

## **DRAFT BASIC ASSESSMENT REPORT**

### **PROPOSED CONSTRUCTION OF BROAD CRESTED GAUGING WEIR ON THE HLIMBITHWA RIVER BELOW THE INVUTSHANE DAM WALL, ILEMBE DISTRICT MUNICIPALITY, KWAZULU-NATAL**

*Submitted in terms of the 2014 Environmental Impact Assessment Regulations promulgated in accordance with the National Environmental Management Act 107 of 1998 (Act No. 107 of 1998), as amended in 2017*



Reference Number:

NEAS:

<b>Name of Client:</b>	<b>Umgeni Water</b>
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<b>Prepared For:</b>	<b>Umgeni Water</b>

## ***Title and Approval Page***

<b>Project Name:</b>	<b>Proposed Construction of Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall, Ilembe District Municipality, Kwazulu-Natal</b>
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## Executive Summary

### INTRODUCTION

Afzelia Environmental Consultants was appointed by Umgeni Water to undertake the Basic Assessment process for the proposed Construction of Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall in accordance with the National Environmental Management Act (Act No. 107 of 1998) and the 2014 Environmental Impact Assessment Regulations, as amended (07 April 2017).

### BASIC ASSESSMENT PROCESS

The proposed Imvutshane Dam gauging weir will entail certain activities that require authorisation in terms of the National Environmental Management Act (Act No. 107 of 1998). The process for seeking authorisation is undertaken in accordance with the 2017 Environmental Impact Assessment Regulations (Government Notice No. R 324, R 325, R 326 and R 327 (07 April 2017), promulgated in terms of Chapter 5 of National Environmental Management Act (Act No. 107 of 1998).

Based on the types of activities involved which include activities that are listed in Government Notice 324 and 327 of the Environmental Impact Assessment Regulations, as amended in 2017, the requisite environmental assessment for the project is a **Basic Assessment Process**.

### PROJECT OVERVIEW

The on-going El Niño phenomenon has caused poor rainfall which, in combination with above-average temperatures, has resulted in a severe drought in South Africa. This combined with the increasing demand on the already scarce water resource amplify the importance of accurate hydrological information and necessitate that existing water be conserved and managed effectively. KwaZulu-Natal in particular has been affected significantly by the recent drought. Due to this the low river levels cause severe disruption to life cycles of aquatic organisms on the downstream side. To ensure accurate monitoring of the environmental release particularly during dry seasons, the request was received by the Engineering Services to design a gauging weir for the Imvutshane Dam.

Imvutshane Dam was completed in 2015 as part of the Maphumulo Bulk Water Supply Scheme Phase 2. The dam is located in Imvutshane River, 10km away from Maphumulo at coordinates 29°12'32"S 31°01'50"E.

Umgeni Water would like to construct a Broad Crested Weir on the river. The geographical co-ordinates of the proposed Construction of the Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall **30°20'27.37"S, 30°38'46.12"E**.

The Broad crested weir was opted over other types of weirs because of the following reasons:

- Relative low construction costs;
- The ability to operate effectively with higher downstream water levels;
- The ability to easily pass over floating debris and that the flow pass through critical depth making it easy to calculate the flow under modular conditions.

The weir is designed as a compound weir to enable measuring of wide range of flows. It consists of three stages including:

- 45 degrees V-Notch cut into the centre of the crest;
- For aeration below the nappe;

- On the v notch the stepping of downstream side is stopped at 500mm from the notch.

### **Cut of Wall**

The cut off wall was designed as a water retaining structure, based on the limit state principles and with maximum allowable cracks width of 0.2 mm. In accordance with the following codes of practice as; Structural use of concrete part 1 and 2 (SANS 10100: 2014), Design of concrete structure for retaining aqueous liquids (BS 8007: 1987) and Steel bars for concrete reinforcing (SANS 920:2011).

### **Gauging Plates**

The stainless-steel gauging plates are placed at the left-hand side of the flank wall facing downstream such that it can be clearly seen by an operator standing at the right-hand side wall. The upstream gauging plate is placed at the distance greater than 4 times the total head of the design flow where there is a lesser downstream draw effect at the level of the apex as recommended by the Manual for planning, design and operation of river gauging weir. The submerge plate is placed at a distance of about 2m downstream of the weir crest where it is assumed to be after the hydraulic jump at a level 300mm below the upstream gauging plate.

### **Hydraulic Consideration**

The V-Notch is sized to accurately measure low flows including the environmental release flow (Design flow) of 0.013m<sup>3</sup>/s. With the 45 degrees V-notch, the Head (H) was found to be 218mm using, where coefficient of discharge Cd was assumed to be 0.6. In addition, the V-notch weir has two stages which will measure a wide range of flows giving the weir a capacity to measure up to 45m<sup>3</sup>/s.

### **Structural Consideration**

#### **Loading Conditions**

- Self-weight;
- Hydrostatic pressure (Recommended Design Flood = 200m<sup>3</sup>/s).

The structural fitness was dictated by the ultimate limit state for an allowable factor of safety of 1.5 against overturning and sliding. The heavy structure increased the factor of safety and was found to be more than 1.5 for both overturning and sliding.

To ensure sustainable accuracy in measurements, two 300mm stainless steel silt pipes blank flanged at the downstream of the structure are provided to release accumulating sediments at the upstream side of the weir. For dissipation of energy of higher flows, the weir is designed with 300square mm steps at the downstream side of the structure.

### **Construction**

#### **River diversion**

To lessen the environment disturbance, the working space shall be isolated by means if a cofferdam in adequate distances from proposed weir position both upstream and downstream of the weir. Temporary flume pipes shall be installed across the working space to allow water across during construction.

#### **Excavation**

Due to unavailability of geotechnical information and the urgency of the project, the founding level will be determined on site during excavation depending on the depth necessary to reach a stable foundation level. Founding rock shall be properly cleaned and be freed of loose material before casting of blinding.

### **Weir**

The weir is constructed with two contraction joints as measures of controlling thermal cracking. Also, to lessen the heat of hydration, 40% of fly ash shall replace cement in the concrete mix, this will consequently add other benefits such as strength and durability and workability improvement. An addition up to 20% clean boulders with sizes up to 150mm will be considered in order to reduce the amount of concrete required.

## IMPACT ASSESSMENT

This Basic Assessment Report focuses on the pertinent environmental impacts that could potentially be caused by the proposed pre-construction, construction operation of a Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall. The purpose of the project is to enable the flow from the dam to be monitored.

The recent El Niño phenomenon has led to below normal rainfall which with a combination of above average temperatures, has resulted in severe drought in South Africa. This combined with the increasing demand on the already scarce water resource amplifies the importance of accurate hydrological information to manage flows from the dam and ensure that water is used and conserved effectively.

KwaZulu-Natal in particular has been affected significantly by the recent drought. Due to this the low river levels cause severe disruption to life cycles of aquatic organisms on the downstream side. To ensure accurate monitoring of the environmental release particularly during dry seasons, the request was received by Umgeni Water Engineering Services to design a gauging weir for the Imvutshane Dam.

The proposed project is located approximately 6km to the south the town of Maphumulo, KwaZulu-Natal Province. The proposed project is located in the Pongola - Mtamvuna Water Management Area, within the U40G quaternary catchment. The closest Sub Quaternary Reach (SQR) to the project is U40G-3843. This river reach is a portion of the Hlimbitwa River system.

Afzelia Environmental Consultants was appointed by Umgeni Water to undertake the Basic Assessment process for the proposed Construction of Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall in accordance with the National Environmental Management Act (Act No. 107 of 1998) and the 2014 Environmental Impact Assessment Regulations, as amended (07 April 2017).

Based on the location and nature of the proposed development, the following environmental specialist studies were conducted:

- ❖ Aquatic Assessment; and
- ❖ Wetland Delineation and Risk Assessment.

According to the Aquatic Assessment, the results of the Present Ecological State (PES) assessment derived largely modified (class D) conditions in the river reach considered in this assessment. The modified conditions were largely attributed to habitat quality level impacts which have resulted in the modification of in-stream habitat and macroinvertebrate communities.

The results of the risk assessment derived a variety of risk ratings for the proposed project. Activities which entail the physical alteration of the watercourse and its habitats were derived to be moderate risk activities before mitigation.

In addition, due to the permanent presence of the weir, the risk rating for the operation and maintenance activity of the broad crest weir structure were determined to be moderate.

The baseline environment indicated some sensitive aquatic biology were present. In addition, the proposed project will be located approximately 50m downstream of the existing Imvutshane Dam wall. Considering the location of the proposed project, the cumulative impact on fish migration and loss of aquatic habitat is considered negligible.

Considering the status of the aquatic ecosystems, and furthermore the nature and requirements of the project, the proposed project has the potential to negatively affect local ecology. However, should the proposed mitigation actions be implemented, impacts may be reduced. In light of the above mentioned, it is the opinion of the specialist that no significant fatal flaws could be identified through the completion of this aquatic ecology study.

The wetland assessment identified no wetland units in close proximity to the proposed Imvutshane Dam gauging weir, as well as within the 500m (Department of Water and Sanitation) DWS regulated area for water use. The vast majority of watercourse units located within the respective study area were riparian zones, although many invaded drainage lines were also present.

No risk assessment was completed as part of this report due to the fact that no definable wetland habitat was identified in a position within the landscape where it may receive impacts from the proposed weir development. It must be noted that riparian areas in close proximity to the proposed gauging weir site will require complete impact and risk assessments as stipulated by DWS.

## RECOMMENDATIONS

Based on the information that is contained in this report and also taking into account the outcome of the impact assessment, the opinions and recommendations included in the specialist studies as well as all supporting documentation, it is the recommendation of the practitioner that the Environmental Authorisation (EA) be granted by the Department of Environmental Affairs for the proposed Construction of Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall.

The following key recommendations, which may also influence the conditions of the EA (where relevant):

- 1) The Layout Option for the proposed construction of Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall is accepted;
- 2) Appointment of an ECO to monitor compliance with the EA and the approved EMPr;
- 3) As discussed in the EMPr, various forms of monitoring are required to ensure that the receiving environment is suitably safeguarded against identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project.
- 4) All mitigation measures provided in the Specialist Studies of the DBAR are to be adhered to, specifically the following:
  - ❖ All contractors and employees must undergo induction prior to commencing work on site. The induction process must include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good 'housekeeping';
  - ❖ All chemicals and toxicants that are required for the Construction Phase of the project must be stored in a bunded area on site;
  - ❖ All machinery and equipment that will be used on site must be inspected daily to identify faults and possible oil and diesel leaks,
  - ❖ All machinery and equipment must be taken off-site for maintenance and servicing. No **machinery and equipment may be serviced on site.**
  - ❖ Cofferdams are temporary structures that are used to displace water and provide dry access to usually submerged areas (such as instream construction etc.). Cofferdams can also be built to prevent water from coming into contact with high impact zones (e.g. construction sites) and reduce the amount of sedimentation and pollution;

- ❖ Adequate sanitary facilities and ablutions must be provided in the working servitude for all personnel throughout the project area. The use of these facilities by all site personnel must be enforced;
- ❖ All contractors and employees on site must be trained in the event of spills, leaks and other impacts on the aquatic systems;
- ❖ No dumping of construction material may take place;
- ❖ All waste that is generated on site during the construction phase must be adequately managed;
- ❖ Where appropriate waste materials must be separated to enable recycling or reuse;
- ❖ Construction activities are proposed to be conducted during the dry season (April – August) in order to ensure that work can be undertaken without disruption that could be caused by flooding and to minimise risk to the water course;
- ❖ Areas that are set aside for laydown yards from construction materials must be placed outside a 32m buffer zone from rivers and water courses;
- ❖ Existing cleared roadways and riparian areas shall be utilised for construction activities;
- ❖ An alien invasive plant management plan shall be compiled for approval prior to commencement of construction. Implementation of the plan to control and prevent the spread of invasive alien plants shall be undertaken throughout the contract period;
- ❖ No chemicals, building materials, hydrocarbons or soils may be stockpiled within the 32m buffer zone.

## **PUBLIC PARTICIPATION**

The Basic Assessment Report provides a full account of the public participation process that was followed for the proposed project.

A 30-Day Authority and Public Review of the draft Basic Assessment Report will take place from the **5 April 2019 to 9 May 2019**. A copy of the report will be placed in public venues within the study area, and a link to Dropbox containing the electronic Draft Basic Assessment Report will be available to all registered Interested and Affected Parties upon request. In addition, hard copies of the report will be submitted to commenting and decision-making authorities.

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## **ACRONYMS AND ABBREVIATIONS**

<b>CA</b>	Competent Authority
<b>DEA</b>	Department of Environmental Affairs
<b>DEDTEA</b>	Department of Economic Development, Tourism and Environmental Affairs (KZN)
<b>DWS</b>	Department of Water and Sanitation
<b>EA</b>	Environmental Authorisation
<b>EAP</b>	Environmental Assessment Practitioner
<b>ECO</b>	Environmental Control Officer
<b>ESO</b>	Environmental Site Officer
<b>EIA</b>	Environmental Impact Assessment
<b>EMPr</b>	Environmental Management Programme
<b>FOS</b>	Factor of Safety
<b>GIS</b>	Geographic Information System
<b>HGM</b>	Hydrogeomorphic Unit
<b>I&amp;AP</b>	Interested and Affected Parties
<b>IDP</b>	Integrated Development Plan
<b>WULA</b>	Water Use License Application
<b>KZN</b>	KwaZulu-Natal
<b>NEMA</b>	National Environmental Management Act (107 of 1998)
<b>NFEPA</b>	National Freshwater Ecosystem Priority Areas
<b>NWA</b>	National Water Act (No 36 of 1998)
<b>PES</b>	Present Ecological State
<b>PPP</b>	Public Participation Process
<b>RDF</b>	Recommended Design Flood
<b>SABS</b>	South African Bureau of Standards
<b>SANS</b>	South African National Standards
<b>SDF</b>	Spatial Development Framework
<b>SMP</b>	Stormwater Management Plan

## GLOSSARY OF TERMS

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

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

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

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

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

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

**Crump weir** - A form of weir with a precise triangular profile often used for discharge monitoring.

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

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

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

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

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

- a) the land, water and atmosphere of the earth;
- b) micro-organisms, plants and animal life;

- c) any part or combination of (a) or (b) and the interrelationships among and between them; and d) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

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

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

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

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

**Environmental Impact Assessment (EIA)** – the process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR.

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

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

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

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

**Fatal Flaw** – issue or conflict (real or perceived) that could result in developments being rejected or stopped.

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

**Watercourse** – means:

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

**Weir** - An artificial obstruction in any watercourse that results in increased water surface level upstream for some, if not all flow conditions. A structure in a river, stream, canal or drain over which free-surface flow occurs. May be used variously for control of upstream water levels, diversion of flow, and/or measurement of discharge.

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

## DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER, SPECIALISTS AND PROPONENT

### NAME AND CONTACT DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)'S ORGANISATION

**Table 5: Contact details of the EAP'S Organisation**

Contact details of the EAP's organisation	
Business name	Afzelia Environmental Consultants (Pty) Ltd
Physical address	Office 101A Windermere Centre, 163-177 Lilian Ngoyi Road, Durban, 4001
Postal address	PO Box 37069, Overport, Durban, 4067
Telephone	031 303 2833
Fax	086 692 2547
E-mail	<a href="mailto:Deshni@afzelia.co.za">Deshni@afzelia.co.za</a>

**Table 6: Names and details of expertise of the EAP involved in the preparation of the report**

Names of the EAPS	Education qualifications	Professional affiliations	Experience at environmental assessments (years)
Miss Deshni Naicker (Lead EAP)	MA (Geography) Environmental and Development Management	International Association for Impact Assessment South Africa (IAIAsa)	9.5
Mr John Marshall (External Reviewer)	Landscape Architect (Dip LA) at Cheltenham (UK)	Professional Landscape Architect (SACLAP) and	21

## NAMES AND EXPERTISE OF SPECIALISTS

**Table 7: Names and details of expertise of each specialist that has contributed to the report**

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix E
Andrew Briggs	MSc Soil Science	Wetland assessments	Wetland Delineation and Risk Assessment. Proposed Gauging Weirs at Umzinto Dam, EJ Smith Dam and Imvutshane Dam KwaZulu- Natal.
Russell Tate	MSc Aquatic Ecotoxicology; BSc Honours Aquatic Health; BSc Zoology and Botany; Professional Natural Scientist: Aquatic Health 400089/15; SASS5 – Department of Water Affairs and Forestry for the River Health Programme; Eco Status application for rivers and streams.	Aquatic assessments	Aquatic Ecological Assessment for the Proposed EJ Smith Gauging Weir. Umzinto, KwaZulu Natal Province, South Africa

## CONTACT DETAILS OF PROPONENT

**Table 8: Contact details of Proponent and Project Manager**

<b>Proponent</b>	<b>Umgeni Water   Head Office</b>
<b>Contact person</b>	Sibusiso Mjwara
<b>Physical address</b>	310 Burger Street, Pietermaritzburg, 3201, South Africa
<b>Postal address</b>	PO Box 9, Pietermaritzburg, 3200
<b>Email</b>	<a href="mailto:Sibusiso.Mjwara@umgeni.co.za">Sibusiso.Mjwara@umgeni.co.za</a>
<b>Tel</b>	033 3411164

<b>Project Manager</b>	<b>Umgeni Water   Head Office</b>
<b>Contact person</b>	Mr Shabeer Khan
<b>Physical address</b>	310 Burger Street, Pietermaritzburg, 3201, South Africa
<b>Postal address</b>	PO Box 9, Pietermaritzburg, 3200
<b>Email</b>	<a href="mailto:Shabeer.Khan@umgeni.co.za">Shabeer.Khan@umgeni.co.za</a>
<b>Tel</b>	033 3411236

## **PURPOSE OF THE BASIC ASSESSMENT**

The purpose of this report is to:

- Determine the policy and legislative context within which the activity is located and how the activity complies with and responds to the said policy;
- Provide a description of the receiving environment that would be affected by the proposed activity;
- State the need and desirability of the proposed activity;
- Provide a summary of specialist studies that have been conducted as part of the BA process;
- Identify, assess and rank the significant impacts and risks that the activity will impose on the surrounding areas and environment;
- Identify suitable measures to avoid, reverse, mitigate or manage identified impacts;
- Outline the Public Participation Process that was undertaken;
- Provide recommendations for the competent authority to make an informed decision.

# 1. Introduction and Project Description

## 1.1. Project Background

Afzelia Environmental Consultants was appointed by Umgeni Water to undertake the Basic Assessment process for the proposed Construction of the Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall in accordance with the National Environmental Management Act (Act No. 107 of 1998) and the 2014 Environmental Impact Assessment Regulations, as amended (07 April 2017).

