FINAL

AQUATIC AND WETLAND IMPACT ASSESSMENT

CES

ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

PROPOSED UPGRADE OF ROAD DR080835 BETWEEN MJANYANA HOSPITAL AND CLARKEBURY AND ASSOCIATED MINING ACTIVITIES, EASTERN CAPE

Project reference number: P40700370

FINAL AQUATIC AND WETLAND IMPACT ASSESSMENT REPORT

Prepared for:

MBSA Consulting
Consulting Engineers ▪ Civil and Electrical

MBSA Consulting Engineers

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1 PROJECT TEAM AND EXPERTISE

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(a) Details of-

(i) The specialist who prepared the report; and

(ii) The expertise of that specialist to compile a specialist report including a curriculum vitae;

(b) A declaration that the specialist is independent in a form as may be specified by the competent authority;

1.1 DETAILS OF SPECIALIST

Ms Jaclyn Smith BSc (Hons) (Lead Report Writer)

Jaclyn is an environmental consultant. She holds a BSc with majors in Environmental Science and Geology from Rhodes University, as well as a BSc (Hons) in Geology from Nelson Mandela Metropolitan University. Jaclyn's honours dissertation looked at the sediment disturbance depth over two beaches in the Port Elizabeth. Jaclyn has over five years' experience as an environment consultant and has undertaken various environmental impact studies. She has undertaken and assisted aquatic specialists with a number of aquatic and wetland impact assessments.

Wetland Training: Rhodes University, Tools for Wetland Assessment (certified competent Wetland Assessment Practitioner).

Dr Alan Carter, Pr.Sci.Nat (Reviewer and Quality Control)

Alan is the executive of the CES East London Office. He holds a PhD in Marine Biology and is a Certified Public Accountant, with extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He has 25 years' experience in environmental management and has specialist skills in sanitation, coastal environments and industrial waste. Dr Carter is registered as a Professional Natural Scientist under the South African Council for Natural Scientific Professions (SACNASP). He is also registered as an EAP with the Environmental Assessment Practitioners of South Africa (EAPSA) interim EAP certification body.

1.2 EXPERTISE

Some of the aquatic projects CES has completed include:

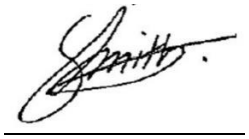
Name of project	Description of responsibility	Date completed
Fort Cox Agricultural College Water and Sanitation Upgrades	Aquatic Assessment	2017
DAFF Qolora Aquaculture Development Zone	Wetland Study	2016
Buffalo City Metropolitan Municipality: Haven Hills Cemetery	Wetland Study	2016
SANRAL R56 Road Upgrade between Matatiele and the KZN Border	Aquatic and Wetland Study	2016
Element Molteno Sewerage Infrastructure	Aquatic Impact Assessment	2015
Lusikisiki Regional Water Supply Scheme	Aquatic Impact Assessment	2015
Element Kwatshatshu Pedestrian Bridge	Aquatic and Botanical Assessment	2016
Element Becclesfarm Bridge	Aquatic and Wetland Study	2016
Senqu Pedestrian Bridge	Aquatic Impact Assessment	2016
Earth Free Kei Road Housing Development	Aquatic and Wetland Study	2017
Amalinda Downs Development	Aquatic and Wetland Study	2018
Hope Village Development	Aquatic and Wetland Study	2018
Boulders WEF Powerline	Aquatic and Wetland Study	2019
Tsomo WWTW	Aquatic and Wetland Study	2019

1.3 DECLARATION

Jaclyn Smith

- I, Jaclyn Smith, declare that, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amended Environmental Impact Assessment Regulations, 2017;
- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;

- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this report are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature

2 INTRODUCTION

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(c) An indication of the scope of, and the purpose for which, the report was prepared;
(cA) An indication of the quality and age of the base data used for the specialist report;
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;
(o) A description of any consultation process that was undertaken during the course of preparing the specialist report;
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto

2.1 PROJECT OVERVIEW AND LOCATION

The Eastern Cape Department of Transport (ECDOT) proposes to upgrade a 20 km section of the DR08035 road from Clarkebury to the Mjanyana Hospital in the Eastern Cape (Figure 2.1). This will include the upgrade of existing bridges and culverts, and the construction of two new bridges along the road (Figures 2.3 and 2.4 below). The decommissioning of the existing bridges will be dependent on the age of the structures (possible heritage features) and on the conditions of the Water Use License (currently under application). The existing bridges do not meet the 1:100-year floodline safety requirements, and therefore, two new bridges have been proposed.

The aim of the road upgrade is to provide easy access to the hospital for villagers along the route of DR08035 from Clarkebury and surrounding areas.

The upgrading of the DR08035 will entail the following at a minimum:

- Upgrading of the road from gravel to a black top surface standards;
- Improvement of existing vertical and horizontal alignments;
- Construction of pavement layers and structures;
- Installation of surface and sub-surface drainage;
- Installation of traffic calming facilities; and
- Sourcing of road construction material from 3 borrow pits and a quarry.

CES was appointed by MBSA Consulting Engineers on behalf of ECDOT to complete an Aquatic and Wetland Impact Assessment that will provide input into the Environmental Impact Assessment and Water Use Licencing Process.

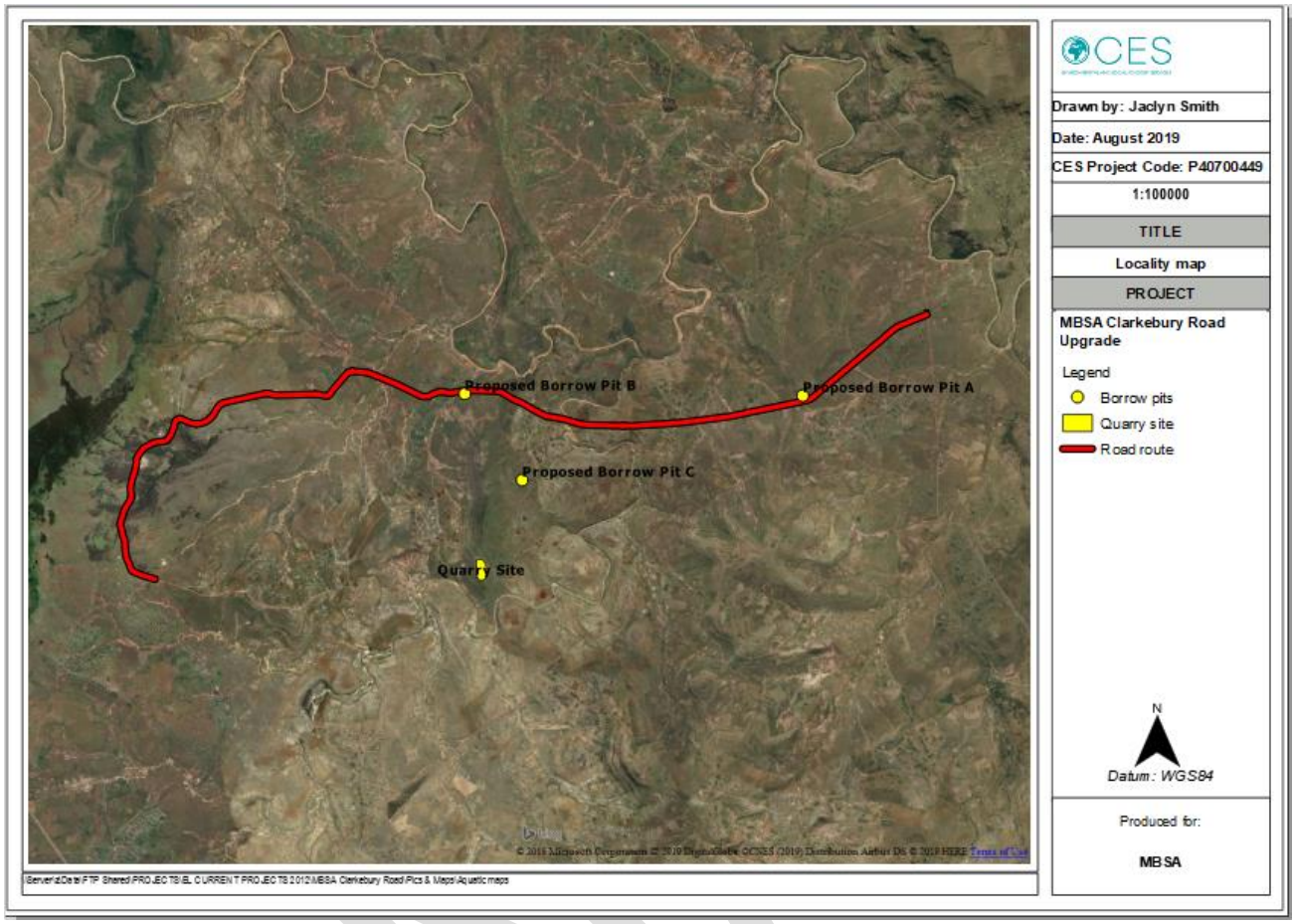


Figure 2.1 Locality map of the proposed road route upgrade and mining areas, Eastern Cape.

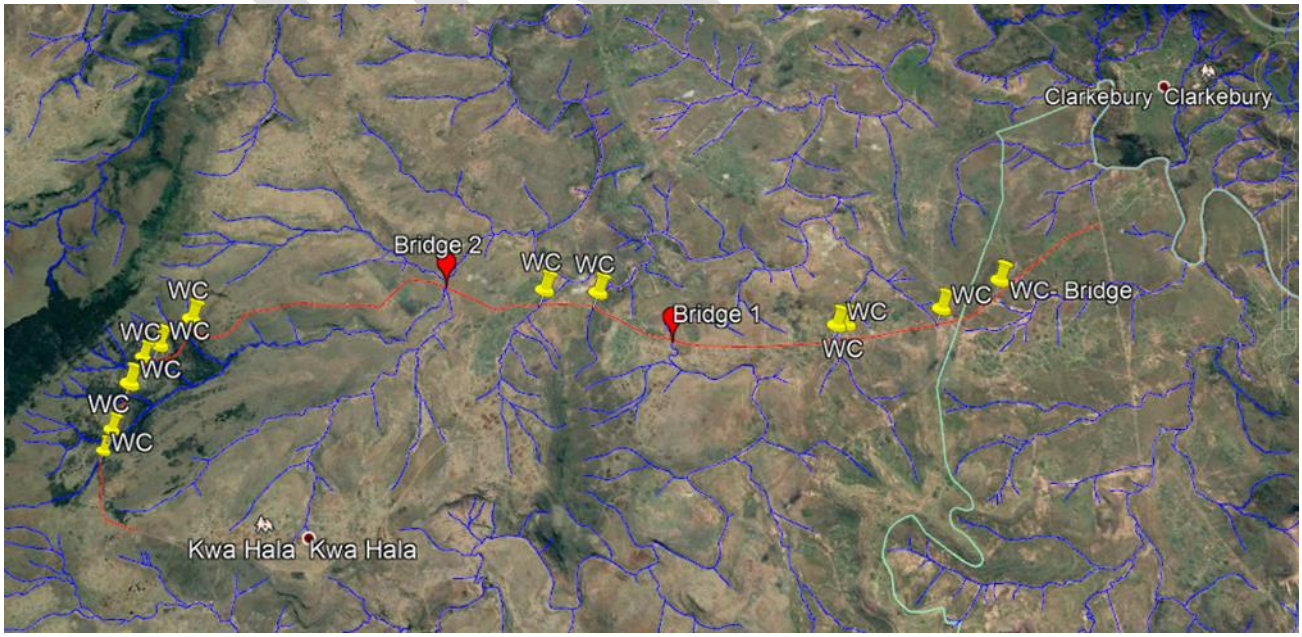


Figure 2.2 Location of water crossings along the road upgrade, including location of new bridges to be constructed.

Figure 2-3: Bridge 1 - new bridge proposed to be constructed across the Tora River roughly 50m to the right of the existing bridge.

Figure 2-4: Bridge 2 - new bridge proposed to be constructed across the Mjanyana River roughly 20m to the right of the existing bridge.

2.2 ALTERNATIVES

There are no location or layout alternatives for the proposed road route upgrade and mining areas. The only alternative assessed for the proposed project is the status quo "No-go" alternative which has been assessed in this report.

2.3 PUBLIC PARTICIPATION

The Public Participation Process (PPP) followed to date has been described in detail in the Draft and Final BAR. The draft aquatic report (attached to the draft BAR) underwent a formal 30-day public commenting and review period from 28 November 2019 until the 30 January 2020. In addition, a public meeting was held on the 11 July 2019 and all comments and issues received during the meeting

were included and addressed in the draft and final BAR. All proof and correspondence to date is available in the draft and final BAR. No comments have been received to date that relates to the aquatic environment.

2.4 OBJECTIVES AND TERMS OF REFERENCE (TOR)

The ToR of this assessment is the following:

- Identify the presence of wetlands and riparian habitats within the general project area;
- Delineate wetlands and the riparian habitat in areas affected by the development;
- Provide a general description of the status of the surface water resources of the area according to published literature;
- Assess the state and sensitivity of nearby watercourses (including wetlands);
- Provide Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) information of affected and nearby watercourses (based on desktop PES and EIS data, if available);
- Provide a sensitivity map and define and map No-Go areas;
- Provide an assessment of the potential direct, indirect and cumulative impacts resulting from the proposed development on any watercourses during construction and operation. This includes the scope, scale and significance of impacts;
- Provide recommendations and mitigation measures that may be applied to reduce impacts;
- Identify rehabilitation measures that can be applied at completion of construction;
- Describe the implications of the No-Go option;
- Identify any fatal flaws associated with the project;
- Describe any assumptions made and any uncertainties or gaps in knowledge; and
- Provide any recommendations on any future specialist inputs required.

2.5 QUALITY AND AGE OF BASE DATA

The quality of the base data used for this specialist report has been described in Table 2.1 below. It should be noted that only datasets and base data relevant to the study area and affected environmental features have been discussed below.

Table 2.1: Base data used and quality thereof

BASE DATASET	DATA AGE	DATA QUALITY
Aquatic CBA Classification according to the Eastern Cape Biodiversity Conservation Plan (ECBCP)	2007	Aquatic CBAs were identified on the basis of sub-quaternary catchments, addressing the linkages between catchments, important rivers and sensitive estuaries. Priority areas were identified through a systematic conservation planning analysis. The data was compiled by Derek Berliner & Philip Desmet for the Department of Water Affairs and Forestry Project No 2005-012. The data is outdated and currently all the ECBCP shapefiles and

		supporting documentation is under review and in the process of being updated.
Department of Water and Sanitation (DWS) Desktop Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) Model.	2014	A combination of expert knowledge and available information on SQR level were used to derive the Desktop PES and EIS model. The objective of the PESEIS is to provide desktop level information on ecological issues as it relates to the protection and management of SQRs. For management purposes this refers specifically to the consideration of ecological reserve issues, water use licensing issues and EWRM (including the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP) activities) and the determination of priorities for monitoring. The PESEIS relates specifically to Rivers (Instream & Riparian aspects) and limited aspects of Valley Bottom Wetlands. Endorheic Wetlands are not addressed. The DWS model has been compiled by the RQIS-RDM; a Planning and Information Branch of the DWS and is the most up to date data set available.
Department of Water Affairs and Forestry: Level 2 River Ecoregional Classification System for South Africa, Lesotho and Swaziland.	2007	The delineation of Ecoregions for SA has been derived from terrain and vegetation data, with altitude, rainfall, runoff variability, air temperature, geology and soil data. The data has been compiled by the RQIS; a Planning and Information Branch of the DWS. DWS will not accept any responsibility for the accuracy of this data -- the outlines may change as the owner incorporates more data sets. Note that transition zones between regions are about 5km wide. The Ecoregions Level 2 document is still in draft form.
The National Freshwater Ecosystem Priority Areas (NFEPA) project	2011-2014	NFEPA was originally completed in 2011 and has recently (2014) been updated. FEPAs were determined through a process of systematic biodiversity planning and involved collaboration of over 100 freshwater researchers and practitioners. FEPAs were identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species

		associated with rivers, wetlands and estuaries, described in detail in the NFEPA Technical Report. The data was compiled by a large number of authors/specialists for the Water Research Commission of SA and is the most recent data available.
National Spatial Biodiversity Assessment (NSBA) – River Ecosystems	2004	The River component of the NSBA was based on the work conducted by the DWAF, CSIR and WRC in the National Freshwater Biodiversity Initiative. The status of river ecosystems was assessed based on the river signatures and the integrity of the main rivers. The NSBA was commissioned by the Department of Environmental Affairs (DEA) as part of the National Biodiversity Strategy and Action Plan. The NSBA was the first ever comprehensive spatial assessment of biodiversity throughout the country. This data is old and should only be used as a baseline to show the change in river conditions over time.
The National Wetland Classification System (NWCS)	2013	The NWCS uses hydrological and geomorphological traits to distinguish the direct factors that influence wetland function. This is presented as a 6 tiered structure with four spatially nested primary levels that are applied in a hierarchical manner between different wetland types on the basis of these direct factors. This Classification system has been commissioned by Freshwater Consulting Group (through SANBI). This data is the most recent data available.

