


ENVIRONMENTAL MANAGEMENT PLAN (EMP) – Draft 1

For the White Umfolozi River Causeway Crossing (Babanango Valley), Zululand, KwaZulu-Natal



Prepared for	Prepared by
<p>Emcakweni Community Trust Representative - Mr. Eric Buthelezi</p> <p>19 Wilson Street, Babanango, 3850, Northern KwaZulu-Natal</p> <p>074 746 0330 eric.but@hotmail.com</p>	<p> ENVIRONMENTAL</p> <p>1 Flamboyant Cl, Glen Anil, Durban North, KwaZulu-Natal</p> <p>031 566 2858 info@idmconsultants.co.za</p>

EDTEA EIA Reference Number: DC26/0009/2019 and KZN/EIA/0001215/2019

August 2019

Contents Page

1	BACKGROUND INFORMATION	4
1.1	INTRODUCTION	4
1.2	LEGAL FRAMEWORK	4
1.2.1	EIA Regulations of 2014 (as amended)	4
1.2.2	Other Legislation Applicable	6
1.3	PURPOSE OF THE EMP	9
1.3.1	Validity period of the EMP	9
1.3.2	Objectives of the EMP	10
1.3.3	Different phases of the EMP	10
1.3.4	Key role players	11
1.3.5	Environmental Awareness	12
1.3.6	Environmental Documents available on site.....	13
2	PROJECT DESCRIPTION AND LOCATION	14
2.1	ACTIVITY LOCATION	14
2.2	DESCRIPTION OF THE ENVIRONMENT LIKELY TO BE AFFECTED BY THE PROPOSED CAUSEWAY DEVELOPMENT	14
2.3	DESCRIPTION OF THE PROPOSED CAUSEWAY DEVELOPMENT	15
2.4	DESIGNS OF THE PROPOSED CAUSEWAY DEVELOPMENT	16
2.5	DIFFERENT PHASES OF THE PROJECT	17
2.5.1	Site Planning	17
2.5.2	Site establishment	17
2.5.3	Construction phase.....	17
2.5.4	Operation Phase	18
2.5.5	Maintenance	18
2.5.6	Rehabilitation Phase.....	19
2.6	HEALTH AND SAFETY	19
3	POTENTIAL ENVIRONMENTAL IMPACTS OF THE PROPOSED CASUEWAY CROSSING	21
3.1	CRITERIA OF ASSIGNING SIGNIFICANCE TO POTENTIAL IMPACTS	21
3.2	POTENTIAL IMPACT OF EACH MAIN ACTIVITY IN EACH PHASE, AND CORRESPONDING SIGNIFICANCE ASSESSMENT.....	21
3.3	POTENTIAL IMPACTS PER ACTIVITY AND LISTED ACTIVITIES	21
3.4	SUMMARY OF POTENTIAL IMPACTS ON ENVIRONMENT.....	21

3.5	PROPOSED MITIGATION MEASURES TO MINIMISE ADVERSE IMPACTS.	21
4	MANAGEMENT PLANS FOR THE PROPOSED CAUSEWAY DEVELOPMENT	22
4.1	SPILL CONTAINMENT	22
4.2	PLANT RESCUE AND RELOCATION PLAN	22
4.2.1	When to remove flora as per the principals of the impact hierarchy	22
4.2.2	Rescuing and relocation general principals.....	23
4.2.3	The Babanango causeway Plant rescue and relocation plan	23
4.3	ALIEN MANAGEMENT CONTROL	24
4.3.1	Purpose of alien management Control	24
4.3.2	Types of alien vegetation	25
4.3.3	Alien control must occur through	25
5	PLANNED MONITORING AND PERFORMANCE ASSESSMENT OF THE ENVIRONMENTAL MANAGEMENT PLAN.	27
5.1	LIST OF IDENTIFIED IMPACTS REQUIRING MONITORING PROGRAMMES.....	27
5.2	FUNCTIONAL REQUIREMENTS FOR MONITORING PROGRAMMES.	28
5.3	COMMITTED TIME FRAMES FOR MONITORING AND REPORTING.	28
5.4	NON-COMPLIANCE	28
5.5	MONITORING OF ALIEN PLANTS	28

LIST OF TABLES

Table 1.1:	Triggered Activities for the proposed causeway crossing	5
Table 1.2:	Other Applicable Legislation to the proposed causeway crossing	6
Table 5.1:	EMP Monitoring Plan.....	27

LIST OF FIGURES

Figure 2.1:	Regional location of proposed Umfolozi River causeway crossing	14
Figure 2.2:	Proposed Umfolozi River Crossing design	16

LIST OF ANNEXURES

Annexure 1:	Impact Methodology and Assessment
Annexure 2:	Environmental Management Plan Migratory Measures

ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
C	Construction
CA	Competent Authority
CBA	Critical Biodiversity Area
CO	Conservation Outcome
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECT	Emcakweni Community Trust
EDTEA	Department of Economic Development, Tourism and Environmental Affairs (KZN)
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EMP	Environmental Management Plan
ESA	Ecological Support Area
ETo	Potential Evaporation
FEPA	Freshwater Ecosystem Priority Area
IDM	Integrated Development Management Consultants
IDME	Integrated Development Management Consultants Environmental
LM	Local Municipality
KZN	KwaZulu-Natal
NBA	National Biodiversity Assessment
NDP	National Development Plan
NEMPAA	National Environmental Management: Protected Areas Act (57 of 2003)
NFEPA	National Freshwater Ecosystem Priority Area
O	Operational
PP	Public Participation
PPP	Public Participation Process
SCC	Species of Conservation Concern
SANBI	South African National Biodiversity Institute
WM	With Mitigation
WMA	Water Management Area
WOM	Without Mitigation
WUL	Water Use License
WULA	Water Use License Application

1 BACKGROUND INFORMATION

1.1 INTRODUCTION

An application has been submitted to the Provincial Department of Economic Development, Tourism and Environmental Affairs on behalf of Emcakweni Community Trust (The Applicant), for the proposed White Umfolozi River causeway crossing situated in the Babanango Valley in Zululand; KwaZulu-Natal. IDM Environmental (IDME) has been appointed as the independent Environmental Consultant by the Emcakweni Community Trust (ECT) to conduct a Basic Assessment (BA) process for the proposed Umfolozi River causeway crossing as part of the Environmental Impact Assessment Regulations of 2014 (as amended). This BA process includes the formulation of a detailed Environmental Management Plan (EMP) that contains all the measures and mitigation measures required to be implemented over the different phases of the project lifecycle.

The proposed development is for the construction of a 200m long and 4m wide causeway crossing over the White Umfolozi River in the Babanango Valley. The development of the Umfolozi River causeway forms part a broader plan to create linked accessibility between the northern and southern sections of the proposed new Babanango Game Reserve. The causeway will replace an existing unsafe causeway (as determined by Engineering Consultants) further downstream that poses a significant hazard when crossing, as well as being a far more onerous alternative between the northern and southern sections of the proposed Reserve. On both the northern and southern sections of the proposed causeway there are existing dirt tracks which will be lengthened to connect to the proposed causeway itself.

As part of this statutory authorisation process, an EMP has been drafted. This serves as a legal document that must be complied with and strictly enforced by the Applicant, Project Manager, Contractor/s and all other parties associated with the proposed causeway crossing development.

1.2 LEGAL FRAMEWORK

Various environmental statutes and associate regulations are applicable. The environmental legislation continues to evolve, resulting in both legislative and regulatory changes that have a material impact on any company and its operations. Environmental legislation in South Africa was promulgated because environmental degradation must at the very least be minimised and at the most prevented. The various environmental legislation related to the proposed causeway crossing is detailed out below.

1.2.1 EIA REGULATIONS OF 2014 (AS AMENDED)

The EIA Regulations of 2014 (as amended), requires Environmental Authorization from the Competent Authority (The Provincial Department of Economic Development, Tourism and Environmental Affairs) before the development of the proposed White Umfolozi River causeway crossing in the Babanango Valley can commence. Activities in Listing Notice 1 and 3 of the EIA Regulations of 2014 (as amended)

will be triggered by the application. These Activities triggered therefore require a BA procedure to be undertaken. **Table 1.1** contains the triggered activities for the proposed White Umfolozi River causeway crossing.

Table 1.1: Triggered Activities for the proposed causeway crossing

Activity Number	Description	Impact on the proposed project
<p>GNR 327/Listing Notice 1 Activity 12</p>	<p>The development of — (i) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs — (a) within a watercourse.</p>	<p>The proposed causeway crossing will be greater than 100 square metres and will cross the White Umfolozi River which is an identified watercourse.</p>
<p>GNR 327/Listing Notice 1 Activity 19</p>	<p>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.</p>	<p>During the construction process of the causeway; soil, sand and rock of more than 10 cubic metres from the River bed will be moved in the process to accommodate the causeway itself.</p>
<p>GNR 324/Listing Notice 3 Activity 12</p>	<p>The clearance of an area of 300 square metres or more of indigenous vegetation. d. In KwaZulu-Natal iii. Biodiversity Stewardship Programme (BSP) Biodiversity Agreement areas;</p>	<p>The clearance of approximately 380m² of indigenous vegetation to accommodate the access tracks on either side of the proposed causeway. This within an area that will be declared a BSP before the construction phase commences and authorisation is received.</p>
<p>GNR 324/Listing Notice 3 Activity 14</p>	<p>The development of — ii. Infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— a) within a watercourse; d. KwaZulu-Natal vii. Critical biodiversity areas or ecological support areas (ESA) as identified in systematic</p>	<p>The causeway has a footprint greater than 10 square metres and crosses the White Umfolozi River (a watercourse). Furthermore the proposed causeway occurs in an ESA.</p>

	biodiversity plans adopted by the competent authority or in bioregional plans.	
--	--	--

1.2.2 OTHER LEGISLATION APPLICABLE

Additional legislation that is applicable to this process includes, but is not limited to, the following:

Table 1.2: Other Applicable Legislation to the proposed causeway crossing

Legislation	Relevance to the development
<p>The Constitution of the Republic of South Africa</p> <p>Section 24</p>	<p>The Constitution stipulates that everyone has the right to an environment that is not harmful to their health or well-being; and the right to have the environment protected, for the benefit of the present and future generations, through reasonable legislative and other measures. The Constitution has thus paved the way for environmental legislation and NEMA in South Africa post-1994 and the need to find a new approach to protecting the environment in an integrated and sustainable manner. This BAR embodies the principals of the Constitution in its formulation.</p>
<p>National Water Act (No. 36 of 1998)</p>	<p>A Full Water Use License Application (WULA) is in the process of being applied for from the Department of Water and Sanitation (DWS) due to the risk posed by the causeway on the surrounding aquatic environment. Section 21 C and I water uses will be applied for authorisation from the Department of Water and Sanitation. The Public Participation Process (PPP) of both the BA and WULA will run in parallel to each other, with the only difference being that the WULA PPP will be conducted over a 60 day period.</p>
<p>National Environmental Management: Biodiversity Act (No. 10 of 2004)</p>	<p>The objectives of this Act are (within the framework of NEMA) to provide for:</p> <ul style="list-style-type: none"> • The management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity; • The use of indigenous biological resources in a sustainable manner; and • The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources. <p>Furthermore, NEMBA specifies that a person may not carry out a restricted activity involving either:</p> <ol style="list-style-type: none"> a) A specimen of a listed threatened or protected species; b) A specimen of an alien species; or c) A specimen of a listed invasive species without a permit.