The on-going El Niño phenomenon has caused poor rainfall which, in combination with above-average temperatures, has resulted in a severe drought in South Africa. This combined with the increasing demand on the already scarce water resource amplify the importance of accurate hydrological information and necessitate that existing water be conserved and managed effectively. KwaZulu-Natal in particular has been affected significantly by the recent drought. Due to this the low river levels cause severe disruption to life cycles of aquatic organisms on the downstream side. To ensure accurate monitoring of the environmental release particularly during dry seasons, the request was received by the Engineering Services to design a gauging weir for the Imvutshane Dam.

Imvutshane Dam was completed in 2015 as part of the Maphumulo Bulk Water Supply Scheme Phase 2. The dam is located in Imvutshane River, 10km away from Maphumulo at coordinates 29°12'32"S 31°01'50"E.

Umgeni Water would like to construct a Broad Crested Weir on the river. The geographical co-ordinates of the proposed Construction of the Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall **30°20'27.37"S, 30°38'46.12"E**. (Refer to **Figure 1: Locality Map**)

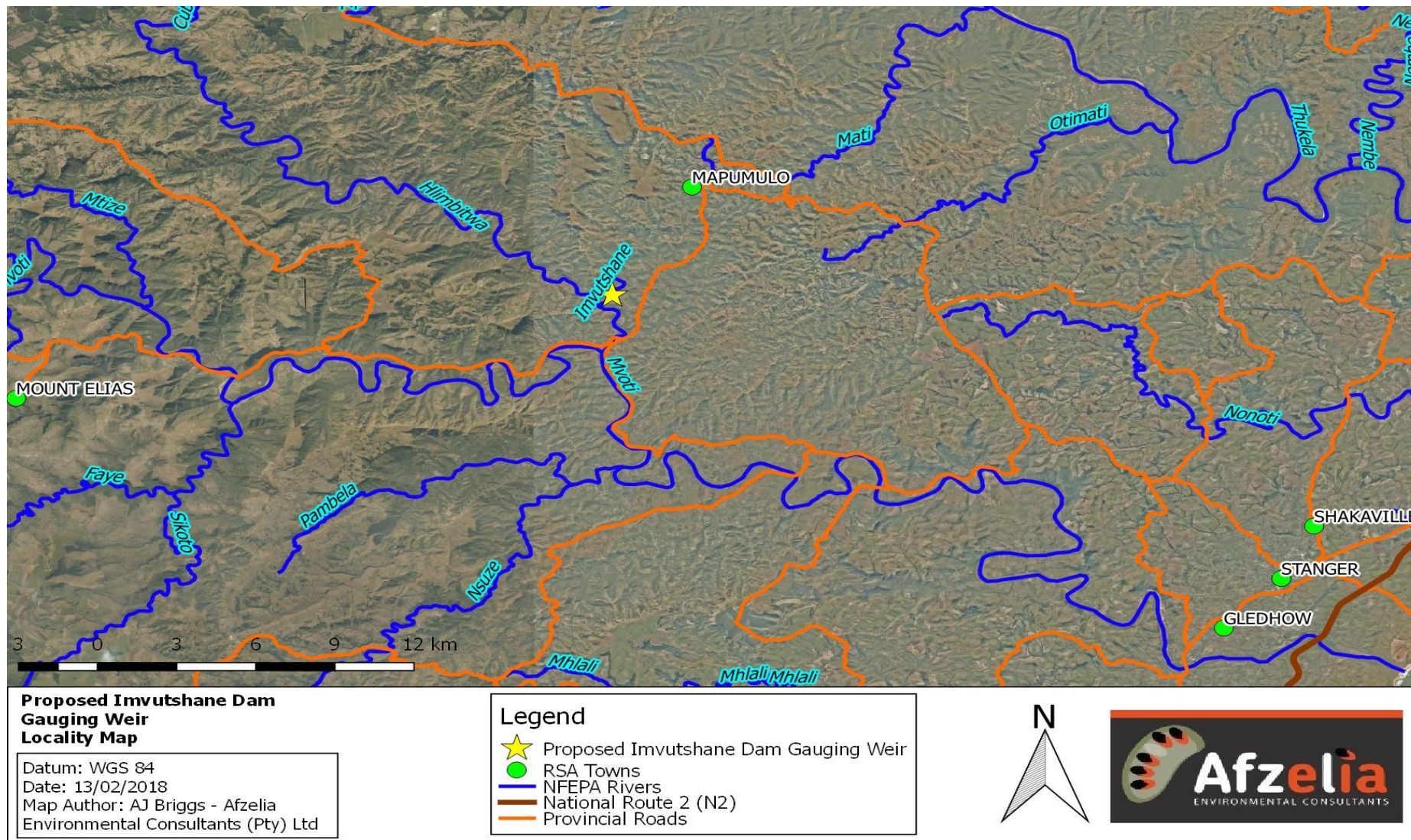


Figure 1: Proposed Imvutshane Dam Gauging Weir – Locality

## 1.2. The Proposed Gauging Weir Description

The Broad crested weir was opted over other types of weirs because of the following reasons:

- Relative low construction costs;
- The ability to operate effectively with higher downstream water levels;
- The ability to easily pass over floating debris and that the flow pass through critical depth making it easy to calculate the flow under modular conditions.

The weir is designed as a compound weir to enable measuring of wide range of flows. It consists of three stages including:

- 45 degrees V-Notch cut into the centre of the crest;
- For aeration below the nape;
- On the v notch the stepping of downstream side is stopped at 500mm from the notch.

### **Cut of Wall**

The cut off wall was designed as a water retaining structure, based on the limit state principles and with maximum allowable cracks width of 0.2 mm. In accordance with the following codes of practice as; Structural use of concrete part 1 and 2 (SANS 10100: 2014), Design of concrete structure for retaining aqueous liquids (BS 8007: 1987) and Steel bars for concrete reinforcing (SANS 920:2011).

### **Gauging Plates**

The stainless-steel gauging plates are placed at the left-hand side of the flank wall facing downstream such that it can be clearly seen by an operator standing at the right-hand side wall. The upstream gauging plate is placed at the distance greater than 4 times the total head of the design flow where there is a lesser downstream draw effect at the level of the apex as recommended by the Manual for planning, design and operation of river gauging weir. The submerge plate is placed at a distance of about 2m downstream of the weir crest where it is assumed to be after the hydraulic jump at a level 300mm below the upstream gauging plate.

### **Hydraulic Consideration**

The V-Notch is sized to accurately measure low flows including the environmental release flow (Design flow) of 0.013m<sup>3</sup>/s. With the 45 degrees V-notch, the Head (H) was found to be 218mm using, where coefficient of discharge Cd was assumed to be 0.6. In addition, the V-notch weir has two stages which will measure wide range of flows giving the weir a capacity to measure up to 45m<sup>3</sup>/s.

### **Structural Consideration**

#### **Loading Conditions**

- Self-weight;
- Hydrostatic pressure (Recommended Design Flood = 200m<sup>3</sup>/s).

The structural fitness was dictated by the ultimate limit state for an allowable factor of safety of 1.5 against overturning and sliding. The heavy structure increased the factor of safety and was found to be more than 1.5 for both overturning and sliding.

To ensure sustainable accuracy in measurements, two 300mm stainless steel silt pipes blank flanged at the downstream of the structure are provided to release accumulating sediments at the upstream side of the weir. For dissipation of energy of higher flows, the weir is designed with 300square mm steps at the downstream side of the structure.



## **Construction**

### **River diversion**

To minimise environmental disturbance, the working space shall be isolated by means of a cofferdam with adequate distances from the proposed weir position, both upstream and downstream of the weir, to enable safe working areas. Temporary flume pipes shall be installed across the working space to allow water across during construction.

### **Excavation**

Due to unavailability of geotechnical information and the urgency of the project, the founding level will be determined on site during excavation depending on the depth necessary to reach a stable foundation level. Founding rock shall be properly cleaned and be freed of loose material before casting of blinding.

### **Weir**

The weir is constructed with two contraction joints as measures of controlling thermal cracking. Also, to lessen the heat of hydration, 40% of fly ash shall replace cement in the concrete mix, this will consequently add other benefits such as strength and durability and workability improvement. An addition up to 20% of clean boulders with sizes up to 150mm will be considered in order to reduce the amount of concrete required.

## **1.3. Proposed Methodology for working within and around rivers / habitats**

Running water in the river will have to be diverted in order to create appropriate conditions for construction at the position of the gauging station. To minimise disturbance to the environment, the working space shall be isolated by means of a cofferdam in adequate distances from the proposed weir position both upstream and downstream of the weir. This will be accomplished by constructing temporary diversion flumes across the working space to allow water to flow across during construction.

## **1.4. Method Statement**

The construction of the Imvutshane Dam Gauging Weir will be performed in a manner that will incorporate the impact mitigation methods, including, but not limited to erosion control measures; emission controls; surface water control measures, 'Surface Storm Water Runoff'; spillage prevention and control measures; environmental health mitigation measures, 'Environmental Health'; traffic control measures; and other construction practice measures, 'Public Services and Utilities' that will minimize the Project's impact on the environment and the surrounding area. The aforementioned controls/measures are covered in detail in "*Umgeni Water's Particular Specification for Environmental Management of Construction Projects*" (UW-EMP)

**Construction will be performed in several stages and will include the following main elements and/or activities:**

- Earthworks/platform creation;
- Construction of a cofferdam;
- Construction of minor access road/parking areas;
- Pipe trenching and laying of short sections of pipework;
- Construction of concrete Gauging Weir;
- Minor electrical and mechanical installation.

## **Equipment**

The following are envisaged equipment to be used during construction:

- TLB;
- Excavator;

- Trucks (7t & 10t);
- Hand held Plate Compactor;
- Water Booster;
- Grader 120G.

## **Construction Procedures**

### **• Access Road**

A permanent as well as a temporary (construction period) access road is required for the project. The existing access road will be cleared, re-shaped and re-gravelled to provide for storm water management. Any surplus material will be stored and taken to a licensed dump.

The Project roads will be gravel surfaced and generally designed with a low profile without ditches to allow stormwater to pass over top. Road construction will be performed in multiple passes of compacting plant starting with the rough grading and levelling off the road way areas. Once rough grade is achieved, base rock will be trucked in, spread and compacted to create a road base. A capping rock will then be spread over the road base and roll-compacted to finish the grade.

Once heavy construction is complete, a final pass will be made with the grading equipment to level out the road surface and more capping rock will be spread and compacted in areas where needed. Water bars, similar to speed bumps will be cut into the roads where needed to allow for natural drainage of water over the road surface and to prevent road washout.

### **• Earth work**

- Site clearance;
- Top soil preservation;
- Formation of the platform/s;
- Foundation excavation;
- Backfilling around the structures; and
- Rehabilitation using topsoil and grassing

Excavated soil and rock that arises through grading will either be used to maintain, repair and reinforce hard standing areas, road surfaces and any other infrastructure as appropriate or transported to spoil at an approved landfill site. Larger excavated rocks will be disposed off-site or crushed and re-used on-site as back fill or roadway material. On completion, top soil shall be re-laid or imported as necessary; and re-seeded with native grasses to control erosion by water and wind.

Stormwater controls, such as diversion ditches in some areas will control stormwater runoff during construction.

Foundation construction shall involve excavation, outer form setting, steel reinforcement assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting around the foundation, and site area restoration. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations. Foundation work for a given excavation will commence after excavation of the earthwork platforms is completed. Backfill for the foundations will be installed immediately after approval of the foundation by the engineer's field inspectors.

### **• Concrete work**

The volume of concrete required for this work is too small to warrant onsite batching and mixing of concrete. Concrete will be supplied by ready mixed concrete suppliers, only when required. Any unused concrete will be taken back to the suppliers batching yard.

- **Electrical System**

Cable ducting shall be constructed within and incorporated in the concrete work. All cables and trenches will be inspected before backfilling. Once the clean fill is covering the cables, the excavated material will then be used to complete the backfilling.

- **Construction Clean-Up**

Site clean-up generally consists of;

- Removal of the camp site;
- Cleaning surplus material;
- Clearing of all waste;
- Remediation of any contamination;
- Closing, ripping and grading of temporary haul roads.

Earthworks will occur at the onset of the project, as structures are complete and during rehabilitation. Landscape works will really be rehabilitation. Rehab will only occur when the site clean-up is complete and is likely to be ongoing during the DLP.

Disturbed areas outside of the paved /gravelled areas will be reseeded to control erosion by water and wind. All construction clean work and permanent erosion control measures will be done in accordance to a formal Storm Water Pollution Prevention Plan for the Project as outlined in the relevant section/s of the *UW-EMP*.

Other site clean-up activities might include landscaping around the Weir, as well as other miscellaneous tasks that are part of normal construction clean-up using a motor grader, dump trucks, front-end loaders, and light trucks for transportation of any waste materials, packaging, etc.

#### **1.4. Storm Water Management Plan**

The proposed Gauging Weir will be constructed across the water course. Minimum impact on natural storm water flow is envisaged. The followings measures are proposed to help mitigate the risk of erosion due to storm water run-off:

- Diversion ditches in some areas to control storm water runoff during construction;
- Stripping areas only when necessary and undertaking progressive rehabilitation;
- Minimizing the size of stripped and destabilized areas;
- Scheduling high-risk works for a drier time of year or drier time slot in the construction phase in order to minimise risk of damage from flooding and ensure that the work is completed as quickly as possible;
- Vegetation is the best defence against storm water run-off on site and must be retained on any area where clearing is not necessary for the works;
- An appropriately sized catch drain will be constructed as necessary and instructed by the Project Engineer to channel run-off to a designated location;
- Appropriately sized earth banks will be used to channel run-off to desired locations;
- Stabilization matting will be used to cover un-stabilized soils to provide a barrier between the soil and rainfall run-off; and
- Once the work is complete, areas disturbed will be stabilized by grassing.

## 1.5. Alternatives

### SITE ALTERNATIVES

No site alternatives have been considered for the proposed Imvutshane Dam gauging weir.

The proposed site for the Broad crested weir was opted over other types of weirs because of the following reasons:

- Relative low construction costs;
- Ability to operate effectively with higher downstream water levels;
- Ability to easily allow floating debris to pass over the structure and to enable the water to flow pass through critical depth making it easy to calculate the flow under modular conditions.

### DESIGN, LAYOUT OR TECHNOLOGY ALTERNATIVES

There are no design, layout or technology alternatives for this project.

### “NO-GO” ALTERNATIVE

The No-Go alternative, which means that the gauging weir will not be constructed, will mean the *status quo* will remain as is and the risk of inadequate flow to maintain the ecological reserve will remain. This is likely to be exacerbated by increasing demand on the already scarce water resource and inadequate flow monitoring accuracy which could further negatively affect the effective management of existing water resources.

The primary goal is to ensure the accurate monitoring of the environmental release particularly during the dry season.

**Should the *status quo* remain, the direct and indirect positive benefits of the proposed gauging weir on the environment and the surrounding community will not be realised.**

