

REPORT

Proposed Construction of the Pongola (Mboza) River Bridge & Vehicular Approaches off District Road D1834

Consultation Basic Assessment Report

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Client: KwaZulu-Natal Department of Transport

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ROYAL HASKONINGDHV (PTY) LTD

19 Park Lane
Floor 3 The Boulevard Umhlanga
Umhlanga
Umhlanga Rocks
4319
Transport & Planning
Reg No. 1966/001916/07

+27 (0)873506660 **T**
durban@rhdhv.com **E**
royalhaskoningdhv.com **W**

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Author(s): Vivienne Vorster

Drafted by: Vivienne Vorster

Checked by: Bronwen Griffiths

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Approved by: Bronwen Griffiths

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PUBLIC REVIEW OF THE CONSULTATION BAR

This **Consultation Basic Assessment Report** (cBAR) is available for comment for a period of **30 days** from the 14th of July until the 14th of August 2017.

This report will then be amended and updated in response to the comments received during this review period. Once finalised, the Final Bar (fBAR) will be submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs, uMkhanyakude District (KZN EDTEA) for decision-making.

Copies of this cBAR are available at strategic public places in the project area (see below) and upon request from Royal HaskoningDHV.

- The local Traditional Authority;
- Jozini Local Municipality (Circle Street , Bottom town, Jozini) and
- uMhlabuyalingana Local Municipality (Main Road R22, KwaNgwanase)

The document may also be accessed at the following;

- Royal HaskoningDHV Offices, 19 Park Lane, The Boulevard, Umhlanga Rocks;

and at the following weblink:

- www.rhdhv.co.za

OPPORTUNITIES FOR PUBLIC REVIEW

The following methods of **public review** of the cBAR are available:

- Completing the comment sheet enclosed with the Background Information Document (BID – which was circulated and can be requested from Royal HaskoningDHV);
- Written submissions by post, e-mail or fax; and
- Telephonic submissions.

DUE DATE FOR COMMENT ON CONSULTATION BASIC ASSESSMENT REPORT (cBAR): 14 August 2017

SUBMIT COMMENTS AND QUERIES TO:

Ms Vivienne Vorster

Royal HaskoningDHV

19 Park Lane, The Boulevard, Umhlanga Rocks

Tel: (087) 350 6664

Vivienne.vorster@rhdhv.com

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Executive Summary

Royal HaskoningDHV have been appointed by the KwaZulu-Natal Department of Transport (KZN DoT) to perform feasibility studies and to investigate, design, and manage the construction for the proposed Pongola (also referred to commonly as the Mboza) River Bridge (Bridge No. 3513). The proposed bridge is located between Ward 10 of Jozini Local Municipality and Ward 13 of the uMhlabuyalingana Local Municipality. The purpose of the bridge will be to link the two (2) communities within the uMkhanyakude District Municipality, KwaZulu-Natal.

The proposed site (GPS co-ordinates: 27°11'17"S 32°14'20"E) is located on the Pongola River approximately 3.5 km to the west of the Mboza Clinic off District Road D1834. The nearest bridge to the site and the associated local communities is 12 km south of this proposed crossing point.

A pedestrian bridge, comprising of a suspended structure with abutments constructed adjacent to the riverbanks, was previously authorised at the same location (Ref: DC27/0009/2014, NEAS: KZN/EIA/0001216/2013) on 27th November 2013.

The community thereafter aired their need and wish for a vehicular bridge. Their request that the site which had been earmarked for the pedestrian bridge be retained and for a vehicular bridge to be constructed and the approach roads be upgraded.

It is proposed that the bridge comprises a total deck span of approximately 60 metres (m). Further the approaches on either side (50 m) of the bridge be upgraded. The total combined length of the proposed works is 160 m. The width of the proposed bridge will be 6 m in order to accommodate a 3 m wide single lane with two (2) 0.5 m shoulders, and a 1.05 m wide pedestrian sidewalk and two (2) 0.475 m parapet hand railings. The height of the carriageway would be approximately 2 m above the water level.

The project includes construction of the bridge and immediate approach roads only (50 m approach road on either end of the bridge). Additional road infrastructure, linking the bridge to existing road network will be augmented when the budget for such construction becomes available. The D1834 is the existing road on the eastern side of bridge 2.8 km away. The D1836 is the existing road on the western side of the bridge 4.7 km away.

There are a number of reasons why the approach roads to the bridge do not form part of this Basic Assessment. These are explained in more detail below:

- The communities' request for a vehicular bridge instead of a pedestrian bridge will require additional budget. At the time of commencement of the project (in 2015) the KZN DoT did not have sufficient budget to allow for both the vehicular bridge and the approach roads to be constructed.
- A decision was taken to include only the bridge in the Basic Assessment Report and that the full Environmental Impact Assessment (EIA) for the approach roads would be undertaken as a separate project.
- Environmental Legislation has since been amended and a full EIA is no longer required for the approach roads and it was queried why the approach roads and bridge do not form a single Basic Assessment Application.
- Impande Consulting Engineers are assisting Royal HaskoningDHV with the design and engineering aspects for the approach roads. These studies are however only in the preliminary stages.
- The feasibility and detailed designs for the bridge have already been completed and it would therefore be beneficial for the bridge construction to go ahead, which would then enable the communities an interim pedestrian access route across the Pongola River.

- The approach roads will then be constructed at a later stage, once all the required designs, studies and approval processes have been completed.

The receiving environment associated with the proposed bridge is summarised below:

A heritage specialist study was undertaken. No heritage sites or features were observed during the ground survey. The area within and surrounding the project footprint, is heavily cultivated and disturbed.

The proposed bridge site is situated within an approximately 25 m zone, which is a completely transformed section of the riparian zone. The indigenous riparian vegetation has been totally removed although remnant patches occur upstream and downstream of the proposed Pongola (Mboza) River Bridge site. A single small (< 2 m) protected Marula (*Sclerocarya birrea* subsp. *caffra*) was observed on the south-eastern bank, adjacent to the approach road reserve and bridge site, and is thus likely not to be impacted upon by the proposed upgrade. The specialist report recommended that an ecological walk down be done to assess whether the Marula tree will need to be relocated or not.

No threatened faunal species were recorded during the brief survey within the immediate surroundings, but suitable habitat occurs within the Pongola River and fringing riverine forest or riparian zone for certain species such as birds and reptiles to exist.

The proposed bridge site falls within a floodplain wetland. The floodplain wetland is in a moderately degraded state due to the high levels of historical and current agricultural practices within the wetland system. The study was limited to the area in the immediate vicinity of the proposed bridge.

The present hydrological state of the Floodplain wetland falls within **Category D** (largely modified). The hydrological function of the wetland system has been significantly modified due to anthropogenic activities such as agricultural practices associated with the rural community and the Pongolapoort Dam (Jozini Dam), constructed up-stream of the proposed bridge site.

The present geomorphological state of the floodplain wetland calculated a score of **Category C** (Moderately modified). Significant erosion and incision of the banks of the Pongola River as well as modification of the stream bed has occurred.

Given the nature of the project and the surrounding biophysical environment, the potential key impacts associated with the project would be experienced during the construction phase. These potential impacts include:

- Increased sediment loads;
- Erosion;
- Loss of aquatic biodiversity;
- Loss of wetland habitat and ecological structure

Most of the construction related impacts can be effectively mitigated through appropriate mitigation measures and recommendations, as detailed in the mitigation measures, the Environmental Management Programme (EMPr) and the Wetland Maintenance Management and Rehabilitation Action Plan (WMMRAP).

Should the recommended mitigation and management guidelines be implemented timeously and to specification, impacts can be potentially reduced to acceptable **Low** significance levels.

This Basic Assessment (BA) follows the legislative process prescribed in the Environmental Impact Assessment (EIA) Regulations (2014 as amended in 2017). This report constitutes the draft Consultation Basic Assessment Report (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 proposed Pongola (Mboza) River Bridge Construction. In addition, it documents Interested and Affected Parties' (I&APs) issues and concerns. This document therefore provides; background information

to the proposed project, a detailed motivation and it includes details of the public consultation process which has been undertaken to date.

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

In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of Acts and sections therein of Environmental Legislation that were taken into consideration during this study and are elaborated on in this report.

The KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN EDTEA) is the Competent Authority for this BA process and the proposed Pongola (Mboza) River Bridge and vehicular approaches needs to be authorised by this Department.

This draft cBAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. Having duly considered the project, in the Environmental Assessment Practitioner's (EAP's) opinion, the project does not pose a detrimental impact on the receiving environment and its inhabitants and any potential negative impacts will be mitigated significantly. The Applicant must be bound to stringent conditions to maintain compliance and a responsible execution of the project.

The impacts identified and assessed by way of risk ratings, have been reported herein. The report at hand (i.e. draft cBAR) will now be made available for comment and amended post comment period to form the final Consultation BAR (i.e. final cBAR). The final cBAR report will, together with a comprehensive issues trail, the final draft of the EMP, and all appendices as referred to, will be submitted to the KZN EDTEA, for decision making.

The final cBAR report will thus be a culmination of scientific specialist studies' findings, public contribution via formal comment, and the drawing of conclusions by the EAP as the environmental specialist.

Glossary

Activity – an activity identified in any notice published by the minister or MEC in terms of Section 24D(1)(a) of the Act as a listed activity or specified activity.

Alternative – in relation to a proposed activity, means different way of meeting the general purpose and requirements of the activity, which may include alternatives to the: property or location; type of activity; design or layout; technology used; operational aspects of the activity and includes the option of not implementing the activity.

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.

Buffer – A buffer is seen as an area that protects adjacent communities from unfavourable conditions. A buffer is usually an artificially imposed zone included in a management plan.

Construction – 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 (EAP) – 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, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR.

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 EMP 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.*

Method Statement – A method statement is a written submission by the Contractor to the Engineer in response to the specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting a Method Statement. It contains sufficient detail to enable the Engineer to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

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.

Pollution – The National Environmental Management Act, No. 107 of 1998 defines pollution to mean any change in the environment caused by – substances; radioactive or other waves; or noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

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.

Re-use – To utilise articles from the waste stream again for a similar or a different purpose without changing the form or properties of the articles.

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).

Soffit – underside of the deck of the bridge.

Species of Conservation Concern – species that have a high conservation importance in terms of preserving South Africa's high biological diversity. If a subpopulation of a species of conservation concern is found to occur on a proposed development site, it would be one indicator that development activities could result in significant loss of biodiversity

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
BID	Background Information Document
CBA	Critical Biodiversity Area
CBAR	Consultation Basic Assessment Report
CMA	Catchment Management Agency
C-PLAN	EKZN Wildlife Conservation Plan
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EGL	Existing Ground Level
KZN EDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EKZNW	<i>Ezemvelo</i> KwaZulu-Natal Wildlife
GA	General Authorisation
I&AP	Interested and Affected Parties
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
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
NGO	Non-Governmental Organisation
OHSA	Occupational Health and Safety Act (Act No. 85 of 1993)
PES	Present Ecological State
PPP	Public Participation Process
PU	Planning Unit
REC	Recommended Ecological Category
RQD	Rock Quality Designation

SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Synchronous Data Flow
SPT	Standard Penetration Test
SWL	Static Water Level
SWMP	Stormwater Management Plan
UKDM	uMkhanyakude District Municipality
WMA	Water Management Agency
WUL	Water Use Licence

1 Introduction

1.1 Background

Royal HaskoningDHV's Engineering Team have been appointed by the **KwaZulu-Natal Department of Transport** (KZN DoT) to perform feasibility studies and to investigate, design, and manage the construction for the **proposed Pongola (Mboza) River Bridge** (Bridge No. 3513) located between Ward 10 of Jozini Local Municipality and Ward 13 of uMhlabuyalingana Local Municipality. The proposed Pongola (Mboza) River Bridge will link these two (2) communities within the uMkhanyakude District Municipality, KwaZulu-Natal.

The proposed site (GPS co-ordinates: 27°11'17"S 32°14'20"E) is located on the Pongola River about 3.5 km to the west of the Mboza Clinic off District Road D1834. At this site the main channel of the river is approximately 55 m wide and 3 m deep and is a perennial river. The nearest bridge to the site and the local communities is 12 km south of this crossing point.

A pedestrian bridge, comprising of a suspended structure with abutments constructed adjacent to the riverbanks, was previously authorised at the same location (Ref: DC27/0009/2014, NEAS: KZN/EIA/0001216/2013) on 27 November 2013.

The community thereafter aired their need and wish for a vehicular bridge. Their request being that the site which had been earmarked for the pedestrian bridge be retained and a vehicular bridge constructed and that the approach roads be upgraded.

It is proposed that the bridge comprises a total deck span of approximately 60 metres (m). Further the approaches on either side (50 m) of the bridge be upgraded. The total combined length of the proposed works is 160 m. The width of the proposed bridge will be 6 m in order to accommodate a 3 m wide single lane with two (2) 0.5 m shoulders, and a 1.05 m wide pedestrian sidewalk and two (2) 0.475 m parapet hand railings. The height of the carriageway would be approximately 2 m above the water level.

The 50 m access road on either side of the bridge will be surfaced with concrete paving at natural ground level or up to 300 mm above the natural ground level and keyed into the ground. The deeper areas in the flood plain will be utilise low lying 1,800 x 1,800 mm culverts to allow water normal flows to pass under, and peak flood levels to pass over the approaches, without causing erosion and without trapping debris.

Royal HaskoningDHV's Environmental Management and Planning Knowledge Group have been appointed as the Environmental Assessment Practitioners (EAPs) to conduct the Basic Assessment study for this project.

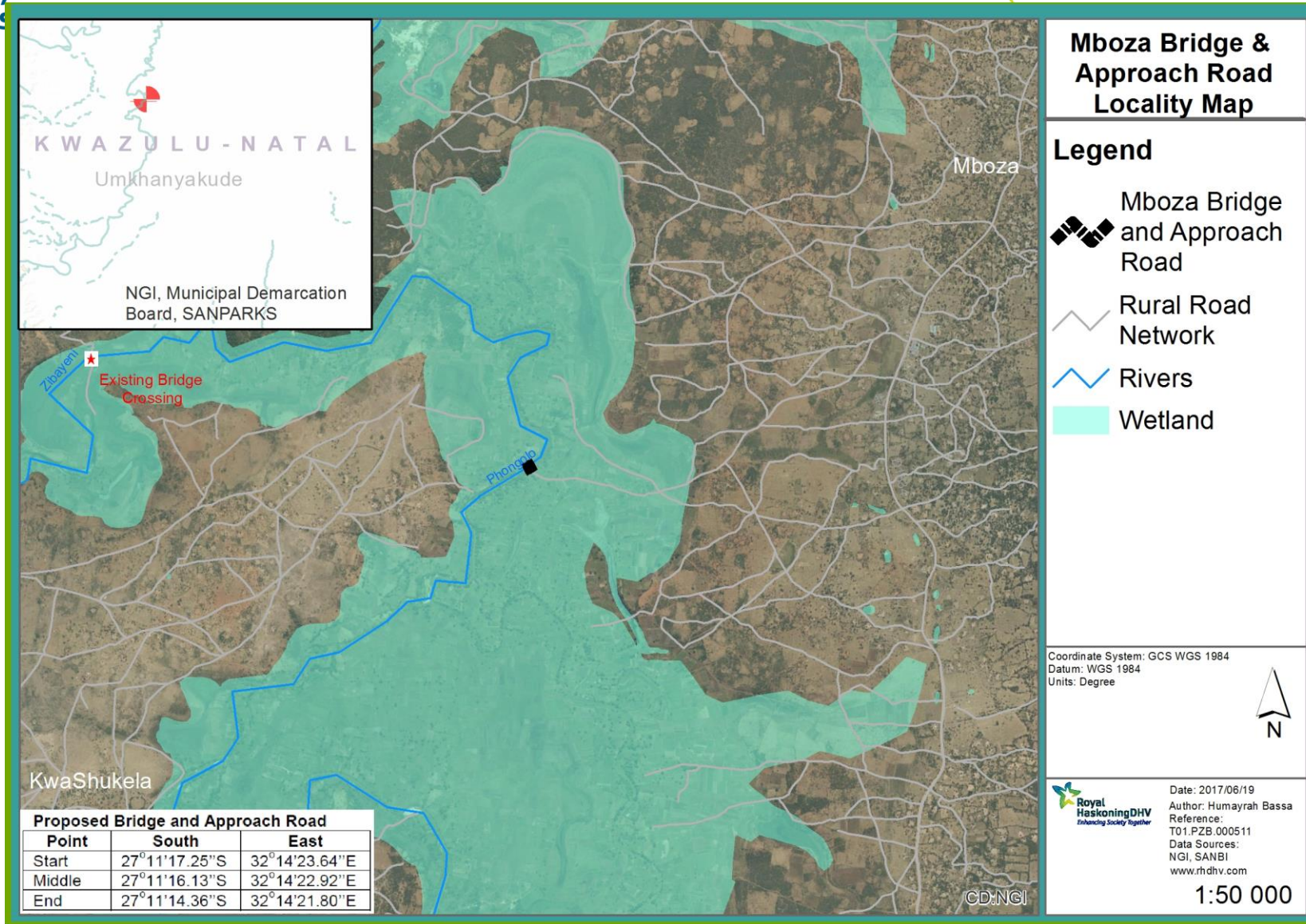


Figure 1-1: Locality map showing the proposed Pongola (Mboza) River Bridge

1.2 Technical Scope of Work

1.2.1 Pongola (Mboza) River Bridge

Transportation, ease of movement and access across the river is difficult for the communities who live on either side of the Pongola River. Currently, school children and local community members use a boat, at the site of the proposed Pongola (Mboza) River Bridge, to cross the river. The use of such a boat is not safe, particularly when the river is flowing strongly, resulting from up-stream rainfall events and when the Pongolapoort Dam sluice gates are opened to release water downstream. The closest bridge facilitating community access across the river is approximately 12 km from the proposed Bridge crossing (**Figure 1-1**).

This is the primary motivating factor for the construction of the proposed Pongola (Mboza) River Bridge.

The Mboza and Zinhlabeni communities are the two communities in closest proximity to the proposed bridge crossing. In terms of social facilities which are in close proximity and cannot be easily accessed by one or other of the communities are; Mboza school and clinic, Esipondweni Hospital, Manaba Primary School, and Munyu Primary School to the West.

The proposed bridge will provide a safe linkage for communities on both sides of the Pongola River to access schools, clinics, cultivated lands (that require tending) and pension pay-out points.



Figure 1-2: Normal Water Levels of the Pongola River at Mboza



Figure 1-3: A boat used by community members to cross the Pongola River

1.2.2 Proposed Bridge Geometry

The main channel of the Pongola River is approximately 55 m wide and 3 m deep at the proposed bridge locality point.

The channel is frequently flowing, especially within the spring months of September / October when the Pongolapoort Dam sluice gates are opened to release excess water.

1.2.3 Site Surveys

All natural and man made features which may have an impact on the siting of the bridge were surveyed. The site survey of the river crossing provided the base data for determining the flood levels and optimizing the position of the structure.

For a single lane road as discussed above, a 1:500 plan area was surveyed at 20 m, either side of the proposed bridge centreline and 25 m back from the river top banks. A 2 km long and 30 m wide road reserve strip, as proposed by the geometric designers, was also surveyed and used to determine the road geometry.

1.2.4 Preliminary Hydrology and Hydraulics

Hydrology and Hydraulics (from the preliminary investigations report)

The catchment of the Pongola River at the Pongola (Mboza) River Bridge site is 8,903 km² with a longest collector of 376 km. However the flow at the site is controlled by the Pongolapoort Dam sluice gates. The flow at this site comprises of water released from the Pongolapoort Dam and the flow from the catchment downstream of the dam. The water volumes released from the dam were provided by the Department of Water and Sanitation. The release is done annually in September / October and released water volumes are measured accurately.

The catchment downstream of the dam is 1,114 km² with the longest collection being 53 km, using the synchronous data flow (SDF) method. The flows at the site catchment were added to the flows from the sluice gates to provide the design floods. The road is a minor rural road connector **Class 5** and thus has been designed for Q10 (10 year flood return period). The minimum freeboard required is 0.3 m from **Figure 8.3** of SANRAL Drainage Manual. The Q2T level for the 20 year flood return period is satisfied for all the options presented in this report.

1.2.5 Geotechnical Design Considerations

The field investigations undertaken for the geotechnical assessment comprised the drilling of five (5) boreholes to a minimum of 21 m depth. The holes were located at the proposed abutment positions and at the positions of the main towers. No holes were drilled in the main channels. The core samples were logged and borehole profiles prepared.

The boreholes indicated that alluvial materials underlie the Site for the entire depth of the boreholes, which for the majority of the investigation cores have terminated in sub-rounded to rounded pebbles and cobbles at depths ranging between 21.4 m and 22.51 m below the existing ground level (EGL). It is inferred that the latter form a basal horizon that overlies the bedrock. The alluvial sediments comprise predominantly clays, silty clays, fine grained sandy silts and silty sands, which are interlayered and laterally discontinuous.

The Standard Penetration Test (SPT) 'Nf' values indicate that the clays are predominantly firm to stiff (Nf <15) to between 7 m and 11 m in depth below EGL on the western abutment and between 11 m and 14 m below EGL on the eastern abutment. Thereafter, the clays become stiff to very stiff and interlayered sands medium dense down to the basal "boulder" layer at depths greater than 21 m below EGL.

The borehole logs indicate that the geology of the site is uniform and a similar geological profile is expected in the main channel.

It is proposed that for the design of the vehicle bridge the geotechnical report used in the design of the pedestrian bridge be adopted and that Augured piles (or similar) be used for supporting the vehicle bridge.

To mitigate any undue risk, additional geotechnical investigations shall be carried out during the bridge construction and these shall be logged and analysed and any necessary mitigation to the design carried out accordingly.

1.2.6 Approach Roads and Motivation for Their Current Exclusion

There are a number of reasons why the approach roads to the bridge do not form part of this Basic Assessment. These are explained in more detail below:

- The communities' request for a vehicular bridge instead of a pedestrian bridge will require additional budget. At the time of commencement of the project (in 2015) the KZN DoT did not have sufficient budget to allow for both the vehicular bridge and the approach roads to be constructed
- A decision was taken to include only the bridge in the Basic Assessment Report and that the full Environmental Impact Assessment (EIA) for the approach roads would be undertaken as a separate project.
- Environmental Legislation has since been amended and a full EIA is no longer required for the approach roads and it was queried why the approach roads and bridge do not form a single Basic Assessment Application.
- Impande Consulting Engineers are assisting Royal HaskoningDHV with the design and engineering aspects for the approach roads. These studies are however only in the preliminary stages.
- The feasibility and detailed designs for the bridge have already been completed and it would therefore be beneficial for the bridge construction to go ahead, which would then enable the communities an access route across the Pongola River.
- The approach roads will then be constructed at a later stage, once all the required designs, studies and approval processes have been completed.

1.2.7 Services Affected and Expropriation

The bridge site and immediate approach roads fall primarily on undeveloped land and it has been confirmed that no services exist which will be affected.

1.3 Approach to the Study

This section of the report describes the approach and methodology employed for the Pongola (Mboza) River Bridge consultation Basic Assessment Report (cBAR).

1.3.1 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;
- Describe the need and desirability of the proposed alternatives;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- 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 the 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 as a result of the proposed activity, the following require addressing and consideration:

- identify suitable measures to avoid, manage or mitigate identified impacts; and
- Identify residual risks that need to be managed and monitored.

Figure 1-4 and Error! Reference source not found. illustrate the approach / methodology employed.

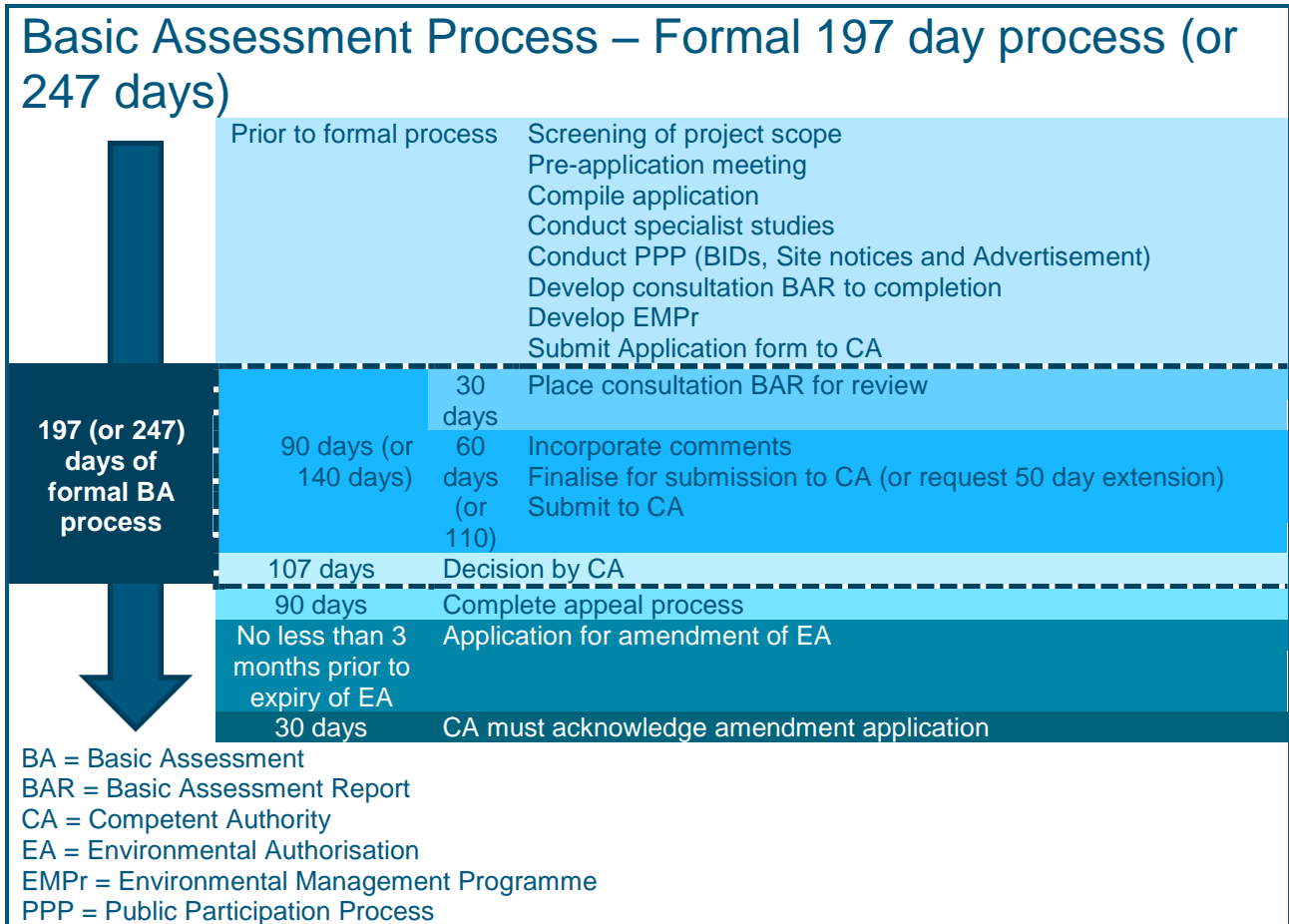


Figure 1-4: Basic Assessment process

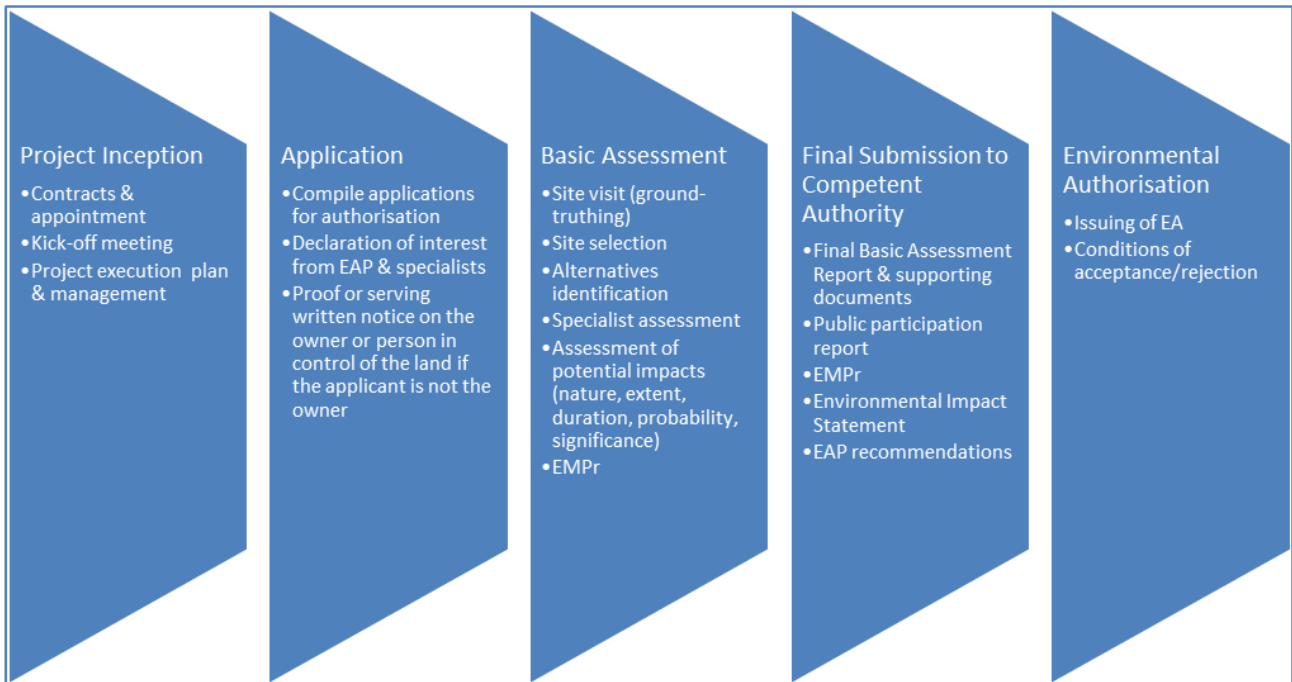



Figure 1-5: Approach to the Basic Assessment Study

1.3.2 Details of the Project Applicant

The Applicant for the proposed project is the KwaZulu-Natal Department of Transport (DoT). The details of the Applicant are as follows:

Table 1-1: Applicant details

Applicant	The Department of Transport	
Representative	Ms Khumbu Sibiya	
Physical Address	172 Burger Street, Pietermaritzburg, 3201	
Postal Address	Private Bag X9043, Pietermaritzburg, 3200	
Telephone	033 355 8600	
Facsimile	033 355 8092	
E-mail	Khumbu.Sibiya@kzntransport.gov.za	

1.3.3 Details of the Environmental Assessment Practitioner

Royal HaskoningDHV has been appointed as the Environmental Assessment Practitioner (EAP) by the KZN DoT. Royal HaskoningDHV is conducting the relevant environmental studies for the proposed project. The professional team at Royal HaskoningDHV has considerable experience in the environmental management and Environmental Impact Assessment (EIA) fields.