	<p>Accordingly, no nationally protected species were located on site. Alien plant species will be required to be removed from the site as per the alien management plan contained in this EMP. The removal of alien species will take place prior to construction, during the construction phase and during operation. The ECO (during construction) and Head Manager (operation) must ensure compliance with this.</p>
<p>National Environmental Management: Protected Areas Act (Act No. 57 of 2003)</p>	<p>The Act provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas. The site where the proposed causeway is to be situated will in the future be declared as a nationally protected area and will fall under the ambit of this Act.</p>
<p>National Environmental Management: Waste Act, 2008 (Act no. 59 of 2008)</p>	<p>All waste generated on site will need to be dealt with according to the EMP (Appendix 1) and relevant legislation. Limited waste volumes will be generated during the site preparation and construction phases, which will be disposed of at a registered landfill site. Relevant sections in this Act include: Section 17 - All attempts must be made by the Applicant/Developer during the different phases to reduce, recycle or re-use waste before it is disposed. Section 25 - All waste (this includes general and hazardous) generated may only be disposed of at a licenced waste disposal sites.</p>
<p>National Environmental Management: Air Quality Act, 2004 (Act no.39 of 2004)</p>	<p>Mitigation measures to control air and dust pollution will be implemented to ensure compliance with this Act. Important Sections in this Act relevant to the causeway include:</p> <p>Section 32 – The control of dust;</p> <p>Section 34 – The control of noise; and</p> <p>Section 35 – The control of offensive odours.</p>
<p>National Forests Act (Act No. 84 of 1998):</p>	<p>The purpose of this Act is to promote the sustainable management and development of forests for the benefit of all and provide special regulatory measures for the protection of certain forests and trees. In terms of section 15(1) of the National Forests Act (NFA), no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.</p>
<p>National Veld and Forest Act 101 of 1998</p>	<p>The purpose of this Act is to prevent and combat veld, forest and mountain fires throughout the Republic. The Act provides for a variety of institutions, methods and practices for achieving this purpose. Firefighting equipment will be available on site during the construction process.</p>

Regulations for the Proper Administration of Special Nature Reserves, National Parks and World Heritage Sites No. R. 1061 of 2005	These Regulations make provision for the registration, conservation and management of protected areas and define rules relative to various aspects of use of such protected areas such as use of biological resources, various authorized, restricted or prohibited activities, “community-eased” natural resources utilization, the use of water resources, access to nature reserves and prevention of pollution. This Regulation will come into play once the Babanango Reserve is proclaimed.
KZN Nature Conservation Ordinance (Ordinance No. 15 of 1974)	In terms of this Ordinance, a permit must be obtained from Ezemvelo KwaZulu-Natal Wildlife to remove or destroy any provincially protected plants listed in this Ordinance. Two provincially protected species of Aloe were found on site. If these are to be removed or destroyed, a permit must be applied from Ezemvelo.
Conservation of Agricultural Resources Act 43 of 1983	To provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, water sources and the vegetation. The Act further requires the combating of weeds and invader plants.
Occupational Health and Safety Act (No. 85 of 1993)	The employer needs to manage his/her staff and crew in strict accordance with the Occupational Health and Safety Act in order to prevent injuries to the staff. Extra care must be taken as specified in this EMP, due to workers operating in a remote area.
KZN Provincial Spatial Development Framework	Alignment of the proposed causeway crossing to the KZN Provincial Spatial Development Framework (PSDF) has been made. The PSDF is a long term (i.e. > 5 year) spatial framework from which various plans will be implemented. It is informed by the NDP and related spatial policies, and takes its strategic direction from the KZN’s development strategy and related policy frameworks. It conveys the KZN’s spatial agenda to National and Provincial departments, as well as state owned enterprises (SOEs) so that their sector plans and programmes are grounded in a sound and common spatial logic. Part of this plan is development and growth and the promotion of sustainable job creation and local economic development in rural underdeveloped areas.
KZN Provincial Growth and Development Plan	The proposed development is aligned with the PGDP, as it addresses the first goal of the PGDP which is that of job creation and local economic development (through tourism initiatives).
The National Development Plan 2030 (NDP)	The NDP aims to eliminate poverty and reduce inequality by 2030. According to the plan, South Africa can realise these goals by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society. Key to this according to the NDP is

	“the transition to an environmentally sustainable low-carbon economy, moving from policy, to process, to action”.
National Heritage Resources Act (Act 25 of 1999)	This Act has been put into place to protect and conserve heritage resources. If anything of heritage importance is found on the proposed site, the construction process will be halted and a suitably qualified specialist will be contacted. In consultation with the Applicant no heritage resources were located on site. Thus no Heritage assessment was undertaken.
KwaZulu-Natal Heritage Act (No. 4 of 1998)	This Act has been put into place to conserve, protect and conserve heritage resources in the KZN province. If anything of archaeological significance is uncovered, a specialist will be contacted. In consultation with the Applicant no heritage resources were located on site.
Public Participation Guideline in terms of National Environmental Management Act, 1998 - (Department of Environmental Affairs 2017)	Guideline document for Public Participation Process for all EIAs. This document was used to guide the Public Participation Process for the proposed application.
DEA (2017), Guideline on Need and Desirability, Department of Environmental Affairs (DEA), Pretoria, South Africa.	This Guideline was utilised in the formulation of the needs and desirability of the proposed application.

1.3 PURPOSE OF THE EMP

The EMP contains all the necessary mitigation and recommended actions as well as the timeframes and person responsible for the actions. The ultimate responsibility of the implementation of the EMP rests on the Applicant. The EMP is a legally binding document that is an important part of the Environmental Assessment process and needs to be strictly adhered to. Workers and contractors must be made aware of the EMP, their responsibilities and sensitive /no go areas. Any transgressions must be treated as serious, with immediate remedial action taken.

1.3.1 VALIDITY PERIOD OF THE EMP

It must be noted of a recent interpretation of the validity period of EMPs by the National Department of Environmental Affairs. This is that EMPs become ‘null and void’ during the operational phase of a development for NEMA Activity triggers that are construction based. This as the Environmental Authorisation is only in effect during the site preparation and construction activities. All three NEMA Activity triggers for the proposed causeway crossing are construction based. However, it must be noted that the causeway may have noticeable impacts on the local environment and the highly sensitive White Umfolozi River during the operational phase as assessed by the EAP and Specialist Team. Under the NEMA Section 28, Duty of Care, it states that:

‘Every person who causes, has caused or may cause significant pollution or degradation of the environment to take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environmental is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution and degradation of the environment.’

Therefore while the EMP may become ‘null and void’ when the causeway is in operation as the Activity triggers are construction based, this EMP is still legally binding, as well as the mitigation measures specified in the Report. This as the Applicant has a responsibility to prevent pollution and environmental degradation as per NEMA. Without the strict mitigation measures as proposed in this Report, pollution and environmental degradation may occur during the operational phase due to the sensitivity of the White Umfolozi River.

1.3.2 OBJECTIVES OF THE EMP

This EMP has the following objectives:

- To outline functions and responsibilities of the responsible persons involved in the site preparation, construction and operation of the proposed White Umfolozi River causeway crossing;
- To state standards and guidelines which are required to be achieved in terms of environmental legislation;
- To outline mitigation measures and environmental specifications which must be implemented to ensure environmental and social protection of the surrounding environment; and
- To prevent long-term or permanent environmental degradation.

1.3.3 DIFFERENT PHASES OF THE EMP

The EMP provides mitigation and management measures for the following phases of the project:

- The White Umfolozi River Causeway planning

Pre-construction planning is an important phase in ensuring that impacts during the subsequent phases are mitigated and that the EMP will be properly implemented and strictly enforced. The phase lays the foundation for the site establishment and the construction phase.

- Site establishment and preparation

Before construction can commence the site must be prepared for construction. Demarcation of the construction site must occur, as well as the set-up of a construction camp and the implementation of strict no go areas around the watercourses and protected flora species. An independent ECO must be appointed to monitor the conditions as specified in this EMP.

- Construction Phase

This involves the construction of the proposed White Umfolozi River Causeway Crossing. This phase has the potential to have the greatest impacts on the environment if proper mitigation measures are not

implemented. The construction process must be clearly defined and must comply with all the measures of this EMP. An independent ECO must monitor the construction phase and report on the findings to the Competent Authority on a weekly basis.

- The White Umfolozi causeway crossing Operation

This section of the EMP provides management and mitigation measures for the usage of the causeway crossing. Environmental actions, procedures and responsibilities as required for this phase are specified. The mitigation measures that are specified in this phase must be monitored by the Applicant. It must be stressed that any pollution or damage to the local environment is an illegal offence as per NEMA.

- Rehabilitation Phase

This section of the EMP provides management principles for the rehabilitation phase after construction and if decommissioning of the project is required. Rehabilitation must be viewed as an on-going process and not confined to one phase.

1.3.4 KEY ROLE PLAYERS

- The Applicant

The Applicant is ultimately accountable for ensuring compliance with the EMP and the conditions contained in the Environmental Authorisation (EA). The Project Manager/ Ranger will report directly to the Applicant regarding all environmental issues regarding the proposed causeway. The ECO must be contracted by the Applicant as an independent appointment to objectively monitor the implementation of relevant environmental legislation, conditions of EA, and the EMP for the project during the site preparation and construction phases. The Applicant must ensure that the ECO is integrated member of the project team. The Applicant is further responsible for taking over the monitoring role during the operational phase. This role must be delegated to a Manager, this can include a Ranger.

- Project Manager/Ranger

The Project Manager has the responsibility of managing the project, contractors, and consultants and for ensuring that the environmental management requirements are met. It is of vital importance for the Project Manager to be familiar with the recommendations and mitigation measures of this EMP and ensuring that these measures are implemented. While the ECO will report weekly during the site establishment and construction phases, the Project Manager is responsible for daily monitoring for compliance. If transgressions occur on site, immediate corrective action must take place and the responsible parties notified. All decisions regarding environmental procedures must be approved by the Project Manager. During the operational phase the Project Manager will be one of the Rangers, who will monitor the causeway on a periodic basis.

- Contractor/s

The contractor is responsible for ensuring that construction methods comply with the recommendations and conditions of the EA and EMP. The Contractor must have appropriate experience in causeway development.

