a river system downstream of an impoundment, within a fast flowing boulder strewn environment.

The species assemblage was dominated by three (3) Orders, namely the:

Order Crustacea: Atiyidae sp.;

Order Ephemeroptera: Baetidae sp., Caenidae sp. and Leptophlebiidae sp.; and

Order Gastropoda: Hydrobiidae sp., Lymnaeidae sp. and Thiaridae sp.

Although not dominant the Orders Hemiptera were observed in good numbers.

A summary of the SASS5 aquatic macroinvertebrate sampling results are provided in the table below.

TABLE 16: MACROINVERTEBRATE DATA, AS PER SASS SAMPLING REQUIREMENT

Site Names	Ecoregions	Parameters	29th November 2018
Phongolo River	Lebombo	SASS Score	121
	Uplands	No Of Taxa	22
	(Upper Foothills)	ASPT	5.5
		Health Class	C (FAIR)

The SASS5 biomonitoring investigation on the Phongolo River identified twenty-two (22) aquatic macroinvertebrate taxa, with a SASS score of one hundred and twenty-one (121) and an Average Score Per Taxa (ASPT) of five point five (5.5). The taxa identified were consistent with those expected in a large river below an impoundment (dam), within the upper foothills during the summer period, and predominantly the taxa showed a moderate sensitivity to water quality impairments. The specialist was re-assured to see a number of Heptageniidae sp., Baetidae sp. (greater than 2 sp.) and Chlorocyphidae sp. within the sample sets, which are sensitive to poor water quality and habitat changes; however, the presence of the Order Gastropoda in high abundance reduced health score significantly.

The SASS interpretation guidelines (Dallas 2007) of the Lebombo Uplands Ecoregion places this site within the health class of Fair (C) (Figure 6), which indicates that a few sensitive species may be lost and a lower abundance of biological populations may occur, whereby zones of competing uses and developmental pressures are dominant features in the landscape.

Observations noted were; Jozini Dam ecological discharge was occurring from the scour valve at the base of the dam wall, with aeration occurring and recorded in the water quality results. The Jozini Dam operational impacts were the main drivers directly below the dam wall with steep gorge sides and security restrictions preventing access to the public; however, downstream at the SASS5 sampling site, an access road and evidence of use by local residence was observed. Additionally, the dam gauging weir was noted downstream of the SASS5 sampling site, creating an artificial standing / slow flowing water body before returning to the faster flowing bolder strewn watercourse.

6.3.3.3. *Conclusions*

The results from the IHAS, SASS5 and IHIA indicate that the Phongolo River has experienced a critical change in habitat, which is to be expected when a free-flowing watercourse is impounded, as has been the case since 1973. This is confirmed in the IHAS results of Critically Modified (PES of F), which is partially supported by the SASS5 ecological category of Fair (C). The SASS5 result is somewhat improved from the IHAS result, indicating the system downstream of the Jozini Dam wall is somewhat improved, with instream habitat favourable for the macro-invertebrate species. This SASS5 score is reassuring for the downstream watercourse and as per the NFEPA requirement, must be enhanced to ensure the negative impacts of the impoundment are negated.

The proposed development site is located within a steeply incised gorge, directly below the dam wall on the Phongolo River, with additional security restrictions evident. This has prevented excessive human traffic into the area and has reduced the immediate pressure on the watercourse with development and homesteads constructed on the escarpment or outside of the watercourse area.

Immediate pressures are associated with grazing, agriculture and harvesting of natural resources.

These impacts are associated with the riparian areas, which provides important buffering to the instream channel, which in turn could affect the aquatic habitat and water quality, if allowed to continue in an unmanaged and unsustainable way.

An increase in construction and operational impacts could occur should the proposed development be implemented; however, this can be reduced and mitigated with the implementation of additional management plans to ensure deterioration is prevented to safeguard the downstream environment.

6.4. Impacts and Residual Risks Assessment

6.4.1. Introduction

Impact assessment must take into account the nature, scale and duration of effects on the environment, whether such effects are positive [beneficial] or negative [detrimental]. It is also imperative that each issue / impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase.

Where necessary, the proposal for mitigation or optimisation of an impact is noted.

The environmental impact assessment is focused on the following phases of the project namely: **Pre-Construction, Construction, and Operational Phases** only. The impacts associated with decommissioning phase are not applicable to this project, however, responsible methods of post-construction clean-up are provided in the EMPr.

