DRAFT BASIC ASSESSMENT REPORT:
UPGRADE OF EXISTING ROADS AND LOW- LEVEL STREAM CROSSINGS ON ROADS P372, P148, D897, D30, L1190, L1333, L1351 AND D2286 AT ISADLWANA AREA WITHIN THE NGUTHU LOCAL MUNICIPALITY, KWAZULU NATAL PROVINCE

PREPARED FOR:

APPLICANT: SOUTH AFRICAN NATIONAL ROAD AGENCY SOC LTD (SANRAL)

December 2022

PREPARED BY:

QPOINT GROUP

Address: Fancourt Office Park 9 Felstead Road,
Northriding Johannesburg, 2162

Tel: 011 568 0916

Email: info@qpoint.co.za

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ACRONYMS AND ABBREVIATIONS:

BA	Basic Assessment
BAR	Basic Assessment Report
DFFE	Department of Forestry, Fisheries & Environment
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EDTEA	Economic Development, Tourism and Environmental Affairs
ECO	Environmental Control Officer
EMF	Environmental Management Framework
EMPR	Environmental Management Programme
GPS	Global Positioning System
Ha	Hectare
HIA	Heritage Impact Assessment
I&AP	Interested and/or Affected Party
KZN	KwaZulu Natal
MAE	Mean Annual Evaporation
MAMSL	Metres Above Mean Sea Level
MAP	Mean Average Precipitation
NEMA	National Environmental Management Act (1998)
NEMWA	National Environmental Management: Waste Act (2008)
NWA	National Water Act (1998)
WUL	Water Use Licence
WULA	Water Use Licence Application

APPENDICES

CONTACT DETAILS

Environmental Impact Assessment Practitioner	
Company	QPOINT GROUP
Project Team	Ms. Amukelani Khosa-- EAP Mr. Shelton Tsanga – Project Manager
Email	shelton@qpoint.co.za
Cell	067 750 8190/ 011 568 0916
Physical Address	Fancourt Office Park 9 Felstead Road, Northriding Johannesburg, 2162

Applicant	South African National Roads Agency SOC Ltd (SANRAL)
Contact Person	Mr. Dudley Mbambo
Tel.	033 392 8113
Email	ChangweA@nra.co.za

Environmental Authority	Department of Forestry, Fisheries & Environment
Contact	Makhosi Yeni
Tel	*072 7591825/ 012 -399 9400*
Email	MYeni@dffe.gov.za

1. INTRODUCTION

Qpoint Group has been appointed to apply for an Environmental Authorisation on behalf of the SANRAL for the proposed upgrade of existing roads and low- level stream crossings on roads P372, P148, D897, D30, L1190, L1333, L1351 And D2286 At Isandlwana Area Within the Nquthu Local Municipality, KwaZulu Natal Province. The technical information given in this report has been supplied by the Applicant project team.

2. PROJECT DESCRIPTION

SANRAL proposes an upgrading of several existing roads from gravel roads to tar surfaced roads located at Nquthu/Isandlwana area which is within the jurisdiction of the Nquthu Local Municipality and uMzinyathi District Municipality in the KwaZulu-Natal.

The proposed roads upgrades include 11 low level stream crossings infrastructures proposed to be upgraded. The existing stormwater management culverts which are in good conditions will only be cleaned off debris and silt, and some will be replaced in case of insufficient structural integrity during construction. The proposed concrete low-lying culverts will require removing of material/soil within a watercourse. It is estimated that some at some stream crossing approximately 10 cubic meters of soil/materials will be removed or deposited, and it is estimated that the entire project will results in approximately 200 cubic meters of material to be removed within all identified watercourses combined.

