REPORT

CONSULTATION BASIC ASSESSMENT REPORT FOR THE PROPOSED UPGRADE OF DANGO BRIDGE (B1372) AND BEDLANE BRIDGE (B1330) SITUATED ALONG THE P393 (R34) ROAD BETWEEN NKWALENI PASS (KM0.0) AND EMPANGENI (KM 24.0) IN KWAZULU-NATAL PROVINCE

Client: KwaZulu-Natal Department of Transport

Reference: MD1668_R0816_D01_P393 c BAR

Revision: 0.1/Draft

Date: 06 September 2017

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Enhancing Society Together

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Reference:	MD1668_R0816_D01_P393 c BAR
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Project number:	MD1668
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Open

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Executive Summary

The **KwaZulu-Natal Department of Transport (DoT)** is proposing to improve the provincial road P393 (R34) from P47-4 at Nkwaleni Pass (km 0.0) to P230 at Empangeni (km 24.0) within the King Cetshwayo District Municipality in KwaZulu-Natal Province (KZN). The proposed project commences at the intersection of P47-4 (R66) with the P393 (R34) at Nkwaleni Pass (km 0.0) and ends at P230 (km 24.0) near Empangeni. The Bedlane River Bridge (B1334) is situated at km 2.6 from Nkwaleni Pass and the Dango River Bridge (B1372) is situated at km 3.9 from Nkwaleni Pass. The existing P393 road is 8.8 m wide and the proposed road geometry for the rehabilitation is 10.0 m wide including shoulders. The proposed footway at the river crossings and where embankments are present is 1.5 m wide.

The proposed rehabilitation comprises the bulk earthworks, layerworks, surfacing, drainage, ancillary works and the upgrade of two (2) bridges. As the rehabilitation of the road (i.e. bulk earthworks, layerworks, surfacing and ancillary works) did not trigger any listed activities, these activities can proceed whilst the Basic Assessment (BA) process for the bridge upgrades is being undertaken.

Royal HaskoningDHV has been appointed by the KwaZulu-Natal Department of Transport to provide independent Environmental Consulting Services for the proposed project by conducting a Basic Assessment (BA) Study in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (as amended in April 2017), promulgated under the National Environmental Management Act (NEMA) (Act No. 107 of 1998)(as amended). ***The upgrade of the Bedlane and Dango bridges triggers the EIA Listed Activities and therefore requires an Environmental Authorisation prior the commencement of the upgrade activities.***

A wetland unit and a single riverine unit will be impacted upon by the proposed upgrade of Bedlane and Dango Bridges, respectively. Given the current **moderately modified** to **largely modified** habitat condition and relatively **low ecological importance and sensitivity** (EIS) rating for the wetlands and river, the minimum recommended management objective for watercourses assessed should be to 'maintain the current *status quo* of aquatic ecosystems without any further loss of integrity / condition or functioning'.

Due to the risk of activities and related stressors which are considered to be **low**, the project would essentially qualify for licensing under a **General Authorisation (GA**). The recent GA (August 2016) also includes a number of activities that are generally authorized for State Owned Companies (SOC's) and institutions that are then subject only to compliance with the conditions of the GA, which includes the Provincial Department of Transport engaging in the "maintenance of bridges over rivers, streams and wetlands and the new construction of bridges done according to the SANRAL Drainage Manual or similar norms and standards."

The most significant ecological impact is likely to be associated with bridge widening during the construction phase, during which time the existing piers and abutments will be enlarged in both an upstream and downstream direction, resulting in the destruction of potential aquatic habitat beyond the existing bridge footprint. However, due to the small extent of the planned bridge widening and the previously disturbed nature of the watercourses and habitat at each bridge crossing site, impact significance is likely to be moderately-low and generally acceptable from an aquatic environmental

perspective. Other more indirect impacts are likely to be of low significance and can be easily mitigated on-site through a range of practical measures recommended in **section 8** of this report, with the principal recommendations including:

- Bridge design recommendations;
- Construction-phase impact mitigation measures;
- Operation-phase impact mitigation measures;
- Post-construction rehabilitation guidelines; and
- Ecological monitoring recommendations.

No protected tree or plant species were recorded within the portions of the wetland / river to be impacted by bridge widening, hence permits for protected plant rescue and relocation will not be required for this project.

Most aquatic ecological impacts can be quite effectively mitigated through appropriate bridge design recommendations and supplemented by the application of on-site practical mitigation measures and management principles. Should the recommended mitigation and management guidelines be implemented timeously and to specification, impacts can be potentially reduced to acceptably **Low** significance levels. This should be sufficient to protect the aquatic environment from further deterioration and can then be considered to be generally acceptable as no loss of critical resources, habitats, services or threatened / endangered species is likely to be associated with the development project.

There were no heritage impacts identified for the proposed project and a Phase One Heritage Assessment identified that the Bedlane and Dango bridges are of **low** significance. An Exemption letter has been compiled for Heritage Resources Agency (Amafa AKwaZulu-Natal), requesting that the Bedlane and Dango bridges not be subjected to a Phase Two Heritage Impact Assessment due to the bridges being less than 60 years old. These bridges will however turn 60 in 2018 at the same time construction activities will have commenced.

This BA follows the legislative process prescribed in the Environmental Impact Assessment (EIA) Regulations 2014 (as amended in 2017). This report constitutes the consultative 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 development, and to document Interested and Affected Parties' (I&APs) issues and concerns. Furthermore, it provides background information of the proposed project, a motivation and details of the proposed project, and describes the public participation undertaken to date.

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

In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of significant portions of environmental legislation that were taken into consideration during this study and are elaborated on in this report.

The KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN DEDTEA) is the Competent Authority for this BA process and the development needs to be authorised by this Department.

This consultative BAR 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 significant detrimental impact on the receiving environment and it inhabitants and can be mitigated significantly. **Alternative 1** for both bridges was the preferred option. The Applicant must be bound to stringent conditions to maintain compliance and ensure a responsible execution of the project.

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

ACRONYMS

AMSL	Above Mean Sea Level
BA	Basic Assessment
BAR	Basic Assessment Report
BGIS	Biodiversity Geographic Information Systems
BID	Background Information Document
CA	Competent Authority
CBA	Critical Biodiversity Area
CV	Curriculum Vitae
DAFF	Department of Agriculture, Fisheries and Forestry
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
GA	General Authorisation
GIS	Geographic Information System
GNR	Government Notice Regulation
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
KZN	KwaZulu-Natal
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM: AQA	National Environmental Management Air Quality Act (Act No. 39 of 2004)
NEM: BA	National Environmental Management Biodiversity Act (Act No. 10 of 2004)
NEM: PAA	National Environmental Management Protected Areas Act (Act No. 57 of 2003)
NEM: WA	National Environmental Management – Waste Act (Act No. 59 of 2008)
NFA	National Forests Act (Act No. 84 of 1998)
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NWA	National Water Act (Act No. 36 of 1998)
OHSA	Occupational Health and Safety Act (Act No 85 of 1993)
PES	Present Ecological State
PPE	Personnel Protective Equipment
PPP	Public Participation Process
REC	Recommended Ecological Category
RMO	Resource Management Objective
SACNASP	South African Council of Natural Science Professionals
SAHRA	South African Heritage Resource Agency
SWMP	Stormwater Management Plan
WUL	Water Use Licence

GLOSSARY

NAME	DESCRIPTION
Activity (Development)	An action either planned or existing that may result in environmental impacts through pollution or resource use. For the purpose of this report, the terms 'activity' and 'development' are freely interchanged.
Alternatives	Different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity.
Applicant	The project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.
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	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 Impact	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.
Decommissioning	The demolition of a building, facility, structure or infrastructure.
Direct Impact	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:* *i. the land, water and atmosphere of the earth;* *ii. micro-organisms, plants and animal life;* *iii. any part or combination of (i) and (ii), and the interrelationships among and between them; and* iv. *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	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 Control Officer (ECO)	An individual nominated through the Client to be present on site to act on behalf of the Client in matters concerning the implementation and day to day monitoring of the EMPr and conditions stipulated by the authorities.
Environmental Impact	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.

NAME	DESCRIPTION
Environmental Impact Assessment (EIA)	In relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application as defined in NEMA.
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 (EMPr)	A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMPr focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.
Fatal Flaw	An event or condition that could cause an unanticipated problem and/or conflict which will could result in a development being rejected or stopped.
Groundwater	Water in the ground that is in the zone of saturation from which wells, springs, and groundwater run-off are supplied.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles as outlined in the National Environmental Management: Waste Amendment Act (No 26 of 2014).Schedule 3: Category A – Hazardous Waste.
Hydrology	The science encompassing the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground.
Indirect Impacts	Indirect or induced changes that may occur as a result of the activity. These types if 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 (I&AP)	Any person, group of persons or organisation interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the 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.
Public Participation Process	A process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters.
Re-use	To utilise articles from the waste stream again for a similar or a different purpose without changing the form of properties of the articles.

NAME	DESCRIPTION
Rehabilitation	A measure aimed at reinstating an ecosystem to its original function and state (or as close as possible to its original function and state) following activities that have disrupted those functions.
Sensitive Environments	Any environment identified as being sensitive to the impacts of the development.
Significance	Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic).
Stakeholder Engagement	The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.
Sustainable Development	Development which meets the needs of current generations without hindering future generations from meeting their own needs.
Visual Contrast	The degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would conform with the land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape.
Watercourse	Defined as: *i. a river or spring;* *ii. a natural channel or depression in which water flows regularly or intermittently;* *iii. a wetland, lake or dam into which, or from which, water flows; and* iv. *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.*
Water Pollution	The National Water Act, 36 of 1998 defined water pollution to be *the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it – less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful (aa) to the welfare, health or safety of human beings;* *(bb) to any aquatic or non-aquatic organisms;* *(cc) to the resource quality; or* *(dd) to property".*
Wetland	*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.*

1 INTRODUCTION

The KwaZulu-Natal Department of Transport (DoT) is proposing to improve the Provincial road P393 (R34) from P47-4 at Nkwaleni Pass (km 0.0) to P230 at Empangeni (km 24.0) within the King Cetshwayo District Municipality in KwaZulu-Natal Province (KZN) (Refer to Figures 1, 2 and 3 below). The project starts at the intersection of P47-4 (R66) with P393 (R34) at Nkwaleni Pass (km 0.0) and ends at P230 (km 24.0) towards Empangeni. The Bedlane river bridge (B1334) is situated at km 2.6 from Nkwaleni Pass and the Dango river bridge (B1372) is situated at km 3.9 from Nkwaleni Pass. The existing P393 road is 8.8m wide and the proposed road geometry for the rehabilitation is 10.0m wide including shoulders. The proposed footway at river crossings and embankments is 1.5m wide. The improvement process will include the following aspects:

- Detailed assessment of all the aspects of the existing road;
- Propose measures that will improve the safety of the travelling public to an acceptable standard;
- Detailed design of the approved pavement strengthening and widening of the road;
- Detailed design of the widening of the bridge decks to accommodate new widened road cross section;
- Detailed analyses to assess the requirements for passing lanes;
- Detailed design of the Stormwater drainage requirements and the replacement of existing structures to meet the KZN DoT standards;
- Contract documentation for the construction of improvement measures; and
- To carry out contract administration and construction supervision during the construction phase.

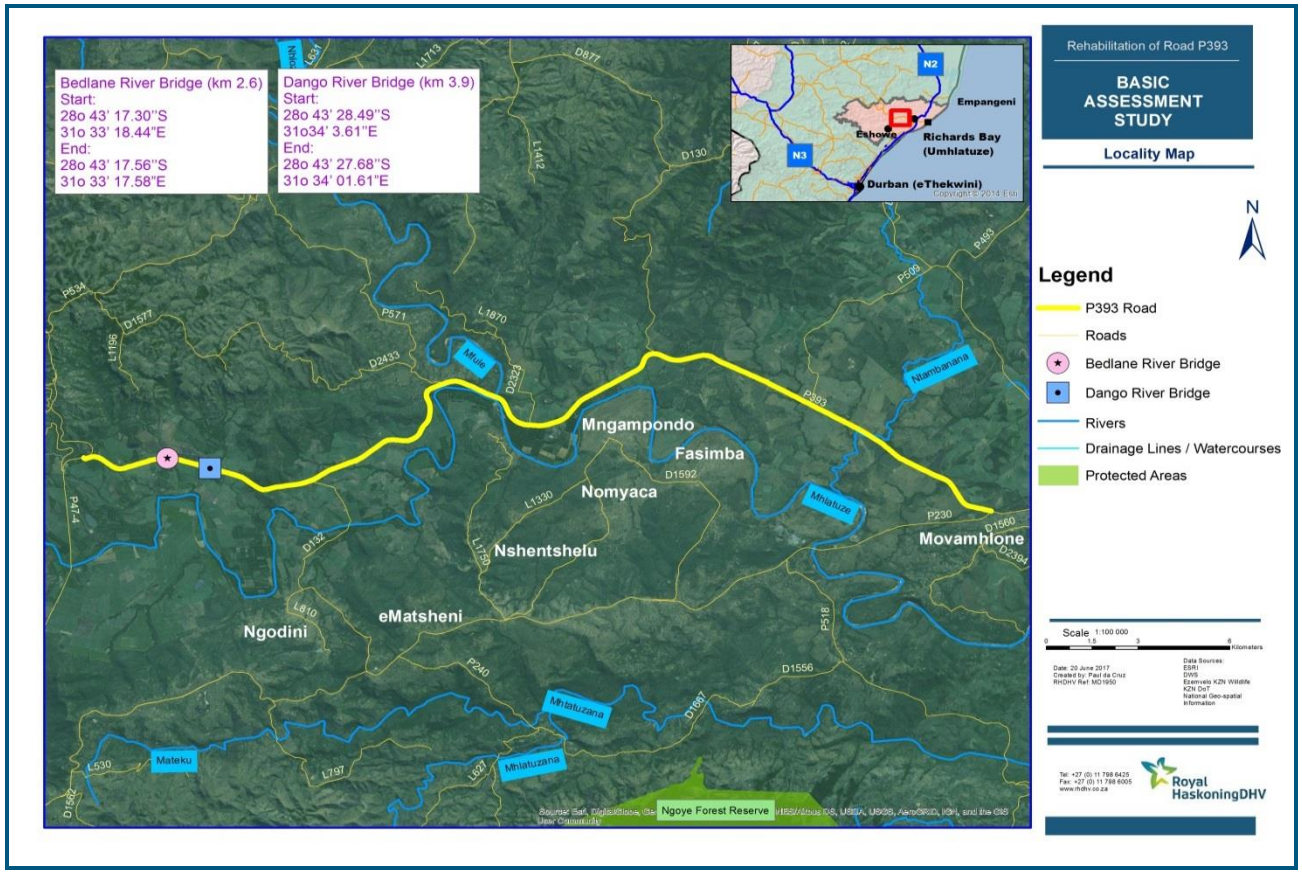


Figure 1: Location of the Study Area

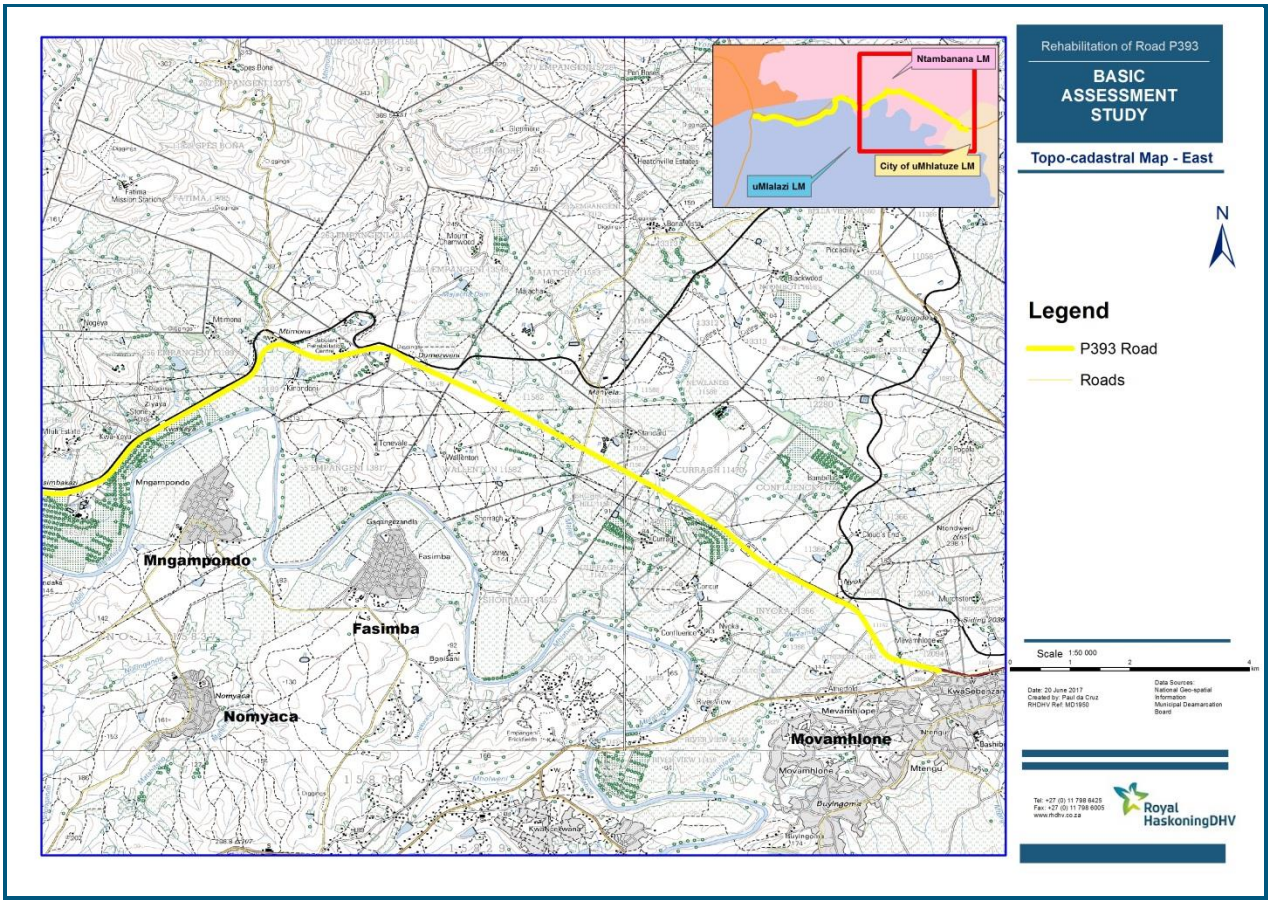


Figure 2: Location of the Study Area (Easterly Direction)

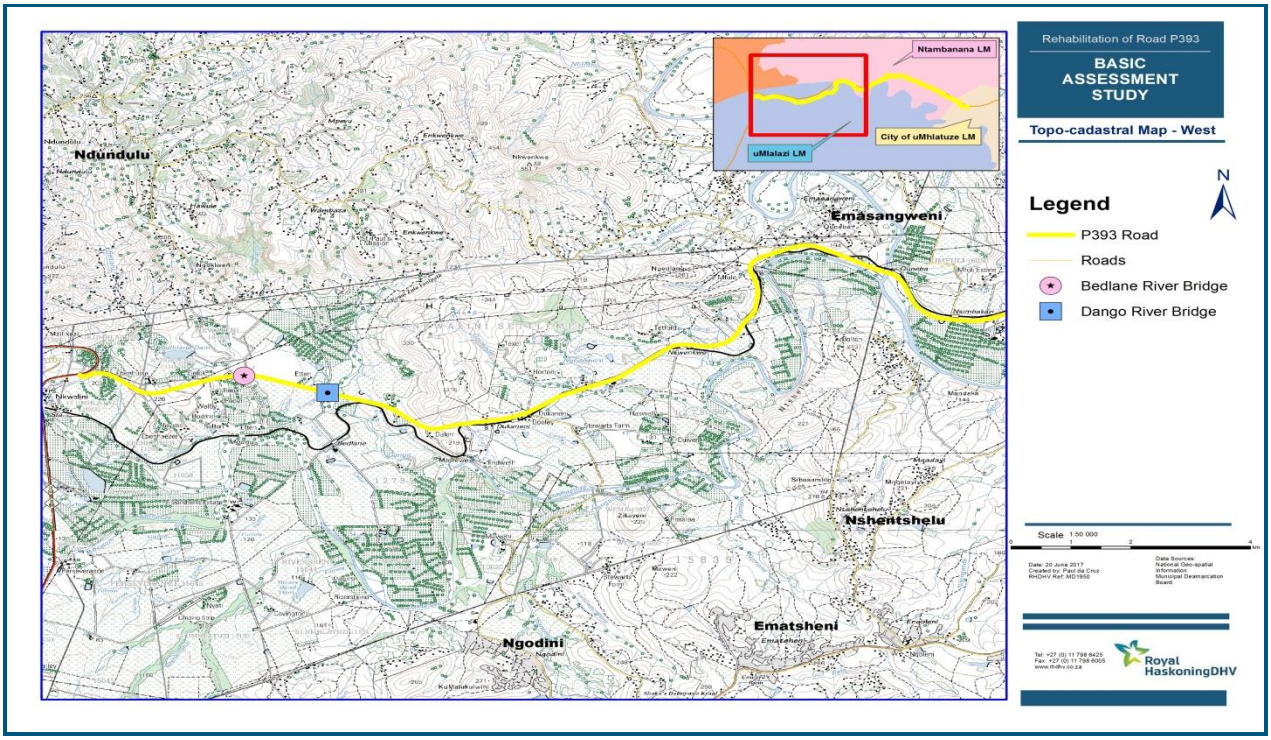


Figure 3: Location of the Study Area (Westerly Direction)

1.1 Broader Description of the Study Area

King Cetshwayo District Municipality formerly known as UThungulu District Municipality is located on the east coast of the KwaZulu-Natal Province. The District is bordered by the uMkhanyakude District on the North-East, the Zululand District to the North, the uMzinyathi to the north-west and west, iLembe District to the south and the Indian Ocean to the east (Refer to Figure 4). King Cetshwayo comprise of six Local Municipalities namely, Nkandla Municipality in the north-west, Mthonjaneni and Ntambanana Municipalities in the north, uMfolozi Municipality in the north east, **uMhlathuze Municipality** in the east and uMlalazi Municipality in the south (Refer to Figure 4). The District includes the industrial town of Richards Bay and the towns of Empangeni, Eshowe, Melmoth and Mtunzini (UThungulu Biodiversity Sector Plan, 2014).