As the project entails development of life long infrastructure will be permanent, decommissioning is not applicable to this project, however, impacts associated with post construction clean-up are considered.

6.4.2. Methodology

The potential environmental impacts associated with the project are evaluated according to its nature, extent, duration, intensity, probability and significance of the impacts, whereby:

- **Nature:** A brief written statement of the environmental aspect being impacted upon by a particular action or activity;
- **Extent:** The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;
- **Duration:** Indicates what the lifetime of the impact will be;
- **Intensity:** Describes whether an impact is destructive or benign;
- **Probability:** Describes the likelihood of an impact actually occurring; and
- **Cumulative:** In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

TABLE 17: CRITERIA TO BE USED FOR THE RATING OF IMPACTS

Criteria	Description			
EXTENT	National (4) The whole of South Africa	Regional (3) Provincial and parts of neighbouring provinces	Local (2) Within a radius of 2 km of the construction site	Site (1) Within the construction site
DURATION	Permanent (4) Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient	Long-term (3) The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. The only class of impact which will be non-transitory	Medium-term (2) The impact will last for the period of the construction phase, where after it will be entirely negated	Short-term (1) The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase
INTENSITY	Very High (4) Natural, cultural and social functions and processes are altered to extent that they permanently cease	High (3) Natural, cultural and social functions and processes are altered to extent that they temporarily cease	Moderate (2) Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way	Low (1) Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
PROBABILITY OF OCCURRENCE	Definite (4) Impact will certainly occur	Highly Probable (3) Most likely that the impact will occur	Possible (2) The impact may occur	Improbable (1) Likelihood of the impact materialising is very low

Significance is determined through a synthesis of impact characteristics. Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

TABLE 18: CRITERIA FOR THE RATING OF CLASSIFIED IMPACTS

	Class	Description
+	Any value	Any positive / beneficial 'impact', i.e. where no harm will occur due to the activity being undertaken.
-	Low impact (4 -6 points)	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
	Medium impact (7 -9 points)	Mitigation is possible with additional design and construction inputs.
	High impact (10 -12 points)	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
	Very high impact (12 - 14 points)	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status		Denotes the perceived effect of the impact on the affected area.
Positive (+)		Beneficial impact.
Negative (-)		Deleterious or adverse impact.
Neutral (/)		Impact is neither beneficial nor adverse.
It is important to note that the status of an impact is assigned based on the <i>status quo</i> – i.e. should the project not proceed. Therefore, not all negative impacts are equally significant.		

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

6.4.3. Potential Impacts and Significance

The following sections will provide a description of the potential impacts as identified by the specialists, EAP and through the PPP as well as the assessment according to the criteria described in Table 17 and Table 18.

All potential impacts associated by the proposed development through the construction and operation of the development life-cycle have been considered and assessed in the following sections. As the infrastructure is expected to be permanent, the decommissioning phase impacts have not been considered.

6.4.4. Aquatic

TABLE 19: AQUATIC IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	Aspect: Removal of vegetation buffering watercourses for construction purposes and for associated activities.	Without	1	1	3	3	-8	Medium
		With	1	2	1	2	-6	Low
	Impact: Direct loss of watercourse and riparian habitat; altering the banks of a watercourse	Mitigation measures: <ul style="list-style-type: none"> ▪ Ensure sufficient buffer between the watercourse and construction areas is provided. Limit the number of watercourse impact points. ▪ Reduced construction servitudes must be enforced at all drainage lines, storm water outlets and watercourse impact areas, in agreement with the ECO. ▪ Concrete encasing of pipe lines within the riparian edge and at all drainage lines, storm water outlets and watercourse impact points must occur. ▪ Rehabilitation of the impacted area to pre-construction or better must occur. ▪ Note: Those watercourses authorised for crossing or working within must be clearly identified and all NO-GO areas must be clearly demarcated to ensure access into them is prevented. ▪ Watercourse impact areas for construction must be limited to permitted points only. 						
		Without	1	2	1	2	-6	Low
Aspect: Sediment input into aquatic ecosystems	With	2	2	2	2	-8	Medium	
	Mitigation measures: <ul style="list-style-type: none"> ▪ Construction of the Tailrace within the <i>Phongolo</i> River must occur in the dry season and must be completed before the first rains of summer or water flows must be operationally managed to keep water flows low while construction within the watercourse is occurring. ▪ The Tailrace must be designed to direct water flows directly downstream so as not to cause multi-directional water flows in the stilling basin, with the Tailrace aligned and designed to displace water flows via an anchored concrete channel with multiple overflow points into the stilling basin ▪ Prior to earthworks occurring, the embankment and area of the watercourse to be excavated and constructed in must be isolated from the Phongolo River main water channel via sturdy shuttering or other engineering options to prevent water flows from impacting the construction area. These measures will also ensure that sediment and construction related impacts are retained within this designated construction area. This will also facilitate an improved ability to work within the watercourse and embankment, ensuring construction is initiated and concluded within the dry season. 							
	Impact: Degradation of the watercourse, impeding, diverting and altering the watercourse and its embankments; Reduced water quality and sediment entering watercourse.							

