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## **FINAL BASIC ASSESSMENT REPORT**

### **PROPOSED REFURBISHMENT OF THE EXISTING ABSTRACTION WEIR AT THE ESPERANZA RAW WATER PUMP STATION BELOW THE UMZINTO DAM AND THE INSTALLATION OF THE V-NOTCH GAUGE TO MEASURE FLOW, UGU 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*



**DEA Reference Number: 14/12/16/3/3/1/1998**

Name of Client:	Umgeni Water
Prepared By:	Afzelia Environmental Consultants (Pty) Ltd
Prepared For:	Umgeni Water

## Title and Approval Page

**\*\*\*\*PLEASE NOTE – ALL TEXT HIGHLIGHTED IN YELLOW REPRESENTS NEW INFORMATION ADDED TO THE FINAL BAR SUBMISSION\*\*\*\***

<b>Project Name:</b>	Proposed Refurbishment of the Existing Abstraction Weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch Gauge to measure flow, Ugu District Municipality, Kwazulu-Natal
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<b>Client</b>	Umgeni Water
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<b>Issue Date Final BAR</b>	<b>21<sup>st</sup> May 2019</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 Refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge to measure flow 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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge entails 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 El Niño phenomenon experienced in the last few years led to below normal rainfall which, in combination with above-average temperatures, 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 causes severe disruption to life cycles of aquatic organisms on the downstream side. To ensure accurate monitoring of the environmental release particularly during dry seasons. Therefore, Umgeni Water proposed to refurbish the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and to install a V-Notch Gauge to measure flow.

The proposed project is located approximately 3 km to the south west of Umzinto within the KwaZulu-Natal Province. Esperanza Pump Station is located in quaternary catchment U80H, on the Umzinto River. Water from the Umzinto Dam is released into Umzinto River and abstracted at a weir approximately 9 km downstream of the dam wall, at Esperanza Pump Station. Water from the weir is then pumped to the Umzinto Waterworks and subsequently released to the nearby communities.

## IMPACT ASSESSMENT

This Basic Assessment Report focuses on the pertinent environmental impacts that could potentially be caused by the proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and to install a V-Notch Gauge to measure flow during the pre-construction, construction and operation phases of the project.

The El Niño phenomenon experienced in the last few years led to below normal rainfall which, in combination with above-average temperatures, 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.

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Therefore, Afzelia Environmental Consultants was appointed by Umgeni Water to undertake the Basic Assessment process for the proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and to install a V-Notch Gauge 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:

1. Aquatic Assessment; and
2. Wetland Delineation and Risk Assessment.

According to the Aquatic Assessment, the results of the PES assessment derived moderately/largely modified (class C/D) conditions in the river reach considered in this assessment. Despite large modification to instream habitat through the presence of the various impoundments, aquatic ecology responses were determined to be moderately modified. The results provide an indication that there have been cumulative impacts on the considered watercourse resulting in the moderately / largely modified nature of the river.

The results of the risk assessment derived low risks for the proposed project. The low risks of the proposed project can be attributed to the small-scale rehabilitation activities. Furthermore, no riparian or bank alterations are anticipated to stem from the proposed project. Considering the nature of the proposed project, limited instream modification can be anticipated. In addition, the short nature of the rehabilitation activities further negates long term impacts.

Considering the status of the aquatic ecosystems, and furthermore the nature and requirements of the project, the proposed project has limited potential to negatively affect local ecology. In light of the above mentioned, it is the opinion of the specialists that no significant fatal flaws could be identified through the completion of the aquatic ecology study.

The wetland assessment identified two wetlands identified within a 500m radius of the proposed Esperanza Pump Station gauging weir site. These wetlands are located a considerable distance upslope of the proposed weir site (>80m) and therefore will not derive any impacts from the proposed gauging weir construction and operation, which therefore alleviates the requirement for an impact or risk assessment.

## 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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of a V-Notch Gauge.

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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of a V-Notch Gauge:

- 1) The Layout Option for the proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of a V-Notch Gauge 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 the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project.

The types of monitoring to be undertaken include:

- a) Baseline Monitoring needs to be undertaken to determine to the pre-construction state of the receiving environment, and serves as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects;
  - b) Environmental Monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded; and
  - c) Compliance Monitoring and Auditing for the independent ECO to monitor and audit compliance against the EMPr and EA, if granted.
  - d) The Department of Water and Sanitation has requested that the Applicant samples upstream and downstream prior to the initiation of the project, during and after construction in order to analyse and manage the impact as well as implement mitigation measures in case of further deterioration of water quality due to the proposed project.
- 4) All mitigation measures provided in the Specialist Studies in **Appendix C** of the DBAR are to be adhered to, specifically the following:
- ❖ All contractors and employees must undergo induction, 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 on a regular basis 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 must be enforced to work staff on site;
- ❖ 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 or recycled;
- ❖ Construction activities are proposed to be conducted during the dry season (April – August);
- ❖ Water that is released from the upstream Umzinto Dam should be limited during the construction phase of the project;
- ❖ 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 should be utilised for construction activities;
- ❖ An alien invasive plant management plan needs to be compiled and implemented prior to construction to control and prevent the spread of invasive aliens;
- ❖ No chemicals, building materials, hydrocarbons or soils must be stockpiled within the 30m buffer zone.

According to baseline study, there has been a loss of connectivity between areas upstream and downstream of the weir and in order to facilitate the movement of fish species, a fish ladder is recommended by the Aquatic specialist.

**Essentially, four types of fishways should be considered namely: Pool and weir, vertical slot, pool and slot and natural by-pass channels. The following fishway concepts should be adhered:**

- ❖ The fishway should have water passing through it during both high flows and low flows to encourage fish to make use of the fishway no matter the flow levels;
- ❖ The fishway should cater for both rheophilic (fastmoving water) and anti-rheophilic (slow moving water) fish species. This can be achieved through having several different flow velocity areas across the fishway;
- ❖ It is recommended that a rough stone surface be cast into the fishway channel floor to cater for climbing and crawling species;
- ❖ Rocks used for the fishway should have flat sides with rounded edges (typical of quarried rock) rather than rounded rocks, as they provide a variety of water velocity and depths that are easy for fish to navigate;
- ❖ Pools or depressions of varying sizes and depths should be created at random throughout the length and width of the fishway and should be placed behind large rocks to create lower velocity resting areas (eddies) for fish. The more pools incorporated in the design, the more successful the fishway will be.



**Additional guidelines for fishway design include:**

- ❖ **Channel slope (gradients)** – between 1/8 and 1/10 is recommended for South African fish;
- ❖ **Fishway entrance** – furthest point upstream that the fish can penetrate, usually in a suitable pool (low turbulence with sufficient depth) located at the base of the weir;
- ❖ **Fishway exit** – located in a quiet area, sheltered, with a low velocity to prevent fish from being swept downstream and to afford protection from predators;
  - The invert level of the exit (i.e. water inflow) should be lower than that of the weir overflow to ensure the low flows are directed down the fishway;
- ❖ **Depth of pool** - small fish (20 to 200 mm in length: at least 300 mm deep to reduce predation and limit turbulence;
  - Larger fish (>200 mm): at least 500 mm, can be deeper to reduce turbulence, if necessary;
- ❖ **Length of pool** – at least 2.5 times the length of the largest fish catered for;
- ❖ **Drop height between pools/rock levels** – maximum of 100 mm to cater for small fish.

## **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 had taken place from the **15 February 2019 to 15 March 2019**. A copy of the report was placed in the Umzinto Public Library within the study area, and an electronic copy of the Draft Basic Assessment Report was available to all registered Interested and Affected Parties upon request. In addition, hard copies of the report were submitted to commenting and decision-making authorities.

A copy of the Final Basic Assessment Report will be placed in the Umzinto Public Library within the study area, and an email notification will be sent to all I&As and Stakeholders regarding the submission of the Final Basic Assessment Report for Environmental Authorisation and upon request an electronic copy will be made available.

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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>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.

**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.

**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 1: 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, 4001
Postal address	PO Box 37069, Overport, Durban, 4067
Telephone	031 303 2835
Fax	086 692 2547
E-mail	<a href="mailto:Deshni@afzelia.co.za">Deshni@afzelia.co.za</a>

**Table 2: 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 Certified Environmental Assessment Practitioner of South Africa (ICB)	21

## NAMES AND EXPERTISE OF SPECIALISTS

**Table 3: 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. For the proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and to install a V-Notch Gauge
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 Esperanza Weir Rehabilitation. Umzinto, Kwa-Zulu Natal Province, South Africa

## CONTACT DETAILS OF PROPONENT

**Table 4: 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
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<b>Tel</b>	033 3411164

<b>Project Manager</b>	<b>Umgeni Water   Head Office</b>
<b>Contact person</b>	Miss Phumi Molefe
<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:Phumi.Molefe@umgeni.co.za">Phumi.Molefe@umgeni.co.za</a>
<b>Tel</b>	031 2687172

## 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 preferred site;
- 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 Refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge to measure flow 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 El Niño phenomenon experienced in the last few years led to below normal rainfall which, in combination with above-average temperatures, 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 Engineering Services to refurbish the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and to install a V-Notch Gauge to measure flow.

The proposed project is located approximately 3 km to the south west of Umzinto within the KwaZulu-Natal Province and is located in the Pongola – Mtamvuna Water Management Area (WMA), within the U80H quaternary catchment. The project is located on the U80H-5109 Sub Quaternary Reach (SQR). This river reach is a portion of the Mzinto River System. Water from the Umzinto Dam is released into Umzinto River and abstracted at a weir approximately 9 km downstream of the dam wall, at Esperanza Pump Station. Water from the weir is then pumped to the Umzinto Waterworks and subsequently released to the nearby communities. The normal flow at Esperanza Pump station is 1521m<sup>3</sup>/ day.

The geographical co-ordinates of the proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge is **30°20'22"S 30°38'38"E**. (Refer to Figure 1: Proposed Esperanza Gauging Weir Site Locality Plan Map and Figure 2: Proposed Esperanza Gauging Weir Locality and Biodiversity Map).