On completion of the desktop assessment a site visit was undertaken on 11 July 2019 (winter) to determine the actual condition of the surface water features within the study area.

2.6 ASSUMPTIONS AND LIMITATION

The following limitations and assumptions are implicit:

- The report is based on a project description provided by the client; and
- Descriptions of the natural environments are based on limited fieldwork and available literature.

3 RELEVANT LEGISLATION

Environmental legislation relevant to the proposed activity is summarised in Table 3.1 below.

Table 3.1: Environmental legislation considered in the preparation of this report

Title of Environmental legislation, policy or guideline	Implications for the project
Constitution Act (108 of 1996)	Obligation to ensure that the proposed development will not result in pollution and ecological degradation; and Obligation to ensure that the proposed development is ecologically sustainable, while demonstrating economic and social development.
National Environmental Management Act (NEMA) (107 of 1998)	The developer must apply NEMA principles, the fair decision-making and conflict management procedures that are provided for in NEMA. The developer must apply the principles of Integrated Environmental Management and consider, investigate and assess the potential impact of existing and planned activities on the environment, socio-economic conditions and the cultural heritage.
National Environmental Management: Biodiversity Act (Act 10 of 2004), and its subsequent amendments. NEMBA Alien and Invasive Species List (Government Notice 599 of 2014)	The proposed development must: • Conserve endangered ecosystems and protect and promote biodiversity; • Assess the impacts of the proposed development on endangered ecosystems; No protected species may be removed or damaged without a permit; and The proposed site must be cleared of alien vegetation using appropriate means.
National Water Act (36 of 1998)	The National Water Act provides details of measures intended to ensure the comprehensive protection of all water resources, including the water reserve and water quality. All necessary Water Use Licence Applications must be submitted to the Department of Water and Sanitation for approval.

4 ASSESSMENT METHODOLOGY

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(e) A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;

4.1 AQUATIC ASSESSMENT APPROACH

The aim of this assessment is to identify the aquatic importance of the rivers affected by the project and to evaluate the sensitivity of these features.

A desktop assessment of the project area was conducted in terms of current surface water classifications and biodiversity programmes and plans. This included the consideration of:

- Eastern Cape Biodiversity Conservation Plan (2011);
- Department of Water and Sanitation Desktop Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) Model (2014);
- Department of Water Affairs and Forestry: Level 2 River Ecoregional Classification System for South Africa, Lesotho and Swaziland (2005);
- The National Freshwater Ecosystem Priority Areas (NFEPA) project (2011 - 2014); and
- National Spatial Biodiversity Assessment (NSBA) – River Ecosystems (2004).

Thereafter a site visit was conducted on 11 July 2019 in order to determine the actual condition of the rivers and wetlands within the proposed study area.

4.2 WETLAND ASSESSMENT

"*Wetland*" is a name given to a variety of ecosystems ranging from rivers, springs, seeps and mires in upper catchments, to midland marshes, pans and floodplains, coastal lakes, mangrove swamps and estuaries at the bottom of a catchment. These ecosystems all share the common primary driver of water and its prolonged presence is a fundamental determinant of soil characteristics, vegetation and animal life (DWAF, 2005).

The National Water Act (Act No. 36, 1998 as amended in 2013) defines wetlands as:

"*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*."

Thus wetlands must have one or more of the following characteristics:

- **Hydromorphic soils**: characteristic soils of prolonged saturation;
- **Hydrophytes**, at least occasionally: highly saturated plants; and
- **High water table**: a high water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

Wetlands are formed from a combination of geology, hydrology and topography. These landforms form in parts of a catchment where the movement of water is slowed down or obstructed, causing soil to become temporarily, seasonally or permanently waterlogged.

Wetland Importance

South Africa is a Contracting Party to the Ramsar Convention on Wetlands and has thus committed itself to the intergovernmental treaty, which provides the framework for the national protection of wetlands and the resources they could provide. The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem. The treaty was adopted in the Iranian city of Ramsar in 1971 and the Convention's member countries cover all geographic regions of the planet. Wetland conservation in South Africa is now driven by SANBI under the requirements of the National Environmental Management: Biodiversity Act (NEMBA, 10, 2004).

In natural capital terms, wetlands may be seen as a significant economic investment. This monetary value is rooted to the fact that the primary tasks of a wetland are to process water and regulate runoff. This is important as the South African economy is heavily dependent on water and yet the climatic variability of the country has meant that for the most part rainfall occurs as intermittent, high intensity storms. The inherent value of wetlands is that they protect and regulate this water source by acting like sponges, soaking up water during flood events and releasing it during dry periods (DWAF, 2005). By regulating water flows during floods, wetlands may reduce flood damage and help prevent soil erosion. As natural filters wetlands help to purify water by trapping pollutants such as heavy metals and disease causing organisms.

The most common ecosystem services provided by wetlands (in general) are:

- Improved water quality;
- Flood attenuation;
- Sediment trapping;
- Reduce number of water borne diseases;
- Herbal medicine; and
- Water storage.

These ecosystem services are provided at very little cost but with significant payback for the South African economy.

Despite being classified as the third most significant life support system on earth (IUCN, 1980), wetlands are some of the most threatened habitats in the world today. Breen & Begg (1989) reported that more than 50% of the wetland inventory in South Africa had disappeared. The main issues have been draining wetlands for crops and pastures, poorly managed burning and grazing resulting in headcut and donga erosion, planting alien invasive vegetation, mining, pollution and urban development. These have been significant as they alter the natural flow of water in wetlands and as water is the driver of wetland formation it follows that any changes would be damaging. A buffer around a wetland is usually recommended in order to protect the wetland from development in close proximity to it.

Aside from the negative impacts of construction in the vicinity of a watercourse or wetland, a major impact that needs to be considered should be the geotechnical competence of soil which is often waterlogged and prone to flooding. Wetland soils are usually high in clay and prone to wet and dry periods, allowing for expansion and contraction of soils. The wetland and watercourse buffers are therefore also important with regards to the demarcation of areas that are not suitable for

construction due to the high soil moisture content and unstable soils. Developing solutions to these problems would be expensive and may not be sustainable in the long term.

4.3 TOOLS AVAILABLE TO DEFINE WETLANDS AND WATERCOURSES

4.3.1 National Freshwater Ecosystem Priority Areas (NFEPA)

The NFEPA programme provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas, or FEPAs. The system comprises a hierarchical classification process of defining a wetland based on the principles of the hydro-geomorphic (HGM) approach at higher levels, with structural features being included at the finer levels (SANBI, 2009).

Wetland ecosystem types were used by NFEPA for representing natural examples of the diversity of wetland ecosystem types across South Africa. Wetlands of the same ecosystem type are expected to share similar functionality and ecological characteristics. The biodiversity target for freshwater ecosystems in South Africa is 20%, which means that we should keep at least 20% of each wetland ecosystem type in a natural or near-natural condition. This serves to conserve many common species and communities, and the habitats in which they evolve. Information used to classify wetlands as FEPAs included:

- Ramsar status;
- Known threatened frog and waterbird occurrences; and
- Expert knowledge on biodiversity importance.

For the purposes of this study Version 4 of the National Wetland Classification System (NWCS) was used as baseline information, as per SANBI's BGIS interactive tool.

The NWCS uses hydrological and geomorphological traits to distinguish the direct factors that influence wetland function. This is presented as a 6 tiered structure with four spatially nested primary levels that are applied in a hierarchical manner between different wetland types on the basis of these direct factors (SANBI, 2009).

- **Level 1:** Distinguishes between marine, estuarine and inland ecosystems based on the degree of connectivity the systems have with the ocean.
- **Level 2:** Categorises the regional wetland setting using a combination of biophysical attributes at the landscape level.
- **Level 3:** Assesses the topographical position of inland wetlands.
- **Level 4:** Concerns the hydrogeomorphic (HGM) units as defined as follows:
    - *Landform* - considering the shape and localised setting of the wetland;
    - *Hydrological characteristics* - nature of water movement into, through and out of the wetland; and
    - *Hydrodynamics* - the direction and strength of flow through the wetland.

The HGM unit is considered the focal point for NWCS as the upper levels mean to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, whilst the lower levels provide more descriptive detail.

As wetlands are formed under the influence of geology, hydrology and topography it is necessary to note these features when delineating a wetland.

- **Geology:** Geology influences the formation of a wetland by geological obstructions such as erosion resistant rock or impervious material close to the surface forcing groundwater to move close to or onto the soil surface.
- **Hydrology*:*** The water transfer mechanisms such as source, movement and exit are important features of a wetland.
- **Topography:** The topography of the landscape influences the likelihood of whether a wetland will form. For instance, under the right conditions wetlands may form in floodplains, valley bottoms, hillslopes, depressions and coastal flats.

A range of 'hydro-geomorphic' types can be defined by considering the above features. Six HGM units are defined for South African inland wetlands (SANBI, 2009):

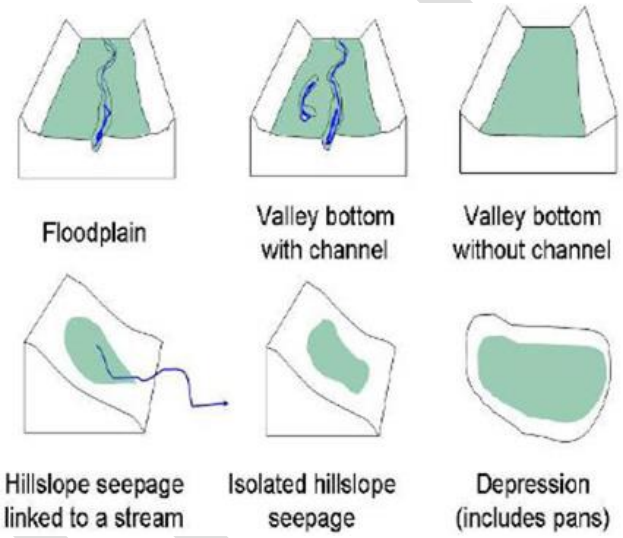


Figure 4.1: The HGM types for South African Inland wetlands (SANBI, 2009).

Important rivers are also classified according to the NFEPA rivers maps. These rivers are considered Freshwater Ecosystem Priority Areas (FEPAs). FEPAs are strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources. FEPAs are an essential part of an equitable and sustainable water resource strategy meaning that they need to stay in a good condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. This means that the areas should be supported by good planning, decision-making and management to ensure that human use does not impact on the aquatic ecosystem.

4.3.2 WET-Health and Present Ecological State

Incorporation of the HGM approach in this system is significant as it has been adopted throughout aquatic assessment with regards to Present Ecological State and WET-Health assessments. These systems can then be easily integrated using the HGM approach in-line with Eco-classification process of river and wetland reserve determinations used by the Department of Water and Sanitation (DWS). The Ecological Reserve of a river or wetland is used by DWS to assess the water resource allocations when assessing water use licence applications (WULAs).

The WET- range of tools were developed to assist those wishing to undertake wetland rehabilitation, in terms of current and future human activities in Environmental Impact Assessments (EIA) or to determine the Present Ecological State (PES) of a wetland in an Ecological Reserve Determination (ERD). These tools were developed as part of a nine-year research programme on wetland management which was initiated in 2003 by the Water Research Commission (WRC) and a range of partners that examines wetland rehabilitation, wetland health and integrity and the sustainable use of wetlands (WRC Project No. K5/1408).

As wetlands are formed under the influence of geology, hydrology and topography it is necessary to note these features when delineating a wetland. The HGM unit is then classified using these features (Figure 4.1).

The materials and methods of WET-Health Wetland Management Series (Macfarlane et al., 2007) establish the current ecological health of a wetland. This assessment defines wetland health "as a measure of the deviation of wetlands structure and function from the wetland's natural reference condition" (Macfarlane et al., 2007).

A Level 1 Rapid Assessment would involve evaluating specific indicators pertaining to three categories of hydrological, geomorphological and vegetation health (Figure 4.2). The purposes of WET-Health are to aid users in understanding the ecological condition of the wetland and to identify the causes of degradation. The assessment criteria and information are specific to South Africa. The three categories (hydrological, geomorphological and vegetation) are assessed by taking into account the extent, intensity and magnitude of an impact which then produces a health score. Evaluation scores within each category are then combined to produce an overall impact of activities on the wetland system which corresponds to a Present State health category that provides an impact score scale of 0-10 and associated health category (ecological state) from A-F (Table 4.1), based on Kleynhans (1996, 1999). Such categories represent natural, largely natural, moderately modified, largely modified, extensively modified, and critically modified.

The WET-Health Assessment also considers the likely trajectory of change based on the threats to or vulnerability of a wetland. Five categories of the Trajectory of Change include: large improvement, slight improvement, remains the same, slight decline and rapid decline. Overall health of the wetland is then presented by the calculated Present Ecological State scores and the most likely Trajectory of Change.