	Aspect: Pollution inputs into the watercourse, e.g. litter, hydrocarbons, etc. Impact: Degradation of the watercourse and riparian habitat; Reduction in water Quality	Without	1	2	2	2	-7	Medium
		With	1	2	1	2	-6	Low
		Mitigation measures: <ul style="list-style-type: none"> Pollution sources must be removed from the watercourse and buffer areas and must be at least 100 m away from any watercourse. Waste, hydrocarbons, sewage, vehicle access and other pollutants must be managed in accordance to a construction EMP, with sufficient mitigations to identify and manage construction concerns. 						
Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Aspect: Long term impacts of Infrastructure operations and maintenance associated with the buffer areas and watercourses. Impact: Cumulative impact	Without	1	2	2	2	-7	Medium
		With	1	2	1	2	-6	Low
		Mitigation measures: <ul style="list-style-type: none"> A monitoring programme must be implemented on a monthly and biannual basis to ensure the watercourse and associated riparian vegetation is managed in compliance to Legal requirements. This must include monthly water quality sampling on the Phongolo River (up-stream and downstream) bi-annual biomonitoring using SASS5, along with fixed point photography at the watercourse impact points. Note: Waste and pollutants must be managed at source and must not impact on the watercourse.. 						
Construction	Aspect: Alteration of the banks and watercourse bed. Impact: Direct loss of watercourse and riparian habitat; altering the banks of a watercourse	Without	1	1	3	3	-8	Medium
		With	1	2	1	2	-6	Low
		Mitigation measures: <ul style="list-style-type: none"> Limit the number of areas of impacts associated with drainage lines, storm water outlets and watercourse and keep to existing impacted areas. Drainage lines, storm water outlets and watercourse impact areas for construction must be limited to approved points only and servitude restrictions must be enforced. Construction within the Phongolo River and its associated old riverbed must occur during the low flow (winter) period. The abstraction point must be isolated from the active Phongolo River channel via shutter or other sturdy engineering methods during the construction phase. Storm water management into the buffer zones and the 100 year flood lines must be implemented to dissipate flows, reduce sediment movement and prevent waste and pollution concerns. Rehabilitation of the impacted area to pre-construction or better must occur. 						