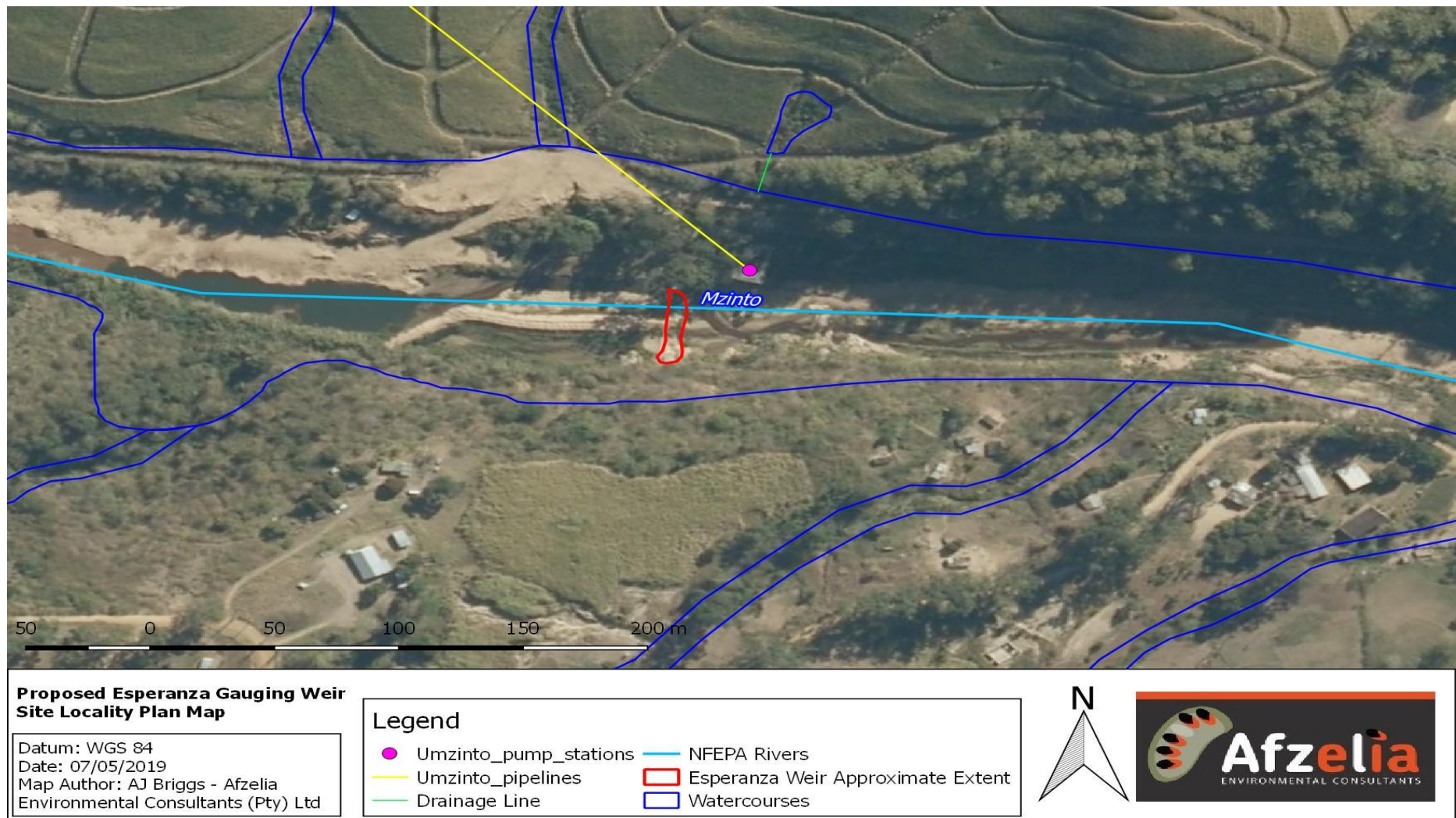


Figure 1: Proposed Esperanza Gauging Weir Site Locality Plan Map



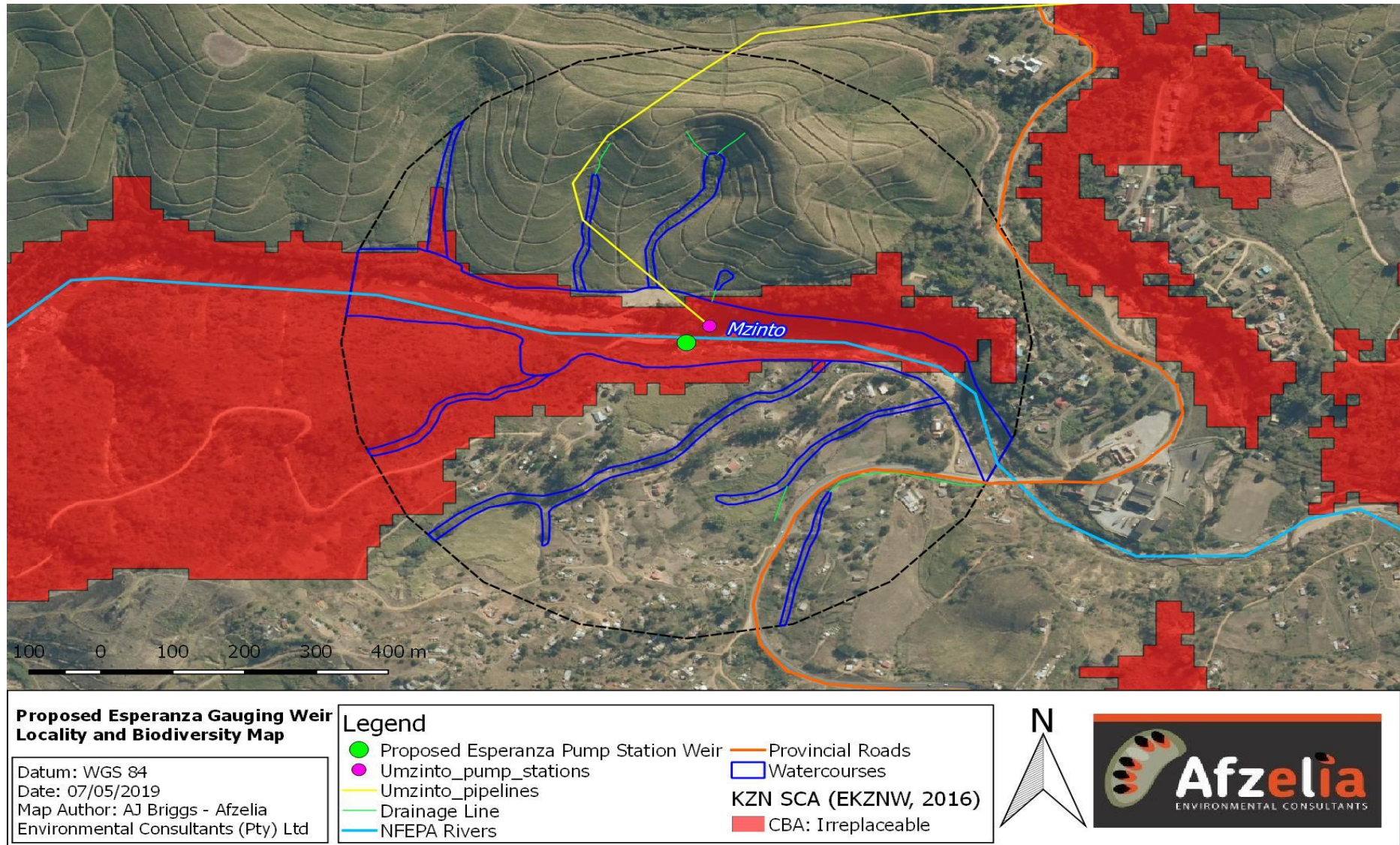


Figure 2: Proposed Esperanza Gauging Weir Locality and Biodiversity Map

## 1.2. The Proposed Gauging Weir Description

A V-Notch crump weir was selected as the most appropriate solution at Esperanza Pump Station because the pattern of the stream lines over a v-notch crump weir is smooth (**Refer to Figure 3 for the overall Esperanza Gauging weir layout**). A Glass Reinforced Plastic (GRP) weir plate of 10mm thickness will be installed onto the concrete up-stands. There is an existing infrastructure to mount the weir plate against at Esperanza Pump Station. The existing concrete weir, on which the weir plate is going to be fixed, is porous and will be repaired in order to restore its water-tightness, refer to **Figure 4**. The existing weir will be rehabilitated in order to ensure that the V-Notch weir can gauge the actual amount of water flowing past it. An extra layer of concrete is going to be fixed onto the existing concrete, refer to **Figure 5**. A 200mm reinforced layer will be added on top of the existing structure to stop water from seeping through.

## 1.3. Proposed Methodology for working within and around rivers /habitat areas

Running water in the river will have to be diverted in order to create conducive conditions for construction as the position of the gauging station. To lessen the 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 proposed Refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge 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 Cofferdams
- 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

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

The Project roads will be gravel surfaced and generally designed with a low profile without ditches to allow storm water pass over top. Road construction will be performed in multiple passes starting with the rough grading and levelling off the roadway 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 finished grade.

Once heavy construction is complete, a final pass will be made with the grading equipment to level-out road surfaces and more capping rock will be spread and compacted in areas where needed. Water bars, similar to speed bumps, will be cut in to the roads in areas 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 spread across the site to the natural grade 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 backfill 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. Storm water controls, such as diversion ditches in some areas will control storm water runoff during construction.

Foundation construction shall involve holes excavation, outer form setting, steel reinforcement assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting, and foundation 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 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 factory.

### • 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 is then used to complete the backfilling.

### • Construction Clean-Up

Site clean-up generally consists of landscaping and earthwork. It is very weather and season sensitive. Landscaping clean-up is generally completed during the first allowable and suitable weather conditions after all of the heavy construction activities have been completed. Disturbed areas outside of the paved /gravelled

areas will be reseeded to control erosion by water and wind. All construction clean-up 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.

### 1.5. Storm Water Management Plan

The proposed Gauging Weir will be constructed across the water course. Minimum impact on natural storm water is envisaged. The followings are measures to mitigate storm 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 destabilized areas
- Scheduling high-risk works for a drier time of year or drier time slot in the construction phase
- Vegetation is the best defense against storm water run-off on site and will be retained on any area where it's not necessary to disturb the soil for works
- A well sized catch drain will be constructed where necessary to channel run-off to a designated location
- Appropriately sized earth bank will be used to channel run-off to a desired location
- 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.