Figure 4: Broader Location of the Study Area
www.demarcation.org.za/2016

1.2 Approach to the Study

1.2.1 Desktop Screening Assessment

During the desktop screening assessment to determine listed activities applicable to the project, the following were noted (Figure 5):

- The P393 and the associated Bedlane and Dango bridges are not located within a Protected Area,
- The bridges are not located in areas within 10km from national parks or WHS'
- The P393 and associated Bedlane and Dango bridges do not traverse any Critical Biodiversity Areas (CBAs) and the ecosystem is not considered threatened.
- The P393 and associated Bedlane and Dango bridges are not located near Community Conservation Areas.
- There are three major rivers occurring within the broader study area and these are Nhlozane, Mhlatuzana and Mateku. In close proximity there is Ntambanana, Mhlatuze and Mfule rivers.

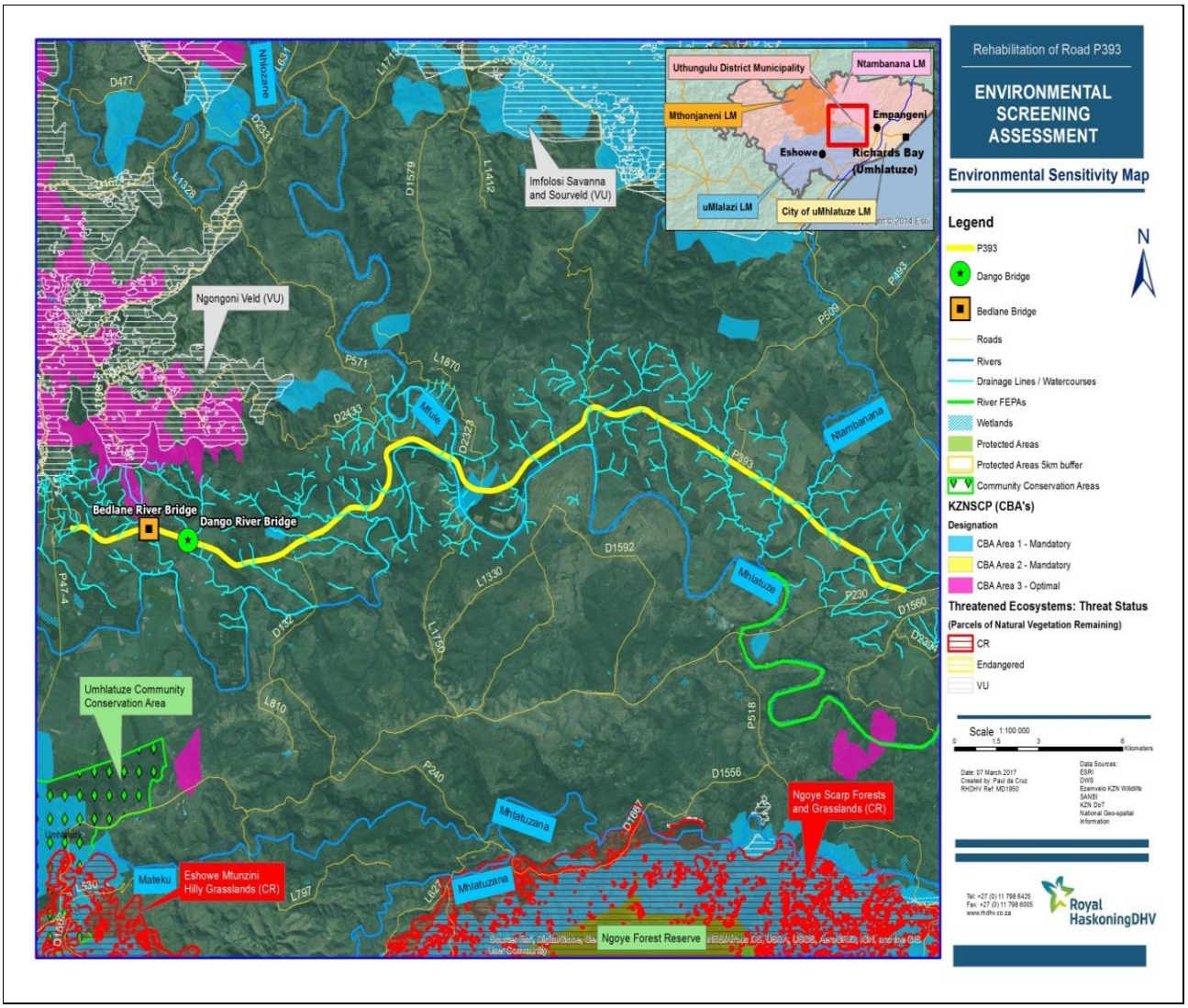


Figure 5: Sensitive Geographical Areas

1.2.2 Pre-application Consultation

An Interpretation Query was lodged with the Competent Authority, the Department of Economic Development, Tourism and Environmental Affairs (DEDTEA), King Cetshwayo District on the **14th of March 2017** to obtain clarity on whether the rehabilitation of the P393 and associated infrastructure would constitute an activity identified in terms of the Section 24(2) and 24D of the National Environmental Management Act (Act No. 107 of 1998) - NEMA (as amended).

On the **17th of April 2017**, DEDTEA confirmed that **Listing Notice 1 – Activity 19** of Government Notice Regulation (GNR) 983 of 4 December 2014 (as amended by GNR 327 of 6 April 2017) is triggered by the proposed upgrade of the two (2) bridges namely Bedlane and Dango thus an application for Environmental Authorisation must be lodged with the Department. In addition, there is another listed activity identified to be triggered by the proposed development and is outlined below:

- Listing Notice 1 – Activity 48(i)(a) of GNR 983 of 4 December 2014 (as amended by GNR 327 of 6 April 2017);
- Listing Notice 1 – Activity 19 of GNR 983 of 4 December 2014 (as amended by GNR 327 of 6 April 2017);

In July 2017, DEDTEA required that a combination application be submitted in terms of Regulation 11 of the EIA Regulations 2014 (as amended in 2017) in order to ensure that the scope of work associated with both bridges can be undertaken as one consolidated Basic Assessment process. Approval for this combined process was obtained from DEDTEA on **10 August .2017**.

1.2.3 Basic Assessment Study

A Basic Assessment (BA) study is the level of environmental assessment applied to activities listed in Listing Notices 1 and 3. This study is applied to activities that are considered less likely to have significant environmental impacts and, therefore, unlikely to require a detailed Environmental Impact Assessment (EIA) study. The Basic Assessment Report (BAR) is a more concise analysis of the environmental impacts of the proposed activity/development than a Scoping and EIA Report. The BAR aims to achieve the following:

- 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 project;
- 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 project and the risk of impact of the proposed activity 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.

This BAR has been compiled in accordance with the stipulated requirements in Appendix 1 of GNR 982 of the EIA Regulations 2014 (as amended in 2017), which outlines the legislative BA process and requirements for assessment of outcomes, impacts and residual risks of the proposed development. The

BAR further incorporates the findings and recommendations of the freshwater and heritage specialist studies conducted for the project.

An Environmental Management Programme (EMPr) has been compiled according to Appendix 4 of GNR the EIA Regulations 2014 (as amended in 2017) for the construction and operational phases of the project. The EMPr has been compiled as a stand-alone document from the BAR and will be submitted to the DEDTEA along with the BAR. The EMPr provides the actions for the management of identified environmental impacts emanating from the project and a detailed outline of the implementation programme to minimise and/or eliminate any anticipated negative environmental impacts and to enhance positive impacts. The EMPr provides strategies to be used to address the roles and responsibilities of environmental management personnel on site, and a framework for environmental compliance and monitoring.

1.3 Structure of the BAR

The BAR is structured as follows:

Table 1: Structure of the Report

Chapter	Description
1	**Introduction** – Provides the background to the project as well as details of the specialist studies conducted and contact details for the project proponent and EAP.
2	**Environmental Legislative Context** – Details the pertinent environmental legislation and the applicability to the project
3	**Project Context & Motivation** – Provides the site locality, project description and need and desirability of the project
4	**Project Alternatives** – Describes the alternatives considered, including the 'no-go' option
5	**Description of the Baseline Environment** – Describes the pre-development context of the site
6	**Public Participation Process** – Explains the public consultation undertaken
7	**Specialist Assessments** – Describes the impact assessment and findings of the specialist studies
8	**Impact Assessment** – Details the impact assessment methodology and quantifies the impacts anticipated
9	**Conclusion & Recommendations** – Provides the EAP opinion and summarises the impact assessment as well as the recommendations.

1.4 Specialist Assessment

To ensure the scientific vigour of the BA study, as well as a robust assessment of impacts, Royal HaskoningDHV commissioned a Freshwater Habitat Impact Assessment (undertaken by Eco-Pulse Environmental Consulting Services) and a Heritage Impact Assessment (undertaken by Active Heritage) as well as obtained input from Lindsay Napier in order to comprehensively identify both potentially positive and negative environmental impacts (social and biophysical), associated with the project, and where possible to provide mitigation measures to reduce the potentially negative impacts and enhance the positive impacts.

1.4.1 Peer Review

In addition to the above, 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 of 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 (Pty) Ltd.**

1.5 Details of the Project Developer

The Developer is the KwaZulu-Natal (KZN) Department of Transport (DoT) and the details of the responsible person are listed in Table 2 below.

Table 2: Applicant Details

Applicant	KwaZulu-Natal Department of Transport
Representative	Ms Khumbu Sibiya
Physical Address	172 Burger Street, Pietermaritzburg, 3200
Postal Address	Private Bag X9043, Pietermaritzburg, 3200
Telephone	033 355 0594
Facsimile	033 345 7537
E-mail	Khumbu.Sibiya@kzntransport.gov.za

1.6 Details of the Environmental Assessment Practitioner

The environmental team of Royal HaskoningDHV have been appointed as an independent Environmental Assessment Practitioner (EAP) by the KZN DoT to undertake the appropriate environmental studies for this proposed project.

The professional team of Royal HaskoningDHV has considerable experience in the environmental management field. Royal HaskoningDHV been involved in and/or managed several of the largest EIAs undertaken in South Africa and within the SACD region 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, and power lines), mixed-use developments, bulk infrastructure and supply (e.g. wastewater treatment works, pipelines, landfills), electricity generation and transmission, urban, rural and township developments, environmental aspects of Local Integrated Development Plans, as well as general environmental planning, development and management. The contact details of the responsible person are provided in Table 3 below.

Table 3: EAP Details

Consultant	Royal HaskoningDHV
Contact Persons	Sibongile Gumbi
Postal Address	PO Box 867, Gallo Manor, 2052 (Johannesburg)
Telephone	011 798 6449
E-mail	Sibongile.gumbi@rhdhv.com
Qualification	MSc Environmental Science

Consultant	Royal HaskoningDHV
Expertise	Sibongile Gumbi has eleven years of experience in the environmental field. Her expertise ranges from Environmental Training, Environmental Auditing and Monitoring, Environmental Impact Assessment studies, Environmental Management Plans and Programmes, Stakeholder Engagement, Project Management. Sibongile is also a registered Pri.Sci.Nat.
Signature of 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 pieces of environmental legislation that need to be considered during this study. This section outlines the legislation that is applicable to the proposed project and has been considered in the preparation of this report.

Table 4: Key Legislation Considered

Acts	Objectives, Important Aspects, Associated Notices and Regulations
National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended	***Objectives:*** To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state. ***Relevant Notices and Regulations:*** ▪ Environmental Impact Assessment Regulations, 2014 (GNR 982 of 4 December 2014) as amended by GNR 326 of 7 April 2017 ▪ Listing Notice 1 (GNR 983 of 4 December 2014) as amended by GNR 327 of 7 April 2017 ▪ Listing Notice 3 (GNR 985 of 4 December 2014) as amended by GNR 324 of 7 April 2017 ***Relevance to the Proposed Project:*** ▪ Development must be socially, environmentally and economically sustainable. ▪ Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated; 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. ▪ 'Polluter Pays' principle. ▪ Any activity that is proposed and which is listed in the NEMA EIA Regulations requires environmental authorisation. ***Listed Activity/ies & Applicability:*** The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse. The proposed widening of Bedlane and Dango bridges will interfere with the watercourses in which they are situated will thus require

Acts	Objectives, Important Aspects, Associated Notices and Regulations
	infilling or depositing of material of more than 5m^3 or the dredging, excavation, removal or moving of soil, sand or rock of more than 10m^3 from / into a watercourse.
National Water Act (Act No. 36 of 1998) (as amended)	***Objectives:*** 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. ***Relevance to the Proposed Project:*** ▪ Sustainable protection, use, development and conservation of water resources – including aquatic ecosystems. ▪ Defines 11 water uses and provides licencing procedures. ***Notices and Regulations:*** ▪ General Authorisation in terms of Section 39 of the National Water Act (Act No. 36 of 1998), Water Use Section 21 (a) – GN538 of 02 September 2016. ▪ General Authorisation in terms of Section 39 of the National Water Act (Act No. 36 of 1998, Water Uses Section 21 (c) and (i) (GNR 509 of 26 August 2016). ***Water Uses Triggered:*** As the proposed development involves the crossing of one wetland and tributaries of the uMhlathuze river, a Water Use Authorisation is required in terms of Section 21(c) and (i) of the NWA. ***The Water Use Authorisation for this project will be in a form of a General Authorisation based on the Risk Assessment results undertaken by Eco-Pulse.*** ▪ Section 21(c) - impeding or diverting the flow of water in a watercourse (applicable for the construction within watercourses); and ▪ Section 21 (i) - altering the bed, banks, course or characteristics of a watercourse (applicable for the construction within watercourses). *It is not foreseen that a Section 21(a) will be triggered as water for Construction purposes will be obtained from the Municipality.*
National Forests Act (Act No. 84 of 1998)	***Purposes:*** The purposes of this Act are to: promote the sustainable management and development of forests for the benefit of all; create the conditions necessary to restructure forestry in State forests; provide special measures for the protection of certain forests and trees; promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes.

Acts	Objectives, Important Aspects, Associated Notices and Regulations
	Notices and Regulations: 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. ***Relevance to the proposed project:*** ▪ 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'. *No protected tree species were identified*
National Heritage Resources Act(Act No 25 of 1999)	***Purposes:*** The Act provides general principles for governing heritage resources management throughout South Africa including national and provincial heritage sites, burial grounds and graves; archaeological and palaeontological sites, and public monuments and memorials. ***Relevance to the Proposed Project:*** South Africa's heritage resources, also described as the 'national estate', comprise a wide range of sites, features, objects and believes. However, according to Section 27(18) of the National Heritage Resources Act (NHRA), Act 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. In accordance with Section 38 of the NHRA, an independent heritage consultant (Active Heritage) has appointed by Royal HaskoningDHV to conduct a Heritage Impact Assessment (HIA). This Phase I HIA will determine the full range of sites, features or objects of cultural heritage significance that occur within the boundaries of the area where it is planned to develop the power line. If any sites, features or objects of cultural significance are found to be endangered by the proposed development, applicable mitigation measures have to be applied to these resources. This is commonly referred to as Phase II studies and has as aim to recover sufficient information and material from sites.

2.1 Other Relevant Environmental Management Instruments

Acts/Guideline/Policies/Environmental Management Instruments	Considerations
The Constitution (No. 108 of 1996)	Chapter 2 – Bill of Right Section 24 – Environmental Rights
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.
National Environmental Management Biodiversity Act (Act No. 10 of 2004) and Regulations: ▪ Threatened or protected species (GN 388) ▪ Lists of species that are threatened or protected (GN 389) ▪ Alien and invasive species regulations (GNR 506) ▪ Publication of exempted alien species (GNR 509) ▪ Publication of National list of invasive species (GNR 507) ▪ Publication of prohibited alien species (GNR 508)	Provide for the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.
National Environmental Management: Protected Areas Act (Act No. 57 of 2003) - NEMPAA	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.
National Environmental Management: Waste Act (Act No. 59 of 2008)	Section 17 - Every attempt must be made to reduce, recycle or re-use all waste before it is disposed. Section 25 - All waste (general and hazardous) generated during construction may only be disposed of at appropriately licenced waste disposal sites.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Section 32 - Control of dust. Section 34 - Control of noise. Section 35 - Control of offensive odours.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	Section 22 - Application for a mining permit / right. Section 39 - Environmental management programme and environmental management plan.
Occupational Health and Safety Act (Act No. 85 of 1993)	Section 8 - General duties of employers to their employees. Section 9 - General duties of employers and self-employed persons to persons other than their employees.
Construction Regulations (2014)	Contractors must comply with the Construction Regulations which lay

Acts/Guideline/Policies/Environmental Management Instruments	Considerations
	out the framework for construction related activities.
Municipal By-laws	
King Cetshwayo District Municipality IDP (2016 – 2017) King Cetshwayo District-Reviewed Spatial Development Framework (2015/2016) uMhlathuze Local Municipality IDP (2016 – 2017)	

2.2 Sustainable Development

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

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

2.3 Climate Change Consideration

The proposed project will take into account energy efficient technologies and consider international best practice in terms of the construction methodologies and management of finite resources. Since climate change concerns include unpredictability and severity in weather patterns, the provision of basic human needs, such as fresh water supply, is considered critical.

3 PROJECT CONTEXT & MOTIVATION

3.1 Site Description and Ownership

The site comprises all the land within the proclaimed limits of the road reserve along the extent of the works, stockpile areas, locations set aside for construction and supervision accommodation and any other location required for the execution of the works. The land in which the proposed project is sited is owned by the Crookes Brothers and Copper Moon Trading 277 Pty Ltd.

3.2 Co-ordinates

3.2.1 Bedlane and Dango Bridges

Table 5: Co-ordinates of the Bridges to be Widened

Bridge Details	Bridge Coordinates	
	Start	End
Bedlane river bridge @ km 2.6	28º 43' 17.30"S 31º 33' 18.44"E	28º 43' 17.56"S 31º 33' 17.58"E
Dango river bridge @ km 3.9	28° 43' 28.49"S 31° 34' 3.61"E	28º 43' 27.68"S 31º 34' 01.61"E

3.2.2 P 393 (R34) Road

Table 6: Co-ordinates of the P393 (R34) Road

Location of the Road	Latitude	Longitude
Point (Start)	28°43'25.09"S	31°31'29.42"E
Point (End)	28°44'17.18"S	31°47'29.87"E

3.2.3 Surrounding Land Uses

Table 7: Surrounding Land uses within a 500m Radius of the Site

Description	Y/N	Description	Y/N
Natural area	Y	Light industrial	N
Low density residential	Y	Medium industrial	N
Medium density residential	N	Heavy industrial	N
High density residential	N	Power station	N
Informal residential	N	Military or police base/station/compound	N
Retail commercial & warehousing	N	Spoil heap or slimes dam	N
Office/consulting room	N	Dam or reservoir	N
Quarry, sand or borrow pit	N	Hospital/medical centre	N
School	N	Tertiary education facility	N

Description	Y/N	Description	Y/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	N
Airport	N	Other:	N

Key: Y = Yes N = No

3.3 Project Description

3.3.1 Bedlane and Dango Bridges Widening

The main structural work required between km 0,0 and km 24,0 comprises of the replacement of two bridges that need to be widened and these are Bedlane bridge (km 2.6) (Figure 6 below) and Dango bridge (km 3.9) (Figure 7 below) also refer to Table 8 for the construction details.

Table 8: Description of Activities at Each Bridge

Bridge Name	Existing Structure	Improvement Structure
Bedlane Bridge at km 2.6	 ▪ Supported, solid reinforced concrete deck of two spans, 10.5m each, supported on conventional reinforced concrete pier and abutments. ▪ The bridge is on a 52.5 degree skew. ▪ The abutments are reinforced concrete cantilever structures and are founded on spread footings, with reinforced concrete wing walls continuous with the abutment at approximately 70 and 20 degrees to the road edge. ▪ The pier is a reinforced concrete wall type structure founded on spread footing. ▪ The existing deck is a reinforced concrete solid slab 600mm thick with a 600mm wide x 150mm thick walkway/kerb on both sides. There is a clear distance of 8.0m between kerbs. The deck is pinned at the abutments by 20mm dowel bars at 600 centres and pinned at the pier by seating on 3 ply malthoid roofing felt over the pier. The existing balustrades are composed of precast concrete railings. ▪ The type and depth of the existing foundations was established from the as-built drawings provided.	▪ **Deck:** The deck to be widened by 2.825m upstream and 1.225m downstream. The deck widening will consist of simply supported solid concrete slabs approximately 600mm deep spanning onto the extended pier and abutments. A 600mm strip along either side of the existing deck to be demolished to expose the existing reinforcement to be lapped with the new deck reinforcement. The new deck is cast and after a minimum of 28 days, the 600mm strip between the new and old deck is cast. This will be done to achieve an adequate bond between the new and old decks and to allow for initial shrinkage and deflection of the new portion of the deck to take place. F-Shape New Jersey and sidewalk will be installed as shown in the drawings. A Thorma joint to be installed across the old and the new decks as detailed. ▪ **Abutments:** The top of the abutments to be demolished 600mm deep and 1800mm length at both ends. Existing wing walls to be retained in order to support the existing road fill. The extended front walls to be dowelled into the existing wall and footing. The new spread footing extension to be dowelled into existing using Y20 bars at 400mm centres. The existing concrete face will be scabbled to expose the aggregates before casting. Dowel bars of Y20 and 600 centres will be installed at the top of the wall to connect into the new deck concrete. ▪ **Pier**: The pier to be extended by 3.84m upstream and 1.12m downstream. The 800mm strip along the height on either side of the existing pier will be demolished to expose the existing reinforcement to be lapped with the new pier reinforcement. The new pier concrete extension is cast to bond with the existing concrete. Two layers of 3ply malthoid roofing felt are placed over the pier top surface before casting the deck. The new spread footing extension is dowelled to the existing by means of Y20 bars at 400mm centres. The existing concrete face to be scabbled in order expose the aggregates before casting.