	Aspect: Sediment input into aquatic ecosystems Impact: Degradation of the watercourse, impeding, diverting and altering the watercourse and its embankments; Reduced water quality and sediment entering watercourse.	Without	1	2	1	2	-6	Low
		With	2	2	2	2	-8	Medium
		Mitigation measures: <ul style="list-style-type: none"> Storm water management into the buffer zones and the 100 year flood lines must be implemented to dissipate flows, reduce sediment movement and prevent waste and pollution concerns. The construction within drainage lines, storm water outlets and the Phongolo River must be scheduled for the dry months. The use of berms, silt curtains, attenuation structures, shuttering and other engineering solutions must occur to prevent sedimentation of the watercourse 						
	Aspect: Pollution inputs into the watercourse, e.g. litter, hydrocarbons, etc. Impact: Degradation of the watercourse and riparian habitat; Reduction in water quality	Without	1	2	2	2	-7	Medium
		With	1	2	1	2	-6	Low
		Mitigation measures: <ul style="list-style-type: none"> Pollution sources must be removed from entering all drainage lines, watercourses and buffer areas and must be at least 100 m away from any watercourse and preferably outside of the 100 year flood line. Waste and sewage areas must be contained and serviced regularly to prevent build up. Hydrocarbons and other pollutants must be store in a bunded, roofed and lockable storage unit and managed in accordance to an EMPr. Water quality monitoring must occur on a weekly and monthly basis at all watercourse impact points up-stream and downstream of the impacted area. Weekly water quality readings and photographic records must be taken, with monthly water samples sent for analysis at a SANAS accredited laboratory. The use of plant, machinery, chemicals, hydrocarbons and concrete while constructing on the embankments and adjacent or within the watercourse must be well controlled to limit the impact on the Phongolo River. No access into the watercourse outside of the shuttering, isolating the construction area from the Phongolo River is permitted. A vegetation specialist must demarcate indigenous plant species, which require permits or licenses prior to their removal (<i>Sclerocarya birrea</i>) or which can be avoided or successfully transplanted. Additionally, the specialist must indicate the alien vegetation onsite with manual control only permitted within the watercourse and its embankments (no chemical control permitted). Water abstracted from the construction areas must not be discharged directly into the river but must rather be discharged into a well vegetated area associated with the dry riverbed, with silt curtains installed for slow controlled release back into the river. The power station and Tailrace must be designed so as to prevent debris accumulating and to rather allow debris to flow around or over the structure. This must be conducted via the use of rounded corners and backfilling to cover the concrete structures to mirror the embankments, so should flood levels ever impact the area, the flood waters are able to flow around or over the structure without causing damage or becoming a debris collection point. 						

		<ul style="list-style-type: none"> ▪ The power station must be sealed from outside water discharges (scour valve 'mist', flood releases, etc) to prevent the build-up of moisture and resulting water within the power station, which could compromise the equipment and result in secondary contamination from hydrocarbons (oil, greases, transmission oils, etc) and must allow for access during all weather or remove shutdown options. ▪ A Method Statement indicating the construction methodology and mitigation methods to prevent impacts on the watercourse must be presented to an Aquatic Specialist for approval prior to construction commencing and must be monitored by the Environmental Control Officer in alignment with the EA, EMPr and this specialist assessment report. ▪ Construction activities must be contained within the development footprint to ensure unnecessary damage to the riparian and terrestrial environment. Storm water discharge and scour release points must be aligned and designed with energy dissipaters to prevent unnecessary erosion. ▪ Permanent backup power, through the supply from a diesel or petrol driven generator, must be available. The generator and its fuel supply, along with any other chemical to be stored on site must be located within the power station, be suitably protected from the outside elements and within a bund capable of containing 110% of the volumes stored. This area must have security control measures in place. ▪ Awareness training to ensure impacts on the watercourses and associated development are reduced must be communicated. ▪ Erosion and sedimentation must be managed via silt curtains, v-drains, berms and other engineered methods with no sediment, as a result of construction to enter the watercourse and adjacent stilling basin. ▪ The site camp, hydrocarbon stores, and all pollution and waste must be appropriately stored outside of the watercourse and its embankment (preferably on the platform associated with the existing valve tie in point) with roofing and bunding to be used as required by the EMPr. ▪ Over clearing of the development area, specifically those areas associated with any watercourses and wetland buffers must be prevented, with all permitted development areas to be clearly demarcated prior to stripping.
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6.4.5. Vegetation