### 1.6 Alternatives

#### SITE ALTERNATIVES

No site alternatives have been considered for the proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge.

**Please refer to Section 1.9: Site Selection and Motivation. (Refer to Appendix E – DEA Motivation Letter in accordance with Appendix 1 and Regulation 19(1) of the EIA Regulations, 2014 as amended).**

#### 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. This will result in the increasing demand on the already scarce water resource to continue and the inadequate measurement accuracy of hydrological information which will 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.**



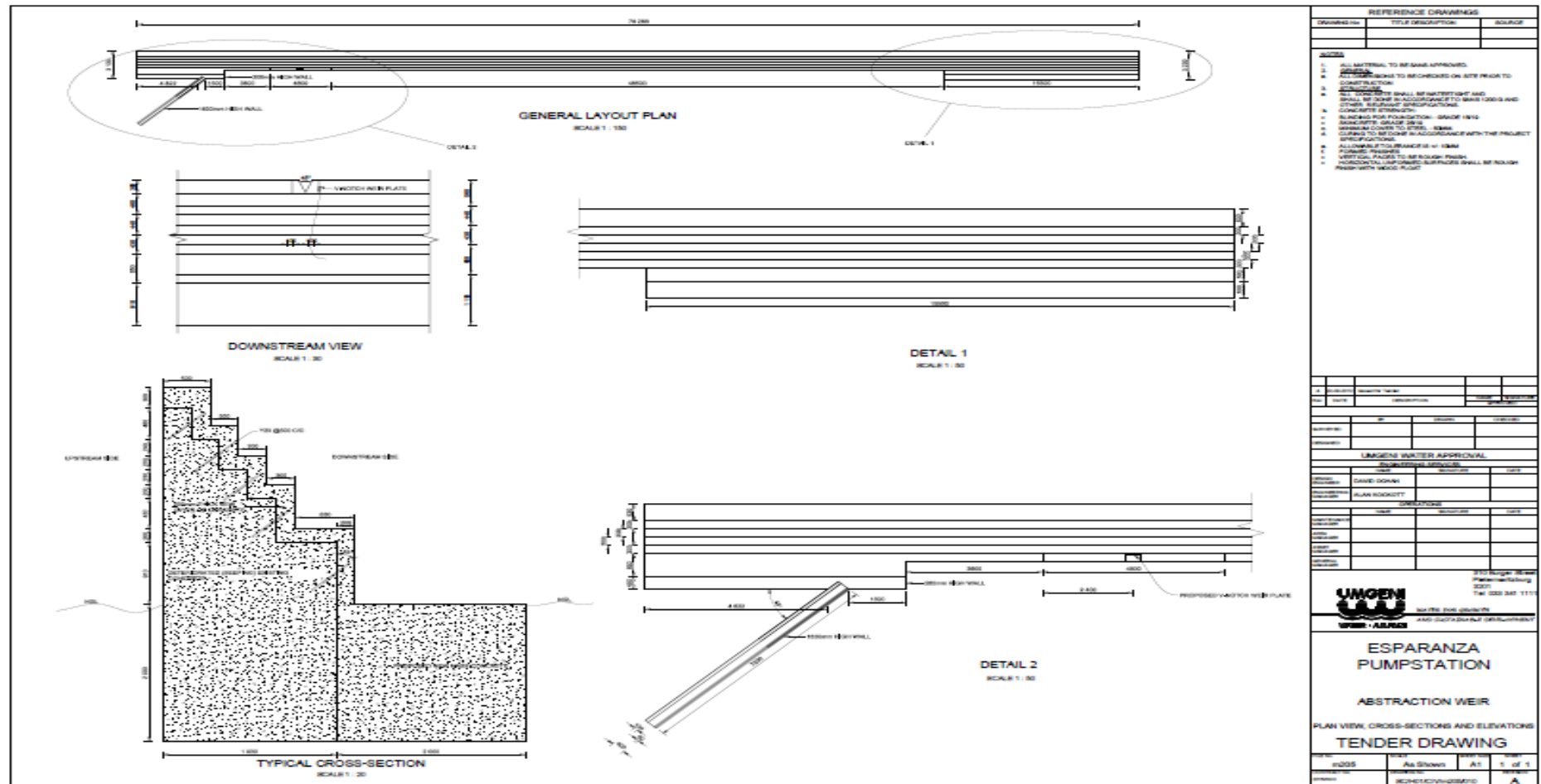
### **1.7. Motivation for Site Selection**

The purpose of these weirs is to measure low flows from Umzinto dam so as to improve dam operating rules, water resources planning initiatives and to monitor water quality of the dams as part of the Umzimayi and Umzinto catchment management forum. Technically gauging weir must be built at the end of straight river reach to allow for uniform stable flow and on competent founding conditions. In addition, there must be easy access to the site to allow personnel to take readings regularly.

The scope of work for this site is simply to refurbish an existing abstraction weir at the Esperanza Raw Water Pump Station including installation of a V-Notch to gauge the actual amount of water flowing past the weir with the design flow of 1521 m<sup>3</sup>/day as seen in **Figure 4**. In addition, the existing concrete wall will be refurbished to prevent further leak was during site inspections. This was considered to be the best option as opposed to venturing in an undisturbed greenfield site where environmental impacts plus financial implication would be high.

**(Please Refer to Appendix E- for a Copy of the DEA Letter of Motivation for Site Selection)**





**Figure 3: Lay out of the Esperanza Pump station- Abstraction Weir**



Figure 4: Position for the Proposed V-Notch Weir

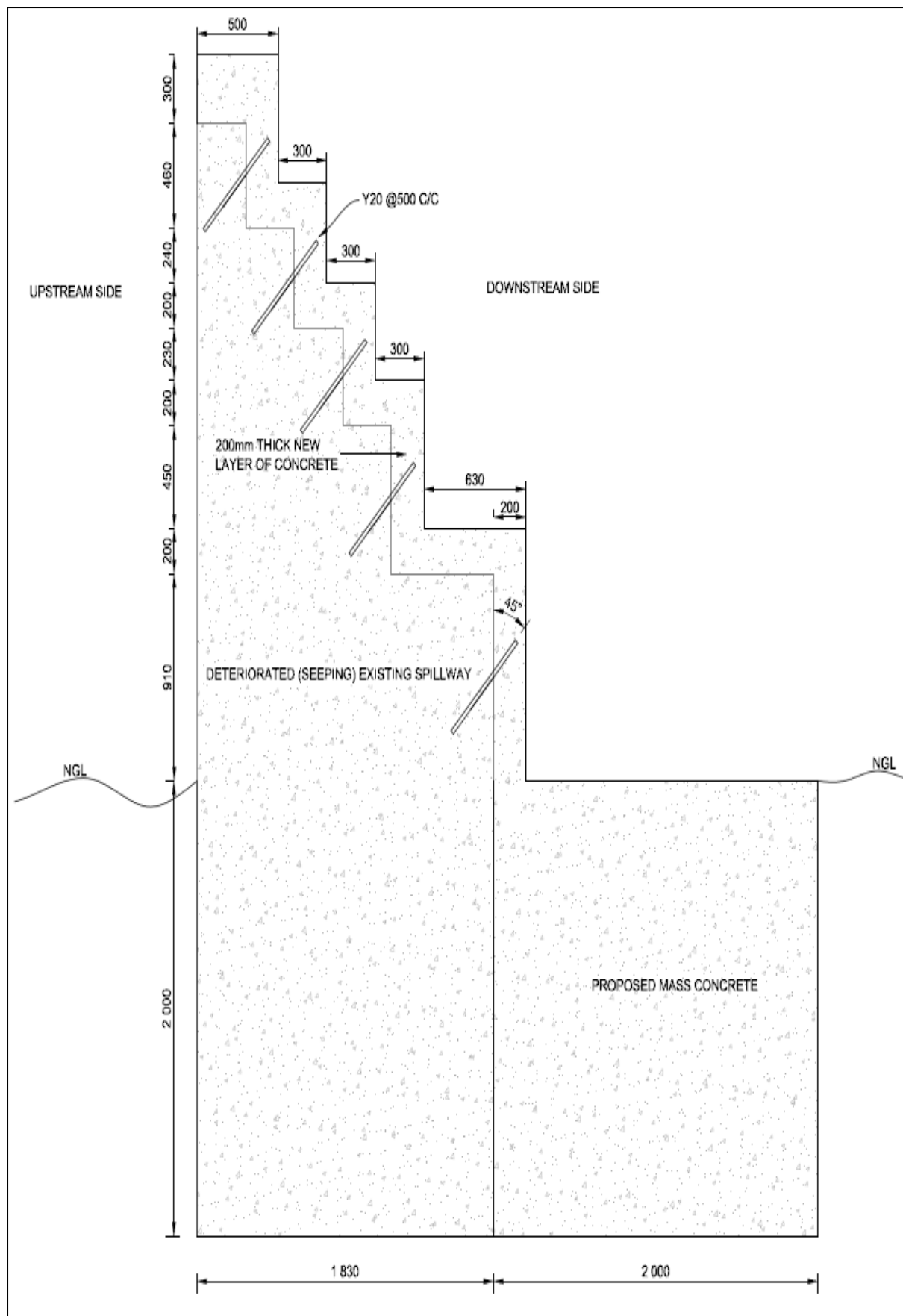


Figure 5: Side View of Existing Spillway

## 2 DESCRIPTION OF THE RECEIVING ENVIRONMENT

### 2.1. Visual Characteristics

The area surrounding the Esperanza gauging weir site comprises of very steep slopes, the study area also comprised primarily of riverine areas and drainage lines.

### 2.2. Climate

The mean annual precipitation is ~1011.3mm and the potential evaporation is ~1161.1mm with a simulated mean annual run-off of ~260.7mm. Rain fall occurs primarily in early summer and late summer with highly infrequent winter rainfall. The maximum temperatures vary between 24-28°C in February and 20-24°C in July whilst the minimum temperatures are between 16-20°C in February and 6-10°C in July.

### 2.3. Vegetation

According to National Classification and Status - The proposed site is located within the KwaZulu-Natal Coastal Belt (CB3).