- ECO

An independent appointment to objectively monitor implementation of relevant environmental legislation, conditions of EA, and the EMP for the project during the site preparation and construction phases. The ECO must be on site prior to any site establishment and must endeavour to form an integral part of the project team. The ECO must be in constant liaison and report to the Applicant, Contractors, Landowners and relevant Authorities. The ECO must further recommend corrective action due to non-compliance. The ECO will be required to conduct weekly monitoring as specified in **Section 4** of this Report.

1.3.5 ENVIRONMENTAL AWARENESS

Environmental awareness training must take place before construction commences. The ECO shall conduct initial induction training with the Applicant, Project Manager and Contractor/s before construction commencement. After such, the Project Manager is to conduct monthly environmental awareness briefings, in consultation with the ECO during the site preparation and construction phases. It is of importance that workers are informed of no-go areas and strictly abide by the EMP, Health and Safety Regulations, as well as conditions of the EA. An environmental awareness plan must be implemented for both the construction and operational phases.

The approved EMP will provide the basis of the information to be supplied, as well as any other relevant documentation, including any specialist reports. All impacts that could potentially arise and affect the environment will be discussed and explained in detail, as well as required mitigation measures.

The consequences of not following the mitigation measures as stipulated in the EMP (i.e. non-compliance) will also be addressed.

Some issues that must form part of the training include:

- Demarcation of the project footprint;
- Sensitive no go areas, such as watercourses, flora and fauna habitats;
- Interpretation of Signage on site;
- Site clearing;
- Fauna species may not be harmed or poached;
- Protected Flora species identification and the removal/permitting process;
- Interaction with potentially dangerous animals;
- Identification of alien species;

- Erosion control measures;
- Storage of fuels and chemicals on site and refuelling areas;
- The repairing of equipment and machinery on site;
- The use of toilets;
- Proper waste disposal and management;
- Spill and emergency plans (including fire);
- Stormwater management;
- Safety and health;
- Noise, dust and light management; and
- The implementation of water saving techniques.

1.3.6 ENVIRONMENTAL DOCUMENTS AVAILABLE ON SITE

The following documents must be available at all times on site during the site preparation and construction phase:

- The approved EMP;
- An Environmental Complaints Register; and
- A list of contacts in case of emergency. This includes details of the Project Manager, ECO, Contractor and relevant departments (in the event of a chemical spillage or pollution).

2 PROJECT DESCRIPTION AND LOCATION

2.1 ACTIVITY LOCATION

The site is located on the properties of Non Pareil, 721/GU (to the North/East) and Portion 4 of Doornkroon, 412/GU (to the South/West). The causeway crossing is approximately 51km south east of Vryheid, approximately 28km west of Ulundi and approximately 7km to the north of the small town of Babanango in the Zululand District of Northern KwaZulu-Natal (**Figure 2.1**).

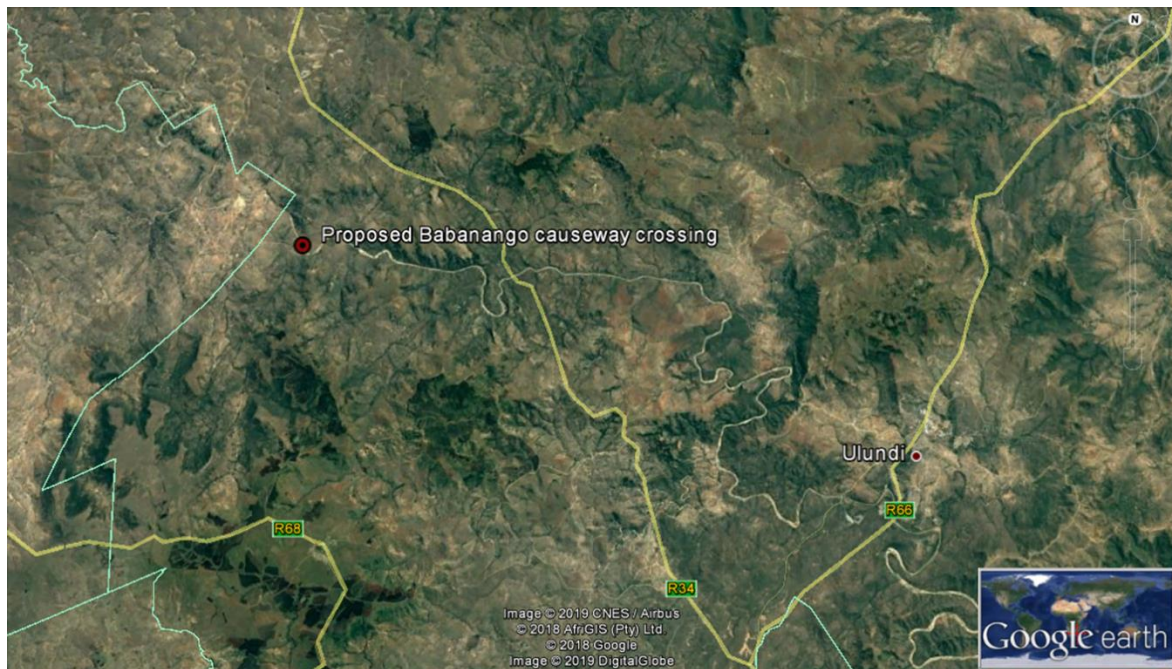


Figure 2.1: Regional location of proposed Umfolozi River causeway crossing

2.2 DESCRIPTION OF THE ENVIRONMENT LIKELY TO BE AFFECTED BY THE PROPOSED CAUSEWAY DEVELOPMENT

The climate of the region is warm and temperate with a mean annual precipitation average of 861mm, falling mainly in the warmer months of October to March. Rainfall events are often intermittent and include dramatic thunderstorm events in the spring and summer months. The average daily mean temperature in February (the hottest average month) is 23.1 C and 16 C in June (the coldest average month). Summer maximums can reach in the upper 30 C.

The proposed causeway crossing traverses the White Umfolozi River located within a valley floor surrounded by adjacent hilltops. The southern bank of the River has been impacted as a result of historical cultivation and cattle grazing. Disturbance of soils during cultivation and cattle grazing has led to an increase in runoff and in the formation of small shallow erosion gullies within the riparian area of the proposed site. The grazing of cattle has further led to the trampling of the riparian vegetation that covers the entire site.

No SCC were encountered within the project footprint at the time of the assessment and, due to the natural high levels of disturbance associated with the flood prone riparian area, the probability of occurrence of SCC is considered to be low. However, the two provincially protected species, *Aloe marlothii* and *Aloe cf. pedunculata* were encountered within the riparian area. Should individuals of these species be removed, a permit will be required from EKZN Wildlife.

A survey of a section of the White Mfolozi River within the Babanango Game Reserve resulted in the capture of 4 fish species out of a potential 10 species that are expected to occur within the section of the White Mfolozi River between Ulundi and the Klipfontein Dam near Vryheid

According to Birdlife South Africa the region is an important area for birds, especially raptors species. Birdlife South Africa noted that a total of 428 bird species have been recorded in the region, with 15 species being regarded as globally threatened.

No existing dwellings or settlements are located on or adjacent to the proposed site. Existing dirt tracks route close to the proposed causeway crossing, but will require lengthening to reach the causeway during operation. The nearest community homesteads are situated on the hilltop some 10km away from the causeway. The communities that surround the proposed site are largely dispersed rural dwellings.

2.3 DESCRIPTION OF THE PROPOSED CAUSEWAY DEVELOPMENT

The proposed development is for a 200m long and 4m wide causeway crossing the White Umfolozi River in Zululand, KwaZulu-Natal (**Figure 2.2**). The causeway forms part a broader plan to create linked accessibility to the proposed Babanango Game Reserve, which will be declared a nationally protected Nature Reserve consisting of various eco-lodges and camps, and the reintroduction of wildlife to the area, including the ‘big five’. The proposed causeway will provide quick, easy and safe access between the northern and southern sections of the proposed Babanango Game Reserve once in operation. The causeway will replace an existing unsafe causeway (as determined by Engineers) further downstream that poses a serious hazard when crossing, as well as being a far longer alternative between the northern and southern sections of the proposed Reserve.

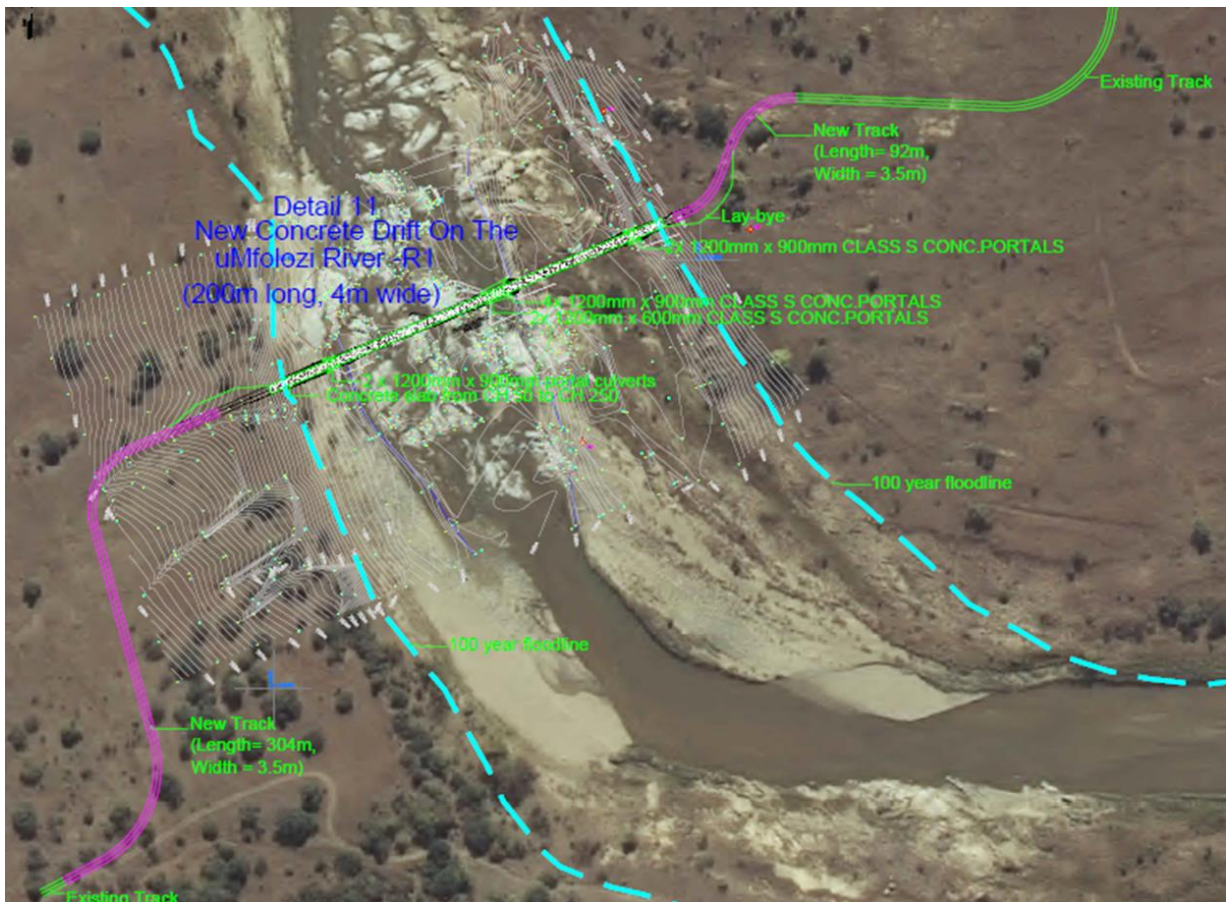


Figure 2.2: Proposed Umfolozi River Crossing design

2.4 DESIGNS OF THE PROPOSED CAUSEWAY DEVELOPMENT

The proposed causeway has been designed to be 200m long and 4m wide and will be constructed in a rocky portion of the White Umfolozi River. The drift is level at the base, but follows the rock profile closely and will be concrete lined up to the 1:100 year flood level. The causeway has been designed to allow the flow of water during the normal dry weather conditions through concrete culverts below the road. Occasional larger floods will pass through the culverts and over the road surface.