TABLE 20: VEGETATION IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	Aspect: Clearing of vegetation for construction. Impact: The loss of and disturbance to floodplain grassland areas	Without	1	1	2	3	-7	Medium
		With	1	1	1	1	-4	Low
	Mitigation measures: <ul style="list-style-type: none"> Excavation in the existing disturbed roadside area only; Restriction of all construction activities to the construction area by way of clear demarcation and toolbox talks; Rehabilitation of any damaged areas outside the construction footprint according to the rehabilitation plan. 							
	Aspect: Clearing of riparian vegetation for construction of pipeline and reservoir. Impact: loss of ecosystem functions or species	Without	1	3	1	3	-8	Medium
With		1	1	1	1	+4	Low	
Mitigation measures: <ul style="list-style-type: none"> Strict excavation in the existing disturbed areas or be kept to a minimum; restricting all construction activities to the construction area by way of clear demarcation and toolbox talks; rehabilitating any damaged areas outside the construction footprint according to the rehabilitation plan. 								
Construction	Impact: Negative ecological impacts are likely to be of medium significance without mitigation, resulting in some loss of habitat, biota and basic ecosystem functions	Without	1	1	2	3	-7	Medium
		With	1	1	1	1	-4	Low
		Mitigation measures: <ul style="list-style-type: none"> During excavations, topsoil must be kept separate from the subsoils. Topsoil should be placed on one side of the trench in the 2m wide work buffer area, while subsoils are deposited on the other side of the trench in the other 2m wide work buffer area. During filling of the trench, the subsoils should be placed in the trench first, followed by the topsoil; rehabilitation of affected areas according to the rehabilitation plan. 						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Aspect: Erosion of soil from the development's footprint into nearby terrestrial areas. Impact: Loss and change of natural habitats and biota with some changes in basic ecosystem functions, but no species' loss	Without	1	3	1	3	-8	Medium
		With	1	1	1	1	+4	Low
	Mitigation measures: <ul style="list-style-type: none"> After construction, topsoil and indigenous grassland vegetation that were carefully removed, should be used to rehabilitate any affected areas; after filling the trench with subsoils and topsoil, the seeds of a suitable soil-binding grass species should be sown in the footprint; rehabilitation of affected areas according to the rehabilitation plan. 							
	Aspect: Alien plant invaders at disturbed environment along the footprint of the proposed pipeline. Impact: Alien plant invader colonisation and dispersal are likely to have negative ecological impacts on the indigenous vegetation types which are present near the development's footprint.	Without	1	1	2	3	-7	Medium
		With	1	1	1	1	-4	Low
	Mitigation measures: <ul style="list-style-type: none"> Removal and destruction of all alien plant invaders which are present in and near the development's footprint BEFORE construction begins; Restriction of all construction activities to the construction area by way of clear demarcation and toolbox talks; Prevention of damage and disturbance to indigenous vegetation outside the development's footprint by way of clear demarcation and toolbox talks; Regular checks of the development's footprint for new growth of alien plant invaders during the construction and operational phases, and destruction of any plant invaders, if found. 							

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Aspect: Construction-related pollutants during the construction phase Impact: Contamination may affect the various habitats, plants and animals and infiltrate the water-table in and near the development's footprint.	Without	1	2	2	1	-6	Medium
		With	1	1	1	1	-4	Low
	Mitigation measures: <ul style="list-style-type: none"> Restricting all construction activities to the construction area by way of clear demarcation and toolbox talks; Careful control of all hazardous substances and compulsory use of drip-trays or impermeable bunding; Cleaning-up liquid and solid hazardous waste spillages immediately; hazardous spillages and contaminated soil should be taken to an authorised waste disposal centre; immediate rehabilitation of any polluted areas. 							
	Aspect: Construction related runoff. Impact: Pollution of watercourse and wetland areas near the development's footprint	Without	1	1	2	3	-7	Medium
		With	1	1	1	1	-4	Low
	Mitigation measures: <ul style="list-style-type: none"> Restricting all construction activities to the construction area by way of clear demarcation and toolbox talks; Careful control of all hazardous substances and compulsory use of drip-trays or impermeable bunding; Cleaning up liquid and solid hazardous waste spillages immediately; hazardous spillages and contaminated soil should be taken to an authorised waste disposal centre; Immediate rehabilitation of any polluted areas. 							
Cumulative	Aspect: Overgrazing and overburning of the veld. Impact: Small negative change in habitats and biota with minimal disruption of ecosystem functions	Without	1	1	2	3	+7	Medium
		With	1	1	1	2	+7	Medium
	Mitigation measures: <ul style="list-style-type: none"> Mitigation involves effective implementation of all mitigation measures mentioned above. 							