Royal HaskoningDHV has been involved in and / or managed several of the largest EIAs undertaken in South Africa to date. A specialist area of focus is on the assessment of multi-faceted projects, including the establishment of linear developments (national and provincial roads, pipelines and power lines), bulk infrastructure and supply (e.g. wastewater treatment works, pipe lines, landfills), electricity generation and transmission, the mining industry, urban, rural and township developments, environmental aspects of Local Integrated Development Plans (LIDPs), as well as general environmental planning, development and management.

Table 1-2: EAP details¹

Detail	Royal HaskoningDHV		
Contact Persons	Vivienne Vorster (EAP)	Bjorn Hoffmann	Bronwen Griffiths
Address	The Boulevard, 19 Park Lane, Umhlanga Rocks Drive, Umhlanga, 4319.	The Boulevard, 19 Park Lane, Umhlanga Rocks Drive, Umhlanga, 4319.	Tygerberg Park, 163 Uys Krige Drive, Platteklouf, 7500
Telephone	087 350 6660	083 468 5156	083 414 8551
Facsimile	N/A	N/A	N/A
E-mail	Vivienne.vorster@rhdhv.com	Bjorn.hoffmann@rhdhv.com	Bronwen.griffiths@rhdhv.com
Qualification	BA (Hons) Environmental Management Certified Environmental Assessment Practitioner with the Interim Certification Board for EAP's of South Africa	BSc (Honours) Environmental Science	MSc Conservation Biology SA Council for Natural Scientific Professions, Professional Natural Scientist, 400169/11
Experience	9 years	7 years	17 years

1.3.4 Peer Review

The EIA Regulations 2014 (as amended in 2017) requires the Environmental Assessment Practitioner (EAP) to be independent, objective and have expertise in conducting EIAs. Such expertise should include knowledge of all relevant legislation and any guidelines that have relevance to the proposed activity. To ensure a lack of bias and to ensure transparency an external technical peer review will be undertaken prior to the public review, during the formal BA process. This peer review has been conducted by Kinvig & Associates Environmental Consultants.

1.3.5 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) EIA regulations 2014 (as amended in 2017) Appendix 1. The contents are as follows in **Table 1-3**.

Table 1-3: Report structure

Chapter	Content
Chapter 1 Introduction	Introduction and background to the project, including the approach to the study and details of the project proponent and EAP.
Chapter 2 Environmental Legislative Context	Includes an explanation on all applicable legislation and the relevant listed activities applied for.
Chapter 3 Project Context and Motivation	Includes the need and desirability for the project and a description of the proposed activities.
Chapter 4 Project Alternatives	Consideration of alternatives (design / layout and no-go) for the project.
Chapter 5 Description of Study Area	A description of the biophysical and social environment.
Chapter 6 Public Participation Process	Overview of the public participation process conducted to date.
Chapter 7	The section highlights the key findings of the specialist studies

¹ Full curriculum vitae of the above practitioners can be found in Appendix D of this report.

Chapter	Content
Summary of Key Specialist Findings	conducted and other environmental considerations.
Chapter 8 Impacts and Residual Risk Assessment	The impacts identified are rated and a significance score obtained.
Chapter 9 Environmental Impact Statement	Conclusions and recommendations of the Environmental Impact Assessment.
Chapter 10 Declarations by the EAP	Declaration of independence by the EAP.

2 ENVIRONMENTAL LEGISLATIVE CONTEXT

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

2.1 The Constitution of South Africa

Section 24 of the Constitution of South Africa (No. 108 of 1996) states that

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

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

2.2 National Legislation and Regulations

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

2.3 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, *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.*

2.3.1 EIA Regulations 2014 (as amended)

The nature of the proposed project includes activities listed in the following Listing Notices – GNR 327 (Listing Notice 1) and GNR 324 (Listing Notice 3) of the EIA Regulations 2014 (as amended). Please refer to **Table 2-1** overleaf.

Please note that the regulations are referred to by their 2017 gazette numbers, These are however noted as being amendments of the 2014 version of the EIA Regulations. Thus for completeness please note that Listing Notice 1 is in terms of GNR 983 (4 December 2014), as amended by GNR 327 (6 April 2017); Listing Notice 2 as GNR 984 (2014), amended by GNR 325 (2017); and Listing Notice 3 as GNR 985 (2014), amended by GNR 324.

Activities within Listing Notice 1 or 3 trigger the need for a Basic Assessment (BA) process, whilst those within Listing Notice 2 trigger the need for a full Scoping and Environmental Impact Assessment (S&EIR) process. Given the consideration below it is noted that a BA process is required, and that a S&EIR is not triggered.

Table 2-1: Listed activities according to Listing Notices 1 & 3 of the EIA Regulations 2014 (as amended)²

Relevant notice	Activity No(s)	Description (Verbatim and as per applicability to proposed development)
Government Notice Regulation No. (GNR) 327 (6 April 2017)	12	<p>The development of iii) infrastructure or structures with a physical footprint of 100 m² or more: Where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse.</p> <p>The proposed construction of infrastructure consisting of a bridge and approaches of approximately 60 m in length and 6 m in width is located within a watercourse (Pongola River) and wetland area (Floodplain wetland). Culverts will be constructed beneath the 50 m approach roads on either side of the bridge.</p>
	19	<p>The infilling or depositing of any material of more than 10 m³ into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m³ from a watercourse.</p> <p>The construction of the bridge and approaches will involve the infilling, dredging and excavation of material from the Pongola River. It is expected that this will exceed 10 m³.</p>
GNR 325	<i>No relevant activities</i>	
GNR 324	<i>No relevant activities</i>	

2.3.2 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 the abstraction of water as well as the crossing of a watercourse within a floodplain wetland, a WUL application will be submitted to the DWS for both consumptive and non-consumptive water uses. The NWA, as applicable to the proposed development (see comment in

² Note that the Activities are specified in terms of the EIA Regulation Amendments gazetted on the 6 April 2017.

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:

- *Abstraction of water from a watercourse*
 - (Abstraction of water from the Pongola River for construction purposes);
- *Impeding or diverting the flow of water in a watercourse*
 - (applicable for the construction of the bridge and approaches (including culverts) over the Pongola River and floodplain wetland); and
- *Altering the bed, banks, course or characteristics of a watercourse*
 - (applicable for the construction of the bridge and approaches (including culverts) over the Pongola River and floodplain wetland).

2.3.3 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.

2.3.3.1 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 keys 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.

2.3.3.2 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.

2.3.4 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 parallel National Environmental Management: Biodiversity Act (NEM:BA).

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.

2.3.5 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 rare or threatened plants were recorded within the proposed site.

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.

2.3.6 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 NEM:WA 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 in terms of this Act will be triggered by the proposed development.

2.3.7 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 NHRA), 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.*

No heritage sites or features were observed within the project footprint, although artefacts may be uncovered during construction activities.

2.3.8 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.

2.3.9 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.

2.3.10 Sustainable Development

The principle of Sustainable Development has been established in the Constitution of the Republic of South Africa (No. 108 of 1996) and given effect by NEMA.

Section 1(29) of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations.

Therefore, Sustainable Development requires that:

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

2.3.11 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."

2.3.12 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 has been dealt with in this section.

2.4 Climate Change Consideration

Transportation systems are designed to withstand local weather and climate. Transportation engineers typically refer to historical records of climate, especially extreme weather events, when designing transportation systems. For example, bridges are often designed to withstand storms that have a probability of occurring only once or twice every 100 years. However, due to climate change, historical climate may no longer be a reliable predictor of future impacts (**United States Environmental Protection Agency – US EPA, 2016**).

Climate change is projected to increase the frequency and intensity of extreme weather events. Specifically, heat waves are likely to be more severe, sea level rise could amplify storm surges in coastal areas, and storms are likely to be more intense. These changes could increase the risk of delays, disruptions, damage, and failure across our land-based, air, and marine transportation systems. Most transportation infrastructure being built now is expected to last for 50 years or longer. Therefore, it is important to understand how future climate might affect these investments in the coming decades (**US EPA, 2016**).

Higher temperatures can cause pavement to soften and expand. This can create rutting and potholes, particularly in high-traffic areas and can place stress on bridge joints. Heat waves can also limit

construction activities, particularly in areas with high humidity. With changes such as these, it could become more costly to build and maintain roads and highways (**US EPA, 2016**).

A study titled “*Climate change and urban road transport a South African case study of vulnerability due to sea level rise*” (**Friedrich and Timol, 2011**) concluded that studies are important for long-term transportation network planning and the preparedness to respond locally to climate change. However, adaptation will be achieved only if sound and co-ordinated long-term planning takes place, and appropriate programmes are developed. For this to occur, multi-disciplinary collaboration regarding transportation planning is essential.

The National Department of Transport acknowledges that there has been a lack of long-term planning for the road network. They note that “*a comprehensive road needs study is considered necessary*”. It is suggested that such a study should include climate change impacts.

3 PROJECT CONTEXT AND MOTIVATION

3.1 Site Descriptors

3.1.1 Surveyor General Numbers / Property Descriptions:

The proposed activity is situated on 2 properties, as detailed in **Table 3-1** below.

The site is situated between Ward 10 of Jozini and Ward 13 of uMhlabuyalingana Local Municipality within the uMkhanyakude District Municipality.

The 21 digit surveyor-general codes and land owner details are also provided in **Table 3-1** below.

Table 3-1: Surveyor-General 21 digit site (erf / farm / portion) reference numbers

21 Digit Reference Number	Farm Name, Farm Number and Portion Number	Landownership
NOHV00000001653300000	Portion 0 (Remaining Extent) Farm Makhathini Flats 16533	Republic of South Africa
NOHV00000001492400000	Portion 0 Farm Maarschalk 14924	Regional & Land Affairs

3.1.2 Land Use Zoning

Table 3-2: Land use zoning

The site is zoned	Agriculture
Is a change of land use or a consent use application required?	No
Must a building plan be submitted to the local authority?	No

3.1.3 Coordinates

Table 3-3: Co-ordinates for the extent of the proposed project site

STARTING POINT OF SITE

Latitude / Longitude	Degrees	Minutes	Seconds
South	27 ⁰	11'	17.24"
East	32 ⁰	14'	23.63"

MID-POINT OF SITE

Latitude / Longitude	Degrees	Minutes	Seconds
South	27 ⁰	11'	15.75"
East	32 ⁰	14'	22.67"

END POINT OF SITE

Latitude / Longitude	Degrees	Minutes	Seconds
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South	27 ⁰	11'	14.35''
East	32 ⁰	14'	21.81''

3.1.4 Access / Directions

The project includes construction of the bridge and immediate approach roads only. (50 m approach road on either end of the bridge). Additional road infrastructure, linking the bridge to existing roads will be augmented when the budget for such construction becomes available.

The D1834 is the existing road on the eastern side of bridge 2.8 km away.

The D1836 is the existing road on the western side of the bridge 4.7 km away.

3.1.5 Surrounding Land Uses

Table 3-4: Surrounding land uses in proximity to the proposed project site

Natural area	Y	Light industrial	N
Low density residential	N	Medium industrial	N
Medium density residential	N	Heavy industrial	N
High density residential	N	Power station	N
Informal residential	Y	Military or police base/station/compound	N
Retail commercial & warehousing	N	Spoil heap or slimes dam	N
Office/consulting room	N	Dam or reservoir	
Quarry, sand or borrow pit	N	Hospital / medical centre	Y
School	Y	Tertiary education facility	N
Church	N	Old age home	N
Sewage treatment plant	N	Train station or shunting yard	N
Railway line	N	Major road (4 lanes or more)	N
Harbour	N	Plantation	Y
Sport facilities	N	Agriculture	Y
Golf course	N	River, stream or wetland	Y
Polo fields	N	Nature conservation area	N
Filling station	N	Mountain, koppie or ridge	N
Landfill or waste treatment site	N	Museum	N
Historical building	N	Protected Area	N
Graveyard	N	Archaeological site	P
Airport	N	Other:	N

Key: Y = Yes P = Possibly N = No

3.2 Project Motivation and Need and Desirability

Table 3-5: Proposed project need, desirability and benefits

Project Need			
1.	Was the relevant provincial planning department involved in the application?	YES	
2.	<p>Does the proposed land use fall within the relevant provincial planning framework?</p> <p>The KwaZulu-Natal Provincial Spatial Development Framework (PSDF) identifies rural services as a development priority, for which access is paramount. The KZN PSDF also recognises the Principle of Accessibility which simply promotes the highest level of accessibility to resources, services, opportunities and other communities. This is intrinsically linked to transportation planning and should consider localised needs for the transportation of people and goods by various modes of transport as guided by the scale and function of a region.</p> <p>At a provincial level there is a strong correlation between the most deprived areas and poor</p>	YES	

	regional accessibility to those areas. In addressing accessibility at provincial and local level, the need for possible new linkages, the upgrade in the capacity of existing linkages and the suitable mix of modes of transport should be considered.		
3.	If the answer to questions 1 and / or 2 was NO, please provide further motivation / Explanation – N/A.		
Desirability			
1.	Does the proposed land use / development fit the surrounding area? The bridge will link two communities to essential social services such as schools and clinics as well as providing a safer route across the Pongola River. A boat is usually used as the existing mode of transport to cross the river when it is flowing. The Umhlabuyalingana Local Municipality has included the need for such a bridge in its 2011-2016 Integrated Development Plan (IDP).	YES	
2.	Does the proposed land use / development conform to the relevant structure plans, SDF and planning visions for the area? The Umhlabuyalingana Local Municipality has included the need for such a bridge within the Integrated Development Plan (IDP), while the Jozini Local Municipality includes construction of a link road and bridge across the Pongola river as one of its priority projects within the IDP.	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 – N/A.		
5.	Will the proposed land use / development impact on the sense of place?		NO
6.	Will the proposed land use / development set a precedent? While the bridge will be a key accessibility development, it is not expected to set a precedent.		NO
7.	Will any person's rights be affected by the proposed land use / development? The land is currently undeveloped. Consultations thus far have indicated that the communities are very happy that the bridge will be constructed. The bridge will not contravene the rights of any person.		NO
8.	Will the proposed land use / development compromise the "urban edge"? The area is completely rural in nature.		NO
9.	If the answer to any of the question 5-8 was YES, please provide further motivation / explanation – N/A.		
Benefits			
1.	Will the land use / development have any benefits for society in general?	YES	
2.	Explain: The construction of the bridge will serve as a safer mode of transport for community members and will enable them to gain access to essential social services such as schools, hospitals and clinics without using a boat as they currently do in order to cross the 55 m wide Pongola River. The nearest existing bridge is 12 km away.		
3.	Will the land use / development have any benefits for the local communities where it will be located?	YES	
4.	Explain: The construction of the bridge will serve as a safe mode of transport for community members and will enable them to gain access to essential social services such as schools and clinics without The nearest existing bridge is 12 km away and it is therefore a long and costly process to cross the river by car / taxi. The construction of the bridge will also enhance employment opportunities for local community members, by decreasing travel times and distances whilst increasing their mobility in general.		

3.2.1 Socio-Economic Value of the Activity

Table 3-6: Socio-economic value of the proposed project

Description	Value
What is the expected capital value of the activity on completion?	R26 Million
What is the expected yearly income that will be generated by or as a result of the activity?	N/A
Will the activity contribute to service infrastructure?	YES
Is the activity a public amenity?	YES
How many new employment opportunities will be created in the development phase of the activity?	10
What is the expected value of the employment opportunities during the development phase?	R1 million
What percentage of this will accrue to previously disadvantaged individuals?	100%
How many permanent new employment opportunities will be created during the operational phase of the activity?	N/A
What is the expected current value of the employment opportunities during the first 10 years?	N/A
What percentage of this will accrue to previously disadvantaged individuals?	N/A

4 PROJECT ALTERNATIVES

In terms of the EIA Regulations (2014) (as amended), 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.*

The EIA Regulations 2014 (as amended) require that alternatives are assessed for the listed activities applicable. In assessing alternatives to the proposed activity, in this instance, by way of implication, **Activities 12**, and **19** of GNR 983 (as amended by GNR 327) are considered.

Please note that the regulations are referred to by their 2017 gazette numbers, These are, however, noted as being amendments of the 2014 version of the EIA Regulations. Thus for completeness please note that Listing Notice 1 is in terms of GNR 983 (4 December 2014), as amended by GNR 327 (6 April 2017); Listing Notice 2 as GNR 984 (2014), amended by GNR 325 (2017); and Listing Notice 3 as GNR 985 (2014), amended by GNR 324.

Activities within Listing Notice 1 or 3 trigger the need for a Basic Assessment (BA) process, whilst those within Listing Notice 2 trigger the need for a full Scoping and Environmental Impact Assessment (S&EIR) process. Given the consideration in **Section 2.3.1** it is noted that a BA process is required, and that a S&EIR is not triggered.

The criteria, upon which the design of the bridge is based, includes numerous factors such as:

- Surrounding topography;
- The potential for erosion and / or scour;
- Geology and hydraulics of the river;
- Construction costs associated with dimensions of the bridge;
- Environmental sensitivities;
- Impact on the watercourse and surrounding floodplain;
- Impact to structure (predicted);
- Consideration of future maintenance of the structure;
- Socio-economic need; and
- Hydrology / Aquatics (curvature / meandering of the river, where a location that is limited in curvature is favoured).

In addition, it is best practice in Integrated Environmental Management (IEM) to consider the project in a holistic manner in order to ensure cumulative impacts are adequately addressed.

Therefore, alternatives for the location of the link road and bridge were considered. The diagram below (**Figure 4-1**) describes the process adopted in the selection and assessment of feasible alternatives of the location of the bridge structure, and has also been adapted to select and assess proposed locations.

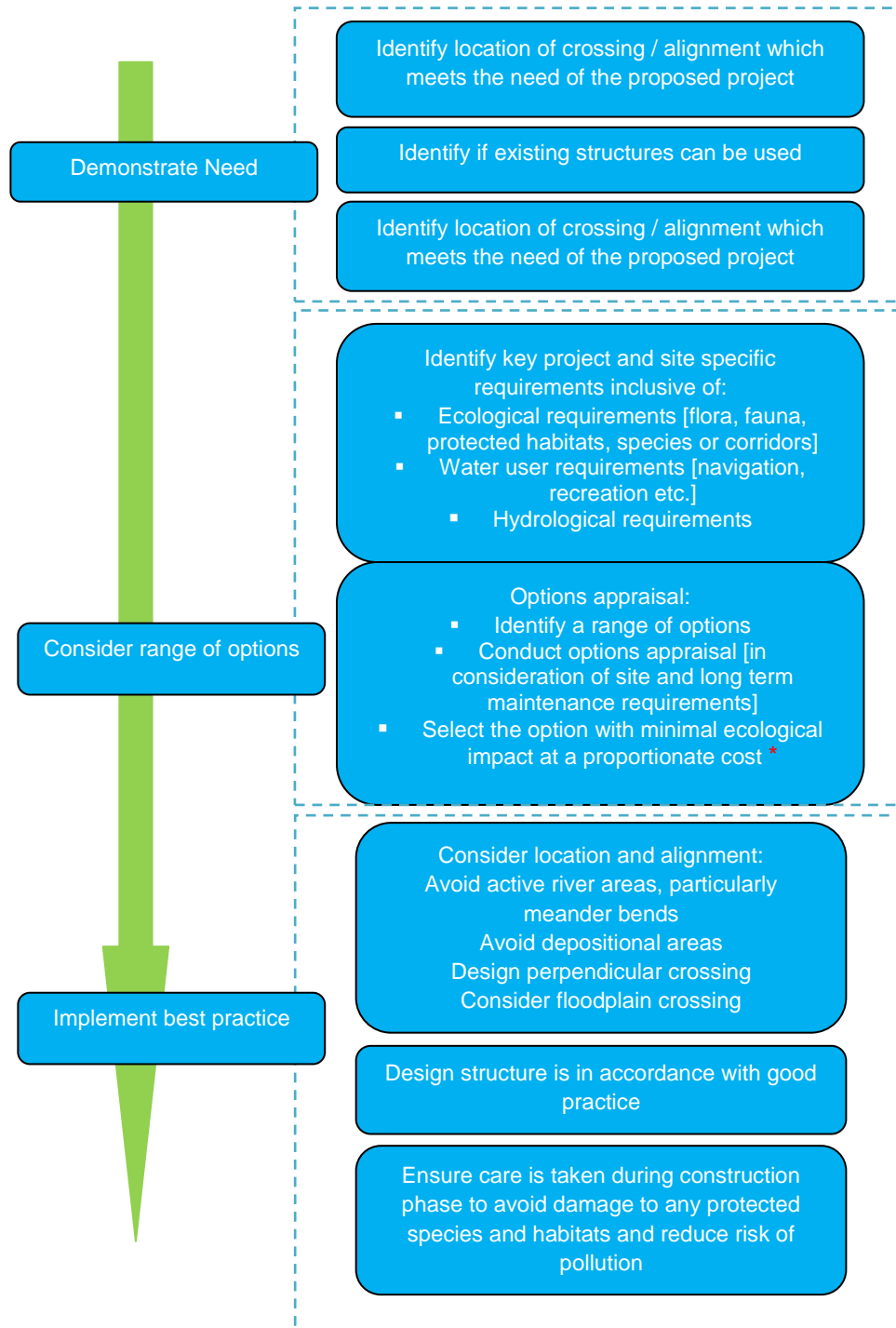


Figure 4-1: Best practice process for site selection

* In the consideration of cost-effective solutions, incurring significant costs to prevent significant environmental harm or achieve significant environmental benefits (e.g. safeguarding protected species and designated sites), would be considered proportionate. However, incurring significant costs for minor environmental benefits would be considered disproportionate.

Figure 4-1 demonstrates that when selecting an appropriate location for a river bridge crossing, several factors need to be considered. Initially, 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, which in this case are the Zinhlabeni and Mboza communities, whilst also taking into consideration where informal crossings currently are occurring.

In this way, the aspect of safety is also addressed, as the formal bridge crossing structure will cater to those community members who cross the river at personal risk.

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, where appropriate;
- (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.

Section 4.1 further explains the selection of the site of the bridge as determined by the above criteria considerations.

4.1 Site Alternatives

Site alternatives were not assessed in detail, as the proposed location is currently used as an informal crossing site and is therefore already disturbed by the communities accessing the area to cross the Pongola River by boat.

Additionally, Environmental Authorisation for a pedestrian bridge at the same location was granted on the 27th of November 2013 (**Ref No. DC/27/0009/2013**).

The community also requested vehicular bridge to be constructed in place of the pedestrian bridge and that the approach roads be improved.

A Preliminary Ecological Assessment was undertaken to identify the alignment which would have the least impact on the surrounding Flora and Fauna. The original alignment was therefore moved slightly at the request of the Ecologist in order to ensure the alignment was within the most disturbed portion of the receiving environment.