Bridge Name	Existing Structure	Improvement Structure
Dango Bridge at km 3,9	 ▪ Supported, voided reinforced concrete deck of three spans, 14.2m each, supported on conventional reinforced concrete piers and abutments. The bridge is on a 45 degree skew. ▪ The abutments are reinforced concrete cantilever structures. The east abutment is founded on spread footings and the west abutment is founded on caissons with reinforced concrete wing walls continuous with the abutment at approximately 67.5 and 22.5 degrees to the road edge. ▪ The piers are reinforced concrete wall type structures and are founded on caissons. ▪ The existing deck is a 900mm deep reinforced concrete voided deck with 840mm wide x 150mm thick walkway/kerb on both sides. There is a clear distance of 7.3m between kerbs. The decks are fixed at the abutments and piers by 20mm dowel bars at 600 centres and seating on 3 ply malthoid roofing felt. The existing balustrades are composed of precast concrete railings.	▪ **Deck:** The deck to be widened by 3.129m upstream and 1.329m downstream. The deck widening will consist of simply supported concrete deck approximately 900mm deep spanning onto the piers and abutments. A 1600mm wide x 200mm deep top strip and 200mm wide x 750m deep bottom strip along either side of the existing deck to be demolished to expose the existing reinforcement to be lapped with the new deck reinforcement. The new deck is cast and after a minimum of 28 days, the 300mm strip between the new and old deck is cast. This will be done to achieve an adequate bond between the new and old decks and to allow for initial shrinkage and deflection of the new portion of the deck to take place. Standard parapets and sidewalk will be installed as shown in the drawings. A Thorma joint to be installed across the old and the new decks as detailed. ▪ **Abutments:** The east abutment wall and footing will be extended by 4.425m upstream and 1.880m downstream. The new wall to be dowelled into existing using Y20 bars at 400mm centres. The west abutment top will be demolished and modified to provide a deck extension seating. The existing wingwalls will be demolished 1000mm deep from the top and raised to match the new deck. The fill behind the raised wingwalls to be soil reinforced in order not to exert earth pressure on the raised wingwalls. The approach embankments will be stabilised by means of gabion boxes. ▪ **Pier:** Pier heads 1.5m deep x 1.0m wide to be added to the piers for the new deck seating. The concrete surface is scabbled and roughened for the new concrete to bond with the old. Three rows of holes at 500mm centres are drilled through and epoxied Y12 bars are placed to hang the pier head reinforcement. The pier head is tied to the pier by means of four rows of 25mm DYWIDAG treaded bars which are torqued with flanged anchor nuts.

Figure 6: Aerial Image of Bedlane Bridge

Figure 7: Aerial Image of Dango Bridge

EIA REGULATIONS 2014 (as amended in 2017): LISTING NOTICE 1 TRIGGERS DUE TO THE BRIDGE WIDENING

Activity 48(i)(a) - *The expansion of infrastructure or structures where the typical footprint is expanded by 100 square meters or more where such expansion occurs within a watercourse*

Activity 19 - *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from (i) a watercourse.*

SECTION 21 WATER USE TRIGGERS

Section 21 (c) - *impeding or diverting the flow of water in a watercourse (applicable for the construction within watercourses)*

Section 21 (i) *- altering the bed, banks, course or characteristics of a watercourse (applicable for the construction within watercourses.*

3.3.1.1 Access and Traffic Accommodation

It is proposed to divert traffic onto half of the existing deck to one lane of 3.0m in order for the contractor to demolish part of the existing deck and re-construct one side of the widening. After completing the first side traffic can then be moved on to the newly constructed portion of the deck and half of the existing deck in two lanes of 3.0m. The opposite side of the bridge will then be partially demolished and re-constructed. Once the structure has been fully widened, traffic can be moved to its final position. No temporary road deviations over watercourses will therefore be required.

3.3.1.2 Part Demolition of the Existing Bridge

- **Pier:** The existing pier ends will be demolished 800mm wide on both sides before connecting the new pier extension.
- **Abutments:** The top of the abutments to be demolished 600mm deep and 1800mm length at both ends. The existing wing walls will be retained in order to support the existing fill.
- **Deck:** The 600mm wide strip along either side of the existing deck will be demolished during the deck widening.
- **Parapets:** The existing handrails and guardrails will be removed and replaced with F Shape New Jersey barriers.

The downstream side will be demolished first with a single lane deviation to the upstream side. After completing the deck widening on the downstream side, traffic will be diverted to the new section of the bridge with a double lane and the upstream side demolished. Care will be taken not to damage the existing reinforcement. This will apply to both bridges.

3.3.1.3 Ancillary Components

The following miscellaneous bridge components are proposed:

- Asphatic Plug type expansion joints,
- Scupper drainage pipes,
- 3 Ply malthoid bearings,
- Double drip moulds (30mm half round) to the full length of the deck cantilevers and
- F Shape New Jersey barriers.

3.3.2 Road Rehabilitation

The project involves widening the existing roadway from 8m to 10m sideways. Widening of this section of road is required to improve safety for vehicles and pedestrians.

3.4 Project Motivation

3.4.1 Need & Desirability

A full mechanistic analysis was conducted along the road section under consideration (P393). This included a project level visual assessment survey, as well as a Falling Weight Deflectometer (FWD) survey in which the residual structural capacity was determined. After assessing the road both structurally (through FWD's) and functionally (through visual assessment), it was determined that rehabilitation in the form of development strengthening was required to ensure that the asset can carry its prescribed 20 year design traffic whilst maintaining a safe environment for all road users.

Table 9: Project Need, Desirability and Benefits

Project Need			
1.	**Was the relevant provincial planning department involved in the application?**	YES	
2.	**Does the proposed land use fall within the relevant provincial planning framework?** As the project is for the rehabilitation of the existing P393 and widening of bridges located along the road, it does not constitute a new land use and is therefore considered to be in line with the provincial framework.	YES	
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?**	YES	
2.	**Does the proposed land use / development conform to the relevant structure plans, SDF and planning visions for the area?**	YES	
3.	**Will the benefits of the proposed land use / development outweigh the negative impacts of it?** The current road is in need of repair and rehabilitation, and therefore the benefits of rehabilitating this road is to ensure that it will continue to be safe to its users and outweighs any impacts which are expected to be most prevalent during the temporary construction phase.	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?** The P393 is an existing road.		NO
6.	**Will the proposed land use / development set a precedent?** The project is limited to the rehabilitation of an existing road and bridges located along the road.		NO

7.	**Will any person's rights be affected by the proposed land use / development?**		NO
8.	**Will the proposed land use / development compromise the "urban edge"?** The area is completely rural in nature and will have no effect on the urban edge.		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 rehabilitation of the P393 and the upgrade of bridges located along the road will ensure that the road is safe for users and can cater to the traffic needs of the surrounding communities.		
3.	**Will the land use / development have any benefits for the local communities where it will be located?**	YES	
4.	**Explain:** The rehabilitation of this road and the bridges situated along the road will ensure that the road is safe for users.		

3.4.2 Socio-economic Value

What is the expected capital value of the activity on completion?	R198 262 190.5
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?	Approximately 70, including 10 youth employees which shall be trained and upskilled as per the Expanded Public Work's National Youth Service.
What is the expected value of the employment opportunities during the development phase?	Approximately R21 900 000.00 in salaries for workers and staff directly involved in the contract (excludes the contribution towards wages of indirect workers on the project i.e. suppliers).
What percentage of this will accrue to previously disadvantaged individuals?	R 4 860 000.00
How many permanent new employment opportunities will be created during the operational phase of the activity?	0
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 in 2017), feasible alternatives are required to be considered as part of the environmental investigations. In addition, the obligation that alternatives are investigated is also a requirement of Section 24(4) of the NEMA (Act No. 107 of 1998) (as amended). An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity which may include alternatives to:

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

4.1 Site Alternatives

The project involves the rehabilitation to a portion of the existing P393; therefore no off-site or other site-specific alternatives have been investigated.

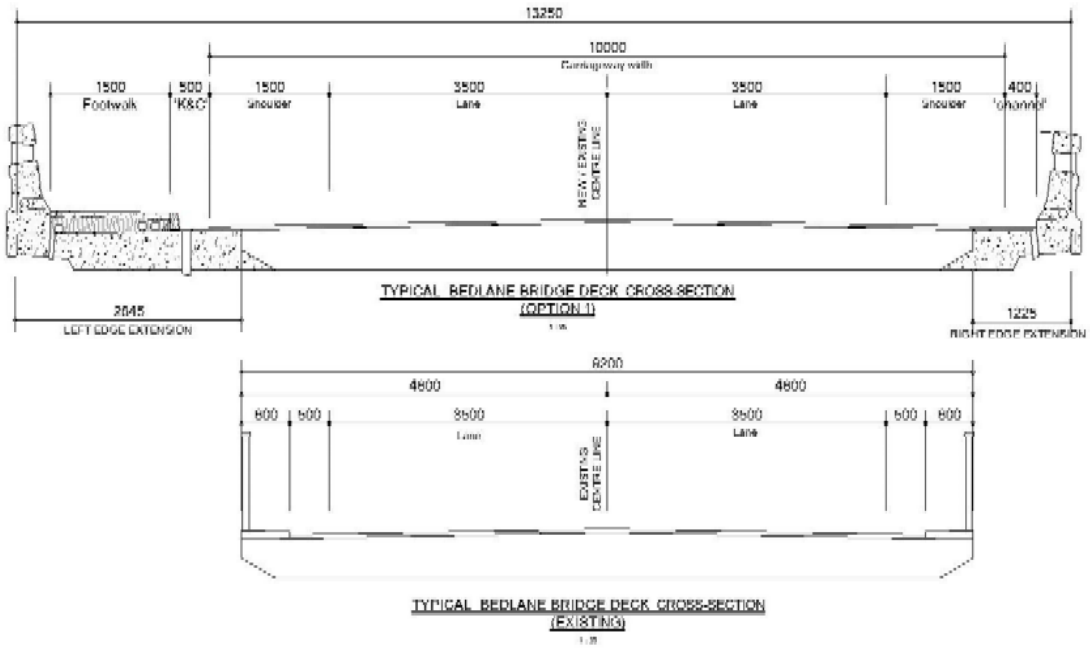
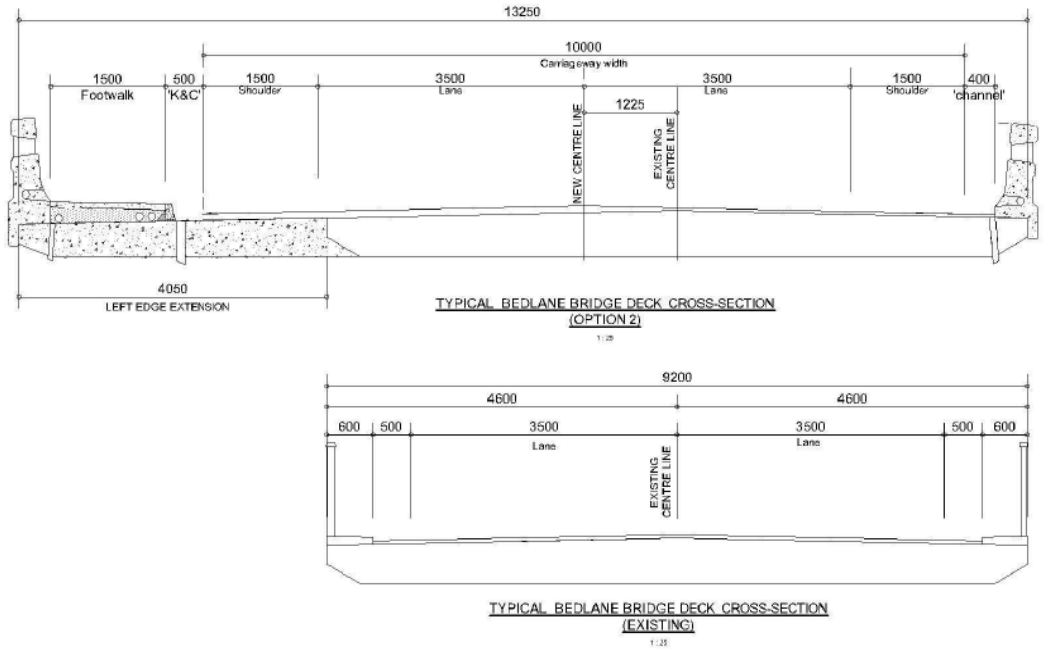
4.2 Layout / Route Alignment Alternatives

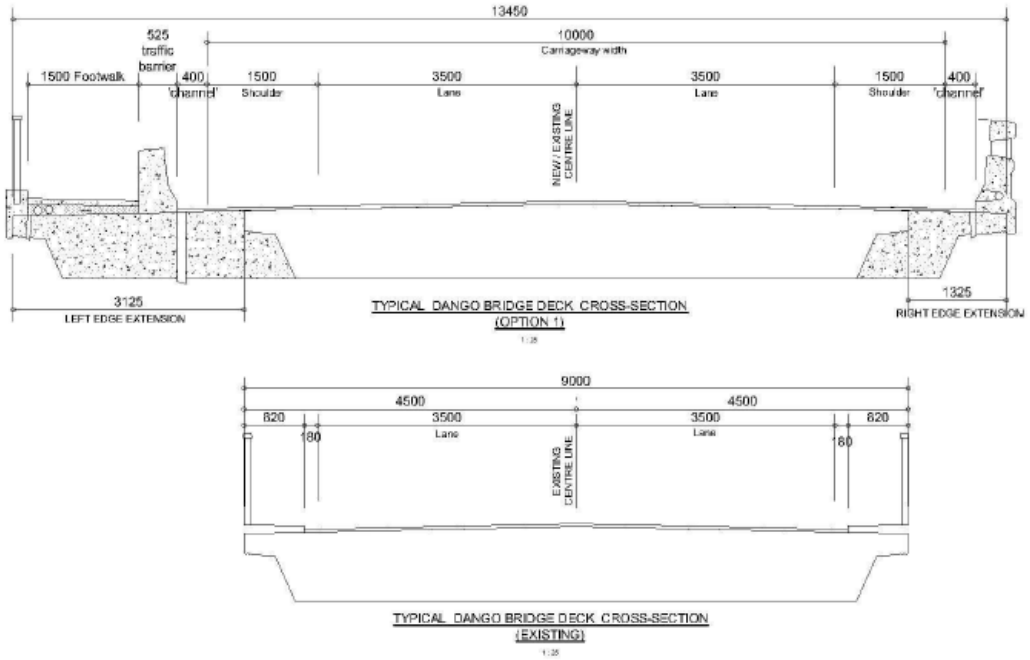
As the project proposes to rehabilitate the existing P393 from km 0, 0 to km 24, 0, the existing layout or alignment will be followed and work will be undertaken within the additional 2 m road reserve.

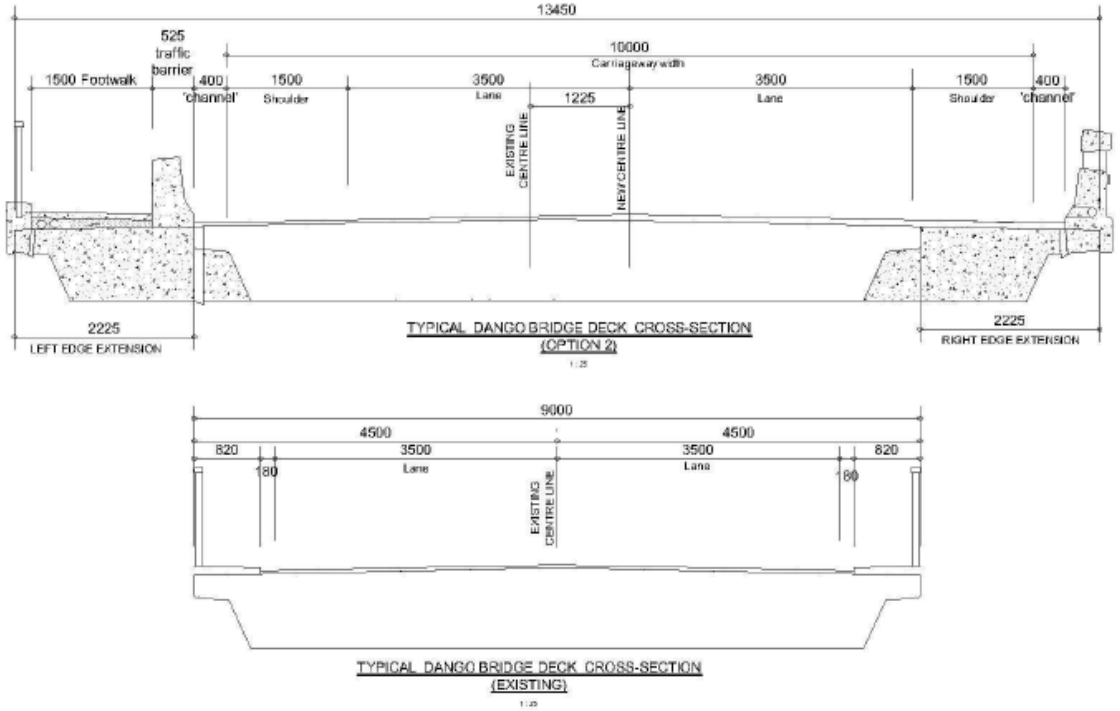
4.3 Design Alternatives

Table 10: Options of Bedlane Bridge and Dango Bridges Design

Bridge Name & Preference	Option 1	Option 2
Bedlane Bridge	This option proposes widening the bridge by 2.825 m up-stream and 1.225 m downstream sides of the bridge. The carriageway centreline of the upgraded road will be at the same position as the existing road. This option will follow the proposed geometric design of the upgraded road.	This option proposes widening the bridge by 4.05 m upstream sides of the bridge. The carriageway centreline of the upgraded road will be offset by 1.225 m to the up-stream from the centreline of the existing road. This option will require a re-alignment of the proposed geometric design of the upgraded road.
Preference	Bridge construction costs for Option 2 are cheaper than for Option 1 as it has less traffic accommodation costs and construction time is less as activities are only on one side. However, the combined costs for the bridge and the road construction for Option 1 are cheaper than for Option 2. Option 2 requires the realignment of the existing road resulting in large quantities of earthworks and road formation when compared to Option 1. The Option 2 road realignment will result in encroachment outside the road reserve requiring additional expropriation. The potential for environmental impacts is also considered to be greater as untransformed areas will be required to be lost as a result of the change in alignment of the road. **Option 1** is therefore the preferred option.	

Bridge Name & Preference	Option 1	Option 2
Option 1 Layout Design		
Option 2 Layout Design		
Dango	This option proposes widening the bridge by 3.125 m	This option proposes widening the bridge by 2.225 m on both

Bridge Name & Preference	Option 1	Option 2
Bridge	up-stream and 1.325 m downstream side of the bridge. The carriageway centreline of the upgraded road will be at the same position as the existing road. This option will follow the proposed geometric design of the upgraded road.	the up-stream and downstream sides of the bridge. The carriageway centreline of the upgraded road will be offset by 1.225 m to the upstream from the centreline of the existing road. This option will require a realignment of the proposed geometric design of the upgraded road
Preference	Bridge construction costs for Option 2 are cheaper than for Option 1 as similar activities are carried out on both sides. However, the combined costs for the bridge and the road construction for Option 1 are cheaper than for Option 2. Option 2 requires the realignment of the existing road resulting in large quantities of earthworks and road formation when compared to Option 1. The Option 2 road realignment will result in encroachment outside the road reserve requiring additional expropriation. The potential for environmental impacts is also considered to be greater as untransformed areas will be required to be lost as a result of the change in alignment of the road **Option 1** is therefore the preferred over option.	
Option 1 Layout Design		

Bridge Name & Preference	Option 1	Option 2
Option 2 Layout Design		

4.4 NO-GO Alternative

The current road is the only road that links Richards Bay and Empangeni as well as Nkwaleni Pass and is currently in a degraded state and is in need of repair and rehabilitation. Thus, should the proposed project not proceed as planned, safety risks associated with road use will increase. The NO-GO option is therefore, not preferred.

5 DESCRIPTION OF THE BASELINE ENVIRONMENT

5.1 Biodiversity

5.1.1 Biological Characteristics

5.1.1.1 Description of Habitats and Vegetation Communities

King Cetshwayo District traverses eight biomes and these are Azonal Forest, Forest, Savanna, Fynbos, Grassland, Indian Ocean Costal Belt, Wetlands and Open Water and contain 47 vegetation types. The study area is affected by two biomes namely Savanna and Grassland Biome and Table 11 outlines the conservation status and extent of each of the vegetation types for both the historical extent and the remaining extent of the vegetation types based on 2008 land cover of the study area (uThungulu Biodiversity Sector Plan, 2014) .

Table 11: Conservation Status and Extent of Vegetation Types in the Study Area

Vegetation Type	Conservation Status	Historical Area (ha)	2008 Area (Ha)	% Loss of vegetation
Savanna Biome				
Zululand Coastal Thornveld	Critically Endangered	46195.2740	23516.62	49.09
Zululand Lowveld	Vulnerable	92070.4100	67869.786	26.28
Grassland Biome				
Maputaland Coastal Belt	Endangered	76215.5530	13648.673	82.09

5.1.1.2 Threatened Ecosystems (Terrestrial)

The threatened ecosystems identified within the King Cetshwayo District are listed in Table 12 under the categories: Critically Endangered (CR), Endangered (EN) and Vulnerable (VU). The proposed study area falls within between critically endangered and least endangered ecosystems (uThungulu Biodiversity Sector Plan, 2014).

Table 12: Conservation Status and Extent of Vegetation Types in the Study Area

ECOSYSTEM	BIOME
Critically Endangered (CR)	
Entumeni Valley - KZN 3	Indian Ocean Coastal Belt, Savanna, Forest
Eshowe Mtunzini Hilly Grasslands - KZN 4	Indian Ocean Coastal Belt, Savanna and Forest
Kwambonambi Dune Forest - KZN	Indian Ocean Coastal Belt, Forest
Kwambonambi Hygrophilous Grasslands - KZN	Indian Ocean Coastal Belt, Forest
Ngoye Scarp Forests and Grasslands - KZN 13	Indian Ocean Coastal Belt, Savanna and Forest
North Coast Dune Forest - KZN 14	Indian Ocean Coastal Belt and Forest
Endangered (EN)	

ECOSYSTEM	BIOME
Qudeni Mountain Mistbelt Forest and Grassland - KZN 35	Grassland, Forest and Savanna
KwaZulu-Natal Coastal Forest - FOz VII1	Forest
Mangrove Forest - FOa 3	Azonal forest
Vulnerable (VU)	
Eastern Scarp Forest - FOz V1	Forest
Imfolosi Savanna and Sourveld - KZN 59	IGrassland, Savanna
Midlands Mistbelt Grassland - Gs 9	Grassland
Eastern Scarp Forest - FOz V1	Forest
Ngongoni Veld - SVs 4	Savanna
Nkandla Forests and Grasslands - KZN 73	Grassland and Forest
Northern Qudeni Mistbelt Grasslands - KZN 75	Grassland
Maputaland Wooded Grassland - CB 2	Indian Ocean Coastal Belt
Swamp Forest - FOa 2	Azonal Forest
KwaZulu-Natal Coastal Belt - CB 3	Indian Ocean Coastal Belt

5.1.1.3 Threatened and Endemic Flora and Fauna Species

The conservation status of species for all taxa groups is based on categories determined by the International Union for Conservation of Nature (IUCN) (IUCN, 2011), namely (uThungulu Biodiversity Sector Plan, 2014):

- Critically Endangered (CR) – the species is considered to be facing an extremely high risk of extinction in the wild, based on IUCN criteria.
- Endangered (EN) – the species is considered to be facing a very high risk of extinction in the wild, based on IUCN criteria.
- Vulnerable (VU) – the species is considered to be facing a high risk of extinction in the wild, based on IUCN criteria.
- Near Threatened (NT) – when evaluated against IUCN criteria, does not qualify for a Threatened category but is close to qualifying for or is likely to qualify in one of those categories in the near future.
- Data Deficient (DD) – there is inadequate information regarding the species' population size, distribution or threats for an assessment to be made.