The KwaZulu-Natal Coastal Belt Grassland (CB3) is characterised by undulating coastal plains. It is comprised mainly of a mosaic of sugarcane fields, timber plantations, thickets, coastal thornveld and secondary *Aristida* grasslands. This vegetation type is considered endangered with at least 50% already transformed by cultivation and urban sprawl (Mucina and Rutherford, 2006; Scott-Shaw and Escott, 2011) According to the National List of Threatened Ecosystem the KwaZulu-Natal Coastal Belt is listed as a vulnerable ecosystem (RSA 2011).

The provincial vegetation classification according to Scott-Shaw & Escott, 2011 states that the proposed site comprises of KwaZulu-Natal Coastal forest: Southern Mesic Coastal Lowlands Forest and are regarded as Critically Endangered.

According to Driver et al, 2011; the wetland vegetation for the proposed site comprises of the Indian Ocean Coastal Belt Group 2 and is regarded as Critically Endangered and moderately protected.

### 2.4. Wetland Vegetation

The majority of the wetland vegetation, however, comprised a mix of obligate wetland vegetation including *Leersia hexandra*, *Cyperus dives* and *Ludwigia octovalvis*. Soils within the wetland units generally comprised medium grey loamy sand with a moderate abundance of orange mottles at a depth of approximately 20cm-50cm.

### 2.5. NFEPA Wetlands

The 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 status of any NFEPA wetlands in an area. **Examination of the NFEPA GIS database identified no NFEPA Wetlands located within the proposed project site.**

## 2.6. Wetlands

The wetland delineation assessment identified two wetlands within a 500m radius of the proposed Esperanza Pump Station gauging weir site. These wetlands are located a considerable distance upslope of the proposed weir site (>80m) and therefore will not derive any impacts from the proposed gauging weir construction and operation, which alleviates the requirement for an impact or risk assessment.

## 2.7. Land Use

The land use within the proposed study area is made up of coastal forest that is surrounded by intensive sugar cane agriculture.

## 2.8. Geology

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

## 2.9. Catchment Characteristics

The proposed project is located in the Pongola – Mtamvuna Water Management Area (WMA), within the U80H quaternary catchment. The project is located on the U80H-5109 Sub Quaternary Reach (SQR). This river reach is a portion of the Mzinto 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 items of legislation.

## 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;
- The social, economic and environmental impacts of activities including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment;
- The right of workers to refuse work that is harmful to human health or the environment;
- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law;
- There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment;
- The environment is held in public trust for the people, the beneficial use of the environment resources must serve the public interest and the environment must be protected as the people's common heritage;
- The cost of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment; and
- 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 5** 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 Esperanza Pump Station 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 Esperanza Pump Station 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 Esperanza Pump Station 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> .
No. R. 327 of April 2017 (Listing Notice 1)	27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for – ii. maintenance purposes undertaken in accordance with a maintenance management plan.	The clearance of vegetation to allow access to the proposed gauging weir site.  This activity will no longer be triggered, as existing access roads will be used during the construction of the Esperanza Pump Station gauging weir.
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 licenced unless it (a) is listed in Schedule 1, (b) is an existing lawful use, (c) is permissible under a general authorisation (GA), or (d) if a responsible authority waives the need for a licence.

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

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

As the proposed development involves the abstraction of water, 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 of 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, abstraction works and pipelines
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, abstraction works and pipelines

The requisite documentation to satisfy DWS's requirements for the Water Use Authorisation process has been compiled and submitted (Please Refer to **Appendix F – Signed copy of the Acknowledgement Receipt for Submission of the WULA to DWS**). 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.

A copy of the DBAR was uploaded on to the AMAFA (SAHRA) website for review and comment. Comments were to be received on the 10 May 2019, to date no comments were received. Should a comment be received a copy will be submitted to the DEA Case Officer.

### 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.

## 4 BASIC ASSESSMENT PROCESS

### 4.1. Environmental Assessment Triggers

The proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge entails 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.

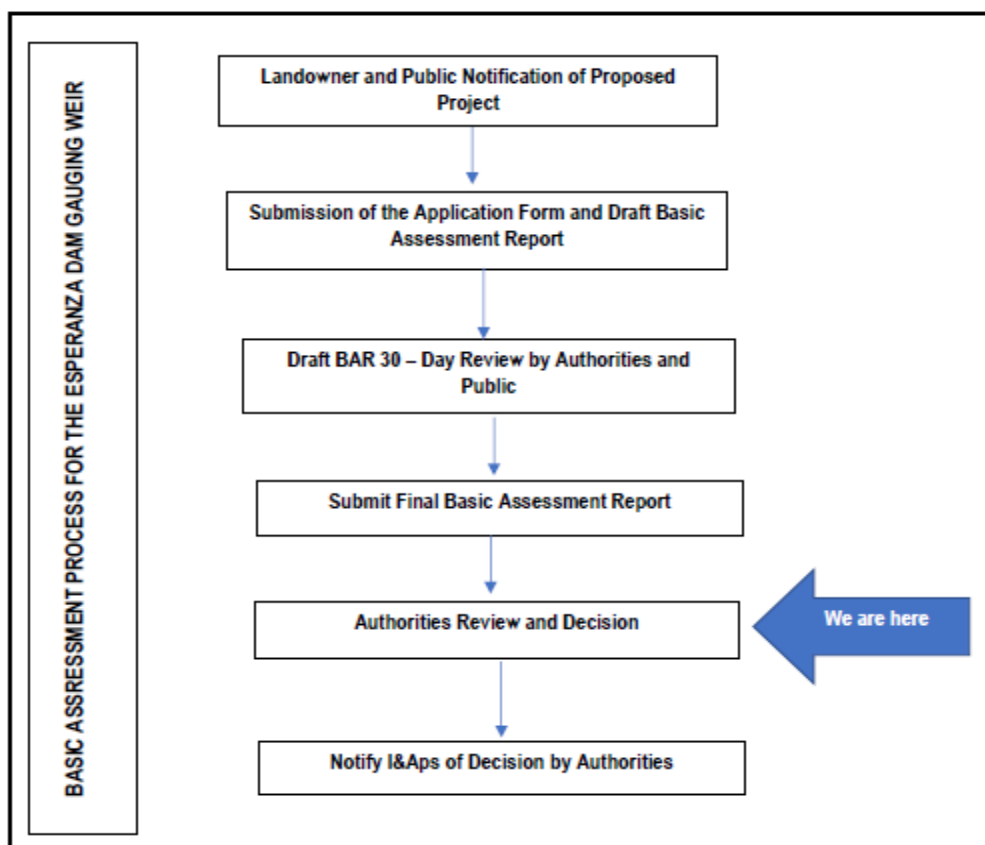
### 4.2. Environmental Assessment Authorities

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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge is provided in **Figure 6**.



**Figure 6:** Basic Assessment Process for the Esperanza Pump Station Weir

### 4.3.2. Landowner Consent

According to Regulation 39 (1) if 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 Illovo Sugar and they have been notified about the project.

### 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 DEA together with the Draft BAR.

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

The Draft BAR was made available to Interested and Affected Parties (I&APs) for a 30-Day review period from the 15<sup>th</sup> February 2019 to the 15<sup>th</sup> March 2019. All comments received have been 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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch 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 positive impacts while limiting the 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 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 Gauging Weir at the Esperanza Pump Station.

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

The following policies, statutes 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 Umdoni Local Municipality;
- The Integrated Development Plan (IDP) for Ugu 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?	R1 489 476.12
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 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 NEMA and GN No. R. 982 of the 2014 EIA Regulations, as amended in April 2017. Detail for the process are 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&APs 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 B**. This database will be maintained and updated as necessary during the course of the BA Process.

### 8.4. Landowner Notification

The Landowner is Illovo Sugar (Pty) Ltd. 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**).

### 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 are 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 **Appendix B3 of the Final BAR.**

### 8.5.3. Newspaper Notices

A newspaper advertisement was placed in the following newspapers as notification of the proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of a V-Notch Gauge weir and the 30-Day Review Period. Advertisements were placed in the following newspapers as notification of the project:

- South Coast Fever.

Proof of these advertisements are provided in **Appendix B 4 of 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 were placed at the public venue that is provided in **Table 8**. Emails were sent to all registered I&APs to notify them of the review of the Draft BAR. The 30-Day public review period took place from **15 February 2019 – 15 March 2019.**

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

Venue	Address	Contact Details
Umzinto Public Library	786 Nelson Mandela Road, Hazdelwood, Umzinto	039 974 1121

### 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;
- DWS: KZN region;
- Ezemvelo KZN Wildlife;
- DAFF;
- Department of Transport;
- Eskom;
- Amafa AkwaZulu-Natali/Heritage KZN;
- Ugu District Municipality;

- Umdoni Local Municipality;
- Municipal Ward Councillor for Ward 11

Proof of notification to commenting authorities of the review period and all proof of deliveries of the Draft BAR to all organs of states is 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, is contained in the Final BAR. The issues that are listed in the Comments and Response Report have been identified from emails, letters and other correspondence received to date on the Project. **(Refer to Appendix B7)**

## 9 ENVIRONMENTAL ATTRIBUTES

The environmental attributes that are associated with the proposed Esperanza Dam weir and abstraction works 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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of the V-Notch gauge weir. The Specialist Reports are contained in **Appendix C** for Specialist Reports. **The Specialist Studies have been submitted to the DEA - Biodiversity Section for comments.**

### 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 in the Pongola – Mtamvuna Water Management Area (WMA), within the U80H quaternary catchment. The project is located in the U80H-5109 Sub Quaternary Reach (SQR). This river reach is a portion of the Mzinto River system. The considered sub quaternary catchment (SQC) 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 U80H-5120 SQR

Component / Catchment	U80H-5109
Present Ecological Status	Largely modified
Ecological Importance Class	High
Ecological Sensitivity	Very High
Default Ecological Category	Natural

The results of the Desktop assessment indicate that the considered SQR PES was in a Class D or largely modified status (Class B). The Ecological Importance in the SQR was determined to be High. The Ecological Sensitivity of the SQR was determined to be very high. The Default Ecological Category for the considered reach was a Class A or Natural Based on desktop information.