6.4.6. Socio-economic & Health

TABLE 21: SOCIO-ECONOMIC AND HEALTH IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)		
Construction	Aspect: Construction activities.	Without	2	3	3	4	+12	High	
		With	3	3	3	4	+13	Very High	
	Impact: Expected to provide in some jobs during the construction phase.	Mitigation measures:							
		<ul style="list-style-type: none"> All labour (skilled and unskilled) and Contractors should be sourced locally where possible. A labour and recruitment policy will be developed, displayed and implemented by the contractor. Recruitment at the construction site will not be allowed. Where possible, labour intensive practices (as opposed to mechanised) should be implemented. The principles of equality, BEE, gender equality and non-discrimination will be implemented. 							
	Aspect: Construction activities.	Without	2	2	2	2	2	-8	Medium
		With	2	1	1	1	1	-5	Low
	Impact: Job creation during the construction phase could result in the influx of people to the area.	Mitigation measures:							
		<ul style="list-style-type: none"> If possible all labour should be sourced locally. Contractors and their families may not stay on-site. No informal settlements will be allowed. 							
	Aspect: Construction activities.	Without	2	2	2	3	2	-9	Medium
		With	2	2	2	1	1	-6	Medium
	Impact: Contractors, the influx of people and potential job creation will result in the proliferation of social ills and issues such as crime, prostitution, the spread of HIV/AIDS, informal settlements etc. Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to a surface water resource.	Mitigation measures:							
		<ul style="list-style-type: none"> The developers need to be actively involved in the prevention of social ills associated with contractors. If possible all labour should be sourced locally. Contractors and their families may not stay on-site. No informal settlements will be allowed. Contractors must be educated about the risk of prostitution and spread of HIV and AIDS. Strict penalties will be built into tenders to deal with issues such as petty crime, stock theft, fence cutting, trespassing etc. No poaching of wildlife or selling of firewood will be allowed. 							

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	Aspect: Construction activities. Impact: Public safety during construction.	Without	2	2	2	1	-7	Medium
		With	1	2	1	1	-5	Low
	Mitigation measures: <ul style="list-style-type: none"> Members of the public adjacent to the construction-site should be notified of construction activities in order to limit unnecessary disturbance or interference. Construction activities will be undertaken during daylight hours. 							
	Aspect: Construction activities. Impact: Contractor's staff safety during construction.	Without	1	2	3	2	-8	Medium
		With	1	2	1	1	-5	Low
	Mitigation measures: <ul style="list-style-type: none"> Ensure the appointment of a Safety Officer to continuously monitor the safety conditions during construction. All construction staff must have the appropriate PPE. The construction staff handling chemicals or hazardous materials must be trained in the use of the substances and the environmental, health and safety consequences of incidents. Report and record any environmental, health and safety incidents to the responsible person. 							

6.4.7. Heritage

TABLE 22: HERITAGE IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)		
Construction	Aspect: Graves.	Without	1	1	1	2	-5	Low	
		With	2	1	1	1	-5	Low	
	Impact: Construction	Mitigation measures:							
		<ul style="list-style-type: none"> Provided the construction crew is made aware of their location, the development should have no significant impact on these burial sites. 							
		Without	2	2	2	2	2	-8	Medium
		With	2	1	1	1	1	-5	Low
	Aspect: Ruins.	Mitigation measures:							
		<ul style="list-style-type: none"> The ruins are not considered to be of historic nature and the pipeline is also not expected to impact on them. 							
	Impact: Construction.	With	1	2	1	1	1	-5	Low
		Mitigation measures:							
<ul style="list-style-type: none"> Ensure the appointment of a Safety Officer to continuously monitor the safety conditions during construction. All construction staff must have the appropriate PPE. The construction staff handling chemicals or hazardous materials must be trained in the use of the substances and the environmental, health and safety consequences of incidents. Report and record any environmental, health and safety incidents to the responsible person. 									

7. STUDY FINDINGS AND CONCLUSIONS

7.1. ENVIRONMENTAL IMPACT STATEMENT

7.1.1. Introduction

Potential environmental impacts [biophysical and social] associated with the proposed Phongola Micro-Hydro Power Station, in Jozini KwaZulu-Natal, have been identified herein. This BA assesses and addresses all potentially significant environmental issues in order to provide the KZN EDTEA with sufficient information to make an informed decision regarding the proposed project.

7.1.2. Key Findings of the Study

Overall, the results of the BA process emerge as having a “**negative low**” environmental significance after mitigation.

The socio-economic impacts are however strongly positive, in that the development will result in a better condition of electricity access and supply for the receiving community. The following are key findings and recommendations of the impact assessment.

7.1.3. Key Conclusions and Recommendations of the Specialist Studies

7.1.3.1. Aquatic Impact Assessment

Impacts associated with the construction phase can be adequately managed through standard environmental management techniques and the mitigations proposed in section 8 of the Aquatic Impact Report. These measures must be incorporated into the EMP, and must be managed through the EDTEA and DWS.

Operational management of the development must occur, to ensure that impacts associated with the utilisation of the infrastructure are prevented and delivery on the expected long-term benefits are realised for the town of Jozini, as well as the watercourse health.