The table below indicates the roads to be upgraded, the length of the roads and the number of watercourses expected to be affected by the establishment of the low-level stream crossings:

Proposed Roads	Road Length	Crossings requiring low level culverts	Crossing Coordinates
P372	31.9km	4	• 28°16'50.88"S, 30°37'24.83"E • 28°20'29.85"S, 30°36'46.07"E • 28°21'22.18"S, 30°37'55.73"E • 28°19'6.53"S, 30°42'56.22"E
P148	1.5km	0	
D897	1.33km	2	• 28°21'39.59"S, 30°40'9.39"E • 28°21'30.43"S, 30°39'44.69"E
D30	9km	2	• 28°19'32.01"S, 30°35'20.33"E • 28°20'45.44"S, 30°32'17.95"E
L1190	6.1km	2	• 28°21'1.43"S, 30°42'57.77"E • 28°21'11.89"S, 30°41'58.64"E
L1333	2.1km	1	• 28°21'14.35"S, 30°40'13.01"E
D2286	4.7km	0	

The major aspects of this project include the following:

➢ Surfacing of the existing gravel road to low traffic volume standards,
➢ Improvement and strengthening the existing pavement structure from Gravel to Surfaced, Vertical and horizontal geometric improvements,
➢ Provision of new road signs and markings.
➢ Minor structures – drifts,
➢ Low level crossings
➢ Trial section using nanotechnology
➢ Slope stabilization
➢ possible 6.5m wide temporary deviation to accommodate two-way traffic during construction.
➢ Opening and re-entry into 3 potential Borrow pits
➢ Stockpile areas and vegetation clearance outside road reserve in excess of one hectare

The project is proposed to be developed in two phases, with phase 1 including the upgrade of the main provincial route P372, which will be upgraded from P372 & R68 intersection (at Luvisi Village) then goes in a south westerly direction through to Isandlwana Battlefield, and from Isandlwana Battlefield the road continues in a south easterly direction to end at P372 & R68 intersection (at Ngwebeni Village). Phase 2 are the local and district connecting roads P148, D897, D30, L1190, L1333, D2286 and road to Isandlwana (refer to figure 2.1 below).