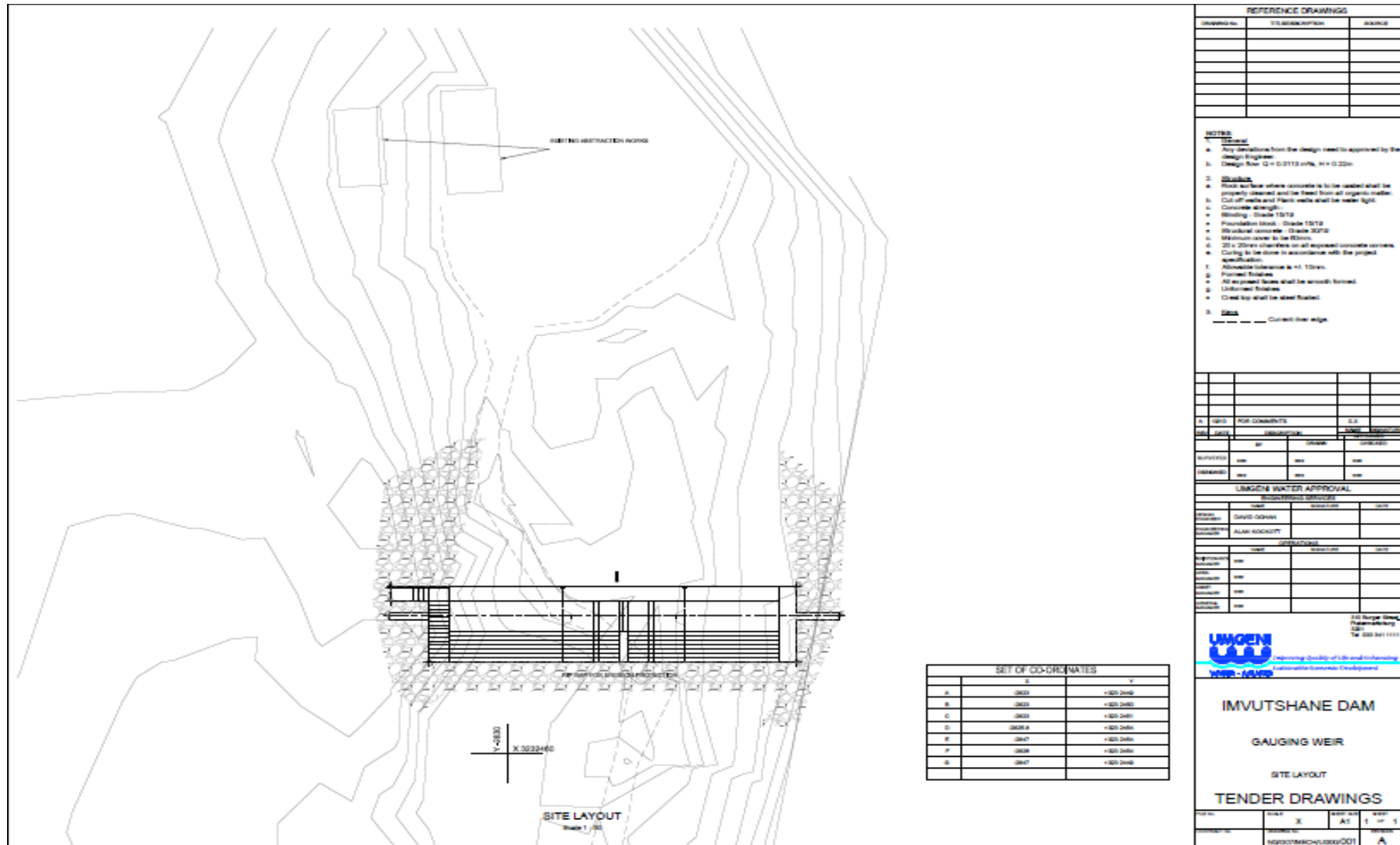


Figure 2: Imvutshane Dam – Gauging Weir Site Layout

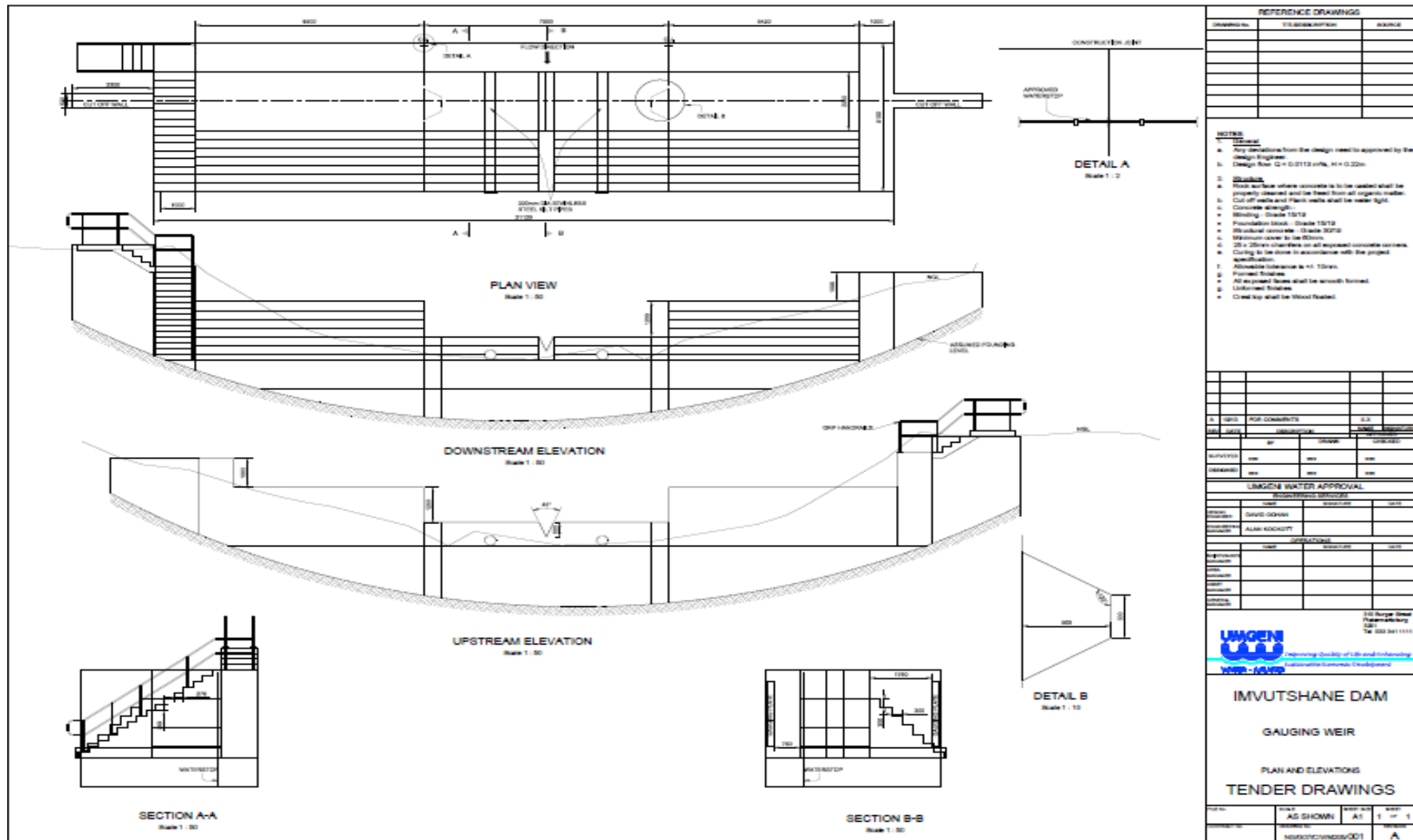


Figure 3: Imvutshane Dam – Planning Elevations

## 2 Description of the Receiving Environment

### 2.1 Visual Characteristics

The topography surrounding the study site is very steep and comprised primarily of riverine areas and drainage lines.

A raw water pumphouse, which is located approximately 30m east of the active channel of the Imvutshane River, appears to consistently discharge a small amount of water, via open drains and a pipe outlet, into the Imvutshane River. The potential erosion associated with this discharge has been mitigated by the strategic placement of Reno-mattresses, which has caused localised impoundment and subsequently led to the formation of a small patch of artificial wetland habitat. The artificial nature and formation of this habitat indicates that it is irrelevant with regards to this assessment.

### 2.2. Climate

The mean annual precipitation is ~895.3mm; potential evapotranspiration is ~1710.3mm with a simulated mean annual run-off of ~120.8 mm. Rain falls primarily in early summer and late summer with highly infrequent winter rainfall. Maximum temperatures vary between 24-28°C in February and 20-24°C in July whilst minimum temperatures are between 16-20°C in February and 6-10°C in July.

### 2.3. Vegetation

According to the National Classification and Status – The proposed site is located within the KwaZulu-Natal Hinterland Thornveld (SVs 3).

The vegetation is found in patches, scattered immediately above SVs 6 Eastern Valley Bushveld, at altitudes 450–900 m in river valleys of mainly the Mpsi (in the Thukela River catchment), Mvoti, Umgeni (below the Howick Falls), Mlazi, and Lufafa (vicinity of Ixopo) and Mtungwane (tributaries of the Mkomazi). The Vegetation is open Thornveld and is dominated by Acacia species on undulating plains found on the upper margins of river valleys, this vegetation type is considered vulnerable (Mucina and Rutherford (2006)).

The provincial vegetation classification according to Scott-Shaw & Escott, 2011 states that the proposed site comprises of KwaZulu-Natal Hinterland Thornveld and is regarded as *Least Threatened*.

According to Driver et al, 2011; the wetland vegetation for the proposed site comprises of the Sub-Escarpment Savanna and is regarded as Endangered and not protected.

### 2.4. Wetland Vegetation

A flat, flood bench feature was also noted within the macro channel of the Imvutshane River. The vegetation was a secondary grassland community dominated by *Sporobolus pyramidalis* with a moderate to low abundance of invasive alien species including *T. minuta* and *L. camara*. The soils are comprised of a dark brown-grey sandy clay, with some faint orange mottling up to approximately 20cm where after distinct sandy alluvial material was found. Given the location of the flood bench (alongside the active channel of the Imvutshane River) and the overall soil characteristics, the flood bench appears to be driven by natural upstream fluvial processes and therefore comprises riparian habitat, not wetland habitat.

The majority of soils within the drainage lines alongside the Imvutshane River comprised brown sand and were colonised by a variety of alien species including *L. camara*, *T. diversifolia*, *T. minuta* and *Ricinus communis*.

## **2.5. NFEPA Wetlands**

The National Freshwater Ecosystem Priority Areas (NFEPA) project aims to produce maps that provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and support sustainable use of water resources. However, as this information is based on broad scale assessments it is critical that ground-truthing is undertaken to verify the existence and the status of any NFEPA wetlands in the area. Examination of the NFEPA GIS database identified no NFEPA Wetlands located within the proposed project site.

## **2.6. Wetlands**

Investigation of the site in close proximity to the proposed Imvutshane Dam gauging weir, as well as within the 500m DWS regulated area for water use, yielded no definable wetland units.

A raw water pump house, which is located approximately 30m east of the active channel of the Imvutshane River, appears to consistently discharge a small amount of water, via open drains and a pipe outlet, into the Imvutshane River. The potential erosion associated with this discharge has been mitigated by the strategic placement of Reno-mattresses, which has caused localised impoundment and subsequently led to the formation of a small patch of artificial wetland habitat. The artificial nature and formation of this habitat indicates that it is irrelevant with regards to this assessment.

A flat, flood bench feature was also noted within the macro channel of the Imvutshane River. Given the location of the flood bench (alongside the active channel of the Imvutshane River) and the overall soil characteristics, the flood bench appears to be driven by natural upstream fluvial processes and therefore comprises riparian habitat, not wetland habitat.

## **2.7. Land Use**

The land use within the proposed study area is made up of riverine forest and is surrounded by bushveld.

## **2.8. Geology**

According to the Department of Agriculture Land Types Database, the study site is underlain by Gnesis.

## **2.9. Catchment Characteristics**

The proposed project is located in the Pongola – Mtamvuna Water Management Area (WMA 4), within the U40G quaternary catchment. The closest Sub Quaternary Reach (SQR) to the project is the U40G-3843 SQR. This river reach is a portion of the Hlimbitwa River system.



### 3 Environmental Legislative Context for the Proposed Project

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

#### 3.1. The Constitution of South Africa (Act No. 108 of 1996)

The Constitution of the Republic of South Africa, Act No. 108 of 1996, is the supreme law of the land and provides amongst others the legal framework for legislation regulating coastal management in general. It also emphasises the need for co-operative governance. In addition, the Environmental clause in Section 24 of the Constitution provides that:

“Everyone has the right –

- a) To an environment which is not harmful to their health or well-being;
- b) To have the environment protected for the benefit of present and future generations through reasonable legislation and other measures that:
  - i. Prevent pollution and ecological degradation;
  - ii. Promotes conservation;
  - iii. Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development”.

The constitution provides the overarching framework for sustainable development.

#### 3.2. National Legislation and Regulations

**This section provides an outline of the applicable national legislation which needs to be taken cognisance of.**

##### 3.2.1. The National Environmental Management Act (Act No. 107 of 1998)

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

The principles of the Act are the following:

- Environmental management must place people and their needs at the forefront of its concern;
- Development must be socially, environmentally and economically sustainable;
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated;
- Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person;
- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued;

- The responsibility for the environmental health and safety consequences of a policy, programme, project or activity exists throughout its life cycle;
- The participation of all interested and affected parties in environmental governance must be promoted;
- Decisions must take into account the interests needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge including traditional and ordinary knowledge;
- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness;
- Social, economic and environmental impacts of activities including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment;
- The right of workers to refuse work that is harmful to human health or the environment;
- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law;
- There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment;
- The environment is held in public trust for the people, the beneficial use of the environment resources must serve the public interest and the environment must be protected as the people's common heritage;
- The cost of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment; and
- Lastly, that the vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.

### **3.2.2. EIA Regulations 2014(as amended on 7<sup>th</sup> April 2017)**

The nature of the proposed project includes activities that are listed in the following Listing Notices – GNR 327 (Listing Notice 1) and GNR 324 (Listing Notice 3) of the EIA Regulations 2014 (As amended in April 2017). Please refer to **Table 6** below.

Please note that the regulations are referred to by their 2017 gazetted numbers, which are however, noted as being amendments of the 2014 version of the EIA Regulations. Thus, for completeness please note that Listing Notice 1 in terms of GNR 983 (4 December 2014), has been amended to GNR 327 (7 April 2017); Listing Notice 2 of GNR 984(2014) has been amended to GNR 325 (2017) and Listing Notice 3 of GNR 985 (2014) has been amended to GNR 324.

Activities that are Listed in Listing Notice 1 and 3 trigger the need for a Basic Assessment (BA) Process, whilst activities that are listed on Listing Notice 2 trigger a full Scoping and Environmental Impact Assessment (S&EIR) process.

Given the activities that are triggered for the proposed Imvutshane Dam Gauging weir, it is noted that a Basic Assessment Process is required and that a Scoping and Environmental Impact Assessment (S&EIR) is not triggered.

**Table 5: Listed Activities in terms of Listing Notice 1 & 3 of the EIA Regulations 2014 (as amended in April 2017)**

Government Notice Number (s):	Activity Number	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R. 327)	Describe the portion of the proposed project to which the applicable listed activity relates.
No. R. 327 of April 2017 (Listing Notice 1)	12	The development of – i. Dams or weirs, where the dam weir, including infrastructure and water surface area, exceeds 100 square metres; or ii. Infrastructure or structures within a physical footprint of 100 square metres or more: Where such development occurs – Within a watercourse.	Construction of the Imvutshane Dam gauging weir and associated infrastructure within 32m from watercourse and within a watercourse.
No. R. 327 of April 2017 (Listing Notice 1)	19	The infilling or depositing of any material of more than 10 cubic metres into or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from. a watercourse	The construction of the Imvutshane Dam gauging weir and associated infrastructure within the watercourse. This will result in the excavating, dredging and infilling within a watercourse of more than 10m <sup>3</sup> .
GNR 325		No Activities are triggered.	
GNR 324		No Activities are triggered.	

### 3.2.3. The National Environmental Management Waste Act (Act No. 59 of 2008) (as amended)

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

The objectives of NEM: WA are to:

- a) “protect the health, well-being and the environment by providing reasonable measures for –
  - i. *minimising the consumption of natural resources;*
  - ii. *avoiding and minimising the generation of waste;*
  - iii. *reducing, re-using, recycling and recovering waste;*
  - iv. *treating and safely disposing of waste as a last resort;*
  - v. *preventing pollution and ecological degradation;*
  - vi. *securing ecologically sustainable development while promoting justifiable economic and social development;*
  - vii. *promoting and ensuring the effective delivery of waste services;*

*viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and*

*ix. achieving integrated waste management reporting and planning;*

*b) to ensure that people are aware of the impact of waste on their health, well-being and the environment;*

*c) to provide for compliance with the measures set out in paragraph (a); and*

*d) generally, to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being.”*

The NEM: WA has been considered, however, no activities in terms of this Act will be triggered by the proposed development.

### **3.2.4. National Water Act (Act 36 of 1998) as amended**

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

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

A water use must be licensed unless it (a) is listed in Schedule 1, (b) is an existing lawful use, (c) is permissible under a general authorisation (GA), or (d) if a responsible authority waives the need for a licence.

If none of these are relevant a so-called Water Use Licence (WUL) must be applied for and obtained prior to the commencement of such listed activity. In terms of such a WUL, the Minister may choose to limit the amount of water which a responsible authority (e.g. CMA, water board, municipality) may allocate. In making regulations and determining items such as GAs, the Minister may differentiate between different water resources, classes of water resources, and geographical areas.

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

As the proposed development involves the abstraction of water, impeding or diverting the flow of water in a watercourse and as well as the alteration of the bed, banks, course or characteristics of a watercourse, a WUL application will be submitted to DWS.

The NWA, as applicable to the proposed development, defines the identified water uses which are potentially applicable under Section 21 as follows:

The following water uses of Section 21 of the NWA are being applied for the WUL are Listed in the Table 6 below

**Table 6: Listed Activities in terms of the National Water Act 1998 (Act No. 36 f 1998) (as amended)**

Section 21	Description of Water Use	Relevance to Project
21 (c)	Impeding or diverting the flow of water in a watercourse	Construction activities within the regulated area of any watercourse. This includes encroachments into the regulated areas of watercourses by the following project infrastructure – weir
21 (i)	Altering the bed, banks, course or characteristics of a watercourse	Construction activities within the regulated area of any watercourse. This includes encroachments into the regulated areas of watercourses by the following project infrastructure – weir

The requisite documentation to satisfy DWS's requirements for the Water Use Authorisation process will be compiled. In addition, an aquatic and wetland assessment has been conducted and is summarised in **Section 12**

### 3.2.5. National Environmental Management: Biodiversity Act (Act 10 of 2004)

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

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

The NEM:BA also provides for:

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

### 3.2.6. National Biodiversity Strategy and Action Plans (2005)

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

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

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

### **3.2.7. The National Environmental Management: Protected Areas Act (Act No.57 of 2003)**

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

The aim of the National Environmental Management Protected Areas Act (Act No. 57 of 2003) (NEMPA) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a Protected Environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

The proposed development does not occur within a Protected Area.

### **3.2.8. National Forest Act (Act No. 84 of 1998)**

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

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

In essence the National Forests Act (NFA) prohibits the destruction of indigenous trees in any natural forest without a licence. In terms of the NFA and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 [Act No. 122 of 1984] for protected tree species), the removal, relocation or pruning of any protected plants will require a licence.

### **3.2.9. KZN Nature Conservation Ordinance (Ordinance No. 150 of 1974)**

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation. In KwaZulu-Natal, the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from *Ezemvelo* KZN Wildlife to remove or destroy any plants listed in the Ordinance. If, protected plant species are to be disturbed, the Applicant must pursue the necessary permit / licencing requirements from the Department of Agriculture, Forestry and Fisheries (DAFF) and *Ezemvelo* KZN Wildlife (EKZNW) prior to clearing of vegetation.

No rare or threatened plants were recorded within the proposed site.

### **3.2.10. National Heritage Resources Act (Act No.25 of 1999)**

The National Heritage Resources Act (Act No. 25 of 1999) was promulgated for the protection of National Heritage Resources and the empowerment of civil society to conserve their heritage resources.

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

### **3.2.11. The National Environmental Management: Air Quality Act (Act No. 39 of 2004)**

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEMAQA) provides for the setting of national norms and standards for regulating air quality monitoring, management and control and describes specific air quality measures so as to protect the environment and human health or well-being by:

- Preventing pollution and ecological degradation, and
- Promoting sustainable development through reasonable resource use.

It also includes the establishment of national ambient dust fall out levels that may be relevant to the construction.

There will be minimal dust impacts associated with the construction phase of the project. Therefore, no authorisation in terms of NEMAQA is required. However, NEMAQA needs to be considered to decrease ambient dust impacts associated with construction activities.

### **3.2.12. Occupational Health and Safety Act (Act No. 85 of 1993)**

The Occupational Health and Safety Act (Act No. 85 of 1993) provides for the health and safety of people at work as well as the health and safety of persons using plant machinery. This act will need to be taken into account should the proposed development be approved.

### **3.2.13. Sustainable Development**

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

Therefore, Sustainable Development requires that:

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

### 3.2.14. Hazardous Substance Act (Act No. 15 of 1973) and Regulations

The object of the Act is *inter alia* to:

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

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

### 3.2.15. Sustainable Development

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

Therefore, Sustainable Development requires that:

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



## 4 Basic Assessment Process

### 4.1. Environmental Assessment Triggers

The proposed Imvutshane Dam gauging weir will entail certain activities that require authorisation in terms of NEMA. Refer to Section 3 for further discussion on the legal framework.

The process for seeking authorisation is undertaken in accordance with the 2014 EIA Regulations (GN No. R. 982, R. 983, R. 984 and R. 985), as amended (07 April 2017), promulgated in terms of Chapter 5 of NEMA. Based on the types of activities involved which include activities in GN No. R. 983, R. 984 and R. 985 of the 2014 EIA Regulations (as amended), the requisite environmental assessment for the 2014 EIA Regulations (as amended), the requisite environmental assessment for the project is a Basic Assessment Process.

### 4.2. Environmental Assessment Authorities

In terms of Regulations, the lead decision making authority for the environmental assessment is DEA, as the Proponent / Applicant is Umgeni Water.

### 4.3. Basic Assessment Process

#### 4.3.1. Formal Process

An outline of the Basic Assessment Process for the proposed Imvutshane Dam gauging weir is provided in Figure 4.