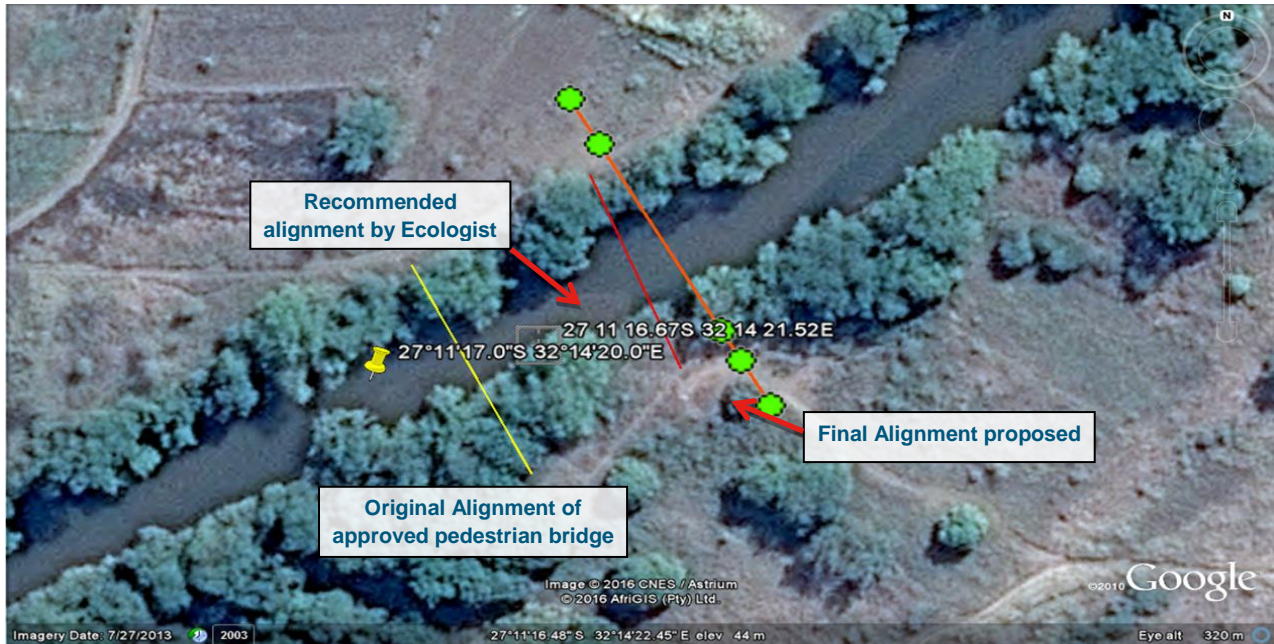


Figure 4-2: Alignment Options Considered

4.2 Layout and Design Alternatives

4.2.1 Alternative Structural Configurations

In selecting alternative structural forms, suitable for the new Pongola (Mboza) River Bridge, consideration has been given to the fundamental design goals applicable to new structures:

- Safety (strength, robustness, etc.);
- Durability, serviceability and sustainability;
- Economy;
- Constructability; and
- Aesthetics.

Safety, Durability, Serviceability and Sustainability

These four design goals are applicable to all structural forms considered and have to be satisfied regardless of the structural form selected.

Economy and Constructability

Economy and constructability are inter-related and by selecting the most appropriate structural system both these goals will be satisfied.

4.2.2 Alternative Structures Considered

Three alternative options were initially considered for the design of the bridge. These options are detailed below.

4.2.3 Option 1

A simply supported six span bridge (spans 6 x 13 m, total 78 m) has been proposed in order to provide sufficient waterway opening for the design flood and with the required freeboard.

The deck for this Option comprises a 900 mm deep reinforced concrete slab deck.

The reinforced concrete abutments are a box type design, to minimize the risk of scouring taking place on the road embankments immediately behind the abutments.

The piers comprise two columns with a top cross beam serving as a beam seating for the deck.

The piles will act as the columns.

Option 1 is not recommended because it requires a lot of staging in the main channel of an aggressive river (fast flowing at times and with high volumes and velocities of water).

4.2.4 Option 2:

This option is a simply supported five span deck (5 x 15 m, total 75 m) comprising precast reinforced concrete modified M3 beams in composite with an *in-situ* reinforced concrete slab.

This option reduces staging in the river, but requires a large crane on site for launching³ the beams. Each beam weighs approximately 12 tonnes.

Over and above the large crane, this option requires an access ramp for the crane. This access ramp would need to be located in the main channel of a very aggressive river.

The piers and abutments are similar to those used in Options 1 and 3.

Option 2 is not recommended because of access for launching the heavy concrete beams.

4.2.5 Option 3:

This option a simply supported six span composite concrete deck (6 x 13.0 m, total 78 m (un-propped)) comprising of standard steel girder beams, in composite with a 200 mm deck slab which gives the same waterway opening as for Options 1 and 2.

This option provides a more constructible solution (particularly given the remoteness of the area) as it does not require temporary works as required in Option 1 and it therefore reduces the amount of risk to the construction from working in 2 m (deep) water.

The steel beams only weigh about 1,5 tonnes, each.

The I-beams erection could be done by an excavator or TLB or a small crane and jacks.

The deck slab erection will not require scaffolding in the main channel.

The reinforced concrete abutments and piers are substantially similar in design to those used in Options 1 and 2.

This was initially the recommended Option based on constructability.

³ The lifting and placing of the beams in position.

All of these options were then revised after meetings with the Environmental Team as it was considered that five or six piers within the active channel would result in unacceptable negative environmental impacts, when the bridge could be built with fewer piers within the river.

4.2.6 Revised Structures Considered

The design of the bridge was then redesigned to include four piers (columns) within the active river channel. This was then reduced to three (3) piers (columns) within the active channel.

The Ecological and Aquatic specialist studies that were undertaken identified that piers within the active river channel were likely to have the most significant impact associated with this project.

The engineering team were requested to assess whether a two (2) pier option within the active river channel was possible, without compromising structural and safety aspects of the bridge design. They were able to design a two (2) pier (column) bridge, which will have a less severe impact on the river bed and associated flow characteristics of the Pongola River whilst maintaining the structural integrity of the bridge.

The two (2) pier (column) concrete option is the preferred alternative from an environmental impact perspective and the three, four, five and six pier (column) options were therefore not evaluated in further detail within the Basic Assessment Report.

Pier Design

The Pongola River is an aggressive working environment with regard to access and drainage. The River is perennial and at a minimum is approximately 2 m deep.

The engineering team have therefore proposed the use of piles as columns and only provide a cross beam to support the deck in all three options.

The proposed pile is an auger pile or driven cast *in-situ* pile, with a permanent casing.

The depth of the piles will be c.a. 18 m as per the geotechnical report.

4.3 No-go Alternative

The No-Go alternative, which means that the bridge will not be constructed, will mean the *status quo* will remain as is. The communities will have to continue to travel 12 km to the next nearest bridge crossing or continue to cross the river by boat when the river channel is full of water.

The primary goal of increased mobility as well as a safe and efficient access to essential services for the communities will not be met.

Existing transportation options such as using the bridge 12 km away are both costly and time consuming for these communities, whilst using a boat to cross the river poses a safety risk to all users.

Should the *status quo* remain, the direct and indirect positive socio-economic benefits to the surrounding communities will not be realised.

5 GENERAL DESCRIPTION OF THE STUDY AREA

5.1 Background to the Study Area

The proposed Pongola Bridge will link two Local Municipalities found within the uMkhanyakude District, namely, the Umhlabuyalingana Local Municipality (LM) and the Jozini Local Municipality.

The eastern end of the proposed bridge (towards the Umhlabuyalingana LM) will lead to the D1834 road (2.8 km away) and the Mboza clinic. The western end of the Bridge (towards Jozini Local Municipality) will lead to the D1836 (4.7 km away) and the Munyu primary school.

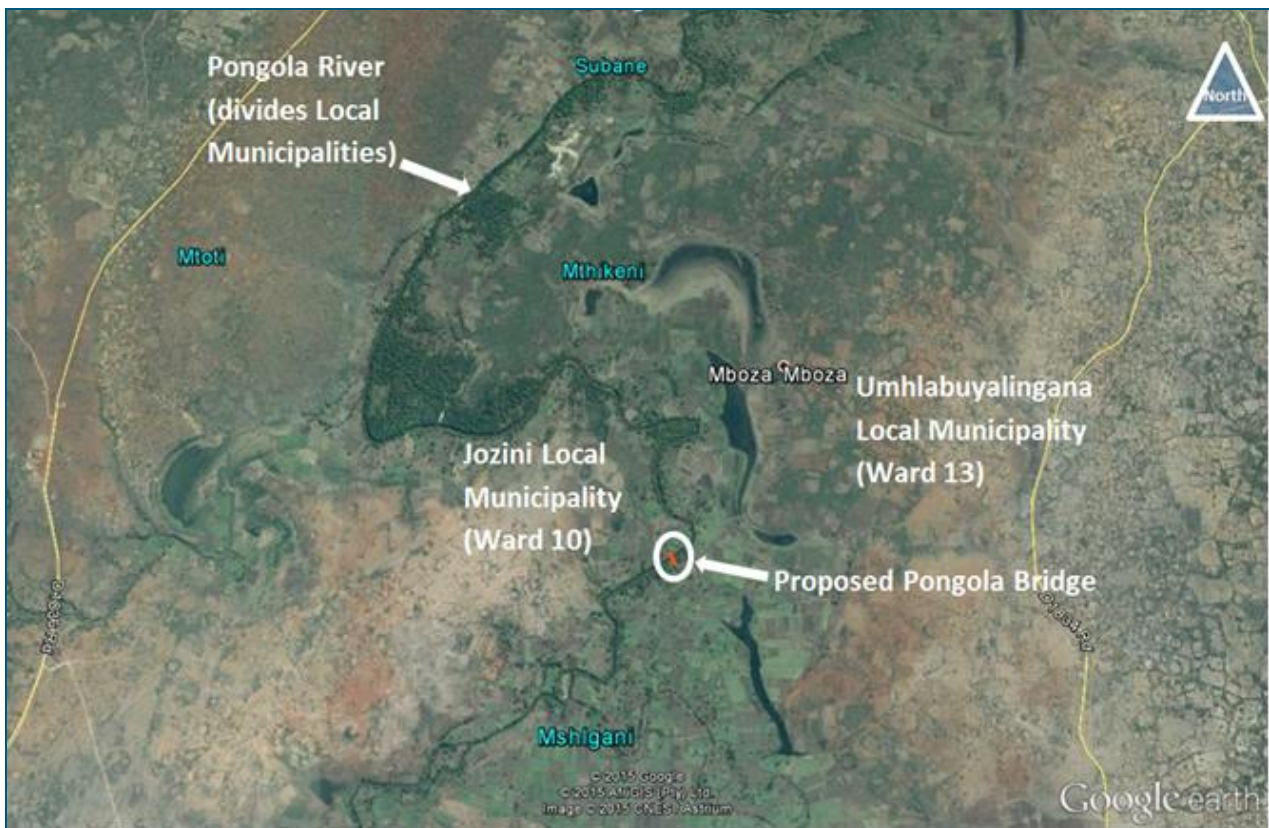


Figure 5-1: Spatial context of the proposed bridge site

Ward 13 within the Umhlabuyalingana Local Municipality is a very rural area, where residents have little access to services, formal housing and employment opportunities. The average income of households is R14, 600 per year while just over 10% of the Ward's working age population is reportedly employed, with 56% not economically active.

Ward 10 of the Jozini LM presents a very similar situation, where a large percentage of people living within the area are unemployed, with little education. The community for the most part do not have access to services such as, electricity and sanitation facilities.

5.2 Biophysical Environment

5.2.1 Regional and Local Biophysical Setting

The proposed bridge is located within the far northern part of KwaZulu-Natal (KZN) between the Swaziland and Mozambique borders, and further bordered by the Indian Ocean and a number of nature and game reserves i.e. Pongolapoort, Ndumo, Tembe Elephant Park, Kosi Bay, iSimangaliso (Greater St Lucia), Mkuze, and Zululand Rhino Reserves.

The region is divided from Swaziland by the Lebombo Mountains forming the high elevations to the west and is drained by the Pongolo River and its associated tributaries.

The floodplain adjacent to the Pongola River is heavily transformed by agricultural activities such as small-scale vegetable crops as well as fruit tree orchards.

5.2.2 Climate

Climate in the region varies considerably, with sub-humid to humid conditions and mean annual rainfall ranging between 600 mm and 1,500 mm. Rainfall occurs primarily during the summer months between December and February, with the average rainfall for January being, with June receiving an average of only of 3 mm.

The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Jozini range from 23.5°C in June to 30.3°C in January. The region is the coldest during June when the mercury drops to 9.1°C on average during the night.

Economic activity is diverse and includes rain fed and subsistence farming, irrigation, afforestation, ecotourism, and heavy industries in the Richards Bay / Empangeni area.

5.2.3 Geotechnical

Topography, Geology and Soils

The topography surrounding the proposed bridge site consists of the floodplain on either side of the river. The ground is level and flat and is primarily used for subsistence farming and agriculture. The proposed location for the bridge is approximately 47 metres above mean sea-level (mamsl). The topography rises gently away from the Pongola River in an easterly and westerly direction.

The boreholes during the Geotechnical study indicate that alluvial materials underlie the site for the entire depth of the boreholes, which largely have been terminated in sub-rounded to rounded pebbles and cobbles at depths ranging between 21.4 m and 22.51 m below existing ground level (EGL). It is inferred that the latter form a basal horizon that overlies the bedrock.

The alluvial sediments comprise predominantly Clays, Silty Clays, fine grained sandy Silts and Silty Sands, which are interlayered and laterally discontinuous. The Standard Penetration Test (SPT) 'Nf' values indicate that the clays are predominantly firm to stiff (Nf <15) to between 7 m and 11 m depth below EGL on the western abutment (Mboza Clinic), and, to between 11 m and 14 m below EGL on the eastern abutment (Munyu Primary School). Thereafter, the clays become stiff to very stiff and interlayered sands medium dense down to the basal "boulder" layer at depths greater than 21 m below EGL.

5.2.4 Vegetation

Terrestrial Vegetation

As the proposed Pongola (Mboza) River Bridge project is situated around rural homesteads and agricultural areas the majority of natural vegetation consisting of Western Maputaland Clay Bushveld (SVI 20) has been transformed into rural homesteads with small scale agricultural lands as well as livestock enclosures (kraals) or degraded through wood harvesting, bush encroachment as well as extensive overgrazing of forb and herb layers. The area is utilised in various ways ranging from houses to ploughed lands, kraals to cleared bushveld used for grazing purposes.

As a result the natural vegetation has become degraded and is mostly transformed. The vegetation thus is comprised of a mixed but mainly compound leaved low (5-10 m) woodlands and wooded grasslands (i.e. savanna).

The proposed Pongola (Mboza) River Bridge site is situated within a transformed section of Lowveld Riverine Forest within the riparian zone of the Pongola River as well as the adjacent heavily transformed Subtropical Alluvial Vegetation within the floodplain. Large sections have been completely transformed due to small-scale agricultural activities within the Pongola floodplain.

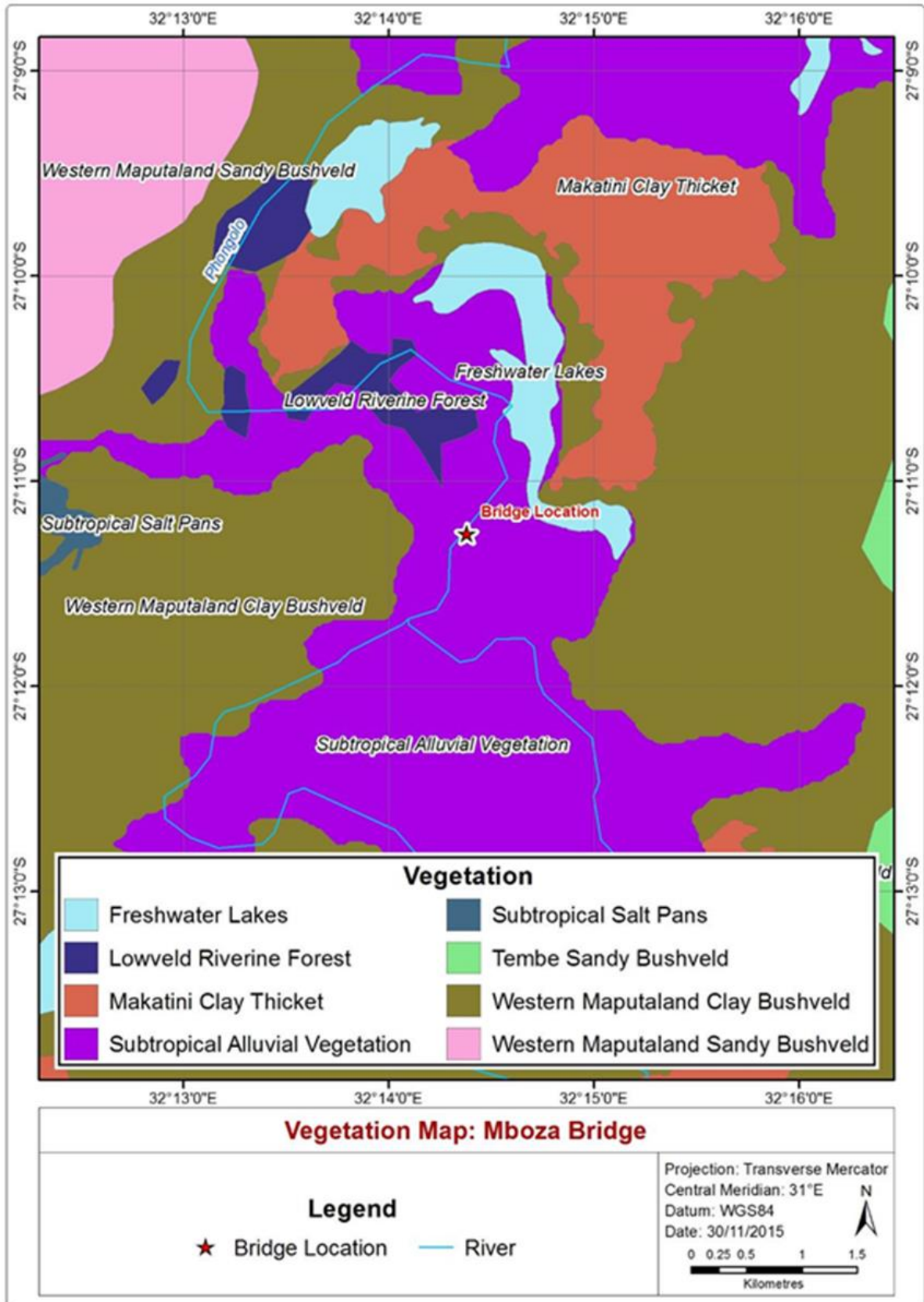


Figure 5-2: Vegetation map of the Pongola (Mboza) River bridge site

5.2.5 Fauna

The majority Western Maputaland Clay Bushveld within the adjacent rural-agricultural homesteads is in various stages of transformation and degradation. Scattered indigenous tree species as well as extensive thickets and bush-encroached areas occur.

The Subtropical Alluvial Vegetation within the extensive floodplain of the Pongola River has been extensively utilized for small-scale agricultural activities. The grass, herb and forb layer suffer from extensive overgrazing, mostly from goats and cattle. Cattle were observed grazing within the floodplain, as well as the seasonal and permanent pans. The cattle's grazing and trampling activities result in the compaction and erosion of hydric soils and damage to the hygrophilous vegetation. However, the opportunistic feeding patterns of goats can have a severe impact on both the composition and productivity of this eco-region. In addition, goats are known to be more destructive than cattle at higher stocking densities (**Skead 1988**).

High livestock densities also pose a considerable threat to wildlife, since high numbers of domesticated animals generally cause a displacement of game, as there is less suitable habitat available.

Furthermore, wild predators and scavengers such as the Black-backed Jackal, Caracal, Leopard, and the White-Backed Vulture, have been eradicated by livestock farmers who see these animals as a threat to their livelihoods. Poisoned carcasses are often used for this purpose; this method is indiscriminate and therefore poses considerable threat to all predators and scavengers; especially the threatened Cape Vulture.

Poaching and illegal hunting (dogs) are further reducing the remnant faunal populations.

The remaining Riverine Forest adjacent to the Pongola River offers suitable habitat for several faunal species, especially birds.

A preliminary faunal survey was undertaken and focused mainly on mammals, birds, reptiles and amphibians of the study area. The survey focused on the current status of threatened animal species occurring, or likely to occur within the study area.

5.2.6 Hydrology

The total catchment of the Pongola River at the Mboza Site is 8,903 km² with a longest collector of 376 km. However the flow at the site of the bridge is controlled by sluice gates. The flow at this site comprises of water released from the Pongolapoort Dam and the flow from the catchment downstream of the dam. The releasing is done annually in September / October and released water volumes are accurately measured.

The catchment downstream of the dam is 1,114 km² with the longest collector being 53 km. Because the catchment is fairly large, the Standard Design Flood Method was utilised to evaluate the flows downstream of the dam; these flows were added to the flows from the opened sluice gates to provide the volumes used for design purposes.

Table 5-1 below, shows the flows released from the dam and the flows from the catchment between the bridge and the dam.

Table 5-1: Parameters for Pongola-Mboza Catchment

Hydrological parameters for the catchments												
Pongola-Mboza												
Description	Catchment properties				Flood return period (years)							
	Area (km ²)	Length of longest water-course km	1085 height m	Basin No.	2	5	10	20	25	50	100	200
Pongola-Mboza Measured DWAF Flows from dam			740	28	192	834	1,200	1,652	1,800	2,300	2,757	3,229
Pongola-Mboza flows from catch D/S of Dam	1,114	53	740	28	127	366	569	795	900	1,152	1,476	1,843
Pongola-Mboza Total (1+2) cumecs	8,903	376		28	319	1,200	1,769	2,447	2,700	3,452	4,233	5,072
Flow Level					37.4	38.2	38.6	38.9	39.0	39.2	39.5	39.7

The sum totals of the flows at the bridge site were extracted from the table above and are summarised below.



Figure 5-3: Summary of water flows at Pongola Bridge site

The Pongola River downstream of the dam comprises a main channel and wide flood plains ranging from 0.5 km to about 5 km in width. At this particular site the main channel is 55 m wide by 3 m deep and the flood plain to the east is about 1.5 km and that to the west is about 1.0 km.

- 200 m to the south of this site there is a 2 m deep (by 50 m wide) channel in the flood plain on the east making it impossible to position the bridge on the south.
- Further south (1.2 km) the main channel meets a tributary from the east and this makes moving the bridge in a southerly direction unviable as then several bridges would be required.
- 200 m to the north of this site there is a 2 m deep by (50-100 m) wide channel in the flood plain on the east making it impossible to position the bridge to the north of this site.
- Further north (1.2 km) the main channel meanders to the west and also meets a tributary coming from the west and this makes moving the bridge north impossible.

Floodlines

The 1:100 year flood is at level 39.45 m while the highest observed flood level is 39.52 m. It is evident that all settlements are above the 45 m level and are thus not within the flood line.

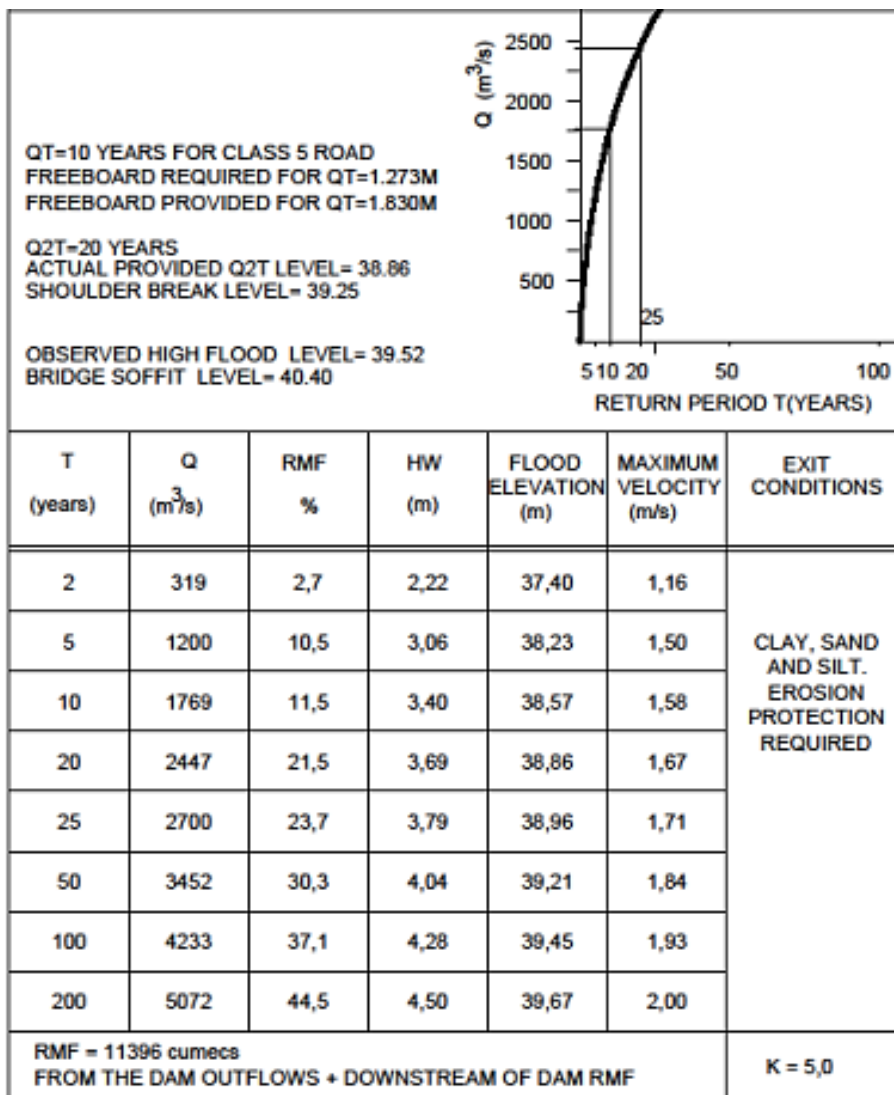


Figure 5-4: Bridge flood flows and flood levels

5.2.7 Usutu to Mhlatuze Water Management Area

The proposed bridge construction project area falls within the Lowveld aquatic ecoregion and the Mfolozi / Pongola catchment (quaternary catchment W45A).

The Usutu to Mhlatuze WMA falls predominantly within northern KwaZulu-Natal. However, a part of it extends into Mpumalanga and borders Swaziland and Mozambique. Two rivers are shared with these countries. The Usutu River has its headwaters in South Africa but flows into Swaziland, whilst part of the Pongola River catchment also lies in the latter country. The two rivers flow together within South Africa to form the Maputo River just prior to entering Mozambique.

Water resources have been well developed in the Upper Usutu, Mkuze and Mhlatuze catchments. However, undeveloped potential exists in the Pongola and Mfolozi catchments. Ground water utilisation in most parts of the water management area is relatively limited and can be developed further. Strong interdependencies between surface and groundwater occur in many areas, with groundwater levels, together with surface flows, being particularly important to water balances in the ecologically sensitive coastal lakes and wetlands, some of which are internationally recognised conservation areas.

5.2.8 Sensitive Habitats

Rivers and streams / drainage lines are longitudinal systems with impacts affecting both upstream and downstream habitat. The entire seasonally inundated or non-perennial drainage lines and their associated indigenous dominated riparian vegetation must be considered as sensitive habitats. Any impact on the riverine area within the study area is therefore also likely to impact on up-stream and downstream areas.

Riparian zones have the capacity to act as biological corridors connecting areas of suitable habitat for birds (**Whitaker & Metevecchi, 1997**), mammals (**Cockle & Richardson 2003**) reptiles and amphibians (**Maritz & Alexander 2007**). Riparian zones may act as potential refugia for certain fauna and could allow for possible re-colonisation of rehabilitated habitats. The riparian vegetation plays a vital role in the re-colonisation of aquatic macro-invertebrates as well as reptiles and amphibians (**Maritz & Alexander 2007**).

The riparian vegetation provides vital refuge, foraging and migratory passages for species migrating to and away from the rivers. The riparian zone comprises plant communities which are contiguous to and affected by surface and subsurface hydrological features of perennial or intermittent water bodies (i.e. rivers and streams).

The riparian vegetation is dependant on the river for a number of functions including growth, temperature control, seed dispersal, germination and nutrient enrichment. Riparian vegetation comprises a distinct composition of species, often different from that of the surrounding terrestrial vegetation. Tree species are positioned according to their dependence or affinity for water, those with the greatest affinity for water are generally located closest to the river channel, often with their roots in the water, and the less water-loving terrestrial species further away from the river.