Mitigations in the form of the implementing a Management Plan and Water Monitoring Plan must occur prior to the operational readiness of the facility to mitigate any long-term impacts.

Based on the findings of this study, it is the opinion of the aquatic ecologist that the Proposed Development of a Micro-Hydro Power Station associated with the Phongolo River be considered

favourably, from an aquatic ecological perspective. The mitigation measures presented in this report must be strictly adhered to, to isolate any potential development hazards and pollutants

and to ensure hydrologic flow management occurs, with the proposed mitigation measures to be incorporated into the Environmental Authorisation, Water Use License and EMPr. Should this occur the specialist expects that the development will have acceptable and manageable levels of risk and impact on the watercourse, while potentially improving the water quality downstream of the Jozini Dam.

7.1.3.2. Biodiversity Assessment

This assessment determined that much of the proposed footprint areas are currently of fairly – very low value for biodiversity. There are areas of higher biodiversity value within the southern portion of the study area. These areas potentially support some sensitive species and ecological communities. However, these are largely out of the footprint areas, and appropriate planning can ensure that they are avoided. Overall, If those areas are adequately protected, biodiversity is unlikely to be substantially negatively affected by this development. The following recommendations are made:

- Avoid impacting on rocky and less disturbed, well-wooded areas in the southern portion of the study area. Maximise use of existing infrastructure and highly disturbed areas.
- Areas away from the infrastructure footprints should be managed appropriately and not disturbed in order to maintain the biodiversity they support.
- During construction and operation, all efforts must be made to minimise sediment input, pollution and disturbance to areas away from the infrastructure footprint area - no waste or materials of any kind must be allowed to enter the surrounding areas during construction or operation.
- Any Nationally Protected Trees on site must be left undisturbed, or will require a permit application to Department of Fisheries and Forestry for their removal.

7.1.3.3. Heritage Impact Assessment

Although unlikely, sub-surface remains of heritage sites could still be encountered during the construction activities associated with the project. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas as well as heavy plant cover in other areas. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits [unnaturally grey appearance of soil compared to the surrounding substrate];
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given should any sub-surface remains of heritage sites be identified as indicated above:

- All operators of excavation equipment should be made aware of the possibility of the occurrence of subsurface heritage features and the following procedures should they be encountered.
- All construction in the immediate vicinity [50 m radius of the site] should cease.
- The heritage practitioner should be informed as soon as possible.
- In the event of obvious human remains the South African Police Services [SAPS] should be notified.
- Mitigation measures [such as refilling etc.] should not be attempted.
- The area in a 50 m radius of the find should be cordoned off with hazard tape.
- Public access should be limited.
- The area should be placed under guard.
- No media statements should be released until such time as the heritage practitioner has had sufficient time to analyze the finds.

The proposed Phongola Micro-Hydro Power Station, in Jozini, KwaZulu-Natal was investigated and it was found to be limited in sites of heritage significance.

Provided the recommendations in this report is followed there is no reason, from a heritage point of view, why this development cannot continue.

7.1.4. EAP Opinion

This BAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed Phongola Micro-Hydro Power Station, in Jozini, KwaZulu-Natal. Having duly considered the proposal, there is unlikely to be any significant negative environmental impacts, and the socio-economic benefits are evident.

The findings conclude that there are no environmental fatal flaws that could prevent the proposed development, provided that the recommended mitigation and management measures contained within the EMPr are implemented.

Given the findings of the specialist studies conducted, as outlined in summary above, it is safe to say that no significant impacts have been identified by these studies. This has resulted in an impact assessment yielding an overall result of having “negative low” impact. This is attributed mostly to the short-term negative impacts, which are likely to occur during the construction phase, which can be adequately mitigated and rehabilitated to an acceptable state of environment. It is therefore the recommendation of the EAP that the environmental

authorisation is granted for the proposed Phongola Micro-Hydro Power Station, in Jozini, KwaZulu-Natal.

The benefits of the proposed project, far outweigh the negative impacts, which are limited to the construction phase. The development will lead to an improvement in the social and economic status *quo*, as the town of Jozini will have improved access to electricity.