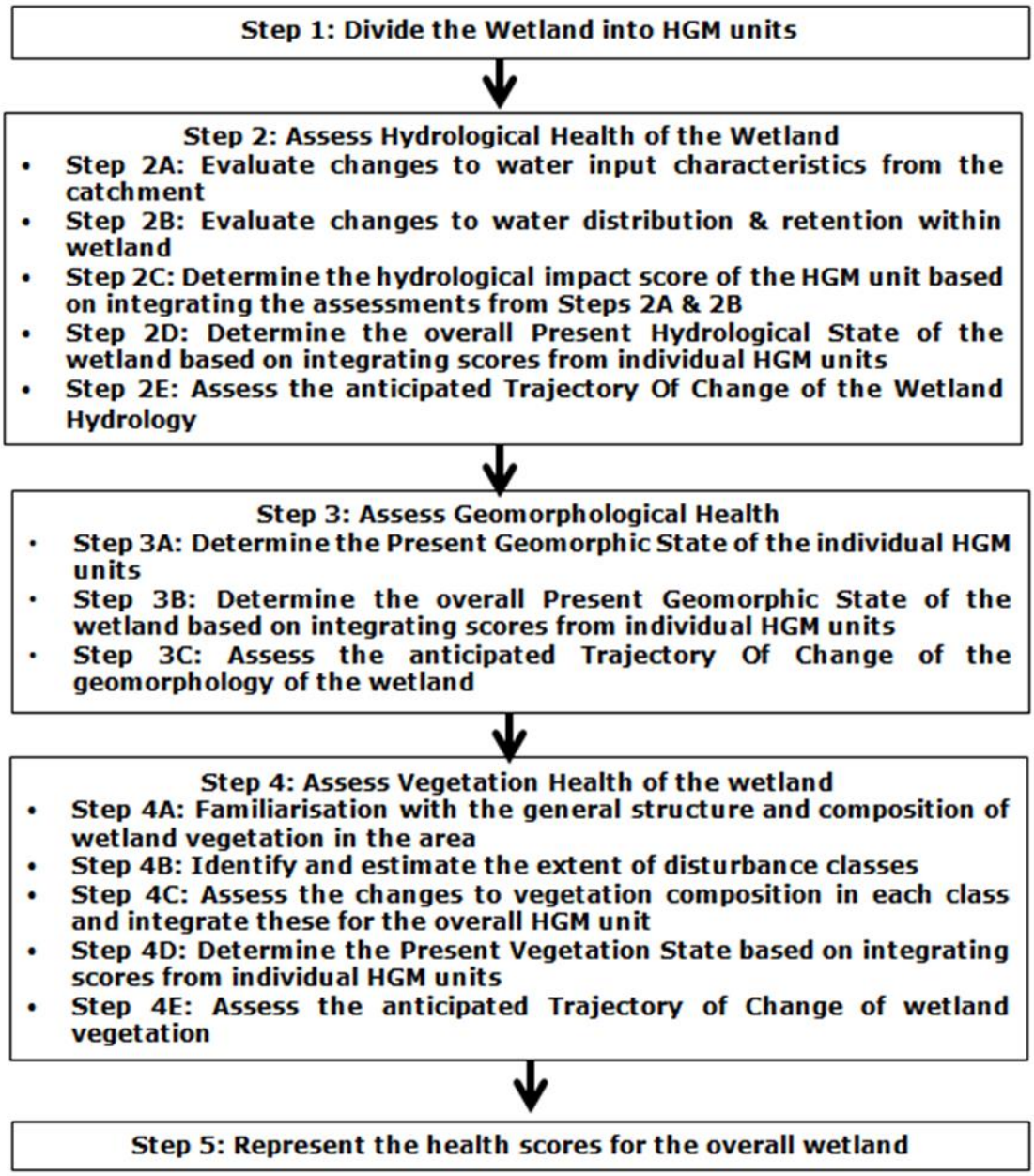


Figure 4.2: The steps involved in the WET-Health Level 1 rapid assessment (MacFarlane et al. 2007).

Table 4.1: Description of A-F ecological categories based on Kleynhans (1996, 1999).

PES Description	Combined impact score	PES Category	Level of disturbance
Unmodified, natural.	0-0.9	**A**	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed
Largely natural with few modifications. A slight change in ecosystem processes is discernable and a small loss of	1-1.9	**B**	Some human-related disturbance, but mostly of low impact potential

natural habitats and biota may have taken place.			
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2-3.9	**C**	Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	**D**	
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	**E**	Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	**F**	

4.3.3 Tools available for wetland delineation

DWAF (2005) wetland delineation

The DWAF (2005) guidelines for "a practical field procedure for delineation of wetlands and riparian areas" are recommended in Gazette No. 19182, Notice No. 1091 of the National Water Act, 1998. This guideline explains the field indicators and methods for determining whether an area is a wetland or a riparian area, and how to find its boundaries. Although the primary driver of a wetland is water, due to its dynamic nature water is not a very useful parameter for identifying the outer boundary of a wetland. What is needed is a method of identifying the indirect indicators of prolonged saturation by water. This includes wetland plants (hydrophytes) and wetland (hydromorphic) soils. Their presence or absence implies the frequency and duration of saturation and is a satisfactory indicator to classify the area as a wetland (DWAF, 2005).

In wetland delineation there are three zones which are distinguished according to a changing frequency of saturation. These are the permanent, seasonal and temporary zone. The primary objective of wetland delineation is usually to define the outer edge of the temporary zone as it marks the boundary between the wetland and the adjacent terrestrial zone. There are four important indicators that are used to define the boundaries of a wetland. The most important one is the soil wetness indicator with terrain unit, soil form and vegetation acting as confirmation. The point where wetland indicators are not present is regarded as the edge of the wetland.

The permanently wet zone is characterised by dark grey, clay soil, caused by a lack of oxygen required for the oxidation of minerals such as iron in the soil. The seasonally wet zone is characterised by grey soils with lots of orange and black mottles. It is generally recommended that there should be a 100m buffer zone between the edge of the delineated temporary zone and any development. Important indicators of each zone are as follows:

- **Wetland vegetation**

In order to tolerate the anaerobic conditions of seasonal or permanent flooding, hydrophytes (water loving plants) have evolved a number of adaptations. Their presence can therefore indicate a moist soil habitat and thus provide a potential boundary of a wetland's seasonally flooded or permanent flooded zones (Macfarlane et al., 2007).

- The **temporary zone** of a wetland will show mainly grasses, some woody species and some sedges.
- The **seasonal zone** will begin to show more hydrophytic (or water loving) sedges with tall grasses (over 1m).
- The **permanent zone** will be noticeable by emergent reeds and sedges, bulrushes or floating and submerged plants. Woody species will have adaptations for permanent wetness such as prop roots (Mangroves).

- **Wetland soils**

Low oxygen levels result in a reduced rate of organic matter decomposition within the soil, where sulphur tends to exist in its reduced form, hydrogen sulphide (H2S), noticeable by its tell-tale rotten-egg smell. These conditions also serve as a catalyst for the metals in the soil to become soluble and begin leaching (DWAF, 2005). The metals produce rich colours of yellow, orange and reds.

- The temporary or seasonal zone of a wetland, where there is more seasonal flooding, produces mottling of colours, as the metals are still in the process of precipitating. These mottles occur within a grey matrix where the metals have already leached.
- The permanent zone of a wetland, where there is more permanent flooding of the soil, produces leaching of metals, with soils remaining a grey ("gleyed") colour.
- It is recommended by DWAF (2005) that soils be sampled on the surface (0-10cm) and between 40 and 50cm.

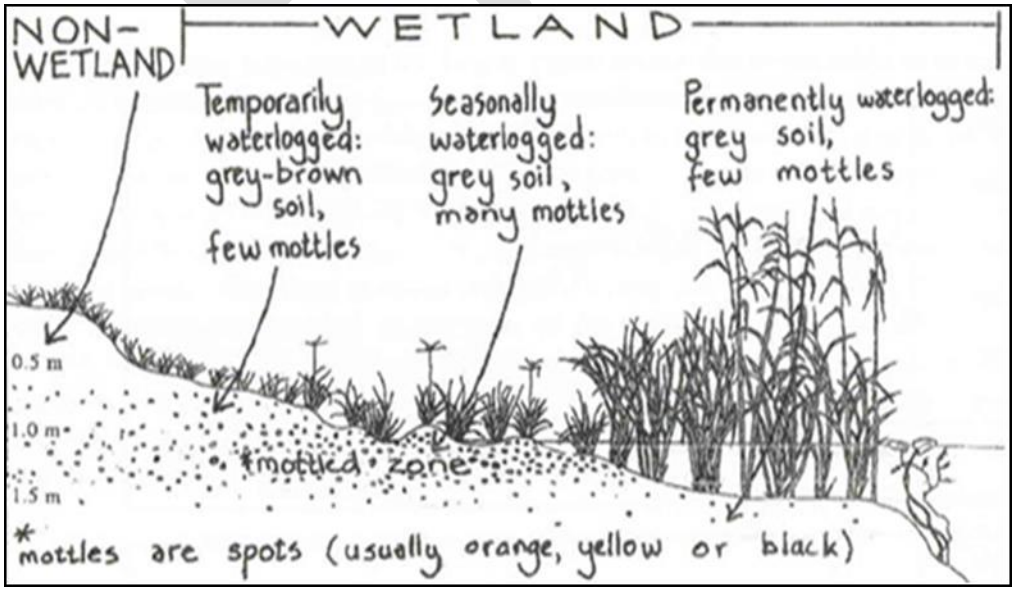


Figure 4.3 A cross-section through a wetland, indicating how the soil wetness and vegetation

indicators change as one moves along a gradient of decreasing wetness, from the middle to the edge of the wetland (DWAF, 2005).

4.3.4 WET_Ecoservices

WET-Ecoservices (Kotze et al., 2008) is used to assess the goods and services that individual wetlands provide, thereby aiding informed planning and decision making. The tool provides guidelines for scoring the importance of a wetland in delivering each of 15 different ecosystem services. The first step is to characterise wetlands according to their hydrogeomorphic setting. Ecosystem service delivery is then assessed either at Level 1, based on existing knowledge or at Level 2, based on a field assessment of key descriptors.

Where there are characteristics relating to effectiveness and opportunity WET-Ecoservices calculates an average for each of the groups and an overall score is calculated from these averages. The overall score is then rated according to the table below. The Ecoservices that are assessed are illustrated in Table 4.2.

Table 4.2 Classes for determining the likely extent to which a benefit is being supplied based on the overall score of that benefit

Score	<0.5	0.5-1.2	1.3-2.0	2.1-2.8	>2.8
Rating of the likely extent to which a benefit is being supplied	Low	Moderately low	Intermediate	Moderately high	High

Table 4.3 Ecosystem services included in, and assessed by, WET-Ecoservices (Kotze et al., 2008)

Ecosystem services supplied by wetlands	Indirect benefits	Regulating and supporting benefits	Flood attenuation	The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream
			Streamflow regulation	Sustaining streamflow during low flow periods
			Water quality enhancement benefits: Sediment trapping	The trapping and retention in the wetland of sediment carried by runoff waters
			Water quality enhancement benefits: Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters
			Water quality enhancement benefits: Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters
			Water quality enhancement benefits: Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts) carried by runoff waters
			Water quality enhancement benefits: Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation.
			Carbon storage	The trapping of carbon by the wetland, principally as soil organic matter
	Direct benefits	Biodiversity maintenance[2]		Through the provision of habitat and maintenance of natural process by the wetland, a contribution is made to maintaining biodiversity
		Provisioning benefits	Provision of water for human use	The provision of water extracted directly from the wetland for domestic, agriculture or other purposes
			Provision of harvestable resources	The provision of natural resources from the wetland, including livestock grazing, craft plants, fish, etc.
			Provision of cultivated foods	The provision of areas in the wetland favourable for the cultivation of foods
		Cultural benefits	Cultural heritage	Places of special cultural significance in the wetland, e.g. for baptisms or gathering of culturally significant plants
			Tourism and recreation	Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife
			Education and research	Sites of value in the wetland for education or research

4.4 IMPACT ASSESSMENT

CES has developed the following impact rating methodology which has been developed in line with Appendix 6 and the impact ratings required in Appendix 1 and 3 of the EIA Regulations (2014, as amended).

CRITERIA	CATEGORIES	EXPLANATION
Overall nature	**Negative**	Beneficial/positive impact.
	Positive	Detrimental/negative impact.
Type	**Direct**	Direct interaction of an activity with the environment.
	Indirect	Impacts on the environment that are not a direct result of the project or activity.
	Cumulative	Impacts which may result from a combination of impacts of this project and similar related projects.
Duration	**Short term**	Less than 5 years.

CRITERIA	CATEGORIES	EXPLANATION
	Medium term	Between 5-20 years.
	Long term	More than 20 years.
	Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.
Extent	Localised	Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
	Study area	The proposed site and its immediate environments.
	Municipal	Impacts affect the municipality, or any towns within the municipality.
	Regional	Impacts affect the wider district municipality or the Eastern Cape Province as a whole.
	National	Impacts affect the entire country.
Consequence	Slight	Slight impacts or benefits on the affected system(s) or party(ies).
	Moderate	Moderate impacts or benefits on the affected system(s) or party(ies).
	Severe/Beneficial	Severe impacts or benefits on the affected system(s) or party(ies).
Probability	Definite	More than 90% sure of a particular fact. Should have substantial supportive data.
	Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
	Possible	Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
	Unsure	Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.
Reversibility	Reversible	The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.
	Irreversible	The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.
Irreplaceable Loss	Resource will not be lost	The resource will not be lost/destroyed provided mitigation measures are implemented.
	Resource may be partly lost	The resource will be partially destroyed even though mitigation measures are implemented.

CRITERIA	CATEGORIES		EXPLANATION
	Resource will be lost		The resource will be lost despite the implementation of mitigation measures.
Mitigation Potential	Easily achievable		The impact can be easily, effectively and cost effectively mitigated/reversed.
	Achievable		The impact can be effectively mitigated/reversed without much difficulty or cost.
	Difficult		The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.
	Very Difficult		The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.
Impact Significance	Low negative	Low positive	Largely of HIGH mitigation potential, after considering the other criteria.
	Moderate negative	Moderate positive	Largely of MODERATE or partial mitigation potential after considering the other criteria.
	High negative	High positive	Largely of LOW mitigation potential after considering the other criteria.

5 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(f) Details of an assessment of a specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying alternatives;
(g) An identification of any areas to be avoided, including buffers;
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.

5.1 DESKTOP INVESTIGATION

5.1.1 Quaternary Catchment and Water Management Area

ROAD UPGRADE ROUTE

The road upgrade route traverses quaternary catchments T12F, T12E and T12G within Water Management Area 7 (Mzimvubu to Tsitsikamma) (Figure 5.1).

MINING AREAS

- Borrow pit A occurs in quaternary catchment T12G;
- Borrow pit B occurs in T12F;
- Borrow pit C and the quarry site occur in quaternary catchment T12E.

All these quaternary catchments area located within Water Management Area 7 (Figure 5.1).

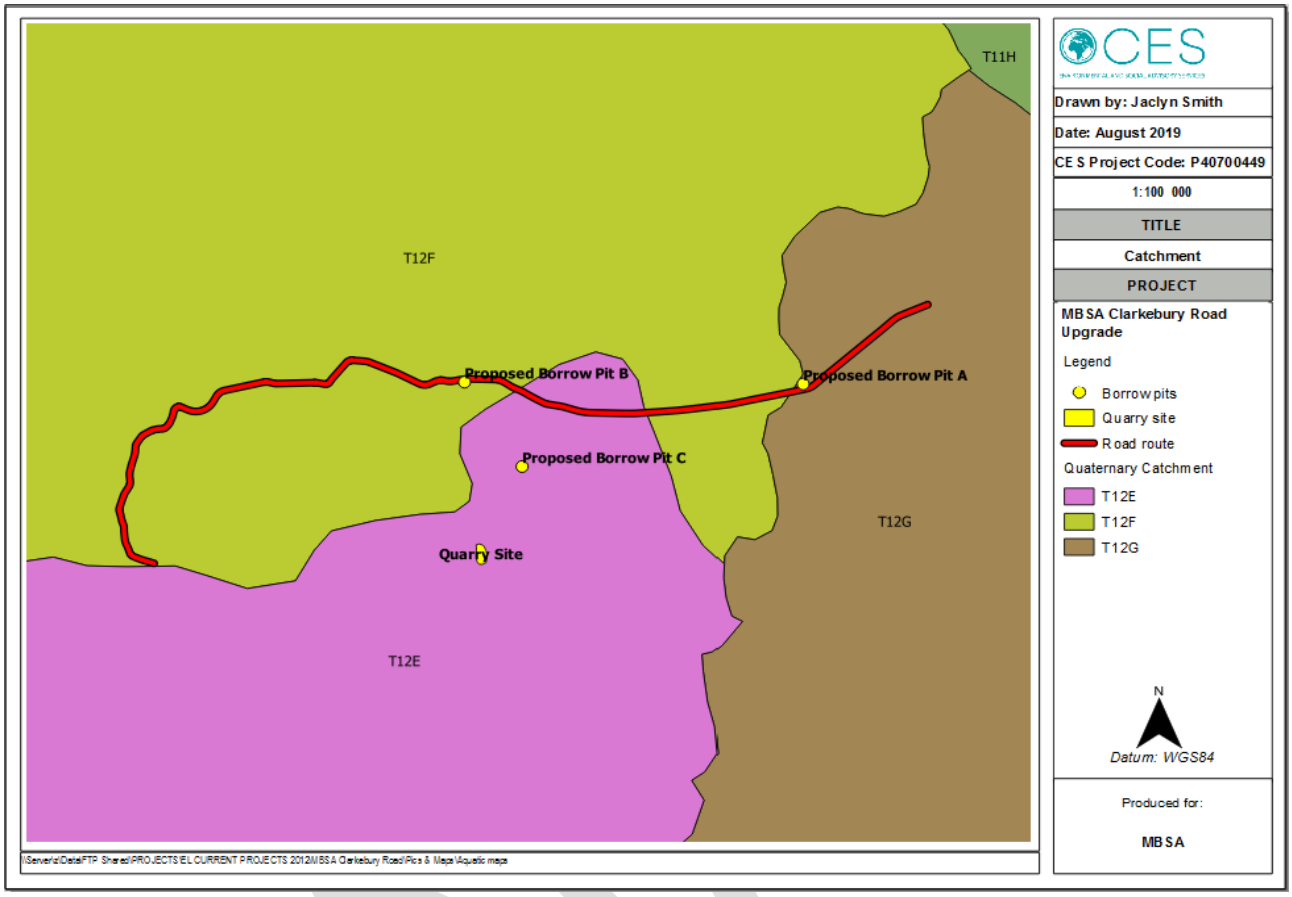


Figure 5.1 Quaternary Catchment locality.