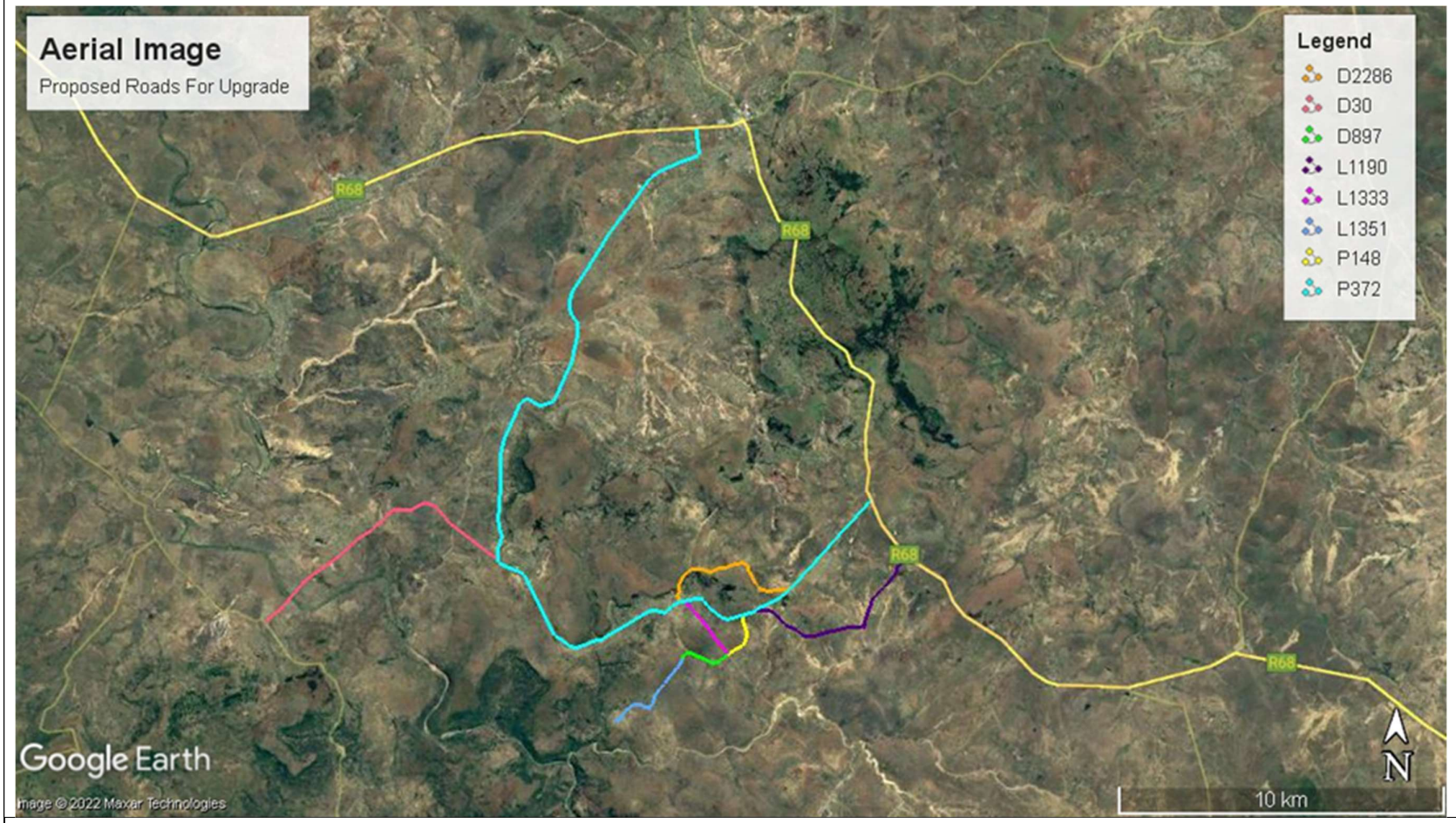

Figure 2.1: Proposed roads to be upgraded/Road's layout

3. SITE DESCRIPTION

3.1. Location

The roads and low-level stream crossings are located approximately 2km (closest road) outside of Nqutu Town. The roads run through Luvisi Village to Isandlwana Battlefield, and from Isandlwana Battlefield the road continues in a south easterly direction to at Ngwebeni Village. The roads affect the following properties: Portion 18, Portion 19, Portion 21 and Remaining Extent of Portion 17 of Farm Reserve 15838 GT. Figure 3.1 and Figure 3.2 below indicate the topo-locality of the project Site.