The causeway will contain bollards which are spaced 900mm apart. These bollards will be utilised to guide the driver over the causeway and indicate the current water level. If the bollards are not visible, no vehicle may cross, as river flows would be high. Signs will be placed on either side of the causeway indicating this.

The culverts will be located in the low spots of the rock profile to allow for low flow conditions. Either side of the drift is sloped, so that it is more forgiving to the River flow and does not have vertical barriers, inhibiting flow. It also has concrete keys, in the rock and the portals are doweled into the rock.

2.5 DIFFERENT PHASES OF THE PROJECT

2.5.1 SITE PLANNING

Before the causeway site establishment and construction can commence, careful planning must take place which will lay the foundations for the abovementioned phases. This will ensure that impacts can be identified at the earliest possible stage and appropriate mitigation measures employed. This in order to prevent/ minimise impacts to acceptable/low levels. The BAR and associated Appendices, forms one part of this planning process. Before site establishment and operation can occur, it is of the utmost importance that the Applicant and Project Manager must ensure plans are in place to implement mitigation measures in the EMP and that rehabilitation is an on-going process, which is not solely defined to the Closure phase.

2.5.2 SITE ESTABLISHMENT

Before construction can commence a number of activities must occur. This includes, but not limited to:

- Environmental Training of workers and subcontractors;
- The clear demarcation of the construction site;
- Demarcating strict no go areas around sensitive environments (watercourses and protected plants/trees). As according to the Botanical specialist, a buffer must be implemented between construction related activities and these sensitive environments. Protected plant and tree species must be clearly marked and avoided;
- Rescuing and relocation of plant species;
- Determining the location of the construction offices/camp, screening and other structures (outside the 1:100 year floodline and buffer);
- Determining and preparing site access (including entry and exit points) and access to different areas of the project, taking into consideration the sensitive areas and existing tracks;
- Determining the need and location for temporary services such as electrical and water;
- The placing of portable toilets away from any watercourses;
- Installation of solid waste collection facilities, including the setting up of a recycling system;
- Implementing of security and safety measures (including repairing existing fencing, signage, lighting and the location of first aid kits, spill kits etc);
- Location of vehicle parking; and
- Implementing erosion control and stormwater management on site.

2.5.3 CONSTRUCTION PHASE

The construction sequence of the proposed causeway is as follows:

- The drift alignment will be set out from the drawings and levels provided by the engineer;
- Sandbags will be placed to create clear and dry working area;
- Final levels will be set out from drawings issued by engineer;
- Rock will be drilled into and dowels will be installed;

- A blinding slab will be cast, if specified;
- Grouted gabions and stone pitching will be installed;
- Steel reinforcement will be installed according to the engineer's drawing and bending schedule. The steel reinforcement must be checked by the engineer for correct fixing and placing before any concrete is cast;
- Shuttering will be erected – including shuttering for edge blocks;
- Pipes/culverts will be laid; and
- Concrete will be mixed, placed, compacted and cured.

According to the Geotechnical Report (**Appendix 6**) the preliminary siting of the proposed causeway crossing is likely to be satisfactory based on the underlying geological/geotechnical conditions. The area of the proposed crossing is underlain by granite bedrock at a shallow depth, with alluvial sediments overlying both the eastern and western abutment positions. It is evident from the engineering drawings that the approach abutments to the crossing comprise a reinforced concrete slab over fill or mass concrete, overlying portals on either side of the crossing, founded into the granitic bedrock. The portals should be founded on shallow base slabs taken through all alluvial sediments into hard pickable granitic bedrock. Dowels or equivalent anchoring might be required at the discretion of the Engineer. The maximum allowable bearing pressure should be restricted to 500kPa.

All trenches excavated beyond a depth of 1.2m must be shored at the discretion of the Engineer due to the possibility of side wall failure within the loose sediments. From the preliminary geotechnical assessment it is evident that the suitable weathered bedrock is expected to occur from surface adjacent to the River to a depth of in the order of 3m below existing ground level on either side of the River.

2.5.4 OPERATION PHASE

Once completed, the causeway will function as a quick and safe crossing between the northern and southern sections of the Babanango Nature Reserve.

2.5.5 MAINTENANCE

It is not anticipated that the proposed causeway will require decommissioning in the near future. The causeway will be constructed to have a lengthy lifespan. Regular maintenance of the causeway will be required to ensure the longevity of it.

Of particular concern is potential blockages of the culvert pipes during the operational phase which may impact on water flow and fish movement. Therefore measures must be implemented to ensure blockages do not occur. These include:

- If sediment accumulation occurs near the culvert pipe's entry and exit points, a shovel will be utilised to clear debris way. This process must be carefully carried out to ensure no damage to the slope of the culvert pipe.
- If sediments are located deeper inside the culvert pipes, the maintenance team must make an extended shovel by welding culvert pipes to the head of the shovel and inserting it to clear away the debris. Once again, this process must be undertaken carefully to ensure that there is no damage to the slope of the culvert pipe.
- An additional solution for debris located deeper inside the culvert pipe would be by pulling out the blockage using a chain and a piece of piping. First, feed a strong chain through the culvert. This can be accomplished by punching a small hole through the blockage with a long pole that is attached to the chain. This allows you to pull the chain through the other side. Attach the end of the chain sticking out of the upstream culvert exit to a section of steel pipe with a diameter similar to but slightly smaller than the culvert pipe. Then, pull it through the pipe from the downstream end. The steel pipe will push against the blockage, forcing it out of the culvert as it is dragged through.

2.5.6 REHABILITATION PHASE

Rehabilitation must be viewed as an on-going process and must not be confined to one specific phase of the development life cycle. Rehabilitation will include the re-vegetation of any disturbed area and the creation of a stable land surface that is not subject to erosion or inundation of water. Re-vegetation should aim to accelerate the natural succession processes so that a healthy plant/riparian community develops and includes the control of invasive alien plants and bush encroachment. Rehabilitation measures have been proposed in the EMP and must be strictly adhered to.

2.6 HEALTH AND SAFETY

The applicant must further adhere to the Health and Safety Act, 29 of 1996. This includes, but is not limited to the following:

- Workers must be provided with dust masks when working in conditions that require protective measures;
- All workers on site must be medically tested to ensure fitness to work in a Reserve environment;
- Operators of equipment and vehicles must be licenced and trained;
- Vehicles must be properly maintained. Hooters and lights must be in working order;
- Clean water must be provided to workers in a suitable container;
- There must be a registered first aider and medical equipment, should the need arise;
- The site must be clearly demarcated, with no-go areas identified and avoided;
- Accidents on site must be immediately reported and suitable action taken;
- Spill kits must be available if the need arises;
- Acceptable sanitation must be provided to workers;

- Rehabilitation must ensure the site is left in safe condition;
- Workers must have experience working in reserves with dangerous animals; and
- An experienced ranger must be on site.

3 POTENTIAL ENVIRONMENTAL IMPACTS OF THE PROPOSED CASUEWAY CROSSING

3.1 CRITERIA OF ASSIGNING SIGNIFICANCE TO POTENTIAL IMPACTS

Impacts are scored in terms of probability (likelihood of occurrence), extent (spatial scale), intensity (severity/magnitude) and duration. Impact significance is determined by summing the numerical value for the impact rating scales for each impact and multiplying by the probability of that impact occurring. See **Annexure 1**.

3.2 POTENTIAL IMPACT OF EACH MAIN ACTIVITY IN EACH PHASE, AND CORRESPONDING SIGNIFICANCE ASSESSMENT

See **Tables 1.1 and 1.2 of Annexure 1** for impacts before and after mitigation measures have been implemented.

3.3 POTENTIAL IMPACTS PER ACTIVITY AND LISTED ACTIVITIES

The impacts that have been identified per activity are listed in the EMP Report **Annexure 1, Tables 1.1 and 1.2**.

3.4 SUMMARY OF POTENTIAL IMPACTS ON ENVIRONMENT

The impact assessment for the proposed White Umfolozi Causeway Crossing illustrates that there is a potential for both positive and negative impacts on the local environment. The impact assessment noted that due to the sensitivity of the site and surrounding areas, many of the potential impacts from the proposed causeway may be significant and have long lasting impact unless strict mitigation, monitoring and management measures are implemented. This especially in terms of impacts on the sensitive White Umfolozi River which may be impacted in terms of water quality, instream habitat, erosion, sedimentation, impact on fish migration and diversion of flow. Impacts will thus extend past the immediate causeway footprint and impact on the River both up and downstream.

It is however the opinion of the EAP that with the strict implementation of mitigation measures as specified in this Report, the EMP and the comprehensive specialist studies conducted and the embracing of principals of the impact mitigation hierarchy tool guiding the assessment process which aims to avoid impacts over rehabilitation or offsetting, the positive impacts can be enhanced while the majority of the negative impacts can be mitigated to Low/ Acceptable levels. This includes the impacts on the White Umfolozi River. An extensive list of engineering, freshwater and ichthyological measures have been proposed to protect this system.

3.5 PROPOSED MITIGATION MEASURES TO MINIMISE ADVERSE IMPACTS.

Refer to **Table 1 of Annexure 2**.

4 MANAGEMENT PLANS FOR THE PROPOSED CAUSEWAY DEVELOPMENT

The following section of the EMP contains various plans and procedures for dealing with various environmental aspects and pollution events for the proposed White Umfolozi Causeway Crossing.