This system is designed to determine the relative risk of extinction, with the main purpose being to catalogue and highlight those taxa that are facing a high risk of global extinction. Species listed as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) collectively are considered as Threatened. These threatened species are published in 'Red Lists' reports, with the aim of identifying and highlighting those species most in need of conservation attention as well as to provide an index of the state of degeneration of biodiversity.

5.1.1.3.1 Flora Species

The recorded flora data for the King Cetshwayo District uThungulu District indicates a number of Red List species, including 2 Critically Endangered, 7 Endangered and 7 Vulnerable (Refer to Table 13).

Table 13: Summarised Conservation Status of Floral Groups within the King Cetshwayo District

Group	Conservation status								Total
	CR	EN	VU	NT	DD	NE	LR	R/E	
Trees*		3	4	2		5	3	1	18
Shrubs	2					1			3
Climbers									0
Herbs#		4	3			3	1		11
Graminoids									
Total	2	7	7	2	0	9	4	1	32

* Including species of cycad
# Including geophytic herbs (e.g. Orchids) and aquatic herbs

5.1.1.3.2 Fauna Species

The recorded faunal data for the King Cetshwayo District includes three (3) Critically Endangered species (Black Rhino, Dlinza Forest Pinwheel & Discus Pinwheel), seven (7) Endangered species, ten (10) Vulnerable species, and 102 rare and endemics (Refer to Table 14). The Dlinza Forest Pinwheel snail(*Trachycystis clifdeni*) is only know to occur within a small patch of the Dlinza forest, and the Discus pinwheel (*Trachycystis placenta*) is only know to occur in the Nkandla Forest patches both of which are formally Protected Areas.

Table 14: Summarised Conservation Status of Faunal Groups within the King Cetshwayo District

Group	Conservation status					LC/LR	Rare and endemics	Not Evaluated	Total
	CR	EN	VU	NT	DD				
Amphibians		1	2	1	2	4	10		20
Reptiles		1	1	2			4		8
Birds		1	1	3			1		6
Mammals	1	2	3		1	4	1		12
Fish		1		2		2	7	3	15
Invertebrates	2	1	3	1			79		86
Total	3	7	10	9	3	10	102	3	147

5.2 Climate

The King Cetshwayo District has a temperate climate with winters being very mild and summers that can be hot and humid. The mean annual temperature varies between 21°C along the coast to 16°C inland. The District lies within the summer rainfall area of South Africa and has a mean annual precipitation ranging from 1 400mm along the coast to 650mm inland. A summary of the climatic conditions in the King

Cetshwayo District is provided in Table 15 and the mean annual precipitation (uThungulu Biodiversity Sector Plan, 2014).

Table 15: Climate Variables of the King Cetshwayo District

Climate Variables	King Cetshwayo District			
Precipitation (Mm)				
	Autumn	Winter	Spring	Summer
Annual Mean	103	11	49.7	138
Temperature (^{O}c)				
	Autumn	Winter	Spring	Summer
Annual Minimum	12.5	3.4	7.7	13.4
Annual Mean	18.8	11.3	15.3	19.6
Annual Maximum	24.8	19.1	22.7	26.6

Empangeni falls within the summer rainfall region. The region normally receives about 948mm of rain per year, with most rainfall occurring mainly during mid-summer. Empangeni receives the lowest rainfall (34mm) in June and the highest rainfall (121mm) in January. The average maximum temperatures for Empangeni ranges from 23ºC in July (winter) to 29ºC in January (summer). The region is coldest during July when the minimum temperature drops to 11.3ºC. The area experiences warm to hot summers and cold winter months. Frost occurs occasionally during winter (SA Explorer Information, 2014).

5.3 Geology, Soils and Topography

King Cetshwayo District has a diverse range of geological forms and soil types due to the variation in elevation. The coastal belt areas are underlain by Cainozic and Recent series which include sand stones, shales and mudstones. This band is narrow to the south and widening northwards towards Mtubatuba. The area being flat has low risk of erosion. The central area is underlain by the Ecca and Table series including granite, sandstone, shales and limestones. The Ecca derived soils are prone to slightly moderate erosion while the Table Mountain series is prone to moderate to severe erosion. The extreme topographic characteristic of the western region is a result of the underlying Table Mountain series and gneiss and granite of the Natal Monocline. Granite derived soils vary considerably but are generally highly productive but are prone to erosion particularly when cultivated on a slope (uThungulu Biodiversity Sector Plan, 2014).

King Cetshwayo District has a varied topography that extends from flat coastal plains to inland hilly areas and steep valleys. The flat coastal region comprises of the Natal Coastal Belt and Zululand Coastal Plain with altitudes ranging from sea level to 450 meters. Inland adjacent to the coastal belt, the Lowveld of Zululand to the north east and the Eshowe Block to the west are characterised by hilly topography and altitudes increasing to 900 meters. The terrain becomes more extreme towards the north-west and in places, the area is characterised by steeply incised valleys with altitudes between 900 and 1400m (uThungulu Biodiversity Sector Plan, 2014).

5.4 Drainage and Biophysical Context

The key biophysical features associated with the study area are summarised in Table 16.

Table 16: Key Biophysical Details of the Study Area

Biophysical Aspects	Desktop Biophysical Details	Source
Elevation a.m.s.l.	Approx. 120 – 150 m a.m.s.l.	Google EarthTM
Rainfall seasonality	Early Summer to Late-Summer	DWAF, 2007
Mean annual precipitation (MAP)	848.4mm	Schulze, 1997
Mean annual temperature	21.8°C winter (July) – 27.5°C in summer (February)	SA Explorer Information
Potential Evaporation (mm) Mean Annual A-pan Equivalent	1792.8mm/annum	Schulze, 1997
Median annual simulated runoff (mm)	77.9mm	Schulze, 1997
Geomorphic Province	South-eastern Coastal Hinterland	Partridge et.al., 2010
Geology	Shale	RSA 1:1000 000 Geological Map (SA Geology Society)
Water management area	Usutu to Mhlathuze	DWS
Quaternary catchment/s	W12F	DWS
Main collecting river in the catchment	Mhlathuze River	CSIR, 2011
Geomorphic zone of the reach assessed	Transitional River	CSIR, 2011
DWA Ecoregion	North Eastern Upland (14.01)	DWA, 2005

5.5 Conservation Context

Understanding the conservation context and importance of the study area and surrounds is important to inform decision making regarding the management of the aquatic resources in the area. In this regard, national, provincial and regional conservation planning information available and was used to obtain an overview of the study site. Key conservation context details of the project site and surrounds have been summarised in Table 17, below.

Table 17: Key Conservation Context Details for the Study Area.

NATIONAL LEVEL CONSERVATION PLANNING CONTEXT			
Conservation Planning Dataset	**Relevant Conservation Feature**	**Location in Relation to Project Site**	**Conservation Planning Status**
National Vegetation Map (Mucina & Rutherford, 2006) Ecosystem Threat Status NBA 2011	Eastern Valley Bushveld (SVs 6)	Remaining intact terrestrial vegetation within the entire study area and surrounds.	Least Threatened
The National Freshwater Ecosystem Priority Area (NFEPA) Assessment (CSIR, 2011)	Wetlands	Wetlands on and adjacent to the site	Wetland vegetation group: Sub-escarpment Savanna (Endangered)
PROVINCIAL AND REGIONAL LEVEL CONSERVATION PLANNING CONTEXT			
KZN Vegetation Map (EKZNW, 2012)	Eastern Valley Bushveld	Untransformed terrestrial bushveld surrounding project sites	Least Threatened
KZN Aquatic Conservation Plan (EKZNW, 2007)	Freshwater Planning Units No. 2117 (Bedlane River Bridge) and 1955 (Dango River Bridge)	Relevant study area and catchment	Broader catchments 'available'
KZN Terrestrial Conservation Plan (EKZNW, 2010)	Terrestrial Planning Units No. 142041 and 142087	Areas surrounding Dango River	100% Transformed
KZN Terrestrial Systematic Conservation Assessment (EKZNW, 2016)	Bushveld/savannah (remaining untransformed) Bu)	N/A	None

The aquatic conservation concerns and features of particular importance to the study area are summarised below as follows:

5.5.1 National Level Aquatic Conservation Priorities

The National Freshwater Ecosystem Priority Area (NFEPA) project (Nel *et al*., 2011), is the first formally adopted national freshwater conservation plan that provides strategic spatial priorities for conserving the country's freshwater ecosystems and supporting the sustainable use of water resource units that includes rivers, wetlands and estuaries. The importance of water resources in meeting national freshwater conservation targets is provided in the National Freshwater Ecosystems Priority Areas (NFEPA) outputs and coverage's (CSIR, 2011).

This coverage reveals that wetlands identified within a 500m radius of the proposed development property have not been identified or classified at a national level of important Freshwater Ecosystem Priority Areas or FEPAs. The wetland vegetation group within which mapped wetlands occur is "Sub-escarpment Savanna", which is regarded as being 'Endangered' in terms of ecosystem threat status and poorly protected (CSIR, 2011).

5.5.2 Provincial Level Aquatic Conservation Priorities

The study area falls within a sub-catchment classified as 'Available' according to the freshwater CPLAN (EKZNW, 2007), which suggests that the catchment has not specifically been identified as a provincial priority area aquatic conservation priority. Despite not being prioritized nationally or provincially, this should not undermine the importance of wetlands and riverine ecosystems in general in terms of their habitat value and being important sources of valuable ecosystem services both to society and the environment in general. In terms of the 2010 KZN Terrestrial Systematic Conservation Plan (CPLAN), the sites of the two bridges crossing the Dango and Bedlane Rivers have not been flagged as being important in terms of potential terrestrial biodiversity priorities.

5.5.3 Regional & Local Level Aquatic Conservation Priorities

Additional conservation planning information is also available in terms of the Biodiversity Sector Plan (BSP) for the uThungulu District Municipality (Elliott & Escott, 2013), which was interrogated in terms of the location, extent and relevance of local conservation priorities identified for the project site and immediate surrounding areas. The BSP is "intended to assist and guide land use planners and managers within the uThungulu District and its respective local municipalities, to account for biodiversity conservation priorities in all land use planning and management decisions, thereby promoting sustainable development and the protection of biodiversity, and in turn the protection of ecological infrastructure and associated ecosystem services" (Elliott & Escott, 2013).

The 'Local Conservation Priorities' spatial output as identified in the Biodiversity Sector Plan (BSP) for the uThungulu District Municipality was reviewed from an aquatic ecosystems conservation perspective, with no local conservation priorities identified.

5.6 Desktop Watercourse Delineation

Initially, a desktop wetland identification and mapping exercise was undertaken in GIS (Geographical Information Systems) based on available imagery (Google EarthTM), elevation contours and existing wetland coverage's for the region (e.g. KZN wetland map, NFEPA wetland coverage). This allowed for the identification of watercourses which were later ground-truthed and delineated in the field using various indicators (discussed under Section 5 of this report). The wetland & river delineation map shown in Figure 8 below identifies and maps the location, extent and spatial distribution of two (2) wetland units, one (1)

artificially created wetland unit and two (2) riverine units within the DWS regulated area for wetland 'water use' (i.e. within a 500m radius of the proposed bridge widening sites). The two wetlands which occur within the DWS regulated area of the Dango River Bridge were classified as channelled valley bottom (CV B) wetlands, with one artificial wetland noted approximately 450m upstream, while the riverine units occurring within the DWS regulated area of the Bedlane River Bridge were classified as transitional rivers (Figure 8, below).

Figure 8: Wetland Delineation Map and HGM Unit Classification for Wetlands within the 500m Regulated Area of the Proposed Bridge Widening Sites

The screening of 'impact potential' for identified wetlands within a 500m radius of the development (which corresponds to the DWS regulated area for wetlands water use) was undertaken in GIS and then verified in the field. Based on the position of the identified water resources in the landscape and in relation to the bridge widening sites, the probability of the proposed upgrades impacting or constituting a water use for each watercourse was determined based on professional opinion and through the interpretation of the criteria/rationale presented in Table 18 below. This resulted in the identification of two (2) key watercourses that have already been directly impacted or are likely to be impacted by the activities associated with the upgrading of bridges and which will require a water use license in some form (Figure 9, below).

This is essentially the channelled riverine ecosystem associated with the Bedlane River and a channelled valley bottom wetland associated with the Dango River at the existing bridge crossings. Other wetlands identified within the 500 regulated area for water use licensing included an artificially created wetland and an additional channelled v alley bottom wetland, however due to these features being located a considerable distance upstream from the bridge sites, these watercourses are unlikely to have sustain direct nor indirect impacts from the facility in any way, shape or form, and thus will not require a water use license in terms of Section 21 of the National Water Act No. 36 of 1998.

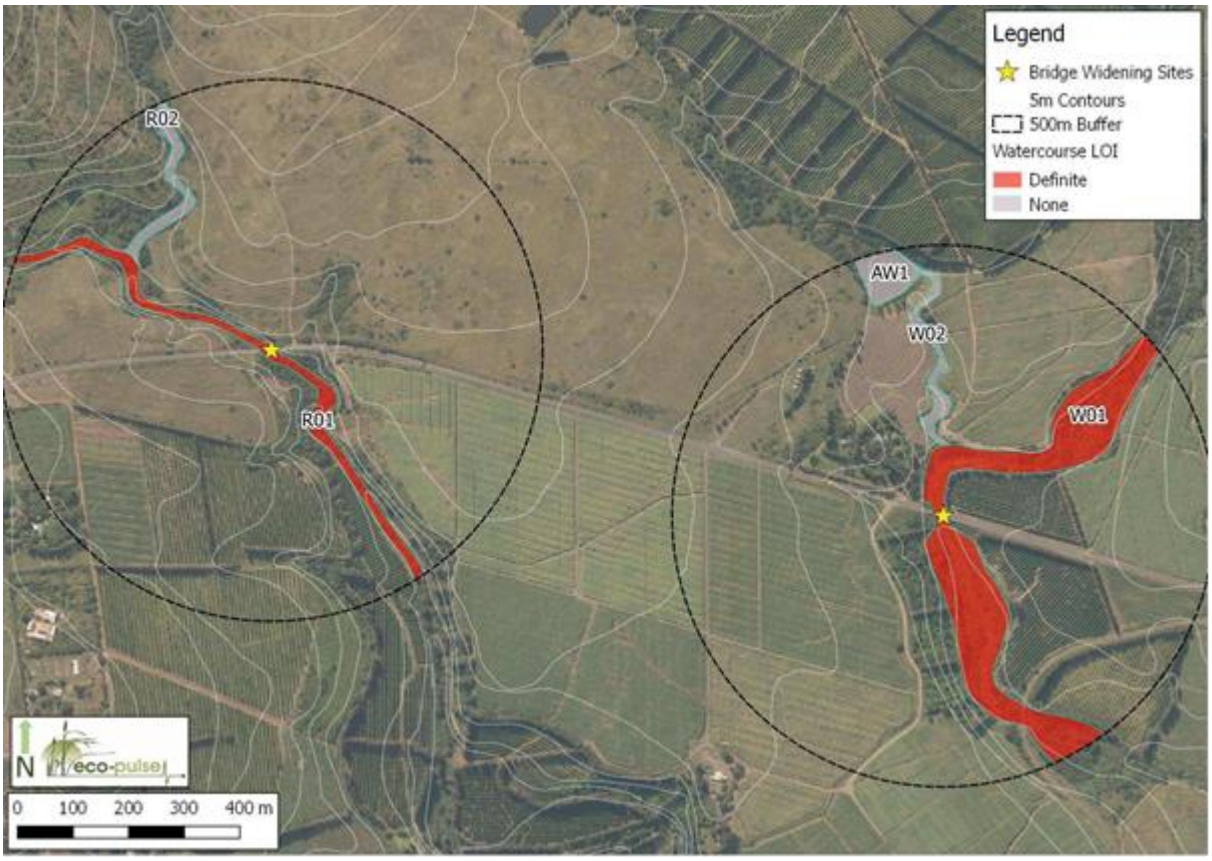


Figure 9: Watercourse Shaded Red=likely to require WULA and Shaded in Purple will not Require WULA

As explained above, through the interpretation of the criteria/rationale presented in Table 18, the probability of the proposed upgrades impacting or constituting a water use for each watercourse was determined.

Table 18: Qualitative 'Impact Potential' Rating Guidelines (Eco-Pulse Consulting, 2017).

Impact Potential	Description and Rating Guidelines
Definite	These resources will require an assessment of aquatic impacts and a Water Use License in terms of NEMA and Section 21 (c) & (i) of the National Water Act (No. 36 of 1998) for the following reasons: ▪ Resources are located **within the footprint of the proposed development** and will be directly impacted; and/or ▪ Resources are located **within 15m upstream or upslope** of the development and trigger requirements for Environmental Authorisation according to the latest NEMA: EIA regulations; and/or ▪ Resources are located downstream or downslope of the development and trigger requirements for Environmental Authorisation according to the latest NEMA: EIA regulations under the following development scenarios: o Within **15m downstream/downslope of a low-risk development** (e.g. for linear activities such as roads and water pipeline development projects); o Within **50m downstream/downslope of a moderate risk development** (e.g. housing estates) Within **100m downstream/downslope of high risk developments and activities associated with large water quality/flow related impacts** (e.g. large dams and water abstraction projects, mining,

Impact Potential	Description and Rating Guidelines
	large industrial sites, WWTW, etc.)
	Assessment guidelines for watercourses where impact potential is regarded as 'definite/probable': 1. Detailed onsite delineation 2. HGM unit classification 3. Habitat assessment 4. PES/functioning/EIS assessment at moderate or high level of detail 5. Risk assessment* 6. Detailed impact assessment with/without pre and post change to PES/functioning 7. Detailed impact mitigation in line with *the mitigation hierarchy: possibly including the need to consider offset requirements.*
Probably / Likely	These resources are <u>likely to require an assessment of aquatic impacts and a Water Use License</u> in terms of NEMA and Section 21 (c) & (i) of the National Water Act (No. 36 of 1998) for the following reasons: ▪ Resources are located within **32m but greater than 15m from** the proposed development activity/activities, with a high likelihood of incurring direct impacts as a result; and/or ▪ Resources are located within a range at which they are likely to incur indirect impacts (e.g. water pollution, erosion and sedimentation) associated with development activities and usually downstream of the development within the following guiding thresholds: o Within **32m downstream/downslope of a low-risk development** (e.g. for linear activities such as roads and water pipeline development projects) o Within **100m downstream/downslope of a moderate risk development** (e.g. housing estates) o Within **500m downstream/downslope of high risk developments and activities associated with large water quality/flow related impacts** (e.g. dams, water abstraction, mining, large industrial sites, WWTW, etc.)
	Assessment guidelines for watercourses where impact potential is regarded as 'possible': 1. Desktop delineation with onsite verification of boundaries 2. HGM unit classification 3. Habitat assessment 4. PES/functioning/EIS assessment at low level of detail 5. Risk assessment* 6. Impact assessment 7. Impact mitigation in line with the mitigation hierarchy: including buffer zones
Unlikely	These resources <u>are unlikely to require an assessment of aquatic impacts or a Water Use License</u> in terms of NEMA and Section 21 (c) & (i) of the National Water Act (No. 36 of 1998) for the following reasons: ▪ Resources are **located a moderate distance upstream or upslope (>32m)** of the proposed development and are unlikely to be directly impacted by the dev elopement activities; and/or ▪ The location of resources and nature of the development activity is **not considered a 'Listed Activity'** according to the latest NEMA: EIA regulations 1 ; and/or ▪ Resources are **located downstream but well beyond the range at which they are likely to incur indirect impacts** (e.g. water pollution, erosion and sedimentation) associated with the development and usually downstream of the development within the following guiding thresholds: o **>32m downstream/downslope of a low-risk development** (e.g. for linear activities such as

Impact Potential	Description and Rating Guidelines
	roads and water pipeline development projects) ○ **>100m downstream/downslope of a moderate risk development** (e.g. housing estates) ○ **>500m downstream/downslope of high risk developments and activities associated with large water quality/flow related impacts** (e.g. dams, water abstraction, mining, large industrial sites, WWTW, etc.).
	Assessment guidelines for watercourses where impact potential is regarded as 'unlikely': 1. Desktop mapping of watercourses within 500m of the development site 2. Desktop HGM unit classification 3. Risk assessment*
None	These resources will not require impact assessment or a Water Use License in terms of NEMA and Section 21 (c) & (i) of the National Water Act (No. 36 of 1998) as resources are: (i) situated **a large distance (>100m) upstream of the impact causing activity**, or (ii) **located within another adjacent sub-catchment**, Such that the drivers and characteristics of the watercourse will not be modified or impacted in any way, shape or form.
	Assessment guidelines for watercourses where impact potential is regarded as 'None': 1. Desktop mapping of watercourses within 500m of the development site

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 Chapter 6 of the EIA Regulations 2014 (as amended in 2017) promulgated under the NEMA (as amended), as well as Public Participation Guideline documents published by the Competent Authority. The public participation process for proposed P393 rehabilitation project will be undertaken according to the stages outlined below.