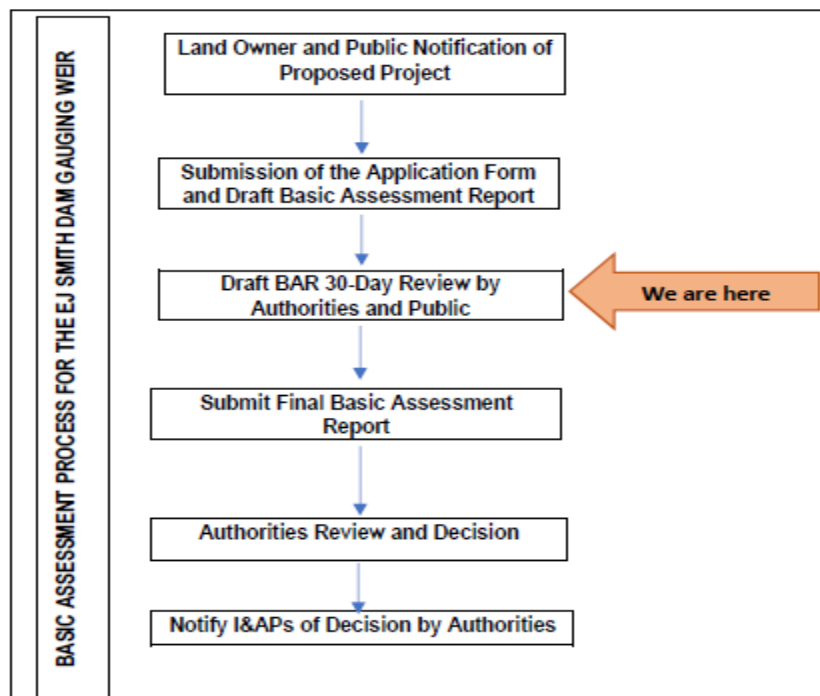


Figure 4: Basic Assessment Process for the Imvutshane Dam Gauging Weir

#### **4.3.2. Landowner Consent**

According to Regulation 39 (1) of GN No. R. 982 of the 2014 EIA Regulations as amended, if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on the land.

The Landowner is Ingonyama Trust and they have been notified about the project. (Refer to Appendix B5)

#### **4.3.3. Application Form**

An application form in terms of Regulation 16 of Government Notice No. R. 982 of the 2014 EIA Regulations as amended in 2017, will be submitted to Department of Environmental Affairs (DEA) together with the Draft BAR.

#### **4.3.4. Public Participation and Review of the BAR**

The Draft BAR will be made available to Interested and Affected Parties (I&APs) for a 30-Day review period. All comments received will be taken into account in the Final BAR and will also be noted in the Comments and Response Report.

More details on the Public Participation Process is provided in **Section 9**.

### **5 Assumptions and Limitations**

The following assumptions were made during the BA Process:

- The detailed engineering design submitted by Umgeni Water to the EAP is the final design;
- No site alternatives have been considered for the proposed Imvutshane Dam gauging weir;
- There are no design, layout or technology alternatives for this project;
- The findings of the Impact Assessment are informed by the Specialist reports which are assumed to be accurate; and
- The mitigation measures that are provided in the EMPr will be implemented and it is assumed that the measures will successfully enhance potential positive impacts while limiting potential negative impacts.

## **6 Need and Desirability**

### **6.1. Need and Desirability of the proposed project**

The DEA (2017), Guideline on Need and Desirability, has been used to inform and provide structure for the Need and Desirability Report for this project.

The concept of “need and desirability” relates to amongst others, the nature, scale and location of the development that is being proposed, as well as the wise use of land. Need and desirability are inter-related and the two should be considered in an integrated and holistic manner.

The on-going El Niño phenomenon has caused poor rainfall which, in combination with above-average temperatures, has resulted in a severe drought in South Africa. This combined with the increasing demand on the already scarce water resource amplify the importance of accurate hydrological information and necessitate that existing water be conserved and managed effectively.

KwaZulu-Natal in particular has been affected significantly by the recent drought. Due to this the low river levels have to potential to cause severe disruption to life cycles of aquatic organisms on the downstream side. To ensure accurate monitoring of the environmental release particularly during dry seasons, Umgeni Water proposes to install a Broad Crested Gauging Weir downstream of the Imvutshane Dam Wall.

The primary goal is to ensure the accurate monitoring of the environmental release particularly during the dry season.

The following policies, statues and documents were examined:

- The National Environmental Management Act Principles;
- Spatial Planning and Land Use Management Act Principles;
- The National Development Plan 2030;
- The Integrated Development Plan (IDP) for Maphumulo Local Municipality;
- The Integrated Development Plan (IDP) for Ilembe District Municipality;
- The Spatial Development Framework; and
- The Environmental Management Framework.

## 7 Socio Economic Value of the Proposed Project

The table below details the socio-economic value of the Proposed Project.

**Table 7: Socio-economic value of the proposed project**

Description	Value
What is the expected capital value of the activity on completion?	R2 348 963.96
What is the expected yearly income that will be generated by or as a result of the activity?	N/A
Will the activity contribute to service infrastructure?	YES
Will the activity be a public amenity	NO
How many new employment opportunities will be created in the development phase of the activity?	10 - 12
What is the expected value of the employment opportunities during the development phase?	R 750 000.00
What percentage of this will accrue to previously disadvantaged individuals?	100%
How many permanent new employment opportunities will be created during the operational phase of the activity?	N/A
What is the expected current value of the employment opportunities during the first 10 years?	N/A
What percentage of this will accrue to previously disadvantaged individuals?	N/A

## 8 Public Participation Process

### 8.1. Public Participation

The purpose of the public participation process for the proposed development includes:

- Provide Interested and Affected Parties (I&APs) with an opportunity to obtain information with regards to the project;
- Allowing I&APs to express their views, issues and concerns with the proposed project;
- Granting I&APs and opportunity to recommend measures to avoid or decrease negative impacts and enhance positive impacts that are associated with the proposed project; and
- Lastly, to enable the project team to incorporate the needs, concerns and recommendation that are made by the I&APs about the proposed project, where feasible.

The public participation process that was followed for the proposed project is governed by the NEMA and GN No. R. 982 of the 2014 EIA Regulations, as amended in April 2017. Detail of the process is provided below. All Public Participation material can be referred to in **Appendix B**

## **8.2. Pre-Application Consultation**

No Pre-Application Consultation Meeting was held with the DEA for the Proposed Project.

## **8.3. Identification of I&As and Compilation of the I&AP Database**

A database of I&APs, which includes authorities, different spheres of government (national, provincial and local), parastatals, ward councillors, stakeholders, interest groups and members of the general public, was prepared and is contained in Appendix B6. This database will be maintained and updated as necessary during the course of the BA Process.

## **8.4. Landowner Notification**

The Landowner is Ingonyama Trust. They have been notified via email and telephone of the project, a copy of the BID was circulated to the Landowner. **(Please refer to Appendix B 5 for Landowner Notification).**

## **8.5. Project Announcement**

The notification process that was undertaken is detailed in the sections to follow:

### **8.5.1. Background Information Document (BID)**

BIDs (**Appendix B1**) and Reply Forms were distributed by email to the I&APs contained in the I&AP Database. The BIDS contain a brief background and description of the project, as well as the BA Process, and listed the details for submitting comments regarding the proposed development. The BID served as a method to notify I&APs of the project and the details on how to register as an I&AP.

Proof of Notification is provided in **Appendix B2**.

### **8.5.2. Onsite Notices**

Onsite Notices will be placed at strategic points within the study area. Notification of the proposed development will be provided on the site notices. The site notices will also notify the public of the Draft BAR 30-Day Review Period.

Proof of the locations of each site notice in relation to the proposed development will be provided in the **Final BAR**.

### **8.5.3. Newspaper Notices**

A newspaper advertisement was placed in the following newspapers as notification of the proposed Broad Crested Weir below the Imvutshane Dam Wall and the 30-Day Review Period. Advertisements will be placed in the following newspapers as notification of the project:

- Zululand Observer Newspaper.

Proof of these advertisements will be provided in the **Final BAR**.

## 8.6. Review Process for the Draft BAR

### 8.6.1 30 Day Public Review Period

In accordance with GN No. R. 982 of the amended 2014 EIA Regulations (07 April 2017), I&APs were granted an opportunity to review and comment on the Draft BAR. Hardcopies of the document will be placed at the public venue that is provided in Table 8. Emails will be sent to all registered I&APs to notify them of the review of the Draft BAR. The 30-Day public review period will take place from **5 April 2019 – 9 May 2019.**

**Table 8: Location of Draft Basic Assessment Report for Review**

Venue	Address	Contact Details
Maphumulo Public Library	Maphumulo Old Main Road, (near the police station), Maphumulo	032 481 2009

### 8.6.2 30 Day Authority Review Period

Hardcopies of the Draft BAR were also provided to the key regulatory and commenting authorities, which include the following:

- DEA;
- KZN EDTEA – Illembe Offices;
- DWS: KZN region;
- Ezemvelo KZN Wildlife;
- DAFF;
- Department of Transport;
- Eskom;
- Amafa AkwaZulu-Natali/Heritage KZN;
- Illembe District Municipality;
- Maphumulo Local Municipality;
- Municipal Ward Councillor for Ward 8

Proof of notification to commenting authorities of the review period and all proof of deliveries of the Draft BAR to all organs of states will be available in the Final BAR.

Should a Public Participation Meeting be requested by I&APS, one will then be held to discuss the project and any concerns by I&APs.

### 8.6.3 Comments and Response Report

A Comments and Responses Report which summarise the issues that are raised by I&APs and the project team's response to these matters, will be contained in the Final BAR. The issues that will be listed in the Comments and Response Report will be identified from completed Reply Forms, emails and other correspondence received by the due date.

## 9 Environmental Attributes

The environmental attributes that are associated with the proposed Imvutshane Dam weir include the geographical, physical, biological, social, economic and cultural aspects of the environment. The following significant environmental attributes are focused on in this report and are discussed in more detail in **Section 11**.

- Geology and Geohydrology;
- Soils;
- Topography;
- Surface Water;
- Flora;
- Fauna;
- Socio-Economic Environment;
- Air Quality;
- Noise;
- Historical and Cultural Features;
- Existing Structures and Infrastructure;
- Transportation; and
- Aesthetic Qualities.

The sensitive environmental features, attributes and aspects for which mitigation measures are included in the BAR and EMPr and are discussed further in **Section 11**.

## 10 Summary of Specialist Studies

The following Specialist Studies were undertaken as part of the Basic Assessment Process for the proposed Broad Crested Weir just below the Imvutshane Dam Wall. The Specialist Reports are contained in **Appendix C**

**1. Aquatic Ecology Assessment;**

**2. Wetland Assessment**

## 10.1. Aquatic Ecology Assessment

### 10.1.1 Details of the Specialist

Specialist Details	
Organisation:	The Biodiversity Company
Name:	Mr. Russell Tate
Qualifications:	MSc (Aquatic Health)
Affiliation (if applicable)	Professional Natural Scientist – Ecological Science, Environmental Science and Aquatic Science (Reg number: 400213/11) with the South African Council for Natural Scientific Professions (SACNASP)

### 10.1.2. Main Findings of the Report

The proposed project is located approximately 6km to the south the town of Mapumulo, KwaZulu-Natal Province. The proposed project is located in the Pongola - Mtamvuna Water Management Area (WMA 4), within the U40G quaternary catchment. The closest Sub Quaternary Reach (SQR) to the project is the U40G-3843 SQR. This river reach is a portion of the Hlimbitwa River system. An unnamed tributary of the Hlimbitwa River will be potentially affected by the proposed project. The considered quaternary catchment is not considered a National Freshwater Ecological Priority Area (NFEPA) (Nel et al., 2011).

The desktop data of the SQR is presented in Table 9 below:

**Table 9 Desktop information for the U40G-3843 Sub Quaternary Reach (SQR)**



Component / Catchment	U40G-3843
Present Ecological Status	Largely modified
Ecological Importance Class	High
Ecological Sensitivity	High
Default Ecological Category	Largely Natural



The results of the desktop assessment indicate that the considered SQR PES was in a class B or largely natural condition. Ecological importance in the SQR was determined to be high. The ecological sensitivity of the SQR was determined to be high. The Default Ecological Category for the considered river reach was class B or largely natural based on desktop information.

The rationality that was used for the selection of the location for the aquatic sampling point was based on the location of the proposed project immediately upstream of the sampling point. The aquatic sampling point, survey methods and photographs details are provided in **Table 10**.

**Table 10: Location of the Aquatic Sampling Points**

Site Name	Assessment Conducted	February 2018
<p>A3 (Upstream)</p> <p>Biology, Water and Habitat Quality</p>		
<p>A3 (Downstream)</p>		

### 10.1.3. Limitations and Assumptions by the Aquatic Specialists

- A single aquatic ecology survey was completed for this assessment. Thus, temporal trends were not investigated;
- No wetlands were considered in this study;
- The extent of the riparian zone was delineated on a desktop level;
- Due to the rapid nature of the assessment and the survey methods applied, fish diversity and abundance was likely to be under estimated;
- Invertebrates were only considered to the Family level and thus a defined species list for aquatic invertebrates was not completed;
- The specific activities and detailed infrastructure plans were not available at the time of writing this report;
- Only sites where there will be a proposed activity were selected for this assessment;
- No precise location for the proposed weir was available. It was therefore assumed that the location of the project would be in proximity to the existing dam structures;
- No alternatives were considered for this assessment.

### 10.1.4. Results and Discussions

#### 10.1.4.1. Water Quality

The results of the *in-situ* water assessment that was conducted indicates that no perturbations in terms of the physical water quality. Considering the rural setting of the study site, limited non-point and point source water quality impacts are expected.

The chemical water quality results of the selected sampling point are provided below in **Table 11**.

**Table 11: Chemical Water Quality Results at A3 (February 2018)**

Constitute	Result
pH	7.3
Electrical Conductivity (mS/cm)	12.3
Chloride (mg/l)	21
Nitrate (mg/l)	0.1
Phosphate (mg/l)	<0.2
Free and Saline Ammonia as N (mg/l)	0.3
Sulphate (mg/l)	4
As (mg/l)	<0.01
Ca (mg/l)	6
Cd (mg/l)	<0.01

Co (mg/l)	<0.01
Cr (mg/l)	<0.01
Cu (mg/l)	<0.01
Fe (mg/l)	0.404
Mg (mg/l)	3
Mn (mg/l)	<0.025
Ni (mg/l)	<0.01
Pb (mg/l)	<0.01

The results of the chemical water quality assessment indicate limited water quality deterioration in the considered river reach and confirm the *in situ* water quality results.

#### 10.1.4.2. Intermediate Habitat Integrity Assessment

The results of the instream and riparian integrity assessment derived a class D (largely modified) status for the considered river reach in this assessment. The predominant factor influencing the quality of the habitats are largely attributed to instream habitat modification relating to the direct impacts from the existing Imvutshane Dam (Refer to Figure 5).



Figure 5: Flow Regulation, Channel and Bed Modification (Site A3; February 2018)

#### **10.1.4.3. Macroinvertebrates**

Biological assessments were completed at a representative site in the considered river reaches. The invertebrate habitat at site A3 was assessed using the South African Scoring System version 5 (SASS5) biotope rating assessment as applied in Tate and Husted (2015). Habitat availability within the assessed watercourse were rated as poor. The low biotope score can be attributed to low diversity/abundance of both the stones in current and vegetation biotopes.

The results of the SASS5 assessment derived SASS5 scores that was 54 with 11 macroinvertebrate families observed with an ASPT of 4.9. The ecological class was found to be class D at the sampled point.

The results of the MIRAI assessment indicate that a seriously modified invertebrate community was present in the considered watercourse based on the survey results. Flow modification was determined to be the primary driver of the macroinvertebrate community. However, considering the overall results, each metric considered was modified and therefore the poor condition of the macroinvertebrate assemblage can be attributed to the cumulative impacts of poor aquatic habitat and flow modification.

Water was being released by the Imvutshane Dam at the time of the survey. It is therefore likely that this release has exacerbated the current ecological modification. Additional surveys are therefore recommended.

#### **10.1.4.4. Fish Community**

A total of 9 fish species were sampled during the February 2018 survey. The sampled species included a listed species. The listed species is *Oreochromis mossambicus* which is listed as Near Threatened (IUCN, 2017). The listed species is threatened by hybridisation and therefore the proposed project will not negatively affect the population of this species. Expected native species composition was determined at the sampled site based on site specific habitat features. Sampled native fish community structures were calculated according to the percentage of the expected fish species sampled at site A3.

The results of the FRAI derived a moderately modified (class C) fish community structure in the unnamed tributary. This modified fish community was largely attributed to the absence of several fish species which is attributed to instream habitat modification. Despite the poor invertebrate responses, the fish community was largely intact. This can be explained through the release of water from the Imvutshane Dam during the survey. It is likely that the release of water resulted in a migratory response from several species which accumulated below the dam wall during the survey. Additional surveys are therefore recommended.

#### **10.1.4.5. Overall Aquatic Ecology Present Ecological Status**

The results of the PES assessment derived largely modified (class D) conditions in the river reach considered in this assessment. The modified conditions were largely attributed to habitat quality level impacts which have resulted in the modification of instream habitat and invertebrate communities. The results of the PES are provided in table 12 below:

**Table 12: Present ecological Status of the river reach assessed in the February 2018 survey**

Aspect Assessed	Ecological Category
Instream Ecological Category	56
Riparian Ecological Category	58
Aquatic Invertebrate Ecological Category	34
Fish Ecological Category	62
Ecostatus	Class D

#### **10.1.4.6. Aquatic Ecological Importance and Sensitivity**

The overall Ecological Importance and Sensitivity (EIS) of the river reach in this study were guided by the desktop information. Several fish species observed during the assessment are considered to be sensitive to flow modification. The downstream SQR data for EIS therefore stands for this project and the unnamed tributary is therefore considered to be of high importance and high sensitivity.

#### **10.1.5. Risk Assessment and Recommendations**

Based on the requirements for the completion of the proposed project the following activities will take place. It is noted that these activities have been drafted based on the Design Report (Umgeni Water, 2016). It is noted that the proposed structure will be approximately 50m downstream of the existing Imvutshane Dam wall.

The results of the risk assessment derived a variety of risk ratings for the proposed project. Activities which entail the physical alteration of the watercourse and its habitats were derived to be moderate risk activities before mitigation.

In addition, due to the permanent presence of the weir, the risk rating for the operation and maintenance activity of the broad crest weir structure were determined to be moderate.

#### **10.1.6. Cumulative Impacts**

The baseline environment indicates that some sensitive aquatic biology were present at the time of sampling. In addition, the proposed project will be located approximately 50m downstream of the existing Imvutshane Dam wall. Considering the location of the proposed project, the cumulative impact on fish migration and loss of aquatic habitat is considered negligible.