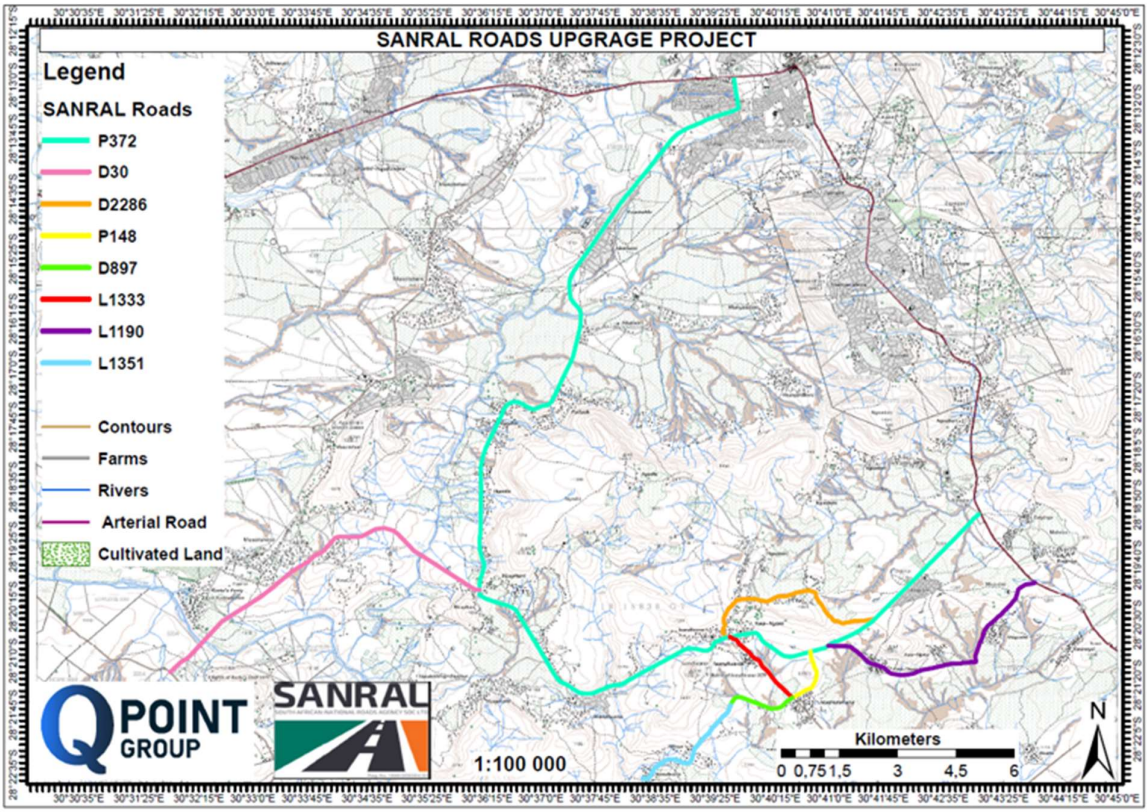

Figure 3.1: Topo-locality map showing the proposed roads

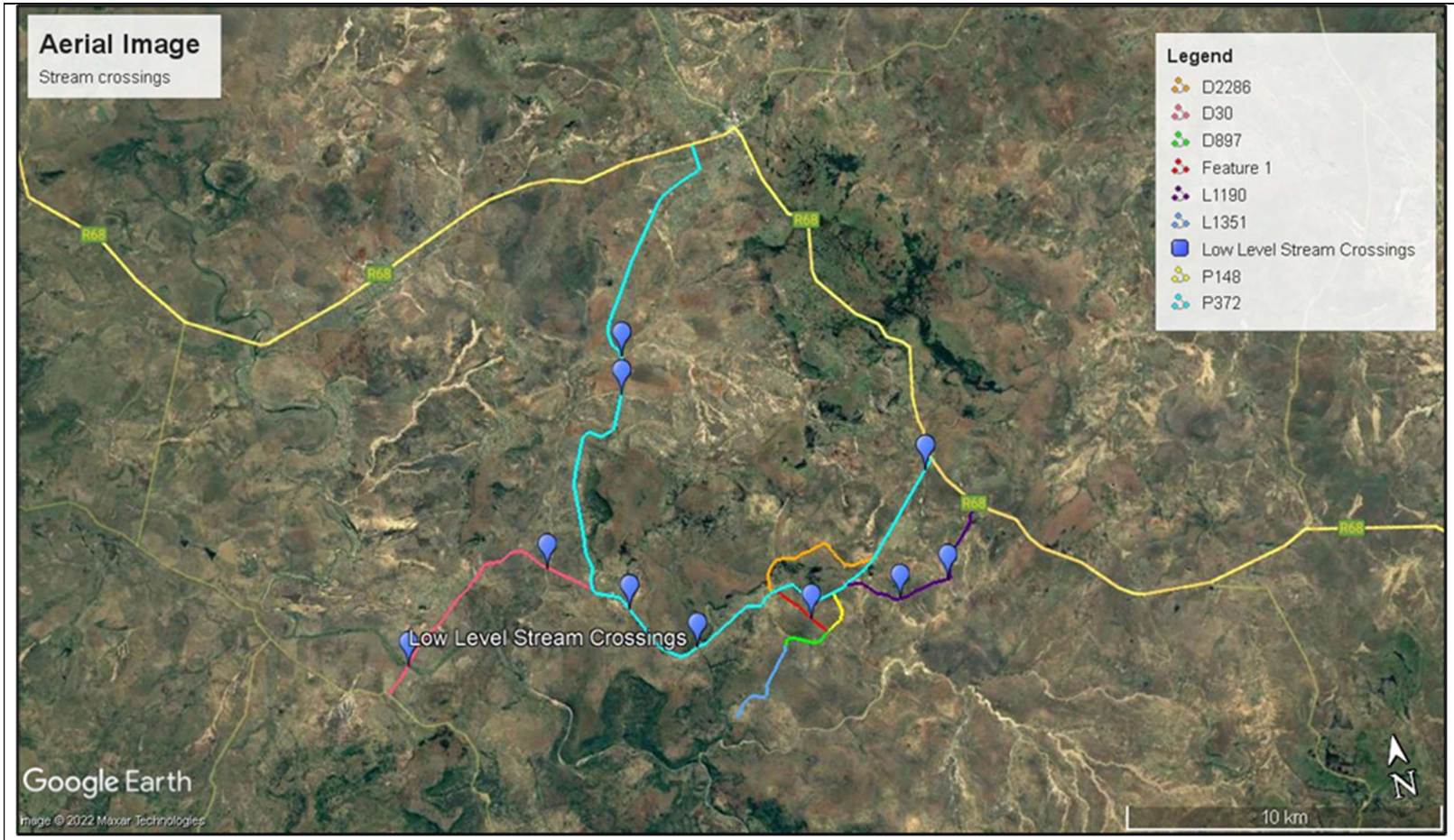

Figure 3.2: Aerial photograph with the proposed roads and stream crossings to be upgraded (Imagery: Google Earth 2022)

Table 3.1: General information pertaining to the site

<table>
<tr><td>District</td><td>uMzinyathi District Municipality</td></tr>
<tr><td>Local Municipality</td><td>Nquthu Local Municipality</td></tr>
<tr><td>Property description</td><td>Portion 18, Portion 19, Portion 21` and Remaining Extent of Portion 17 of Farm Reserve 15838 GT</td></tr>
<tr><td>Wards</td><td>Ward 9, 10, 11 and 14</td></tr>
<tr><td>Surveyor-General code</td><td>
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<tr><td>N</td><td>0</td><td>G</td><td>T</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>5</td><td>8</td><td>3</td><td>0</td><td>0</td><td>0</td><td>1</td><td>7</td></tr>
<tr><td>N</td><td>0</td><td>G</td><td>T</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>5</td><td>8</td><td>3</td><td>0</td><td>0</td><td>0</td><td>1</td><td>8</td></tr>
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<tr><td>N</td><td>0</td><td>G</td><td>T</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>5</td><td>8</td><td>3</td><td>0</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