5.1.2 Rivers

ROAD UPGRADE ROUTE

There are a number of major and minor rivers traversing the route upgrade. The Mjanyana River and its tributaries traverse sections of the western extent of the route, followed by the Ncityana River, then the Tora River and a number of tributaries of the Mgwali River and the Kungxushungxushi River towards the eastern section of the route. All the rivers and tributaries within the route ultimately drain into the Mgwali River which occurs north of the route upgrade (Figure 5.2).

MINING AREAS

The quarry site is surrounded by three tributaries of the Tora River.

- Borrow pit A is surrounded by a tributary of the Mgwali River, 450m to the north west of the site and;
- The Kungxushungxushu River approximately 300m south of the borrow pit site;
- The Ncityana River occurs approximately 140m west of Borrow Pit B;
- Borrow Pit C occurs along a tributary of the Tora River (Figure 5.2).

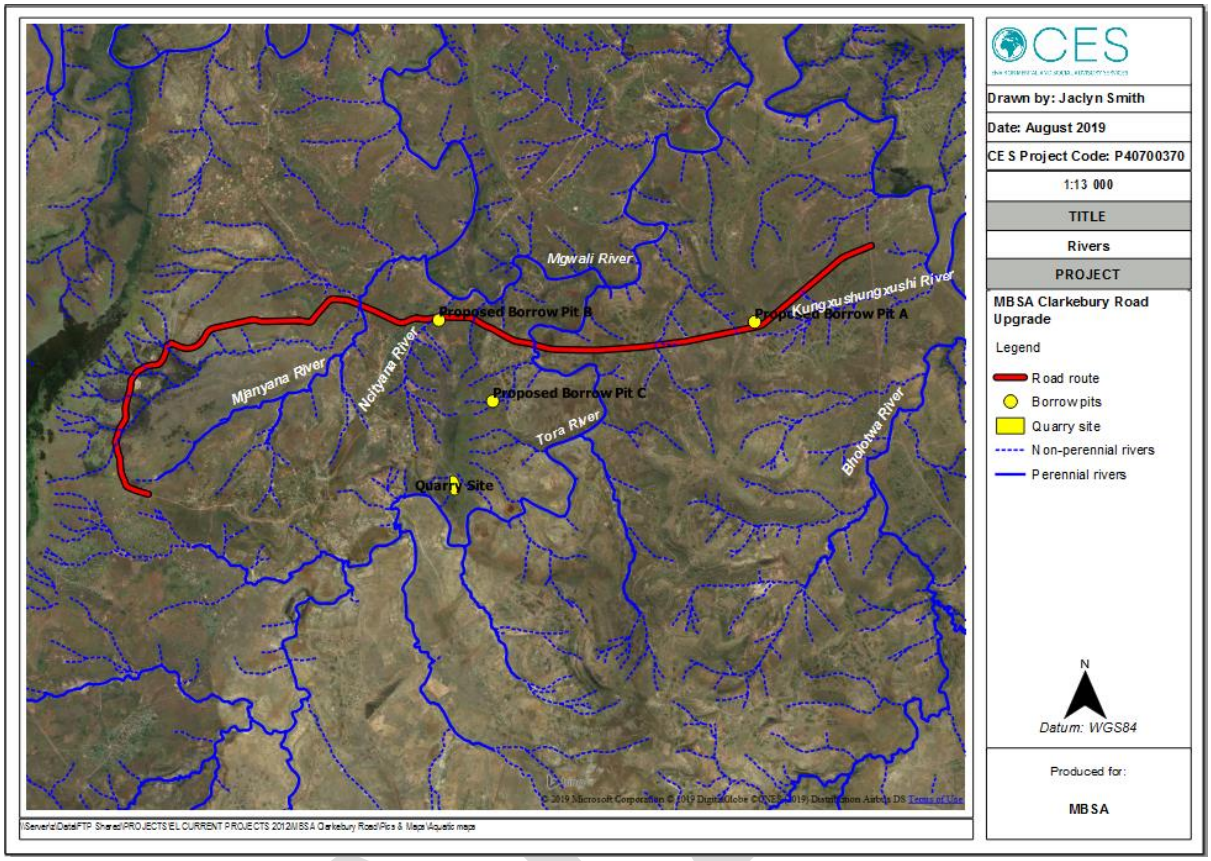


Figure 5.2 Rivers Map of the study site.

5.1.2.1 The National Spatial Biodiversity Assessment (2004)

The National Spatial Biodiversity Assessment of 2004 is a framework document within which fine-scale conservation planning in identified priority areas should occur. The NSBA integrates terrestrial, river, marine, estuarine and wetland ecosystems using available spatial data, relevant conservation planning software and a series of expert and stakeholder workshops. It is important to note that the NSBA was conducted at a national scale (1:250 000), and thus can only provide a general context for biodiversity assessments at a local level.

An important tool used in the NSBA is conservation status. Conservation status aims at identifying threatened ecosystems, and is based on the classification scheme developed by the IUCN to categorise species. Of the 120 rivers in South Africa that have been classified using this categorisation, 44 % are critically endangered, 27 % are endangered, 11 % are vulnerable and 18 % are least threatened.

The Tora River and Mgwali River (north of the study area) are listed as **VULNERABLE** in terms of NSBA (2004). Vulnerable ecosystems are ecosystem types that still have the majority of their original extent (measured as area, length or volume) left in natural or near-natural condition, but have experienced some loss of habitat or deterioration in condition. These ecosystem types are likely to have lost some of their structure and functioning, and their structure and functioning will be further compromised if they continue to lose natural habitat or deteriorate in condition.

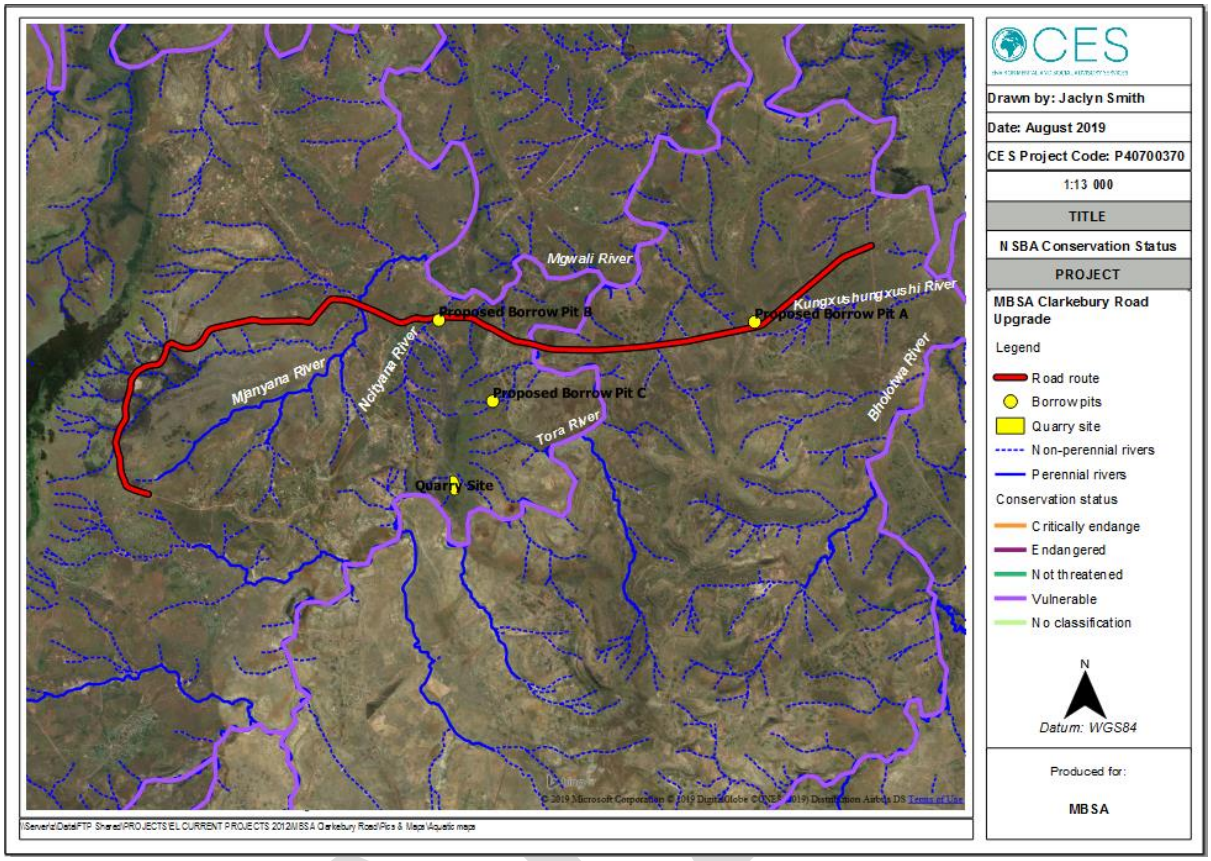


Figure 5.3 NSBA Conservation status of Rivers within the study area.

5.1.2.2 National Freshwater Ecosystem Priority Areas (NFEPA), 2011-2014

The National Freshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas, or 'FEPAs'.

FEPAs were identified based on:

- Representation of ecosystem types and flagship free-flowing rivers;
- Maintenance of water supply areas in areas with high water yield;
- Identification of connected ecosystems;
- Representation of threatened and near-threatened fish species and associated migration corridors; and
- Preferential identification of FEPAs that overlapped with:
    - Any free-flowing river;
    - Priority estuaries identified in the National Biodiversity Assessment 2011; and
    - Existing protected areas and focus areas for protected area expansion identified in the National Protected Area Expansion Strategy.

NFEPA has classified the Tora and Mgwali Rivers (affected by both road route upgrade and mining areas) as Upstream Management Areas (Figure 5.4). Upstream Management Areas are rivers and sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream River FEPA's and Fish Support Areas.

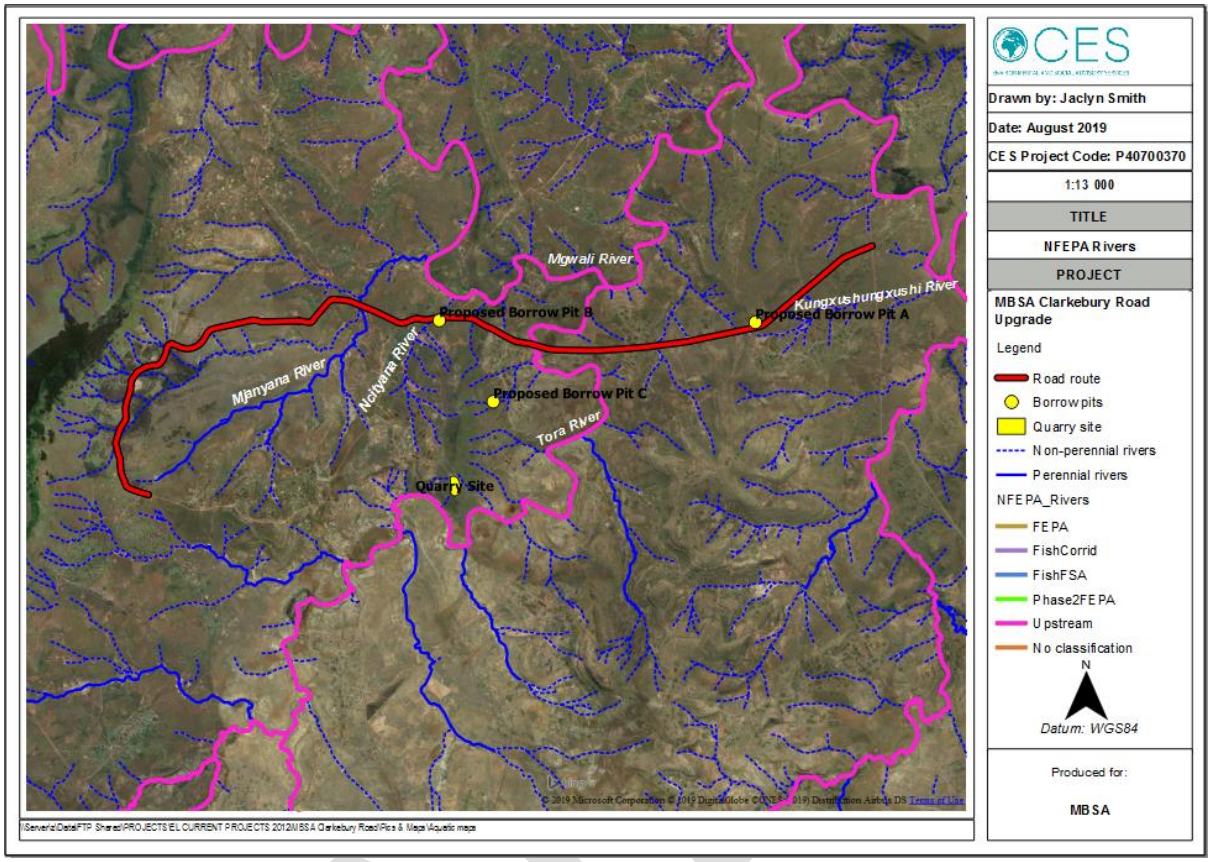


Figure 5.4 NFEPA status of the rivers in the study area.

5.1.2.3 Present Ecological State

According to DWS PESEIS (2014) the PES of the reaches of the Tora River likely to be affected by the project is classified as **C: moderately modified** while the EI is rated as **moderate** and the ES is rated as **moderate.** The PES of the reach of Mgwali River (downstream of the Tora River) which may be affected by the any adverse impacts associated with the project is classified as **D: Largely modified** while the EI is rated as **moderate** and the ES is rated as **moderate**.

The tables provided in Appendix A indicate the Present Ecological State, Ecological Importance and Ecological Sensitivity classification of the reaches of the Tora and Mgwali River assessed by the DWS as part of the Desktop PESEIS (2014).