5.2.9 Wetland Ecological Description

The National Freshwater Ecosystem Priority Areas (NFEPA), database was consulted to define the aquatic ecology of the wetland feature systems close to or being traversed by the proposed bridge that may be of ecological importance.

Applicable aspects are discussed below:

- The proposed bridge infrastructure falls within the Usutu to Mhlatuze Water Management Area (WMA). Each Water Management Area is divided into several sub-Water Management Areas

(subWMA), where catchment or watershed is defined as a topographically represented area which is drained by a stream or River network. The subWMA indicated for the project footprint is the Pongola subWMA.

- The subWMA is not regarded important in terms of fish rehabilitation, translocation and relocation zones for fish, however it is considered as an important fish sanctuary for *Hydrocynus vittatus*. The subWMA is further classified as a fish support area.
- According to the NFEPA database, the proposed bridge and road infrastructure are located within a natural floodplain wetland.
- The wetland features are indicated to fall within Category C (percentage natural land cover 25-75%; PES equivalent: moderately modified).
- The wetland feature is further classified as a WETFEPa, with particular importance of being located within 500 m of an important waterbird point locality as well as a RAMSAR wetland.
- The “wetveg” type is identified as Lowveld Group 10, listed as endangered.

This information is represented in graphic format in **Figure 5-4**, **Figure 5-6** and **Figure 5-7**.

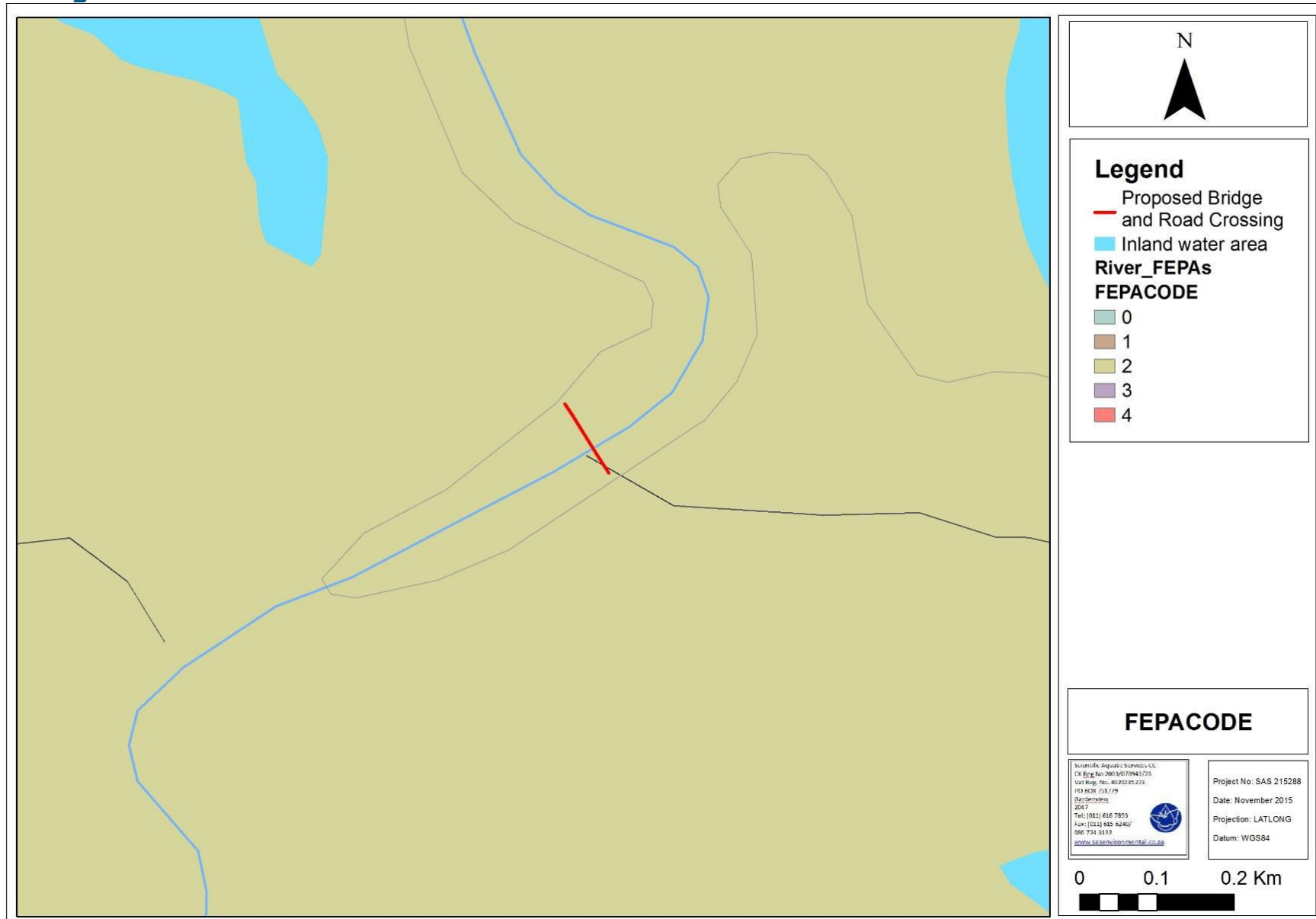


Figure 5-5: The subWMA associated with the proposed bridge infrastructure are classified by the NFEPA database as a Fish support area

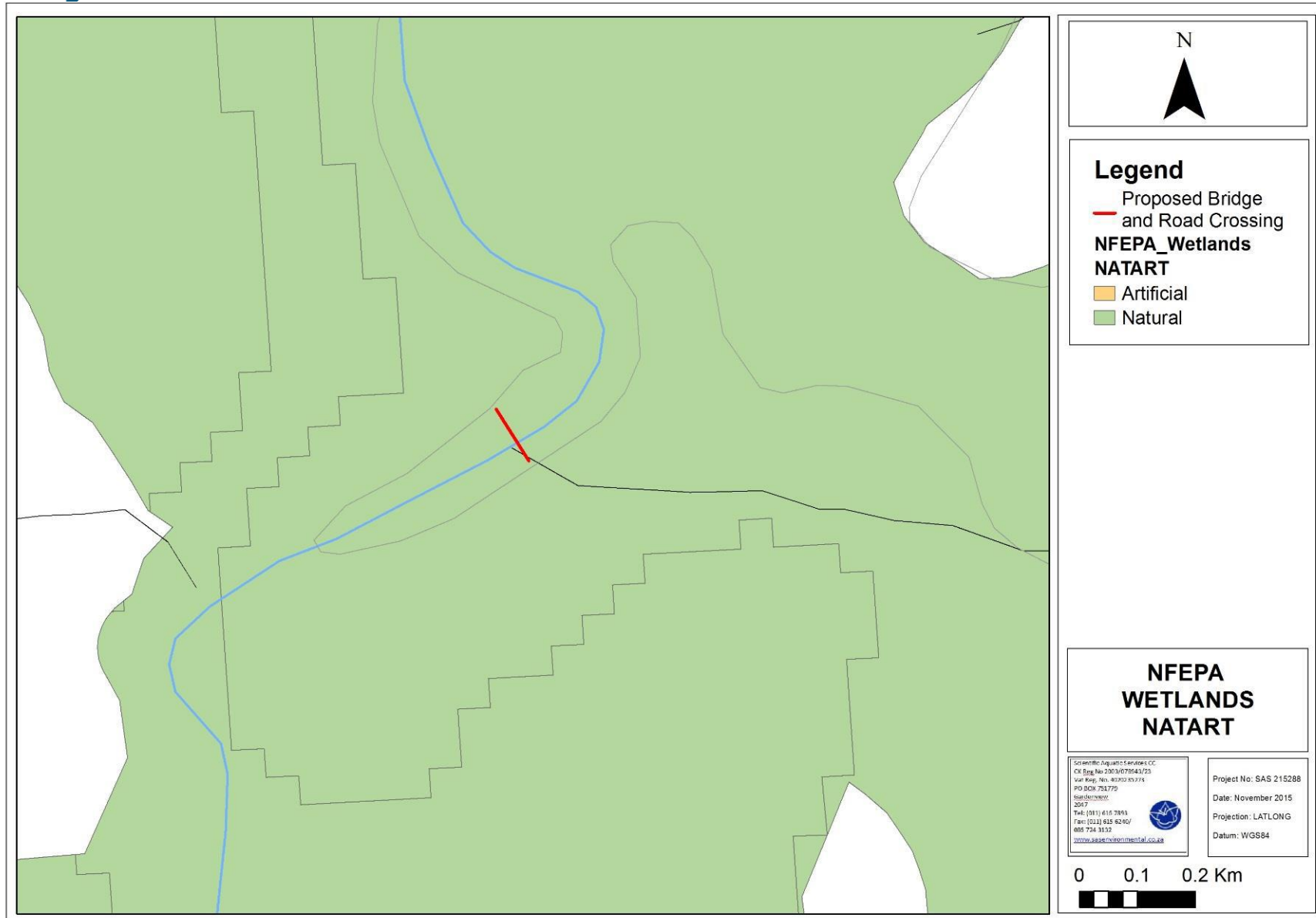


Figure 5-6: Natural wetlands associated with the proposed infrastructure according to the NFEPA database

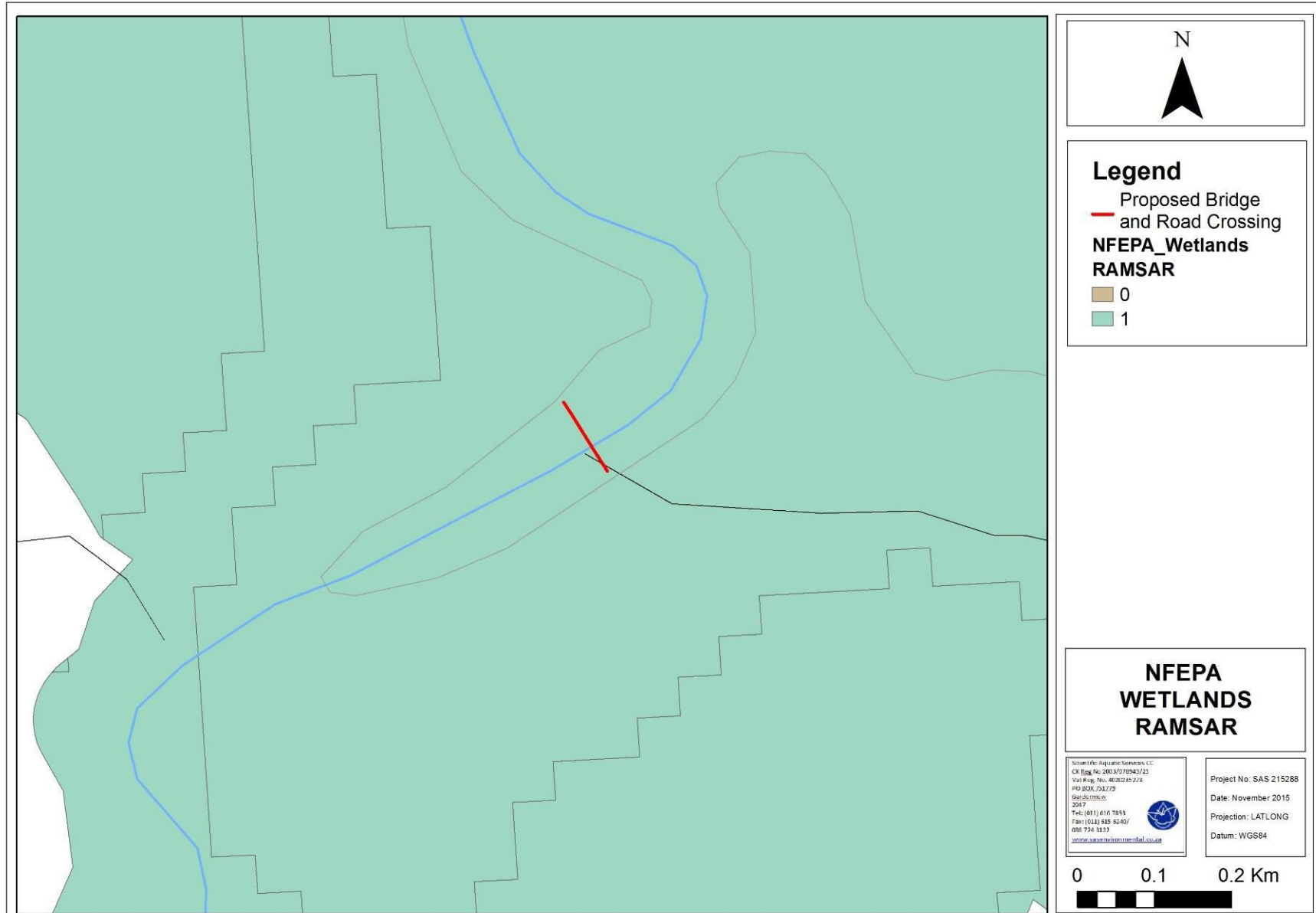


Figure 5-7: The wetlands surrounding the proposed bridge infrastructure are classified as RAMSAR wetland

5.3 Socio-economic Environment

The project site is found in the overlapping jurisdiction of the Umhlabuyalingana Local Municipality (LM) (Ward 13) and the Jozini LM (Ward 10), within the uMkhanyakude District Municipality in the province of KwaZulu Natal.

The particular challenges faced by local residents (due to the proposed development) which may affect their lifestyles or livelihoods (whether of a positive or negative consequence), can only be ascertained when viewed in context of their everyday lives. The most credible data that lends to such an understanding has been assimilated and presented by Statistics South Africa via the 2011 South African Country Survey. Relevant results for the said Wards are presented within this section. The results for both relevant Wards are similar due to their proximity and rural nature.

5.3.1 Ward 13 Umhlabuyalingana Local Municipality

According to Census 2011, produced by Statistics South Africa, there are 8,113 people living in Ward 13 of the Umhlabuyalingana LM. The median age in the Ward is 16 years, with 53% of the Ward's population under the age of 18 years. This is reflective of a very young population. Fifty four (54%) percent of the population are recorded as 'female.'

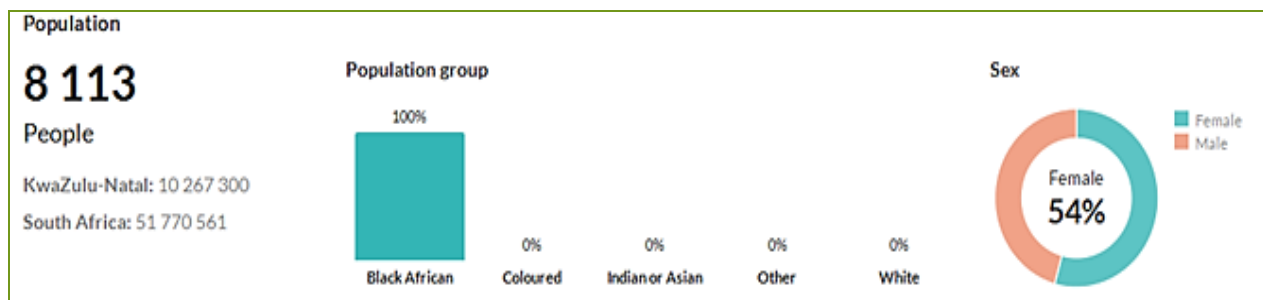


Figure 5-8: Ward 13 population

Heads of households are primarily female (54%). This may be ascribed to a number of reasons, although the primary reason may be that many working age men, tend to migrate to the larger cities in search of work, leaving the female of the household in charge.

The average income of households is R14, 600 per year. When assessed further one can estimate that each household is living off approximately \$3 per day. This is well below the United National Poverty assessment of the 'breadline' conditions of \$2 per person, per day, bearing in mind that the average household in the Ward supports at least five people.

An estimated 51% of the Ward's population utilise the local water service provider for access to potable water. A small percentage, 14.6% utilise water from nearby rivers. Very few homes in the Ward have access to electricity supply (7%), and a small number of homes have access to chemical / flush toilets (44%). Over 34% of Ward residents still utilise pit latrines and bucket toilets, while almost 19% reportedly have no access to any form of toilet facility.

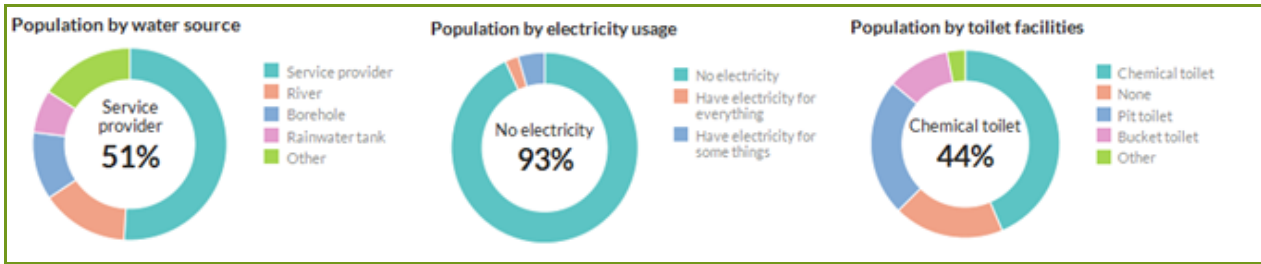


Figure 5-9: Services Provision

Just over 10% of the Ward’s working age population is reportedly employed, with 56% not economically active. This is indicative of a subsistence based economy, where residents are ‘living off the land’. This kind of food insecurity will leave the Ward’s population very vulnerable during times of severe climatic changes such as droughts and floods. Ninety two percent (92%) of the small number of employed individuals reportedly work in the formal sector within the Ward, with a small percentage (7.6%) in the informal sector.

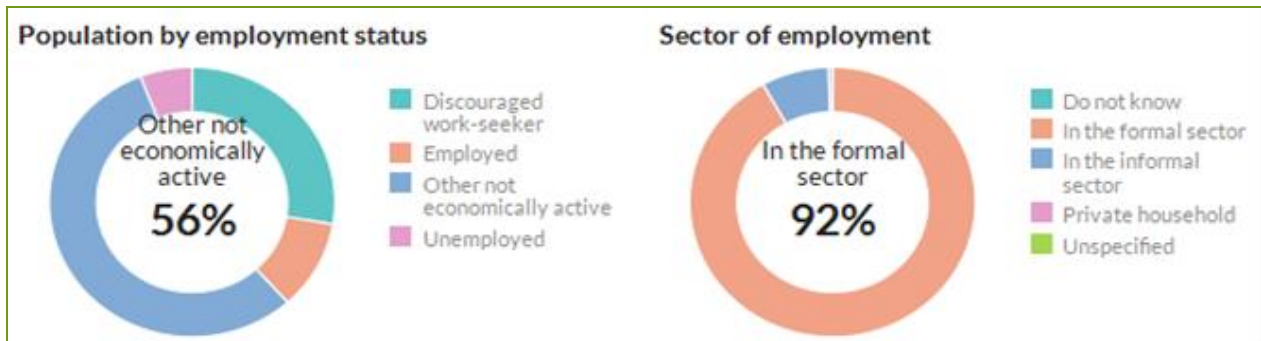


Figure 5-10: Ward 13 Employment

Slightly over 42% of the Ward’s population have completed Grade 9 or a higher educational level, with just over 18% of that figure completing Grade 12 or a higher educational level. Thirty three (33%) of individuals have never been to school. These statistics are indicative of a very high uneducated population, higher than the province’s and national average.

5.3.2 Ward 10 Jozini Local Municipality

According to Census 2011, produced by Statistics South Africa, there are 11,085 people living in Ward 10 of the Jozini LM. The median age in the Ward is 16 years, with 54% of the Ward’s population under the age of 18 years. This is reflective of a very young population. Fifty five percent (55%) of the population are recorded as ‘female.’

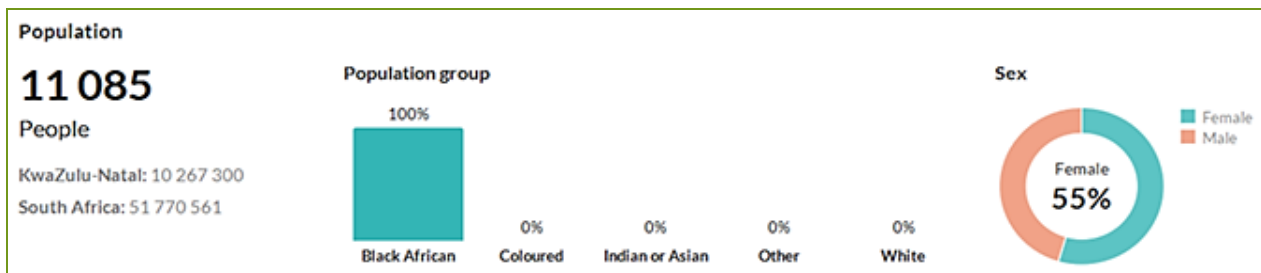


Figure 5-11: Ward 10 Population

Heads of households are primarily female (56.5%). This may be due to a number of reasons, although the primary reason may be that many working age men tend to migrate to the larger cities in search of work, leaving the female of the household in charge.

The average income of households is R14, 600 per year. When assessed further one can estimate that each household is living off approximately \$3 per day. This is well below the United National Poverty assessment of the ‘breadline’ conditions of \$2 per person, per day, bearing in mind that the average household in the Ward supports at least five people.

An estimated 45% of the Ward’s population utilise the local water resources that are freely available due to poor access to tapped water. Very few homes in the Ward have access to electricity supply, and an even smaller number of homes have access to chemical / flush toilets. Over 50% of Ward residents still utilise pit latrines.

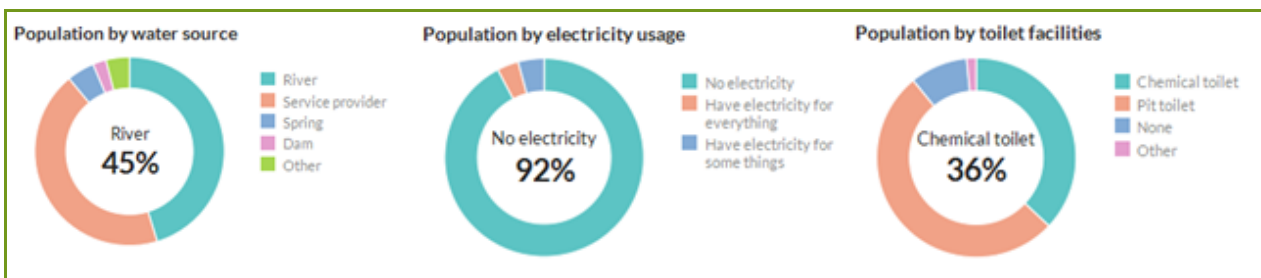


Figure 5-12: Services Provision

Just over 7% of the Ward’s working age population is reportedly employed, with 61% not economically active. This is indicative of a subsistence based economy, where residents are ‘living off the land’. This kind of food insecurity will leave the Ward’s population very vulnerable during times of severe climatic changes such as droughts and floods. Eighty four percent (84%) of the small number of employed individuals reportedly work in the formal sector within the Ward, with a small percentage (12%) in the informal sector.

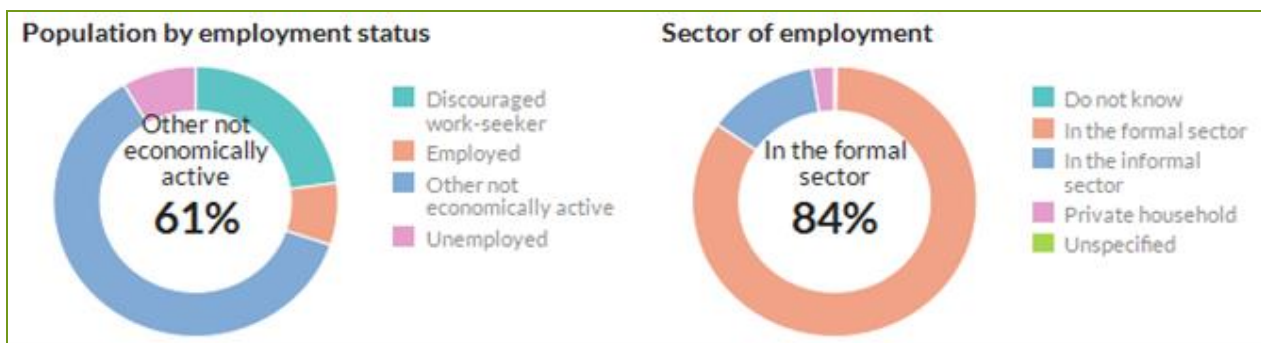


Figure 5-13: Ward 10 Employment

Slightly over 41% of the Ward’s population have completed Grade 9 or a higher educational level, with almost 25% of that figure completing Grade 12 or a higher educational level. Slightly over 36% of individuals have never been to school. These statistics are indicative of a very high uneducated population, higher than the province’s and national average.

5.3.3 Background to the Cultural Heritage of the Area

The greater Maputaland is endowed with heritage sites of various traditions and periods spanning the Stone Ages, Iron Ages, and the Historical Period. However, the majority of these occur to the west of the Pongola River in the foothills of the Lebombo Mountains.

A second large concentration occurs adjacent to, and on the dune cordon along the coastline. The coastal plain by contrast to the rest of Maputaland, is devoid of known archaeological sites.

Oliver Davies, an archaeologist who conducted pioneering research and surveys in northern KwaZulu Natal in the 1960's and 1970's, commented that the coastal plain was unpromising for archaeological research due to its being covered by superficial sands and bush coverage which affect preservation and visibility (**Avery 1980**). By contrast, the foothills of the Lebombo in the vicinity of Ingwavuma lying to the west of the study area, is well endowed with archaeological sites. The provincial heritage data base of the KwaZulu-Natal Museum lists twenty nine sites in the Ingwavuma magisterial district. These include Early Stone Age, Middle Stone Age, Later Stone Age, and Later Iron Age sites.

Only a handful of Later Stone Age sites have been recorded in the greater Maputaland. These relate to San hunter-gatherers or, their immediate ancestors. The stone tool technology is smaller, and more diverse and specialised, than those made during the Middle Stone Age.

Apart from human history the greater Maputaland also has extensive fossil deposits and geomorphology dating back to the Cretaceous, Tertiary and Quaternary periods. The Cretaceous fauna yielded by sequences includes ammonites, bivalves, gastropods, and nautiloids in abundance. Vertebrates are uncommon, only fish and reptiles being noted so far. Plant remains are relatively abundant in the form of logs and lignite chips. The Tertiary limestone deposits contain marine macro-fossils, calcareous nannofossils and planktic foraminifers (**Avery 1980**). Shell imprints have been found imprinted in concretions to the immediate south of Thembe Elephant Park and may therefore palaeontological significance (Anderson 2008).



Figure 5-14: Rural homestead with livestock pen and cultivated fields

6 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 326) under the NEMA (as amended).

The public participation process for proposed Pongola (Mboza) River Bridge project is undertaken according to the phases outlined below.