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</td></tr>
<tr><td>Nearest town</td><td>Nqutu Town</td></tr>
<tr><td>Coordinates</td><td>
<table>
<tr><th>Proposed Roads</th><th>Crossing Coordinates</th></tr>
<tr><td>P372</td><td>• 28°16'50.88"S, 30°37'24.83"E
• 28°20'29.85"S, 30°36'46.07"E
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<tr><td>P148</td><td></td></tr>
<tr><td>D897</td><td>• 28°21'39.59"S, 30°40'9.39"E
• 28°21'30.43"S, 30°39'44.69"E</td></tr>
<tr><td>D30</td><td>• 28°19'32.01"S, 30°35'20.33"E
• 28°20'45.44"S, 30°32'17.95"E</td></tr>
<tr><td>L1190</td><td>• 28°21'1.43"S, 30°42'57.77"E
• 28°21'11.89"S, 30°41'58.64"E</td></tr>
<tr><td>L1333</td><td>• 28°21'14.35"S, 30°40'13.01"E</td></tr>
<tr><td>D2286</td><td></td></tr>
</table>
</td></tr>
<tr><td>Current land use</td><td>Residential areas (Low and Medium density)
Natural Area</td></tr>
<tr><td>Surrounding land use</td><td>Residential Areas (Low and Medium density)
Natural areas</td></tr>
</table>

4. NEED AND DESIRABILITY

GNR 792 of 2017: Integrated Environmental Management Guideline on Need and Desirability, defines the need as being the timing of a development and its desirability as being the location of the said development.