5.1.3 Ecoregions

South Africa is a geologically, geomorphologically, climatically and ecologically complex country, and this has resulted in a diverse range of ecosystems, including rivers. River ecoregional classification or typing allows the grouping of rivers according to similarities based on a top-down nested hierarchy. The principle of river typing is that rivers grouped together at a particular level of the typing hierarchy will be more similar to one another than rivers in other groups. Ecological regions are regions within which there is relative similarity in the mosaic of ecosystems and ecosystem components (biotic and abiotic, aquatic and terrestrial).

ROAD UPGRADE ROUTE

According to Department of Water Affairs and Forestry (2005) Level 2 River Ecoregional Classification System, the road upgrade route falls within **Level 2 Ecoregion 16.06: South-Eastern Uplands** of the **Level 1 Ecoregion 16: South Eastern Uplands.**

This Level 1 Ecoregion has the following characteristics:

- Mean annual precipitation: Generally high.
- Coefficient of variation of annual precipitation: Mostly moderate to low.
- Drainage density: Medium in the north, tending towards low in the south.
- Stream frequency: Low to medium in the south, tending towards medium high in the north.
- Slopes <5%: <20% (central areas), 20-50% (northern areas) and 50-80% (southern areas).
- Median annual simulated runoff: Moderate to high.
- Mean annual temperature: Moderate to moderately high.

Table 5.1 provides attributes of the Level 2 Ecoregion.

Table 5.1. Attributes of the Level 2 Ecoregion South-Eastern Uplands.

Main Attributes	South-Eastern Uplands 16.06
Terrain Morphology: Broad division	Lowlands, Hills; moderate and high relief, Closed Hills, mountains; moderate and high relief.
Terrain Morphology	Irregular undulating lowlands with hills, Low mountains.
Vegetation types (dominant types in bold) (Primary)	Moist Upland Grassland, Valley Thicket, Eastern Thorn Bushveld, Afromontane Forest
Altitude (m a.m.s.l.)	0 - 1300
MAP (mm)	500 - 800
Coefficient of variation (% of annual precipitation)	<20 - 30
Rainfall concentration index	30 -50
Rainfall seasonality	Later Summer, Mid Summer, Early Summer
Mean annual temp (°C)	14 - 18
Mean daily max temp (°C) February	24 - 28
Mean daily max temp (°C) July	16 - 20
Mean daily min temp (°C) February	12 - 18
Mean daily min temp (°C) July	2 - 8
Median annual simulated runoff (mm) for quaternary catchment	20 - 250

MINING AREAS

The mining areas fall within **Level 1 Ecoregion 16: South Eastern Uplands** and **Level 2 Ecoregion 16.06: South-Eastern Uplands** as discussed above.

5.1.4 Wetlands

Wetlands in South Africa have been mapped on a broad-scale by various stakeholders and have been included in the National Freshwater Ecosystem Priority Assessment (NFEPA, 2011-2014). Due to the broad-scale nature of the NFEPA map it is not spatially accurate and, therefore, some error is expected. The location of NFEPA wetlands was derived from the National Land Cover 2000 (Van Den Berg et al., 2008) and inland water features from the Department of Land Affairs' Chief Directorate: Surveys and Mapping (DLA-CDSM). All wetlands are classified as either 'natural' or 'artificial' water bodies.

The NFEPA wetland map identifies important or sensitive wetlands and wetland clusters. A wetland cluster is a group of wetlands all within 1 km of each other and which are surrounded by relatively natural vegetation. Wetland clusters allow for important ecological processes such as the migration of insects and frogs between the wetlands.

There are **no wetland clusters** within proposed road upgrade route and mining areas.

ROAD UPGRADE ROUTE

According to NFEPA there are no wetlands occurring directly within the road upgrade route however there a number of natural and artificial (water storage dams) within 500m of the route (refer to Figure 5.5 and Table 5.2).

MINING AREAS

According to NFEPA there are no wetlands within 500m of the quarry site, borrow pit B and borrow pit C. There is one artificial wetland within the footprint of borrow pit A.

It should be noted that none of the NFEPA wetlands within 500m of the study areas were classified as final FEPA wetlands.

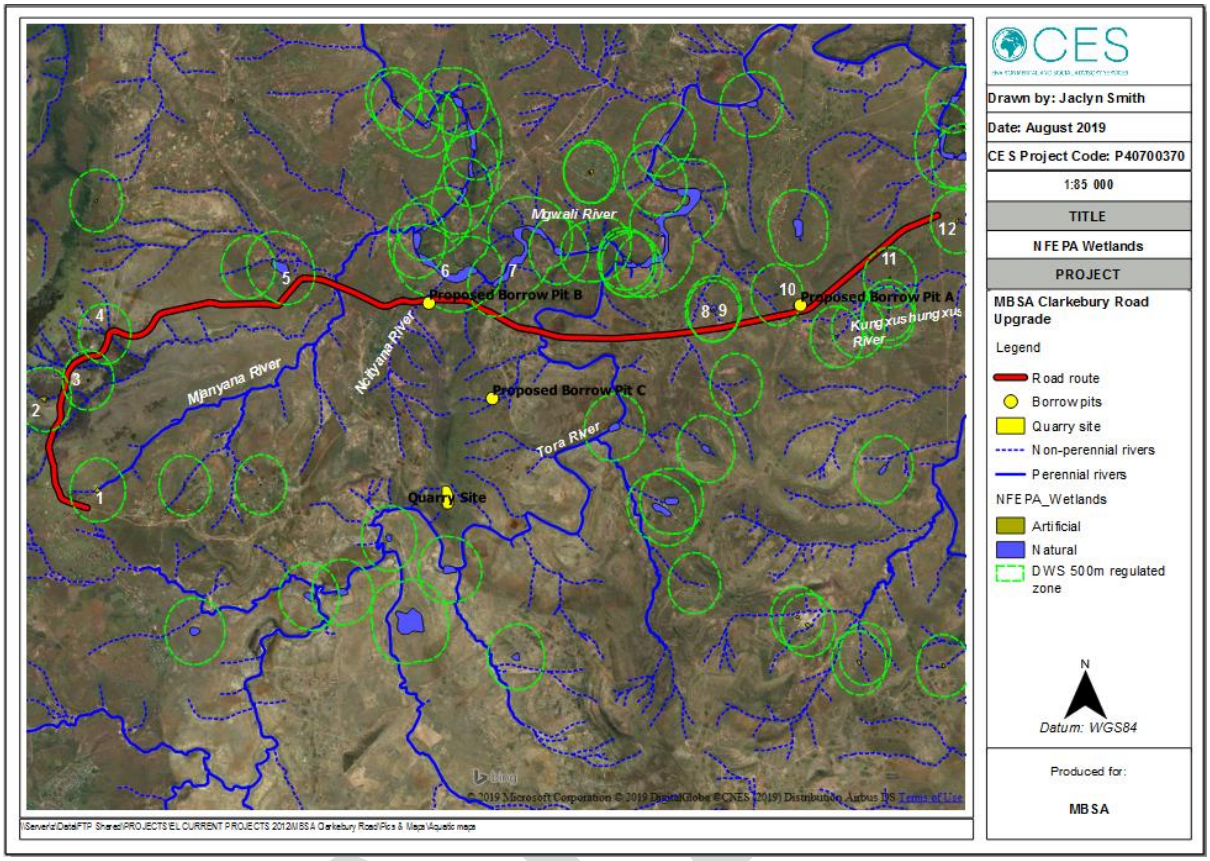


Figure 5.5: Wetlands surrounding the study area.

Table 5.2. Wetland classification for the wetlands located within 500m of the study area (Nel et al., 2011).

Wetlands	Level 3: Landscape Unit	Level 4: HGM Unit	Wetland Type	Natural/ Artificial	Wetland condition (if available)	FEPA Status
	Landscape setting	HGM Type				
Wetland 1, 2, 4	Valley floor	Channelled valley-bottom wetland	Sub-Escarpment Grassland Group 7 Channelled valley-bottom wetland	Artificial	Z3- Heavily to critically modified- Percentage natural land cover <25%	No
Wetland 3, 8, 9, and 10	Valley floor	Unchannelled valley-bottom wetland	Sub-Escarpment Grassland Group 7 Unchannelled valley-bottom wetland	Artificial	Z3- Heavily to critically modified- Percentage natural land cover <25%	No

Wetlands	Level 3: Landscape Unit Landscape setting	Level 4: HGM Unit HGM Type	Wetland Type	Natural/ Artificial	Wetland condition (if available)	FEPA Status
Wetland 5	Valley floor	Channelled valley-bottom wetland	Sub-Escarpment Grassland Group 7 Channelled valley-bottom wetland	Natural	Z1 – Heavily to critically modified- Wetland overlaps with a 1:50,000 "artificial" inland water body.	No
Wetland 6	Valley floor	Channelled valley-bottom wetland	Sub-Escarpment Grassland Group 7 Channelled valley-bottom wetland	Natural	C – Moderately Modified – Percentage natural land cover 25 – 75%	No
Wetland 7	Valley floor	Unchannelled valley-bottom wetland	Sub-Escarpment Grassland Group 7 Unchannelled valley-bottom wetland	Natural	AB – Natural or Good – Percentage natural land cover ≥ 75%	No
Wetland 11, 12	Bench	Flat wetland	Sub-Escarpment Grassland Group 7 Flat wetland	Artificial	Z3- Heavily to critically modified- Percentage natural land cover <25%	No

5.1.5 Vegetation

According to NFEPA the study area falls within Sub-Escarpment Grassland Group 7 and according to SANBI (2018) the vegetation in the study area is classified as Mthatha Moist Grassland of the Grassland

Biome. This vegetation type occurs along undulating plains and hills with grassland dominated by *Eragrostis plana*, *Sporobolus africanus* and *Themeda triandra*.

5.2 SITE SURVEY

A site survey was conducted on 11 July 2019. The purpose of the site visit was to gather data regarding the surrounding watercourses, ground truth the desktop study, delineate wetlands and assess the state of the aquatic and wetland environment. This includes identifying any potential impacts that the road route upgrade and mining areas may have on the aquatic and wetland environment and the significance of those impacts.

5.2.1 Wetland classification and delineation

ROAD UPGRADE ROUTE

The site visit investigation identified one additional natural seepage wetland system within 500m of the road route. It is anticipated that this wetland system is the mostly likely to be affected by any negative environmental impacts associated with the road upgrade. Refer to Figure 5.6 for wetland delineation and Table 5.3 for wetland classification.

There were a number of additional wetlands identified within 500m of the road upgrade route, which appeared to be artificially modified water storage dams (Figure 5.7 and 5.8).

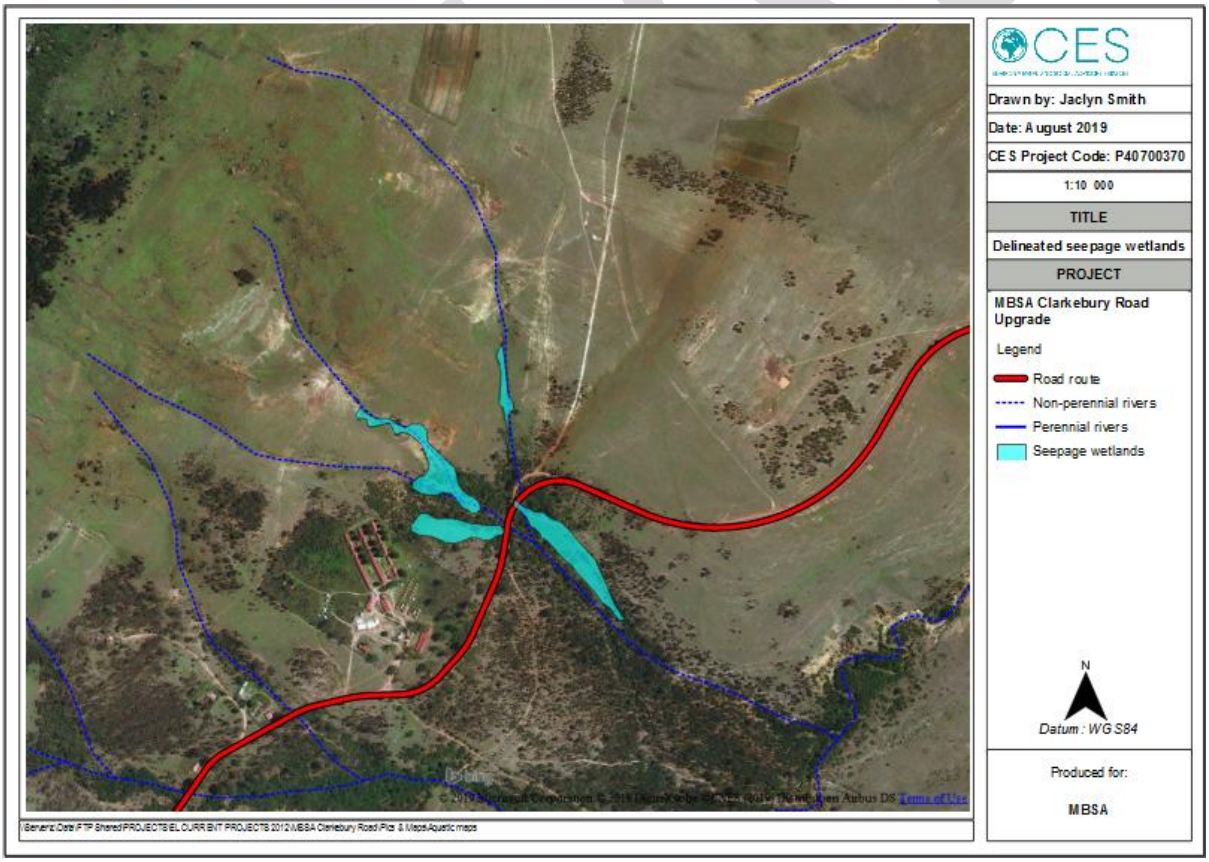


Figure 5.6 Delineation of the natural wetlands within 500m of the road upgrade route.

Table 5.3 Wetland Classification according to Ollis et al. (2013).