The rationality that was used for the selection of the location for the aquatic sampling points 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	May 2018
-----------	----------------------	----------

A1  
(Upstream)

Biology,  
Water and  
Habitat  
Quality



**A1**  
**(Downstream)**



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

- A Single Aquatic ecology site 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 predominantly using desktop data and a low confidence site investigation;
- 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 proposed activity was selected for this assessment;
- No alternatives were considered for this assessment;
- The exact listed activities have not been provided for the report;
- The height and current inundation zone of the impoundment is assumed to remain as the baseline assessment; and
- It is assumed that no major earthworks will be required for the proposed project.

### 10.1.4. Results and Discussion

#### 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 from below the Umzinto Dam Wall (February 2018)

Constitute	Result
pH	7.1
Electrical Conductivity (mS/cm)	22.5
Chloride (mg/l)	34
Nitrate (mg/l)	0.1
Phosphate (mg/l)	0.2
Free and Saline Ammonia as N (mg/l)	0.3
Sulphate (mg/l)	2
As (mg/l)	<0.01
Ca (mg/l)	7
Cd (mg/l)	<0.01
Co (mg/l)	<0.01
Cr (mg/l)	<0.01
Cu (mg/l)	<0.01
Fe (mg/l)	1.206
Mg (mg/l)	6
Mn (mg/l)	<0.025
Ni (mg/l)	0.013
Pb (mg/l)	<0.01

The results of the chemical water quality assessment indicated that there was limited water quality deterioration in the considered river reach and confirm the *in-situ water quality*.



#### 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 influencing the quality of the habitats are largely attributed to instream habitat modification relating to the direct impacts of the Esperanza impoundment (**Photo 1**). However, alien vegetation and riparian clearing was evident during the survey (**Photo 2 and Photo 3**).

The riparian delineation indicated dominance of the marginal zone by *Arundo donax* upstream of the weir and *Phragmites australis* downstream of the weir. As stated above, the riparian zone has a high abundance of alien vegetation and was determined to be largely modified. The delineated riparian zone is provided in **Figure 7**.



**Photo 1: Flow Regulation, abstraction, Channel and bed modification (A1; May 2018)**





**Photo 2: Cleared marginal and upper riparian zone in the Mzinto River at A1 (May 2018).**



**Photo 3: Riparian habitat downstream of the Esperanza Weir. Note the abundance of alien vegetation (*Melia azedarach*, *Tithonia diversifolia*; May 2018)**



May 2019



Figure 7: Riparian delineation for the Esperanza Weir Project

#### 10.1.4.3. Macroinvertebrates

Biological assessments were completed at representative sites in the considered river reaches. The invertebrate habitat at each site 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 the stones in current. Invertebrate habitat typically consisted of gravel / sand substrates and marginal vegetation. The assessment of substrates observed high concentrations of filamentous algae, which suggest nutrient enrichment.

The results of the SASS5 assessment derived a SASS5 score of 221 with 33 macroinvertebrate families observed with an ASPT of 6.7. The ecological class was found to be Class A (Natural) at the sampled point.

The results of the Macroinvertebrate Response Assessment Index (MIRAI) assessment indicate that a moderately/largely modified invertebrate community was present in the considered watercourse based on the survey results. The primary driver of the macroinvertebrate community was determined to be habitat availability. The presence of several sensitive species in the SASS5 sample confirmed the good water quality as indicated in the water quality assessment of the study.

#### 10.1.4.4 Fish Community

A total of 9 fish species were sampled during the May 2018 survey and a sampled species included a listed species. The listed species is *Oreochromis mossambicus* which is listed as Near Threatened (ICUN, 2017). *Oreochromis mossambicus* is threatened by hybridisation and therefore the proposed project will not negatively affect the population of this species. The sampled native fish community structures were calculated according to the percentage of the expected fish species sampled at a site.

The Fish Response Assessment Index (FRAI) results indicates a moderately modified (class C) fish community structure. This was largely attributed to the absence of several fish species which is attributed to instream modification. The presence of catadromous fish species provides an indication that connectivity within the Mzinto River is intact, considering this the proposed rehabilitation project should consider constructing a fishway.

#### 10.1.5 Overall Aquatic Ecology Present Ecological Status

The results of the PES assessment derived moderately / largely modified (class C/D) conditions in the river reach. Despite large modification to instream habitat through the presence of the various impoundments, aquatic ecology responses were determined to be moderately modified. The results provide an indication that there have been cumulative level impacts in the considered watercourse resulting in the moderately / largely modified nature of the Mzinto River. The results of the PES are provided in table 11 below:



Table 12: Present Ecological Status of the river reach assessed in the May 2018 survey.

Aspect Assessed	Ecological Category
Instream Ecological Category	45
Riparian Ecological Category	51
Aquatic Invertebrate Ecological Category	60
Fish Ecological Category	65
Ecotatus	Class C / D

#### 10.1.6. 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. However, considering the PES of the river reaches the ecological importance and sensitivity can both be regarded as low.

#### 10.1.7. Risk Assessment and Recommendations

The requirements for the completion of the proposed project the following activities will take place.

- ❖ Rehabilitation and operation of the Esperanza Weir.

The riparian area adjacent to the existing weir has been cleared of vegetation. Considering this, limited impacts to this area are anticipated (**Photo 4**)



Photo 4: Cleared area on the left bank of the Mzinto River

The results of the risk assessment derived **low risks** for the proposed project. The low risks of the proposed project can be attributed to the small-scale rehabilitation activities. However, some impacts to hydrology can be anticipated through the construction phase. Furthermore, no riparian or bank alterations are anticipated to stem from the proposed project. Considering the nature of the proposed project, limited instream modification can be anticipated. In addition, the short nature of the rehabilitation activities further negates long terms impacts.

#### 10.1.8. Cumulative Impacts

The risk assessment indicated **low risk** to the **downstream/upstream aquatic environment** and therefore no cumulative impact can be anticipated to stem from the proposed project.

#### 10.1.9. Mitigation actions recommended by the Aquatic Specialists

- ❖ All contractors and employees must undergo induction, 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 on a regular basis 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 and must be placed outside of the riparian zone / 32 buffer zone. The use of these facilities must be enforced to work staff on site;
- ❖ 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 or recycled;
- ❖ Construction activities are proposed to be conducted during the dry season, where feasible (April – August);
- ❖ Water that is released from the upstream Umzinto Dam should be limited during the construction phase of the project;
- ❖ 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 should be utilised for construction activities;
- ❖ An alien invasive plant management plan needs to be compiled and implemented prior to construction to control and prevent the spread of invasive aliens;
- ❖ No chemicals, building materials, hydrocarbons or soils must be stockpiled within the 32m buffer zone;

According to baseline study, there has been a loss of connectivity between areas upstream and downstream of the weir and in order to facilitate the movement of fish species, a fish ladder is recommended by the Aquatic specialist.

**Essentially, four types of fishways should be considered namely: Pool and weir, vertical slot, pool and slot and natural by-pass channels. The following fishway concepts should be adhered:**

- ❖ The fishway should have water passing through it during both high flows and low flows to encourage fish to make use of the fishway no matter the flow levels;
- ❖ The fishway should cater for both rheophilic (fastmoving water) and anti-rheophilic (slow moving water) fish species. This can be achieved through having several different flow velocity areas across the fishway;
- ❖ It is recommended that a rough stone surface be cast into the fishway channel floor to cater for climbing and crawling species;
- ❖ Rocks used for the fishway should have flat sides with rounded edges (typical of quarried rock) rather than rounded rocks, as they provide a variety of water velocity and depths that are easy for fish to navigate;
- ❖ Pools or depressions of varying sizes and depths should be created at random throughout the length and width of the fishway and should be placed behind large rocks to create lower velocity resting areas (eddies) for fish. The more pools incorporated in the design, the more successful the fishway will be.

**Additional guidelines for fishway design include:**

- ❖ **Channel slope (gradients)** – between 1/8 and 1/10 is recommended for South African fish;
- ❖ **Fishway entrance** – furthest point upstream that the fish can penetrate, usually in a suitable pool (low turbulence with sufficient depth) located at the base of the weir;
- ❖ **Fishway exit** – located in a quiet area, sheltered, with a low velocity to prevent fish from being swept downstream and to afford protection from predators;
  - The invert level of the exit (i.e. water inflow) should be lower than that of the weir overflow to ensure the low flows are directed down the fishway;
- ❖ **Depth of pool** - small fish (20 to 200 mm in length: at least 300 mm deep to reduce predation and limit turbulence;
  - Larger fish (>200 mm): at least 500 mm, can be deeper to reduce turbulence, if necessary;
- ❖ **Length of pool** – at least 2.5 times the length of the largest fish catered for;
- ❖ **Drop height between pools/rock levels** – maximum of 100 mm to cater for small fish.

#### **10.1.10. Conclusion and Recommendations**

The results of the PES assessment derived largely modified (class D) conditions in the river. The modified conditions were largely attributed to cumulative habitat and water quality level impacts which have resulted in the modification of instream habitat, invertebrate and fish communities.

The results of the risk assessment derived predominantly low risks for the proposed project. However, due to the permanent presence of the weir, the risk rating for the operation and maintenance activity of the V-notch structure was determined to be moderate. It is however anticipated that the overall impact of the proposed project will be low when considering the recommended mitigation measures and the nature of the proposed project.

The baseline environment indicated largely tolerant aquatic biology. In addition, the proposed project will be located approximately 20m downstream of the existing Esperanza 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 the 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

Upon investigation of the site in close proximity to the proposed Esperanza Pump Station gauging weir, as well as within the 500m DWS regulated area for water use, two wetland units were identified approximately 80m and 100m upstream of the proposed Pump Station gauging weir site. These wetland units, being located a considerable distance upstream of the proposed site, will not receive any impacts from the construction or operation of the proposed gauging weir and, as such, will not require a DWS mandated Risk Assessment. The general study area comprised primarily of riverine areas and drainage lines. The steep topography, which characterised the study area (20-40%), does not lend itself to wetland formation. The Classification System for Wetlands and Other Aquatic Ecosystems in South Africa, compiled by Ollis et al. (2013), states that a characteristic longitudinal gradient of higher than 10% is applicable to Mountain headwater streams. The longitudinal gradient of wetland units is typically gentler than 10% (i.e. 0.5% to 5%), however, seepage wetlands frequently occur on steeper slopes (Ollis et al. 2013).