SANRAL has identified these roads to be upgraded from gravel to surface roads and for the culverts and small lying bridges to be upgraded in order to improve them for the communities and business within the Isandlwana area. The project is desirable because it has the potential to increase road user safety since it will greatly enhance the grade and road geometry of the current alignment, which is currently a factor in the problems with stream crossings during rainy seasons that affect road user safety.

The project has the potential to significantly contribute to local economic development through the creation of job opportunities during the project's construction phase, and it is desirable for local construction contractors and associated local community enterprises to gain temporary economic benefits from the construction phase.

5. LEGISLATIVE FRAMEWORK

The following legislation has been considered in this project:

5.1. Environmental Legislation

The National Environmental Management Act (NEMA), 1998 (Act 107 of 1998, as amended) is South Africa's overarching environmental legislation, and contains a comprehensive legal framework to give effect to the environmental rights contained in section 24 of The Constitution. Section 2 of NEMA contains environmental principles that form the legislated foundation for sustainable environmental management in South Africa.

5.1.1. National Environmental Management Act, EIA Regulations (2014)

Environmental Authorisation (EA) is required in terms of the EIA Regulations (2014, as amended 2017), published in terms of section 24(5) read with section 44 of the National Environmental Management Act (NEMA, Act No. 107 of 1998), as certain of the listed activities are triggered, as indicated in Table 7.1 below.

Table 5.1: Applicable listed activities (EIA Regulations 2014, as amended)

Activity No(s):	Relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 1** of the EIA Regulations, 2014 as amended	Description of the portion of the proposed project to which the applicable listed activity relates.
12	The development of - (ii) infrastructure or structures with a physical footprint of 100 square metres or more, where such development occurs (a) within a watercourse.	The proposed project requires the development of infrastructure with a combined footprint greater than 100 m^2 within watercourses along the route.
19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	Some infilling of more than 10m^3 of soil and/or concrete would be required for the establishment of low-level culverts where some of the roads cross a watercourse.
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre - (i) where the existing reserve is wider than 13,5 meters	The proposed project would require road widening of more than 6 metres (i.e., 3 meters on either side) to allow bypass during construction.
Activity No(s):	Relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 3** of the EIA Regulations, 2014 as amended	Description the portion of the proposed project to which the applicable listed activity relates.
12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan: d. KwaZulu Natala	the upgrading of the roads would require clearance of 300 m^2 or more of indigenous vegetation in an area mapped as formally protected area named Isandlwana.

5.1.2. National Water Act (1998)

In terms of the National Water Act, Act No. 36 of 1998 (NWA), the relevant water uses for the proposed operations are as follows:

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

Other provisions of the NWA have been taken into account, specifically relating to Part 4 (Section 19), which deals with pollution prevention, in particular situations where pollution of a water resource occurs or might occur as a result of activities on land.

5.2. Other Legislation

The following table outlines other, non-environmental legislation which will or may be applicable to the project.

Table 5.2: Other applicable legislation

LEGISLATION	RELEVANT SECTIONS	PERTAINS TO
The Constitution Act (No 108 of 1996)	Chapter 2, Section 24	Bill of Rights: Environmental rights
Conservation of Agricultural Resources Act (1983)	Section 5	Prohibition of the spreading of weeds
Fencing Act (No 31 of 1963)	Section 17	Clearing of bush for fencing
Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (No 36 of 1947)	Sections 3 – 10	Control of the use of pesticides, herbicides and fertilizers, and precautions to protect workers in this regard
National Environmental Management Act (No 107 of 1998) and regulations (2010)		
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 32	Control of dust
	Section 34	Control of noise
	Section 35	Control of offensive odours
National Environmental Management: Biodiversity Act (No 10 of 2004)	Section 57	Restricted activities involving listed threatened or protected species
	Sections 65–69	Regulation of activities involving alien species
	Sections 71, 73 and 75	Regulation of activities involving invasive species
National Environmental Management: Waste Amendment Act (No 26 of 2014)	Chapter 4, Part 4	Waste management activities
	Chapter 5	Licensing of waste management activities
	Chapter 5	Institutional and planning matters
	Chapter 7	Compliance and enforcement
National Heritage Resources Act (No 25 of 1999)	Section 34	Protection of structures older than 60 years
	Section 35	Protection of archaeological and paleontological sites and material as well as meteorites
	Section 36	Conservation of burial grounds and graves
National Forests Act (No 84 of 1998), as amended by	Section 7	Prohibition on destruction of trees in natural forests