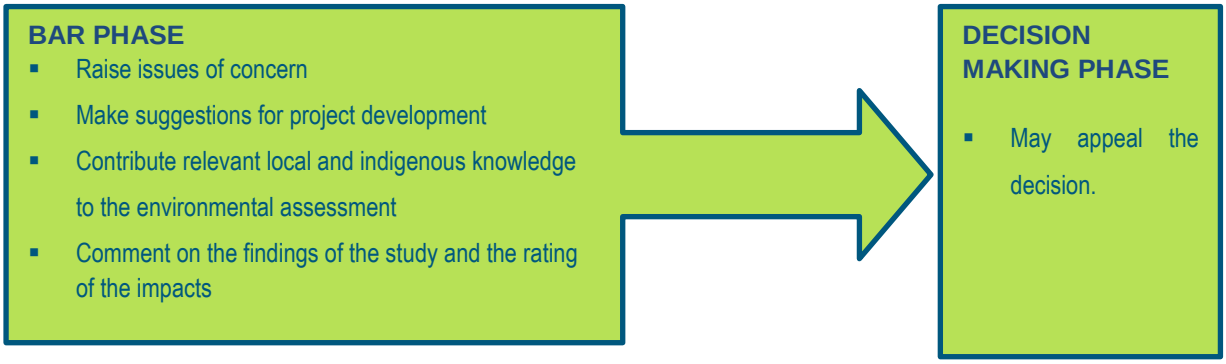


Figure 10: Responsibilities of I&APs

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

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

government, to relevant structures in the non-governmental organisation (NGO) sector, to the communities of wards of residential dwellings which surround the works;
- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The fielding of queries from I&APs and others, and providing appropriate information;
- The convening of specific stakeholder groupings/forums as the need arises;
- The preparation of reports based on information gathered throughout the BA *via* the PPP and feeding that into the relevant decision-makers;
- The PPP includes distribution of pamphlets or Background Information Documents (BIDs) and other information packs; and
- Where appropriate site visits may be organised, as well as targeted coverage by the media.

The proposed P393 PPP has entailed the following activities.

6.1 Authority Consultation

The competent authority, the KZN DEDTEA, is required to provide an EA (whether positive or negative) for the project. The KZN DEDTEA was consulted from the outset of this study, and has been engaged throughout the project process. Authority consultation included the following activities:

- Pre-application consultation with **Mr Muzi Mdamba KZN DEDTEA** on **14 March 2017.**
- A response on the Interpretation Query was received from the **KZN DEDTEA on the 11th of April 2017**.
- Pre-application meeting and site inspection with **Ms Simphiwe Mbiko KZN DEDTEA on 15 June 2017**
- Submission of the combined application for the bridges was submitted on **28 July 2017 to KZN DEDTEA** and approval was received on **10 August 2017**
- Submission of an application for environmental authorisation in terms of Section 26 of the EIA Regulations 2014 (as amended in 2017) on **06 September 2017.**

In July 2017, EDTEA required that a combination application be submitted in terms of Regulation 11 of the EIA Regulations 2014 (as amended in 2017) in order to ensure that the scope of work associated with both bridges can be undertaken as one consolidated Basic Assessment process.

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 from the outset and to provide background information about the project during the BA process.

Relevant key stakeholders were consulted and sent pamphlets or BIDs and other information packs (where requested). All relevant stakeholders will be allowed an opportunity to comment on the draft Consultation Basic Assessment Report (BAR). The identified stakeholders of this project are provided in Table 19.

Table 19: Key Stakeholders

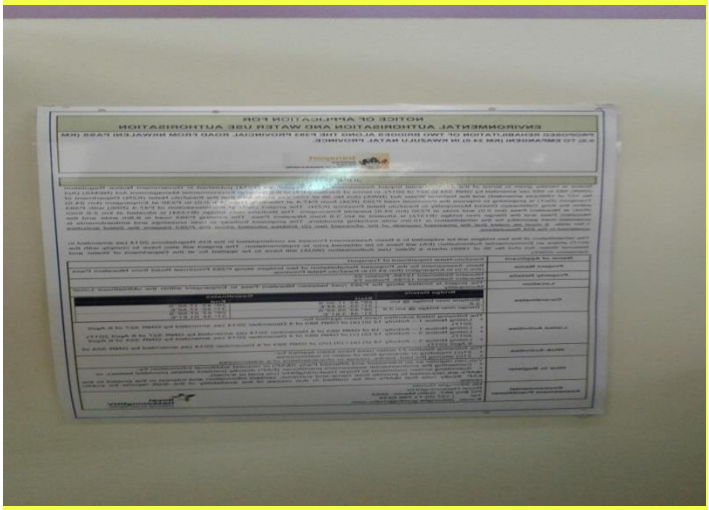
OWNERS AND OCCUPIERS OF LAND ADJACENT TO THE SITE	
▪ Mthembu Tribal Authority ▪ Fowler Farming ▪ Tongaat Hulett (Riversbend) ▪ Department of Transport	
LOCAL AUTHORITY	
Mr Mandla Nkosi	King Cetshwayo District Municipality
Dr Nhlanhla Sibeko	UMhlathuze Local Municipality
Mr Sipho Ntombela (Ward 21-Councillor)	UMhlathuze Local Municipality
STATE DEPARTMENTS	
Ms Shamilla Ramburan	National Department of Water & Sanitation
Mr Sandile Dlalisa	Department of Rural Development and Land Reform
Mr Thando Tubane	Department of Corporate Governance and Traditional Affairs
Mr Andy Blackmore	Ezemvelo KZN Wildlife
Ms Seokwang Modise	Department of Agriculture, Forestry and Fisheries
Mrs Bernadete Pawandiwa	Amafa aKwaZulu-Natal

6.3 Site Notification

The EIA Regulations 2014 (as amended in 2017) require that a site notice be fixed at a place visible to the public at the boundary or on the fence of the site where the activity to which the application relates and at points of access or high through traffic. The purpose of this is to ensure that the I&APs were identified primarily from responses received from the notices erected and notify the public of the project as well as to invite the public to register as stakeholders and inform them of the PP Process.

Royal HaskoningDHV erected a number of notices at various noticeable locations along the P393 road and Empangeni Public Library (refer to Table 20).

Table 20: Site Notices

Site Notices	
	Placed at Empangeni Public Library
	Placed near the Dango Bridge
	Placed near the Bedlane Bridge

6.4 Identification of Interested and Affected Parties

As mentioned above, 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. This database will be updated on an on-going basis throughout the BA process.

6.5 Briefing Paper

A BID for the proposed project was compiled in English 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 Advertising

In compliance with the EIA Regulations 2014 (as amended in 2017), a notification of the commencement of the BA process for the project was advertised in a local newspaper **The Eyethu Baywatch 06 September 2017**. I&APs were requested to register their interest in the project and become involved in the BA process. The primary aim of these advertisements was to ensure that the widest group of I&APs possible was informed and invited to provide input and questions and comments on the project.

6.7 Issues Trail

Issues and concerns raised in the public participation process during the BA process have been and will continue to be compiled into an Issues Trail together with the responses thereof.

6.8 Public Review of the draft BAR

The draft Consultation BAR will be made available for authority and public review for a total of 30 days from **06 September 2017** to **06 October 2017**. The report will be made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Empangeni Public Library;
- UMhlathuze Local Municipality; and
- Electronically on the Royal HaskoningDHV Website: www.rhdhv.co.za.

6.9 Final Consultation BAR

The final stage in the BA process entails the capturing of responses and comments from I&APs on the BAR in order to refine the BAR, and ensure that all issues of significance are addressed. The final BAR (i.e. fBAR) will be the product of all comments and studies, before being submitted to KZN DEDTEA for review and decision-making.

6.10 PPP Summary

A summary of the PPP is provided in Table 21 below. It must be noted that there were no public meetings scheduled for the project.

Table 21: Summary of Public Participation Process

Activity	Description
Identifying Stakeholders	Stakeholders were identified and a database of all I&APs were compiled.
Publishing Newspaper Adverts	Eyethu Baywatch
Distribution of a BID	BIDs were distributed electronically and by hand to I&APs.
Erection of Site Notices	A number of A2 site notices were erected on the perimeter of the site.
Preparation of an on-going Issues Trail	Comments, issues of concern and suggestions received from stakeholders thus far have been captured in an Issues Trail.
Release of Draft Report	The draft BAR has been advertised and made available for a period of 30 days for public review and comment. This BAR is now available for review until 30 September 2017.
Release of final Report	The fBAR will be the product of all comments and studies, before being submitted to KZN EDTEA for review and decision-making.

7 SPECIALIST ASSESSMENTS

7.1 Geotechnical Assessment

This study was undertaken by an independent specialist: Davies Lynn & Partners.

7.1.1 Geology and Sub-Soils

7.1.1.1 Overview of the Site

The geology of the sites is characterised by alluvial subsoils and River Terrance deposits associated with the Bedlane and Dango Rivers, which are both underlain by Pietermaritzburg Formation Shale.

7.1.1.2 Bedlane River Bridge Geology

7.1.1.2.1 Alluvium

Alluvial soils deposited by the Bedlane River blanket the area surrounding the site of the Bedlane River Bridge and are typically described as slightly moist to moist, dark brown, moderately clayey fine to medium grained SANDs with abundant boulders and river debris. The alluvium ranged between 0.9m (TP3) near the eastern abutment and extended to greater than 1.5m near the western abutment (TP1).

7.1.1.2.2 Pietermaritzburg Formation Shale

(W4/W3) dark grey weathered orange brown on joints, highly to moderately weathered, closely jointed, soft to medium hard rock, SHALE, is encountered at depths ranging between 0.9m (TP3) and 1.5m (TP2) depth below existing ground levels.

7.1.1.3 Dango River Bridge Geology

7.1.1.3.1 Alluvium

Alluvial soils deposited by the Dango River blanket eastern abutment of the Dango River Bridge and are typically described as moist, medium brown, fine to medium grained SANDs to depths greater than 2.5m in thickness.

7.1.1.3.2 Fill

Fill material from previous roadwork operations typically described as dark brown loose to dense, intact to voided, moderately clayey silty SAND with abundant cobbles and boulders is encountered at TP1 and TP2 to depths of 0.9m and 1m respectively.

7.1.1.3.3 River Terrace/ Conglomerate Deposit

A river terrace/ conglomerate deposit is found underlying the fill material across the western abutment. This horizon consists of a partially cemented SANDY CLAY matrix with abundant hard rock cobble to boulder sized clasts from a depth of 0.9m at Dango TP2, and extending to greater than 2.5m depth at

Dango TP1. With reference to the river bank exposure beneath the Dango River Bridge, this horizon is anticipated to extend to depths of approximately 2.6m below the top of the existing exposed footing at the western abutment. Excavation through this horizon with a TLB proved to be difficult.

7.1.1.3.4 Pietermaritzburg Formation Shale

Highly to moderately weathered Shale bedrock is exposed beneath the western bridge abutment and is typically described as, medium to dark grey weathered orange brown, highly fractured and laminated soft to medium hard rock Shale. Residual Clays were found overlying Pietermaritzburg formation Shale at TP3 from 1.8m to 2.5m depth below existing ground level. The Residual Clays were typically described as, yellowish to olive brown blotched grey, very stiff, intact, sandy silty CLAY.

7.1.2 Proposed Bridge Widenings

Potential upgrades to the existing Bedlane and Dango River Bridges reportedly entail the widening of the existing deck and piers of the existing bridge structures.

7.1.2.1 Founding Conditions of Bedlane River Bridge

The anticipated founding conditions at the site of the Bedlane River Bridge are represented by Test Pits Bedlane 1 to Bedlane 3. At the time of the geotechnical investigation the site conditions were considerably wetter than during the Walk over Terrain Appraisal. This resulted in the proposed southern pier test pits positions becoming inaccessible. A sandy alluvial horizon occurs to depths of approximately 0.6m to greater than 1.7m below EGL. Weathered Shale bedrock was encountered at a depth of 0.6m and 1.5m below existing ground levels at TP3 and TP2 respectively. Although shallow water seepage was encountered in all of the Test Pits, it is in our opinion that the depth to bedrock should not exceed 3m across this site and shallow foundations located within the weathered Shale bedrock are considered feasible provided adequate shoring and dewatering is implemented.

7.1.2.2 Founding Conditions of Dango River Bridge

7.1.2.2.1 Western Abutment Dango River Bridge

The founding conditions at the western abutment of the Dango River Bridge are represented by Test Pits Dango 1 to Dango 3. A fill horizon occurs to depths of approximately 0.9m (Dango TP2) to 1m (Dango TP1) below EGL which directly overlies a partially cemented river terrace/ conglomerate deposit to depths ranging between 0.9m (Dango TP2) and great than 2.5m (Dango TP1) depth below existing ground level which is underlain by residual and weathered Shale bedrock. The river bank exposure below the western abutment of the Dango River Bridge indicates that the river terrace/ conglomerate deposit is approximately 1.8m thick and increases to approx. 2.6m thick from the top of the bridge footing of the western abutment. This horizon is directly underlain by weathered Shale Bedrock beneath the bridge structure. The depths to weathered Shale are anticipated to range from approximately 4m to 5m depth from the existing road centre line levels at the western abutment, at which depth suitable for founding within the weathered Shale bedrock can be anticipated.

7.1.2.2.2 Eastern Abutment Dango River Bridge

Alluvial Sands and SANDY CLAYS represent the shallow subsoil conditions across the eastern bridge abutment and are represented by Test Pits Dango TP4 and Dango TP5. These Sands and Sandy Clays are shown to extend to depths greater than 3.1m (Dango TP4). In order to determine accurate depths to bedrock and competent founding horizons, a deeper geotechnical investigation would need to be undertaken.

7.2 Freshwater Habitat Assessment

This study was undertaken by an independent specialist: Eco-Pulse Environmental Consulting Services.

7.2.1 Wetland and Aquatic Assessment

Freshwater aquatic resources and associated habitat requiring further assessment to inform water use licensing included a large channelled valley bottom wetland system (W01) associated with the Dango River at the existing bridge crossing to be upgraded, and a semi-perennial transitional river (R01) associated with the Bedlane River at the bridge crossing (Figure 11). These watercourses will likely be directly or indirectly impacted by the proposed bridge upgrading (widening) and will require some form of a water use license. Summary details of these watercourses and their locations are included below in Table 22, with the watercourses shown mapped in Figure 11. These two watercourses (wetlands W01 and River R01 and associated riparian habitat) were subject to further detailed field delineation and a baseline aquatic ecological assessment to inform the assessment of potential impacts and recommendation of impact mitigation/management measures, ecological monitoring requirements and water use licensing requirements.

Table 22: Summary of the Watercourses Assessed

Water Resource Unit	HGM Type	Location	GPS Coordinates
Bedlane River R01	Transitional River	Associated with the Bedlane River at the existing bridge site	28 º 43' 17.30" S | 31º 33' 18.44" E
Wetland W01	Channelled valley bottom (CVB) wetland	Associated with the Dango River at the existing bridge site	28 º 43' 28.49" S | 31º 34' 3.61" E

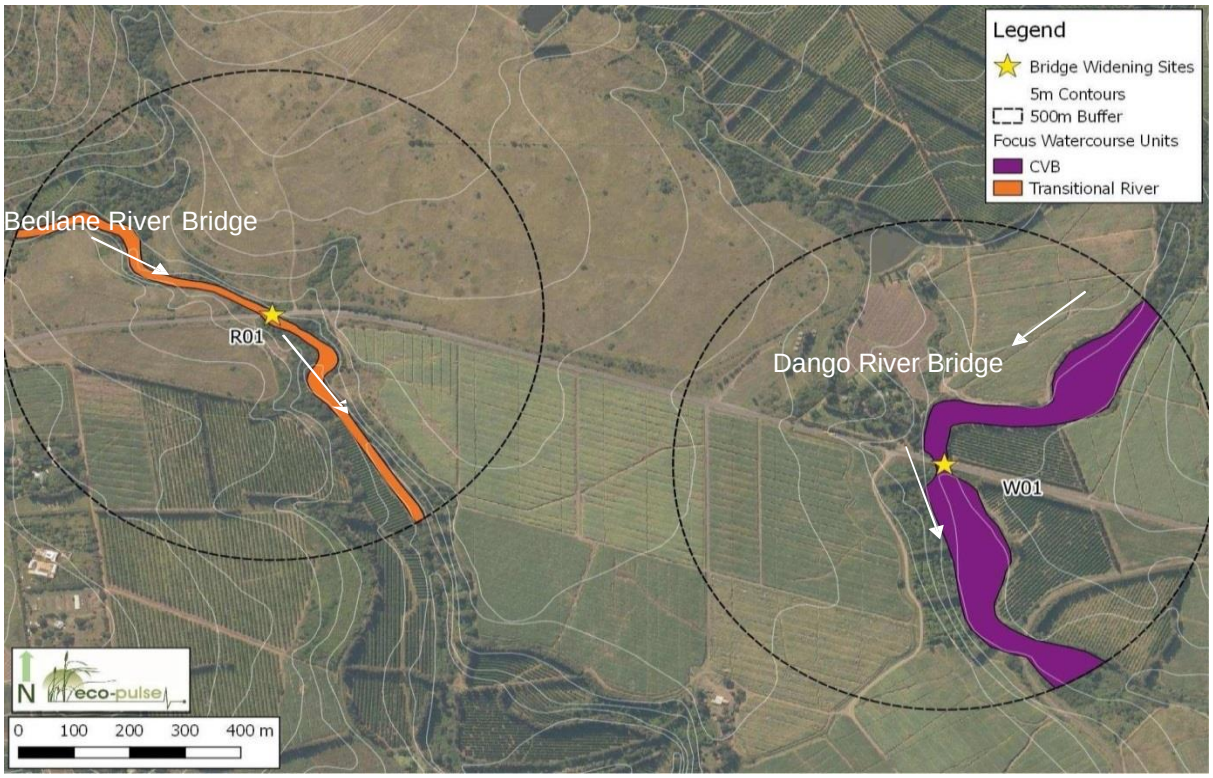


Figure 11: Delineated and Classified Watercourses. 'White' Arrows Show Direction of Flow.

7.2.1.1 Delineation of a Wetlands and Riparian Areas

Wetland W01 associated with the Dango River was identified as requiring further detailed assessment to inform the WULA and was therefore subject to detailed in-field sampling and delineation according to the methods and techniques found in the Department of Water Affairs wetland delineation manual 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005). Three specific wetland indicators were used in the detailed field delineation of wetlands, which included: topography, vegetation and soil morphology. In most cases, the soils provided a good indication of the level of wetness of the soils (permanent, seasonal and temporary), with low matrix Chroma and soil mottling present. However, due to the largely transformed nature of the vegetation at the site as well as the extensive soil disturbance in some areas, delineation was challenging. In these instances, topography and to a lesser extent and soil morphology were vital in determining the outer boundary of wetlands (i.e. the boundary between the temporary wetness zone and adjacent terrestrial land.

The riparian area associated with the Bedlane River (R101) was delineated based on a unique set of delineation indicators for riparian areas delineation which included: (i) presence of alluvial soils and recent river deposits, (ii) channel morphology/topography and (iii) differences in vegetation composition and structure between riparian areas and adjacent terrestrial habitat. As the sole reliance on one indicator can be misleading (e.g. many species of plants can successfully grow within aquatic and semi-aquatic / terrestrial habitats), a combination of all three indicators was used to provide for a logical, defensible and technical basis for riparian area delineation.

7.2.1.2 Classification and Description of Wetlands and Riparian Areas

Table 23: Summary of Basic Biophysical Details of Wetlands and Rivers Assessed.

ATTRIBUTES	WETLAND HGM UNITS	
	W01	R01
Type	Channelled valley bottom wetland	Transitional River
Extent/area	~7.9 ha	N/A
Landform	Valley bottom	Valley bottom
Dominant water input	Combination of subsurface/ groundwater and overland flow	Overland flows
Wetness regime	Seasonal	Seasonal
Dominant Vegetation	Phragmites australis reedbed (above bridge), Hygrophilous grassland (below bridge)	*P.* aust ralis reedbed (above bridge), closed canopy riparian forest (below bridge).
Existing Impacts	▪ *Moderate to high levels of Invasive e Alien Plants (IAPs)* ▪ *Infilling associated with existing road and bridge development* ▪ *Sedimentation* ▪ *Erosion* ▪ *Soil disturbance* ▪ *Small upstream dams*	▪ *Moderate to high levels of IAPs* ▪ *Infilling associated with existing road and bridge development* ▪ *Vegetation clearing* ▪ *Reduced flows within the unit as a result of flow impoundment via a large upstream dam.*
Wetland W01 is a large channelled v alley bottom (CV B) wetland associated with the Dango River. The channel is approximately 1.5m deep and 3-4m wide below the bridge, whilst, above the bridge the channel is considerably less confined and is approximately 1m deep and 6m wide. The wetland unit comprised a mixture of vegetation types with two key vegetation communities identified, with the vegetation above the bridge and within the macro channel below the bridge comprised of a Phragmites australis reedbed with moderate to high abundances of Invasive Alien plants (IAPs), most notably Coix lacryma-jobi and Chromolaena odorata. The vegetation flanking either side of the macro channel below the bridge comprised of a hygrophilous grassland vegetation community dominated by Panicum maximum with moderate abundances of Sporobolus africanus and Arundo donax, with the latter being more prevalent near the edge of the macro channel. Sub-dominant species located above the bridge included Bridelia micrantha, Trema orientalis, Casuarina equisetifolia, Melia azedarach and Ricinus communis whilst sub-dominant species below the bridge including Paspalumurvillei, Setaria megaphylla, Cyperus sexangularis, Rubus cuneifolius, Ricinus communis as well as Melia azedarach saplings.		
		

Photo 1. View from the top of the infilled right hand bank (RHB), above the Dango River bridge, showing wetland unit W01 looking downstream. The Phragmites aust ralis reedbed is a prominent feature of the wetland at this location.

Photo 2. View from the top of the infilled RHB, above the Dango River bridge, showing wetland W01 looking from west to east across the unit. Note the level of sedimentation within the wetland and woody alien trees colonising disturbed peripheral wetland areas.

Photo 3. View from the Dango bridge looking downstream showing the dominance by P. australis reeds within the macro channel of the wetland, flanked by short hygrophilous grassland.

Photo 4. View from the top of the infilled RHB looking beneath the existing bridge on the Dango River.