Wetland	Level 2 Regional Setting	Level 3 Landscape Unit	Level 4 HGM Unit
Delineated natural wetlands	South-eastern Uplands	Slope	Seepage wetlands

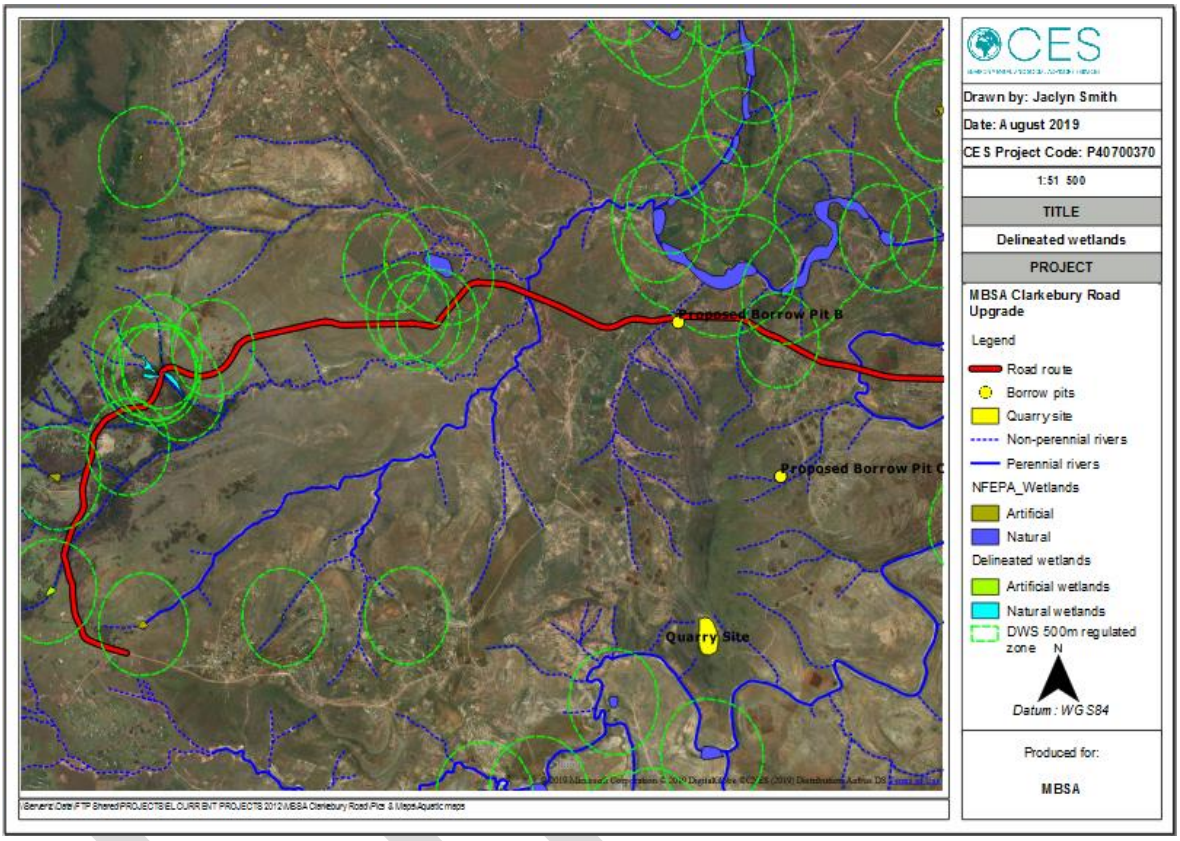


Figure 5.7 Map of delineated artificial and natural wetlands and NFEPA wetlands within 500m of the road upgrade route.

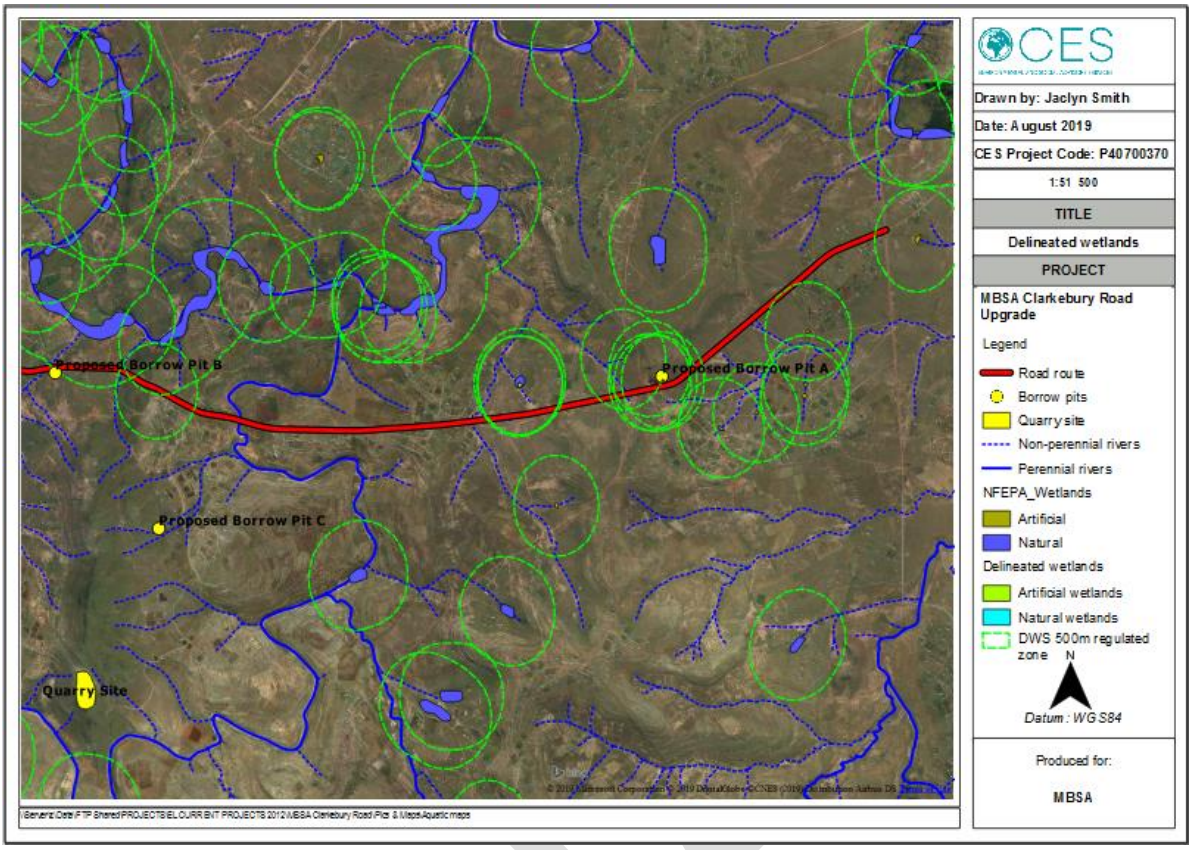


Figure 5.8 Map of delineated artificial and natural wetlands and NFEPA wetlands within 500m of the road upgrade route.

5.2.1.1 Ecosystem services of natural seepage wetlands

Ecosystem services were assessed for the natural seepage wetlands. The overall scores (average of effectiveness and opportunity scores) for the goods and services provided by the wetland are illustrated below, including threats and opportunities (Table 5.4). The rating of the extent to which a benefit is being supplied for each ecosystem service is also listed. The overall scores are shown in a radar diagram in Figure 5.9. The majority of the ecosystem services were rated as intermediate ecosystem services such as flood attenuation, streamflow regulation, erosion control, carbon storage and maintenance of biodiversity. Nitrate removal and toxicant removal were rated as moderately high while ecosystem services such as sediment trapping, cultural significance, tourism and education were rated moderately low.

These scores were based on factors such as:

- Extent of vegetation cover in the wetland;
- Extent of nitrate and toxicant sources in the wetland's catchment;
- Location with frequently grazed area; and
- Presence of alien invasive vegetation.

Table 5.4 Ecosystem Services provided by seepage wetlands.

Ecosystem service	Overall score	Extent to which benefit is being supplied (as per Table 4.2)
Flood attenuation	1.5	Intermediate
Streamflow regulation	2.0	Intermediate
Sediment trapping	0.9	Moderately low
Phosphate trapping	2.0	Intermediate
Nitrate removal	2.3	Moderately high
Toxicant removal	2.1	Moderately high
Erosion control	1.9	Intermediate
Carbon storage	1.3	Intermediate
Maintenance of biodiversity	1.3	Intermediate
Water supply for human use	1.3	Intermediate
Natural resources	2.6	Moderately high
Cultivated foods	1.6	Intermediate
Cultural significance	1.0	Moderately low
Tourism and recreation	1.0	Moderately low
Education and research	0.8	Moderately low
TOTAL		
Average score	**1.6**	**Intermediate**
Threats	1.0	Intermediate
Opportunities	2.0	Moderately low

Threats to the ecosystem services provided by the wetlands are relatively low and relate to transformation of land within the wetland's catchment and increased grazing by cattle.

Opportunities to enhance the supply of ecosystems services by the wetlands relate to better control/ monitoring of land uses within the wetland's catchment.

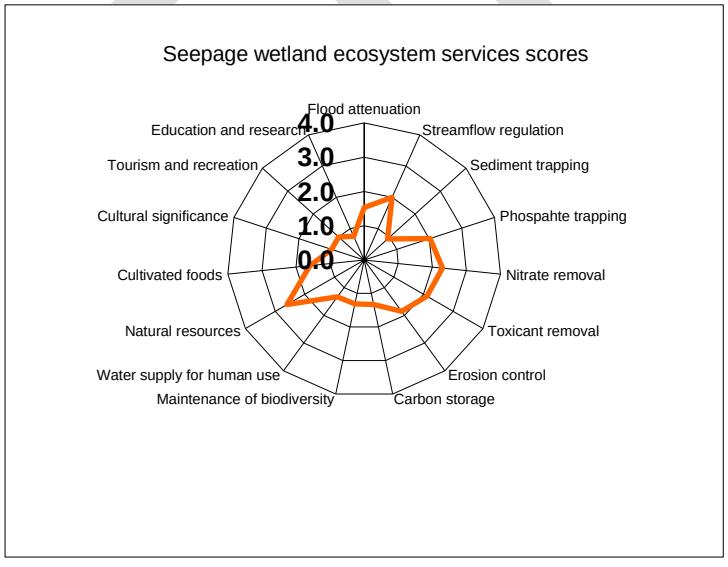


Figure 5.9 Radar diagram of Ecosystem Services for the seepage wetland system.

5.2.1.2 Present Ecological State of seepage wetlands

The seepage wetland system is considered to be in a **modified** condition. This is based on the current and lasting impacts and effects on the wetland system which include modifications to make a small dam upstream, construction of the gravel road and associated pipe culvert systems crossing the two stream systems, grazing by livestock and invasion of the area by alien vegetation.

Hydrology

The hydrological health was assessed as "C", ie. moderately modified with a moderate change in ecosystem processes. It is expected that the hydrological health will remain stable for the next 5 years.

	Hydrology	
	Impact score	**Change score**
	Wetland 1	**Wetland 1**
Overall weighted impact score	**3.0**	**0.0**
Present state category	**C**	→

Geomorphology

The geomorphological health was assessed as "A", i.e. natural. There is very little change in geomorphology present within the wetland. It is expected that the hydrological health will remain stable over the next 5 years.

	Geomorphology	
	Impact score	**Change score**
	Wetland 1	**Wetland 1**
Overall weighted impact score	**0.3**	**0.0**
Present state category	**A**	→

Vegetation

The vegetation health was assessed as "C", i.e. moderately modified. Impacts on the vegetation relate to the presence of alien invasive plant species within the wetland and land uses within and surrounding the wetland which have somewhat altered the natural state of the wetland. It is expected that the vegetation condition will deteriorate slightly over the next 5 years.

	Vegetation	
	Impact score	**Change score**
	Wetland 1	**Wetland 1**
Overall weighted impact score	**2.8**	**-1.0**
Present state category	**C**	↓

Overall PES

For the overall present ecological state, the following equation was used:

Health = ((Hydrology score) x3 + (Geomorphology score) x2 + (Vegetation score) x2)) ÷ 7.

This resulted in a score of 2 or a PES of C, reflecting the **moderately modified** state of the wetland.

	HYDROLOGY		GEOMORPHOLOGY		VEGETATION		OVERALL PES		OVERALL TRAJECTORY OF CHANGE	
WETLAND 1	**0**	**A**	**0**	**A**	**0.6**	**A**	**0.17**	**A**	**0**	↓

MINING AREAS

Borrow pit A

It was observed during the site investigation that Borrow Pit A has a number of artificial wetlands formed within the site, which shows evidence of previous mining activities. These small artificial wetlands formed small pools in depressions left from the mining activities. These artificial wetlands will be affected by the proposed mining activities.

Views of the artificial wetlands formed within depressions found in borrow pit A which formed as a result of previous mining activities within this area.

Borrow pit B

There were no wetlands identified within and within close proximity to Borrow Pit B. However, there did appear to be areas characteristic of dry water storage dams (artificial wetlands) which may have formed in depressions as a result of previous disturbance and what appears may be previous mining activity on the site.

Borrow pit C

There were no wetlands identified within the borrow pit.

Quarry site

There were no wetlands identified within the quarry site study area.

Ecosystem services associated with the artificial wetlands (water storage dams) are expected to be water storage and livestock watering.

5.2.2 Riparian zones

ROAD UPGRADE ROUTE

The site investigation confirmed that there are a number of rivers (perennial and non-perennial) and associated riparian areas within the road upgrade route.

The following photographs are taken of the watercourses within the road upgrade route. It was evident during the site visit that riparian vegetation was relatively sparse and erosion was common within and surrounding the existing watercourse crossings.

Existing pipe culvert structure over a tributary of the Kungxushungxushu River along the eastern section of the route upgrade.

South western upstream view of the pipe bridge over a tributary of the Mgwali River.

Downstream northern view of the tributary of the Mgwali River.

Eastern view of the existing Tora River bridge.

South western view of the pipe bridge over the tributary of the Mgwali River.

Northern downstream view of the tributary of the Mgwali River.

Southern upstream view of the Ntciyana River.

Northern downstream view of the causeway over the Ntciyana River.

Southern upstream view of the Mjanyana River.

North western view of the bridge over the Mjanyana River.

Northern downstream view of the Mjanyana River.

Eastern views of existing pipe culverts and crossings over non-perennial tributaries of the Mjanyana River.

MINING AREAS

Borrow pit A

During the site investigation it was observed that borrow pit A is surrounded by a tributary of the Kungxushungxushi River to the south east and a tributary of the Mgwali River to the north west which occur approximately 170m and 300m, respectively, from the site (photographs of these rivers shown in road upgrade route section above).

Borrow pit B

It was observed that Borrow Pit B occurs within close proximity to a non-perennial tributary (drainage line) which ultimately drains into a tributary of the Mgwali River.

Southern view of the non-perennial tributary (drainage line) of the Mgwali River bordering Borrow Pit B.

Borrow pit C

The site investigation showed that the borrow pit C occurs along a tributary of the Tora River which appears to have been eroded. The area around borrow pit C shows evidence of previous mining and disturbance.

South western view of the tributary of the Tora River within the study area of borrow pit C.

Quarry site

The quarry site is surrounded by tributaries of the Tora River which range from 20 to 180m from the quarry site. The Tora River occurs south of and downslope of the quarry site.

South eastern view of the Tora River which runs south and downslope of the quarry site.

5.2.3 Wetland and riparian vegetation

The following indigenous plant species were observed within the riparian and wetland areas:

- *Acacia natalitia*;
- *Aloe species*;
- *Cyperus dives*; and
- Gymnosporia species.

The following alien invasive plant species observed on site:

- *Acacia mearnsii*;
- *Eucalyptus species*;
- *Cirsium vulgare*; and
- Lantana camara.

5.2.4 Observations

The following observations were made with regards to existing threats/impacts on the wetland and river surrounding the study site:

- Extensive erosion within and surrounding watercourse centralised around existing road and bridge infrastructure;
- Overgrazing from surrounding livestock;
- Waste collected/dumped near watercourses; and
- Road/culvert infrastructure crossing a number of watercourses.

6 SITE SENSITIVITY

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(f) Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying alternatives;
(g) An identification of any areas to be avoided, including buffers;
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;

A sensitivity map (Figure 6.1 below) was developed based on desktop and site information gathered, and was classified into areas of high, moderate and low sensitivity.

High Sensitivity

- All natural delineated wetlands, delineated riparian zones of rivers and tributaries of the rivers affected by the activity.

All activities within high sensitivity areas must be closely monitored by a qualified ECO to ensure that all proposed mitigation measures are implemented to manage and minimize potential impacts on the watercourse.

Moderate Sensitivity

- All artificial wetlands;
- Areas within 50m of natural wetlands, artificial wetlands, and rivers.
- Moderate sensitivity areas act as buffers for the high sensitivity areas. Activities that may have an indirect impact on high sensitivity areas must not occur within these buffer areas. Such activities would include:
  - Stockpiling of topsoil, subsoil, etc;
  - Temporary ablution facilities;
  - Site camp establishment;
  - Temporary laydown areas for equipment/materials;
  - Overnight parking of heavy machinery/vehicles;
  - Concrete batching; and
  - Storage of chemicals/hazardous substances.

Low Sensitivity

- 500 m low sensitivity area placed around wetlands (regulated by DWS).