4.1 SPILL CONTAINMENT

In the unlikely event of a spill, immediate action must take place to prevent any further damage to the environment. If a spill does take place, the following actions must occur:

- Isolate and demarcate the spill area;
- Identify the nature and source of the spill;
- Stop the source of the spill;
- Contain the spill;
- Remove the spilled product for treatment or authorized disposal;
- Determine if there is any soil, groundwater or other potential environmental impact;
- If necessary, contact a suitably qualified Specialist;
- If necessary, remedial action must be taken in consultation with the Department of Environmental Affairs, Department of Water and Sanitation, the Local Municipality, and any other relevant party; and
- Incident must be documented.

Mitigation measures proposed to limit the likelihood of a spill occurring have been proposed in the following EMP. These deal with equipment and the storing of chemicals on site. A spill kit must be stored on site to deal with spills. Furthermore, it must be ensured that no contaminants enter the surrounding watercourses or into neighbouring properties.

4.2 PLANT RESCUE AND RELOCATION PLAN

Before site establishment and construction can commence, a plant rescue and relocation plan must be implemented under the guidance of a suitably qualified specialist with the aid of the ECO and Project Manager. This Plan must be implemented in order to guide the process of the search and rescue of flora within the causeway footprint. Flora will only be removed as a last resort as per the principals of the impact hierarchy tool that guides the EIA process. While focus will be on species of conservation concern, where possible all flora (including 'common' species) will be rescued and relocated if removal is required due to the development of the proposed causeway.

4.2.1 WHEN TO REMOVE FLORA AS PER THE PRINCIPALS OF THE IMPACT HIERARCHY

- Where possible locate the proposed project footprint (causeway and dirt track) around flora species (clearly mark species that will not be removed);

- Trim branches/bushes over removal of vegetation; and
- Rescuing and relocating of flora should be viewed as an absolute last option where plant species cannot be avoided.

4.2.2 RESCUING AND RELOCATION GENERAL PRINCIPALS

- Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed.
- Re-planting into the wild must cause as little disturbance as possible to existing natural ecosystems.
- Rescue must be limited to only those areas where plants will be destroyed by the development. No plants should be removed from areas that will otherwise not be disturbed.
- Where possible (and if plants are hardy) plant rescued species in disturbed areas.

4.2.3 THE BABANANGO CAUSEWAY PLANT RESCUE AND RELOCATION PLAN

The Plant Rescue and Relocation must include:

- The appointment of a suitably qualified specialist to undertake a plant rescue and relocation exercise;
- This specialist must update the botanical list in the Vegetation Study;
- The footprint of proposed causeway and dirt track must be clearly marked out prior to breaking ground;
- All flora species close to the proposed construction footprint that will not be removed must be clearly marked and may not be defaced, disturbed, destroyed or removed. They should be cordoned off with construction tape or similar barrier and marked as no-go areas;
- If any protected flora species are to be removed, cleared, or transplanted a permit must be applied from either the Department of Agriculture, Forestry or Fisheries for nationally protected species or Ezemvelo KwaZulu-Natal Wildlife for provincially protected species. Construction may not commence until all permits have been applied for.
- Species that cannot be avoided must be relocated.
- If removal is required two actions must take place:
 - Must be preferably immediately planted in an area of similar conditions, as close to site as possible or in degraded areas.
 - The plants must be planted into a suitable container and stored in a temporary nursery on or near site. Replanting will occur after construction has ceased.
- Species of conservation concern that require removing should take place in the following manner:
 - Each plant that is to be removed must be photographed before removal takes place;
 - Tagged with a unique number or code; and

- Gps coordinates captured.
- If relocation cannot take place, for every one species lost, five indigenous species must be replanted.
- Training of all contractors and workers on site must take place by the ECO. During this training all contractors and workers must be made aware of:
 - Protected species identification;
 - Species that have been demarcated;
 - The procedure to follow when removing flora species;
 - The importance of remaining within the construction footprint; and
 - Rehabilitation.
- Once the plant rescue and relocation exercise has been completed the ECO will provide permission for site preparation and construction activities to commence.
- The ECO to monitor construction activities for
 - To ensure construction activities remain within demarcated areas (prevent construction creep);
 - To ensure the demarcated flora species are not disturbed during site preparation and construction;
 - To monitor replanted plants or plants stored at the nursery; and
 - To monitor for any new species observed within the development footprint that were missed during the preconstruction plant sweeps.

4.3 ALIEN MANAGEMENT CONTROL

4.3.1 PURPOSE OF ALIEN MANAGEMENT CONTROL

Invasive alien plants are species introduced (either deliberately/accidentally) into a natural environment where they are not normally found and have a serious negative impact on the receiving environment by not only outcompeting indigenous species, but also impacting on water resources, health of the ecosystem and posing a fire hazard. Invasive species especially become prominent after disturbance and construction related activities and pose a serious threat to KwaZulu-Natal's protected Reserves. Therefore, proper action must take place to ensure invasive species do not become prominent due to the development of the proposed White Umfolozi River Causeway. The purpose of alien management control around the proposed site will be to:

- to ensure that alien plants do not become established on site (by removing alien species regularly);
- to ensure that alien plant species do not become dominant in all or parts of the landscape; and
- to implement a monitoring programme to detect the presence of alien plant species as well as to monitor the success of the alien management plan.

4.3.2 TYPES OF ALIEN VEGETATION

According to the National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) the following categories of invasive plants exist:

- Category 1a: Invasive species requiring compulsory control and removal. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits for riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

The Project Manager and ECO must have a full list of each plant in the different categories and information on how to remove them.

4.3.3 ALIEN CONTROL MUST OCCUR THROUGH

Rehabilitation must involve control of invasive species. Alien species on site must be identified, categorized and removed, using one or a combination of methods. Invasive alien plant species are difficult to control. Methods should be used that are appropriate for the species concerned, as well as to the ecosystem in which they occur. When controlling invaders, damage to the environment must be limited to a minimum. There are three basic methods by which encroachers or weeds are controlled:

Physical (mechanical):

- Uprooting (hand pulling);
- Cutting back;
- Chopping, slashing and felling; and
- Ring-barking (girdling).

Chemical:

- Foliar application;
- Stem notching and application;
- Stump treatment; and
- Soil treatment.

Biological treatment

- Which involves the use of host-specific natural enemies of weeds or invaders from the plant's country of origin, to either kill or remove the invasive potential of these plants.

During the construction and operational phase of the proposed causeway, alien invasive plants must be actively identified and removed as per the identified methods above. It must be noted that already invasive alien plants are being actively removed within the proposed Babanango Game Reserve by the Babanango Management. This removal must be extended to the proposed causeway site and continue during the operational phase.

5 PLANNED MONITORING AND PERFORMANCE ASSESSMENT OF THE ENVIRONMENTAL MANAGEMENT PLAN.

To ensure compliance to the EMP and conditions of the EA, regular monitoring must take place and where necessary recommendations for corrective action must be proposed. This monitoring will take place by the Project Manager on a daily basis during the site establishment, construction and operational phases and on a monthly basis during the site establishment and construction phases by the independent ECO. The key to successful environmental monitoring is regular monitoring to identify and implement corrective measures in a timely manner and independent auditing of the Environmental Authorisation to evaluate successful compliance with environmental specifications and outcomes. The ultimate purpose of environmental monitoring and auditing is to confirm that all relevant programmes, legislation, laws and policies are adhered to and abided by and that the environmental specifications are being implemented in an effective and correct manner. Monitoring and auditing is intended to promote environmental best practice, ensure protection of resources and support sustainable development. An environmental monitoring checklist should be developed and must be in line with the EMP. A list of identified impacts requiring monitoring programmes is contained below.

5.1 LIST OF IDENTIFIED IMPACTS REQUIRING MONITORING PROGRAMMES.

Soil	Erosion
	Loss of top soil
	Contamination
	Compaction of soil
Ground and Surface Water	Pollution of surrounding watercourses
	Usage
White Umfolozi River	Loss of instream habitat
Vegetation	Destruction of indigenous and Riparian vegetation
	Protected species
	Alien Vegetation infestation
Wildlife	Disturbance/Harm
	Barrier to movement/ Hazard
	Habitat Destruction

Climate	Atmospheric Emissions
Air Quality	Dust Generation
	CO and CO ₂ Emissions
Traffic	Increased Traffic and Safety
Noise	Noise Disturbance
Visual	Visual aesthetics
Lighting	Lightening impacts
Waste	Litter

Figure 5.1: EMP Monitoring Plan

5.2 FUNCTIONAL REQUIREMENTS FOR MONITORING PROGRAMMES.

Ongoing inspection by the Project Manager (and/or Landowner) during all phases of the development and weekly inspections and compilation of an audit report to be submitted to the EDTEA during site clearance and construction phases by the Environmental Control Officer (ECO). An Environmental Register must be kept on site recording complaints by the public, for monitoring results and the notification of emergencies and incidents.

5.3 COMMITTED TIME FRAMES FOR MONITORING AND REPORTING.

The appointed ECO will submit weekly audit reports to EDTEA on all of the abovementioned impacts requiring monitoring during the site clearance and construction phase.

5.4 NON-COMPLIANCE

Failure by the contractor, operator and their staff and suppliers to comply with all relevant programmes laws, legislation, policies and mitigation measures laid out in this EMPr must result in immediate action by the Project Manager and Applicant. This includes notifications, setting of timeframes to remedy the situation and in cases of continue negligence all site activities must be halted and possible legal actions.

5.5 MONITORING OF ALIEN PLANTS

Regularly monitoring of invasive alien plants must occur. It is important to have early detection methods in place to ensure the control of alien species. Photographic records must be kept of the areas that are to be cleared and at regular intervals during and after clearing activities. Written records must be kept of daily operations, e.g., plants cleared, area/location cleared, the amount of herbicide used, the success of method used etc. This data can be used for future operations and will aid in the determining of the most effective manner in clearing a species. It is important to keep abreast of changing legislation and new methods in clearing alien species.

Annexure 1

Impact Assessment

To ensure uniformity, the impacts are addressed in a standard manner so that their significance can be compared. Each impact is identified in terms of probability (likelihood of occurring), extent (spatial scale), intensity (severity) and duration (temporal scale). Each rating scale is assigned a numerical value and the sum of the numerical rating is multiplied by the probability of that impact occurring to give the resulting significance of the impact. Below contains the impact assessment for the preferred alternative.

Nature of impact

A brief description of the type of impact the proposed development will have on the affected environment.

Extent/Scale

The physical extent of the impact.

- i. Footprint
The impacted area extends only as far as the actual footprint of the activity.
- ii. Site
The impact will affect the entire or substantial portion of the site/property.
- iii. Local
The impact could affect the area including neighbouring properties and transport routes.
- iv. Regional
Impact could be widespread with regional implication.
- v. National
Impact could have a widespread national level implication.

Duration

The duration of the impact.

- i. Short term
The impact is quickly reversible within a period of one year, or limited to the construction phase, or immediate upon the commencement of floods.
- ii. Medium term
The impact will have a short term lifespan (project lifespan 1 – 10 years).
- iii. Long term
The impact will have a long term lifespan (project lifespan > 10 years).
- iv. Permanent
The impact will be permanent beyond the lifespan of the development.