#### **10.1.7. Mitigation actions recommended by the Aquatic Specialists**

- The working areas should be outside of the proposed 30m buffer zone if feasible;
- Construction activities are proposed to be conducted in the dry season (April-August);
- Releases of water from the Imvutshane Dam should be limited during the construction period;
- Laydown yards for construction materials should be placed outside a 30m buffer zone from the rivers;
- No chemicals, building materials hydrocarbons or soils must be stockpiled within the 30m buffer zone;
- River diversions must be done in a manner that avoids downstream erosion;
- Any disturbed areas must be re-vegetated with indigenous plant species.

### **10.1.8. Conclusion and Recommendations**

The results of the PES assessment derived largely modified (class D) conditions in the river reach considered in this assessment. The modified conditions were largely attributed to habitat quality level impacts which have resulted in the modification of instream habitat and macroinvertebrate communities.

The results of the risk assessment derived a variety of risk ratings for the proposed project. Activities which entail the physical alteration of the watercourse and its habitats were derived to be moderate risk activities before mitigation.

In addition, due to the permanent presence of the weir, the risk rating for the operation and maintenance activity of the broad crest weir structure were determined to be moderate.

The baseline environment indicated some sensitive aquatic biology were present. In addition, the proposed project will be located approximately 50m downstream of the existing Imvutshane Dam wall. Considering the location of the proposed project, the cumulative impact on fish migration and loss of aquatic habitat is considered negligible.

Considering the status of the aquatic ecosystems, and furthermore the nature and requirements of the project, the proposed project has the potential to negatively affect local ecology. However, should the proposed mitigation actions be implemented, impacts may be reduced. In light of the above mentioned, it is the opinion of the specialist that no significant fatal flaws could be identified through the completion of this aquatic ecology study.

## 10.2. Wetland Delineation and Risk Assessment

### 10.2.1 Details of the Specialist

Specialist Details	
Organisation:	Afzelia Environmental Consultants
Name:	Mr. Andrew Briggs
Qualifications:	MSc Conservation Ecology (Stellenbosch University)
Affiliation (if applicable)	Candidate Natural Scientist (Reg number: 116886) with the South African Council for Natural Scientific Professions (SACNASP)

### 10.2.2. Main Findings of the Report

Investigation of the site in close proximity to the proposed Imvutshane Dam gauging weir, as well as within the 500m DWS regulated area for water use, yielded no definable wetland units. The topography surrounding the study site was very steep, similar to that found at both the Umzinto Dam and EJ Smith Dam sites, and accordingly, with the exception of the Imvutshane Dam (artificial reservoir), the study area comprised primarily of riverine areas and drainage lines.

A raw water pump house, which is located approximately 30m east of the active channel of the Imvutshane River, appears to consistently discharge a small amount of water, via open drains and a pipe outlet, into the Imvutshane River. The potential erosion associated with this discharge has been mitigated by the strategic placement of Reno-mattresses, which has caused localised impoundment and subsequently led to the formation of a small patch of artificial wetland habitat. The artificial nature and formation of this habitat indicates that it is irrelevant with regards to this assessment.

A flat, flood bench feature was also noted within the macro channel of the Imvutshane River. The vegetation was a secondary grassland community dominated by *Sporobolus pyramidalis* with a moderate to low abundance of *T. minuta* and *L. camara*. The soils comprised a dark brown-grey sandy clay, with some faint orange mottling up to approximately 20cm where after distinct sandy alluvial material was found. Given the location of the flood bench (alongside the active channel of the Imvutshane River) and the overall soil characteristics, the flood bench appears to be driven by natural upstream fluvial processes and therefore comprises riparian habitat, not wetland habitat.

The majority of soils within the drainage lines alongside the Imvutshane River comprised brown sand and were colonised by a variety of alien species including *L. camara*, *T. diversifolia*, *T. minuta* and *Ricinus communis*.



**Photo 1: View of the drain and entrance to the outlet pipe of the raw water pumphouse in close proximity to the Imvutshane River.**



**Photo 2: View of the gabion retaining wall below the outlet pipe which are acting as a control to minimise erosion caused by the discharge of water from the raw water pumphouse.**





**Photo 3:** An example of dark brown sandy terrestrial soils extracted from alongside a drainage line within the study area. Note the absence of wetland indicators (i.e. mottling or grey soil matrix).



**Photo 4:** Down stream view from a low bridge immediately below the Imvutshane Dam wall showing the active channel and riparian habitat of the Imvutshane River.



**Photo 5: Soil sample showing a dark brown-grey sandy clay soil matrix underlain by alluvial material extracted from a flood bench within the macro channel of the Imvutshane River**



**Photo 6: View of the flood bench on the left-hand side of the Imvutshane River. The large trees are in close proximity to the edge of the active channel of the river.**

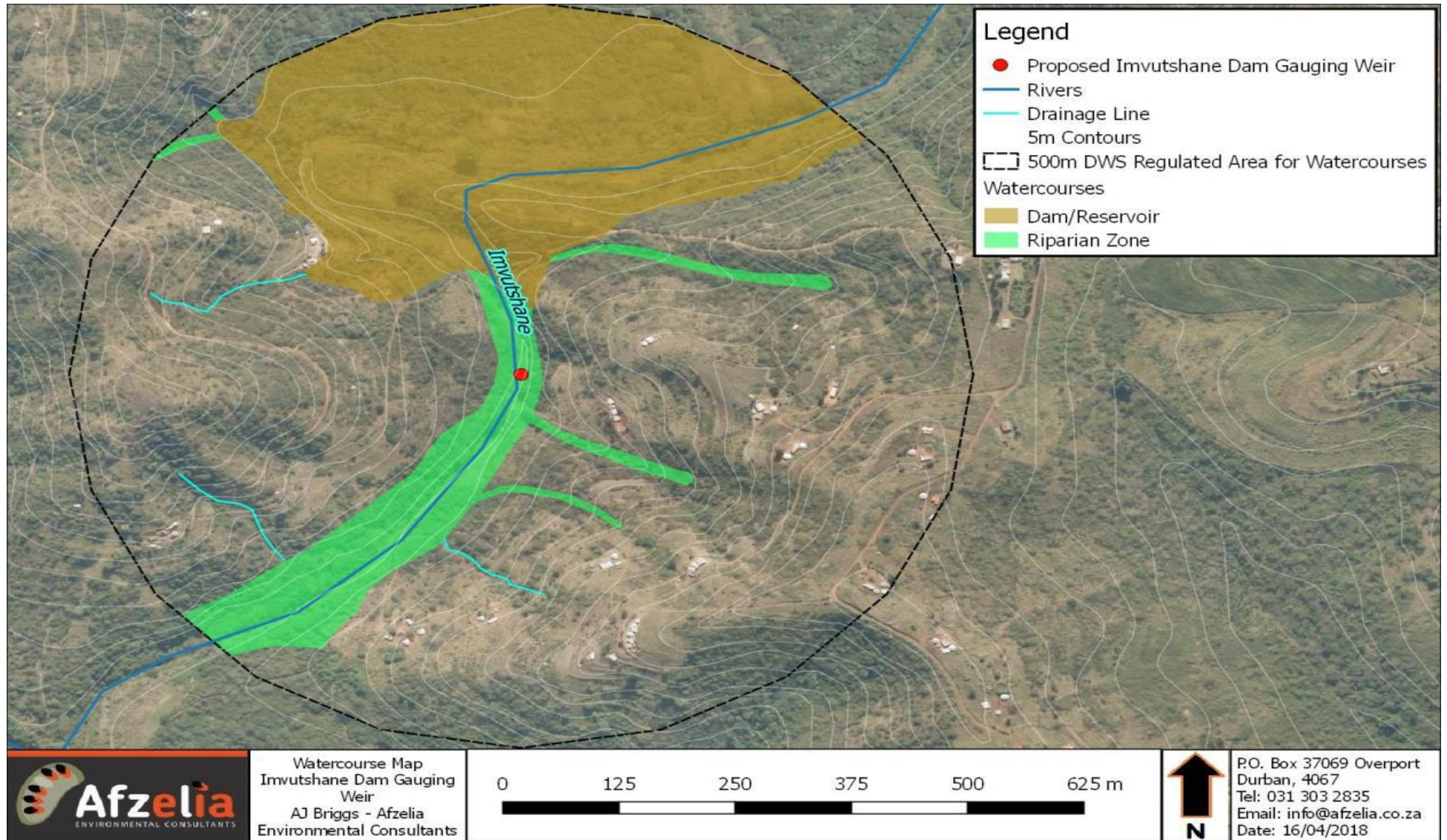


Figure 6: Watercourse map showing the riparian units in the vicinity of the proposed Imvutshane Dam Gauging weir.

### **10.2.3. Impact Risk Assessment**

The Department of Water and Sanitation (DWS) Notice 509 of 2016 (General Authorisation in terms of Section 39 of the National Water Act 36 of 1998) for water uses as defined in Section 21 (c) and (i) stipulates that a risk assessment must be conducted for all wetlands within 500m (wetland regulated area of a watercourse) of a development. The GA also stipulates that a risk assessment must be conducted for all riparian habitats should the activity fall within the delineated boundary of the river or within the 1:100 year floodline of the river.

There were no wetland units identified in close proximity to the proposed Imvutshane Dam gauging weir, as well as within the 500m DWS regulated area for water use.

It must be noted that an impact and risk assessment will be necessary for the riparian habitats on the site as these habitats will likely derive certain negative impacts from the proposed gauging weir construction.

### **10.2.4. Assumptions and Limitations**

- The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge.
- The hand-held Garmin GPSmap 60Cx used to delineate the wetland habitat and record various points of interest had an accuracy of  $\leq 3\text{m}$ .
- Only wetlands that were likely to be impacted by proposed development activities were assessed in the field. Wetlands located within a 500m radius of the sites but not in a position within the landscape to be measurably affected by the developments were not considered as part of this assessment.
- Riparian zones were mapped using the best available desktop spatial datasets as well as onsite data from the aquatic assessment report compiled by The Biodiversity Company (2018).

### **10.2.5. Conclusion**

The vast majority of watercourse units located within the respective study area were riparian zones, although many invaded drainage lines were also present.

No risk assessment was completed as part of this report due to the fact that no definable wetland habitat was identified in a position within the landscape where it may receive impacts from the proposed weir development. The specialist has noted that the riparian areas in close proximity to the proposed gauging weir site will require complete impact and risk assessments as stipulated by DWS.

## 11. Impact Assessment

### 11.1. Overview

This section of the Report focuses on the pertinent environmental impacts that could potentially be caused by the proposed Imvutshane Dam Broad Crested Weir during the pre-construction, construction and operational phases of the project.

An “impact” refers to a change in an environment that results from an environmental activity (or aspect), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

Identified potential environmental impacts are linked to the project activities, which relates to the proposed development and its associated infrastructure.

### 11.2. Project Alternatives

For the purpose of efficient and effective monitoring, aspects that are associated with construction, have been outlined into different sections for pre-construction, construction and operational phases. In order for one to understand impacts that are related to the proposed project, it is important to unpack the activities that are associated with the project cycle.

PRE-CONSTRUCTION PHASE
Project Activities
<ul style="list-style-type: none"><li>• Applicant (Umgeni Water) to appoint an ECO</li><li>• Negotiations and agreements with any affected landowners and stakeholders</li><li>• Detailed engineering design</li><li>• Detailed geotechnical design</li><li>• Site survey</li><li>• Procurement of contractors</li><li>• Marking of the construction servitude</li><li>• Capture pre-construction photographic records</li><li>• Development of method statements</li><li>• Approval of method statements</li><li>• The development and approval of construction plans</li><li>• Construction site planning including, but not limited to, access and layout.</li></ul>

## Environmental Activities

- Diligent compliance monitoring of the EA, EMPr and any other relevant environmental legislation.
- Barricading and installing barriers around buffer areas that are identified in the specialist studies.
- Ongoing consultation with landowners and affected parties.
- Establish the baseline water quality data for river crossings that are based on the aquatic and wetland studies.

## CONSTRUCTION PHASE

### Project Activities

- Site Establishment (including the sit camp and labour camp areas).
- Fencing of the construction site camp area.
- Registration of the servitude.
- Site clearing.
- The delivery of construction material to site.
- The transportation of equipment, machinery, materials and personnel to site.
- The storage and handling of material (hazardous and non-hazardous).
- Cut, fill and cover activities.
- Designated areas for the stockpiling of sand, crushed stone, aggregate, etc.
- Stormwater control procedures or mechanisms.
- The management of the topsoil and spoil on the site.
- The management of waste and waste water on the site.
- Traffic control measures on site.
- Bulk earthworks.
- Security for the site.
- Electrical supply for the site.
- The construction of the weir and the abstraction works.
- Concrete works.
- Temporary river diversion for the weir.
- Rehabilitation.

### **Environmental Activities**

- The rehabilitation of the construction footprint or area.
- The control of invasive plant species.
- Diligent compliance monitoring of the EA, EMPr and other relevant environmental legislation.
- Conduct environmental awareness training of all site personnel.
- Implement the EMPr.
- Ongoing consultation with landowners and affected parties.
- The ongoing search, rescue and relocation of any red data, protected and endangered species, medicinal plants etc.
- The ongoing monitoring of red data, protected ad endangered species, medicinal plants etc.
- Storage and use of construction materials and hydrocarbons.
- Rehabilitation activities.

### **OPERATIONAL PHASE**

#### **Project Activities**

- Servitude access and management requirements.
- The routine maintenance and inspection of the rehabilitated abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and V-Notch Gauge.
- Repair and maintenance work of the of the rehabilitated abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and V-Notch Gauge.

### **Environmental Activities**

- Erosion monitoring programme.
- The management of sensitive areas.
- The management of vegetation clearance.
- Stormwater control management.
- Pollution control measures.
- Operation and maintenance of the rehabilitated weir and the V-Notch Gauge
- The control of invasive plant species.
- Satisfy the EWR.
- Ongoing consultation with landowners and affected parties.

### 11.3. Environmental Aspects

Environmental aspects are regarded as components that are associated with a development / construction's activities, products and services that may interact with the environment and cause and impact to the environment. The environmental aspects that have been identified for the proposed Imvutshane Dam broad crested gauging weir, are linked to the project activities.

#### ENVIRONMENTAL ASPECTS

##### Pre-construction Phase

- Insufficient construction site planning and engineering layout designs.
- Poor consultation with landowners, affected parties, stakeholders and authorities.
- Site specific environmental issues are not being fully understood.
- Inadequate environmental and compliance monitoring of the site.
- The absence of relevant permits for the site.
- Lack or inadequate provision of barricading of sensitive areas and environmental features.
- Poor waste management practices on site.
- Absence of ablution facilities.

#### ENVIRONMENTAL ASPECTS

##### Construction Phase

- Inaccurate walk-down survey of the site.
- Inadequate environmental and compliance monitoring of the site.
- Lack of environmental awareness.
- Construction beginning without search and rescue of indigenous and protected plant species.
- Indiscriminate site clearing.
- Poor site establishment.
- The poor management of access and use of areas for access that are not approved.
- Poor transportation practices.
- Poor traffic management.
- The disturbance of topsoil
- The disruptions to any existing services.
- Poor consultation with landowners and affected parties.



## ENVIRONMENTAL ASPECTS

### Construction Phase

- The inadequate storage and handling of material.
- The inadequate storage and handling of hazardous material on site.
- Erosion.
- Poor maintenance of equipment and machinery on site.
- Pollution from the ablution facilities.
- Poor management of the construction camp area.
- Poor waste management practices – hazardous, general solid and liquid.
- Poor management of the any pollution generation activities.
- Poor management of water.
- Damage to any significant fauna and flora.
- Environmental damage to any sensitive area.
- The disruption of any archaeological and culturally significant features if encountered.
- Increase in noise levels due to construction activities.
- Increase in dust and emissions into the environment.
- The influence to resource quality of the affected river from the river diversions.
- Poor rehabilitation practices of areas.

### Operational Phase

- Poor consultation with affected parties, stakeholders, authorities and landowners.
- Lack of environmental and compliance monitoring of the gauging weir and abstraction works.
- Poor management of vegetation.
- Inadequate monitoring and management of access, routine maintenance and maintenance works,
- Not complying and satisfying the EWR.

## 11.4. Potential Significant Environmental Impacts

Environmental impacts are changes that occur in an environment as a result from an environmental aspect, whether desirable or undesirable. The potential significant impacts that are associated with the preceding activities and environmental aspects for the pre-construction, construction and operation phase of the proposed Esperanza Pump Station gauging weir are stated below.

### Potential significant environmental impacts during the Construction Phase.

Feature	Impact
Topography of the site	<ul style="list-style-type: none"> <li>➤ Visual impacts during construction.</li> <li>➤ Crossing of watercourses (topographic features).</li> <li>➤ Erosion of affected areas.</li> </ul>
Geohydrology of the site.	<ul style="list-style-type: none"> <li>➤ Groundwater pollution due to the occurrence of any spillages on site.</li> </ul>
Surface Water	<ul style="list-style-type: none"> <li>➤ Increased stormwater runoff on site.</li> </ul>
Geology and Soil	<ul style="list-style-type: none"> <li>➤ Impacts that are associated with the sourcing of construction material.</li> <li>➤ Loss of topsoil.</li> <li>➤ Soil erosion through the clearance of areas and construction activities.</li> <li>➤ Soil contamination through construction related activities. (cement spillages, diesel or oil spillages, chemical spillages, etc).</li> <li>➤ The compaction and erosion of removed and stockpiled soil on site.</li> <li>➤ Contamination of soil through the incorrect storage, handling, disposal of hazardous waste on site.</li> <li>➤ Poor stormwater control measures during construction resulting in erosion.</li> </ul>
Flora	<ul style="list-style-type: none"> <li>➤ The loss of sensitive vegetation.</li> <li>➤ The loss of sensitive habitats.</li> <li>➤ Damage and loss of vegetation of conservation significance.</li> <li>➤ Proliferation of exotic vegetation in disturbed areas.</li> <li>➤ Destruction of potential red list plants during site clearing and construction.</li> <li>➤ Disturbance of sensitive plant species during relocation processes.</li> </ul>
Fauna	<ul style="list-style-type: none"> <li>➤ Loss of habitats during the site clearing process.</li> <li>➤ Loss of habitats during construction.</li> <li>➤ The illegal poaching or hunting of mammals.</li> </ul>

**Noise**

**Aesthetics**

**Air Quality**

**Transportation**

**Safety and security**

**Socio-economic (positive)**

**Socio-economic (negative)**

**Waste Management**

**Water Users**

**Riparian Habitat**

- Killing of snakes during the construction phase due to lack or poor environmental education procedures.
- Potential illness and or death of fauna due to pollution and or littering.
- Damage or clearance of habitats of conservation importance.
- Loss of fauna species of conservation importance.
- The obstruction to the corridors of movement that are used by animals.
- Disturbance / stressing of sensitive fauna;
- Noise nuisance.
- Reduction in visual quality of the area.
- Increase in dust levels.
- Greenhouse gas emissions.
- Increase in traffic on the local road network
- Safety risk to landowners and surrounding communities.
- Generation of employment opportunities for the local community.
- Contribution to the local community
- Safety and security issues.
- Conflicted land uses.
- Nuisance from noise and dust.
- Inappropriate disposal of hazardous waste, causing contamination of soil by spillages from chemicals, oil / diesel, cement etc.
- The inappropriate disposal of excess spoil material (rock and soil) that is generated as part of the earthworks causing changes to drainage patterns, smothering sensitive vegetation.
- Land, air and water pollution through poor waste management practices.
- Water quality deterioration and disturbance to the flow caused by construction activities may adversely affect downstream water users.
- Water that will be abstracted from watercourses for construction purposes causing flow reduction and ecological damage downstream.
- The loss of riparian and instream vegetation within the construction footprint.