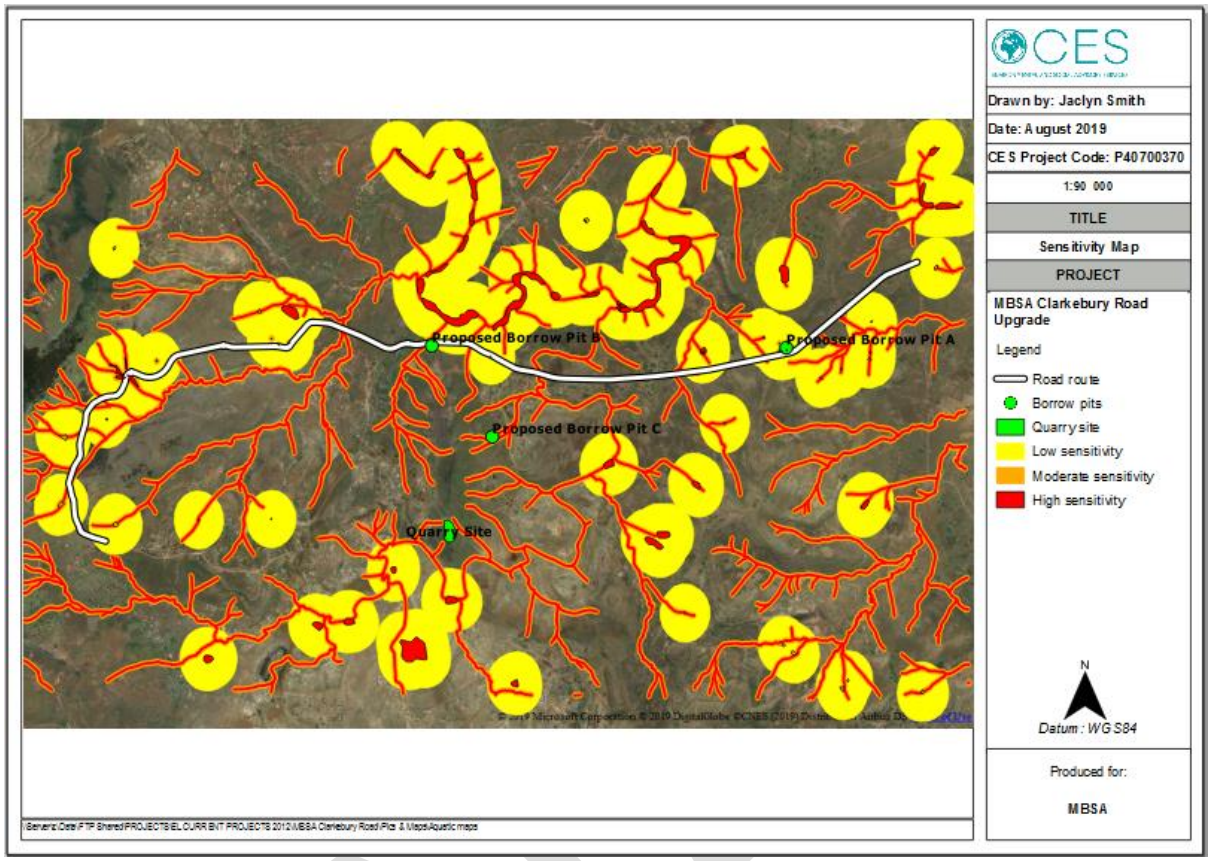


Figure 6.1 Sensitivity map of the study area

7 MANNER IN WHICH THE ENVIRONMENTAL MAY BE AFFECTED

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(cB) A description of the existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;
(k) Any mitigation measures for inclusion in the EMPr;

Impacts that could be a direct or indirect result of the proposed activity were identified for the Planning and Design, Construction and Operation Phase. These included the consideration of direct, indirect and cumulative impacts that may occur, and also considers the no-go or existing impacts.

Table 7.1 below provides a summary of the potential issues identified and their applicability to each phase of the proposed activity.

Table 7.1 Potential issues identified that could result from the proposed development.

Theme	Potential issues	Source of issue	Potential receptors	Phase			
				Planning and Design	Construction	Operation	Mine Decommissioning
Legislative Environment	Legal and policy compliance	• Licensing and Authorisations	• ECDOT	X	X	X	
Aquatic and wetland environment	Scheduling of construction	• Inappropriate construction scheduling	• Rivers and wetlands		X		
	Stormwater Management	• Inappropriate design of stormwater infrastructure		X	X	X	
	Material stockpiling	• Inappropriate stockpiling of material during construction.			X		
	Invasion of alien species	• Failure to plan for removal and management of alien vegetation			X	X	
	Disturbance of aquatic and wetland vegetation and habitat	• Placement of culverts and bridges during planning. • Uncontrolled vegetation clearance during construction.		X	X		X
	Changes to fluvial geomorphology and hydrology	• Inappropriate placement of infrastructure during planning • Earthworks • Vegetation clearance during construction.		X	X	X	X
	Erosion and sedimentation	• Vegetation clearance during construction.			X		

	Water quality	• Accidental spillages and pollution during construction.			X		
	Maintenance	• Poor maintenance of infrastructure				X	

Table 7.2 Impacts and mitigation measures for the Planning and Design, Construction and Operation Phases of Road Upgrade and Mining areas.

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
PLANNING AND DESIGN PHASE														
Legislative Environment														
Legal and policy compliance	Road Upgrade Route & Mining areas	During the planning and design phase non-compliance with the legal requirements and policies of South Africa as they pertain to the aquatic environment could lead to damage to the aquatic environment, unnecessary delays in construction activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.	**Negative**	**DIRECT**	**Study area**	**Short-term**	**Moderate**	**Completely reversible**	**Resource will not be lost**	**Possible**	**Moderate**	**Moderate**	• All legal matters pertaining to permitting must be completed prior to any construction or mining activity. • In particular, all necessary Water Use Licences must be in order for any of the following activities: - Construction activities within the 1:100 year floodline, (or within the riparian zone of watercourse) and within 500 m of a wetland or where infrastructure will traverse rivers or drainage lines (if applicable).	**Low**
Aquatic and wetland environment														

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Stormwater management	Road Upgrade Route	During the planning and design phase inappropriate design of bridges and stormwater structures may result in increased levels of erosion, sedimentation and pollution of the watercourses.	**Negative**	**Direct**	**Severe**	**Study area**	**Long-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• Appropriate stormwater structures must be designed to minimise erosion and sedimentation of watercourses. • All road sections situated on slopes must incorporate stormwater diversion. • Stormwater design must be in line with and DWS requirements.	**Low**
	Mining areas												• Appropriate stormwater structures must be designed around all mining areas to minimise erosion and sedimentation of watercourses. • Appropriate stormwater diversion measures must be put in place to capture and control runoff from mining areas.	**Low**
Disturbance of aquatic and wetland vegetation and habitat	Mining areas	During the planning and design inappropriate placement and design of mining areas within watercourses and wetlands may result in adverse impacts on the integrity of these watercourses and downstream rivers and wetlands.	**Negative**	**Direct**	**Moderate**	**Study area**	**Medium-term**	**Possible**	**Reversible**	**Resource may be partly lost**	**Achievable**	**Moderate**	• Mining must not take place within the high sensitivity areas of the Aquatic and Wetland Assessment Report as far as possible as these areas fall within Upstream Management Areas. • Care must be taken to reduce the risk of aquifer penetration.	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Changes to fluvial geomorphology and hydrology	Road Upgrade route	During the planning and design phase inappropriate design of bridge and culvert infrastructure may result in scouring of the river bed and changes to the hydrology of the watercourses.	**Negative**	**Direct**	**Moderate**	**Study area**	**Long-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• Scour countermeasures must be incorporated in the design of all bridges and all culverts in the study areas. • All culverts must be designed in such a manner so as to not impede or divert natural baseflows or increase upstream flood inundation. • Box culverts should be selected over pipe culverts, as they are less restrictive in terms of flow and also aid in reducing habitat fragmentation. • Bridges should span the entire width of the river if the width of the river is sufficiently narrow. • The number of piers placed within the river should be limited to as much as possible to limit the disturbance to the bed and banks of the river. • All culverts/bridges should be designed by an Engineer to be above the 1:100 year floodline or major flood event.	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
CONSTRUCTION PHASE														
Legislative Environment														
Legal and policy compliance	Road Upgrade Route & Mining areas	During the construction phase non-compliance with the legal requirements and policies of South Africa s they pertain to the aquatic environment could lead to damage to the aquatic environment, unnecessary delays in construction activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.	**Negative**	**Direct**	**Moderate**	**Localised**	**Short-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• All construction related conditions in the Environmental Authorisation must be adhered to. • All conditions in the Water Use Licence must be adhered to especially relating to water monitoring etc (if required). • All conditions in any other permits must be adhered to. • An ECO must be appointed to oversee construction activities.	**Low**
Aquatic and Wetland Environment														
Scheduling of construction	Road Upgrade Route & Mining areas	Inappropriate construction scheduling that does not take into account seasonal requirements of the aquatic environment could lead to short-term impacts on the aquatic environment such as excessive sediment mobilization.	**Negative**	**Indirect**	**Moderate**	**Study area**	**Short term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• Wherever possible, construction activities should be undertaken during the driest part of the year to minimize downstream sedimentation due to excavation, etc. • When not possible, suitable stream diversion structures must be used to ensure the river is not negatively impacted by construction activity.	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Stormwater management	Road Upgrade Route	During the construction phase the inappropriate routing of stormwater runoff may lead to construction debris entering watercourses and sedimentation and erosion of surrounding watercourses, adversely affecting the aquatic environment	**Negative**	**Direct**	**Moderate**	**Localised**	**Short-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• Stormwater must be managed effectively to minimize the ingress of construction debris and sediment-laden stormwater into surrounding watercourses.	**Low**
	Mining areas												• Stormwater must be managed effectively to minimize the ingress of construction debris and sediment-laden stormwater into surrounding watercourses. • Stormwater measures such as interceptor ditches should be installed around mining areas to capture and control stormwater runoff.	

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Material stockpiling	Road Upgrade Route & Mining areas	During the construction phase, stockpiling of construction materials within moderate sensitivity areas could result in erosion and mobilisation of the materials into the nearby watercourses, resulting in sedimentation and a decrease in water quality and aquatic habitat.	**Negative**	**Direct, Indirect**	**Moderate**	**Localised**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• No construction material must be stored within the moderate sensitivity area indicated in Figure 6.1 of the Aquatic and Wetland Assessment Report. • Stockpiles must not be placed within the moderate sensitivity area indicated in the Aquatic and Wetland Assessment Report. • Stockpiles must be monitored for erosion and mobilisation of materials towards watercourses. If this is noted by an ECO, suitable cut-off drains or berms must be placed between the stockpile area and the nearest watercourse. • Stockpiles should not exceed 1.5 m in height. • Stockpiles should be covered during windy periods.	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Invasion of alien species	Road Upgrade Route & Mining areas	• Failure to remove and manage alien vegetation could result in the invasion of alien vegetation in riparian areas during the construction and operation phase. This would have an adverse impact on the aquatic ecosystem. • During the construction phase, the removal of existing vegetation creates 'open' habitats that will inevitably be colonised by pioneer plant species. While this is part of a natural process of regeneration, which would ultimately lead to the re-establishment of a secondary vegetation cover, it also favours the establishment of undesirable alien species in the area. These species colonise areas of disturbance and once established, they are typically very difficult to eradicate and can pose a threat to the ecosystem. Failure to monitor alien vegetation during construction could lead to infestations.	**Negative**	**Indirect**	**Moderate**	**Localised**	**Medium-term**	**Probable**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• A Rehabilitation and Alien Vegetation Management Plan must be developed and implemented clearly to construction activities, to reduce the establishment and spread of undesirable alien plant species. • Construction vehicles and machinery must not encroach into areas outside/surrounding the planned project footprint. • Alien Management Plan must be implemented during the construction phase. • Alien plants must be eradicated from the impacted areas as they appear. • Monitor the project area for any new growth of invasive plants until completion of construction. • Short-term monitoring must take place for alien invasive plant species growth for a period of 12 months after construction has been completed should be conducted	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Disturbance of aquatic and wetland vegetation and habitat	Road Upgrade Route & Mining areas	During the construction phase indiscriminate removal or unnecessary encroachment into riparian and wetland vegetation may lead to disturbance of the aquatic ecosystem.	**Negative**	**Direct, Indirect**	**Severe**	**Study area**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• Removal of any riparian and wetland vegetation must take place under the supervision of an ECO. • Removal of alien vegetation should be prioritised. • Banks must be artificially stabilised as soon as possible if riparian vegetation is removed. • Vehicles and machinery must not encroach into areas outside/surrounding road upgrade footprint.	**Low**
Changes to fluvial geomorphology and hydrology	Road Upgrade Route & Mining areas	During the construction phase inappropriate placement of infrastructure, earthworks within the watercourse and prolonged coffer dams/diversion structures may alter natural flow patterns	**Negative**	**Direct, cumulative**	**Severe**	**Localised**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• Damage to bed and banks of the watercourses must be avoided other than to complete specific works within the watercourse. • No material, sediment or debris from bridge/culvert construction must be left or allowed to build up in the watercourse. • Coffer dams and any temporary diversions should not be in place for more than 30 days if possible. • Construction activities within watercourses should take place within the dry season, when the flows are at their lowest, where possible.	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Erosion and sedimentation	Road Upgrade Route & Mining areas	During the construction phase, vegetation clearance and lack of implementation of erosion control measures may result in deterioration of the surrounding habitat as a result of erosion of banks, slopes and bed of watercourse and resultant sedimentation.	**Negative**	**Indirect, Cumulative**	**Severe**	**Study area**	**Long-term**	**Probable**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• Vegetation clearing must be kept a minimum and only to the site footprint. • Erosion controls and sediment trapping measures must be put in place. • All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated. • Disturbed areas must be constantly monitored for erosion channels and these must be rehabilitated immediately.	**Low**

Water quality	Road Upgrade Route & Mining areas	During the construction phase, accidental spillages of wet concrete and chemical/hazardous substances in the vicinity of watercourse may result in water pollution, adversely affecting the aquatic ecosystem.	**Negative**	**Direct, indirect**	**Severe**	**Study area**	**Short-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• No concrete mixing must take place within 32m of any watercourse. • No machinery must be parked overnight within 50 m of the rivers/wetlands. • All stationary machinery must be equipped with a drip tray to retain any oil leaks. • Chemicals used for construction must be stored safely on bunded surfaces in the construction site camp. • Emergency plans must be in place in case of spillages onto road surfaces or within water courses. • No ablution facilities must be located within 50 m of any river or wetland system. • Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution. • Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it. • All general waste and refuse must be removed from site and disposed and windproof temporary storage area before being	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
													disposed of at a registered landfill site.	
OPERATION PHASE														
Legislative Environment														
Legal and policy compliance	Road Upgrade Route & Mining areas	During the operation phase non-compliance with the legal requirements and policies of South Africa as they pertain to the aquatic environment could lead to damage to the aquatic environment and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.	**Negative**	**Direct**	**Moderate**	**Study area**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• All operational related conditions in the Environmental Authorisation must be adhered to. • All conditions in the Water Use Licence must be adhered to especially relating to water monitoring etc (if required). • All condition stipulated in any other additional permits must be adhered to.	**Low**
Aquatic and Wetland Environment														
Stormwater management	Road Upgrade Route & Mining areas	During the operation phase, inappropriate stormwater infrastructure may result in adverse impacts on the aquatic environment such as erosion and sedimentation	**Negative**	**Direct**	**Moderate**	**Localised**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• Stormwater infrastructure must be maintained and monitored for effectiveness with respect to controlling and minimising erosion and sedimentation of watercourses.	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Invasion of alien species	Road Upgrade Route & Mining areas	During the operational phase failure to monitor the effectiveness of a rehabilitation and alien vegetation removal plan post-construction could result in alien plant invasion within watercourses	**Negative**	**Direct**	**Moderate**	**Localised**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• An alien vegetation removal and rehabilitation plan must be implemented post-construction. • The effectiveness of this plan should be monitored on a biannually for the first year following construction or until such time as the ECO deems the rehabilitation sufficient. • Alien plants must be removed from aquatic environments through appropriate methods such as hand pulling, cutting etc. This must be done under the supervision of the ECO.	**Low**
Maintenance	Road Upgrade Route & Mining areas	During the operation phase inadequate maintenance of culverts, bridges and the road surface may lead to obstruction of flow in the watercourses	**Negative**	**Indirect**	**Moderate**	**Study area**	**Long-term**	**Possible**	**Reversible**	**Resource ill not be lost**	**Moderate**	**Moderate**	• All infrastructures such as culverts, bridges etc. must be maintained and monitored on a regular basis to check for failure of infrastructure.	**Low**

POTENTIAL ISSUES	Aspect	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Decommissioning phase														
Disturbance of aquatic and wetland vegetation and habitat	Mining areas	During the decommissioning phase, failure to rehabilitate disturbed areas and restore natural topography to the disturbed areas.	**Negative**	**Direct**	**Moderate**	**Study area**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• Rehabilitation must be implemented during the decommissioning of the mining areas. • All disturbed mining areas must be restored to their natural topography and must be self-draining. • Re-vegetation must take place as soon as possible during the mine decommissioning process.	**Low**

Table 7.3 Impacts and mitigations measures associated with the No-Go Alternative.