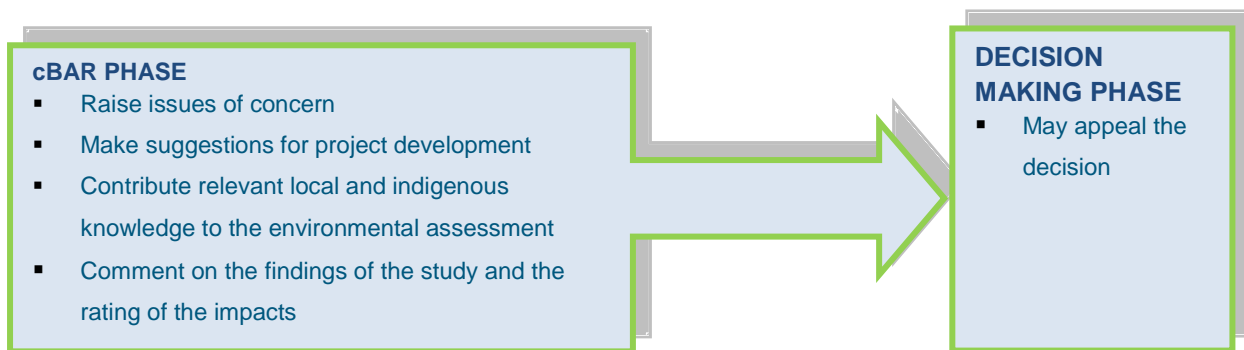


Figure 6-1: Responsibilities of I&APs in the different PPP stages

Figure 6-2 (below) depicts the approach taken by Royal HaskoningDHV, where one way information flow is avoided and information exchange is promoted, thereby enabling a higher level of engagement.

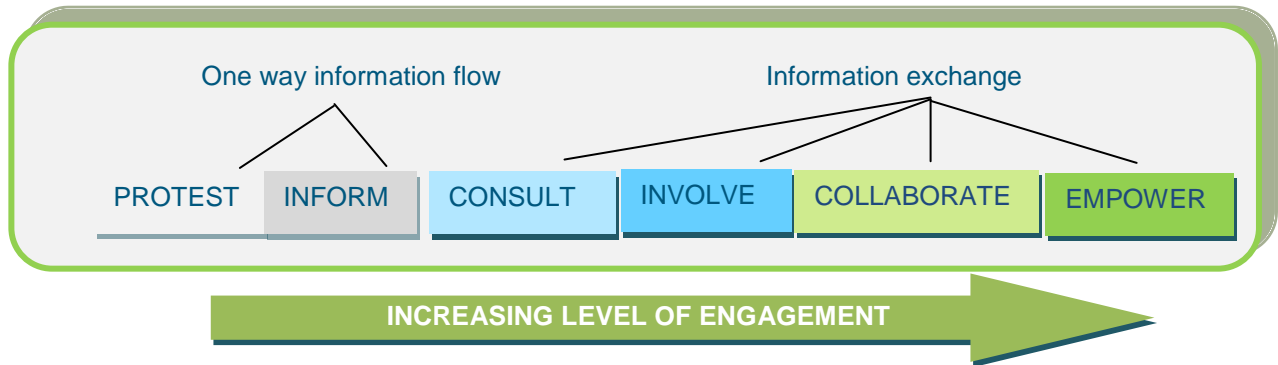


Figure 6-2: Stakeholder engagement spectrum (DEAT, 2002)

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 of the Basic Assessment Process, and it is noted that there are different categories of stakeholders that must be engaged, from the different levels and categories of government, to relevant structures in the non-governmental organisation (NGO) sector, to the communities living within the wards 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 Councils. 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 Background Information Documents (BIDs); and
- Where appropriate site visits may be organised, as well as targeted coverage by the media.

6.1 Authority Consultation

The competent authority which is the KZN EDTEA, is required to provide an environmental authorisation (EA) (whether positive or negative) for this proposed 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 meeting and site visit undertaken with Ms Felicia Mdamba from KZN EDTEA (uMkhanyakude District) held on the 7th of June 2016.
- Due to the time lapse, KZN EDTEA requested a follow up Pre-Application meeting and site visit, which was undertaken with Ms Felicia Mdamba on the 7th of June 2017.
- Submission of an application for environmental authorisation in terms of Section 26 of the EIA Regulations 2014 (as amended) on 27 June 2017.

6.2 Consultation with Other Relevant Stakeholders

Consultation with other relevant key stakeholders were, and will continue to be undertaken through telephone calls and written correspondence in order to actively engage these stakeholders 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 encouraged and allowed an opportunity to comment on the cBAR.

The identified stakeholders of this project are provided in Table 6-1 below.

Table 6-1: Key stakeholders

OWNERS AND OCCUPIERS OF LAND ADJACENT TO THE SITE	
Title Deed Land Owners are: The Republic of South Africa and Regional and Land Affairs.	
Tribal Authority on either side of the Pongola River are the following: Chief Vilane Phosani Joseph (within uMhlabuyalingana Local Municipality) Chief Madevu Mpontshane (within Jozini Local Municipality)	
LOCAL AUTHORITY	
Vusi T; Gcinani Ndaba	uMkhanyakude District Municipality
Siboniso Myeni	Jozini Local Municipality
Town planning - Ziyanda	uMhlabuyalingana Local Municipality
J.B Gwala	Umhlabuyalingana Local Municipality Ward 13 Councillor
Jabulani Mkhwmubi	Jozini Local Municipality Ward 10 Councillor
STATE DEPARTMENTS	
Ms. Weziwe Tshabalala	AMAFA KwaZulu-Natal
Mrs. Felicia Mdamba	KwaZulu-Natal Department of Economic Development and Environmental Affairs
Ms. Modise / Mr Wiseman Rozani	KwaZulu-Natal Department of Agriculture, Forestry and Fisheries
Ms Dinesree Thambu / Mr Dominic Wieners	Ezemvelo KZN Wildlife
Ms. Shamilla Ramburan	National Department of Water and Sanitation

Please refer to Appendix E for further details.

6.3 Site Notification

The EIA Regulations 2014 (as amended) 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. Additional site posters should be fixed 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.

Please refer to **Appendix E** for details.

6.4 Identification of Interested and Affected Parties

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

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

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

6.5 Briefing Paper

A briefing paper or BID for the proposed project was compiled in English (refer to **Appendix E**) and distributed to key stakeholders.

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.

6.6 Focus Group Meetings

A public meeting will not be held. Following consultation with KZN EDTEA, the EAP convened a Focus Group Meeting with the local Traditional Council (as representatives of all local I&APs affected by the proposed project) and the relevant Ward Councillors.

These Focus Group Meetings were held on the 13th of June 2017. The first meeting was held with the Traditional Chief and Ward Councillor within the Jozini Local Municipality. The second meeting, held later on the same day, was with the Traditional Chief and Ward Councillor within the uMhlabuyalingana Local Municipality.

Key outcomes of the meeting included the following:

- All participants indicated that they knew about the project and had first heard about it in 2011;
- All participants were fully supportive of the proposed bridge;
- They queried the delay in completion of the project since 2011;
- The only question raised was by the Councillor for Ward 13 of the Umhlabuyalingana Local Municipality, who queried whether the bridge will be a vehicular bridge, as he was unsure whether it was still a pedestrian bridge only.

6.7 Advertising

In compliance with the EIA Regulations 2014 (as amended), notification of the commencement of the BA process for the project will be advertised in the Isolezwe newspaper in isiZulu (only). The advert will appear in the newspaper on the 14th of July 2017.

I&APs will be 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.

6.8 Issues Trail

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

The only comments, issues and queries raised thus far in the process are captured below, in Section 6.9.

An Issues Trail will be compiled and will include all comments received and responses provided to date.

6.9 Key Issues Raised by the Public (Summarised)

A comment raised at the focus group meeting with the Traditional Chief and Councillor for Ward 10 of the Jozini Municipality held on the 13th of June 2017, was as follows:

- Both the Chief and Councillor indicated that they are very happy with the proposed bridge. They also stated that they have known about the bridge since 2011 and to date nothing has been constructed, so they doubt that the bridge will ever be constructed.

The only question raised at the focus group meeting held with the Traditional Chief and Councillor for Ward 13 of the Umhlabuyalingana Local Municipality held on the 13th of June 2017 was whether the bridge will be a vehicular bridge. They had also known about the proposed bridge for a long time, although they were unsure as to whether it was still a pedestrian bridge only.

Further comments will be captured when received during the BA process.

6.10 Public Review of the draft Consultation BAR

All registered I&APs will be notified of the availability of the report, electronically and through the local Traditional Councils (as representatives of all local I&AP's affected by the proposed project).

The cBAR will be made available for authority and public review for a total of **30 days** from **14 July 2017 to 14 August 2017**.

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

- The local Traditional Authority;
- Jozini Local Municipality (Circle Street , Bottom town, Jozini) and
- uMhlabuyalingana Local Municipality (Main Road R22, KwaNgwanase)

In addition, the reports will be available for viewing in electronic format;

- Electronically on the Royal HaskoningDHV Website: www.rhdhv.co.za

6.11 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 cBAR (i.e. final cBAR) will be the product of all comments and studies, before being submitted to KZN EDTEA for review and decision-making.

7 SUMMARY OF SPECIALIST FINDINGS AND EXISTING IMPACTS

7.1 Biophysical Environment

7.1.1 Terrestrial Vegetation Assessment

Mr. Clayton L. Cook, an Independent Ecological Consultant, was appointed by Royal HaskoningDHV (RHDHV) to undertake a specialist ecological assessment for the proposed Pongola (Mboza) River Bridge.

The vegetation comprises of a mixed but mainly compound leaved short (5-10 m) woodlands and wooded grasslands. A few large indigenous tree species are scattered around the homesteads including *Senegalia* (*Acacia nigrescens*), *Schotia brachypetala*, *Spirostachys africana*, and *Ziziphus mucronata*. Several large protected Marula (*Sclerocarya birrea* subsp. *caffra*) were observed adjacent to the road reserve as well as close to the homesteads.

Table 5 1: Vegetation units observed around the proposed Pongola (Mboza) River Bridge site.

PONGOLA (MBOZA) RIVER BRIDGE					
	Vegetation Type	Conservation Target	Protected	Remaining	Conservation Status
Foa 1	Lowveld Riverine Forest	100 %	50 %		Critically endangered
Aza 7	Subtropical Alluvial Vegetation	31 %			Least threatened
SVI 20	Western Maputaland Clay Bushveld	19 %	11.30 %	65.70 %	Vulnerable

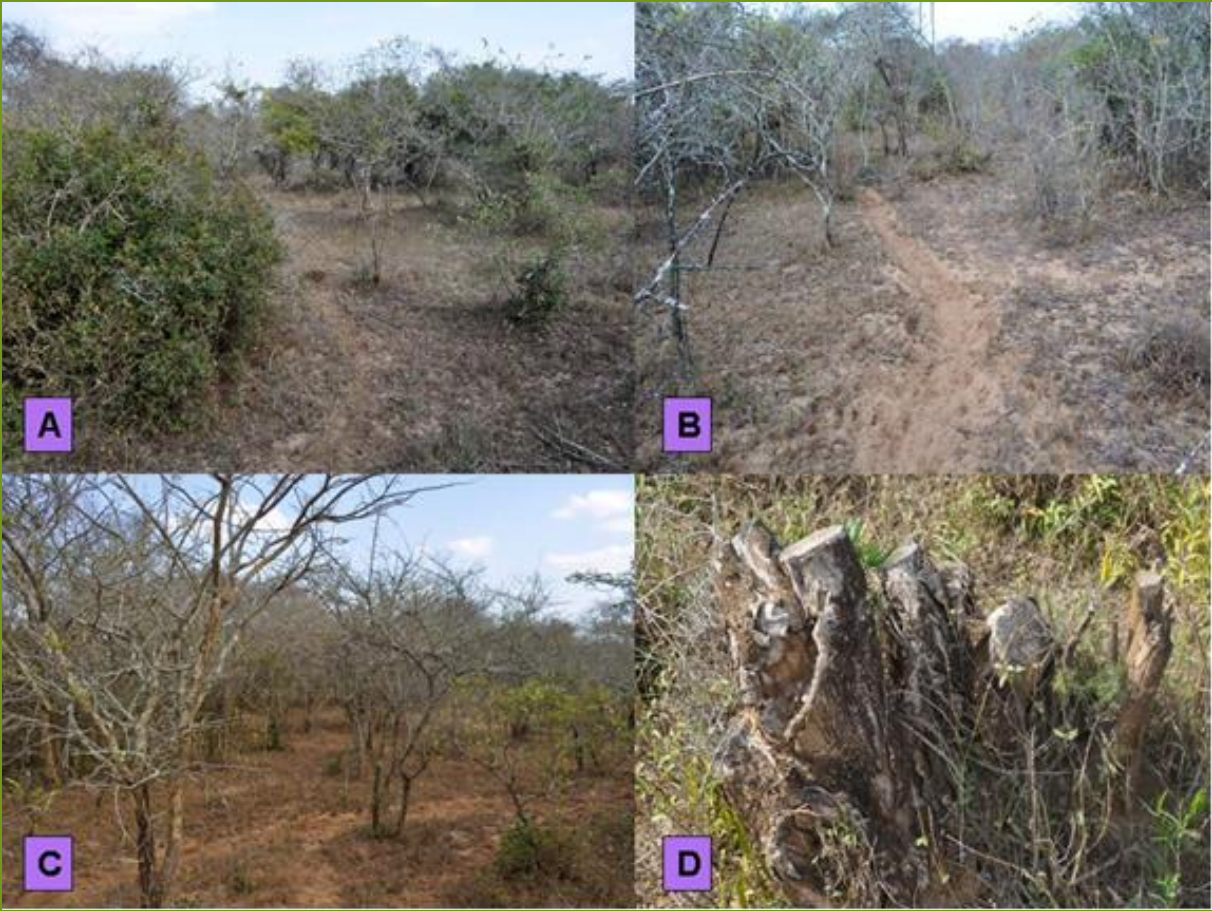


Figure 7-1: A collage of photographs displaying the current impacts observed adjacent to the existing rural homesteads adjacent to the Pongola (Mboza) River Bridge



Figure 7-2: Lowveld Riverine Forest on the banks of the Pongola River

Table 7-1: Characteristics of Lowveld Riverine Forest

Vegetation Type	Lowveld Riverine Forest(FOa 1) & Subtropical Alluvial Vegetation (Aza 7)	Tree cover	0-60 %
Soil	Recent alluvial deposits with deep, fine-textured soils (e.g. Dundee soil Form).	Shrub cover	0-40 %
Topography	Pongola River	Herb cover (weedy pioneers)	0-30%
Land use	Rural-agricultural (Livestock drinking & small-scale agricultural lands, orchards)	Grass cover	0-40%
Dominant Tree spp.	<i>Ficus sycomorus</i> , <i>Ekebergia capensis</i> , <i>Trichilia emetica</i> , <i>Vachellia robusta</i> subsp. <i>clavigera</i> , <i>Combretum erythrophyllum</i> , <i>Sclerocarya birrea</i> subsp. <i>caffra</i> ^o , <i>Tabernaemontana elegans</i> , <i>Rauvolfia caffra</i> , <i>Vachellia xanthophloea</i> , <i>Ziziphus mucronata</i>		
Dominant Shrubs	<i>Kraussia floribunda</i> , <i>Grewia caffra</i> , <i>Grewia occidentalis</i> , <i>Searsia pyroides</i> var. <i>integrifolia</i> , <i>Dichrostachys cinerea</i> , <i>Vachellia nilotica</i> , <i>Euclea natalensis</i> , <i>Strychnos madagascariensis</i> , <i>Strychnos spinosa</i> , <i>Gymnosporia buxifolia</i> , <i>Carissa tetramera</i> , <i>Ehretia rigida</i> subsp. <i>rigida</i> , <i>Grewia bicolor</i> , <i>Gardenia volkensii</i> .		
Dominant Grasses	<i>Eragrostis ciliaris</i> , <i>E. pallens</i> , <i>Panicum maximum</i> , <i>Setaria sphacelata</i> , <i>Tragus berteronianus</i> , <i>Digitaria eriantha</i> , <i>Cynodon dactylon</i> , <i>Phragmites mauritianus</i> , <i>Urochloa mossambicensis</i> , <i>Setaria incrassata</i> .		
Dominant Herbs	<i>Solanum panduriforme</i> , <i>Tagetes minuta</i> [*] , <i>Bidens pilosa</i> [*] , <i>Zinnia peruviana</i> [*]		
Alien Invasive Vegetation	<i>Opuntia ficus-indica</i> [*] , <i>Melia azedarach</i> [*] , <i>Psidium guajava</i> , <i>Caesalpinia decapetala</i> , <i>Opuntia monocantha</i> [*] , <i>Opuntia imbricata</i> [*] , <i>Lantana camara</i> [*] , <i>Agave sisalana</i> [*] , <i>Cereus jamacara</i> [*]		
Protected Tree Species	<i>Sclerocarya birrea</i> subsp. <i>caffra</i>		
Conservation Status	Critically Endangered		
Sensitivity	Medium-High		

^o Protected Tree Species

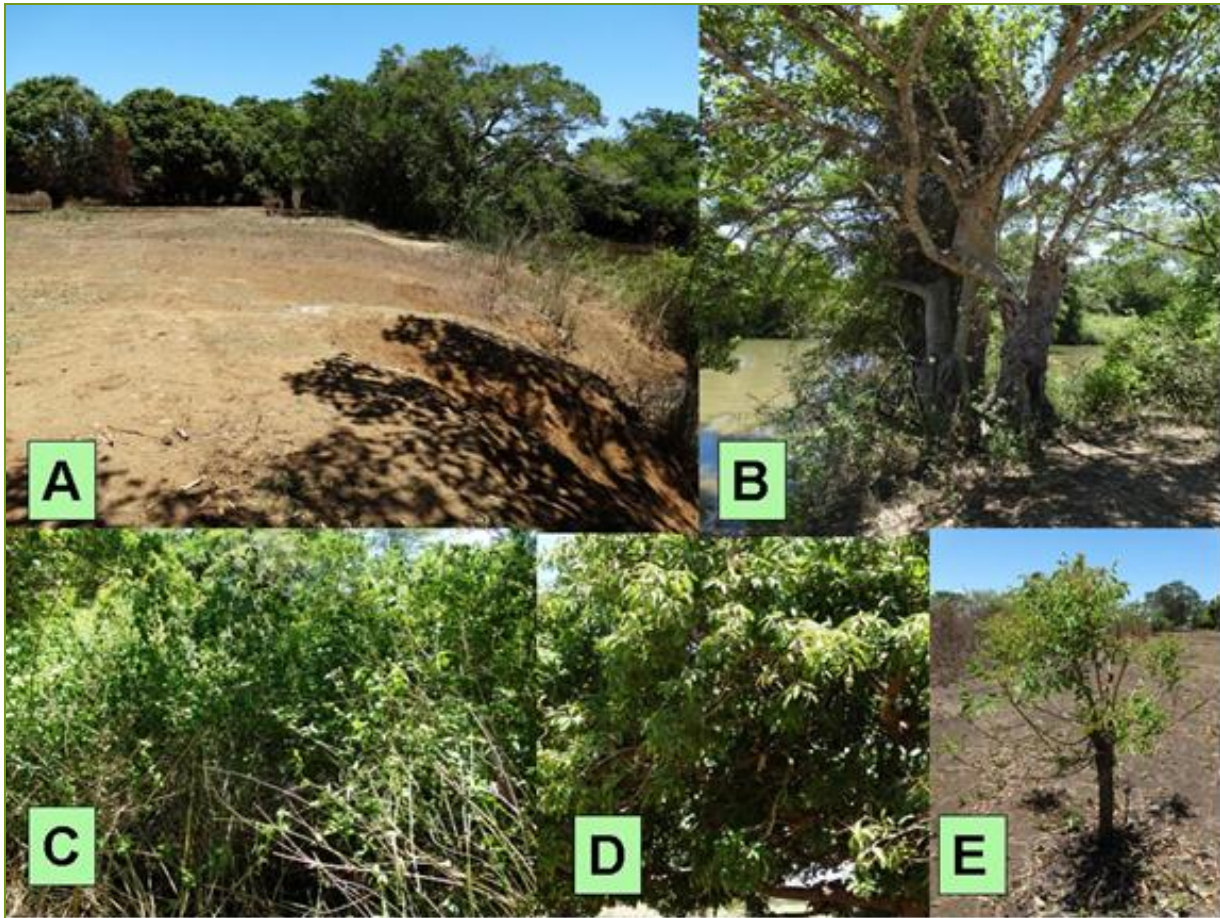


Figure 7-3: Dominant Vegetation Observed within the proposed Pongola (Mboza) River Bridge Site

The proposed bridge site is situated within an approximately 25 m completely transformed section of the riparian zone. The indigenous riparian vegetation has been completely removed although remnant patches occur upstream and downstream from the proposed bridge site.

The proposed Pongola (Mboza) River Bridge site comprises mainly of a transformed and degraded section of Lowveld Riverine Forest (FOa 1) as well as Subtropical Alluvial Vegetation (Aza 7) vegetation unit 2.

The southern embankment of the proposed Pongola (Mboza) River Bridge comprises an already completely transformed section of the riparian zone. All trees, shrubs and herbs have been cleared for approximately 25 m and the area contains limited vegetation and utilised for livestock drinking activities. A single large Sycamore Fig (*Ficus sycomorus*) occurs immediately adjacent or downstream from the proposed bridge alignment. Approximately 25 m upstream from the bridge site are several large Sycamore Figs (*Ficus sycomorus*), Cape Ash (*Ekebergia capensis*), Natal Mahogany (*Trichilia emetica*), Weeping Boer-Bean (*Schotia brachypetala*), and Quinine Tree (*Rauvolfia caffra*). Tree cover ranged from approximately 0-100% coverage) with the larger indigenous trees forming a closed canopy. The shrub and small tree layer comprises 0-40% coverage with several Toad Trees (*Tabernaemontana elegans*), Rhin-Coffee (*Kraussia floribunda*), and Climbing Raisin (*Grewia caffra*). Dense thickets of alien invasive Triffid Weed (*Chromolaena odorata*), Lantana (*Lantana camara*), and Mauritius Thorn (*Caesalpinia decapetala*) occur within the disturbed margins of the riparian zone. In-stream vegetation was dominated by a small patch of Mauritius Reed (*Phragmites mauritianus*).

A single small (< 2 m) protected Marula (*Sclerocarya birrea* subsp. *caffra*) was observed on the south-eastern side of the river, adjacent to the approach road reserve and bridge site. Three (3) larger Marula

occur approximately 15 m from the current access road and should not be impacted by the proposed Pongola (Mboza) River Bridge development. The trees have been ring-barked for traditional medicine purposes.

It is noted that the Department of Agriculture, Forestry and Fisheries (DAFF) will have to be approached to obtain the required permits for the removal of any protected tree species.

Forbs were dominated by pioneer weedy plant species such as Lantana (*Lantana camara**), Tall Fleabane (*Conyza albida*), Flax-Leaf Fleabane (*Conyza bonariensis*), Common Black jack (*Bidens pilosa*), Tall Khaki weed (*Tagetes minuta*), Mexican Poppy (*Argemone ochroleuca*), and Fine-leaved Verbena (*Verbena aristigera*). The grassland areas on the banks have been used for grazing purposes, and have been grazed to the ground level and are dominated by the grasses *Eragrostis ciliaris*, *E. pallens*, *Panicum maximum*, *Setaria sphacelata*, *Tragus berteronianus*, *Digitaria eriantha*, *Cynodon dactylon*, *Phragmites mauritianus*, *Urochloa mossambicensis*, and *Setaria incrassata*. The grasses cover approximately 0-40% of the area and the forbs 0-5%.

7.1.2 Protected Flora

The Department of Water Affairs and Forestry (relevant portion now Department of Forestry and Fisheries [DAFF]) developed a list of protected tree species. In terms of Section 15(1) of the National Forests Act, 1998, *no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.*

A single small (< 2 m) Marula (*Sclerocarya birrea* subsp. *caffra*) tree was recorded on the south-eastern bank, adjacent to the proposed Pongola (Mboza) River Bridge and approach road alignment. The specialist report recommended that an ecological walk down be done to assess whether the small Marula tree will need to be relocated or not.

Trees are protected for a variety of reasons, and some species require strict protection while others require control from over harvesting and utilization. The DAFF will have to be approached to obtain the required permits for the removal or relocation of any protected tree species.

If the small Marula needs to be removed, it should be carefully excavated with a bulldozer and re-planted away from any construction activities. The three larger Marula trees occur approximately 15 m from the existing access road and should not be impacted upon by the proposed Pongola (Mboza) River Bridge or approach road.

No red listed plant species were observed during the current brief field survey or are likely to occur within the transformed and degraded riparian vegetation which will be impacted upon by the proposed bridge. No epiphytic Leopard Orchids (*Ansellia africana*) were observed in the adjacent large riparian trees. As a precautionary measure a suitably qualified ecologist should inspect the site prior to construction activities commencing to ascertain if any rare or threatened plant species have emerged or were accidentally missed during the previous field survey which was undertaken prior to any significant rainfall.

7.1.3 Faunal Assessment

Amphibians

Amphibians have declined dramatically in many areas of the world. These declines seem to have worsened over the past 25 years and amphibians are now more threatened than either mammals or birds, though comparisons with other taxa are confounded by a shortage of reliable data.

As the survey was undertaken for only 1 day during daylight hours of the summer wet months (November) during an El Nino drought cycle; only a small proportion of species are present. Limited surface water was present within the flood-plain and river fed pans. Ideally, a herpetological survey should be undertaken throughout the duration of the wet season (November-March) including several nocturnal surveys. It is only during this period that accurate frog species lists can be compiled.

The only threatened amphibian species which may occur within the area is the Spotted Shovel-nosed Frog.

The proposed bridge site and direct approach roads however provide no suitable habitat for Spotted Shovel-nose Frogs.

Reptiles

All reptile species are sensitive to major habitat alteration and fragmentation. As a result of human presence in the area as well as on the site; coupled with habitat destruction and high levels of disturbances, alterations to the original reptilian fauna are expected to have already occurred.

Removal of large riparian tree species and dead trunks for firewood collection destroys numerous habitats for many arboreal reptile species. Clearing of rock material destroys vital habitat for numerous rupicolous reptile species including the Agamids, Cordylids, Geckonids, and Skinks. The majority of snake species hibernate in old tree trunks, termite mounds or under suitable rocks.

The indiscriminate killing of all snake species results in the alteration of species composition, with the disappearance of the larger and the more sluggish snake species.

The frequent burning of the under-storey and limited basal vegetation cover has a high impact on the remaining reptile species and their abundances.

The proposed site does not constitute any significant habitat for any threatened reptile species, or reptiles in general. Five (5) reptile species were recorded during the brief field survey mainly within the adjacent riverine forest up-stream and downstream of the proposed Pongola (Mboza) River Bridge. A probable species list is provided in the preliminary ecological survey specialist report, although actual species lists will most likely contain far fewer species due to high levels of habitat transformation.

No threatened reptile species have been recorded for the 2732 AA QDGC or are likely to occur within the bridge site or the immediate open areas surrounding the site due to extensive habitat transformation and degradation.

The closed woodland riparian zone up-stream and downstream from the bridge site provide important habitat for arboreal reptile species as well as the aquatic Water Monitor (*Varanus niloticus*).

Avifauna

Forty-Four (44) bird species were recorded during the brief field survey (total 8 hours). Species recorded during the field survey are common, widespread and typical of a riverine forest and woodland / bushveld environment.

Several Purple Crested Turacos, as well as Trumpeter Hornbills, were observed calling and feeding in the fruiting figs within the remnant patches of riverine forest. Three (3) roosting Black-crowned Night Herons were flushed from the large Sycamore Fig Tree immediately up-stream from the proposed Pongola (Mboza) River Bridge site. A Malachite Kingfisher was observed foraging within the Pongola River.

The majority of bird species were recorded within the remnant riverine forest and scattered woodland pockets adjacent to the site. High levels of human disturbance as well as habitat transformation and degradation occurs within the proposed Pongola (Mboza) River Bridge site, as well as along the road

reserves of the approach road, and results in the disappearance of the more secretive or sensitive bird species.