### **Aquatic Ecology**

### **Flow Regime**

### **Water Quality**

- The change in the morphological characteristics of the river.
- The destruction of wetland or aquatic habitat units.
- Soil erosion.
- Disruptions to the aquatic biota community due to water contamination.
- Disruption to the aquatic biota community due to the alteration of the flow.
- Disturbance to the aquatic biota community during construction activities.
- Alteration to habitat.
- The loss of aquatic -dependant biodiversity.
- Alteration of flow causing loss of aquatic biodiversity.
- The release of contaminants from equipment and concreting activities causing reduction in water quality.
- Water quality impacts due to siltation and pollution.
- The inflow of contaminated stormwater causing reduction in surface water quality.

## Potential significant environmental impacts for the Operation Phase.

Feature	Impact
Topography	➤ Loss of visual amenity for local people due to additional infrastructure, poor waste management, erosion, change in landform, clearance of vegetation, alien plant encroachment.
Flora	➤ The encroachment by exotic species due to site clearance and the lack of an alien invasive plant eradication programme for the site.
Aesthetics	<ul style="list-style-type: none"> <li>➤ The visibility of the weir and abstraction works to the visual receptors.</li> <li>➤ Poor rehabilitation procedures for the construction footprint.</li> </ul>
Water	➤ Damage to the weir and abstraction works from the occurrence of major flooding.
Socio – Economic (positive)	➤ The generation of employment activities for the local community
Socio – Economic (negative)	<ul style="list-style-type: none"> <li>➤ Safety and security issues through the improper access control during inspections and maintenance activities.</li> <li>➤ The increase in the use of the local road network for the operation and maintenance purposes.</li> </ul>

### 11.5. Impact Assessment Methodology

The impact assessment that is carried out for each environmental impact that may arise from the proposed project, forms the basis in order to determine which management measures that will be required to prevent or minimise these impacts. It is also a means in which the mitigation measures that are determine in the impact assessment which are then translated to action items. These actions items are required in order to prevent or to keep those impacts that cannot be prevented within acceptable levels.

In order to establish best management practices and prescribe mitigation measures, the following project-related information needs to be adequately understood:

- ✚ **Activities** that are associated with the proposed project;
- ✚ **Environmental aspects** that are associated with the project activities;
- ✚ **Environmental impacts** resulting from the environmental aspects; and
- ✚ The nature of the surrounding **receiving environment**.

Information provided by specialists was used to calculate an overall impact score by multiplying the product of the nature, magnitude and the significance of the impact by the sum of the extent, duration and probability based on the following equation:

$$\text{Overall Score} = (N \times M \times S) \times (E + D + P)$$

Where:

- N = Nature;
- E = Extent
- M = Magnitude
- D = Duration
- P = Probability
- S = Significance

**Table 13: Impact Methodology Table**

Nature				
Negative Impact		Neutral Impact		Positive Impact
-1		0		+1
Extent				
Local	Regional		National	International
1	2		3	4
Magnitude				
Low		Medium		High
1		2		3
Duration				
Short Term (0-5 years)		Medium Term (5-11 years)		Long Term
1		2		3
Probability				
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain
1	2	3	4	5
Significance				
No Impact / None	No Impact After Mitigation / Low		Residual Impact After Mitigation / Medium	Impact Cannot be Mitigated / High
0	1		2	3

The following definitions apply:

For the methodology for the impact assessment, the analysis is conducted on a qualitative basis with regards to the **nature, extent, magnitude, duration, probability and significance** of the impacts.

**The following scoring system applies:**

#### **Nature / Status**

The project could have a positive, negative or neutral impact on the environment.

#### **Extent**

- **Local** – extends to the site and its immediate surroundings.
- **Regional** – impact on the region but within the province.
- **National** – impact on an interprovincial scale.
- **International** – impact outside of South Africa.

#### **Magnitude**

Is the degree to which an impact may cause irreplaceable loss of resources.

- **Low** – natural and social functions and processes are not affected or minimally affected.
- **Medium** – the affected environment is notably altered, the natural and social functions and processes continue albeit in a modified way.
- **High** – the natural or social function or processes could be substantially affected or altered to the extent that could temporarily or permanently cease.

#### **Duration**

- **Short term** – 0-5 years.
- **Medium term** – 5 – 11 years.
- **Long term** – the impact ceases after the operation life cycle of the activity either because of natural processes or by human intervention.
- **Permanent** – mitigation is either by natural process or by human intervention, will not occur in such a way or in such a time span that the impact can be considered transient.

#### **Probability**

- **Almost certain** – that the event is expected to occur in most circumstances.
- **Likely** – that the event will probably occur in most circumstances.
- **Moderate** – that the event should occur at some time.
- **Unlikely** – that the event could occur at some time.
- **Rare / Remote** – that the event may occur in exceptional circumstances.

#### **Significance**

Provides an overall impression of an impacts importance, and the degree to which the impact can be mitigated.

The range for significance ratings are as follows:

- 0** – Impact will not affect the environment; therefore, no mitigation is necessary.
- 1** – No impact after mitigation.
- 2** – Residual impact after mitigation.
- 3** – Impact cannot be mitigated.

Impact Scores will be ranked in the following way as listed in the table below:

**Table 14 Ranking of overall impact score**

Impact Rating	Low / Acceptable Impact	Medium	High	Very High
Score	0 to 30	31 to 60	61 to 90	91 to 117

## **12 Impact Management**

The impacts for each environmental feature that has been identified are assessed for the pre-construction, construction and operation phases for the proposed Imvutshane Dam Broad Crested Gauging Weir.

### **12.1. Geohydrology**

#### **12.1.1. Potential Impacts**

Groundwater could adversely affect excavation conditions, stability of excavated slopes and trenches. Pumping and possibly local de-watering will be required.

Groundwater may be impacted on as follows during the construction phase:

- Contamination of the groundwater resulting from the incorrect storage/handling and disposal of hazardous waste materials.
- Contamination of groundwater through spillages from equipment, machinery and vehicle storage



### 12.1.2 Impact Assessment

Geohydrology							
<b>Project Lifecycle</b>	Construction and Operational Phases						
<b>Potential Impact</b>	Contamination through spillage of fuel, hazardous chemicals, leaking vehicles, leaking machinery, etc.						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ All construction activities to comply with the NWA.</li> <li>❖ Ensure that all containers and storage areas within which hazardous materials are stored comply with the relevant SANS standards to prevent leakage.</li> <li>❖ Regularly inspect all vehicles for leaks.</li> <li>❖ Re-fuelling of vehicles must take place off-site; if this is not possible then re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil.</li> <li>❖ Littering is prohibited. Adequate number of rubbish bins shall be provided during the construction and operational phases to ensure proper disposal of rubbish.</li> <li>❖ Staff must be trained to deal with fuel/chemical spills and spill kits must be easily available at all times.</li> <li>❖ Mixing of cement and concrete must be done on impermeable surface and all spills must be cleaned up immediately.</li> <li>❖ Ensure that all activities impacting on groundwater resources are managed according to the relevant DWS licensing requirements.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Medium	Short Term	Moderate	2	24
<b>With Mitigation</b>	Negative	Local	Low	Short Term	Unlikely	1	4

## **12.2. Surface Water**

### **12.2.1. Potential Impacts**

- Poor storage and use of construction materials and hydrocarbons (Construction Phase) causing contamination of water resources;
- Lack of or poor rehabilitation activities (Construction Phase) resulting in erosion and siltation of water courses;
- Operation and maintenance of the rehabilitated weir (Operation) causing flow reduction;

### 12.2.2. Impact Assessment

Surface Water - Hydrology							
<b>Project Lifecycle:</b>	Construction Phase						
<b>Potential Impact</b>	Impacts to watercourses from temporary diversions						
<b>Proposed Mitigation</b>	Minimise influence to downstream flow regime when diverting and impeding flow (cofferdams, temporary river crossings etc.). • Prevent erosion caused by temporary in-stream diversion. Install suitable buttressing / stabilisation structures to prevent future erosion, if required. • Select appropriate crossing points (geotechnical conditions, sensitivity of riparian habitat and in-stream habitat), depending on technical feasibility.						
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Short Term	Likely	2	24
<b>With Mitigation</b>	Negative	Local	Low	Short Term	Unlikely	1	4
<b>Project Lifecycle:</b>	Operational Phase						
<b>Potential Impact</b>	Impact to the flow regime in the Hlimbitwa River during the operation of the Broad Crested Gauging weir.						
<b>Proposed Mitigation</b>	❖ Water must not be abstracted from the Hlimbitwa River to the extent that it impacts negatively on the EWR of the river. The EWR must be satisfied and over abstraction must not take place.						
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Short Term	Moderate	2	12
<b>With Mitigation</b>	Negative	Local	Low	Short Term	Unlikely	1	4

Surface Water – Water Quality							
<b>Project Lifecycle:</b>	Construction and Operational Phase						
<b>Potential Impact</b>	Contamination of surface water through sedimentation from silt-laden run-off from disturbed areas.						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Conduct water quality monitoring (baseline and during construction) at suitable up - and downstream sites.</li> <li>❖ All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area.</li> <li>❖ Storage area and ablution facilities to be located a minimum of 50m from edge of riparian habitat areas.</li> <li>❖ Where necessary, install in-stream silt traps during construction within the watercourse channel and along the riparian habitat.</li> <li>❖ The style of silt trap will depend on materials used and the water movement patterns.</li> <li>❖ Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses.</li> <li>❖ Ensure proper storage of material (including fuel, chemicals, lubricating fluids, hydraulic fluid and paints, etc) that could cause water pollution.</li> <li>❖ Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand.</li> <li>❖ Reduce sediment loads in water from dewatering operations.</li> <li>❖ All dewatering should be done through temporary sediment traps (e.g. constructed out of geo-textiles and hay bales)</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Medium	Short Term	Moderate	2	20
<b>With Mitigation</b>	Negative	Local	Low	Short Term	Unlikely	1	4
<b>Project Lifecycle:</b>	Construction and Operational Phase						
<b>Potential Impact</b>	Contamination through spillage of fuel, Hazardous chemicals; cement, leaking vehicles and machinery, etc.						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage.</li> <li>❖ Regularly inspect all vehicles for leaks.</li> <li>❖ Re-fuelling of vehicles must take place off-site.</li> <li>❖ Littering is prohibited. Ensure that an adequate number of rubbish bins is provided during the construction and operational phases to facilitate proper disposal of rubbish.</li> <li>❖ Staff must be trained to deal with fuel/chemical spills and spill kits must be easily available at all times</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>

<b>Without Mitigation</b>	Negative	Local	Medium	Short Term	Moderate	2	20
<b>With Mitigation</b>	Negative	Local	Low	Short Term	Unlikely	1	4
<b>Project Lifecycle:</b>	Construction and Operational Phase						
<b>Potential Impact</b>	Inadequate Stormwater management causing erosion and possible damage to construction operations / infrastructure due to lack of maintenance.						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Existing stormwater infrastructure should be maintained during construction activities to prevent the deterioration and subsequent failure of current infrastructure.</li> <li>❖ Temporary berms should be constructed on the downstream perimeter of the site to channel runoff containing silt to a location where silt is allowed to settle prior to discharging into the existing stormwater infrastructure or natural watercourse.</li> <li>❖ The main contractor is to control stormwater during construction by installing berms at the top of all cut and fill embankments.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Medium	Short Term	Moderate	2	20
<b>With Mitigation</b>	Negative	Local	Low	Short Term	Unlikely	1	4

The methodology used by the aquatic specialist differs slightly from that described in Section 13. All impacts were analysed with regards to their nature, extent, magnitude, duration, probability and significance.

The assessments that follow were extracted from the Aquatic and Wetland Baseline and Impact Assessment (The Biodiversity Company, 2018) (Tables 15, 16 and 17).

**Table 15: Activity and impact table for the Proposed Project**

Phase	Activity	Aspect	Impact
<b>Construction</b>	Site access and clearing of working areas.	Reduced vegetative cover and compaction of soils	<ul style="list-style-type: none"> <li>Increased runoff and erosion</li> </ul>
	Excavations	Alterations to water chemistry, Stream channel construction activities	<ul style="list-style-type: none"> <li>Deterioration of water quality, alteration of instream and bankside aquatic habitat</li> </ul>
	Explosives	Alterations to water chemistry, direct impact to aquatic fauna and hydrological alteration	<ul style="list-style-type: none"> <li>Loss of aquatic habitat, deterioration of water quality and direct impacts to aquatic fauna</li> </ul>
	River diversion	Stream channel construction activities	<ul style="list-style-type: none"> <li>Alteration of instream and bankside aquatic habitat</li> </ul>
	Storage and use of construction chemicals and hydrocarbons	Contaminated runoff	<ul style="list-style-type: none"> <li>Deterioration of water quality</li> </ul>
	Construction of broad crested weir	Hydrological alteration	<ul style="list-style-type: none"> <li>Alteration of hydrology</li> </ul>
<b>Operation</b>	Operation and maintenance of the broad crested weir.	Physical presence of structure	<ul style="list-style-type: none"> <li>Modification of instream habitats</li> </ul>

Table 16: DWS Risk Impact Matrix for the Proposed Project

Aspect	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial Scale	Duration	Consequence
<b>Construction Phase</b>								
Site access and clearing of working areas	1	2	2	2	1.75	2	1	4.75
Excavations	2	2	2	3	2.25	2	1	5.25
River diversion	2	2	2	3	2.25	2	1	5.25
Storage and use of construction chemicals and hydrocarbons	0	1	1	1	0.75	1	1	2.75
Rehabilitation activities	3	2	2	2	2.25	2	1	5.25
<b>Operational Phase</b>								
Operation and maintenance of the broad crested weir	3	2	2	2	2.25	2	1	5.25

Table 17: DWS Risk Impact Matrix for the Proposed Project

Aspect	Frequency of Activity	Frequency of Impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
<b>Construction Phase</b>								
Site access and clearing of working areas	2	3	1	3	9	42.75	Low	Low
Excavations	2	4	5	1	12	63	*Moderate	Low
River diversion	2	4	5	1	12	63	*Moderate	Low
Storage and use of construction chemicals and hydrocarbons	2	3	1	3	9	24.75	Low	Low
Construction of Broad Crest Weir	2	4	5	1	12	63	Moderate	Low
<b>Operational Phase</b>								
Operation and maintenance of the Broad Crested weir	5	5	5	1	16	84	Moderate	Moderate
(*) denotes-In accordance with General Notice 509 'Risk is determined after considering all listed control / mitigation measures. Borderline moderate risk scores can be manually adapted downwards up to a maximum of 25 points (from a score of 80).								



The following recommendations are provided for the project:

- The working areas should be outside of the proposed 30m buffer zone if feasible;
- Construction activities are proposed to be conducted in the dry season (April-August);
- Releases of water from the Imvutshane Dam should be limited during the construction period;
- Laydown yards for construction materials should be placed outside a 30m buffer zone from the rivers;
- No chemicals, building materials hydrocarbons or soils must be stockpiled within the 30m buffer zone;
- River diversions must be done in a manner that avoids downstream erosion;
- Any disturbed areas must be re-vegetated with indigenous plant species.

## **12.3. Geology and Soil**

### **12.3.1. Potential Impacts**

The proposed development of the broad crested gauging weir will require suitable geological founding conditions.

During the construction phase for the proposed project, areas of vegetation will be cleared, this may lead to soil erosion. The EMPr will address this issue and include suitable erosion and water management measures in order to minimise the risk of erosion.

Soil may be contaminated by the poor storage of construction material (including hazardous substances), inadequate housekeeping practices and spillages (i.e. cement, diesel/oil etc). Specific mitigation measures are contained in the EMPr, where the primary objective is for the effective and safe management of materials on site, in order to minimise the impact of these materials on the biophysical environment.

### 12.3.2 Impact Assessment

<b><u>Geology and Soil</u></b>							
<b>Project Life Cycle:</b>	<b>Construction and Operational Phases</b>						
<b>Potential Impact:</b>	<b>Soil Erosion</b>						
<b>Proposed Mitigation:</b>	<p><u>Erosion Control:</u></p> <ul style="list-style-type: none"> <li>❖ Suitable erosion protective measures to be implemented for access roads.</li> <li>❖ Stabilisation of cleared areas to prevent and control erosion. The method chosen (e.g. watering, planting, retaining structures, commercial anti-erosion compounds) will be selected according to the site-specific conditions.</li> <li>❖ Monitoring to be conducted to detect erosion at least on a weekly basis and immediately after rain events</li> <li>❖ Exposed areas to be rehabilitated as soon as possible to avoid erosion.</li> <li>❖ The Contractor shall take measures to the approval of the Engineer to ensure that there is no undue stormwater damage and soil erosion resulting from the construction activities outside the construction camp and works areas.</li> <li>❖ During construction, water diversion soil berms will be constructed to divert surface and stormwater from traversing the disturbed areas.</li> <li>❖ Sufficient cross and side stormwater drainage measures shall be constructed on access roads to the site to prevent erosion.</li> <li>❖ At all stages of the project lifespan, stormwater control measures as specified by the Engineer shall be applied to keep soil on site by minimising:               <ul style="list-style-type: none"> <li>▪ The erosion of temporary stockpiles of topsoil and permanent spoil dumps;</li> <li>▪ The erosion from construction roads, excavations and the other cleared areas;</li> <li>▪ The silt-laden run off from all areas stripped of vegetation, including excavation surfaces and stockpiles of spoil and topsoil; and</li> <li>▪ The contaminated run off from storage areas.</li> </ul> </li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Medium	Medium	Likely	3	42
<b>With Mitigation</b>	Negative	Local	Low	Short	Unlikely	1	4

Geology and Soil							
Proposed Project Lifecycle	Pre – Construction and Construction Phases.						
Potential Impact	Loss of Topsoil.						
Proposed Mitigation Measures:	<ul style="list-style-type: none"> <li>❖ During site preparation, special care must be taken during the clearing of the works area where organic material will be stored separately from the topsoil and spoil material to ensure for the protection thereof. <b>This topsoil must be re-used during the rehabilitation phase.</b></li> <li>❖ Wind and water erosion-control measures to be implemented to prevent loss of topsoil.</li> <li>❖ After excavation, all soils must be replaced in the same order as they were removed.</li> <li>❖ Remove, stockpile and preserve topsoil for re-use during rehabilitation.</li> <li>❖ Topsoil shall be temporarily stockpiled, separately from (clay) subsoil and rocky material, when areas are cleared. If mixed with clay subsoil the usefulness of the topsoil for rehabilitation of the site will be lost.</li> <li>❖ Stockpiled topsoil shall not be compacted and shall be replaced as the final soil layer.</li> <li>❖ No vehicles are allowed access onto the stockpiles after they have been placed.</li> <li>❖ Stockpiled soil shall be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season (September to March inclusive). The need for such measures will be indicated in the site-specific report.</li> <li>❖ Topsoil stripped from different sites must be stockpiled separately and clearly identified as such. <b>Topsoil shall be used for rehabilitation of the site from which it was removed, unless the Project Manager approves otherwise. Topsoil obtained from sites with different soil types must not be mixed.</b></li> <li>❖ Topsoil stockpiles must not be contaminated with <b>oil, diesel, petrol, waste or any other foreign matter</b>, which may inhibit the growth of vegetation and existence of microorganisms in the soil.</li> <li>❖ Soil must not be <b>stockpiled on drainage lines or near watercourses</b> without prior consent from the Project Manager.</li> <li>❖ Soil shall be exposed for the minimum time possible once cleared of invasive vegetation, that is the timing of clearing and grubbing shall be coordinated as far as possible to avoid prolonged exposure of soils to wind and water erosion.</li> <li>❖ Stockpiled topsoil must be either vegetated with indigenous grasses or covered with a suitable fabric to prevent erosion and invasion by weeds.</li> </ul>						
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	Negative	Local	Medium	Medium	Likely	3	42
With Mitigation	Negative	Local	Low	Short	Unlikely	1	4

## 12.4. Flora

### 12.4.1. Potential Impacts

Vegetation will be lost within areas that are to be cleared for the proposed project infrastructure. The clearing of vegetation for construction purposes may result in the proliferation of exotic vegetation, which could spread beyond the construction footprint. This potential impact will need to be managed effectively.