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Status-quo – No road upgrade and mining	Should the project not proceed then the current land use will remain the same. In this instance, the likelihood of potential disturbance and contamination of surrounding watercourses is reduced.	**Positive**	**Direct**	**Moderate**	**Study area**	**Medium -term**	**Possible**	**Completely reversible**	**Resource will not be lost**	**Achievable**	**Low**	• N/A	**Low**

8 ASSESSMENT OF CUMULATIVE IMPACTS

In terms of Environmental Impact Assessments, a cumulative impact is defined as:

"The past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities".

The main cumulative impact that the upgrading of the road and development of mining areas may bring about is the increase in and attraction of new houses or developments to the area which may result in an increase in adverse impacts on the surrounding aquatic environment including erosion, sedimentation and contamination of surrounding water resources. This cumulative impact is, however, anticipated to be relatively low given the relatively rural setting of the study area.

9 IMPACT STATEMENT, CONCLUSION AND RECOMMENDATIONS

In terms of Appendix 6 of 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(I) Any conditions for inclusion in the environmental authorisation;
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation;
(n) A reasoned opinion as to-
(i) whether the proposed activity, activities or portions thereof should be authorised; and
(iA) regarding the acceptability of the proposed activity or activities, and
(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;

(q) Any other information requested by the competent authority.

9.1 CONCLUSIONS

The Eastern Cape Department of Transport proposes to upgrade a 20 km section of the DR08034 road from Clarkebury to the Mjanyana Hospital in the Eastern Cape.

CES was appointed by MBSA Consulting Engineers on behalf of ECDOT to complete an Aquatic and Wetland Impact Assessment that will provide input into the Environmental Impact Assessment Process and Water Use Licence Application process.

The non-perennial and perennial rivers on site are considered to be of moderate ecological importance and the natural seepage wetlands on site were considered to be moderately modified. Adverse impacts on site and to the rivers and wetland system could negatively impact the watercourses and downstream river and wetland systems. Care must be taken to limit the impact on the artificial wetlands identified within the study area as they provide ecosystem services to the surrounding communities in the form of water storage and livestock watering.

It should also be noted that the Tora River, Mgwali River and their associated tributaries are considered Upstream Management Areas. Therefore, appropriate mitigation measures in this report must be properly enforced to limit any adverse impacts on these rivers and the downstream systems.

The potential for these adverse impacts can be reduced by limiting the construction activities associated with the development (except those required for upgrading road and constructing bridge and culvert structures within the watercourses) to areas outside of areas indicated as MODERATELY sensitivite, unless absolutely necessary and under the guidance of a qualified ECO.

The HIGH pre-mitigation impacts relate to water quality, erosion, sedimentation, changes to fluvial geomorphology and hydrology of the aquatic systems and disturbance of wetland and riparian habitat during the construction phases. These HIGH pre-mitigation impacts can be mitigated to a LOW post-mitigation impact by application of the proposed mitigation measures.

Table 8.1: Assessment of pre- and post-mitigation impact significance.

	Aspect	PRE-MITIGATION			POST-MITIGATION		
		LOW -	MOD -	HIGH -	LOW -	MOD -	HIGH -
Planning and Design	Road route upgrade and mining areas	0	3	0	3	0	0
	Road route upgrade	0	1	1	2	0	0
	Mining areas	0	1	1	2	0	0
Construction	Road route upgrade and mining areas	0	3	4	7	0	0
	Road route upgrade	0	1	0	1	0	0
	Mining areas	0	1	0	1	0	0
Operation	Road route upgrade and mining areas	0	4	0	4	0	0
Decommissioning	Mining areas	0	1	0	1	0	0
TOTAL		0	15	6	21	0	0

9.2 WATER USE LICENCE

A Water Use Licence Application (WULA) is required for any construction activity within the extent of a watercourse (i.e. riparian and instream habitat or within 100 m of the watercourse); within the 1:100 year floodline; or within 500 m of a wetland in terms of the following triggers from the National Water Act (No. 36 of 1998):

- Section 21 (c) - impeding or diverting the flow of water in a watercourse; and
- Section 21 (i) - altering the bed, banks, course or characteristics of a watercourse.

It is recommended that DWS is consulted regarding requirements for WULA'S which must be secured for all proposed bridges and culverts and mining activities affecting the watercourses.

9.3 RECOMMENDATIONS FOR THE PROPOSED ACTIVITY

All the mitigation measures provided below are to be implemented in the Planning and Design, Construction, Operation and Decommissioning Phases of the proposed activities.

9.3.1 Planning and Design

- All legal matters pertaining to permitting must be completed prior to any construction or mining activity. In particular, all necessary Water Use Licences must be in order for any of the following activities:

- Construction activities within the 1:100-year floodline, (or within the riparian zone of watercourse) and within 500 m of a wetland or where infrastructure will traverse rivers or drainage lines (if applicable).

- Appropriate stormwater structures must be designed to minimise erosion and sedimentation of watercourses.
- All road sections situated on slopes must incorporate stormwater diversion.
- Stormwater design must be in line with and DWS requirements.
- Appropriate stormwater diversion measures must be put in place to capture and control runoff from mining areas.
- Mining must not take place within the high sensitivity areas of the Aquatic and Wetland Assessment Report as far as possible as these areas fall within Upstream Management Areas.
- Care must be taken to reduce the risk of aquifer penetration.
- Scour countermeasures must be incorporated in the design of all bridges and all culverts in the study areas.
- All culverts must be designed in such a manner so as to not impede or divert natural baseflows or increase upstream flood inundation.
- Box culverts should be selected over pipe culverts, as they are less restrictive in terms of flow and also aid in reducing habitat fragmentation.
- Bridges should span the entire width of the river if the width of the river is sufficiently narrow.
- The number of piers placed within the river should be limited to as much as possible to limit the disturbance to the bed and banks of the river.
- All culverts/bridges should be designed by an Engineer to be above the 1:100-year floodline or major flood event.

9.3.2 Construction

- All construction related conditions in the Environmental Authorisation must be adhered to.
- All conditions in the Water Use Licence must be adhered to especially relating to water monitoring etc (if required).
- All conditions in any other permits must be adhered to.
- An ECO must be appointed to oversee construction activities.
- Wherever possible, construction activities should be undertaken during the driest part of the year to minimize downstream sedimentation due to excavation, etc.
- When not possible, suitable stream diversion structures must be used to ensure the river is not negatively impacted by construction activity.
- Stormwater must be managed effectively to minimize the ingress of construction debris and sediment-laden stormwater into surrounding watercourses.
- Stormwater must be managed effectively to minimize the ingress of construction debris and sediment-laden stormwater into surrounding watercourses.
- Stormwater measures such as interceptor ditches should be installed around mining areas to capture and control stormwater runoff.
- No construction material must be stored within the moderate sensitivity area indicated in Figure 6.1 of the Aquatic and Wetland Assessment Report.

- Stockpiles must not be placed within the moderate sensitivity area indicated in the Aquatic and Wetland Assessment Report.
- Stockpiles must be monitored for erosion and mobilisation of materials towards watercourses. If this is noted by an ECO, suitable cut-off drains or berms must be placed between the stockpile area and the nearest watercourse.
- Stockpiles should not exceed 1.5 m in height.
- Stockpiles should be covered during windy periods.
- A Rehabilitation and Alien Vegetation Management Plan must be developed and implemented clearly to construction activities, to reduce the establishment and spread of undesirable alien plant species.
- Construction vehicles and machinery must not encroach into areas outside/surrounding the planned project footprint.
- Alien Management Plan must be implemented during the construction phase.
- Alien plants must be eradicated from the impacted areas as they appear.
- Monitor the project area for any new growth of invasive plants until completion of construction.
- Short-term monitoring must take place for alien invasive plant species growth for a period of 12 months after construction has been completed should be conducted.
- Removal of any riparian and wetland vegetation must take place under the supervision of an ECO.
- Removal of alien vegetation should be prioritised.
- Banks must be artificially stabilised as soon as possible if riparian vegetation is removed.
- Vehicles and machinery must not encroach into areas outside/surrounding road upgrade footprint.
- Damage to bed and banks of the watercourses must be avoided other than to complete specific works within the watercourse.
- No material, sediment or debris from bridge/culvert construction must be left or allowed to build up in the watercourse.
- Coffer dams and any temporary diversions should not be in place for more than 30 days if possible.
- Construction activities within watercourses should take place within the dry season, when the flows are at their lowest, where possible.
- Vegetation clearing must be kept a minimum and only to the site footprint.
- Erosion controls and sediment trapping measures must be put in place.
- All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated.
- Disturbed areas must be constantly monitored for erosion channels and these must be rehabilitated immediately.
- No concrete mixing must take place within 32m of any watercourse.
- No machinery must be parked overnight within 50 m of the rivers/wetlands.
- All stationary machinery must be equipped with a drip tray to retain any oil leaks.
- Chemicals used for construction must be stored safely on bunded surfaces in the construction site camp.

- Emergency plans must be in place in case of spillages onto road surfaces or within water courses.
- No ablution facilities must be located within 50 m of any river or wetland system.
- Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution.
- Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it.
- All general waste and refuse must be removed from site and disposed and windproof temporary storage area before being disposed of at a registered landfill site.

9.3.3 Operation

- All operational related conditions in the Environmental Authorisation must be adhered to.
- All conditions in the Water Use Licence must be adhered to especially relating to water monitoring etc (if required).
- All condition stipulated in any other additional permits must be adhered to.
- Stormwater infrastructure must be maintained and monitored for effectiveness with respect to controlling and minimising erosion and sedimentation of watercourses.
- An alien vegetation removal and rehabilitation plan must be implemented post-construction.
- The effectiveness of this plan should be monitored on a biannually for the first year following construction or until such time as the ECO deems the rehabilitation sufficient.
- Alien plants must be removed from aquatic environments through appropriate methods such as hand pulling, cutting etc. This must be done under the supervision of the ECO.
- All infrastructures such as culverts, bridges etc. must be maintained and monitored on a regular basis to check for failure of infrastructure.

9.3.4 Decommissioning

- Rehabilitation must be implemented during the decommissioning of the mining areas.
- All disturbed mining areas must be restored to their natural topography and must be self-draining.
- Re-vegetation must take place as soon as possible during the mine decommissioning process.

9.4 FATAL FLAWS

It is the opinion of the specialist that NO FATAL FLAWS exist with the proposed development.

9.5 ENVIRONMENTAL STATEMENT AND OPINION OF THE SPECIALIST

The aquatic impacts of all aspects for the road upgrade and mining areas were assessed and considered to be acceptable, provided that the mitigation measures provided in this report are implemented. All impacts are rated as MODERATE to HIGH pre-mitigation. Therefore, implementation of recommended mitigation measures coupled with comprehensive rehabilitation and monitoring in terms of re-vegetation and restoration is an important element of the mitigation strategy. Implementing the recommended mitigations measures will reduce impacts to LOW significance.

It is recommended that the proposed road upgrade and mining activities are authorised provided the all mitigation measures in this report are implemented.

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APPENDIX A

Present Ecological State, Ecological Importance and Sensitivity data for the reach of the Toro River most likely to be affected by the development.

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
T12E-06802	Tora	22.94	2	Y		MODERATELY MODIFIED	C

MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (DEC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)
MODERATE	MODERATE	C	0.00

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	NONE	FISH SPP/SQ	2.00	INVERT TAXA/SQ	39.00	FISH PHYS-CHEM SENS DESCRIPTION	MODERATE
RIP/WETLAND ZONE CONTINUITY MOD	LARGE	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	2.79	FISH NO-FLOW SENSITIVITY DESCRIPTION	MODERATE
POTENTIAL INSTREAM HABITAT MOD ACT.	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	VERY LOW	INVERT REPRESENTIVITY PER SECONDARY, CLASS	VERY HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	VERY HIGH
RIPARIAN-WETLAND ZONE MOD	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	VERY LOW	INVERT RARITY PER SECONDARY: CLASS	VERY HIGH	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS	LOW	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	LOW

POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	**ECOLOGICAL IMPORTANCE : RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING**	LOW	**HABITAT DIVERSITY CLASS**	VERY LOW	**STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION**	LOW
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	MODERATE	**HABITAT SIZE (LENGTH) CLASS**	LOW	**RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION**	**LOW**
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	**INSTREAM MIGRATION LINK CLASS**	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	MODERATE		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	MODERATE		
				INSTREAM HABITAT INTEGRITY CLASS	MODERATE		

Present Ecological State, Ecological Importance and Sensitivity data for the reach of the Mgwali River most likely to be affected by the development.

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
T12F-06661	Mgwali	44.66	3	Y		LARGELY MODIFIED	D

MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (DEC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)
MODERATE	MODERATE	C	0.00

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	SMALL	FISH SPP/SQ	3.00	INVERT TAXA/SQ	33.00	FISH PHYS-CHEM SENS DESCRIPTION	MODERATE
RIP/WETLAND ZONE CONTINUITY MOD	LARGE	FISH: AVERAGE CONFIDENCE	1.67	INVERT AVERAGE CONFIDENCE	1.06	FISH NO-FLOW SENSITIVITY DESCRIPTION	MODERATE
POTENTIAL INSTREAM HABITAT MOD ACT.	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT REPRESENTIVITY PER SECONDARY, CLASS	HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	VERY HIGH
RIPARIAN-WETLAND ZONE MOD	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT RARITY PER SECONDARY: CLASS	HIGH	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	MODERATE	FISH RARITY PER SECONDARY: CLASS	MODERATE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES	LOW	HABITAT DIVERSITY CLASS	VERY LOW	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL	LOW

		(EX FISH) RATING				**CHANGES DESCRIPTION**	
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	MODERATE	**HABITAT SIZE (LENGTH) CLASS**	MODERATE	**RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION**	**LOW**
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	**INSTREAM MIGRATION LINK CLASS**	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	MODERATE		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	MODERATE		
				INSTREAM HABITAT INTEGRITY CLASS	MODERATE		