River unit R01 ('Bedlane River') has been classified as a small mixed bedrock-alluvial transitional river containing localised riffles and shallow pools. The active channel of the river was approximately 0,5m deep and varied between 2-3m in width whilst the macro channel was approximately 4m deep and 8- 10m wide. A large farm dam is located approximately 1km upstream from the location of the existing Bedlane River bridge. Instream vegetation was found to be variable, with communities above the bridge comprising P. australis reeds with moderate to low abundances of B. micrantha, Canna indica and C. lacryma-jobi whilst instream vegetation below the bridge was largely limited except for very low abundances of C. lacryma-jobi and C. odorata. The riparian vegetation upstream was also markedly distinct from the riparian vegetation downstream with upstream riparian vegetation comprising a secondary riparian forest community dominated by M. azedarach and B. micrantha with sub-dominant species including P. maximum, P. australis, Commelina erecta, , C. lacryma-jobi, A. donax, and Lantana camara. The riparian vegetation downstream of the bridge comprised a closed canopy riparian forest dominated by B micrantha and Ficus sur with sub-dominant species including Syzygies cordatum, Oplismenus hirtellus, Pteridium aquilinum, C. odorata, Psidium guajava, M. azedarach and C. equisetifolia. Some localised harvesting of instream P. australis reeds was noted within the macro channel immediately above the bridge.

Photo 5. View above the Bedlane bridge looking across unit R01, from the Left Hand Bank (LHB). Note the small scale harvesting of reeds by locals.	*Photo 6. View from east to west looking across unit R01 from above the Bedlane bridge. The secondary riparian forest at this locality comprised a mix of alien and indigenous woody vegetation.*
	
Photo 7. View looking downstream of unit R01 from below the Bedlane bridge. Note the cobble-dominated instream habitat with limited vegetation within the active river channel	*Photo 8.View from the Bedlane bridge looking dowstream of unit R01. Note the disturbed habitat next to the bridge which then graduates into a largely indigenous riparian forest*

7.2.2 Baseline Ecological Assessment of Wetlands

7.2.2.1 Present Ecological State (PES) of Wetlands

The current health or Present Ecological State (PES) of wetlands was assessed using the WET- Health tool (Macfarlane et al. 2007) which was applied at a rapid level 1 assessment level. WET-Health assesses wetland condition or PES based on an understanding of both catchment and on-site impacts. The approach to assessing wetland PES essentially works by comparing a wetland in its current state with the estimated/anticipated baseline/reference conditions for the wetland. Specification of the reference state is followed by an impact-based approach, whereby the extent and intensity of anthropogenic impacts are interrogated to interpret the level of modification to the primary drivers of wetland health, namely (i) hydrology, (ii) geomorphology and (iii) the structure and composition of wetland vegetation (Refer to Table 24, below).

Table 24: Comparing Anticipated Wetland Reference State with Present State for Wetland 'W01' Associated with the Dango River.

Component of Wetland Health	Reference State	Present State
Hydrology	Water inputs to the wetland dominated by surface flows from overtopping of the river channel with lateral subsurface inputs contributing to a far lesser extent. Through flows a mix of channelled surface flows and diffuse flows outside of the	Seasonal to permanent wetland, flows are largely confined to a single channel which has become somewhat incised, resulting in limited overtopping of the banks thereby altering the natural wetness regime with peripheral wetland areas.

Component of Wetland Health	Reference State	Present State
Geomorphology	Gradual slope with naturally even/slightly undulating topography flows concentrated along a central channel.	Infilling due to artificial activities, channel incision and erosion gulley formation linked with surface runoff from altered/hardened catchment areas, increased sedimentation due to increased agricultural practices in the catchment. Reduced sediment inputs due to upstream farm dams.
Vegetation	100% native vegetation dominated by mixed hygrophilous grassland and sedge land habitat of the Sub-escarpment savanna vegetation group. No alien/exotic vegetation.	Monotypic reedbeds and hygrophilous grassland community with moderate to high levels of alien/exotic vegetation.

A summary of the results of the WET-Health condition/PES assessment (i.e. impacts to and current state of each component of wetland health: hydrology, geomorphology and vegetation) is included below in Table 25 for the channelled valley bottom wetland W01 associated with the Dango River bridge, which was found to be in a 'Largely Modified' state ("D" PES category).

Table 25: Summary of the WET-Health Assessment Results for Wetland W01.

Wetland Unit	HGM TYPE	Extent	Hydrology	Geomorphology	Vegetation	Overall PES
			Impact Score	Impact Score	Impact Score	Impact Score
W01	Channelled valley-bottom wetland	~7.9 ha	4.5	3.9	5.2	4.5
PES Category			D	C/D	D	D: Largely Modified

Key impacts to this wetland include:

1. Moderate to high levels of invasive alien plant colonisation of wetland areas.
2. Infilling associated with the construction of the existing bridge over the wetland.
3. Sedimentation resulting from agricultural practices (sugarcane farming) within the upstream catchment.
4. Channel incision due to increased flood peaks resulting from land use change in the catchment.
5. Reduced flows and sediment inputs due to upstream farm dams.

7.2.2.2 Wetland Functionality (Ecosystem Services) Assessment

The predicted level of importance of the various potential goods and services have been summarised in Table 26, below, with some of the key findings of the WET-Eco services (wetland functionality) assessment including:

- The level of supply provided for several regulating and supporting services (such as stream flow regulation water quality enhancement and sediment trapping) is generally regarded as moderate, which is driven by a moderate to moderately low local/regional demand and a moderate to moderately-high capacity for the wetland to provide these key services in the landscape.
- With the exception of harvestable resources (wetland is regarded as moderately important at providing reeds and other natural resources), provisioning and cultural services are not considered particularly

important for the wetland which can be linked to low supply/demand levels and due to the moderate to large level of modification due to anthropogenic impacts, the wetland is not considered a useful reference wetland site with very few opportunities for educational/tourism/research use identified.

Table 26: Summary of the Importance of Wetland Unit W01 in Providing Ecosystem Goods & Services

Ecosystem Service/Benefit		W01: Importance Rating and Score (/4)
REGULATING AND SUPPORTING SERVICES	Flood attenuation	Moderately Low (1.2)
	Stream flow regulation	Moderate (1.9)
	Sediment trapping	Moderate (2.3)
	Erosion control	Moderately Low (1.4)
	Phosphate removal	Moderate (2.1)
	Nitrate removal	Moderate (1.6)
	Toxicant removal	Moderate (1.6)
	Carbon storage	Moderately Low (1.3)
	Biodiversity maintenance	Moderately Low (1.4)
PROVISIONING SERVICES	Water supply	Moderately Low (1.4)
	Harvestable natural resources	Moderate (1.6)
	Food for livestock	Very Low (0.5)
	Cultivated foods	Very Low (0.5)
CULTURAL SERVICES	Cultural significance	Moderately Low (1.5)
	Tourism & recreation	Very Low (0.3)
	Education and research	Very Low (0.1)

7.2.2.3 Ecological Importance & Sensitivity (EIS) of Wetlands

Based on the PES assessment and importance of the wetland in terms of wetland goods and services, the Ecological Importance and Sensitivity (EIS) of the wetland was rated using the Wetland EIS tool dev eloped by Eco-Pulse (2015). A summary of the EIS assessment for wetland unit W01 is provided below in Table 27. Generally speaking, the wetland (W01) was found to be of Moderate Ecological Importance & Sensitivity (EIS), which is driven largely by the moderate importance of the wetland in terms of providing key regulating and supporting services, particularly flow regime regulations, sediment trapping and water quality enhancement. This is despite the wetland obtaining a relatively low ecological sensitivity rating (due to the existing lev el of habitat degradation and poor condition of the wetland).

Table 27: Summarized EIS assessment results for the wetland unit W01.

	W01 (Score out of 4)
Ecological Importance	2.3
Biodiversity maintenance	1.4
Flow regime regulation	1.9
Water quality enhancement	1.8

Sediment & erosion regulation	2.3
Climate regulation	1.3
Ecological Sensitivity	1.2
EIS	2.3
EIS Rating	Moderate
Socio-cultural Importance	1.6
Provisioning services	1.6
Cultural services	1,5
Socio-cultural Importance Rating	Moderately Low

7.2.3 Baseline Ecological Assessment of Rivers

7.2.3.1 Present Ecological State (PES) of Rivers

The 'habitat integrity' of a river refers to the "maintenance of a balanced composition of physic- chemical and habitat characteristics on a temporal and spatial scale that are comparable to the characteristics of natural habitats of the region" (Kleynhans, 1996). It is seen as a surrogate for the assessment of biological responses to driver changes. Habitat integrity for instream and riparian habitats was assessed separately based on the following indicators of habitat integrity:

- Water abstraction;
- Flow modification;
- Inundation;
- Bed modification;
- Bank erosion;
- Channel modification;
- Water quality;
- Solid waste disposal;
- Vegetation removal;
- Exotic vegetation;
- Connectivity;

A summary of the results of the IHI assessment undertaken for the riverine unit R01 (Bedlane River) is presented below in Table 28 and Figure 7. The results of the IHI assessment undertaken suggests that River R01 can be regarded as being in a 'Moderately Modified' state (reflected by a "C" PES Category), which is based on the combined assessment of both instream and riparian habitat integrity. The moderate level of modification is primarily attributed to the extent of woody and herbaceous alien plant infestation of the instream and riparian areas of the river as well as the significant effect of upstream dams and abstraction on flows to the downstream river.

Table 28: Summary of the Index of Habitat Integrity (IHI) Results for River R01: Bedlane River.

HGM	Zone	IHI Score & IHI Class	Description	Weighted overall Score
R01: mixed bedrock-alluvial transitional river	Instream	77% Fair	The combined habitat integrity rating for this river reach assessed was regarded as "fair" or "moderately modified" ("C' ecological category). The reason for the moderate reduction in habitat integrity which has resulted in the river attaining a PES rating of 'fair" is as a result of the impacts vegetation clearing which were considered moderate, with riparian vegetation being the most affected by moderately high levels of exotic/alien vegetation which has replaced much of the natural vegetation. Hydrological modifications were also apparent, with the impact of an upstream dam on flows being regarded as large and mainly affecting the instream habitat associated with the active river channel and with mainly low flows affected. Water quality was deemed to be fair, with elevated nutrients likely due to various forms of agriculture	78% Fair ('C' Ecological Category)
	Riparian	80% Good/ Fair		

7.2.3.2 Ecological Importance and Sensitivity (EIS) of Rivers

For the purposes of this assessment, river EIS was based on rating the importance and sensitivity of riparian & in-stream biota (including fauna & flora) and habitat, using both desktop and on-site indicators. A breakdown of the EIS scores and ratings for the mixed bedrock-alluvial transitional river (R01) has been provided in Table 13, below. For the bedrock-alluvial river, river EIS was regarded as Low: the functioning and/or biodiversity features have low-medium sensitivity to anthropogenic disturbance and they typically play a very small role in providing ecological services at the local scale. This can be attributed to the following:

- The small river is unlikely to harbour any rare or endangered species due to fairly high levels of hydrological modification and habitat degradation;
- Despite being relatively small and inherently sensitive to flow related changes, the level of modification of instream and riparian habitat (fair condition) somewhat reduces overall sensitivity to flow-related water quality changes;
- The river has a fairly low diversity of instream and riparian habitat types with few biotopes present in the river and it is likely that only some intolerant biota will be present within the system;
- During times of environmental stress the instream and riparian habitat is likely to offer very limited refugia for biota due to limited diversity of habitat types and presence of other anthropogenic impacts;
- Instream and riparian habitat exhibits low connectivity within a relatively transformed agricultural landscape; and;
- The river has not been identified as being of particular national/provincial conservation importance in terms of the available plans for the region.

Table 29: Summary of the EIS Assessment for the River Unit R01: Bedlane River

Determinant		River EIS Assessment R01 (stream)
RIPARIAN & INSTREAM BIOTA	Rare & endangered species	Very Low
	Unique species (endemic, isolated, etc.)	Very Low
	Intolerant species sensitive to flow/water quality modifications	Moderate
	Species/taxon richness	Moderate
RIPARIAN & INSTREAM HABITAT	Diversity of habitat types	Low
	Refugia	Very Low
	Sensitivity to flow changes	Moderate
	Sensitivity to flow related water quality changes	Moderate
	Migration route/corridor (instream & riparian)	Very Low
	Importance of conservation & natural areas	Very Low
EIS Category		Low

7.2.4 Potential Impacts

7.2.4.1 Construction Phase: Habitat Destruction and Modification of Aquatic Habitat

Direct habitat destruction and modification impacts are likely to be localised and remain largely within the construction footprint/impact zone. Given that the project entails a bridge upgrade (widening) and not an entirely new bridge development (i.e. widening of the bridge/deck by 2.825m upstream and 1.225m downstream for the Bedlane Bridge; 3.129m upstream and 1.329m downstream for the Dango Bridge), direct impacts are already present and additional direct loss or destruction of aquatic habitat is likely to be limited to small sections of already disturbed riparian/wetland habitat upstream and downstream of the existing bridges across the Bedlane and Dango Rivers. The most noteworthy direct impacts will arise from instream (river bed) and bank modifications resulting from the extension of bridge piers, which will require vegetation clearing within the impacted area. The overall extent of the impact will be very limited and located within an area already impacted by the disturbance caused by the existing bridge structure. Direct impacts to aquatic vegetation/habitat caused by construction taking place within and across the river channel and riparian zone of the Bedlane River and the wetland associated with the Dango River will likely include the following:

- Destruction or modification of instream habitat (biotopes) where piers are extended within the natural channel (river bed modification);
- Destruction or modification of wetlands or riparian vegetation and river banks (bank modification) at the approach to the bridge resulting from widening of the bridge structure in both an upstream and downstream direction;
- Unintentional physical destruction or modification of wetland and instream or riparian habitat outside of the construction zone caused by machinery and construction staff accessing areas upstream and downstream of the bridge crossing; and
- Sedentary (slow moving) fauna such as invertebrates, slow moving reptiles and amphibians may be

killed within the construction servitude or forced to migrate into adjoining habitats.

Indirect habitat modification and subsequent biota impacts will be localised and limited to the affected wetland, river reach and aquatic biota (fauna) utilising the aquatic habitats and will be short- term in terms of impact duration. The intensity of these impacts is also negated by an abundance of available habit for fauna both upstream and downstream of the bridge crossing which should provide suitable refugia during the construction phase. Indirect/secondary impacts to aquatic vegetation/habitat caused by construction within and across the wetland/river channel and riparian zone may include the following:

- Temporary noise, dust and light disturbance which will cause local fauna to move away from the construction zone in the short-term; and
- Temporary instream river fragmentation impacts from any required temporary diversions which can inhibit/reduce the mobility of aquatic fauna between successive wetland/river reaches in the short-term.

7.2.4.2 Operation Phase: Habitat Destruction and Modification of Aquatic Habitats

During the operational phase of the project (i.e. once construction upgrades to the bridges cease, flows are reinstated and the widened bridge structures become operational) any disturbance caused during construction is likely to promote the establishment of disturbance-tolerant species, including Invasive Alien Plants (IAPs), weeds and pioneer species within wetland and riverine habitats. Whilst initiated during construction, the persisting impact of invasive alien plants (IAPs) and pioneer plants is generally considered an operational and long-term issue. Since these species of plants typically have rapid reproductive turnover and are able to outcompete native species for environmental resources, alter soil stability, promote erosion, change litter accumulation and soil properties and promote or suppress fire, IAPs are widely recognised as one of the single largest impacts on biodiversity in South Africa. Encroachment by alien plants will result in the deterioration of freshwater habitat integrity if rehabilitation and monitoring are not implemented correctly. The extent and severity of existing alien plant populations within the wetland and river reach of the Dango and Bedlane Rivers, respectively, somewhat lowers the intensity of expected alien plant impacts, however, this should not negate the need to manage IAPs at the site.

7.2.4.3 Construction Phase: Flow Modification and Erosion and Sedimentation

Given the need for construction works within an active wetland/river channel, flow and associated erosion and sediment regime impacts will be largely unavoidable but short-term in nature and can be managed though the correct timing of construction and the implementation of the key mitigation measures provided in this report concerning works taking place within a watercourse. Temporary direct flow modifications may need to take place during bridge construction to facilitate the construction process and manage environmental and occupational risks, and may include:

- Coffer dams and/or temporary diversions, which can result in a reduction in flows downstream if environmental flows are not catered for, thus affecting the maintenance of key shallow riffle or run biotopes directly downstream of the bridge.
- Inundation or back-flooding upstream of cofferdams altering naturally occurring instream habitats such as wetland habitat, sediment bars, riffles and runs.
- While no indication of any abstraction has been provided for construction purposes, where this does occur, abstraction can potentially result in the reduction of flows downstream, potentially affecting the

maintenance of key shallow water biotopes (runs and riffles) on which species rely.

Indirect flow-related erosion and sedimentation/ turbidity impacts during the bridge widening process may include:

- Disturbance of wetland and river bed & bank profiles associated within widening of bridge infrastructure which may render soil particles susceptible to suspension and transport downstream, resulting in the sedimentation and increased turbidity of downstream wetland areas and river reaches.
- Dewatering and diversion of flows around instream work areas (usually required to ensure a 'dry working area' for the duration of construction) can focus flows downstream, thus altering the rate and distribution of flows and resulting in potential scouring/erosion. This may also disconnect instream habitat reaches or microhabitats from flow or change the nature of flows in these biotopes.
- Note that flow-related erosion (i.e. scouring) and/or sedimentation and turbidity impacts will be more pronounced during rainfall events and higher rainfall periods of the year and are directly linked with flow volumes and velocities. Some of the key ecological consequences associated with the sedimentation of freshwater habitat and increased water turbidity include:
  - Partial to complete burial of aquatic vegetation and instream biotopes such as runs, riffles and pools due to sediment deposition.
  - Reductions in soil saturation rates of areas buried with sediment and/or eroded.
  - Colonisation by alien invasive and weedy plant species associated with recent erosional and depositional features.
  - The creation of low light conditions reducing photosynthetic activity and the visual abilities of foraging instream aquatic biota.
  - Increased downstream drift by benthic invertebrates causing localised reductions in population densities. and
  - Reduced density and diversity in benthic invertebrate and fish communities as a result of reduced water quality (suspended solids impacting intolerant taxa).

Due to existing sediment impacts and flow modifications (as a result of upstream dams and agricultural activities), any additional short-term impacts associated with bridge construction, across both the Dango River and Bedlane River, are unlikely to be significant.

7.2.4.4 Operation Phase: Flow Modification and Erosion and Sedimentation

Since the bridge widening project only considers the extension of existing infrastructure, with no new instream piers or culverts planned, potential long-term modifications to local river and wetland hydrological and sediment regime as a result of the bridge widening are highly unlikely and where these do occur, impacts are likely to be of low/negligible significance.

7.2.4.5 Construction Phase: Water Quality

Pollutants/contaminants associated with construction projects vary and may enter the watercourses during construction activities and have the capacity to negatively affect receiving water resource integrity/quality, the direct result of which is reduced suitability for consumption (humans and livestock). Secondary to the direct use value of the water resource is the sensitivity of aquatic biota (particularity fauna as vegetation is highly degraded) to changes physio-chemical water quality. Where significant changes in water quality occur, a shift in species composition will result, favouring tolerant species, and potentially resulting in the localised reduction of sensitive species. Sudden drastic changes in water quality can also have chronic effects on aquatic biota such as fish, invertebrates and amphibians which have specific pollution tolerances. Where these tolerances are exceeded localised extinctions may result. While water quality impact are possible and may have a measurable effect of water resource quality and aquatic biota sensitive to water quality modifications, these impacts are unlikely and in the event that they do occur will probably be short-lived. Potential construction phase contaminants and their relevant sources may include:

- Hydrocarbons – leakages from petrol/diesel stores and machinery/vehicles, spillages from poor dispensing practices.
- Oils and grease - leakages from oil/grease stores and machinery/vehicles, spillages from poor handling and disposal practices.
- Cement - spillages from poor mixing and disposal practices.
- Bitumen - spillages from poor application, handling and disposal practices.
- Sewage – leakages from and/or poor servicing of chemical toilets and/or informal use of surrounding bush by workers.
- Suspended solids – suspension of fine soil particles as a result of soil disturbance and altered flow patterns.
- Workers are likely to generate solid waste during construction which could easily end up contaminating the riparian zone and river water, and would migrate downstream to disturb downstream ecosystems.

Water for construction will also be obtained from a Municipal source, and will not be abstracted from the river or wetland. No section 21(a) water use is therefore required

7.2.4.6 Operation Phase: Water Quality

Potential operation phase contaminants and their relevant sources can be variable but are likely to be considerably fewer and of less of a concern than construction phase contaminant risks. Given that the bridge widening is not a new development but merely an upgrade to an existing structure, the operational-phase water quality impacts will remain as per the existing road and bridge structure. This includes the potential accumulation of pollutants on the road surface where they will be flushed into adjacent/downstream watercourses after rainfall events, albeit to a very low lev el. Operation phase water quality impacts are therefore likely to be of very low intensity or significance for a project of this nature and are unlikely to have a negative biotic response within the receiving river habitat. Operation phase contaminants/pollutant may include:

- Suspended solids (turbidity) – should scouring and channel erosion result from poor bridge design and installation leading to sedimentation and increased water turbidity downstream.

- Heavy metals – from car engine wear and fluid leakage.
- Hydrocarbons, oils and grease – from petrol/ diesel leakages from vehicles or incomplete fuel combustion.
- Solid waste- from littering associated with vehicle drivers.

7.3 Heritage Assessment

The Heritage Study was undertaken by an Independent Specialist: Active Heritage

7.3.1 Background to Archaeological History of Area

The archaeological history of the Province of KwaZulu-Natal (KZN) dates back to about 2 million years and possibly older, which marks the beginning of the Stone Age. The Stone Age in KZN was extensively researched by Professor Oliver Davies formerly of the Natal Museum. The Stone Age period has been divided in to three periods namely: Early Stone Age (ESA) dating between 2 million years ago to about 200 000 years ago, Middle Stone Age (MSA) dating between 200 000 years ago to about 30 000 years ago, and the Later Stone Age (LSA) which dates from 30 000 to about 2 000 year ago. The Stone Age period ends around approximately 2 000 years ago when Bantu speaking Age farmers from the north arrived in southern Africa. The Iron Age is also divided into three periods, namely: Early Iron Age (EIA) dating between AD 200 and AD 900, Middle Iron Age (MIA) dating between AD 900 and AD 1300, Late Iron Age (LIA) dating between AD 1 300 and 1 820.