### 12.4.2. Impact Assessment

Flora Pre- Construction Phase	
<b>Potential Impact</b>	<b>Destruction of indigenous flora during site establishment</b>
<b>Proposed Mitigation Measures:</b>	<ul style="list-style-type: none"> <li>❖ Vegetation clearing shall be kept to a minimum, and this shall only occur where it is absolutely necessary, and the use of a brush-cutter for this operation is highly preferable to the use of a TLB or other earth-moving equipment.</li> <li>❖ Rehabilitate all disturbed areas as soon as the construction is completed within the proposed development area.</li> <li>❖ Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm and this can be achieved through provision of appropriate awareness to all personnel.</li> <li>❖ Other than on public roads and thoroughfares, vehicles and construction workers shall under no circumstances be allowed outside the site boundaries in order to prevent impact on the surrounding vegetation.</li> <li>❖ Where possible, natural vegetation must not be cleared and encouraged to grow.</li> <li>❖ Disturbance of vegetation must be limited only to areas of construction.</li> <li>❖ Prevent contamination of natural areas by any pollution.</li> <li>❖ Proliferation of alien and invasive species is expected within disturbed areas and this must be eradicated and controlled to prevent further spread.</li> <li>❖ <b>No storage of building material or rubble is allowed in the sensitive areas, such as riparian habitats.</b></li> <li>❖ Avoid translocating stockpiles of topsoil from one place to sensitive areas in order to avoid translocating soil seed banks of alien species.</li> </ul>

	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

<b>Flora and Fauna Pre - Construction Phase</b>							
<b>Potential Impact</b>		<b>Loss of Habitat and Habitat Fragmentation</b>					
<b>Proposed Mitigation Measures:</b>		<ul style="list-style-type: none"> <li>❖ The most significant way to mitigate the loss of habitat is to limit the development footprint within the natural habitat areas remaining.</li> <li>❖ No structures shall be built outside the area demarcated for the development.</li> <li>❖ Although it is unavoidable that sections of the road access and pipeline routes will need to traverse areas of potential sensitivity, the development shall be constructed in such cases so as to avoid further impact to these areas.</li> <li>❖ All stockpiles, construction vehicles, equipment and machinery shall be situated away from areas of natural vegetation.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

Flora Construction Phase							
<b>Potential Impact</b>		<b>Loss of vegetation due to fuel and chemical spills</b>					
<b>Proposed Mitigation</b>		<ul style="list-style-type: none"> <li>❖ Appropriate measures shall be implemented in order to prevent potential soil pollution through fuel and oil leaks and spills. Compliance monitored by an appropriate person must be undertaken.</li> <li>❖ Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks.</li> <li>❖ Emergency on-site vehicle and plant maintenance shall be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Drip-trays must be placed under the oil sump of vehicles and equipment when not in use.</li> <li>❖ Implement suitable erosion control measures.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

Flora Construction Phase							
<b>Potential Impact</b>		<b>Introduction of Alien Species.</b>					
<b>Proposed Mitigation</b>		<ul style="list-style-type: none"> <li>❖ During construction, the construction area and immediate surroundings shall be monitored regularly for emergent invasive vegetation.</li> <li>❖ Promote awareness of alien plants to all personnel on site.</li> <li>❖ The establishment of pioneer species shall be considered with the natural cycle of rehabilitation of disturbed areas in order to assist with erosion control, dust suppression and the establishment of more final canopy species. <b>This can be controlled during construction phase and thereafter more stringent measures should be implemented during the rehabilitation and post rehabilitation.</b></li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

Flora Construction Phase							
<b>Potential Impact</b>		<b>Destruction of Alien Vegetation</b>					
<b>Proposed Mitigation</b>		<ul style="list-style-type: none"> <li>❖ All alien seedlings and saplings must be removed as they become evident for the duration of construction phase.</li> <li>❖ Manual / mechanical alien plant removal is preferred to chemical control.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

Flora Construction Phase							
<b>Potential Impact</b>		<b>Increased Soil Erosion</b>					
<b>Proposed Mitigation</b>		<ul style="list-style-type: none"> <li>❖ Topsoil shall be stored in such a way that it does not compromise its plant-support capacity.</li> <li>❖ Topsoil from the construction activities shall be stored for post-construction rehabilitation work and shall not be disturbed more than is absolutely necessary.</li> <li>❖ Protect topsoil in order to avoid erosion loss on steep slopes.</li> <li>❖ Protect topsoil from contamination by aggregate, cement, concrete, fuels, litter, oils, domestic and waste.</li> <li>❖ An ecologically-sound storm water management plan must be implemented during construction and appropriate water diversion systems put in place.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

Flora Construction Phase							
<b>Potential Impact</b>		<b>Loss of Ecologically Sensitive Areas (ESA) habitats</b>					
<b>Proposed Mitigation</b>		<ul style="list-style-type: none"> <li>❖ Other than public thoroughfares, vehicles and construction workers shall under no circumstances be allowed outside the site boundaries in order to prevent impact on the surrounding vegetation.</li> <li>❖ Where possible, natural vegetation must not be cleared and encouraged to grow.</li> <li>❖ All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation.</li> <li>❖ Disturbance of vegetation must be minimised and limited only to the construction footprint.</li> <li>❖ Prevent contamination of natural grasslands by any pollution.</li> <li>❖ Areas cleared of vegetation must be re-vegetated with appropriate endemic plants prior to the Contractor leaving the site.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	Negative	Local	Medium	Medium term	Almost Certain	2	32
With Mitigation	Negative	Local	Low	Short-Term	Likely	1	6

Flora and Fauna Construction Phase	
<b>Potential Impact</b>	<b>Damage to plant and animal life outside of the proposed development area.</b>
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Fauna (mammal, reptile and amphibian) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be rescued and relocated by an experienced person.</li> <li>❖ Proliferation of alien and invasive species is expected within disturbed areas. All alien invasive species must be controlled prior to the establishment of indigenous vegetation to the extent that their spread is prevented, and they do not out compete indigenous species.</li> <li>❖ No unauthorised vehicles shall be allowed to drive through the site during the construction phase.</li> <li>❖ No trapping or any other method of catching or killing any animal may be performed on site.</li> <li>❖ Illegal hunting is prohibited.</li> <li>❖ No dumping or on site waste disposal in any form is permitted.</li> <li>❖ No damage and/or removal/trapping/snaring of indigenous plant or animal material for cooking and other purposes will be allowed.</li> <li>❖ All areas to be affected by the proposed development will be rehabilitated with indigenous vegetation.</li> </ul>



		❖ Construction activities should be restricted to the development footprint area. Compliance must be monitored by the Environmental Control Officer (ECO).					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	Negative	Local	Medium	Medium term	Almost Certain	2	32
With Mitigation	Negative	Local	Low	Short-Term	Likely	1	6

Flora Construction / Post Construction Phase							
<b>Potential Impact</b>		<b>Loss of habitat due to construction activities</b>					
<b>Proposed Mitigation</b>		<ul style="list-style-type: none"> <li>❖ All areas that have been cleared during construction of the proposed project will be rehabilitated and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed landfill site.</li> <li>❖ As much vegetation growth as possible should be promoted within the proposed development site in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during rehabilitation. In terms of the percentage of coverage required during rehab and also the grass mix to be used for rehab, the EMPr will be consulted for guidance. However, endemic plant material to be used for rehabilitation shall be similar to that found in the surrounding area.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	Positive	Local	Medium	Medium term	Almost Certain	2	32
With Mitigation	Positive	Local	Low	Short-Term	Likely	1	6

## 12.5. Terrestrial Ecology - Fauna

### 12.5.1 Potential Impacts

Vulnerable species could occur within the study area and the construction of the proposed development may have a negative impact on the habitats of such species. Fauna could also be adversely affected through the construction related activities (such as noise, illegal poaching and habitat loss) for the proposed Imvutshane Dam Broad Crested gauging weir.

### 12.5.2 Impact Assessment

<b>Fauna Pre-Construction Phase</b>	
<b>Potential Impact</b>	<b>Loss and displacement of animals on site.</b>
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Any fauna (mammal and reptile) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be rescued and relocated by suitably experienced personnel .</li> <li>❖ Training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily.</li> <li>❖ The contractor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase.</li> <li>❖ Vehicles must adhere to a speed limit, 40 km/h is recommended for light vehicles and a lower speed for heavy vehicles.</li> <li>❖ All construction and maintenance vehicles must remain on properly demarcated and prepared roads. Off-road driving shall be strictly prohibited.</li> <li>❖ No fires shall be allowed on the site</li> <li>❖ No trapping or any other method of catching of any animal or bird may be performed on site</li> <li>❖ • No dogs or other domestic pets shall be allowed on the site.</li> </ul>

	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Positive	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Positive	Local	Low	Short-Term	Likely	1	6

Flora and Fauna Pre-Construction Phase							
<b>Potential Impact</b>		<b>Loss of Habitat &amp; Habitat Fragmentation</b>					
<b>Proposed Mitigation</b>		<ul style="list-style-type: none"> <li>❖ The best way to mitigate the loss of habitat is to limit the development footprint within the remaining natural habitat areas.</li> <li>❖ No structures shall be built outside the area demarcated for the development.</li> <li>❖ Although it is unavoidable that sections of the road access and pipeline routes will need to traverse areas of potential sensitivity, the development shall be constructed in such cases so as to avoid further impact to these areas.</li> <li>❖ All stockpiles, construction vehicles, equipment and machinery shall be situated away from the natural vegetation.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

**Flora and Fauna  
Construction Phase**

<b>Potential Impact</b>	<b>Damage to plant and animal life outside of the proposed development area.</b>
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Any fauna (mammal, reptile and amphibian) that becomes trapped in the trenches or in any construction or operational related activity must not be harmed and must be rescued and relocated by suitably qualified and experienced personnel.</li> <li>❖ Proliferation of alien and invasive species is expected within disturbed areas. All alien invasive species must be controlled prior to the establishment of indigenous vegetation to the extent that their spread is prevented, and they do not out compete indigenous species.</li> <li>❖ No unauthorised vehicles should be allowed to drive through the site during the construction phase.</li> <li>❖ No trapping or any other method of catching or killing any animal may be performed on site.</li> <li>❖ Illegal hunting is prohibited.</li> <li>❖ No dumping of waste in any form is permitted.</li> <li>❖ No damage and/or removal/trapping/snaring of indigenous plant or animal material for any purpose will be allowed.</li> <li>❖ All areas that are affected by the removal of vegetation for the proposed development will be rehabilitated using appropriate endemic vegetation.</li> <li>❖ Construction activities shall be restricted to the development footprint area. Compliance must be monitored by Environmental Control Officer (ECO).</li> </ul>

	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

Fauna Construction Phase							
Potential Impact		Disturbance to animals					
Proposed Mitigation		<ul style="list-style-type: none"> <li>❖ Animals living within the site and surrounding areas shall not be unnecessarily disturbed. If it is necessary to relocate fauna to enable the project to continue, an appropriately qualified and experienced expert shall be used for this task.</li> <li>❖ During construction, refresher training must be conducted to construction workers with regards to littering and poaching.</li> <li>❖ The Contractor and his/her employees shall not bring any domestic animals onto site.</li> <li>❖ Toolbox talks should be provided to contractors regarding disturbance to animals.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	Negative	Local	Medium	Medium term	Almost Certain	2	32
With Mitigation	Negative	Local	Low	Short-Term	Likely	1	6

Fauna Operational Phase							
Potential Impact		Disturbance of faunal species					
Proposed Mitigation		<ul style="list-style-type: none"> <li>❖ The disturbance of fauna shall be minimized.</li> <li>❖ Animals living within the site and surrounding areas shall not be unnecessarily disturbed. If it is necessary to relocate fauna to enable the project to continue, an appropriately qualified and experienced expert shall be used for this task.</li> </ul>					
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	Positive	Local	Medium	Medium term	Almost Certain	2	32
With Mitigation	Positive	Local	Low	Short-Term	Likely	1	6

## 12.6. Aesthetic Quality

### 12.6.1. Potential Impacts

Potential visual impacts during the construction phase of the proposed project will be caused by poor placement of the construction camp and equipment, as well as poor management of rubble, refuse and construction material on site. Additionally, destruction of the surrounding natural environment would decrease the aesthetic appeal of the area. Thus, visual impacts must be minimised.

### 12.6.2. Impact Assessment

Aesthetics Quality							
<b>Proposed Project Lifecycle:</b>	Construction Phase						
<b>Potential Impact</b>	Reduction in visual quality due to construction activities						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ On-going housekeeping to maintain a tidy construction area.</li> <li>❖ Construction camp to be positioned to minimize its visual impacts</li> <li>❖ Damage to the natural environment must be minimised.</li> <li>❖ Vegetation shall not be cut or cleared unless absolutely necessary.</li> <li>❖ The clearing of the site shall be kept to a minimum and surrounding vegetation shall be left intact as a natural shield.</li> <li>❖ The fragmentation of stands of indigenous vegetation and straight lines of trees should as far as possible be avoided.</li> <li>❖ No painting or marking of natural features shall be allowed. Marking for surveying and other purposes shall only be with pegs, danger tape and beacons.</li> <li>❖ Trees and all woody shrubs shall be protected from damage. Excavated material shall not be placed over retained vegetation. The movement of plant, vehicles and people across areas of retained vegetation shall also be minimised.</li> <li>❖ Temporary storage areas for waste, construction materials and equipment other than inside the site camp shall be minimised. Such areas must be agreed with the Project Manager prior to their use.</li> <li>❖ Particular aspects of concern to landowners and local residents should be addressed during construction.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>

<b>Without Mitigation</b>	Negative	Local	Medium	Short term	Likely	2	24
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Unlikely	1	4
<b>Project Lifecycle</b>	Operational Phase						
<b>Potential Impact</b>	Reduction in visual quality due to the permanent weir.						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ On-going housekeeping to maintain a tidy area.</li> <li>❖ Rehabilitate the area after construction.</li> <li>❖ No painting or marking of natural features shall be allowed. Marking for surveying and other purposes shall only be with pegs, danger tape and beacons.</li> <li>❖ Trees and all woody shrubs shall be protected from damage.</li> <li>❖ Particular aspects of concern to landowners and local residents shall be addressed</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Medium	Short term	Likely	2	24
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Unlikely	1	4

## 12.7. Noise

### 12.7.1 Potential Impacts

During construction, localised increases in noise and vibration will be caused by the following:

- Operation of motorised vehicles for transportation of personnel, materials, and equipment to, from, and within the development site;
- Drilling operations;
- Operation of mobile and stationary motorised equipment within the site boundary (e.g. haul trucks, excavators, bulldozers, loaders, drill rigs, aggregate crushers, conveyor systems and generators);
- Operation of various auditory safety signals, alarms, or sirens (e.g. vehicle backup alarms and blast warning); and
- General construction activities on site.

During the operational phase, the weir and the abstraction works are unlikely to increase noise levels in the area by any significant degree.

Noise that emanates from construction and operational activities will be addressed through targeted best practices for noise monitoring and management detailed in the EMP. The associated regulated standards must be adhered to.

Project personnel working on the site will experience the greatest potential exposure to the highest levels of noise and vibration. Workplace noise and vibration issues will be managed as part of the Occupational Health and Safety Management System to be employed on site, which will include specific measures aimed at preventing hearing loss and other deleterious health impacts.

### 12.7.2 Impact Assessment

Noise							
<b>Project Lifecycle</b>	Construction Phase						
<b>Potential Impact</b>	Excessive noise levels as a result of construction activities						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ The provisions of SABS 1200A will apply to all areas within audible distance of residents.</li> <li>❖ Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners/occupiers and community members.</li> <li>❖ Construction activities generating output levels of 85 dB or more will be confined to normal working hours (08h00 – 16h00, Monday to Friday outside bank holidays).</li> <li>❖ Noise preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to be employed.</li> <li>❖ Noise to be monitored (baseline and during construction). Sampling locations to consider major noise sources and sensitive receptors.</li> </ul>						
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Short term	Likely	2	24
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Unlikely	1	4



## 12.8. Air Quality

### 12.8.1 Potential Impacts

Potential impacts during the construction phase include the following:

- Dust will be generated during the construction period from various sources, including blasting, earthworks, stockpiles, use of access roads, transportation of spoil material and general construction activities on site; and
- Exhaust emissions from vehicles and equipment.

Mitigation measures are detailed in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored (dust fallout particulate matter) and managed and that regulated thresholds are not exceeded.

### 12.8.2 Impact Assessment

Air Quality	
<b>Project Lifecycle</b>	Construction Phase
<b>Potential Impact</b>	Excessive dust levels as a result of construction activities
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather.</li> <li>❖ Dust suppression to be undertaken for all bare areas, including construction area and access roads. Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of sensitive receptors.</li> <li>❖ Speed limits to be strictly adhered to.</li> <li>❖ The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties).</li> <li>❖ Air quality to be monitored (baseline and during construction) for dust fallout and particulate matter. Sampling locations to consider major sources of dust, the location of sensitive receptors and wind directions.</li> </ul>

	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Short term	Likely	2	24
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Unlikely	1	4

## 12.9. Safety and Security

### 12.9.1 Potential Impacts

During construction, there may be the potential for employees to be injured, as well as the safety of landowners and surrounding communities may be compromised. All environmental hazards and safety risks must be included in the employees' safety file for inclusion into the contractor's mitigation measures.