No threatened bird species were recorded during the brief survey but suitable habitat occurs within the Pongola River and fringing riverine forest or riparian zone for certain red listed bird species including: Pels Fishing Owl, African Finfoot, Half-collared Kingfisher, European Roller, and White-backed Night Heron. The adjacent floodplain areas could offer suitable foraging areas for Yellow-billed Storks during high-rainfall flooding events.

The high levels of human disturbances within the proposed Pongola (Mboza) River Bridge site severely restricts the likelihood of any of the above-mentioned threatened bird species occurring in the vicinity of the proposed bridge.

If any threatened bird species occur it is highly unlikely that the bridge servitude following an existing informal access road, livestock pathways and transformed riparian zone will form critical habitat for any threatened bird species.

The construction of the Pongola (Mboza) River Bridge will have no significant impact on any threatened bird species if construction activities are restricted to the bridge site.

Mammals

No small mammal trapping was conducted. Fieldwork was augmented with previous surveys in similar habitats, as well as published data. The area was initially traversed on foot to ascertain the presence of available refuges. Limited suitable refuges such as burrows, artificially created rock piles, stumps were observed.

The majority of mammal species likely to occur around the homesteads are urban exploiters such as the House Rat and House Mouse as well as feral cats. Several mounds of the African Molerat, as well as burrows, of the Natal Multimammate Mouse were observed in the sandier sections within the adjacent Pongola River floodplain. Evidence of Water Mongoose (i.e. Latrine), as well as Cape Clawless Otters, were observed adjacent to a permanently inundated pan 800 m to the south of the proposed Pongola (Mboza) River Bridge site.

Evidence of Common Duiker was observed within the closed wooded pockets, while Vervet Monkeys were observed foraging within a fruiting Sycamore Fig adjacent to the Pongola River. A Slender Mongoose was observed darting across an informal access road towards the Pongola River.

No sensitive or endangered mammals were recorded within the study area.

The majority of larger mammal species are likely to have been eradicated or have moved away from the area during the previous agricultural and current high-levels of anthropogenic activities. This is mainly a result of increased development pressure and human disturbances such as daily hunting with dogs and poaching (wire snares), as well as habitat alteration and degradation by vegetation clearance and frequent fires. Smaller mammal species are extremely vulnerable to dogs and cats, snares and poaching activities.

It is highly unlikely that the proposed bridge site constitutes significant habitat for any species of threatened mammal species or will have a significant impact on any threatened mammal species.

7.1.4 Sensitive Environments

All rivers including the Pongola River as well as adjacent floodplain (to a lesser extent) must be considered as Highly sensitive habitats due to ecological functioning as well as providing suitable habitat as well as biological or dispersal corridors for remaining faunal species. The Pongola River and Lowveld Riverine Forest (FOa 1) azonal vegetation type comprises an 'Endangered' vegetation type (**Mucina & Rutherford 2006**).

Activities within the adjacent remnant patches of the closed woodland riparian zone must be severely restricted and managed (these areas must be demarcated as no-go zones). Vegetation clearance must be restricted to the already transformed section on the southern embankments and removal of two (2) indigenous riparian trees and shrubs on the northern embankment.

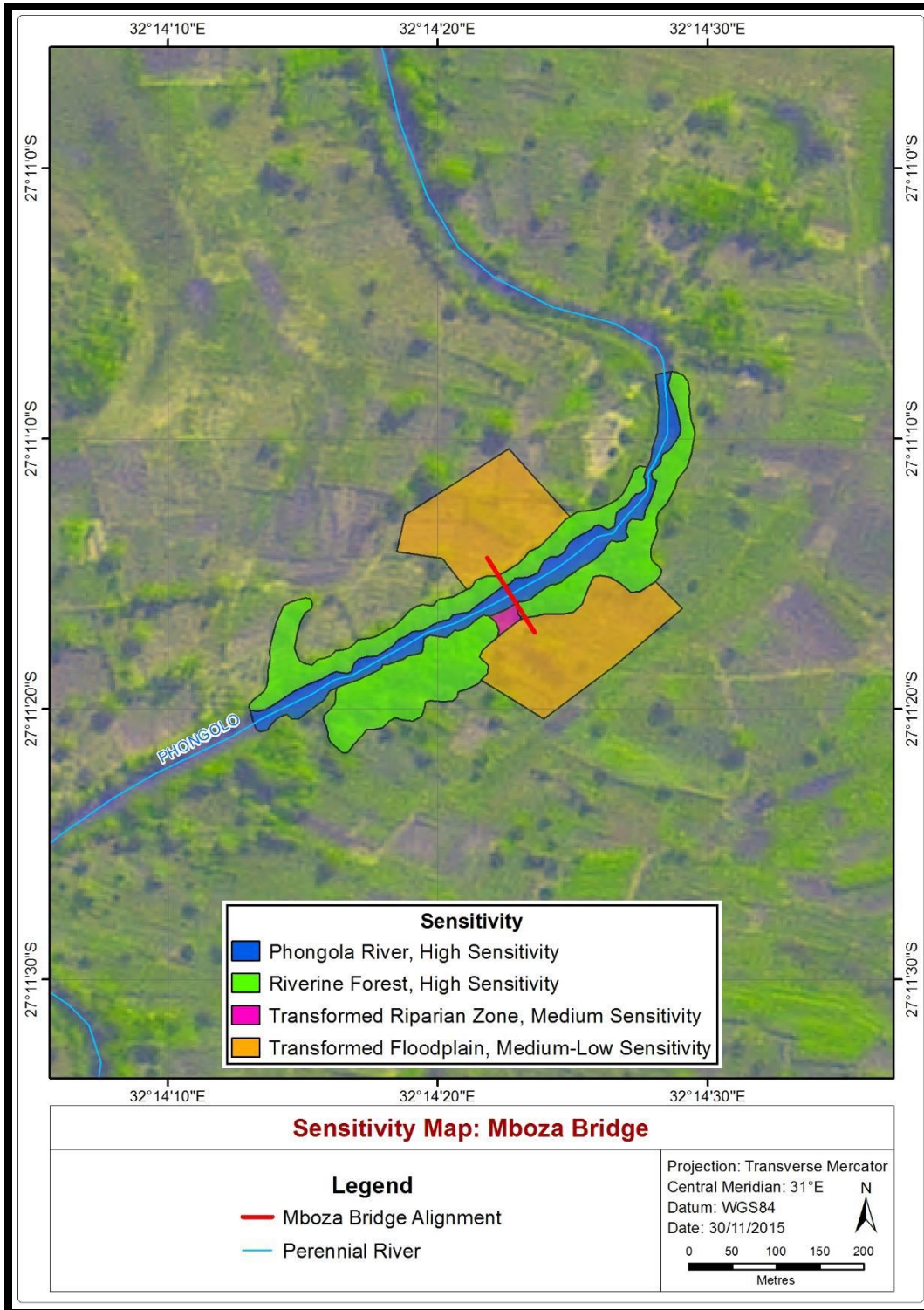


Figure 7-4: Ecological sensitivity map for the proposed Pongola (Mboza) River Bridge site.

7.2 Aquatic and Wetland Ecological Assessment

Scientific Aquatic Services (SAS) was appointed by Royal HaskoningDHV to undertake an Aquatic and Wetland Ecological Assessment for the proposed Pongola (Mboza) River Bridge.

7.2.1 Historical Quaternary Catchment Information

Water resources are generally classified according to the degree of modification or level of impairment. The classes used by the South African River Health Program (RHP) are presented in the table below and will be used as the basis of classification of the systems in this field and desktop study as well as future field studies.

Table 7-2: River health status

Class	Description
A	Unmodified, natural
B	Largely natural, with few modifications
C	Moderately modified
D	Largely modified
E	Extensively modified
F	Critically modified

In addition, the ecological category (EC) classification will be employed using the eco-status A to F continuum approach (Kleynhans *et al*, 2007). This approach allows for boundary categories denoted as B/C, C/D etc., as illustrated below.



Figure 7-5: Ecological category classification

Studies undertaken by the Institute for Water Quality Studies assessed all quaternary catchments as part of the Resource Directed Measures for Protection of Water Resources. In these assessments the Ecological Importance and Sensitivity (EIS), Present Ecological Management Class (PEMC) and Desired Ecological Management Class (DEMC) / Recommended Ecological Category (REC) were defined and serve as a useful guideline in determining the importance and sensitivity of aquatic ecosystems prior to assessment or as part of a desktop assessment.

In order to define the EIS, PEMC and DEMC, a study undertaken by **Kleynhans (1999)** helped define the quaternary catchment of concern (W45A). The findings by **Kleynhans (1999)** formed part of a project entitled "A procedure for the determination of the ecological reserve for the purpose of the national water balance model for South African rivers".

The PES/EIS database, as developed by the Department of Water and Sanitation (DWS) Resource Quality Information Services (RQIS) department, was utilised to obtain additional background information on the project area.

PES/EIS summary

A summary of the PES/EIS data, as obtained from the databases consulted, is tabulated below.

Table 7-3: Summary of ecological status of catchment, as well as selected sub-quaternary catchment (SQ) reach

Quaternary Catchment (Kleynhans 1999)				
Catchment	EIS ¹	PES ²	DEMC ³	
W45A	Very High	Class B: Largely Natural	Class A: Highly Sensitive	
Sub-quaternary catchment reach (Department of Water and Sanitation (DWS) Resources Quality Information Services (RQIS) PES/EIS database: accessed 21 August 2015)				
SQRs	PES ⁴	Mean EI ⁵	Mean ES ⁶	Default EC ⁷
W45A-02246 (Pongola River)	D	Moderate	Very High	A
¹ EIS – Ecological Importance and Sensitivity ² PES – Present Ecological Sensitivity Class ³ DEMC – Desired Ecological Management Class ⁴ PES – Present Ecological State; confirmed in database that assessments were performed by expert assessors ⁵ EI – Ecological Importance ⁶ ES – Ecological Sensitivity ⁷ EC – Ecological Category; default based on median PES and highest of EI or ES means				

The **Kleynhans (1999)** database indicates more natural conditions for the PES for the catchment as a whole, when compared to that obtained from the DWS RQIS database for the specific SQR in question.

With reference to the latter, it is clear that the system is already facing moderate to large impacts with the PES being far removed from the desired / default ecological state.

7.2.2 Riparian Vegetation Assessment

The VEGRAI assessment result for the Pongola River is presented in the table below. The results of this assessment indicate that the Pongola River falls within Ecostatus **Category D**, indicating that the vegetation within the system is largely modified. Large changes to the riparian vegetation (mainly the non-marginal zone) of the river due to alien floral invasion and cultivated fields were observed. No deviations as a result of impacted water quality were observed.

Table 7-4: Results of the VEGRAI assessment for the Pongola River system

Level 3 Assessment					
Metric Group	Calculated Rating	Weighted Rating	Confidence	Rank	% Weight
Marginal	56,3	37,5	3,3	1,0	100,0
Non Marginal	20,0	6,7	0,0	2,0	50,0
2,0					150,0
Level 3 VEGRAI (%)				44,2	
VEGRAI EC				D	
Average Confidence				1,7	

7.2.3 Invertebrate Habitat Assessment

The Invertebrate Habitat Integrity Assessment (IHIA) results indicated that there are a number of small to large impacts on the habitat of the area. Overall the site obtained an IHIA rating of 74%, which is indicative of moderately modified (**Category C**) conditions.

Table 7-4 below, summarizes of the results obtained from the application of the Intermediate Habitat Assessment Index (IHAS) to the bio-monitoring site. This index determines habitat suitability, with particular reference to the requirements of aquatic macro-invertebrates.

From the results of the application of the IHAS index it is evident that the Pongola River in the area provided inadequate habitat conditions for sustaining a diverse macro-invertebrate community at the time of assessment.

Table 7-5: Summary of results obtained from the application of the IHAS index to the Pongola River at site Mboza 1

Site	Mboza 1 (Pongola River) Summer (October 2015)
IHAS Habitat score	51
Habitat adjustment score	+34
McMillan, 1998 Habitat description	Habitat diversity and structure is inadequate for supporting a diverse aquatic macro-invertebrate community
Stones habitat characteristics	A lack of diverse substrate is present in the river segment with the river reach dominated by sand habitat with no rocky habitat present
Vegetation habitat characteristics	Marginal vegetation was present out of current but had a limited amount (1-25%) of leafy material present to provide habitat and cover for suitable adapted macro-invertebrate families. Aquatic vegetation was absent.
Other habitat characteristics	Habitat such as stones, bedrock, gravel and muddy substrate was absent at the site with only sand substrate available for colonisation by suitable adapted macro-invertebrates. The absence of this habitat may limit the diversity of suitably macro-invertebrates possibly supported by the system
IHAS general stream characteristics	The river at this point is wide (>10 m) and on average shallow (0.5 m) and there is limited diversity in depth and flow at the site (shallow run only under conditions at the time of assessment). The surrounding vegetation consisted of a mix of grasses and shrubs. The dominant activity in the area is agriculture (crops).

7.2.4 Aquatic Macro-invertebrates: SASS

The results of the aquatic macro-invertebrate assessment according to the SASS5 index are summarised in the tables below.

Table 7-6: Results obtained at the site per biotope sampled

Parameter	Site	Stones	Vegetation	Gravel, sand and Mud	Total
SASS5 Score	Pongola (Mboza) River Bridge site	0	82	22	85
Number of		0	13	3	14

Taxa					
ASPT		0	6.3	7	6.1

Table 7-7: Summary of the results obtained from the application of the SASS5 index at the site during summer

Type of Result	Mboza 1 (the site)
Biotores Sampled	Fringing vegetation; Sand
Sensitive Taxa Present	<i>Atyidae; Hydracarina; Heptageniidae; Calopterygidae; Lepoceridae</i>
Sensitive Taxa Absent	<i>Caenidae; Leptophlebiidae; Oligoneuridae; Aeshnidae; Gomphidae; Naucoridae; Ecnomidae; Hydroptilidae; Elmidae; Psephenidae; Dixidae; Ancyliidae.</i>
SASS5 score	85
Adjusted SASS5 score	119
SASS5 % of theoretical reference score*	45.9
ASPT score	6.1
ASPT % of theoretical reference score**	87.1
Dickens and Graham, 2001 SASS5 classification	Class D (largely impaired)
Dallas 2007 classification	Class C (moderately impaired)

*SASS5 reference score = 185; **ASPT reference score = 7.0

- The SASS scores indicated Category D (largely impaired) conditions at site Mboza 1 according to the **Dickens and Graham (2001)** classification system;
- According to the **Dallas (2007)** classification system, a Category C (moderately impaired) classification was obtained for site;
- The apparent discrepancy in results obtained for site Mboza 1 is due to the **Dallas (2007)** classification system being more sensitive to changes in ASPT compared to the **Dickens and Graham (2001)** classification system. It must also be noted that no data for the local aquatic region was available for the **Dallas (2007)** system and the adjacent most applicable ecoregion data was used for interpretation. For the purpose of this assessment both classification systems are deemed relevant.
- However, results employing the **Dickens and Graham (2001)** classification system are in agreement with the PES for the SQR in which the proposed river crossing is planned (DWS RQIS PES/EIS database, PES classified as Class D). As a result this classification system is deemed most applicable and representative of conditions at the time of assessment. Furthermore the **Dallas (2007)** indicate limited data from which to make inferences, confirming that the **Dickens and Graham (2001)** classification system may be better suited to meet the assessment objectives;

- The SASS data indicates that the aquatic macro-invertebrate community of this system, prior to any of the proposed developments taking place, supports an aquatic community of limited abundance and diversity when compared to the reference score for a Lebombo Uplands Lower aquatic ecoregion stream;
- As observed in the IHAS index, this limited community diversity can partially ascribed to natural limitations posed in the system by the lack of suitable habitat and cover for aquatic macro-invertebrates;
- However, other factors such as impacts resulting from agricultural return flows or run off, as well as the potential for other unidentified point and diffuse sources of pollution in the larger catchment resulting from other anthropogenic activities (for example informal rural settlements with associated water quality impacts), may also contribute to the observed trend (impaired macro-invertebrate community);
- Future SASS5 and ASPT results should be monitored and any alterations in the scores should be identified, with particular reference to potential seasonal/annual variations in SASS score which seem relatively stable in the data collected to date scores;
- Considering the proposed bridge crossing construction activities, three potential impacts that may affect the aquatic community have been identified. These are impacts on instream flow and hydrological function, changes to instream habitat and impacts on instream biota;
- Such impacts can have a negative effect on both macro-invertebrate diversity and sensitivity which, based on the PES EIS database, is known to be sensitive to changes in flow. Such potential impacts should be mitigated and close monitoring of trends must take place.

7.2.5 Aquatic Macro-invertebrates: MIRAI

In terms of ecological category classification, the MIRAI Ecostatus tool revealed an ecostatus category classification Category D for the site. This is in agreement with SASS5 results obtained using the **Dickens and Graham (2001)** classification system and also the PES for the SQR in question (DWS RQIS PES/EIS database).

All macro-invertebrate indices confirm a macro-invertebrate community deteriorated from what is expected based on diversity and sensitivity, when compared to what is expected for a pristine stream in the ecoregion. Reasons for this appear to be a combination of current anthropogenic impacts, most notably return flow and run-off from agricultural activities, combined with inadequate habitat conditions (lack of stone habitat, limited vegetation habitats and lack of depth and flow diversity) unable to support a diverse macro-invertebrate community.

Long term, natural variation of biological activities within the system may also affect macro-invertebrate community dynamics. Future monitoring efforts will help to identify and elucidate potential seasonal variation.

7.2.6 Fish Community Integrity

The Habitat Cover Rating (HCR) results for the Mboza 1 site on the Pongola River indicate that under low flows, resulting in shallow conditions, a combination of slow and fast flows dominate the system. Cover feature availability is limited, with fish demonstrating a preference for deep conditions, rocky substrate or dense vegetation cover, none of which are expected to occur at the proposed crossing point.

Sampling for fish was conducted within the Pongola River (site Mboza 1) over a 1 hour period using electronarcosis methods as well as cast netting and using a hand held sweep net. No fish species were observed or captured during the assessments.

The most likely reasons for the absence of fish in the system is:

- limited habitat and cover;
- limited flow and depth diversity;
- anthropogenic activity around the assessment site as the river here is often used by the local community for recreational activities such as swimming (personal observation at time of assessment);
- potential impacts from overutilization of fish stocks in the system and impacts from changes on instream flows as a result of the Jozini Dam operation.

Fish migration, with specific reference to eel species, is likely to occur within a free flowing river system such as the Pongola River and some seasonal variation in fish community assemblage is deemed likely. In addition such migratory patterns are likely to be affected by impoundments upstream of the assessment site, most notably the Pongolapoort Dam.

The results of the survey thus did not support the findings of survey data in the DWS RQIS PER/EIS database, where a large variety of expected fish species were listed. Due to the high integrity, diversity and sensitivity of the fish community based on the desktop assessment, it is evident that the specific site proposed for the bridge crossing is of reduced sensitivity and can be considered a good position for crossing from a fish community conservation point of view.

Because no fish were collected during the assessments, the FRAI score was defined as **Class F** when compared to the expected fish assemblage.

7.2.7 Aquatic Ecological Importance and Sensitivity

The EIS method was applied to the Pongola River in order to ascertain the current sensitivity and importance of the systems. The results of the assessment are presented in the table below.

Table 7-8: Results of the EIS assessment for the Pongola River (site Mboza 1)

Biotic Determinants	Pongola River
Rare and endangered biota	2
Unique biota	2
Intolerant biota	3
Species / taxon richness	2
Aquatic Habitat Determinants	
Diversity of aquatic habitat types or features	1
Refuge value of habitat type	2
Sensitivity of habitat to flow changes	3
Sensitivity of flow-related water quality changes	3
Migration route/corridor for instream and riparian biota	3
Nature Reserves, Natural Heritage sites, Natural areas, PNEs	2
RATING AVERAGE	2.3
EIS CATEGORY	High

The Ecological Importance and Sensitivity Assessment analysis of the Pongola River provided a score of 2.3 which is regarded as highly important and sensitive despite the low PES of the system as a result of local and regional impacts.

The increased importance and sensitivity of the stream is mainly as a result of high diversity and sensitivity of aquatic biota in the Pongola river system. The system also has some importance with regards to use as a migration corridor with specific reference to eels and the provision of refugia for species relying on the system. Despite the system having a poor diversity of habitat features on a local scale the habitats provided by the system are diverse on a reach scale which increases the EIS of the system.

The system is considered moderately sensitive to alterations in flow and flow-related water quality changes with year round water required in the system to support the sensitive aquatic biota. The EIS classification corresponds with that provided in the databases provided

7.2.8 Wetland Results and Interpretation

During the field assessment it was evident that the floodplain wetland is in a moderately degraded state due to the high levels of historical and current agricultural practices within the wetland system. It should be noted that the assessment was largely restricted to the portion of the Floodplain wetland and Pongola River in the immediate vicinity of the proposed road and bridge infrastructure, although cumulative impacts from the surroundings were also considered, where applicable.

The banks of the Pongola River were mainly associated with riparian habitat and included species such as *Ficus sycomorus* (Sycamore fig), *Trichilia emetica* (Natal mahogany), *Vachellia xanthophloea* (Fever Tree), *Sclerocarya birrea* subsp. *caffra* (Maroela / Marula), *Vachellia kraussiana* (Scented-pod Thorn) and *Mangifera indica* (Mango), with alien vegetation comprising mainly *Lantana camara* (Tickberry).

The remainder of the floodplain vegetation has been severely altered as a result of current and historic agricultural practices, and were predominantly associated with agricultural crops such as *Zea Mays* (Corn), as well as alien vegetation associated with agricultural crop lands, namely *Datura ferox* (Large thorn apple), *Tagetes minuta* (Tall khaki weed), *Argemone mexicana* (Yellow-flower Mexican poppy) and *Xanthium strumarium* (Large cocklebur).

Although transformation of the wetland vegetation has occurred, the Pongola River is still considered to be of importance in terms of the provision of an ecological corridor through a largely transformed area. Furthermore, the system is likely to provide important ecosystem services and function and may provide the habitat to support an increased abundance of fish species. Being classified by the NFEPA database (2011) as a RAMSAR wetland as well as a WETFPEPA with particular importance in being located within 500 m of a threatened waterbird point locality, the wetland plays an important role in delivering ecosystem services, despite being in a moderately degraded condition.



Figure 7-6: The Pongola River (left) and the cultivated crop lands associated with the floodplain wetland (right)

7.2.9 Wetland Functionality

The characteristics of the wetland were used to quantitatively determine the value, and by extension, sensitivity, of the wetland. Each characteristic was scored to give the likelihood that the service is being provided.

The scores for each service were then averaged to give an overall score to each feature, presented in the table below:

Table 7-9: Wetland Functions and Service Provision.

Ecosystem Service	Floodplain Wetland
Flood Attenuation	1.7
Streamflow regulation	1.8
Sediment trapping	2.4
Phosphate assimilation	2.0
Nitrate assimilation	2.0
Toxicant assimilation	2.0
Erosion control	2.1
Biodiversity maintenance	1.9
Carbon Storage	1.7
Water Supply	3.3
Harvestable resources	3.4
Cultivated foods	3.6
Cultural significance	1.5
Tourism and recreation	1.1
Education and research	1.0
SUM	31.5
Average Score	2.1

The Floodplain wetland has a moderately high importance, in terms of function and service provision. This is mainly due to the socio-cultural level of service provision being high, despite the ecological services being of intermediate levels.

In terms of ecological service provision, the wetland plays a moderately high role in sediment trapping and erosion control, although dams up-stream affect its natural flow regime and sediment supply. However runoff intensity has likely increased as a result of agricultural practices within the catchment which may significantly reduce the features effectiveness in controlling erosion.

The significant disturbance of soils due to agricultural practices within the wetland, coupled with the absence of diverse indigenous obligate and facultative species is likely to reduce the wetlands ability to assimilate chemical substances. The wetland plays an intermediate role in biodiversity maintenance due to the significant level of disturbance that affected its hydrological regime and natural vegetation community assemblage.

During the field assessment it was evident that the wetland plays an important role in service provision for the local community, with specific emphasis on water-supply, harvestable resources and cultivated foods. The resource is widely used by the rural community for small scale agricultural practices.

Loss of the floodplain wetland from the area would therefore be detrimental from a community perspective, and care should be taken during the construction of the bridge and associated road, to ensure stream continuity of the wetland feature is ensured, as well as to prevent unnecessary wetland damage due to poor management.

7.2.10 Wetland Present Ecological State (PES)

The present hydrological state of the Floodplain wetland calculated a score which falls within **Category D** (largely modified). The hydrological function of the wetland system has been significantly modified due to anthropogenic activities such as agricultural practices associated with the rural community and the upstream Pongolapoort (Jozini) Dam.

The present geomorphological state of the floodplain wetland calculated a score which falls within **Category C** (Moderately modified). Significant erosion and incision of the banks of the Pongola River as well as modification of the stream bed has occurred. In addition, sediment-trapping by dams upstream has changed the sediment balance of the Pongola River system.

The present water quality state of the Pongola River associated with the floodplain wetland calculated a score which falls within **Category A** (natural). Although the on-site water quality testing showed slightly elevated EC values from those expected under pristine conditions the general water quality conditions were considered to be largely natural.

The present vegetation state of the Pongola River calculated a score which falls within **Category D** (moderately modified). Surrounding anthropogenic activity related to agricultural and rural development has resulted in the removal of indigenous species and the invasion by alien vegetation, most notably the understorey of the riparian zone.

The overall score for the wetland which aggregates the scores for the four modules, namely hydrology, geomorphology, water quality and vegetation, was calculated using the formula⁴ as provided by the IHI methodology. The overall score calculated falls within the PES **Category C/D** (moderately to largely modified): A large loss of natural habitat, biota and basic ecosystem functions has occurred.

⁴ $((Hydrology\ score) \times 3 + (geomorphology\ score) \times 2 + (vegetation\ score) \times 2) / 7 = PES$

7.2.11 EIS Determination

The method used for the EIS determination was adapted from the method as provided by **DWA (1999)** for floodplains. A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. In addition, the confidence of scores is indicated within the table below (Conf), where 0 indicates a very low confidence and 4 indicates a high confidence.

The average of the determinants is used to assign the EIS Category as listed in the table below.

From the results it is evident that the Floodplain wetland has an EIS falling within Category C (moderate sensitivity).

Table 7-10: EIS Determination

Determinant	Floodplain	
	Score	Conf
Primary Determinants		
1. Rare & Endangered Species	1	2
2. Populations of Unique Species	1	3
3. Species / taxon Richness	2	4
4. Diversity of Habitat Types or Features	2	4
5. Migration route / breeding and feeding site for wetland species	2	2
6. PES as determined by IHI / Wet-health assessment	2	4
7. Importance in terms of function and service provision	3	4
Modifying Determinants		
8. Protected Status according to NFEPA Wetveg	3	4
9. Ecological Integrity	2	4
TOTAL	18	
AVERAGE	2.0	
OVERALL EIS	C	

7.2.12 Recommended Ecological Category

Based on the findings of the assessment it is evident that the floodplain wetland is degraded to a significant degree with a moderate EIS value.

Due to the significance of impacts already present within the wetland and due to the disturbance and transformation of the surrounding catchment area, it is doubtful that the PES of the features can be significantly increased without an extensive rehabilitation plan. It is therefore deemed important that the PES (C/D) category of the floodplain wetland and the river itself be maintained and that additional disturbance due to the proposed development be avoided, managed and mitigated.

Taking into consideration the PES and EIS values obtained for the wetland feature, the appropriate REC of the floodplain wetland should be a **Class C**.