Intensity

This criteria evaluates intensity of the impact and are rated as follows:

- i. Minor
The activity will only have a minor impact on the affected environment in such a way that the natural processes or functions are not affected.
- ii. Low
The activity will have a low impact on the affected environment
- iii. Medium
The activity will have a medium impact on the affected environment, but function and process continue, albeit in a modified way.
- iv. High
The activity will have a high impact on the affected environment which may be disturbed to the extent where it temporarily or permanently ceases.
- v. Very high
The activity will have a very high impact on the affected environment which may be disturbed to the extent where it temporarily or permanently ceases.

Probability

This describes the likelihood of the impacts actually occurring.

- i. Improbable
The possibility of the impact occurring is highly improbable (less than 5% of impact occurring).
- ii. Low
The possibility of the impact occurring is very low, due either to the circumstances, design or experience (between 5% to 20% of impact occurring).
- iii. Medium
There is a possibility that the impact will occur to the extent that provision must be made therefore (between 20% to 80% of impact occurring).
- iv. High
There is a high possibility that the impact will occur to the extent that provision must be made therefore (between 80% to 95% of impact occurring).
- v. Definite
The impact will definitely take place regardless of any prevention plans, and there can only be relied on migratory actions or contingency plans to contain the effect (between 95% to 100% of impact occurring).

Determination of significance

Significance is determined through a synthesis of the various impact characteristics and represents the combined effect of the extent, duration, intensity and probability of the impacts.

- i. No significance
The impact is not substantial and does not require any mitigation action.

- ii. Low
The impact is of little importance, but may require limited mitigation.
- iii. Medium
The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
- iv. High
The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation and management is essential.

The following assessment scale is used to determine the significance of the identified potential impacts on the environment.

Significance = (probability + duration + scale) x intensity

- Probability: 1 – 5
- Extent: 1 – 5
- Duration: 1 – 4
- Intensity: 1 – 10

Significance rating criteria

>75	High environmental significance
50 – 75	Medium environmental significance
<50	Low environmental significance

Impact Hierarchy

The mitigation hierarchy tool was used to guide the process in dealing with potential impacts of the proposed causeway crossing and the formulating of the various mitigating measures specified in the EMP. The mitigation hierarchy is typically used when planning and implementing development projects in order to provide a systematic, logical and sustainable approach in dealing with possible impacts associated with the development. This to ensure the positive impacts are amplified and negative impacts have the lowest possible effect on the receiving environment.

The following steps/hierarchy was utilised as the core in dealing with possible impacts. When mitigation measures were being formulated to deal with potential impacts, the below measures in the table were used. The favoured mitigation option was the avoidance of impacts and the least preferred option is offsetting

<u>Avoidance</u>	The first step of the mitigation hierarchy comprises of measures taken to avoid creating impacts from the outset. This is the most environmentally sustainable and cost effective option.
<u>Minimization</u>	The second preferred option involves measures taken to reduce the duration, intensity and/or extent of impacts that cannot be completely avoided.
<u>Restoration</u>	The third preferred option is restoration measures which aim to rehabilitate degraded or removed ecosystems following exposure to impacts that cannot be completely avoided or minimised.
<u>Offsetting</u>	The least preferred option is offsetting. This involves implementing measures taken to compensate for any residual, adverse impacts after full implementation of the previous three steps of the mitigation hierarchy.

The potential impacts as assessed by the EAP are identified in **Table 1.1 and 1.2** below.

Table 1.1: Impact Assessment during the Site Preparation and Construction Phases

Nature	Type	Extent	Duration	Intensity	Probability	Without Mitigation	With Mitigation
<u>Impacts linked to the Site Preparation and Construction Phases</u>							
<u>Soil Erosion, loss of topsoil and contamination impacts</u>							
1) Soil Pollution	Negative	Local	Short	High	High	Medium	Low
2) Compaction of soils	Negative	Site	Short	Medium	High	Low	Low
3) Soil Erosion	Negative	Local	Long	Medium	High	Medium	Low
4) Loss of top soil	Negative	Site	Short	Medium	High	Low	Low
<u>Water Quality and Quantity Impacts</u>							
5) Water Quality Impairment	Negative	Local	Short	High	High	Medium	Low
6) Loss of instream habitat	Negative	Local	Permeant	Medium	Definite	Medium	N/A
7) Disturbance of Riparian and instream habitat	Negative	Local	Long	Medium	Definite	Medium	Low
8) Impact on Fish and migration patterns	Negative	Local	Long	High	Definite	High	Low
9) Altering of flow patterns of the White Umfolozi River	Negative	Local	Long	High	Definite	High	Low
10) Stormwater and runoff	Negative	Local	Long	Medium	High	Medium	Low
11) Water Quantity	Negative	Local	Short	Minor	Low	Low	Low
<u>Flora and Fauna Impacts</u>							
12) Impact on fauna activity	Negative	Local	Medium	Medium	Definite	Medium	Low
13) Loss of Riparian vegetation and protected species	Negative	Local	Permeant	Medium	Definite	Medium	Low
14) Impact on vegetation	Negative	Local	Permeant	Medium	Definite	Medium	Low
<u>Other environmental Impacts associated with the development of the proposed causeway</u>							
15) Noise Impacts	Negative	Local	Medium	Medium	Definite	Medium	Low
16) Air Pollution	Negative	Local	Short	Low	High	Low	Low
17) Light Pollution	Negative	Site	Short	Minor	Definite	Low	Low
18) Visual and Aesthetic	Negative	Local	Short	Minor	High	Low	Low
19) Solid Waste disposal	Negative	Local	Medium	Medium	Definite	Medium	Low
20) Increase in traffic	Negative	Local	Short	Low	Low	Low	Low
21) Social Impacts	Positive	Regional	Medium	Medium	High	-	-

Table 1.2: Impact Assessment during the Operational Phase

Nature	Type	Extent	Duration	Intensity	Probability	Without Mitigation	With Mitigation
Impacts linked to the Operational Phase							
Soil Erosion, loss of topsoil and contamination impacts							
1) Soil Pollution	Negative	Local	Short	Medium	Low	Low	Low
2) Compaction of soils	Negative	Site	Short	Medium	Medium	Low	Low
3) Soil Erosion	Negative	Local	Long	Medium	High	Medium	Low
Water Quality and Quantity Impacts							
4) Water Quality Impairment	Negative	Local	Short	High	Medium	Medium	Low
5) Disturbance of riparian and instream habitat	Negative	Local	Long	Medium	Medium	Medium	Low
6) Impact on Fish and migration patterns	Negative	Local	Long	High	Definite	High	Low
7) Altering of flow patterns of the White Umfolozi River	Negative	Local	Permeant	High	High	High	Low
8) Stormwater and runoff	Negative	Local	Long	Medium	High	Medium	Low
Flora and Fauna Impacts							
9) Impact on fauna activity	Negative	Local	Permeant	Low	High	Low	Low
10) Impact on vegetation	Negative	Local	Long	Medium	High	Medium	Low
Other environmental Impacts associated with the development of the proposed causeway							
11) Noise Impacts	Negative	Local	Permeant	Low	Definite	Low	Low
12) Air Pollution	Negative	Site	Short	Low	Medium	Low	Low
13) Visual and Aesthetic	Negative	Local	Permeant	Minor	High	Low	Low
14) Increase in traffic	Negative	Local	Permeant	Low	Low	Low	Low
15) Social Impacts	Positive	Regional	Medium	Medium	High	-	-

Annexure 2

ENVIRONMENTAL MANAGEMENT PLAN MIGRATORY MEASURES

The Environmental Management Plan is presented in **Table 1** below. It includes all the necessary mitigation and recommended actions as well as the timeframes and person responsible for the actions.

Table 1: Environmental Management Plan

ENVIRONMENTAL MANAGEMENT PLAN			
Objective	Action/ Description	Phase/action	Responsibility
Demarcation of the project footprint	Before construction can commence the project site must be clearly demarcated with the planning and implementing of access points to the site, one entry and exit point into the White Umfolozi River, the setup of the construction camp, working servitudes and strict no go areas around protected flora species (two Aloe species).	Site Planning and Establishment	Project Manager & Environmental Control Officer
	The project footprint must be confined to as small an area as possible.	Site Planning and Establishment	Project Manager & Environmental Control Officer
Construction and Construction Camp setup	Careful planning should go into the setup of the construction camp. The construction camp must be located away from sensitive areas (watercourses and protected flora species) and the size minimized to be no larger than 0.5 ha.	Site Planning and Establishment	Project Manager & Environmental Control Officer
	Construction camps, storage areas, soil stockpile areas and laydown areas must be located outside of the 17m buffer or the 1: 100 year floodline, whichever is greatest.	Site Planning and Establishment	Project Manager & Environmental Control Officer
	Adequate drainage measures must be implemented in the construction camp to avoid water logging, erosion and uncontrolled stormwater runoff into the White Umfolozi River.	Site Establishment	Project Manager & Environmental Control Officer
	Fire prevention facilities must be present at the construction camp.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Chemical toilets must be provided by the contractor in accordance with DWS requirements. No effluent may be released into the soil or the White Umfolozi River.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	These toilets must be maintained and regular emptied and monitored for any leaks.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Rubbish bins need to be placed on site so that no litter or food waste is left around the development. A Recycling system must be set up.	Site Establishment and Construction	Project Manager & Environmental Control Officer

	A maximum construction working servitude of 3m be permitted to either side of proposed causeway footprint.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Ensure that concrete and cement works are undertaken in specified areas only.	Construction	Project Manager & Environmental Control Officer
	Ensure that all operations that involve the use of cement and concrete are carefully controlled. Water and slurry from concrete mixing operations must be contained to prevent pollution of the ground surrounding the mixing points.	Construction	Project Manager & Environmental Control Officer
	Use plastic trays or liners when mixing cement and concrete. Do not mix cement and concrete directly on the ground.	Construction	Project Manager & Environmental Control Officer
	Excess concrete from mixing must be deposited in a designated area awaiting removal to an approved landfill site.	Construction	Project Manager & Environmental Control Officer
	The Project Manager must monitor weather forecasts in order to avoid exposing soil or the development to destructive weather patterns. Appropriate action must be taken in advance in the event of destructive weather.	Site Establishment and Construction	Project Manager
	Temporary access roads created during site establishment phase to different sections of the construction footprint that will not be utilised during the operational phase must be rehabilitated.	Rehabilitation	Project Manager & Environmental Control Officer
	Once construction ceases there must be a removal of all toilets, bins, machinery and other equipment on site. The site must be rehabilitated.	Rehabilitation	Project Manager & Environmental Control Officer
Chemical storage and spill treatment	The Contractor/s must provide the ECO with a full list of all petroleum, chemical, harmful and hazardous substances and materials on site, together with storage, handling and disposal procedures for these materials.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Chemicals and fuels must not be stored on site overnight. Chemicals and fuel shall be stored in a safe and secure building.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	When chemicals and fuel are brought to site, they must be stored in designated areas outside of the River and buffer area or the 1:100 year floodline, whichever is greatest.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Clear signage must be placed at all storage areas containing hazardous substances / materials.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Ensure that all hazardous substances (chemicals, oils, etc.) are stored in appropriate, weather and tamper proof containers which are clearly labelled.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Fuels and chemicals may not be stored under trees.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Staff dealing with harmful chemicals must be aware of their potential impacts and follow the appropriate safety measures.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	A chemical spill kit must be available if harmful chemicals are to be used on site.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	In the event of a spill immediate action must occur. The relevant government authorities must be notified.	Site Establishment and Construction	Project Manager & Environmental Control Officer