The following recommendations / conditions, although not exhaustive, may be considered for inclusion in the environmental authorisation:

- During excavation of the trench, subsoils should have been placed in the work buffer on one side of the trench, while topsoil should have been placed in the work buffer on the other side of the trench for later use during rehabilitation.
- A permit may be required from Ezemvelo KZN Wildlife for the removal of any protected plant species that maybe removed from the site for the development of the micro-hydro power plant or they may need to be transplanted to a safe area, should there be a likelihood of them being affected by the upgrade.
- The EMPr [including the Rehabilitation Plans provided in the Vegetation and Aquatic and Wetland Assessments] and conditions thereto must be adhered to;
- An ECO must be appointed and all Contractor staff to be trained on the EMPr requirements prior to commencement of activities;
- Alien vegetation and invader species within the vicinity of construction zone are to be removed and indigenous vegetation, where appropriate, to be introduced and managed;
- Monthly environmental compliance monitoring to be conducted during construction and incidents recorded and addressed accordingly;
- A suitably qualified Botanist must be appointed to undertake the demarcation, and relocation of all the protected plant species as well as obtain the relevant licences and permits required from EKZN Wildlife and DAFF respectively.
- All mitigation measures of the specialist studies must be adhered to
- The Rehabilitation plan must be costed for in tender documents, along with the rest of the EMPr.

7.1.5. Conclusion

This study provided a quantified analysis of the impacts associated with the proposed development. The EAP is of the opinion that the project should be positively authorised, outlining the key findings of the study.

The BA process and report complies with the EIA Regulations of 2014 [as amended in 2017], under which this project has applied and therefore meets all relevant requirements.

The project is envisaged to have a “**negative low**” significance rating post application of mitigations proposed by the relevant specialists.

7.1.6. Assumptions, Gaps and Limitations of the study

The BA process followed the legislated process required and as governed and specified by the EIA Regulations [2014 as amended in 2017]. Inevitably, when undertaking scientific studies, challenges and limitations are encountered. For this specific BA, the following challenges were encountered:

7.1.6.1. Aquatic Impact Assessment

- The information used to characterise potentially affected water resources for this report are sourced from available DWS, Water Research Council (WRC), DEA and other online GIS tools. This information is supplemented using Google Earth.
- Technical information was provided in the Ninham Shand Report: *Pongolapoort Hydro Feasibility Study: Study of Civil and Electro-mechanical Works, Report No: 400288 / 3699 (2004)*, with complete design details not available for the proposed development at the point of this assessment.
- The composition of aquatic biota in the study area, prior to major disturbance, is not always known. For this reason, reference conditions are hypothetical, and are based on professional judgement and / or inferred from the limited data available.
- Watercourse and riparian ecosystems are dynamic and complex. Aspects of the ecology of these systems, some of which may be important, may have been overlooked. The findings of this study were based on a single site visit undertaken at the end of November 2018.
- An additional assessment in the dry season would have provided a seasonal assessment, however as this is to provide potential impacts, the specialist is of the opinion that this report provides sufficient information for the Competent Authorities to assist in their decision making.

7.1.6.2. Biodiversity Assessment

The limitation of desktop studies is by definition that the specialist does not examine the site firsthand, and this must be acknowledged. Nevertheless, in this situation, this is considered acceptable, given the information available, the size and quality of the site and the specialist's pre-existing knowledge and experience of the broader area.

7.1.6.3. Heritage Impact Assessment:

- It is assumed that the SAHRIS database locations are correct.
- It is assumed that the paleontological information collected for the project is comprehensive.
- It is assumed that the social impact assessment and public participation process of the BA will result in the identification of any intangible sites of heritage potential.

7.1.7. Recommendations

7.1.7.1. Recommendations to the CA

It is advised that the application be assessed holistically, taking into consideration the study area and the fact that the development is confined to an highly modified and degraded environment and the project required in order to improve water supply to the area.. The impacts associated with the development is significantly lower as the area has been highly transformed.

The project, in the EAP's opinion, does not pose a detrimental impact on the receiving environment and it inhabitants and can be mitigated to an acceptable level.

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

No post-construction monitoring is specified in this BA, however, it remains the duty of the Applicant to ensure the infrastructure is kept in sound condition.

7.1.7.1. Recommendations to the Applicant

The Applicant must adhere to the recommendations provided by the specialist and the EAP.

The EMPr summarises these recommendations.

The Applicant must take full responsibility for the execution of the project in a manner which does not negatively impact on the environment by ensuring that responsible decisions are made.

8. DECLARATIONS BY THE EAP

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

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

Kuda Zhandire (EAP)