7.2.13 Air Quality

An Air Quality Emissions License will not be required for the project, as there will only be limited dust liberation and emissions during the construction phase of the bridge. Air emissions during the operational phase will be due to the vehicles that travel and utilise the bridge.

The proposed development will seek to establish best-practise approaches for air quality management as per National Standards; to effectively manage the release of any fugitive dust from construction activities, equipment and construction vehicles into the atmosphere.

7.3 Waste Management

Existing impacts within the surrounding area are primarily due to the communities who live in the area. Impacts include inappropriate disposal of general waste and pollution of the river due to runoff.

In order to minimise impacts from waste on the biophysical environment, waste skips / bins will be provided throughout the construction phase with separate skips / bins made available for debris and solid waste. Solid waste will be transported to a registered landfill site to avoid the pollution of surrounding areas and roads, as well as to minimize nuisance impacts such as dust and odours.

All waste, both general and hazardous waste, will be collected and disposed of at approved licensed waste disposal and / or recycling facilities.

7.4 Socio Economic Environment

7.4.1 Cultural Heritage

Active Heritage was appointed by Royal HaskoningDHV to undertake a Cultural Heritage Impact Assessment for the proposed Pongola (Mboza) bridge project.

A desktop study was conducted of the archaeological databases housed in the KwaZulu-Natal Museum and the SAHRA inventory of heritage sites. Aerial photographs of the area were surveyed. The SAHRIS website was researched to evaluate past surveys in the area. In addition, the available archaeological and historical literature covering KwaZulu-Natal was also consulted.

A site visit was made to the project area, a ground survey, following standard and accepted archaeological procedures, was conducted and the Heritage Specialist walked the area on foot and surveyed the area for potential heritage sites. Both sides of the Pongola River were surveyed during the study.

No heritage sites or features were observed during the ground survey. However, the area within, and surrounding the project footprint, is heavily cultivated and disturbed. The entire project footprint and surrounding area is littered with Thembe and Zulu homesteads, cultivated fields, and some livestock enclosures. Google aerial photographs do show the outlines of possible features that were invisible during the ground survey but it is difficult to date these.

A number of homestead and domestic activity area sites were identified on the project footprint but these appear to be younger than 60 years.

The consultants at Active Heritage CC advise that during construction great care be taken during construction, to avoid obvious homestead outlines, stone walling, grindstones, and graves. Cultural and Heritage material is often associated with old homesteads and domestic activity areas, but not always visible above surface.

7.4.2 Social Basic Assessment

The Social Basic Assessment was undertaken by K. Moonsamy, a Social Specialist within Royal HaskoningDHV. It was externally peer reviewed by Ms Hilda Bezuidenhout.

There are a number of villages (small communities) that will benefit from the proposed Bridge development. Some of those in closest proximity have been identified as:

Umhlabuyalingana Local Municipality (LM)

- Mshenga – 2.3 km away;
- Siphondweni – 5.5 km away;
- Hlazane – 4.8 km away; and
- Mshlgani – 1.3 km away.

Jozini Local Municipality

- Subane – 5 km away;
- Msenyeni – 4.8 km away; and
- Mtoti – 4.2 km away.

The local population utilises the Pongola River and floodplain for its natural food resources (such as fishing) and growing subsistence crops. Agricultural activities are limited to subsistence and small-scale commercial farming. Much of the area is under threat due to subsistence for survival purposes or/and to developmental pressures.

The communities in both municipalities had voiced their need for a bridge over the Pongola River. Initially a pedestrian bridge, however later the communities realised the additional future advantages of a vehicular bridge. Access to other areas, increasing human movement (including for the purposes of trading or reaching social service institutions such as clinics and schools), are a few of the beneficial values that local communities envisage themselves deriving from the proposed Pongola (Mboza) River Bridge. The Umhlabuyalingana LM has included the need for such a bridge in its 2011-2016 Integrated Development Plan (IDP).

The bridge has been identified as a critically important mechanism that will increase communication, access to facilities, and the general movement of people, thereby increasing social, recreational and ultimately, economic ties.

7.4.3 Noise

Noise generated during construction activities is not expected to be significant, although noise nuisance will be monitored closely. At this stage no blasting activities are expected, however, should these be required all legislated measures will be implemented and monitored.

8 IMPACTS AND RESIDUAL RISKS ASSESSMENT

8.1 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.

8.2 Methodology

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

1. Nature

This is a brief written statement of the environmental aspect being impacted upon by a particular action or activity.

2. Extent (E)

Extent refers to the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. 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.

- Site (1) – Within the construction site.
- Local (2) – Within a radius of 2 km of the construction site.
- Regional (3) – the scale applies to impacts on a provincial level and parts of neighbouring provinces.
- National (4) – the scale applies to impacts that will affect the whole South Africa.

3. Duration (D)

Duration indicates what the lifetime of the impact will be.

- Short-term (1) – less than 5 years.
- Medium-term (2) – between 5 and 15 years.
- Long-term (3) – between 15 and 30 years.
- Permanent (4) – over 30 years and resulting in a permanent and lasting change that will always be there.

4. Intensity (I)

Intensity describes whether an impact is destructive or benign.

- 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.

5. Probability (P)

Probability describes the likelihood of an impact actually occurring.

- Improbable (1) – Likelihood of the impact materialising is very low.
- Possible (2) – The impact may occur.
- Highly Probable (3) – Most likely that the impact will occur.
- Definite (4) – Impact will certainly occur.

6. Cumulative (C)

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.

7. Significance (S)

Significance is determined through a synthesis of impact characteristics. Significance is 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.

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 EMP.

8.3 Rating of Potential Impacts

The potential impacts identified are explained per phase of the project and mitigation measures are provided. The impacts are categorised and expanded upon in separate sections referred to as the; pre-construction, construction and operational phases.

Potential Impacts were assessed as overall potential impacts for the 2 (two) pier 6 span concrete bridge option, as this was the preferred alternative from an environmental perspective and the three and four pier option were not assessed in further detail. It is termed Alternative 1 within the impact tables below.

Table 8-1: Significance ratings

Score		Elaboration
- (13 – 16 points)	NEGATIVE VERY HIGH	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.
- (10 – 12 points)	NEGATIVE HIGH	These are impacts which individually or combined pose a significantly high negative risk to the environment. These impacts pose a high risk to the quality of the receiving environment. 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.
- (7 – 9 points)	NEGATIVE MODERATE	These are impacts which individually or combined pose a moderate negative risk to the quality of health of the receiving environment. These systems would not generally require immediate action but the deficiencies should be rectified to avoid future problems and associated cost to rectify once in HIGH risk. Aesthetically and / or physically non-compliance can be expected over a medium term. In this case the impact is medium term, moderate in extent, mildly intense in its effect and probable. Mitigation is possible with additional design and construction inputs.
- (0 – 6 points)	NEGATIVE LOW	These are impacts which individually or combined pose a deleterious or adverse impact and low negative risk to the quality of the receiving environment, and may lead to potential health, safety and environmental concerns. Aesthetically and / or physical non-compliance can be expected for short periods. In this case the impact is short term, local in extent, not intense in its effect and may not be likely to occur. 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.
0	NEUTRAL	Impact is neither beneficial nor adverse. These are impacts which cannot be classified as either positive or negative or classified and null and void in the case of a negative impact being adequately mitigated to a state where it no longer renders a risk.
+(0 – 6 points)	POSITIVE LOW	These are impacts which individually or combined pose a low positive impact to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is short term, local in extent, not intense in its effect and may not be likely to occur. A low impact has no permanent impact of significance.
+(7 – 9 points)	POSITIVE MODERATE	These are impacts which individually or combined pose a moderate positive effect to the quality of health of the receiving environment. In this case the impact is medium term, moderate in extent, mildly intense in its effect and probable.

Score		Elaboration
+ (10 – 12 points)	POSITIVE HIGH	These are impacts which individually or combined pose a significantly high positive impact on the environment. These impacts pose a high benefit to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is longer term, greater in extent, intense in its effect and highly likely to occur. The effects of the impact may affect the broader environment.
+ (13 – 16 points)	POSITIVE VERY HIGH	These are permanent and important beneficial impacts which may arise. Individually or combined, these pose a significantly high positive impact on the environment. These impacts pose a very high benefit to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is long term, greater in extent, intense in its effect and highly likely or definite to occur. The effects of the impact may affect the broader environment.

Table 8-2: Planning phase impacts

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
Phase: Planning and Design - Bridge					
Sub-phase: Direct Impacts					
	Inadequate or incompetent Planning and Design of infrastructure	1	Without	-11	Negative High
			With	-4	Negative Low
1	Mitigation: (a) Ensure best practicable solutions of design which are best suited to the receiving environment which will then result in the provision of infrastructure for communities in the surrounding communities. (b) The number of piers (i.e. columns) within the river channel is an important consideration, and the fewest piers possible should be used, without compromising safety aspects. (c) Consideration must also be given to the design which will minimise the need for maintenance and costs associated therewith. (d) Ensure correct, peer and supervisor reviewed designs are developed. (e) The height of the bridge should accommodate the 1:100 yr flood events. (f) The following environmental design recommendations should be incorporated into the design of the proposed Pongola (Mboza) River bridge: <ul style="list-style-type: none"> ▪ The design of the bridge infrastructure will need to seek a balance of economic, technical and safety requirements, whilst also ensuring that risks and impacts to the riverine environment are minimised as far as possible. ▪ The proposed bridge design, involving a bridge structure that spans the entire width of the active channel, is generally supported as this will serve to minimise disturbance to the instream active channel zone. The number and width of vertical support piers within the active channel be limited as far as practically possible without compromising the structural stability and safety of the bridge. ▪ Bridge infrastructure will need to be designed to be appropriately protected and robust enough in the long-term to withstand a significant flood event. ▪ No infilling within instream aquatic and riparian habitat must be undertaken. ▪ All management measures as contained within the <u>Construction Method Statement for Watercourse Crossings</u> must be adhered to and implemented correctly. 				
2	Location and design of the bridge could lead to impacts on the natural environment.	1	Without	-11	Negative High
			With	-6	Negative Low
	Mitigation: All elements must be considered in the location and design of the bridge, such as existing degradation and avoiding areas with greater scour probability and meanders in the river.				

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
3	Unsound design which will require maintenance in the near future.	1	Without	-8	Negative Moderate
			With	-4	Negative Low
Mitigation: Ensure that the best practicable design is used and that the professionalism and integrity of the bridge design is maintained.					
Sub-phase: Indirect Impacts					
4	The banks of the river will be altered which may impact on the functioning of the river and the integrity of the structure.	1	Without	-8	Negative Moderate
			With	-5	Negative Low
Mitigation: The use of protective measures such as gabions and revetments (i.e. bank and stream bed stabilisation) to protect the banks and riverine habitats should be considered during the design phase, if required.					
Sub-phase: Cumulative Impacts					
5	The provision of the bridge will enable better transportation options and access to services	1	Without	8	Positive Moderate
			With	13	Positive Very high
Mitigation: The development will promote accessibility which can only have a positive impact in terms of socio-economic opportunities as well as safety.					
Average without mitigation				-6.2	Negative Moderate
Average with mitigation				-1.2	Negative Low

Table 8-3: Planning phase No-Go impacts

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
Phase: Planning - No-Go					
Sub-phase: Direct Impacts					
1	No vegetation will be lost, no impact on the river and the environment will remain as is (i.e. <i>status quo</i> remains).	1	Without	+4	Positive low
			With	+4	Positive low
Mitigation: N/A					
Sub-phase: Direct Impacts					
2	People will continue to cross the river in a small boat, which is not a safe mode of transport across the Pongola River	1	Without	-11	Negative High
			With	+10	Positive High
Mitigation: The proposed bridge is a mitigation measure for the current crossing of the river by boat.					
Sub-phase: Indirect Impacts					
3	Surrounding communities will have	1	Without	-8	Negative Moderate

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	difficulty accessing services such as clinics and schools		With	+10	Positive High
Mitigation: The proposed bridge is a mitigation measure to enable better access to services.					
Sub-phase: Cumulative Impacts					
4	Potential loss of economic, educational and health opportunities to people, due to a lack of transport options.	1	Without	-9	Negative Moderate
			With	+8	Positive Moderate
Mitigation: The proposed bridge is a mitigation measure to enable better access to services.					
Average without mitigation				-6	Negative low
Average with mitigation				+8	Positive Moderate

Table 8-4: Construction phase impacts

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
Phase: Construction – Bridge					
Sub-phase: Direct Impacts					
	Destruction / loss of vegetation.	1	Without	-9	Negative Moderate
			With	-5	Negative Low
Mitigation:					
1	<p>(a) The appropriate design and the use of the mitigation hierarchy must strive first to avoid disturbance of ecosystems and loss of biodiversity, and where this cannot be avoided altogether, to minimise, rehabilitate, and then finally offset any remaining residual negative impacts on biodiversity.</p> <p>(b) Extent of disturbance – Vegetation removal / stripping must be limited to the construction footprint.</p> <p>(c) All indigenous trees and plants occurring outside the proposed Pongola (Mboza) River Bridge and approach road, shall be left undisturbed and permits will be required for the removal of the protected tree species namely a single small Marula (<i>Sclerocarya birrea</i> subsp. <i>caffra</i>).</p> <p>(d) No unnecessary destruction to surrounding vegetation especially in the adjacent natural areas is permitted.</p> <p>(e) No areas outside the construction footprint may be cleared. These areas must be demarcated with signage and some form of fencing to exclude entry and demarcate the footprint extent</p> <p>(f) Any trees with large root systems shall be cut manually and removed.</p> <p>(g) Grubbing is not permitted as a method of clearing vegetation.</p> <p>(h) Where herbicides are used to clear vegetation, selective and biodegradable herbicides registered for the specific species should be applied to individual plants only. General spraying and the use of non-selective herbicides (e.g. Roundup, Mamba) must be prohibited at all times.</p> <p>(i) All alien vegetation should be eradicated within the linear infrastructure servitudes over a five-year period. Invasive species (<i>Chromolaena odorata</i>, <i>Lantana camara</i>, <i>Caesalpinia decapetala</i>) should be given the highest priority.</p> <p>(j) Disturbed areas of natural vegetation must be rehabilitated immediately to prevent soil erosion.</p>				
2	Loss of faunal species due to construction activities as well as onsite poaching or killing of domestic animals (i.e. cattle and	1	Without	-9	Negative Moderate
			With	-4	Negative Low

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	goat safety).				
	<p>Mitigation:</p> <p>(a) Regular information sharing discussions with the Contractors must be pursued, giving residents an opportunity to voice concerns and grievances throughout the project construction duration.</p> <p>(b) Apart from residents, animals such as cattle and goats will also be at a greater health and safety risk during the construction phase due to an increased number of heavy vehicles. Caution must be applied and strict implementation of speed limits must be ensured.</p> <p>(c) Education of site personnel / employees with regard to poaching or harming of any animals and wildlife encountered should be undertaken.</p> <p>(d) Induction and environmental awareness training of employees needs to be undertaken regularly.</p> <p>(e) No wild animal may under any circumstance be hunted, snared, captured, injured, killed, harmed in any way or removed from the site. This includes animals perceived to be vermin (snakes, rats, mice, etc.). Any fauna that are found within the construction zone must be moved to the closest point of natural or semi-natural vegetation outside the construction corridor.</p> <p>(f) The handling and relocation of any animal perceived to be dangerous / venomous / poisonous must be undertaken by a suitably trained individual.</p> <p>(g) All vehicles accessing the site should adhere to a low speed limit (25 km/h is recommended) to avoid collisions with susceptible species such as reptiles (snakes and lizards).</p> <p>(h) No litter, food or other foreign material should be disposed of on the ground or left around the site or within adjacent natural areas and should be placed in demarcated and fenced rubbish and litter area that is animal proof.</p>				
	Impact on ecosystem conservation targets and Impact to species of conservation concern.	1	Without	-9	Negative Moderate
With			-4	Negative Low	
3	<p>Mitigation:</p> <p>Protection of conservation-important vegetation:</p> <p>(a) Prior to commencement of construction, a qualified botanist should be appointed to undertake a walk through of the site, to identify all species of conservation importance and apply for the necessary permits and licences.</p> <p>(b) For each protected indigenous tree removed from the construction footprint, three (3) indigenous replacement trees of the same species should be planted.</p> <p>(c) No harvesting of plants for firewood, medical purposes or other uses is to be permitted.</p> <p>(d) Where possible, cut vegetation to ground-level rather than removing it completely, leaving root systems intact to ensure rapid re-colonization in areas that are not to be permanently hardened.</p> <p>(e) All vegetative material removed from the construction footprint, particularly trees, must be given to the local community. This can be arranged through the local traditional leaders and the developer shall be responsible for delivering the material to the local community outside the construction area.</p>				

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	Increased sediment loads and erosion control.	1	Without	-10	Negative High
			With	-5	Negative Low
4	<p>Mitigation:</p> <p>(a) No soil stockpiles must be located within 32 m of the river.</p> <p>(b) No laydown or storage areas must be located within 50 m of any watercourse and / or the 1:100 year flood line.</p> <p>(c) No vehicle turning area may be located within 32 m of the river</p> <p>(d) Incorporate adequate erosion and stormwater management measures in order to prevent erosion and the associated sedimentation of the river and wetland areas. Management measures may include berms, silt fences, hessian curtains, stormwater diversion away from areas susceptible to erosion and stormwater attenuation. These should be chosen according to the specifics of the area being controlled. Care should however be taken to avoid additional disturbance during the implementation of these measures. In this regard specific attention should be given to the attenuation of stormwater in order to prevent erosion.</p> <p>(e) During construction, drift fences constructed from hessian sheets should be installed at erodible areas to minimise erosion. Silt traps should also be provided to remove sand / silt particles from runoff.</p> <p>(f) The crossing design must ensure that the soils in the Pongola River remain inundated with water after heavy rainfall events. In order to achieve this the following should be implemented:</p> <ul style="list-style-type: none"> The pioneer layer should be constructed out of a porous material or from material which is coarse enough to assist with the movement of water through the structure to allow wetting of the soils to occur on the downstream side of the crossing and prevent excessive upstream inundation; The extent to which culverts are used in the system should reach as far as possible to ensure that during freshets the broadest possible area becomes inundated allowing for recharge of the wetland soils across the width of the wetland; The design should ensure that the permanent wetland zone should have inundated soil conditions throughout the year extending to the soil surface; The design should ensure that the seasonal wetland zone should have water logged soils within 300 mm of the soil surface for at least the high flow season (November to January); Temporary wetland zone areas should have waterlogged soil conditions occurring to within 300 m of the land surface during the wettest part of the summer season ; Ensure that no incision and canalisation of the Pongola River takes place as a result of the construction of the bridge: The crossing structure must allow for sufficient dispersion of water through the wetland area to prevent the concentration of flow in the permanent zone or the active channel which could lead to scouring and incision of the system. <p>(g) Topsoil layer must be stripped from the construction footprint and stockpiled separately from overburden (subsoil and rocky material).</p> <p>(h) The slope and height of stockpiles must be limited to 2 m to avoid soil compaction. Topsoil stockpiles should be seeded with <i>Eragrostis tef</i> to prevent wind erosion and to be able to maintain the soils and prevent water erosion. The <i>E. tef</i> can then be utilised during the spreading of the topsoil as a green manure. (<i>E. tef</i> is a sterile annual grass that lasts approximately six months).</p> <p>(i) Spoil material must be hauled to a designated spoil site – such a spoil site must be approved / licensed for use as such.</p>				
5	Inconvenience from noise and dust will pose a nuisance to surrounding residents.	1	Without	-10	Negative High
			With	-6	Negative Low
	<p>Mitigation:</p> <p>(a) Frequent and effective dust-suppression is advised, particularly on dirt roads.</p>				

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	(b) Dust must be suppressed on the construction site during dry periods by the regular application of water. Note that when water is deemed scarce that alternative options to wetting down for dust suppression should be investigated and confirmed as appropriate with the Department prior to use. (c) Water used for this purpose must be used in quantities that will not result in the generation of runoff. (d) Surrounding communities and adjacent landowners are to be notified upfront of noisy construction activities. (e) Provide all equipment with standard silencers. (f) Maintain silencer units on vehicles and equipment in good working order. (g) Construction staff working in areas where the 8-hour ambient noise levels exceed 60 dBA should wear ear protection equipment.				
6	Local labour will be recruited to perform short term, unskilled labour on the project.	1	Without	+8	Positive Moderate
			With	+9	Positive Moderate
Enhancement: It is recommended that every effort is made to employ local labour.					
7	Cultural Heritage artefacts may be uncovered during construction activities.	1	Without	-10	Negative High
			With	-7	Negative Moderate
Mitigation:					
(a) Should graves or any archaeological material be identified then all construction work must stop and the heritage consultants or Amafa be contacted for further evaluation. (b) South African National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and KwaZulu-Natal Heritage Act (Act No. 4 of 2008) require that operations that expose archaeological or historical remains must cease immediately, pending evaluation by the provincial heritage agency (AMAFA).					
8	Impact on instream flow and hydrological function	1	Without	-9	Negative Moderate
			With	-6	Negative Low
Mitigation:					
(a) The pier structure must be designed in such a way as to ensure that turbulent flow is minimised to prevent downstream erosion and scour through the use of streamlined support column shapes. (b) All crossing construction should be undertaken in the low flow season and must be completed within 6 months. (c) The duration of construction works needs to be kept to the absolute minimum and all project planning must be orchestrated to achieve this goal. (d) The construction infrastructure, coffer dams and any water diversions must at no time lead to upstream ponding and inundation or lead to the constriction of flow and downstream erosion. (e) Minimise disturbance of instream and bankside areas and minimise activities in these areas. (f) Unless approved by the Environmental Control Officer (ECO), all instream areas and banks are NO-GO areas to general activities during the construction phase. (g) Any construction-related waste must not be placed in the vicinity of any riparian areas (i.e. minimum of 32 m separation from any waste storage to the edge of the watercourse). (h) Edge effects (i.e. impacts on areas beyond the construction footprint due to less than desirable care and management) during construction and operation, need to be strictly controlled through ensuring good housekeeping and strict management of activities near the crossing. (i) During construction, drift fences constructed from hessian sheets should be installed at erodible areas to minimise erosion. Silt traps must be provided to remove sand / silt particles from runoff. (j) Limit the footprint area of the construction activity to what is absolutely essential in order to minimise environmental damage. (k) The characteristics of the streambed are likely to be altered locally. In particular the rock and rubble created during the construction process is likely to have sharp edges, and not smooth surfaces that					

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	<p>are typically associated with river rocks and pebbles. Therefore, all rock and rubble must be removed from the watercourse once construction is completed. Any rock placed in the watercourse to enhance the dissolved oxygen content of the water must adhere to the same criteria and have only smooth rock surfaces.</p> <p>(l) Riparian areas that may have been disturbed during construction should be rehabilitated through re-profiling (re-shaping) and re-vegetation upon completion of the construction phase.</p> <p>(m) Any equipment and machinery associated with construction activities must be removed from the river bed and banks as soon as it is no longer required.</p> <p>(n) Loss of stream continuity should be prevented during the rehabilitation phase of the development, through ensuring that no obstructions occur as a result of rehabilitation activities within and adjacent to the Pongola River.</p> <p>(o) Monitoring, as per the requirements of the Wetland, Maintenance, Management and Rehabilitation action Plan (Scientific Aquatic Services, November 2015) must be implemented during construction and operational activities, as specified.</p>				
9	Loss of aquatic species and biodiversity	1	Without	-10	Negative High
			With	-6	Negative Low
<p>Mitigation:</p> <p>(a) Edge effects (impacts on areas beyond the construction footprint due to less than desirable care and management) during construction and operation need to be strictly controlled through ensuring good housekeeping and strict management of activities near the river crossing.</p> <p>(b) As far as possible, all construction activities should occur in the low flow season, during the drier winter months.</p> <p>(c) It must be ensured that migratory connectivity and stream continuity is maintained throughout the construction phase of the project.</p> <p>(d) On-going aquatic biomonitoring commencing at least 6 months before construction and for at least a year after construction is to take place; to monitor the impacts on aquatic biota and in order to allow the identification of required impact minimisation measures for each system.</p> <p>(e) Please refer to the mitigation measures presented above for recommendations pertaining to hydrological and habitat management controls which will minimise the impact on biota.</p>					
10	Loss of Wetland Habitat and Ecological Structure	1	Without	-9	Negative Moderate
			With	-6	Negative Low
<p>Mitigation:</p> <p>(a) Create permanent roadside swales in places where runoff from roads is not collected in a stormwater system to allow it to be biologically cleansed prior to seeping into wetland areas.</p> <p>(b) Incorporate adequate erosion and stormwater management measures in order to prevent erosion and the associated sedimentation of the wetland areas. Management measures may include berms, silt fences, hessian curtains, stormwater diversion away from areas susceptible to erosion and stormwater attenuation. Care should however be taken so as to avoid additional disturbance during the implementation of these measures In this regard specific attention should be given to the attenuation of stormwater in order to prevent erosion.</p> <p>(c) Maintain habitat connectivity, especially where the approach road is within the floodplain wetland.</p> <p>(d) Edge effects (impacts on areas beyond the construction footprint due to less than desirable care and management) during construction need to be strictly controlled through ensuring strict regulation of no-go areas and management of activities near the river crossing.</p> <p>(e) Rescue and relocate amphibian species to nearby areas, if encountered.</p>					
Sub-phase: Indirect Impacts					
11	Deterioration of local freshwater	1	Without	-9	Negative Moderate

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	ecosystem and ecological conditions downstream, due to construction activities.		With	-5	Negative Low
	Mitigation: (a) Instream sediment control measures must be installed. (b) Before any work commences in the river channel, sediment control / silt capture measures (e.g. silt curtains) must be installed downstream of the working areas within the river. (c) Quantities of silt fences / curtains must be decided on site with the engineer, contractor and ECO, and included as a line item in any budgeting and Bill of Quantities provided to the contractors for pricing of the proposed construction. (d) The ECO must be present during the location and installation of the silt curtains. (e) During works within the channel, the downstream silt curtains must be regularly checked and maintained (i.e. de-silted to ensure continued capacity to trap silt), and repaired (as necessary). (f) Method statements for sediment control must be compiled and submitted to the ECO for comment and the Engineer for approval. (g) Runoff generated from cleared and disturbed areas / slopes that drain into the river or wetlands must be controlled using erosion control and sediment trapping measures (e.g. silt fences, sandbags, earthen berms, synthetic logs), particularly where slopes are exposed. (h) Sediment barriers (e.g. silt fences, sandbags, hay bales, earthen filter berms, retaining walls, check dams) must be established to protect water resources from erosion and sedimentation impacts from upslope. (i) The berms, sandbags and silt fences must only be removed once vegetation cover has successfully re-colonised the disturbed areas post-rehabilitation.				
12	Impact on ecological functioning and ecosystem services supply.	1	Without	-11	Negative High
			With	-6	Negative Low
	Mitigation: As per items 1 and 2 above.				
13	Geomorphological impacts are likely to be associated mainly with activities which may impact on channel beds and banks and result in erosion and sedimentation in watercourses.	1	Without	-9	Negative Moderate
			With	-7	Negative Moderate
	Mitigation: As per items 1, 2, 4 and 8 above.				
14	Sewage pollution into the Pongola River due to poor servicing of chemical toilets and / or informal use of surrounding bush by personnel.	1	Without	-9	Negative Moderate
			With	-5	Negative Low
	Mitigation: (a) Sanitation – portable toilets (1 toilet per 10 users minimum) to be provided where construction is occurring. (b) Workers must use these facilities and not the natural environment. (c) Toilets must not be located within the 1:100 yr flood line of a watercourse or closer than 50 m from any natural water bodies including rivers, streams, riparian areas and wetlands. (d) Waste from chemical toilets must be disposed of regularly (i.e. at least once a week) and the waste disposed of at a site that is registered to receive such waste.				