	Bio-remediation and rehabilitation must take place after any accidental spills.	Immediate, Rehabilitation must occur	Project Manager & Environmental Control Officer
	Polluted soils must be disposed of at an approved landfill site.	Rehabilitation	Project Manager
Vehicle access and Movement	Construction Routes must be clearly defined. There must be one entry and exit point into the White Umfolozi River.	Site planning	Project Manager & Environmental Control Officer
	Vehicle access must be strictly contained onsite. Vehicles may only use designated roads and access points as determined by the ECO and Project Manager before operations commence.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Vehicles should be parked out of the flood line and buffer when not in use in order to prevent compaction of the soil profile.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Erosion and stormwater measures must be implemented along the access road where necessary.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	The access road condition must be regularly monitored and repaired when the condition deteriorates.	Operation	Project Manager
	Speed limits on access roads and onsite must be set at 30 km/hr.	All Phases	Project Manager
	Animals have right of way. Vehicles must slow down when approaching an animal.	All Phases	Project Manager
Minimise the potential for ground and surface water pollution	Construction of the causeway must take place during the dry winter months.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Avoid the use of infill material or construction material with pollution / leaching potential when constructing the causeway.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Servicing and maintenance of vehicles as far as possible must occur outside of the watercourse buffer and 1:100 year floodline. If maintenance does occur on site due to breakdown, all steps must be undertaken to avoid hydrocarbon spills/leakages.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Minimise petrol, diesel, and oil leaks by allocating a loading zone, which is protected against such leaks. Drip trays must be secured and emptied regularly.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Spilled hydrocarbon or any harmful chemical must be treated as a hazardous waste and needs to be disposed of as it occurs in appropriate hazardous waste containers and removed off site as soon as possible.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	No washing of equipment or machinery may occur on the site or in the watercourse.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Site staff shall not be permitted to use the surrounding watercourses for bathing, washing of clothing or collecting of water.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Inspect all storage facilities and vehicles daily for the early detection of deterioration or leaks.	Site Establishment and Construction	Project Manager & Environmental Control Officer

Causeway development in the White Umfolozi River	Limit the movement of construction personnel and construction vehicles through the River during the construction of the proposed causeway to that which is absolutely necessary.	Construction	Project Manager & Environmental Control Officer
	Minimise the extent of infilling within the instream habitat.	Construction	Project Manager & Environmental Control Officer
	Prevent excessive disturbance of the bed and banks during culvert and abutment development.	Construction	Project Manager & Environmental Control Officer
	In order for the low level crossing to not be a hindrance, sufficient water volume must be able to pass beneath the crossing. The widest possible gaps between supports must be provided. The use of numerous small diameter pipes must be avoided.	Construction	Project Manager & Environmental Control Officer
	If possible, use excavators instead of bulldozers during the construction of the causeway in order to reduce sedimentation, and consolidate the entry and exit points to reduce scouring.	Construction	Project Manager & Environmental Control Officer
	Turbidity curtains must be erected downstream of the proposed causeway during high risk activities such as the development and removal of sandbag coffer dams / berms and the dredging of the river bed.	Construction	Project Manager & Environmental Control Officer
	Place debris catch netting under the causeway structure during construction in order to ensure that any debris which accidentally falls into the River is captured and does not contaminate downstream areas	Construction	Project Manager & Environmental Control Officer
	Should pumps be required, the pump inlet must be located at a sufficient height above the sediment which accumulates on the River bed so as to reduce the amount of sediment captured. A suitable sediment filter should also be installed in front of the pump inlet in order to remove any sediment or debris from the pumped water.	Construction	Project Manager & Environmental Control Officer
	Any water pumped from the dry working space within the River must be pumped into a retention dam (or similar structure) in order to ensure that sediment settles out of suspension before the water is pumped back into the River downstream. Energy dissipation and erosion protection measures must be implemented at the discharge points.	Construction	Project Manager & Environmental Control Officer
	Strictly prohibit the excavation of a new channel or drainage canals for the diversion of water away from the construction area.	Construction	Project Manager & Environmental Control Officer
	Throughflow to downstream freshwater habitats must be maintained during construction. This can be achieved by the development of flume pipes through dry work areas, which divert water away from the direct construction works area. Alternatively, water can be pumped from areas upstream of the impoundment to a suitable area downstream of the impoundment. An ECO should be consulted in this regard.	Construction	Project Manager & Environmental Control Officer
	Sandbags utilised for the diversion of the River must be in good condition so as to avoid the bursting of the bags and sedimentation of downstream areas.	Construction	Project Manager & Environmental Control Officer
Any debris which collects above the sandbag coffer dams / berms during the construction phase must be removed and disposed of at a registered waste disposal facility	Construction	Project Manager & Environmental Control Officer	

	Once construction is completed the sandbag coffer dams / berms must be removed and the original flow patterns re-instated.	Construction	Project Manager & Environmental Control Officer
	The ECO must check the River and associated riparian area for erosion damage after every heavy rainfall event. Should erosion or sedimentation be noted immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences; the use of sandbags, rock packs, gabion baskets or similar structures in order to stabilize bank slump or eroded banks etc. Care must be taken to prevent additional disturbance to the river during the implementation of these measures.	Construction	Project Manager & Environmental Control Officer
	Immediately rehabilitate any accidental disturbance to freshwater habitat falling outside of the demarcated construction footprint area	Construction	Project Manager & Environmental Control Officer
	The natural flow of the River must not be permanently diverted or blocked.	Construction	Project Manager & Environmental Control Officer
	The bed and the banks of the River must be rehabilitated to as close to their original condition as possible. Ensure that the bed of the river is restored to its natural base level in order to prevent erosion or upstream ponding (i.e. the base of culverts/pipes must tie in with the natural base level of the river bed).	Rehabilitation	Project Manager & Environmental Control Officer
Causeway Operation and Maintenance	The causeway must be regular maintained during operation.	Operation	Project Manager
	The causeway must be inspected on a regular basis and after heavy rains to ensure no damage is caused to the causeway.	Operation	Project Manager
	The proposed low level causeway should not block flow or create a barrier to fish movement and migration. Fish should be able to pass freely beneath the structure, or jump and swim over the top when overtopping occurs.	Operation	Project Manager
	Do not remove natural vegetation from the banks and channels of the River during maintenance.	Operation	Project Manager
	If sediment accumulation occurs near the pipe's entry and exit points, a shovel will be utilised to clear debris way. This process must be carefully carried out to ensure no damage to the slope of the pipe.	Operation	Project Manager
	If sediments are located deeper inside the pipes, the maintenance team must make an extended shovel by welding pipes to the head of the shovel and inserting it to clear away the debris. Once again, this process must be undertaken carefully to ensure that there is no damage to the slope of the pipe.	Operation	Project Manager
	An additional solution for debris located deeper inside the pipe would be by pulling out the blockage using a chain and a piece of piping.	Operation	Project Manager
Stormwater Management	Stormwater measures including piping, silt fences, gabions and sand bags should be undertaken when necessary to prevent soil loss, erosion and uncontrolled stormwater flow into the White Umfolozi River.	Site Planning and Construction	Project Manager & Environmental Control Officer
	Divert stormwater away from the construction footprint area. Stormwater must not be discharged directly into the White Umfolozi River or the 17m buffer. Stormwater should rather be discharged as diffuse flow at multiple discharge points into well vegetated areas outside of the buffer, and energy dissipaters (such as areas of rock riprap grassed with indigenous vegetation or similar structures) must be constructed where stormwater is released in order to reduce the runoff velocity and therefore erosion.	All Phases	Project Manager & Environmental Control Officer

	Install many small, shallow mitre type drains, cut off drains or berms at regular intervals along access roads. Drains should be protected from erosion with the use of riprap grassed with indigenous vegetation or similar structures. These drains/berms will direct surface water off the access roads and will prevent the concentration of flows and the erosion of the road surface and the river during both the construction phase and the operational phase.	All Phases	Project Manager & Environmental Control Officer
	All sediment trapping devices should be checked regularly.	Monitoring	Project Manager & Environmental Control Officer
	Regular maintenance of the stormwater system must be carried out.	All Phases	Project Manager
Minimize the wastage of water	Ensure that all construction personnel are trained in water wise principles, and that they practise prudent use of water during the construction phase.	Site Planning and Construction	Project Manager & Environmental Control Officer
	Ensure that consumption does not exceed permitted quantities. Take action to reduce consumption if necessary.	All Phases	Project Manager & Environmental Control Officer
	Water must not be taken from the White Umfolozi River.	All Phases	Project Manager & Environmental Control Officer
Conservation of topsoil and Erosion prevention	Conserve topsoil through pre-emptive stripping and stockpiling prior to the commencement of works in any area, pending reapplication during rehabilitation.	Site Establishment	Project Manager and Environmental Control Officer
	Topsoil stripped from the operation footprint must not be spoiled, but stockpiled and preserved for use in rehabilitation.	Site Establishment	Project Manager and Environmental Control Officer
	Care must be taken not to mix topsoil and subsoil during stripping.	Site Establishment	Project Manager and Environmental Control Officer
	All stockpiles and spoil material should be located outside of the 17m buffer or the 1: 100 year floodline, whichever is greatest.	Site Establishment	Project Manager and Environmental Control Officer
	Stockpiles should be located on disturbed areas.	Site Establishment	Project Manager and Environmental Control Officer
	All stockpiles should be protected from windy conditions or heavy rain. This includes cloth or vegetation.	Site Establishment	Project Manager and Environmental Control Officer
	All stockpiles must be kept neat and tidy and free of weeds.	Site Establishment	Project Manager and Environmental Control Officer
	Stockpiles should not be greater than 2m.	Site Establishment	Project Manager and Environmental Control Officer