7.3.1.1 Description of Sites and Material Observed

7.3.1.1.1 Archaeological Description of the General Area Surveyed

The middle reaches of the Thukela River Valley to the immediate south west of the project area has been thoroughly surveyed by archaeologists during the last 30 years or so. This area was the focus of various research projects by archaeologists associated with the then Natal and Ondini Museums respectively (Huffman 2007). Three Early Iron Age sites have also been excavated in the recent past notably by archaeologist Len van Schalkwyk who has been working in this area for many years (ibid). The records of the KwaZulu-Natal Museum indicate the presence of 2 Early Stone Age sites, 3 Middle Stone Age sites, 6 Intermediate Stone Age sites, 8 Early Iron Age sites, 3 Later Iron Age sites, and 2 Historical sites in this area. However, none of these occur on the actual footprint. The greater Eshowe area was pivotal in the rise and development of the Zulu kingdom in the 1820's, the Anglo Zulu-War of 1979, and the Bambatha Rebellion of 1910 (Derwent 2006). Various historical period sites occur in or adjacent to Eshowe. These include Queen Nandi's grave, the Manadawe Cross, Norwegian Soldiers Grave, Fort Kwa Mondi, King Cetshwayo Grave, The Eshowe Jail, the Old Residency, Fort Nongqayi, and the military Ikhanda of King Shaka – KwaBuluwayo. None of these sites are located closer than 1km to the proposed development (Fig 1). They are therefore not threatened and merit no further discussion.

No archaeological and heritage sites was located adjacent to the P393 (R34). However, both the Bedlane and Dango Bridges that are located on the P 393 further discussed below.

7.3.1.1.2 Bedlane Bridge

The Bedlane Bridge is situated approximately 3km to the east of the R66 on the P393. It spans a small river and is approximately 32m long. The surface of the bridge is tarred but the metal railing has been damaged (Figs 12 & 13). The bridge is not unique and is characteristic of many structures and similar bridges build during the 1950's and 1960's. It is rated as having low heritage value (Table 12). However, it is important to notice that a built heritage specialist, following a thorough investigation, may give the structure a different rating. A date of 1958 is inscribed on the side of the bridge and indicates the period of construction (Fig 14).

Figure 12: The P394 (R34) Crossing the Bedlane Bridge.

Figure 13: Damage to the Existing Metal Railing is Visible.

Figure 14: Inscription of 1958 on Bedlane Bridge Showing the Construction Completion Date.

7.3.1.1.3 Dango Bridge

The Dango Bridge is situated approximately 3.8 km to the east of the R66 on the P393. It spans a small wetland and is approximately 30m long. It appears to be almost identical to Bedlane Bridge and was also

constructed in 1958 (Fig 17). The surface of the bridge is tarred and the metal railing is in a better condition that those on the Bedlane Bridge (Figs 15 & 16). The bridge is not unique and is characteristic of many structures and similar bridges build during this period. It is rated as having low heritage value (Tables 30 and 31). However, it is important to notice that a built heritage specialist, following a thorough investigation, may give the structure a different rating. A date of 1958 is inscribed on the side of the bridge and indicates the period of construction.

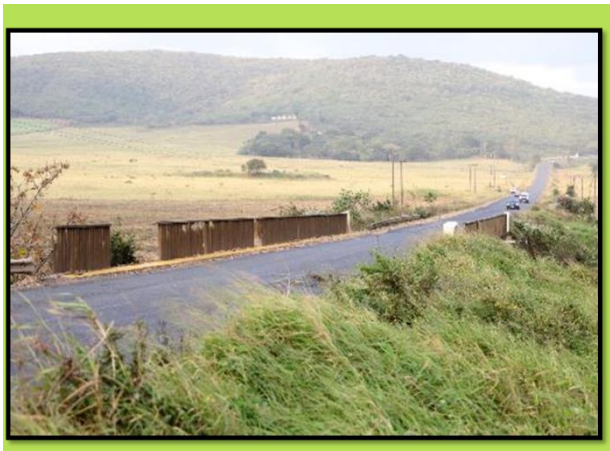


Figure 15: The P393 in the vicinity of the Dango Bridge.

Figure 16. The Dango Bridge.

Figure 17. Inscription of 1958 – Showing the Construction Completion Date of the Dango Bridge.

Both the Dango and Bedlane Bridges have been rated as Generally Protected C and have a low significance (Tables 30 and 31). Again it is important to mention that these rating values may differ significantly from those afforded by a built heritage specialist.

Table 30: Field Rating and Recommended Grading of Sites (SAHRA 2005)

Level	Details	Action
National (Grade I)	The site is considered to be of National Significance	Nominated to be declared by SAHRA
Provincial (Grade II)	This site is considered to be of Provincial significance	Nominated to be declared by Provincial Heritage Authority
Local Grade IIIA	This site is considered to be of HIGH significance locally	The site should be retained as a heritage site
Local Grade IIIB	This site is considered to be of HIGH significance locally	The site should be mitigated, and part retained as a heritage site
Generally Protected A	High to medium significance	Mitigation necessary before destruction
Generally Protected B	Medium significance	The site needs to be recorded before destruction
Generally Protected C	Low significance	No further recording is required before destruction

Table 31: Evaluation of Dango and Bedlane Bridges

Significance criteria in terms of Section 3(3) of the NHRA		
	Significance	Rating
1.	Historic and political significance - The importance of the cultural heritage in the community or pattern of South Africa's history.	Low
2.	Scientific significance – Possession of uncommon, rare or endangered aspects of South Africa's cultural heritage.	None.
3.	Research/scientific significance – Potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.	Low
4.	Scientific significance – Importance in demonstrating the principal characteristics of a particular class of South Africa's cultural places/objects.	Low
5.	Aesthetic significance – Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.	None.
6.	Scientific significance – Importance in demonstrating a high degree of creative or technical achievement at a particular period.	None.
7.	Social significance – Strong or special association with a particular community or cultural group for social, cultu-ral or spiritual reasons.	None
8.	Historic significance – Strong or special association with the life and work of a person, group or organization of importance in the history of South Africa.	None
9.	The significance of the site relating to the history of slavery in South Africa.	None.

Subsequent to the undertaking of the HIA by Active Heritage, and based on the recommendation received in the HIA, a built heritage specialist (Lindsay Napier) was appointed to confirm the rating associated with the 2 bridge structures. A low rating was subsequently confirmed by the built heritage specialist. An exemption letter requesting the Heritage Resource Agency (Amafa) that the project be not subjected to a Phase Two Heritage Assessment was compiled.

8 IMPACT ASSESSMENT

8.1 Introduction

Impact assessment must take account of the nature, scale and duration of effects on the environment, whether such effects are positive (beneficial) or negative (detrimental). 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. A brief discussion of the impact and the rationale behind the assessment of its significance is provided in this Section.

The EIA of the project activities is determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects. The environmental impact assessment is focussed on the following phases of the project namely:

- Planning Phase;
- Construction Phase; and
- Operational Phase.

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

8.2 Impact Assessment 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:

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

The criteria to be used for the rating of impacts are provided in Table 32.

Table 32: Criteria to be used for the Rating of Impacts

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

Significance is determined through a synthesis of impact characteristics. Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact (Refer Table 33).

Table 33: Criteria for the Rating of Classified Impacts

Class	Description
Any positive value	Any positive / beneficial 'impact', i.e. where no harm will occur due to the activity being undertaken.
Low impact (1-5 points)	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
Medium impact (6-10 points)	Mitigation is possible with additional design and construction inputs.
Medium-High impact (11 -15 points)	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment
High impact	The design of the site may be affected. Mitigation and possible remediation are essential during the

Class	Description
(16 -20 points)	construction and/or operational phases. The effects of the impact may affect the broader environment.
Very high impact (21 - 25 points)	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status	Denotes the perceived effect of the impact on the affected area.
Positive (+)	Beneficial impact.
Negative (-)	Deleterious or adverse impact.
Neutral (/)	Impact is neither beneficial nor adverse.
It is important to note that the status of an impact is assigned based on the status quo – i.e. should the project not proceed. Therefore, not all negative impacts are equally significant.	

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

8.3 Potential Impacts and Significance

The following sections will provide a description of the potential impacts as identified by the specialist assessment, EAP and through the PPP as well as the assessment according to the criteria described in Table 32 and Table 33.

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

8.3.1 Planning Phase Impacts

Table 34: Bedlane and Dango Bridges Alternative 1 and Alternative 2

PHASE: PLANNING AND DESIGN									
No.	POTENTIAL ASPECT/ IMPACT	Alternative	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
1	**ASPECT** Incorrect design of bridges.	Alternative 1	Without Mitigation	-4	-3	-4	-4	-15	Negative Medium High
			With Mitigation	-2	-2	-2	-2	-8	Negative Medium
	IMPACT Exorbitant costs that will have to be spent in the implementation of the project.	Alternative 2	Without Mitigation	-4	-4	-4	-4	-16	Negative High
			With Mitigation	-2	-3	-3	-3	-11	Negative Medium High
	MITIGATION MEASURE	The best design option which will be cost effective must be implemented.							
2	**ASPECT** Expropriation process resulting from the encroachment of the project outside the servitude.	Alternative 1	Without Mitigation	-4	-3	-4	-4	-15	Negative Medium High
			With Mitigation	-2	-2	-2	-2	-8	Negative Medium
	IMPACT Displacement of the nearby famers and ligation processes.	Alternative 2	Without Mitigation	-4	-4	-4	-4	-16	Negative High
			With Mitigation	-2	-3	-3	-3	-11	Negative Medium High
	MITIGATION MEASURE	The best design option which will result in minimal environmental and social impacts must be implemented.							
3	**ASPECT** Incorrect location of construction site camp and associated infrastructure.	Alternative 1	Without Mitigation	-4	-3	-4	-4	-15	Negative Medium High
			With Mitigation	-2	-2	-2	-2	-8	Negative Medium
	IMPACTS Occurrence significant environmental impacts (water quality, disturbance of flora and fauna, visual and air quality).	Alternative 2	Without Mitigation	-4	-3	-4	-4	-15	Negative Medium High
			With Mitigation	-2	-2	-2	-2	-8	Negative Medium
	MITIGATION MEASURE	The location of the site camp must be carefully planned and affected landowners be notified well in advanced in writing. An Environmental Control Officer must be appointed to guide and advise the project on environmental matters prior construction activities. Care must be taken							

PHASE: PLANNING AND DESIGN									
No.	POTENTIAL ASPECT/ IMPACT	Alternative	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
		that such construction camp does not trigger additional EIA Regulations 2014 (as amended in 2017) listed activities							
4	**ASPECT** Contractor employing people which are not from the area.	**Alternative 1**	Without Mitigation	-4	-3	-4	-4	**-15**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-2	**-8**	**Negative Medium**
	IMPACT Riots by the local communities.	**Alternative 2**	Without Mitigation	-4	-3	-4	-4	**-15**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-2	**-8**	**Negative Medium**
	MITIGATION MEASURE	The Client and the Contractor must abide by the Labour Law and also liaise with appropriate structures of the local community such as Tribal Authorities and Councillors in affording opportunities of employment to unskilled community members.							
5	**ASPECT** Contractor not having the necessary tools and employees.	**Alternative 1**	Without Mitigation	-4	-3	-4	-4	**-15**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-2	**-8**	**Negative Medium**
	IMPACT Delays of the construction activities.	**Alternative 2**	Without Mitigation	-4	-3	-4	-4	**-15**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-2	**-8**	**Negative Medium**
	MITIGATION MEASURE	The Client must include all the necessary documentation in the Tendering Process. This will allow the appointed Contractor to cost appropriately for all the components required during the construction process as well as personnel.							
							Average for Alternative 1 without mitigation	**-15**	Negative Medium High
							Average for Alternative 1 with mitigation	**-8**	Negative Medium
							Average for Alternative 2 without mitigation	**-14**	Negative Medium High
							Average for Alternative 2 with mitigation	**-9.2**	Negative Medium

8.3.2 Construction Phase Impacts

Table 35: Bedlane Bridge Alternative 1 and Alternative 2

PHASE: CONSTRUCTION									
No.	POTENTIAL IMPACT	Alternative	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
1	**ASPECT** Construction traffic: movements of trucks delivering construction material.	Alternative 1	Without Mitigation	-2	-3	-2	-3	-10	Negative Medium
			With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Dust emissions from debris handling and debris piles; mobile plant/machinery and general construction activities.		Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High
		Alternative 2	With Mitigation	-2	-2	-2	-3	-9	Negative Medium
	MITIGATION MEASURE	▪ Dust suppression measures and the coordination of delivery trucks must be implemented by the appointed Contractor to minimise dust nuisance in the surrounding communities.							
2	**ASPECT** Vegetation clearance in areas not affected by the construction activities.	Alternative 1	Without Mitigation	-2	-3	-2	-3	-10	Negative Medium
			With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Exposed soil which further causes erosion and runoff.		Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High
		Alternative 2	With Mitigation	-2	-2	-2	-3	-9	Negative Medium
	MITIGATION MEASURE	▪ Vegetation must be cleared in a phased manner and avoid clearance in areas not affected by construction activities to minimise erosion. ▪ Any erosion channels developed during the construction period should be backfilled and compacted, and the areas restored to a proper condition. The Contractor should ensure that cleared areas are effectively stabilised to prevent and control erosion.							
3	**ASPECT** Mismanagement of chemicals by construction workers.	Alternative 1	Without Mitigation	-2	-3	-2	-3	-10	Negative Medium
			With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Uncontrolled oil and chemical spillages.	Alternative 2	Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High

PHASE: CONSTRUCTION									
No.	POTENTIAL IMPACT	Alternative	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
			With Mitigation	-2	-2	-2	-3	-9	Negative Medium
	MITIGATION MEASURE	▪ Oil and other spillages and leakages must be minimized and controlled accordingly by cleaning the spill as soon as possible. ▪ Chemicals must be stored appropriately on site and a Materials Safety Data Sheet be provided by the contractor. ▪ Workers handling these chemicals must be trained about their potential hazard.							
4	ASPECT Mismanagement of construction waste.	Alternative 1	Without Mitigation	-2	-3	-2	-3	-10	Negative Medium
			With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Scattered litter, construction debris and contaminated rags all over the construction site.	Alternative 2	Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High
			With Mitigation	-2	-2	-2	-3	-9	Negative Medium
	MITIGATION MEASURE	▪ Construction related (solid hazardous and general) waste must be collected regularly from the site and disposed of at an appropriate registered landfill site. ▪ Construction waste must not be stored more than 30 days on site.							
5	ASPECT Lack of provision of ablutions.	Alternative 1	Without Mitigation	-2	-3	-2	-3	-10	Negative Medium
			With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Creation of informal ablutions.	Alternative 2	Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High
			With Mitigation	-2	-2	-2	-3	-9	Negative Medium
	MITIGATION MEASURE	▪ The Contractor must ensure good health and safety of workers by providing the necessary equipment's (PPE, ablution facilities that must be serviced weekly).							
6	ASPECT Complains from neighbouring landowners about the construction noise.	Alternative 1	Without Mitigation	-2	-3	-2	-3	-10	Negative Medium
			With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Increase in noise pollution from construction activities and workers.	Alternative 2	Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High
			With Mitigation	-2	-2	-2	-3	-9	Negative Medium

PHASE: CONSTRUCTION									
No.	POTENTIAL IMPACT	Alternative	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
	MITIGATION MEASURE	▪ Normal working hours (07H00 to 17H00) must be adhered to all the time. Should there be activities that will need to be undertaken at night; the nearby landowners must be notified well in advanced. ▪ Construction vehicles must be fitted with silencers to limit the noise emission.							
7	**ASPECT** Proliferation of social ills and crime.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT The influx of people seeking potential employment opportunities.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ Proper procedures must be followed by the Contractor through liaising with the local authorities regarding employment opportunities for the local community.							
8	**ASPECT** Lack of health and safety plans implementation.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Injuries and accidents of construction workers and public by construction activities.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ The Contractor must ensure good health and safety of workers by providing the necessary equipment's (PPE, ablution facilities that must be serviced weekly). ▪ Clearly visible construction signs must be erected by the Contractor to ensure safety of the public.							
9	**ASPECT** Vegetation clearance not affecting the construction activities.	**Alternative 1**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-1	-3	-2	**-8**	**Negative Medium**
	IMPACT **Ecology** Habitat destruction and associated disturbances to remaining faunal species.	**Alternative 2**	Without Mitigation	-2	-4	-2	-5	**-13**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ The Contractor needs to maintain close site supervision. The construction workers must be limited to the construction site in order to avoid destruction and disturbance of vegetation that is not affected by construction activities.							

PHASE: CONSTRUCTION									
No.	POTENTIAL IMPACT	Alternative	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
10	**Impacts on River ASPECT** Changes in vegetation composition, structure and habitat for biota as well as the fragmentation of habitat.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Physical destruction and modification of aquatic habitat vegetation and soils.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-3	-2	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ It is strongly recommended that works take place in winter (the dry season) when flow velocities will be at their lowest, and thus more easily manageable. ▪ Spill prevention measures must be put in place prior to any activities taking place. Other spill response equipment must also be on-site during construction activities. ▪ It is recommended that river flow be allowed to bypass the works on one side of the watercourse with temporary structures placed (e.g. sand bags etc.) to keep the works dry. Once work is completed, the watercourse flow should be allowed to return to its normal state. ▪ An appropriate bridge design must be in place to avoid or minimise the impacts. ▪ Access control should be in place on site. ▪ Onsite best management practices must be implemented for sediment and pollution controls. ▪ Post-construction rehabilitation must be implemented. ▪ Ultimately, the risk of water resource degradation and biodiversity reduction/loss must drive sustainability in development design and operation.						
11	**Impacts on River ASPECT** Flow of water modification.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Erosion and sedimentation impacts. Water quality and stormwater impacts.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-3	-2	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ It is strongly recommended that works take place in winter (the dry season) when flow velocities will be at their lowest, and thus more easily manageable. ▪ Spill prevention measures must be put in place prior to any activities taking place. Other spill response equipment must also be on-site during construction activities. ▪ It is recommended that river flow be allowed to bypass the works on one side of the watercourse with temporary structures placed (e.g.						

PHASE: CONSTRUCTION									
No.	**POTENTIAL IMPACT**	**Alternative**	**Mitigation**	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance = E+D+I+P**	**Status Classification**
		sand bags etc.) to keep the works dry. Once work is completed, the watercourse flow should be allowed to return to its normal state. ▪ An appropriate bridge design must be in place to avoid or minimise the impacts. ▪ Access control should be in place on site. ▪ Onsite best management practices must be implemented for sediment and pollution controls. ▪ Post-construction rehabilitation must be implemented. ▪ Ultimately, the risk of water resource degradation and biodiversity reduction/loss must drive sustainability in development design and operation.							
13	**Heritage** There were no heritage features discovered during the survey of the site. It is possible that during the construction phase there might be features uncovered and disturbed.	**Alternative 1**	Without Mitigation	-1	-1	-1	-1	**-4**	**Negative Low**
			With Mitigation	-1	-1	-1	-1	**-4**	**Negative Low**
		Alternative 2	Without Mitigation	-1	-1	-1	-1	**-4**	**Negative Low**
			With Mitigation	-1	-1	-1	-1	**-4**	**Negative Low**
	MITIGATION MEASURE	It is recommended should heritage features and artefacts be uncovered during construction phase, the construction activities must be halted by the Contractor and a heritage specialist be notified to conduct further investigation. Construction work must be suspended in the areas affected until further instructions from the heritage specialist.							
							Average for Alternative 1 without mitigation	-10	**Negative Medium**
							Average for Alternative 1 with mitigation	-5	**Negative Low**
							Average for Alternative 2 without mitigation	-11	**Negative Medium High**
							Average for Alternative 2 with mitigation	-7	**Negative Medium**

Table 36: Dango Bridge Alternative 1 and Alternative 2

PHASE: CONSTRUCTION									
No.	**POTENTIAL IMPACT**	**Alternative**	**Mitigation**	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance = E+D+I+P**	**Status Classification**
1	**ASPECT** Construction traffic: movements of trucks	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**

PHASE: CONSTRUCTION									
No.	POTENTIAL IMPACT	Alternative	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
	delivering construction material.		With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Dust emissions from debris handling and debris piles; mobile plant/machinery and general construction activities.		Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High
		Alternative 2	With Mitigation	-2	-2	-2	-3	-9	Negative Medium
	MITIGATION MEASURE	▪ Dust suppression measures and the coordination of delivery trucks must be implemented by the appointed Contractor to minimise dust nuisance in the surrounding communities.							
2	**ASPECT** Vegetation clearance in areas not affected by the construction activities.		Without Mitigation	-2	-3	-2	-3	-10	Negative Medium
		Alternative 1	With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Exposed soil which further causes erosion and runoff.		Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High
		Alternative 2	With Mitigation	-2	-2	-2	-3	-9	Negative Medium
	MITIGATION MEASURE	▪ Vegetation must be cleared in a phased manner and avoid clearance in areas not affected by construction activities to minimise erosion. ▪ Any erosion channels developed during the construction period should be backfilled and compacted, and the areas restored to a proper condition. The Contractor should ensure that cleared areas are effectively stabilised to prevent and control erosion.							
3	**ASPECT** Mismanagement of chemicals by construction workers.		Without Mitigation	-2	-3	-2	-3	-10	Negative Medium
		Alternative 1	With Mitigation	-2	-1	-1	-1	-5	Negative Low
	IMPACT Uncontrolled oil and chemical spillages.		Without Mitigation	-2	-3	-3	-4	-12	Negative Medium High
		Alternative 2	With Mitigation	-2	-2	-2	-3	-9	Negative Medium
	MITIGATION MEASURE	▪ Oil and other spillages and leakages must be minimized and controlled accordingly by cleaning the spill as soon as possible. ▪ Chemicals must be stored appropriately on site and a Materials Safety Data Sheet be provided by the contractor.							