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	(e) Toilet facilities must be serviced weekly and in a responsible manner by a registered waste contractor to prevent pollution and improper hygiene conditions. (f) Sanitation safe disposal / clearance certificates must be maintained on site for the duration of construction.				
	Pollution of site and surrounding due to inappropriate waste management practices (hazardous and general waste).	1	Without	-9	Negative Moderate
			With	-4	Negative Low
15	<p>Mitigation: General topics: (a) Link all topics below to “tool-box” talks for education of all site staff. (b) Provide adequate rubbish bins and waste disposal facilities on-site and educate / encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal. (c) Rubbish bins must be equipped with a closing mechanism to prevent their contents from blowing out or wild animals from accessing the contents. (d) No litter, refuse, wastes, rubbish, rubble, debris and builders waste must be placed, dumped or deposited on adjacent properties or into the river during or after the construction period. (e) The construction site must be kept clean and tidy and free from rubbish. (f) Empty litter bins weekly or as required (i.e. before they reach capacity). (f) Recycling / re-use of waste is to be encouraged. Formal waste separation to be carried out into non-recyclable and recyclable, with recyclable separated further into at least paper, plastic, and glass. (g) No solid waste may be burned on site.</p> <p>The following pollution prevention measures must be implemented at the site: (h) The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, bitumen, paint) needs to be administered. Construction materials that are able to spill must be stored in appropriate containment structures (e.g. drip-trays, or bunded areas). (i) Storage containers must be regularly inspected to enable early detection of leaks. (j) All employees handling fuels and other hazardous materials are to be properly trained in their safe use, environmental restrictions and methods for proper disposal. (k) Hazardous storage and re-fuelling areas must be bunded prior to their use on site during the construction period. The bund wall must be sufficient to contain at least 110% of any stored volume. (l) Mixing and / or decanting of chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from stormwater ingress / egress. (m) Cement / concrete batching is to be located in an area to be hardened and must first be approved by the ECO. No batching activities must occur directly on the ground. (n) Drip trays must be utilised at all fuel / chemical dispensing areas. Provide drip-trays beneath standing machinery / plant. (o) Material Safety Data Sheets (MSDS) sheets must be kept on site within the Environmental File. Information must be linked to the Emergency Response Plan (ERP) held in terms of the Occupational Health & Safety requirements. (p) No re-fuelling, servicing or chemical storage must occur outside the established construction camp. (q) Routinely check machinery / plant for oil or fuel leaks each day before construction activities begin. No vehicle that is leaking is allowed / permitted be used on the site. (r) Vehicle maintenance must not take place on site unless a specific lined and bunded area is constructed within the construction camp for such a purpose. (s) Ensure that transport, storage, handling and disposal of hazardous substances is adequately controlled and managed. Correct emergency procedures and cleaning up operations must be implemented in the event of accidental spillage – cross link to the ERP. (t) Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (i.e. not</p>				

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	to be disposed of within the natural environment). (t) Any contaminated soil from the construction site must be removed and rehabilitated timeously and appropriately. (u) An emergency spill response procedure must be formulated and staff are to be trained in spill response – cross link to the ERP. (v) All necessary equipment for dealing with spills of fuels / chemicals must be available at the site (DRIZIT or similar product). (w) Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.				
Sub-phase: Cumulative Impacts					
16	The bridge construction could alter the volume (reduced flows), timing and pattern of flows reaching downstream water resources. This ultimately affects the aquatic habitat and biota and hydrological variability.	1	Without	-7	Negative Moderate
			With	-5	Negative Low
Mitigation: As per items 8, 9 and 10 above.					
Average for construction phase impacts without mitigation				-8.3	Negative Moderate
Average for construction phase impacts with mitigation				-4.4	Negative Low

Table 8-5: Construction phase No-Go impacts

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
Phase: Planning – No-Go					
Sub-phase: Direct Impacts					
1	No vegetation will be lost, no impact on the river and the environment will remain as is (i.e. <i>status quo</i> remains).	1	Without	+4	Positive low
			With	+4	Positive low
Mitigation: N/A					
Sub-phase: Direct Impacts					
2	People will continue to cross the river in a small boat, which is not a safe mode of transport across the Pongola River	1	Without	-11	Negative High
			With	+10	Positive High
Mitigation: The proposed bridge is a mitigation measure for the current crossing of the river by boat.					
Sub-phase: Indirect Impacts					
3	Surrounding communities will have difficulty accessing services such as clinics and schools	1	Without	-8	Negative Moderate
			With	+10	Positive High
Mitigation: The proposed bridge is a mitigation measure to enable better access to services.					

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
Sub-phase: Cumulative Impacts					
4	Potential loss of economic, educational and health opportunities to people, due to a lack of transport options.	1	Without	-9	Negative Moderate
			With	+8	Positive Moderate
Mitigation: The proposed bridge is a mitigation measure to enable better access to services.					
Average without mitigation				-6	Negative low
Average with mitigation				+8	Positive Moderate

Table 8-6: Operational phase impacts – Bridge

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
Phase: Operational - Bridge					
Sub-phase: Direct Impacts					
1	Erosion and sedimentation of wetlands leading to loss of wetland habitat and potential erosion of the stream channel and incision of the river system	1	Without	-11	Negative High
			With	-7	Negative Moderate
Mitigation: (a) Adhere to measures in the stormwater management plan and stormwater management within the EMP. (b) Ensure that management and mitigation measures are adequately implemented to limit the potential impact on aquatic resources. (c) Ensure that disturbed areas have been adequately stabilised and rehabilitated to minimise residual impacts to affected resources. (d) Monitoring of the construction activities is critical to ensure that any issues are captured in a timely manner. (e) It must be ensured that migratory connectivity and stream continuity is maintained throughout the construction phase of the project; (f) Monitoring, as per the requirements of the Wetland, Maintenance, Management and Rehabilitation action Plan (Scientific Aquatic Services, November 2015) must be implemented during construction and operational activities, as specified. (g) Measures contained within the Spill Contingency Plan, as appended to the EMP, must be adhered to. (h) Suitable erosion control measures must be implemented at stormwater discharge points, exposed areas and high embankments. These measures may include sand bags; bunds or grips and soil saver. (i) Runoff management and erosion protection at bridge endfills and approach fills near the river (e.g., directing bridge runoff into areas where it will not create additional erosion at its outfall position).					
2	The bridge will increase mobility of communities and road users, increasing their access to services, while being a safer option than crossing the river in a small boat	1	Without	+9	Positive Moderate
			With	+10	Positive High
Mitigation: Maintenance of the bridge and associated infrastructure in order to maintain the positive socio-economic impacts.					
3	Economic opportunities due to increased mobility and access to broader area and range of	1	Without	+9	Positive Moderate
			With	+15	Positive High

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
	services.				
Enhancement: (a) Adequate maintenance should be undertaken to prolong the structure and safe usage. (b) During the operational phase an annual assessment should be undertaken to determine if any excessive erosion of the structure is occurring. Photographic records should be maintained (pre- and post-construction) and any necessary maintenance and rehabilitation implemented					
Sub-phase: Indirect Impacts					
4	Incorrect rehabilitation and reshaping of the stream bed and banks in areas of disturbance leads to on-going deterioration of stream banks and altered stream flow patterns	1	Without	-9	Negative Moderate
			With	-4	Negative Low
Mitigation: Adequate stormwater management must be incorporated into the design of the proposed structure in order to prevent erosion and the associated sedimentation of the system for the life of the structure.					
	Instream flow and hydrological function: * Altered structure of riparian habitat and riparian vegetation. * Proliferation of alien vegetation leading to altered habitat for fauna and flora.	1	Without	-13	Negative Very High
			With	-8	Negative Moderate
5	Mitigation: (a) Removal of alien vegetation and good housekeeping must take place at all times. (b) Sheet runoff from access roads should be curtailed and slowed down by the strategic placement of energy dissipation structures. (c) Adequate stormwater management must be incorporated into the design of the proposed structure in order to prevent erosion and the associated sedimentation of the system for life of the structure.				
6	Due to greater mobility and opportunities for trading, there is the possibility that small crimes may also increase - primarily due to increased movement of people and access to economic opportunities.	1	Without	-9	Negative Moderate
			With	-4	Negative Low
Mitigation: Policing in the area must be increased in order to deter would be criminals. It is unlikely that crime will increase a substantial amount, due to the remote nature of the site. Trends should however be noted and reacted on.					
Sub-phase: Cumulative Impacts					
7	The new bridge and approach roads perpetuate habitat fragmentation.	1	Without	-9	Negative Moderate
			With	-6	Negative Low
Mitigation: Fauna and flora within the wider area are already fragmented and hence the impact is not considered to be significant.					
Average for Operational impact without mitigation				-4.7	Negative Low
Average for Operational Impacts with mitigation				-0.5	Negative Low

The **No-go** impacts for the operational phase are the same as for the construction phase of the project.

Table 8-7: Operational phase No-Go impacts

No.	Impact	Alternative	Mitigation	Significance = E+D+I+P	Interpretation
Phase: Planning – No-Go					
Sub-phase: Direct Impacts					
1	No vegetation will be lost, no impact on the river and the environment will remain as is (i.e. <i>status quo</i> remains).	1	Without	+4	Positive low
			With	+4	Positive low
Mitigation: N/A					
Sub-phase: Direct Impacts					
2	People will continue to cross the river in a small boat, which is not a safe mode of transport across the Pongola River	1	Without	-11	Negative High
			With	+10	Positive High
Mitigation: The proposed bridge is a mitigation measure for the current crossing of the river by boat.					
Sub-phase: Indirect Impacts					
3	Surrounding communities will have difficulty accessing services such as clinics and schools	1	Without	-8	Negative Moderate
			With	+10	Positive High
Mitigation: The proposed bridge is a mitigation measure to enable better access to services.					
Sub-phase: Cumulative Impacts					
4	Potential loss of economic, educational and health opportunities to people, due to a lack of transport options.	1	Without	-9	Negative Moderate
			With	+8	Positive Moderate
Mitigation: The proposed bridge is a mitigation measure to enable better access to services.					
Average without mitigation				-6	Negative low
Average with mitigation				+8	Positive Moderate

9 ENVIRONMENTAL IMPACT STATEMENT

9.1 Introduction

Potential environmental impacts (biophysical and social) associated with the proposed Pongola (Mboza) River Bridge project, 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.

9.2 Key Findings of the Study

Overall, the results of the BA process emerge as having a “**negative low**” and “**positive low**” (i.e. operational phase) environmental significance after mitigation.

The socio-economic impacts are, however, **strongly positive**.

The results of the impact assessment indicate that the most significant impacts as a result of the proposed bridge would include impacts on the terrestrial and aquatic ecological environments. These impacts can however be successfully mitigated through the measures and recommendations presented in this study and in the Environmental Management Programme – EMP (contained within Appendix B). The site sensitivity map is presented in Figure 9-1 overleaf.

Transportation, ease of movement and access across the Pongola River is currently very difficult for the communities on either side of the river. School children and local community members use a boat, at the site of the proposed Bridge, to cross the river. The use of such a boat is not safe, particularly when the river is flowing strongly, resulting from up-stream rainfall events and when the Pongolapoort Dam sluice gates are opened to release water downstream. The closest bridge facilitating community access across the river is approximately 12 km away.

This is the primary motivating factor for the construction of the proposed Pongol (Mboza) River Bridge.

The proposed bridge will provide a safe linkage for communities on both sides of the Pongola River to access schools, clinics, cultivated lands (that require tending) and pension pay-out points.

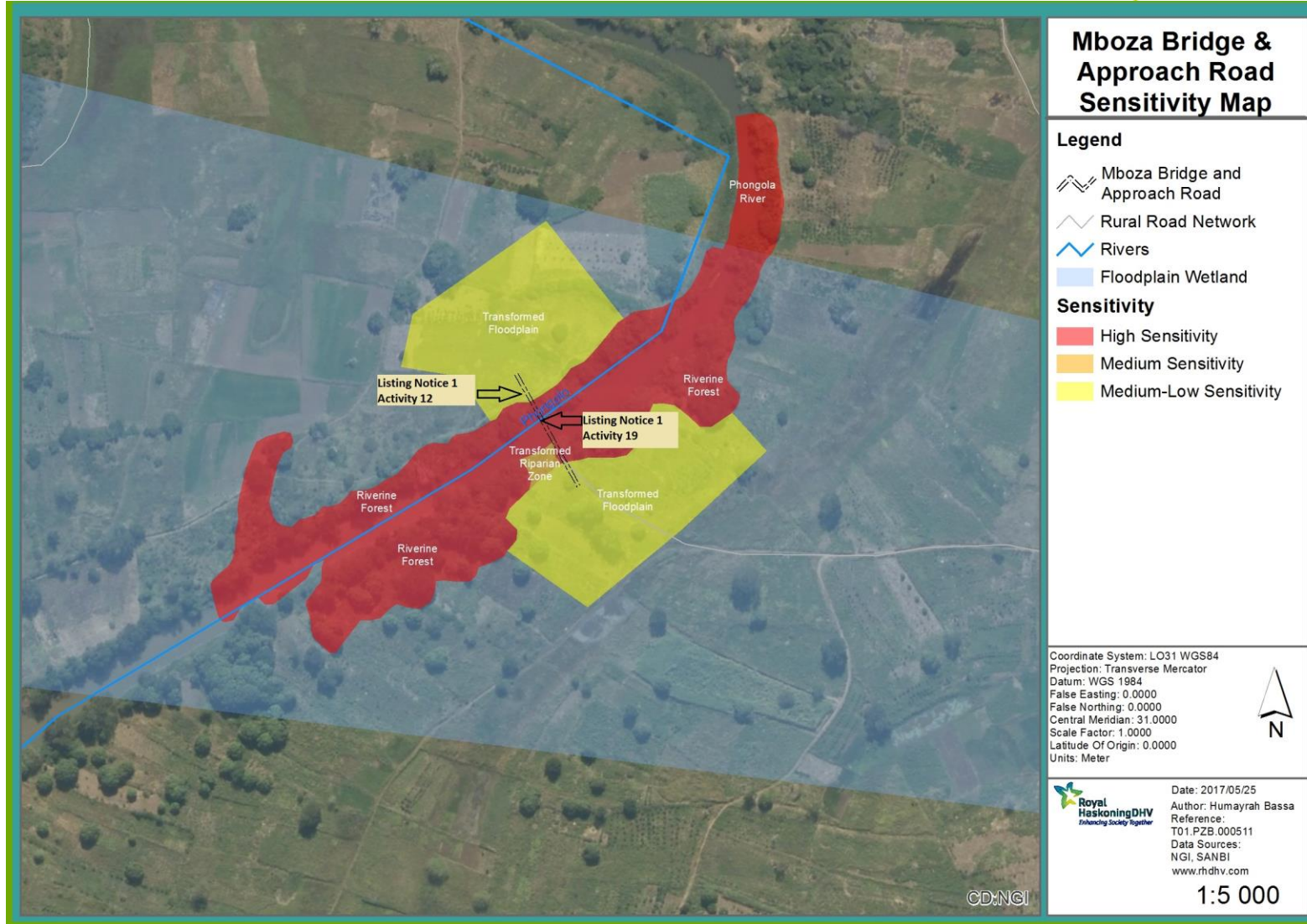


Figure 9-1: Sensitivity Map for the Proposed Pongola (Mboza) River Bridge

The following provide the key findings of the impact assessment.

9.2.1 Key Recommendations of the Specialist Studies

9.3.1.1 Terrestrial Fauna and Flora

The **Preliminary Ecological study** undertaken by Independent Specialist, **Mr Clayton Cook**, concluded the following:

“During the construction phase of the proposed Pongola (Mboza) River Bridge, habitat destruction and alteration inevitably takes place. This happens with the construction of approach roads, and the clearing of the vegetation on the bridge site. These activities will have an impact on the associated vegetation and fauna; especially ground living and fossorial species occurring within and in close proximity of the bridge site, both through modification of habitat and disturbance caused by human activity. The proposed impact will be of a definite low; short term negative impact on remaining natural vegetation and associated faunal species within the Pongola (Mboza) River Bridge site and immediate adjacent areas.”

9.3.1.2 Aquatic and Wetland Assessment

The **Aquatic and Wetland Assessment Report** undertaken by **Scientific Aquatic Services** concluded the following:

“Prior to any impact from the proposed river crossing construction, the system is already significantly impacted upon and transformed. Impacts include agricultural run-off and return water flow with associated water quality impact, flow related impacts from the up-stream impoundment, vegetation removal and use of the riverine resource by the local population.

Potential impacts identified included impact on in-stream flow and hydrological function, changes to in-stream habitat and impacts on instream biota.

Therefore, on this basis, should the project proceed it may potentially have an ecological impact of high significance both within and potentially beyond the boundaries of the project if mitigation is not applied. With mitigation the impact can be limited to a low level significance impact of low to moderate severity with limited spatial impact. However, due to the duration of the activity, the impact is expected to remain at moderate levels during the operational phase, whilst it can be reduced to low levels during the planning and construction phases.

The following general conclusions were drawn on completion of the wetland assessment:

- *Using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa (Ollis, et. al., 2013), the entire system was classified as a floodplain wetland;*
- *The wetland is registered as a RAMSAR wetland;*
- *The floodplain wetland has a moderately high importance in terms of function and service provision. Although transformation of the wetland vegetation has occurred, the wetland is considered to be of high importance from a socio- cultural service provision perspective;*
- *The floodplain wetland has an EIS falling within **Category C** (moderate sensitivity);*
- *The Present Ecological State (PES) of the wetland features was determined using the Integrated Habitat Integrity (IHI) methodology. The overall PES score calculated for the floodplain wetland fall within **Category C/D** (moderately to largely modified);*
- *Taking into consideration the PES and EIS values obtained for the wetland feature, the appropriate REC of the floodplain wetland should be a **Class C**.*

It is the opinion of the wetland ecologists that the proposed development activities will have a negative moderate to negative low impact on the wetland resources, specifically with regards to impacts on hydrology and sedimentation of the Pongola River if mitigation measures are not adhered to. Provided that the management and maintenance recommendations are strictly adhered to, impacts on the wetland features are likely to be reduced to negative low impacts.

After conclusion of the freshwater assessment, it is the opinion of the ecologists that the proposed development activities be considered favourably, provided that the management and monitoring recommendations are strictly adhered to.”

9.3.1.3 Heritage Impact Assessment

The **Heritage Impact Assessment** undertaken by **Active Heritage cc** recommended the following:

“The proposed development of the Pongola (Mboza) River Bridge may proceed from a heritage point of view as no known heritage sites are threatened. The area is also not part of any known cultural landscape. However, there is a vague possibility that construction work may unearth cultural material that was invisible during the ground survey. Cultural and heritage material is often associated with homesteads and domestic activity areas, but not always visible above surface. The fact that the footprint lies upon a domestic landscape suggests the possibility of hidden graves lying below the surface. These may well be discovered, or even exposed, during construction.

Should graves or any archaeological material be identified then all construction work must stop and the heritage consultants or Amafa be contacted for further evaluation. We also draw stakeholders attention to the South African National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and the KwaZulu-Natal Heritage Act (Act No. 4 of 2008) which requires that operations that expose archaeological or historical remains should cease immediately, pending evaluation by the provincial heritage agency.”

9.3.1.4 Social Basic Assessment

The **Social Basic Assessment** undertaken by **Kementhree Moonsamy of Royal HaskoningDHV** recommended the following:

“While impacts related to the construction stage of the proposed Pongola (Mboza) River Bridge development and approaches are for the most part, short term, it is the impacts that may be experienced during the longer term operational stage of the project which are of major significance.

The two measured positive impacts during the operational phase relate to increased access to local services (education, health facilities), and increased opportunity for trade and the subsequent growth of local businesses. In this regard, it is recommended that the Project always bear the objective that local impacts (and perhaps regional impacts in the long term), be to the positive social and economic benefit of the local populations. There are no significant long term negative impacts envisaged.”

9.3 EAP Opinion

This BAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed Pongola (Mboza) River Bridge project within the uMkhanyakude District of KwaZulu-Natal.

Having duly considered the potentially negative and positive impacts associated with the proposed project, it is the opinion of the EAP that there is unlikely to be any significant long-term negative environmental impacts.

The findings conclude that there are **no environmental fatal flaws** that could prevent the proposed Pongola (Mboza) Bridge for being constructed, provided that the recommended mitigation and management measures contained within the EMPr are implemented.

It is therefore recommended that Environmental Authorisation be granted for the proposed Pongola (Mboza) River Bridge, in the uMkhanyakude District Municipality.

The following **recommendations**, although not exhaustive, may be considered for inclusion in the conditions of the Environmental Authorisation:

- The EMPr (including: Stormwater Management Plan [SWMP], Construction Method Statement, Spill Contingency Plan and Wetland, Maintenance, Management and Rehabilitation Action Plan appended to the EMPr) and conditions thereto must be adhered to.
- An Environmental Control Officer (ECO) must be appointed and all Contractor staff to be trained on the EMPr requirements prior to commencement of activities.
- It is recommended that an Environmental Officer of suitable seniority be part of the Construction team and oversee daily environmental compliance. Any incidents must be reported to the ECO immediately to determine the way forward.
- 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 must be conducted during construction and incidents recorded and addressed accordingly.
- A suitably qualified Botanist must be appointed to undertake a walk-through, with the ECO in attendance, prior to construction commencing. The botanist must confirm the position of the construction infrastructure to be put in place and confirm that this is suitably placed.
- Should any of the shrubs and trees identified in the Terrestrial Vegetation Assessment earmarked for a permit be required to be removed, then a permit from EKZN Wildlife and / or the Department of Agriculture, Forestry and Fisheries (DAFF) must be applied for prior to the removal of the vegetation.
- Monitoring during construction and for a period of 3 months after the completion of construction, as detailed in the Wetland, Maintenance, Management and Rehabilitation Action Plan Rehabilitation Plan, must be undertaken.

9.4 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 in Section 9.2.

The BA process and report complies with the EIA Regulations of 2014 (as amended), 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.

The socio-economic impacts are however **strongly positive**.

9.4.1 Assumptions, Gaps and Limitations of the study

The Basic Assessment (BA) process followed the legislated process required and as governed and specified by the Environmental Impact Assessment (EIA) Regulations 2014 (as amended). Inevitably,

when undertaking scientific studies, challenges and limitations are encountered. For this specific BA, the following challenges were encountered and are summed in terms of the following limitations and assumptions:

- The vegetation and faunal surveys were restricted to a single season during an El Nino drought cycle. The faunal and vegetation assessments were based on a single site survey in the current summer season, and only species of plants visible and / or flowering in mid-summer were detected. It is possible that plants which flower at other times of the year are under represented, especially geophytes which flower after adequate rainfall. Thus, only those flowering plants that flowered at the time of the visit could be identified with high levels of confidence.
- Certain plant species, particularly geophytes, will only flower in seasons when conditions are optimal and may thus remain undetected, even over a survey that encompasses several seasons. Other plant species may be overlooked because of their very small size and / or extreme rarity. Several faunal species are highly secretive and may remain undetected over extensive surveys conducted for extended periods.
- This report deals exclusively with a defined area and the extent and nature of the vegetation and habitat / ecosystems in that area.
- Reference conditions are unknown. The composition of aquatic biota in aquatic resources associated with the study area, prior to major disturbance, is limited and based only on a single assessment performed. For this reason, reference conditions are largely hypothetical, as based on professional judgement and / or inferred from limited data available.
- Ecological assessment timing: aquatic and terrestrial ecosystems are dynamic and complex. It is likely that aspects, some of which may be important, could have been overlooked. A more reliable assessment of the biota would require routine seasonal sampling, with sampling being undertaken on a quarterly basis to cover seasonal variability.
- Accessibility: The area is dominated by private agricultural land within the study area and as such access to sampling sites was hampered to some degree. In addition the Pongola River is dominated by deep pools which reduced the areas suitable for sampling even further. Furthermore infestation of the riparian zone of the system by alien invasive species and in particular *Lantana camara* reduced the availability of suitable sampling points even further. In addition the presence of crocodiles also limited safe access to the river and sampling areas.
- The report is based on information obtained via the project team and is valid based on such information received at the time. Should any critical elements of the project have changed (e.g. design elements); the report will need to take account of such adjustments.

9.5 Recommendations

9.5.1 Recommendations to the CA

It is advised that the application be assessed holistically, taking into consideration the study area and the need for the proposed bridge.

The two pier (2) pier (column) concrete bridge is the preferred alternative, as piers within the active river channel are likely to have the most significant impact associated with the project.

In order to have the least possible environmental impact, the 2 pier alternative assessed within this Basic Assessment is recommended for authorisation.

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

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

9.5.2 Monitoring Requirements

A Monitoring Plan, as detailed in the Wetland, Maintenance, Management and Rehabilitation Action Plan, should be implemented.

The water resource monitoring plan comprises the following monitoring programs:

- **Erosion**
 - Monitoring should take place after every rainstorm or flood that takes place and has an influence on the water flow of the river.
- **Wetland crossing infrastructure**
 - Monitoring must take place after every rainstorm or flood that takes place.
 - Special care must be taken to ensure that there is no hollowing-out (i.e. incisions) caused by the water flow around or over river crossing infrastructure.
 - Culverts and bridge infrastructure must be inspected for any blockages or damage.
 - Aquatic Biomonitoring must be done on a quarterly basis from three (3) months prior to construction commencing to three (3) months after completion of construction.
- **Alien Vegetation**
 - Identify priority species to control and provide control methodology for each.
 - Seek guidance from a suitably qualified contractor prior to the removal of any living individual in order to establish the most species specific eradication method.
 - Develop protocols for the removal of all alien species that show recruitment.
 - Avoid the use of herbicides as far as possible. Should herbicides be used, only herbicides approved by the Department of Water & Sanitation (DWS) must be used and care must be taken with the choice of herbicide to ensure no additional impacts on the river areas or indigenous floral species result from the herbicide used. Removal of alien vegetation within the riparian zone must be done manually.
 - Footprint areas must kept as small as possible when alien and weed species are removed.
- **Water monitoring**
 - When constructions / operations are approved, water upstream and downstream of the proposed site must be tested at least once a month for a minimum of three (3) months before construction commences. This ensures that base values for the comparison of water quality during the construction and operational phase are obtained, so that impacts can be detected early and thus accordingly mitigated.
 - Aquatic Bio-monitoring must be done on a quarterly basis prior to, during and post construction of the bridge and once after construction.
 - Bio-monitoring should take place using the SASS5, MIRAI and IHAS indices as a minimum along with sediment chemistry monitoring. All aquatic bio-monitoring should be undertaken by a South African River Health Program (SA RHP) accredited aquatic ecologist.

9.5.3 Recommendations to the Applicant

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

The EMPr summarises these recommendations, as does **Section 8** of this report.

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.

10 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.

Vivienne Vorster (EAPSA)

EAP



With its headquarters in Amersfoort, The Netherlands, Royal HaskoningDHV is an independent, international project management, engineering and consultancy service provider. Ranking globally in the top 10 of independently owned, non-listed companies and top 40 overall, the Company's 6,500 staff provide services across the world from more than 100 offices in over 35 countries.

Our connections

Innovation is a collaborative process, which is why Royal HaskoningDHV works in association with clients, project partners, universities, government agencies, NGOs and many other organisations to develop and introduce new ways of living and working to enhance society together, now and in the future.

Memberships

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