	On any areas where the risk of erosion is evident, special measures need to be implemented to prevent erosion. These may include, but not be restricted to: • Using mechanical cover or packing structures such as geofabric to stabilise steep slopes or hessian, gabions and mattress and retaining walls • Straw stabilising • Brushcut packing • Mulch or chip cover • Hydroseeding • Sprigging or sodding • Constructing anti-erosion berms • Erection of barriers • Erection of shade nets etc. These erosion control measures must be regularly maintained.	All Phases	Project Manager and Environmental Control Officer
	Brush-packing of eroded areas must occur to prevent animals from utilising the area until it has recovered.	All Phases	Project Manager
	Mitre drains along the roads to stop water from flowing at speed thereby reducing erosion.	All Phases	Project Manager
	Wind screening and barriers should be installed where necessary.	All Phases	Project Manager
	Appoint a Project Manager to inspect the crossing bi-annually as well as after heavy rainfall events for two years following construction in order to determine whether any additional erosion control measures are required. Should erosion or sedimentation be noted immediate corrective measures must be undertaken.	Operation	Project Manager and Environmental Control Officer
Limit the disturbance and destruction of vegetation	Demarcate the construction footprint clearly with the use of danger tape or pegs and strictly prohibit any activities outside of the demarcated footprint area. Danger tape/pegs must be removed after the completion of construction activities.	Site Planning	Project Manager & Environmental Control Officer
	Protected plants and trees must be marked, their location recorded and must be. If any protected species cannot be avoided a permit must be applied for from the relevant authority.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
	A Plant Rescue and Relocation Plan must be implemented before construction commences.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
	Rescued plants must be planted immediately in a similar environment with similar conditions close to site. 'Hardy' plants to be planted in disturbed areas on the southern bank of the White Umfolozi River.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
	If the rescued plant cannot be immediately planted, it must be stored at the Zulu Rock Lodge for planting as soon as the construction process ceases.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
	The removal of protected species must be done with due care. The plants should be relocated into areas with the same aspect, soil conditions and elevation.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
	For every one indigenous tree removed, five indigenous trees will be planted and where possible of the same species.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
	Trees and bush that will not be removed must be clearly marked.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
	Consider the selective trimming of branches before opting to remove any trees.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer

Keep surrounding vegetation, especially larger trees and shrubs, to create a screen that reduces flood impacts.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
Construction activities must be carefully planned and implemented in such a way that facilitates and aids in the rehabilitation and establishment of plant communities.	Construction	Project Manager & Environmental Control Officer
Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.	Site Planning, Establishment and Construction	Project Manager & Environmental Control Officer
Re-vegetation of disturbed surfaces should occur immediately after the construction activities are completed.	Rehabilitation	Project Manager & Environmental Control Officer
Immediately rehabilitate any accidental disturbance to portions of the riparian areas falling outside of the demarcated construction footprint area. Rehabilitation may include the ripping and reprofiling of excessively compacted areas.	Rehabilitation	Project Manager and Environmental Control Officer
Once construction has been completed all construction waste, rubble, and equipment must be removed from the site footprint area and the growth of riparian vegetation promoted.	Rehabilitation	Project Manager and Environmental Control Officer
Revegetated areas must be audited by an ECO once a week for six weeks after construction in order to monitor revegetation success. Thereafter, revegetation must be monitored every three months for a period of six months and the need for further revegetation, alien species removal and erosion control measures must be determined. After six months the ECO should assess whether any further revegetation or actions are required or whether revegetation can be considered a success.	Rehabilitation	Environmental Control Officer
Remove all invasive alien plant species.	All Phases	Project Manager and Environmental Control Officer
No muddy or dirty equipment or machinery may be brought onto site as this may contain invasive alien plant seeds	Site Establishment and Construction	Project Manager & Environmental Control Officer
Removal of invasive alien species needs to coincide with planting of indigenous species to replace alien plants, and ensure a healthy plant cover – especially on embankments.	All Phases	Project Manager and Environmental Control Officer
Areas for re-vegetation/alien clearing should be demarcated in order to prevent further disturbance. Furthermore, access roads for machinery should avoid any of the vegetation focus areas and areas with existing natural vegetation.	All Phases	Project Manager and Environmental Control Officer
Alien species removal is to take place manually, by hand as far as possible. The use of herbicides should be avoided. Should the use of herbicides be required, only herbicides which have been certified safe for use in aquatic environments by an independent testing authority may be considered. The ECO must be consulted in this regard	All Phases	Project Manager and Environmental Control Officer
Dispose of removed alien plant material at a registered waste disposal site or burn on a bunded surface where no stormwater runoff is expected.	All Phases	Project Manager and Environmental Control Officer
Remove alien invasive vegetation before seed is set and released.	All Phases	Project Manager and Environmental Control Officer

	Cover removed alien plant material properly when transported, to prevent it from being blown from vehicles.	All Phases	Project Manager and Environmental Control Officer
	Control bush encroachment on site. Remove vegetation where necessary.	All Phases	Project Manager
	No collecting of firewood by guests is permitted.	All Phases	Project Manager
Protection of Fauna	All effort must be made to minimise the disturbance of wild animals on and within the close vicinity of the causeway site.	Site Establishment and Construction	Project Manager and Environmental Control Officer
	Smaller fauna species must be removed from the construction site where possible by a suitably qualified individual to a safe location. This includes snakes, small mammals, tortoises, frogs and reptiles etc	Site Establishment and Construction	Project Manager and Environmental Control Officer
	Larger fauna must be given time to move away from the site.	Site Establishment and Construction	Project Manager and Environmental Control Officer
	No trapping, snaring, hunting, fishing or killing of any animal may occur on the causeway site.	Site Establishment and Construction	Project Manager and Environmental Control Officer
	No domestic animals must be allowed on the construction site.	Site Establishment and Construction	Project Manager and Environmental Control Officer
	To prevent possible collisions with animals in natural areas the drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths. Speed limits must be adhered to.	Site Establishment and Construction	Project Manager and Environmental Control Officer
	All food should be securely stored away to prevent attraction of faunal species. Bins must have tightly fitting lids to prevent faunal species raiding the bins.	Site Establishment and Construction	Project Manager and Environmental Control Officer
	The nesting sites of birds in trees (in particular raptors) may not be disturbed and a buffer implemented under the guidance of the ECO.	Site Establishment and Construction	Project Manager and Environmental Control Officer
	Ensure that construction personnel are briefed on the potential occurrence of protected faunal species, what they look like, and where they are likely to be found. Personnel are to be instructed that these species are not to be hurt or destroyed if encountered. This applies specifically to the snakes, lizards and spiders, as these are often perceived to be vermin and pests.	Site Establishment (Training)	Project Manager and Environmental Control Officer
	Develop a procedure for dealing with animals encountered on the site, including dangerous animals and vermin. Where necessary, call in professionals to remove the animals. Personnel are to be instructed on the presence of dangerous game and the appropriate behaviour and safety upon encountering such game.	Site Establishment and Construction	Project Manager
Where possible, large/canopy trees should be retained (pertaining to all development areas) since they provide critical important breeding habitat for bird species.		Project Manager and Environmental Control Officer	

		Site Establishment	
	Disturbed areas will be rehabilitated and vegetation planted to resemble the area prior to the causeway, both in terms of vegetation cover and habitat.	Rehabilitation Phase	Project Manager & Environmental Control Officer
Waste Management	Waste generated on site must be disposed of in clearly marked bins. A recycling system must be setup during the site preparation and construction phase.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Domestic/general waste and hazardous waste must be separated and bins clearly marked.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	The recycling system and bins must be animal proof	Site Establishment and Construction	Project Manager & Environmental Control Officer
	No solid waste must be burned on site.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	The use of toilets must be adhered to. The veldt may under no circumstances be used.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Disposal of waste that cannot be recycled must take place at a registered landfill facility.	Site Establishment and Construction	Project Manager & Environmental Control Officer
Minimise atmospheric emissions and dust generation	Inspection of vehicles and warning systems will be implemented for vehicles emitting excessive emissions.	Site Establishment and Construction	Project Manager
	All construction vehicles and machinery should be kept up to date with servicing to ensure air emissions are at legislated levels.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Exhaust emission control devices are to be installed on vehicles and/or machinery where practical.	When practical	Project Manager
	Construction vehicles and machinery should not be left running when not in use to reduce the amounts of emissions released into the air when possible.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Handling must minimise the creation of dust. Handling must be reduced during windy conditions.	On windy days	Project Manager & Environmental Control Officer
	Wetting of construction area must occur during very dry or windy conditions or if dust becomes a major problem.	On windy days	Project Manager & Environmental Control Officer
	Rehabilitation will ensure good vegetative cover which will reduce dust creation.	Rehabilitation Phase	Project Manager & Environmental Control Officer
Control noise	Operational hours during the construction phase will be restricted from Monday to Friday between 7 am and 5 pm.	Site Establishment and Construction	Project Manager

	No contractor activity is permitted on Weekends and Public Holidays unless essential.	Site Establishment and Construction	Project Manager
	Adjacent communities and adjacent landowners are to be notified upfront (48 hours) of noisy construction activities (blasting, excavations and piling activities).	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Noise from workers during the construction phase must be controlled.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Manuel digging must be favoured where possible over the use of machinery.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Where possible noise suppression and silencers must be applied to all construction equipment and vehicles. Construction equipment and vehicles must be maintained.	Site Establishment and Construction	Project Manager
	Noisy operations should be combined so that they occur where possible at the same time.	Site Establishment and Construction	Project Manager
	Hearing protection will be provided for employees operating heavy or noisy machinery.	Site Establishment and Construction	Project Manager
	Noise level monitoring will be implemented if necessary.	Monthly	Project Manager
Reduce the visual impact	The site must be kept neat and tidy at all times.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. No afterhours construction work or work on weekends or public holidays is permitted.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Tilt spotlight luminaires to direct the light to the intended spot, instead of allowing it to light areas outside its purpose.	Site Establishment and Construction	Project Manager
	Avoid Razor wire, security spikes or similar features.	Site Establishment and Construction	Project Manager
	A limit to the number of vehicles permitted access to the site per day must be enforced.	Site Establishment and Construction	Project Manager
	Avoid shiny metals in structures. If possible, shiny metal structures should be darkened or screened to prevent glare.	Site Establishment and Construction	Project Manager
	Night-time light sources must be directed away from nearby watercourses.	Site Establishment and Construction	Project Manager

Safety and Security	All laborers must wear identifiable clothing at all times while on the property, i.e. Overall, or T-shirt, with contractor's name.	Site Establishment and Construction	Project Manager
	Walking to and from the main gate is prohibited.	Site Establishment and Construction	Project Manager
	No open fires shall be allowed on site under any circumstances.	Site Establishment and Construction	Project Manager
	Fire prevention facilities must be present.	Site Establishment and Construction	Project Manager & Environmental Control Officer
	Firefighting equipment is maintained and in good working order. All fire fighters must wear Personal Protective Clothing.	Site Establishment and Construction	Project Manager
	In the event of Security emergency Managers/Staff must contact the General Manager/Security Manager of the Manyoni Private Game Reserve. Contact details for both the community channel and telephone (including afterhours contact) must be readily available.	Site Establishment and Construction	Project Manager