PHASE: CONSTRUCTION									
No.	**POTENTIAL IMPACT**	**Alternative**	**Mitigation**	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance = E+D+I+P**	**Status Classification**
		▪ Workers handling these chemicals must be trained about their potential hazard.							
4	**ASPECT** Mismanagement of construction waste.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Scattered litter, construction debris and contaminated rags all over the construction site.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ Construction related (solid hazardous and general) waste must be collected regularly from the site and disposed of at an appropriate registered landfill site. ▪ Construction waste must not be stored more than 30 days on site.							
5	**ASPECT** Lack of provision of ablutions.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Creation of informal ablutions.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ The Contractor must ensure good health and safety of workers by providing the necessary equipment's (PPE, ablution facilities that must be serviced weekly).							
6	**ASPECT** Complains from neighbouring landowners about the construction noise.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Increase in noise pollution from construction activities and workers.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ Normal working hours (07H00 to 17H00) must be adhered to all the time. Should there be activities that will need to be undertaken at night; the nearby landowners must be notified well in advanced. ▪ Construction vehicles must be fitted with silencers to limit the noise emission.							
7	**ASPECT**	**Alternative**	Without	-2	-3	-2	-3	**-10**	**Negative Medium**

PHASE: CONSTRUCTION									
No.	**POTENTIAL IMPACT**	**Alternative**	**Mitigation**	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance = E+D+I+P**	**Status Classification**
8	Proliferation of social ills and crime.	**1**	Mitigation						
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT The influx of people seeking potential employment opportunities.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ Proper procedures must be followed by the Contractor through liaising with the local authorities regarding employment opportunities for the local community.							
8	**ASPECT** Lack of health and safety plans implementation.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Injuries and accidents of construction workers and public by construction activities.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ The Contractor must ensure good health and safety of workers by providing the necessary equipment's (PPE, ablution facilities that must be serviced weekly). ▪ Clearly visible construction signs must be erected by the Contractor to ensure safety of the public.							
9	**ASPECT** Vegetation clearance not affecting the construction activities.	**Alternative 1**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-1	-3	-2	**-8**	**Negative Medium**
	IMPACT Ecology Habitat destruction and associated disturbances to remaining faunal species.	**Alternative 2**	Without Mitigation	-2	-4	-2	-5	**-13**	**Negative Medium High**
			With Mitigation	-2	-2	-2	-3	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ The Contractor needs to maintain close site supervision. The construction workers must be limited to the construction site in order to avoid destruction and disturbance of vegetation that is not affected by construction activities.							
10	**Impacts to Wetlands ASPECT**	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**

PHASE: CONSTRUCTION									
No.	POTENTIAL IMPACT	Alternative	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
	Changes in vegetation composition, structure and habitat for biota as well as the fragmentation of habitat.		With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Physical destruction and modification of aquatic habitat vegetation and soils.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-3	-2	**-9**	**Negative Medium**
	MITIGATION MEASURE	▪ It is strongly recommended that works take place in winter (the dry season) when flow velocities will be at their lowest, and thus more easily manageable. ▪ Spill prevention measures must be put in place prior to any activities taking place. Other spill response equipment must also be on-site during construction activities. ▪ It is recommended that river flow be allowed to bypass the works on one side of the watercourse with temporary structures placed (e.g. sand bags etc.) to keep the works dry. Once work is completed, the watercourse flow should be allowed to return to its normal state. ▪ An appropriate bridge design must be in place to avoid or minimise the impacts. ▪ Access control should be in place on site. ▪ Onsite best management practices must be implemented for sediment and pollution controls. ▪ Post-construction rehabilitation must be implemented. ▪ Ultimately, the risk of water resource degradation and biodiversity reduction/loss must drive sustainability in development design and operation.						
	Impacts on Wetland ASPECT Flow of water modification.	**Alternative 1**	Without Mitigation	-2	-3	-2	-3	**-10**	**Negative Medium**
			With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	IMPACT Erosion and sedimentation impacts. Water quality and stormwater impacts.	**Alternative 2**	Without Mitigation	-2	-3	-3	-4	**-12**	**Negative Medium High**
			With Mitigation	-2	-2	-3	-2	**-9**	**Negative Medium**
11	**MITIGATION MEASURE**	▪ It is strongly recommended that works take place in winter (the dry season) when flow velocities will be at their lowest, and thus more easily manageable. ▪ Spill prevention measures must be put in place prior to any activities taking place. Other spill response equipment must also be on-site during construction activities. ▪ It is recommended that river flow be allowed to bypass the works on one side of the watercourse with temporary structures placed (e.g. sand bags etc.) to keep the works dry. Once work is completed, the watercourse flow should be allowed to return to its normal state. ▪ An appropriate bridge design must be in place to avoid or minimise the impacts.						

PHASE: CONSTRUCTION									
No.	**POTENTIAL IMPACT**	**Alternative**	**Mitigation**	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance = E+D+I+P**	**Status Classification**
		▪ Access control should be in place on site. ▪ Onsite best management practices must be implemented for sediment and pollution controls. ▪ Post-construction rehabilitation must be implemented. ▪ Ultimately, the risk of water resource degradation and biodiversity reduction/loss must drive sustainability in development design and operation.							
13	**Heritage** There were no heritage features discovered during the survey of the site. It is possible that during the construction phase there might be features uncovered and disturbed.	**Alternative 1**	Without Mitigation	-1	-1	-1	-1	**-4**	**Negative Low**
			With Mitigation	-1	-1	-1	-1	**-4**	**Negative Low**
		Alternative 2	Without Mitigation	-1	-1	-1	-1	**-4**	**Negative Low**
			With Mitigation	-1	-1	-1	-1	**-4**	**Negative Low**
	MITIGATION MEASURE	It is recommended should heritage features and artefacts be uncovered during construction phase, the construction activities must be halted by the Contractor and a heritage specialist be notified to conduct further investigation. Construction work must be suspended in the areas affected until further instructions from the heritage specialist.							
							Average for Alternative 1 without mitigation	-10	**Negative Medium**
							Average for Alternative 1 with mitigation	-5	**Negative Low**
							Average for Alternative 2 without mitigation	-11	**Negative Medium High**
							Average for Alternative 2 with mitigation	-7	**Negative Medium**

8.3.3 Operational Phase Impacts

The operational impacts and mitigation thereof discussed below also relates to the combined project (i.e. both the Bedlane and Dango bridges).

Table 37: Bedlane and Dango Bridges Alternatives 1 and Alternative 2

PHASE: OPERATIONAL								
No.	**POTENTIAL IMPACT**	**Mitigation**	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance = E+D+I+P**	**Status Classification**
1	There are no significant impacts anticipated during the operational phase of the project. However, the below should be considered. ▪ After the completion of the excavations, the newly excavated softer soils could potentially offer favourable habitat for certain burrowing animal species. ▪ Colonisation of adjacent wetland habitat by alien plants, weeds and other undesirable plant species affecting habitat integrity and species diversity. ▪ Residual impacts that arose during the construction phase and incorrect rehabilitation of construction-related access. ▪ Clearing of the servitude through the use of herbicides may also pollute nearby watercourses if not properly undertaken. ▪ During the inspections of the servitude, impacts may occur on the watercourses and wetlands. ▪ Physical destruction and/or modification of aquatic habitat. ▪ Flow modification and erosion/sedimentation impacts ▪ Water quality impacts. ▪ Alien invasive plant species encroachment.	Without Mitigation	-2	-1	-2	-3	**-8**	**Negative Medium**
		With Mitigation	-2	-1	-1	-1	**-5**	**Negative Low**
	MITIGATION MEASURE	▪ Care should be taken at all times to prevent any potential impacts that might result from operational activities. KZN DoT must monitor the rehabilitation activities to prevent residual impacts and operational status of the project at least annually. ▪ Should there be any damages on the bridges and associated infrastructure, they should be fixed immediately. ▪ The surrounding communities should be encouraged to report any incidents that occur by using the emergency number provided and/or by reporting to the municipality. ▪ Ecological monitoring should be conducted by KZN DoT to determine the success of the rehabilitation process. ▪ All invasive alien plants that have colonised the construction site must be removed, preferably by uprooting. ▪ Environmental friendly and safe Herbicides should be utilised where hand pulling/uprooting is not possible.						

8.3.4 No Go Alternative

Table 38: No Go Alternative

NO GO ALTERNATIVES FOR THE PROJECT								
No.	POTENTIAL IMPACT	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
	▪ Environmental health and safety risks will persists. ▪ Increased vehicles and pedestrians accidents on the road where the bridges are located. ▪ Increased costs should the project be implemented 10 years post the proposed time.	Without Mitigation	-3	-4	-4	-4	**-14**	**Negative High**
		With Mitigation	+3	+4	+4	+4	**+14**	**Positive High**
1	MITIGATION MEASURE	▪ It is recommended that the project be implemented as planned and also consider the mitigation measures that have been included in this report and the Environmental Management Programme.						

9 CONCLUSION AND RECOMMENDATIONS

The Basic Assessment Process for the proposed project has been undertaken in accordance with EIA Regulations published in Government Notice 982 to 985 of 4 December 2014 (as amended in 2017), in terms of the National Environmental Management Act (NEMA; No107 of 1998). The Basic Assessment Process is aimed at ensuring informed decision-making and environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA (No 107 of 1998), the commitment to sustainable development is evident in the provision that "development must be socially, environmentally and economically sustainable and requires the consideration of all relevant factors". NEMA also imposes a duty of care, which places a positive obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA's preventative principle, potentially negative impacts on the environment and on people's environmental rights (in terms of the Constitution of the Republic of South Africa, Act 108 of 1996) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of "reasonable measures".

In assessing the environmental feasibility of the proposed project, the requirements of all relevant legislation has been considered, including inter alia:

- The Constitution of South Africa (No. 108 of 1996);
- National Environmental Management Act (Act No. 107 of 1998) (as amended) and EIA Regulations 2014 (as amended in 2017);
- National Environmental Management: Waste Act (Act No. 59 of 2008) (as amended);
- National Environmental Management Biodiversity Act (Act No. 10 of 2004);
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004);
- National Water Act (Act No. 36 of 1998) (as amended);
- National Forests Act (Act No. 84 of 1998);
- National Heritage Resources Act (Act No. 25 of 1999);
- Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)(as amended);
- KZN Nature Conservation Ordinance (Ordinance No.15 of 1974);
- Hazardous Substance Act (Act No. 15 of 1973) and Regulations; and
- Occupational Health and Safety Act (Act No. 85 of 1993).

This relevant legislation has informed the identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project. The conclusions of this EIA are the result of comprehensive studies and specialist assessments. These studies were based on issues identified through the Basic Assessment Process and the parallel process of public participation. The public consultation process has been rigorous and extensive, and every effort has been made to include representatives of all stakeholders within the process.

9.1 Assumptions, Uncertainties or Gaps in Knowledge

When undertaking scientific studies, challenges and limitations are encountered. For this specific BA, the following challenge was encountered:

- All information provided by the Engineering team to the EAP was correct and valid at the time it was provided.
- The EAP does not accept any responsibility in the event that additional information comes to light at a later stage of the process.
- All data from unpublished research is valid and accurate.
- The scope of this investigation is limited to assessing the potential environmental impacts associated with the bridge upgrade associated with the P393 rehabilitation.

9.1.1 Fresh Water

- This report deals exclusively with a defined area and the extent and nature of river and wetland ecosystems in that area.
- Additional information used to inform the assessment was limited to data and GIS coverage's available for the Province at the time of the assessment.
- All field assessments were limited to day-time assessments.
- Sampling by its nature, means that generally not all aspects of ecosystems can be assessed and identified.
- With ecology being dynamic and complex, there is the likelihood that some aspects (some of which may be important) may have been overlooked.
- Not all wetlands and rivers within the 500m DWS regulated area were assessed/delineated in the field. Focal areas at risk of being impacted or triggering Section 21 water use were flagged during the desktop risk/screening exercise to be assessed in detail in the field. Thus, finer habitat type details of the systems not formally assessed were not acquired.
- The wetland boundary was identified and classified along a transitional gradient from saturated through to terrestrial soils which makes it difficult to identify the exact boundary of the wetland. The boundaries mapped in this specialist report therefore represent the approximate boundary of wetlands as evaluated by an assessor familiar and well-practiced in the delineation technique.
- Mapped boundaries are based largely on the GPS locations of soil sampling points. GPS accuracy will therefore affect the accuracy rating of mapped sampling points and therefore wetland/riparian boundaries. Soil sampling points were recorded using a GarminTM Oregon Global Positioning System (GPS) with an accuracy of 3-5m.
- Infield soil and vegetation sampling was only undertaken within a specific focal area in the vicinity of the proposed development, while the remaining water resource/HGM units were delineated at a desktop level with limited accuracy.
- It is important to note that delineation of wetlands on this site was difficult in some areas due to the extent of soil disturbance, infilling, removal of indigenous wetland vegetation and replacement of the native vegetation community with invader exotic/alien plants.
- Inferences made about the ecological integrity/river health of the rivers/stream assessed were based on selected variables, sampled on selected occasions at selected geographic locations. This limits the degree to which this information can be extrapolated spatially (within or across river systems) and temporally (i.e. over seasons). Rivers by nature are highly variable ecosystems and can display fine and large scales changes in the structure, composition and quality of the habitat over short periods of time.

- Note that a risk-based approach was followed in selecting the most appropriate assessment tools for the assessment, with the choice of tools selected with due consideration of expected project risks and costs for collecting and reporting on the assessments.
- It is acknowledged that whilst the river Index of habitat Integrity (IHI) assessment tool is a rapid assessment tool and is not designed to monitor short-term changes in aquatic conditions, it does however provide a useful framework for assessing existing impacts and documenting the PES of rivers and streams where a rapid assessment is appropriate. Eco-Pulse therefore apply the IHI tool routinely to river assessments undertaken for developments that we regard as “lowrisk”, such as the case of minor road upgrades, re-alignments and culvert/bridge upgrades (asper this project).
- Whilst the South African Scoring System (SASS) (and the use of other more detailed assessments) can be a useful tool for assessing baseline water q1uality conditions, it adds cost to the assessment and we therefore apply this approach selectively to projects where we believe it would add significantly to the assessment and/or is likely to be recommended as an approach for monitoring project impacts. We would therefore typically apply SASS to moderate to high risk activities and particularly in instances where planned activities pose a real risk to water quality.
- It is also worth noting that SASS is not an appropriate tool for assessing wetlands and ephemeral river systems.
- It should be noted that while WET-Health (Macfarlane et al., 2008) is the most appropriate technique currently available to undertake assessments of wetland condition/integrity, it is nonetheless a rapid assessment tool that relies on qualitative information and expert judgment.
- While the tool has been subjected to an initial peer review process, the methodology is still being tested and will be refined in subsequent versions. For the purposes of this assessment, the assessment was undertaken at a rapid level with limited field verification. It therefore provides an indication of the PES of the system rather than providing a definitive measure.
- The Ecological Importance and Sensitivity assessment did not specifically address the finerscale biological aspects of the rivers such as fauna (amphibians and invertebrates) occurring.
- No detailed assessment of aquatic fauna/biota was undertaken. Fauna documented in this report are based on site observations during site visits and are therefore not intended to reflect the overall faunal composition of the habitats assessed.
- The vegetation information provided is based on observation points, not formal vegetation plots. As such species documented in this report should be considered as a list of dominant and/or indicator wetland/riparian species and only provide a very general indication of the composition of the wetland/riverine vegetation communities.
- The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the field survey and based on the assessor’s working knowledge and experience with similar road/bridge upgrade projects in KZN.
- Evaluation of the significance of impacts with mitigation takes into account mitigation measures and best management practice, as provided in this report.

9.1.2 Heritage

Limited field investigations were performed on foot and by vehicle where access was readily available. Sites were evaluated by means of description of the cultural landscape, direct observations and analysis of written sources and available databases. It is necessary to realize that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. It was assumed that the information as provided by Royal HaskoningDHV was accurate. It is

assumed that the public participation process performed as part of the environmental impact assessment was sufficiently encompassing not to be repeated in the Heritage Assessment Phase.

9.2 Key Findings

The preceding chapters of this report provide a detailed assessment of the predicted environmental impacts on specific components of the social and biophysical environment as a result of the proposed project. This chapter concludes the report by providing a holistic evaluation of the most important environmental impacts identified through the process. In so doing, it draws on the information gathered as part of the Basic Assessment Process and presents an informed opinion about the proposed project. The Basic Assessment Study investigated two bridge design alternatives for the proposed project and they are outlined below:

- Bedlane Bridge
  - Design Option 1
  - Design Option 2
- Dango Bridge
  - Design Option 1
  - Design Option 2

The major environmental impacts associated with the proposed project as discussed in the EIA include:

- Potential Impacts on Ecology
- Potential impacts on Freshwater
- Potential impacts on Heritage

No fatal flaws were identified since the impacts can be mitigated to acceptable levels. The project is envisaged to have a “Negative Low” significant impact rating post application of mitigation measures proposed.

9.3 Conclusion of Specialist Studies

From the findings of the specialists’ studies undertaken, the following conclusions were made with regards to the impacts:

9.3.1 Freshwater

A channelled valley bottom wetland and a transitional river will be impacted by the proposed upgrade of Bedlane and Dango bridges located along the P393 Provincial Road between Empangeni and Nkwaleni Pass. Given the current moderately modified to largely modified habitat condition and relatively low ecological importance and sensitivity (EIS) rating for the wetlands and river, the minimum recommended management objective for watercourses assessed must be to maintain the current status quo of aquatic ecosystems without any further loss of integrity (PES) or functioning (EIS). This management objective is driven by the generally fair PES condition and moderate EIS. This is also supported by Ezemvelo KZN Wildlife (EKZNW) in their guideline document: Guidelines for Biodiversity Impact Assessment (EKZNW, 2013).

Based on the nature of the project and the receiving aquatic environment at the sites, key impacts were identified, namely the physical destruction and/or modification of aquatic habitat, flow modifications and erosion/sedimentation impacts and water quality impacts. With good environmental management and adequate mitigation of potential ecological impacts at the sites, the overall impact of the proposed Bedlane and Dango bridges upgrade on the ecological condition and functioning of the wetlands and riverine habitat is unlikely to be of such an intensity and extent that the Present Ecological State (PES) will be significantly altered.

Most aquatic ecological impacts can be quite effectively mitigated through appropriate bridge design recommendations, supplemented by the application of on-site practical mitigation measures and management principles to control direct wetland/riverine habitat destruction, soil erosion and sedimentation, flow modification and pollution impacts and risks in conjunction with post-construction rehabilitation and ecological monitoring recommendations. Should the recommended mitigation and management guidelines be implemented timeously and to specification, impacts can be potentially reduced to acceptably Low significance levels. This would be sufficient to protect the aquatic environment from further deterioration and can then be considered to be generally acceptable as no loss of critical resources, habitats, services or threatened/endangered species is likely to be associated with the development project.

9.3.2 Heritage

During the phase one assessment it was identified that the bridges are of low significance in terms of the Heritage Act. There were also no heritage impacts identified along the proposed P393 upgrade as well the Bedlane and Dango bridges. It was noted though that these two bridges will turn 60 years in 2018 therefore, they have to be reported to the South African Heritage Resources Agency, and AMAFA. A built heritage specialist has confirmed the findings of phase one and subsequent to that a Phase Two Heritage Assessment exemption has been compiled for submission to the Heritage Resource Agency.

A summary of the impacts and associated ratings are provided in Table 39.

Table 39: Summary of Negative and Positive Impacts: Bedlane and Dango Bridges

Planning Phase		
Average for Alternative 1 without mitigation	-15	**Negative Medium High**
Average for Alternative 1 with mitigation	-8	**Negative Medium**
Average for Alternative 2 without mitigation	-14	**Negative Medium High**
Average for Alternative 2 with mitigation	-9.2	**Negative Medium**
Construction Phase		
Bedlane Bridge		
Average for Alternative 1 without mitigation	-10	**Negative Medium**
Average for Alternative 1 with mitigation	-5	**Negative Low**
Average for Alternative 2 without mitigation	-11	**Negative Medium High**
Average for Alternative 2 with mitigation	-7	**Negative Medium**
Dango Bridge		

Average for Alternative 1 without mitigation	-10	Negative Medium
Average for Alternative 1 with mitigation	-5	Negative Low
Average for Alternative 2 without mitigation	-11	Negative Medium High
Average for Alternative 2 with mitigation	-7	Negative Medium
Operational Phase Impacts		
Without mitigation	-8	Negative Medium
With mitigation	-5	Negative Low

Table 40: Summary Impact Table for all Three Phases Alternatives

Alternatives	Planning	Construction	Operation	Total
Bedlane Bridge Alternative 1 (without mitigation)	-15	-10	-8	-11
Bedlane Bridge Alternative 1 (with mitigation)	-8	-5	-5	-6
Bedlane Bridge Alternative 2 (without mitigation)	-14	-11	-8	-11
Bedlane Bridge Alternative 2 (with mitigation)	-9.2	-7	-5	-7
Dango Bridge Alternative 1 (without mitigation)	-15	-10	-8	-11
Dango Bridge Alternative 1(with mitigation)	-8	-5	-5	-6
Dango Bridge Alternative 2 (without mitigation)	-14	-11	-8	-11
Dango Bridge Alternative 2 (with mitigation)	-9.2	-7	-5	-7

From the above summary Impact Table 40, it can be seen that **Alternative 1** with a total scoring of -6 for both Bedlane and Dango bridges respectively will result in less environmental impacts after the implementation of the mitigation measures. Therefore, **Alternative 1** for both bridges is preferred from the environmental perspective.

9.4 Recommendations

9.4.1 Recommendations to the Competent Authority (CA)

The project, in the EAP's opinion, does not pose a detrimental impact on the receiving environment and it inhabitants and can be mitigated significantly. Therefore, the EAP recommends the proposed project proceed as planned. The Applicant should be bound to stringent conditions to maintain compliance and a responsible execution of the project. In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this BA study are included within an EMPr.

The EMPr must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for the construction phase of the project is considered to be vital in achieving the appropriate environmental management standards as detailed for this project. In addition, the following key conditions should be included as part of the authorisation:

- The Developer is not negated from complying with any other statutory requirements that is applicable to the undertaking of the activity. Relevant key legislation that must be complied with by the proponent includes *inter alia*:

- Provisions of the National Environmental Management Waste Act (Act No. 59 of 2008) (as amended);
- Provisions of the National Heritage Resources Act, 1999 (Act No. 25 of 1999)
- KwaZulu-Natal Heritage Act (Act no 4 of 2008);
- Provisions of the National Water Act, 1998 (Act No. 36 of 1998)(as amended);
- Provisions of the National Forests Act (Act No. 84 of 1998); and
- Provisions KwaZulu-Natal Nature Conservation Ordinance (Ordinance No. 15 of 1974);

- The Developer must appoint a suitably experienced (independent) Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation / rehabilitation measures and recommendations are implemented and to ensure compliance with the provisions of the EMPr.

9.4.2 Recommendations to the Applicant

The Applicant must adhere to the recommendations provided by the specialists and the EAP. The EMPr summarises these recommendations. The Applicant must take full responsibility for the execution of the project in a manner which does not negatively impact on the environment by ensuring that responsible decisions are made.

9.5 Declaration 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.

Signed: Sibongile Gumbi *Pr.Sci.Nat.*

Appendix A
Locality Maps

Royal HaskoningDHV

Appendix B
Photographs

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Appendix C
Facility Illustration

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Appendix D
Specialists Reports

Royal HaskoningDHV

Appendix E
Public Participation Documents

Royal HaskoningDHV

Appendix F

Environmental Management Programme

Royal HaskoningDHV

Appendix G
Peer Review Documents