### 12.9.2 Impact Assessment

<b>Safety and Security</b>	
<b>Project Lifecycle</b>	Construction Phase
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>❖ The uncontrolled access to proposed boundary extension.</li> <li>❖ Construction employees getting injured during working hours on the site.</li> <li>❖ Open trenches and construction vehicles may pose a safety risk while on site.</li> </ul>
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Compliance with Occupational Health and Safety Act (Act No. 85 of 1993).</li> <li>❖ The Contractor must provide an Occupational Health and Safety Management Plan for approval prior to the commencement of works in terms of the Construction Regulations (2014).</li> <li>❖ Proper supervision of employees at all times. Employees to be clearly identifiable.</li> <li>❖ Employees to remain within the site boundary and no loitering to be allowed. • Access into and out of the servitude must only be via existing access roads from local public roads.</li> <li>❖ Contractor to prepare and submit, for approval, a rescue procedure for employees in the case of an injury.</li> <li>❖ Any employees of the Contractor or his sub-contractors found to be in breach of any of the Environmental Protection specifications may be ordered to leave the site forthwith.</li> <li>❖ Supervisory staff of the contractor, or sub-contractors shall not direct any person to undertake any activities, which would place such person/organization in contravention to any law, regulation or the EMPr itself.</li> </ul>

	<ul style="list-style-type: none"> <li>❖ Depending on the type of contravention or action it may also be necessary for the work to be called to a halt until such time as the contravention or action is corrected and investigated.</li> <li>❖ When working in the area of encroachment is prevalent, all open excavated trenches and foundations should be clearly marked and secured to keep people and fauna from falling in.</li> </ul>						
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	Negative	Local	High	Short term	Unlikely	3	36
With Mitigation	Negative	Local	High	Short-Term	Rare	1	9

## 12.10 Traffic

### 12.10.1.Potential Impacts

During the construction period, there will be an increase in traffic on the local road networks due to the delivery of plant and material, transportation of staff and normal construction-related traffic.

As part of the construction phase, measures will be implemented for the selective upgrade of the roads (if necessary) and to render these roads safe for other users (amongst others). After the construction phase, the local roads will only need to be used for operation and maintenance purposes.

All the appropriate traffic safety measures and control must be implemented to minimise any potential impacts associated the installation of the broad crested gauge to measure flow. Any disruptions to the transportation network must be mitigated and will be discussed in the EMP.

## 12.10.2. Impact Assessment

Traffic							
<b>Project Lifecycle</b>	Construction Phase						
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>❖ Disruptions to existing road users</li> <li>❖ Safety risks</li> <li>❖ Increase in dust levels</li> </ul>						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Make provision to ensure that landowners and affected parties can always access their properties .</li> <li>❖ A speed limit of 40km/h on roads within the project area is to be adhered to by the contractor, his subcontractors and all personnel.</li> <li>❖ Access roads to be maintained in a suitable condition.</li> <li>❖ Suitable erosion protective measures to be implemented for access roads during the construction phase.</li> <li>❖ Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented.</li> <li>❖ Clearly demarcate all access roads.</li> <li>❖ Clearly mark pedestrian-safe access routes.</li> </ul>						
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	High	Short Term	Unlikely	3	36
<b>With Mitigation</b>	Negative	Local	High	ShortTerm	Rare	1	5

## 12.11. Socio-Economic Environment

### 12.11.1 Potential Impacts

A positive impact could be the creation of short-term work opportunities for local communities during construction, as well as long-term work during the operation and maintenance of the Imvutshane Dam broad crested gauging weir. In addition, the proposed project will result in a sustained economic and social beneficiation from the water services.

There are also negative impacts associated with the construction of the gauging weir and are as follows:

- Traffic disruptions;
- Dust, noise and visual impacts;
- Proximity to construction work and associated inconvenience and dangers; and
- Sense of place.

### 12.11.2 Impact Assessment

Traffic							
<b>Project Lifecycle</b>	Construction Phase						
<b>Potential Impact</b>	Direct Employment						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Where feasible introduce a programme to transfer skills particularly during the construction phase of the project.</li> <li>❖ Maximise employment opportunities to be created for women.</li> <li>❖ A Community Liason Officer (CLO) shall be appointed by the Contractor to effectively manage the employment of local people, liason with the Councillor as well as liaison with local people.</li> <li>❖ The selection process should be transparent and must include both men and women.</li> <li>❖ The project proponent should designate a person to ensure that employment is handled correctly, transparently and is not disruptive to the project. All evidence of the labour process must be stored by the project proponent.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Positive	Local	Low	Short term	Almost Certain	2	14
<b>With Mitigation</b>	Positive	Local	Medium	Short-Term	Almost Certain	3	49
<b>Project Lifecycle</b>	Construction and Operational Phases						

Potential Impact	Poor communication with landowners, stakeholders and affecter parties						
Proposed Mitigation	<ul style="list-style-type: none"> <li>❖ A CLO must be appointed on the project to manage the stakeholder engagement process during the construction phase.</li> <li>❖ Establish lines of communications with affected parties, adjacent landowners, and community members, particularly the adjacent school and residential complexes.</li> <li>❖ Establish processes and procedures to effectively verify and address complaints and claims received.</li> <li>❖ Provide the relevant contact details to affected parties, adjacent landowners, and community members for queries / raising of issues or complaints.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	High	Medium term	Almost Certain	2	48
<b>With Mitigation</b>	Positive	Local	High	Medium-Term	Almost Certain	2	49
<b>Traffic</b>							
<b>Project Lifecycle</b>	Construction						
<b>Potential Impact</b>	Health and safety on site						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Contractor to appoint a CLO, or to assign such responsibilities to a competent staff member who will have adequate time to fulfil relevant functions.</li> <li>❖ The Contractor must submit a Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval prior to the commencement of work. These requirements are aligned with the Construction Regulations (2003).</li> <li>❖ Construction related material must be kept in an access-controlled area.</li> <li>❖ The requirements of the Occupational Health and Safety Act (Act 85 of 1993) and related regulations shall be adhered to.</li> <li>❖ Maintain access control to prevent access of the public to the construction areas</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Low	Short term	Likely	2	12
<b>With Mitigation</b>	Negative	Local	Medium	Short Term	Rare	2	6

<b>Project Lifecycle</b>	Construction						
<b>Potential Impact</b>	Nuisance Factors such as noise and dust						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Construction activities to remain within the designated construction areas.</li> <li>❖ The provisions of SANS 10103:2008 will apply to all areas at the perimeter of the site, within audible distance of residents.</li> <li>❖ Working hours to be agreed upon with Project Manager, so as to minimise disturbance to adjacent landowners and community members.</li> <li>❖ Where possible, noise disturbance should be at times after school hours.</li> <li>❖ Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather.</li> <li>❖ Dust suppression to be undertaken for all unsurfaced haul roads and access roads, etc.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Low	Short Term	Likely	2	12
<b>With Mitigation</b>	Negative	Local	Medium	Short Term	Rare	2	6
<b>Project Lifecycle</b>	Construction						
<b>Potential Impact</b>	Traffic Disruptions						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Before any work can start, the Local Traffic Department must be consulted about measures to be taken regarding pedestrian and vehicular traffic control.</li> <li>❖ To undertake negotiations and confirm arrangements with the adjacent landowners regarding the use of traffic arrangements.</li> <li>❖ Ensure that appropriate traffic safety measures are implemented. • Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Low	Short term	Likely	2	12
<b>With Mitigation</b>	Negative	Local	Medium	Short Term	Rare	2	6

## 12.12. Waste Mitigation

### 12.12.1 Potential Impacts

Waste management aims to avoid waste pollution of land, air and water during and as a consequence of the construction of the gauging weir.

The following describes the impacts during the construction phase:

- Waste generated from site preparations (e.g. plant material);
- Domestic waste;
- Surplus and used building material;
- Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags);
- Wastewater (sanitation facilities, washing of plant, operations, etc.); and
- Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks.

Poor waste management and practices during construction including lack of proper waste disposal, littering, and burning of refuse should not be tolerated.

### 12.12.2 Impact Assessment

<b>Waste Management</b>	
<b>Project Lifecycle</b>	Construction Phase
<b>Potential Impact</b>	Land, Air and Water Pollution can occur through poor waste management practices.
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Sufficient ablution facilities to be provided at the Construction Camp within the construction site.</li> <li>❖ Suitable litter receptacles to be positioned strategically across the site at all working areas.</li> <li>❖ Waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes).</li> <li>❖ The Contractor shall dispose of all refuse generated on site or from the activities of construction or its related activities.</li> <li>❖ The contractor shall on a weekly basis dispose of all refuse at an approved refuse disposal site.</li> <li>❖ Proof of disposal must be kept on record.</li> <li>❖ Littering by the workers is prohibited.</li> <li>❖ Clearly marked litter bins must be provided on site.</li> <li>❖ Monitor the presence of litter on site.</li> <li>❖ All staff shall be educated regarding the need and method of minimising waste and disposing of it in a sustainable manner.</li> </ul>



	<ul style="list-style-type: none"> <li>❖ The entire site will be cleared of construction material, metal, tins, glass bottles, and food packaging or any other type of empty container or waste material or waste equipment used by the construction team on a daily basis.</li> <li>❖ Waste material that may harm humans or animals shall be removed immediately.</li> <li>❖ No waste shall be disposed of in the surrounding environment.</li> <li>❖ Hazardous waste such as diesel, oil or petrol spillages are to be collected and stored in specially marked containers and disposed of at a permitted waste disposal site.</li> <li>❖ No refuse or litter is allowed to be burnt on site.</li> <li>❖ The recycling of all waste is to be encouraged by both the contractor and staff.</li> <li>❖ All vehicle parking areas and vehicle servicing areas are to be inspected carefully for diesel, oil and other spillages weekly and appropriate clean up undertaken.</li> </ul>						
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<b>Without Mitigation</b>	Negative	Local	Medium	Short term	Likely	3	36
<b>With Mitigation</b>	Negative	Local	Medium	Short Term	Unlikely	1	8

### 12.13 Cumulative Impacts

According to GN No. R. 982 of the amended EIA Regulations (07 April 2017), a “cumulative impact”, in relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Cumulative impacts can be identified by combining the potential environmental implications of the proposed project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

The following cumulative impacts are anticipated for the proposed gauging weir:

- Loss of sensitive vegetation types;
- Encroachment of alien vegetation;
- Traffic impacts.

Cumulative Impacts							
<b>Potential Impact</b>	Loss of sensitive vegetation types						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Appropriate measures should be implemented in order to prevent potential soil pollution through fuel and oil leaks and spills and then compliance monitored by an appropriate person.</li> <li>❖ Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks.</li> <li>❖ Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations.</li> <li>❖ Drip-trays must be placed under vehicles and equipment when not in use.</li> <li>❖ Implement suitable erosion control measures.</li> <li>❖ All conditions of the EMPr must be adhered to.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Medium	Long Term	Likely	2	32
<b>With Mitigation</b>	Negative	Local	Low	Long Term	Unlikely	1	6
Cumulative Impacts							
<b>Potential Impact</b>	Encroachment of alien vegetation						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Rehabilitation measures must be implemented once construction activities are complete to ensure that alien vegetation will be controlled during the construction and operational phases.</li> <li>❖ All conditions of the EMPr must be adhered to.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Medium	Short Term	Moderate	2	20
<b>With Mitigation</b>	Negative	Local	Low	Short Term	Unlikely	1	4

<b>Potential Impact</b>	Construction related traffic disruptions and deterioration of the access roads leading to site.						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ Ensure that the necessary signage and traffic measures are implemented for safe and convenient access to the site.</li> <li>❖ Suitable erosion protective measures to be implemented for access roads during the construction phase.</li> <li>❖ Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented.</li> <li>❖ All conditions of the EMPr must be adhered to at all times.</li> </ul>						
	<b>Nature (positive / negative)</b>	<b>Extent</b>	<b>Magnitude</b>	<b>Duration</b>	<b>Probability</b>	<b>Significance</b>	<b>Score</b>
<b>Without Mitigation</b>	Negative	Local	Medium	Short Term	Likely	2	24
<b>With Mitigation</b>	Negative	Local	Low	Short Term	Unlikely	1	4

## 13. Conclusion and Recommendations

### 13.1 Environmental Impact Statement

The recent El Niño phenomenon led to below normal rainfall which with a combination of above average temperatures, has resulted in severe drought in South Africa. This combined with the increasing demand on the already scarce water resource amplify the importance of accurate hydrological information and necessitate that existing water be conserved and managed effectively.

KwaZulu-Natal in particular has been affected significantly by the recent drought. Due to this the low river levels cause severe disruption to life cycles of aquatic organisms on the downstream side. To ensure accurate monitoring of the environmental release particularly during dry seasons, the request was received by the Umgeni Water Engineering Services to design a gauging weir for the Imvutshane Dam.

The proposed project is located approximately 6km to the south the town of Mapumulo, KwaZulu-Natal Province. The proposed project is located in the Pongola - Mtamvuna Water Management Area, within the U40G quaternary catchment. The closest Sub Quaternary Reach (SQR) to the project is U40G-3843. This river reach is a portion of the Hlimbitwa River system.

Afzelia Environmental Consultants was appointed by Umgeni Water to undertake the Basic Assessment process for the proposed Construction of the Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall in accordance with the National Environmental Management Act (Act No. 107 of 1998) and the 2014 Environmental Impact Assessment Regulations, as amended (07 April 2017).

Based on the location and nature of the proposed development, the following environmental specialist studies were conducted:

- ❖ Aquatic Assessment; and
- ❖ Wetland Delineation and Risk Assessment.

According to the Aquatic Assessment, the results of the Present Ecological Status assessment derived largely modified (class D) conditions in the river reach considered in this assessment. The modified conditions were largely attributed to habitat quality level impacts which have resulted in the modification of instream habitat and macroinvertebrate communities.

The results of the risk assessment derived a variety of risk ratings for the proposed project. Activities which entail the physical alteration of the watercourse and its habitats were derived to be moderate risk activities before mitigation.

In addition, due to the permanent presence of the weir, the risk rating for the operation and maintenance activity of the broad crest weir structure were determined to be moderate.

The baseline environment indicated some sensitive aquatic biology were present. In addition, the proposed project will be located approximately 50m downstream of the existing Imvutshane Dam wall. Considering the location of the proposed project, the cumulative impact on fish migration and loss of aquatic habitat is considered negligible.

Considering the status of the aquatic ecosystems, and furthermore the nature and requirements of the project, the proposed project has the potential to negatively affect local ecology. However, should the proposed mitigation actions be implemented, impacts may be reduced. In light of the above mentioned, it is the opinion of the specialist that no significant fatal flaws could be identified through the completion of this aquatic ecology study.

The wetland assessment identified no wetland units in close proximity to the proposed Imvutshane Dam gauging weir, as well as within the 500m DWS regulated area for water use. The vast majority of watercourse units located within the respective study area were riparian zones, although many invaded drainage lines were also present.

No risk assessment was completed as part of this report due to the fact that no definable wetland habitat was identified in a position within the landscape where it may receive impacts from the proposed weir development. It must be noted that riparian areas in close proximity to the proposed gauging weir site will require complete impact and risk assessments as stipulated by DWS.

## 13.2 Recommendations

Based on the information that is contained in this report and also taking into account the outcome of the impact assessment, the opinions and recommendations included in the specialist studies as well as all supporting documentation, it is the recommendations of the practitioner that the Environmental Authorisation be granted by the Department of Environmental Affairs for the proposed Construction of Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall.

The following key recommendations, which may also influence the conditions of the EA (where relevant), accompany the BA for the proposed BAR for the proposed Construction of Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall:

- 1) The Layout Option for the proposed is accepted Construction of Broad Crested Gauging Weir on the Hlimbithwa River below the Imvutshane Dam Wall;
- 2) Appointment of an ECO to monitor compliance with the EA and the approved EMPr;
- 3) As discussed in the EMPr, various forms of monitoring are required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project.
- 4) All mitigation measures provided in the Specialist Studies of the DBAR are to be adhered to, specifically the following:
  - ❖ All contractors and employees must undergo induction prior to commencing work on site. The induction process must include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good 'housekeeping';
  - ❖ All chemicals and toxicants that are required for the Construction Phase of the project must be stored in a bunded area on site;
  - ❖ All machinery and equipment that will be used on site must be inspected daily to identify faults and possible oil and diesel leaks,
  - ❖ All machinery and equipment must be taken off-site and serviced, **no machinery and equipment are to be serviced on site.**
  - ❖ Cofferdams are temporary structures that are used to displace water and provide dry access to usually submerged areas (such as instream construction etc.). The Cofferdams can also be built to prevent water from coming into contact with high impact zones (e.g. construction sites) and will reduce the amount of sedimentation and pollution;
  - ❖ Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. The use of these facilities by all site personnel must be enforced;
  - ❖ All contractors and employees on site must be trained in the event of spills, leaks and other impacts to the aquatic systems;
  - ❖ No dumping of construction material on -site may take place;
  - ❖ All waste that is generated on site during the construction phase must be adequately managed;

- ❖ Waste materials must be separated to enable recycling or reuse;
- ❖ Construction activities are proposed to be conducted during the dry season (April – August) in order to ensure that work can be undertaken without disruption that could be caused by flooding and to minimise risk on the water course;
- ❖ Areas that are set aside for the laydown yards from construction materials should be placed outside a 32m buffer zone from the rivers;
- ❖ Existing cleared roadways and riparian areas shall be utilised for construction activities;
- ❖ An alien invasive plant management plan shall be compiled for approval prior to commencement of construction. Implementation of the plan to control and prevent the spread of invasive alien plants shall be undertaken throughout the contract period;
- ❖ No chemicals, building materials, hydrocarbons or soils must be stockpiled within the 32m buffer zone.

## **APPENDIX A**

**Appendix A 1 – EAP’s Declaration**

**Appendix A 2 – EAP’s Curriculum Vitae**

## **APPENDIX B**

**Appendix B 1 – Background Information Document**

**Appendix B 2 – Proof of Distribution of BIDs to Respective I&Ps**

**Appendix B 3 – Copy of Site Notice**

**Appendix B 4 – Newspaper Advertisements**

**Appendix B 5 – Landowner Notification**

**Appendix B 6 – I&AP Database**



## **APPENDIX C**

### **Appendix C 1 – Aquatic Ecology Assessment**

### **Appendix C 2 – Wetland Assessment**

## **APPENDIX D**

### **Draft Environmental Management Programme**

## **APPENDIX E**

### **Other Information**