The wetland units, classified as seepage wetlands, were partially invaded by sugarcane agriculture (*Saccharum officinarum*) which was also prevalent throughout the left-hand bank catchment in the vicinity of the proposed site. The majority of the wetland vegetation, however, comprised a mix of obligate wetland vegetation including *Leersia hexandra*, *Cyperus dives* and *Ludwigia octovalvis*. The edges of the wetland units comprised primarily invasive alien plants including *Rubus cuneifolius*, and *S. officinarum*. Soils within the wetland units generally comprised medium grey loamy sand with a moderate abundance of orange mottles at a depth of approximately 20cm-50cm.

The drainage lines and ephemeral riparian areas within the vicinity of the proposed site comprised primarily of *S. officinarum* agriculture and a mix of alien shrubs such as *Lantana camara*, *Ageratum conyzoides*, *Solanum mauritianum*, *Senna didymobotrya* and localised clumps of *Eucalyptus sp.* Soils within these areas generally comprised medium brown sand, which is indicative of non-wetland habitat.

It must be noted that the Umzinto River, specifically, did not form part of this assessment due to its location within a riparian zone. The assessment of this riverine unit is included within the study compiled by The Biodiversity Company (2018).





**Photo 5: View from a point on the left-hand bank of the Umzinto River near to the site of the proposed gauging weir looking upstream showing the active channel as well as distinct riparian habitat.**



**Photo 6: View from lower extent of a drainage line within the study area shows the extent of the sugarcane cultivation as well as the level of alien plant invasion within these drainage lines, which in this case was dominated by *L. camara*.**



**Photo 7: Medium brown sandy terrestrial soil extracted from within an ephemeral riparian zone within the study area, note the absence of wetland indicators (i.e. Mottling or grey soil matrix)**



**Photo 8: View from the left hand bank of the Umzinto River looking from north to south across the river showing the proposed site of the new gauging weir which will be mounted on the existing infrastructure.**





**Photo 9: View looking from south to north of a seepage wetland in the vicinity of the proposed site. This wetland, as well as the other identified wetland, is located a considerable distance upslope of the proposed site and therefore will not receive any impacts**



**Photo 10: An example of a seasonal wetland soil found onsite.**



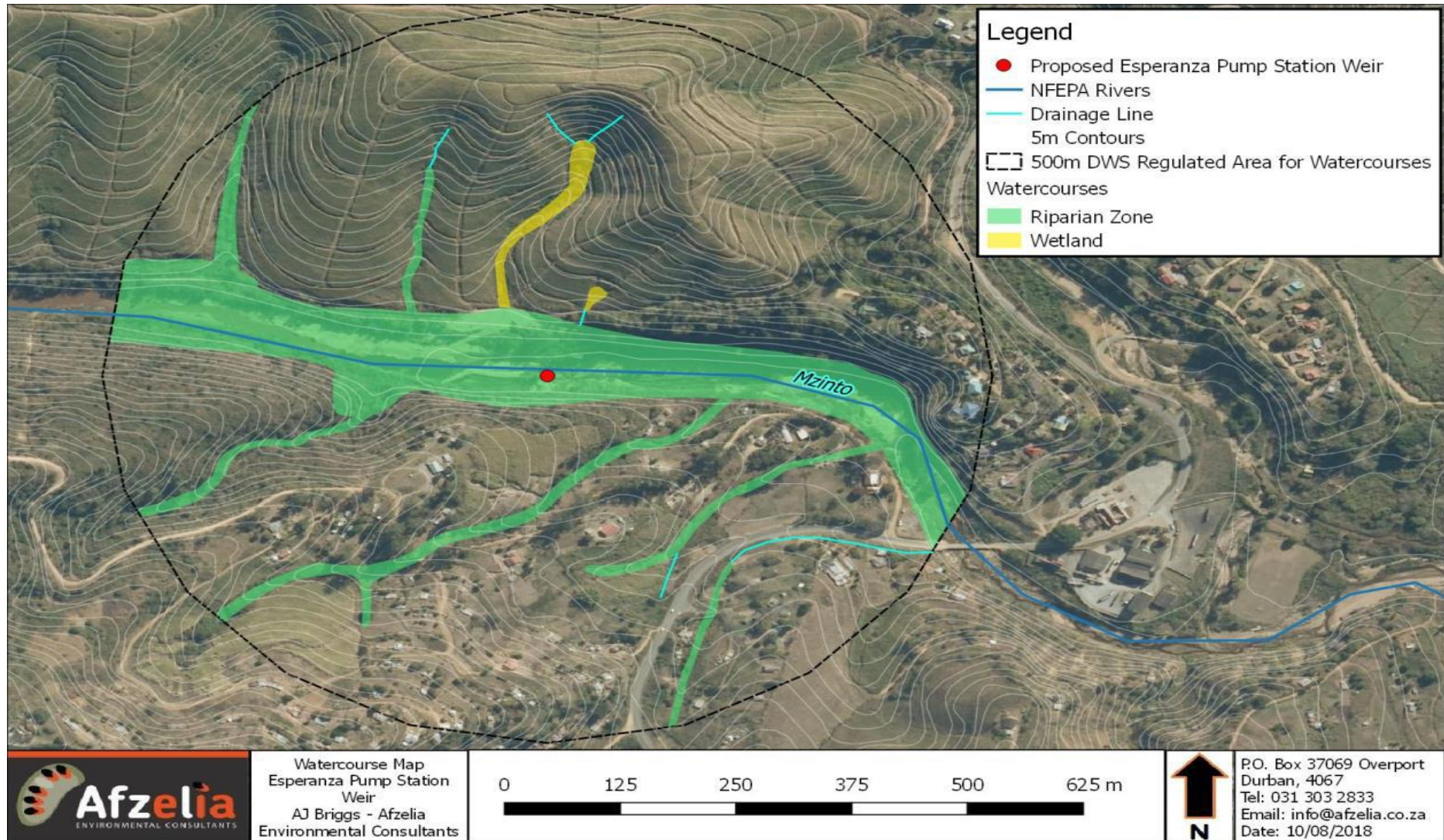


Figure 8: Watercourse map showing the riparian units in the vicinity of the Proposed Esperanza Pump Station Gauging Weir.

### 10.2.3 Impact and 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 two wetlands identified within a 500m radius of the proposed Esperanza Pump Station gauging weir site. These wetlands are located a considerable distance upslope of the proposed weir site (>80m) and therefore will not derive any impacts from the proposed gauging weir construction and operation, which alleviates the requirement for an impact or risk assessment.

It must be noted that an impact and risk assessment will be necessary for the riparian habitat of the Umzinto River as this habitat 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 GPS map 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 majority of watercourse units located within the respective study areas were riparian zones, although many invaded drainage lines were also present. Two wetlands were identified a considerable distance upslope of the Umzinto River and were not formally assessed due to their respective locations as they will not receive any impacts from the proposed gauging weir construction.

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 developments. 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.

## 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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and to install a V-Notch Gauge to measure flow 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.

The impacts to the environmental features are linked to the project activities, which relates to the proposed development and its associated infrastructures.

### 11.2. Project Activities

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 statement</li> <li>• The development and approval of construction plans</li> <li>• The construction site planning, 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 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.
- Landscaping.

### 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 Esperanza Pump Station 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.
- The site specific environmental issues are not 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 area 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.
- Indiscriminate site clearing.
- Poor site establishment.
- The poor management of access and use of the access roads to site.
- 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
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Construction Phase
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- 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
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- 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
<b>Topography of the site</b>	<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>
<b>Geohydrology of the site.</b>	<ul style="list-style-type: none"> <li>➤ Groundwater pollution due to the occurrence of any spillages on site.</li> <li>➤ Poor construction practices.</li> </ul>
<b>Surface Water</b>	<ul style="list-style-type: none"> <li>➤ Increased stormwater runoff on site.</li> <li>➤ Water leakages.</li> </ul>
<b>Geology and Soil</b>	<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 pollution 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>➤ The contamination of soil through spillages and leakages that occur on site.</li> <li>➤ Soil contamination due to the incorrect or the mismanagement storage of hazardous chemicals.</li> <li>➤ Poor stormwater control measures during construction.</li> </ul>
<b>Flora</b>	<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> </ul>

**Fauna**

- Destruction of potential red list plant during site clearing and construction.
- Disturbance of sensitive plant species during relocation processes.
- Loss of habitats during the site clearing process.
- Loss of habitats during construction.
- The illegal poaching or hunting of mammals.
- 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.

**Noise**

- Localised noise increase.
- Increase in noise levels.
- Noise nuisance.

**Aesthetics**

- Reduction in visual quality of the area.

**Air Quality**

- Increase in dust levels.
- Greenhouse gas emissions.

**Transportation**

- Construction related traffic.
- Increase in traffic on the local road network

**Safety and security**

- Safety risk to landowners and surrounding communities.

**Socio-economic (positive)**

- Generation of employment opportunities for the local community.
- Contribution to the local community

**Socio-economic (negative)**

- Safety and security issues.
- Conflicted land uses.
- Nuisance from noise and dust.

**Waste Management**

- The generation of waste from site preparations.
- The generation of domestic waste.
- Surplus and used building material.
- Hazardous waste, such as contamination of soil by spillages from chemicals, oil / diesel, cement etc.
- The disposal of excess spoil material (rock and soil) that is generated as part of the earthworks.

**Water Users**

**Riparian Habitat**

**Aquatic Ecology**

**Flow Regime**

**Water Quality**

- 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.
- The loss of riparian and instream vegetation with the construction footprint.
- 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 to the flow.
- The effect on aquatic biodiversity.
- The release of contaminants from equipment and concreting activities.
- Water quality impacts due to siltation and pollution.
- The inflow of contaminated stormwater.
- Impacts on water quality due to poor construction activities.
- Impacts to the water quality due to spillages (cement, diesel / oil).

**Potential significant environmental impacts for the Operation Phase.**

Feature	Impact
<b>Topography</b>	<ul style="list-style-type: none"> <li>➤ Visual impacts from infrastructure.</li> <li>➤ Visual impacts from disturbed areas.</li> <li>➤ Crossing of water courses.</li> <li>➤ Erosion of affected areas.</li> </ul>
<b>Flora</b>	<ul style="list-style-type: none"> <li>➤ The encroachment by exotic species through the lack of the eradication programme for the site.</li> </ul>
<b>Aesthetics</b>	<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>
<b>Water</b>	<ul style="list-style-type: none"> <li>➤ Damage to the weir and abstraction works from the occurrence of major flooding.</li> </ul>
<b>Socio – Economic (positive)</b>	<ul style="list-style-type: none"> <li>➤ The generation of employment activities for the local community</li> </ul>
<b>Socio – Economic (negative)</b>	<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 determined in the impact assessment which are then translated to action items. These action 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
Permanent				
1				
Probability				
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain
1	2	3	4	5
Significance				
No Impact / None	No Impact Mitigation / Low	After	Residual Impact Mitigation / Medium	After 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 Esperanza Dam Gauging Weir and abstraction works.

### 12.1. Geohydrology

#### 12.1.1 Potential Impacts

Groundwater will adversely affect excavation conditions, stability of the excavated slopes in the trenches and 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 or from the batching plant.

## 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 NWA.</li> <li>❖ Ensure that all hazardous storage containers and storage areas 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 must be prohibited by providing adequate number of rubbish bins 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 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**

- Storage and use of construction materials and hydrocarbons (Construction Phase);
- Rehabilitation activities (Construction Phase);
- Operation and maintenance of the rehabilitated weir (Operation);

## 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.						
	<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>	Impact to the flow regime in the Umzinto River during the operation of the Esperanza Gauging weir.						
<b>Proposed Mitigation</b>	❖ Water that is abstracted from the Umzinto River must not impact the EWR of the river. The EWR must be satisfied and over abstraction must not take place.						
	<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	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 50m from edge of riparian habitat.</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, paint) 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 must be prohibited by providing adequate number of rubbish bins 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> </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 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> <li>❖ Runoff is to be diverted into the site and, either discharged by gravity or, if required, pumped to the Municipal stormwater network.</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 to 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
Operation	Storage and use of construction materials and hydrocarbons.	Contaminated runoff	❖ Deterioration of water quality
	Rehabilitation activities	Hydrological alteration	❖ Alteration of hydrology.
	Operation and maintenance of the V-Notch Crump Weir.	Physical presence of structure	❖ Modification instream habitats

**Table 16: DWS Risk Impact Matrix for the Proposed Project**

Aspect	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial Scale	Duration	Consequence
Construction Phase								
Storage and use of construction chemicals and hydrocarbons	1	2	1	1	1.25	1	1	3.25
Rehabilitation activities	2	2	2	2	2	1	1	5
Operational Phase								
Operation and maintenance of the rehabilitated weir	1	1	1	1	1	1	1	3

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>								
Storage and use of construction chemicals and hydrocarbons	1	3	5	1	10	32.5	Low	Low
Rehabilitation activities	1	3	5	1	10	50	Low	Low
<b>Operational Phase</b>								
Operation and maintenance of the rehabilitated weir	1	5	5	1	16	48	Low	Low
(*) 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 32m buffer zone if feasible;
- Construction activities are proposed to be conducted in the dry season (April – August);
- 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;
- All 'shock tubes' and detonation wires must be recovered following each blast;
- No mixture of ammonium nitrate-fuel oil mixtures must take place in or near the river (30m buffer);
- Any disturbed areas must be re-vegetated within indigenous plant species.

### **12.3. Geology and Soil**

#### **12.3.1 Potential Impacts**

The proposed development of the gauging and abstraction works will require suitable geological foundation conditions.

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

Soil may be polluted by the poor storage of construction material, 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. The same objective will apply to the correct management and handling of hazardous substances (e.g. Fuel, chemicals etc).

## 12.3.2 Impact Assessment

<u>Geology and Soil</u>							
<b>Project Life Cycle:</b>	<b>Construction and Operational Phases</b>						
<b>Potential Impact:</b>	<b>Soil Erosion</b>						
<b>Proposed Mitigation:</b>	<u>Erosion Control:</u> <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.</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>❖ Cross and side stormwater drainage measures shall be constructed on access roads to the site.</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>						
	Nature (positive / negative)	Extent	Magnitude	Duration	Probability	Significance	Score
<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 should be temporarily stockpiled, separately from (clay) subsoil and rocky material, when areas are cleared. If mixed with clay sub-soil the usefulness of the topsoil for rehabilitation of the site will be lost.</li> <li>❖ Stockpiled topsoil should not be compacted and should 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 should be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season. 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 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 later growth of vegetation and 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 should be exposed for the minimum time possible once cleared of invasive vegetation, that is the timing of clearing and grubbing should be coordinated as much 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	
Potential Impact	Mitigation
<b>Destruction of indigenous flora during site establishment</b>	<ul style="list-style-type: none"> <li>❖ Vegetation clearing should be kept to a minimum, and this should only occur where it is absolutely necessary, and the use of a brush-cutter is highly preferable to the use of 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>❖ Vehicles and construction workers should under no circumstances be allowed outside the site boundaries 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 the disturbed areas and they should be eradicated and controlled to prevent further spread.</li> <li>❖ <b>No storage of building materials or rubbles are allowed in the sensitive areas, such as the 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

**Flora and Fauna  
Pre - Construction Phase**

Potential Impact	Mitigation						
<b>Loss of Habitat and Habitat Fragmentation</b>	<ul style="list-style-type: none"> <li>❖ The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining.</li> <li>❖ No structures should 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 should be constructed in such cases so as to avoid further impact to these areas.</li> <li>❖ All stockpiles, construction vehicles, equipment and machinery should 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 Construction Phase							
Potential Impact		Mitigation					
Loss of vegetation due to fuel and chemical spills		<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. Drip-trays must be placed under 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
Without Mitigation	Negative	Local	Medium	Medium term	Almost Certain	2	-32
With Mitigation	Negative	Local	Low	Short-Term	Likely	1	-6

Flora Construction Phase							
Potential Impact		Mitigation					
Introduction of Alien Species.		<ul style="list-style-type: none"> <li>❖ During construction, the construction area and immediate surroundings should be monitored regularly for emergent invasive vegetation.</li> <li>❖ Promote awareness to all personnel on site.</li> <li>❖ The establishment of pioneer species should be considered with the natural cycle of rehabilitation of disturbed areas, which assists with erosion control, dust and establishment of more permanent 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
Without Mitigation	Negative	Local	Medium	Medium term	Almost Certain	2	-32
With Mitigation	Negative	Local	Low	Short-Term	Likely	1	-6

Flora Construction Phase							
Potential Impact		Mitigation					
Destruction of Alien Vegetation		<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 removal is preferred to chemical control.</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 Construction Phase							
Potential Impact		Mitigation					
Increased Soil Erosion		<ul style="list-style-type: none"> <li>❖ Topsoil should be stored in such a way that it does not compromise its plant-support capacity.</li> <li>❖ Topsoil from the construction activities should be stored for post-construction rehabilitation work and should 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 wastes.</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
Without Mitigation	Negative	Local	Medium	Medium term	Almost Certain	2	-32
With Mitigation	Negative	Local	Low	Short-Term	Likely	1	-6



Flora Construction Phase							
Potential Impact		Mitigation					
<b>Loss of Ecologically Sensitive Areas (ESA) habitats</b>		<ul style="list-style-type: none"> <li>❖ Vehicles and construction workers should under no circumstances be allowed outside the site boundaries 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 limited only to areas of construction.</li> <li>❖ Prevent contamination of natural grasslands by any pollution.</li> <li>❖ Areas cleared of vegetation must be re-vegetated with indigenous plants local to the area prior to contractor leaving the site.</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							
Potential Impact		Mitigation					
<b>Damage to plant and animal life outside of the proposed development area.</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 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 the disturbed areas and they should be eradicated and controlled to prevent their spread.</li> <li>❖ No unauthorised vehicles should be allowed to drive through the site during the construction activities.</li> <li>❖ No trapping or any other method of catching of any animal may be performed on site.</li> <li>❖ Illegal hunting is prohibited.</li> <li>❖ No dumping of 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 by indigenous vegetation.</li> </ul>					

		❖ Construction activities should be restricted to the development footprint area and then the compliance in terms of footprint can be monitored by 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							
Potential Impact		Mitigation					
Loss of habitat due to construction activities		❖ All areas to be affected by the proposed project will be rehabilitated after construction and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed registered landfill site. ❖ 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 landscaping. 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, the plant material to be used for rehabilitation should be similar to what is found in the surrounding area.					
	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 will have a negative impact on the habitats of such species. Fauna could be adversely affected through the construction related activities (such as noise, illegal poaching and habitat loss) for the proposed Esperanza Dam gauging weir and abstraction work.

### 12.5.2 Impact Assessment

Fauna Pre-Construction Phase	
Potential Impact	Mitigation
<b>Loss and displacement of animals on site.</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 an experienced person.</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, 30-40 km/h is recommended for light vehicles and a lower speed for heavy vehicles.</li> <li>❖ All construction and maintenance vehicles must stick to properly demarcated and prepared roads. Off-road driving should be strictly prohibited.</li> <li>❖ No fires should be allowed at 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 should be allowed at 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							
Potential Impact		Mitigation					
<b>Loss of Habitat &amp; Habitat Fragmentation</b>		<ul style="list-style-type: none"> <li>❖ The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining.</li> <li>❖ No structures should 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 should be constructed in such cases so as to avoid further impact to these areas.</li> <li>❖ All stockpiles, construction vehicles, equipment and machinery should 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							
Potential Impact		Mitigation					
Damage to plant and animal life outside of the proposed development area.		❖ Any 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.					
		❖ Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent their spread.					
		❖ No unauthorised vehicles should be allowed to drive through the site during the construction activities.					
		❖ No trapping or any other method of catching of any animal may be performed on site.					
		❖ Illegal hunting is prohibited.					
		❖ No dumping of any form is permitted.					
Flora and Fauna Construction Phase							
Potential Impact		Mitigation					
Damage to plant and animal life outside of the proposed development area.		❖ No damage and/or removal/trapping/snaring of indigenous plant or animal material for cooking and other purposes will be allowed.					
		❖ All areas to be affected by the proposed development will be rehabilitated by indigenous vegetation.					
		❖ Construction activities should be restricted to the development footprint area and then the compliance in terms of footprint can be monitored by 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

Fauna Construction Phase							
<b>Potential Impact</b>		<b>Mitigation</b>					
<b>Disturbance to animals</b>		<ul style="list-style-type: none"> <li>❖ Animals residing within the designated area shall not be unnecessarily disturbed.</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>					
	<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 term	Almost Certain	2	32
<b>With Mitigation</b>	Negative	Local	Low	Short-Term	Likely	1	6

Fauna Operational Phase							
<b>Potential Impact</b>		<b>Mitigation</b>					
<b>Disturbance of faunal species</b>		<ul style="list-style-type: none"> <li>❖ The disturbance of fauna should be minimized.</li> <li>❖ Animals residing within the designated area shall not be unnecessarily disturbed.</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	Medium	Medium term	Almost Certain	2	32
<b>With Mitigation</b>	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, the visual impacts should 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 should be minimised.</li> <li>❖ Vegetation should be cut only if necessary.</li> <li>❖ The clearing of all sites should be kept to a minimum and surrounding vegetation should as far as possible be left intact as a natural shield.</li> <li>❖ The fragmentation of stands of indigenous vegetation and straight lines on trees should as far as possible be minimized.</li> <li>❖ No painting or marking of natural features shall be allowed. Marking for surveying and other purposes shall only be with pegs and beacons.</li> <li>❖ Trees and all woody shrubs should be protected from damage to provide a natural visual shield. Excavated material should not be placed on such plants and movement across them should not be allowed as far as practical.</li> <li>❖ No construction rubble, construction material, refuse, litter or any other material not found naturally in the surroundings should be allowed at any time to be lying around on the construction site.</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 and abstraction works.						
<b>Proposed Mitigation</b>	<ul style="list-style-type: none"> <li>❖ On-going housekeeping to maintain a tidy area.</li> <li>❖ Rehabilitate and revegetate 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 and beacons.</li> <li>❖ Trees and all woody shrubs should be protected from damage to provide a natural visual shield.</li> <li>❖ Particular aspects of concern to landowners and local residents should 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 may increase the noise levels in the study area but minimally.

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

## 12.8. 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 included 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 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

## 12.9. 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

Safety and Security	
<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>❖ Demolition activities</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 to the Construction Manager 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> </ul>

	<ul style="list-style-type: none"> <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> <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
<b>Without Mitigation</b>	Negative	Local	High	Short term	Unlikely	3	36
<b>With Mitigation</b>	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. Haul roads and access roads will also be created on site, within the construction domain.

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 with the refurbishment of the existing abstraction weir at the Esperanza raw water pump station and the installation of the v-notch gauge to measure flow. Any disruptions to the transportation network must be mitigated and will be discussed in the EMPr.

## 12.10.2 Impact Assessment

Traffic							
<b>Project Lifecycle</b>	Construction Phase						
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>❖ Inadequate road conditions</li> <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 for landowners and affected parties to access their properties.</li> <li>❖ Speed limit of 40km/h on roads within the project area to be adhered to.</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>						
	<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	Short Term	Unlikely	3	36
<b>With Mitigation</b>	Negative	Local	High	Short Term	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 Esperanza Dam gauging weir scheme. 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>❖ Employment opportunities to be created for women.</li> <li>❖ A CLO should be appointed by the Contractor to effectively manage the employment process.</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



Project Lifecycle	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>							
Project Lifecycle	Construction						
Potential Impact	Health and safety on site						
Proposed Mitigation	<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 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 bare areas, including construction area, access roads, site yard, 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 Management

### 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 at the batching plant, 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

Waste Management	
<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 litterbins must be provided on site.</li> <li>❖ Monitor the presence of litter on site</li> <li>❖ All staff shall be sensitised to this effect.</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 man or animals should be removed immediately.</li> <li>❖ No hazardous materials e.g. oil, diesel and fuel should be disposed of in the surrounding environment.</li> <li>❖ Any diesel, oil or petrol spillages are to be collected and stored in specially marked containers and disposed of at a permitted waste disposal site and must be treated as hazardous waste.</li> <li>❖ No refuse or litter is allowed to be burnt on site.</li> <li>❖ The recycling of all waste is to be encouraged of 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.</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 causes severe disruption to life cycles of aquatic organisms on the downstream side. To ensure accurate monitoring of the environmental release particularly during dry seasons. Therefore, Umgeni Water proposed to refurbish the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and to install a V-Notch Gauge to measure flow.

The proposed project is located approximately 3 km to the south west of Umzinto within the KwaZulu-Natal Province. Esperanza Pump Station is located in quaternary catchment U80H, on the Umzinto River. Water from the Umzinto Dam is released into Umzinto River and abstracted at a weir approximately 9 km downstream of the dam wall, at Esperanza Pump Station. Water from the weir is then pumped to the Umzinto Waterworks and subsequently supplied to nearby communities.

Therefore, Afzelia Environmental Consultants was appointed by Umgeni Water to undertake the Basic Assessment process for the proposed Esperanza Dam Gauging Weir and abstraction works 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 PES assessment derived moderately/largely modified (class C/D) conditions in the river reach considered in this assessment. Despite large modification to instream habitat through the presence of the various impoundments, aquatic ecology responses were determined to be moderately modified. The results provide an indication that there have been cumulative impacts on the considered watercourse resulting in the moderately / largely modified nature of the river.

The results of the risk assessment derived low risks for the proposed project. The low risks of the proposed project can be attributed to the small-scale rehabilitation activities. Furthermore, no riparian or bank alterations are anticipated to stem from the proposed project. Considering the nature of the proposed project, limited instream modification can be anticipated. In addition, the short nature of the rehabilitation activities further negates long term impacts.

Considering the status of the aquatic ecosystems, and furthermore the nature and requirements of the project, the proposed project has limited potential to negatively affect local ecology. In light of the above mentioned, it is the opinion of the specialists that no significant fatal flaws could be identified through the completion of the aquatic ecology study.



The wetland assessment identified two wetlands identified within a 500m radius of the proposed Esperanza Pump Station gauging weir site. These wetlands are located a considerable distance upslope of the proposed weir site (>80m) and therefore will not derive any impacts from the proposed gauging weir construction and operation, which therefore alleviates the requirement for an impact or risk assessment.

## 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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of a V-Notch Gauge.

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 refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of a V-Notch Gauge:

- 1) The Layout Option for the proposed refurbishment of the existing abstraction weir at the Esperanza Raw Water Pump Station below the Umzinto Dam and the installation of a V-Notch Gauge 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 the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project.

The types of monitoring to be undertaken include:

- a) Baseline Monitoring needs to be undertaken to determine to the pre-construction state of the receiving environment, and serves as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects;
  - b) Environmental Monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded; and
  - c) Compliance Monitoring and Auditing for the independent ECO to monitor and audit compliance against the EMPr and EA, if granted.
  - d) The Department of Water and Sanitation has requested that the Applicant samples upstream and downstream prior to the initiation of the project, during and after construction in order to analyse and manage the impact as well as implement mitigation measures in case of further deterioration of water quality due to the proposed project
- 4) All mitigation measures provided in the Specialist Studies in **Appendix C** of the BAR are to be adhered to, specifically the following:
- ❖ All contractors and employees must undergo induction, 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 on a regular basis 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 must be enforced to work staff on site;
- ❖ 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 or recycled;
- ❖ Construction activities are proposed to be conducted during the dry season (April – August);
- ❖ Water that is released from the upstream Umzinto Dam should be limited during the construction phase of the project;
- ❖ 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 should be utilised for construction activities;
- ❖ An alien invasive plant management plan needs to be compiled and implemented prior to construction to control and prevent the spread of invasive aliens;
- ❖ No chemicals, building materials, hydrocarbons or soils must be stockpiled within the 30m buffer zone;

According to baseline study, there has been a loss of connectivity between areas upstream and downstream of the weir and in order to facilitate the movement of fish species, a fish ladder is recommended by the Aquatic specialist.

**Essentially, four types of fishways should be considered namely: Pool and weir, vertical slot, pool and slot and natural by-pass channels. The following fishway concepts should be adhered:**

- ❖ The fishway should have water passing through it during both high flows and low flows to encourage fish to make use of the fishway no matter the flow levels;
- ❖ The fishway should cater for both rheophilic (fastmoving water) and anti-rheophilic (slow moving water) fish species. This can be achieved through having several different flow velocity areas across the fishway;
- ❖ It is recommended that a rough stone surface be cast into the fishway channel floor to cater for climbing and crawling species;
- ❖ Rocks used for the fishway should have flat sides with rounded edges (typical of quarried rock) rather than rounded rocks, as they provide a variety of water velocity and depths that are easy for fish to navigate;
- ❖ Pools or depressions of varying sizes and depths should be created at random throughout the length and width of the fishway and should be placed behind large rocks to create lower velocity resting areas (eddies) for fish. The more pools incorporated in the design, the more successful the fishway will be.

**Additional guidelines for fishway design include:**

- ❖ **Channel slope (gradients)** – between 1/8 and 1/10 is recommended for South African fish;
- ❖ **Fishway entrance** – furthest point upstream that the fish can penetrate, usually in a suitable pool (low turbulence with sufficient depth) located at the base of the weir;
- ❖ **Fishway exit** – located in a quiet area, sheltered, with a low velocity to prevent fish from being swept downstream and to afford protection from predators;

- The invert level of the exit (i.e. water inflow) should be lower than that of the weir overflow to ensure the low flows are directed down the fishway;
- ❖ **Depth of pool** - small fish (20 to 200 mm in length: at least 300 mm deep to reduce predation and limit turbulence;
  - Larger fish (>200 mm): at least 500 mm, can be deeper to reduce turbulence, if necessary;
- ❖ **Length of pool** – at least 2.5 times the length of the largest fish catered for;
- ❖ **Drop height between pools/rock levels** – maximum of 100 mm to cater for small fish.

## **APPENDIX A**

**Appendix A 1 – EAP’s Declaration**

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

**Appendix A 3 – Specialist’s Declaration**

## **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 B 7 – Comments and Response Report**

## **APPENDIX C**

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

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

## **APPENDIX D**

### **Environmental Management Programme**



## **APPENDIX E**

### **Other Information**

## **APPENDIX F**

### **ACKNOWLEDGMENT OF RECEIPTS FOR WULA**