LEGISLATION	RELEVANT SECTIONS	PERTAINS TO
the Forestry Laws Amendment Act (No 35 of 2005)	Sections 12–16	Declaration of trees, groups of trees, woodlands or tree species as protected
	Section 17	Declaration of controlled forest areas
National Water Act (No 36 of 1998)	Section 19	Prevention and remedying effects of pollution, particularly where pollution of a water resource occurs or might occur as a result of activities on land
	Section 20	Control of pollution of water resources following an emergency incident
	Chapter 4 (Sections 21-55)	Governs water use
Occupational Health and Safety Act (No 85 of 1993)	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self-employed persons to persons other than their employees

6. INVESTIGATING ALTERNATIVE

The EIA Regulations (2014, as amended) require that alternatives to a proposed activity must be considered, including the "No-go" or "Do-nothing" Alternative. The No-go Alternative is the option of not undertaking the proposed activity or any of its alternatives. The No-go Alternative also provides the baseline against which the impacts of other alternatives are compared.

6.1. Project and Site Alternatives

No project alternatives were investigated within the ambit of this EIA. The project proposal, *viz*. roads, culverts and low- level bridges upgrades is in line with surrounding land use and development trends, and it is important for SANRAL to upgrades these roads to improve their grade and safety for the affected communities who uses the roads, and this includes the no -go alternative.

6.2. Layout Alternatives

No layout alternatives have been investigated as the proposed layout goes in line with the need for the upgrade of roads: P372, P148, D897, D30, L1190, L1333, L1351, and D2286 and the upgrading of low-level stream crossings.

6.3. No-go Alternative

The 'no-go' alternative refers to the scenario in which the proposed activity does not take place and the site remains as it is.

If the no-go alternative is taken, the impacts that can be anticipated to be associated with the proposed township establishment would not come to pass and the conditions and trends on the property can be expected to remain as per the status quo. Impacts that can be expected to be experienced in case of the no-go alternative being selected include the following:

Table 6.1: Potential impacts that may be associated with the **no-go option**

Aspect	STATUS	EXTENT	MAGNITUDE	LIKELIHOOD	SIGNIFICANCE
Bio-physical aspects					
Levels and trends of erosion and of sedimentation of drainage lines remain unchanged	Neutral	Local	Low-medium	Highly probable	Low
No removal of alien vegetation within road reserve	Neutral	Local	Low	Highly probable	Low
No removal of protected species	Neutral	Local	Low	Highly probable	Low
Habit availability remains unchanged – no habitat destruction or fragmentation	Neutral	Local	Medium	Definite	Medium
No rehabilitation of the flood line area	Neutral	Local	Medium	Definite	Medium
No faunal fatalities resulting from construction-related activities	Neutral	Local	Low	Definite	Low
No disruption of the activities of fauna on and around the site due to e.g. noise, nor trapping / hunting / killing fauna by labourers out of fear or for food	Neutral	Local	Low	Definite	Low
No roadkilll within the development	Neutral	Local	Low	Definite	Low

Aspect	STATUS	EXTENT	MAGNITUDE	LIKELIHOOD	SIGNIFICANCE
Socio-economic aspects					
No job creation or sustaining of jobs in construction-related fields (construction phase)	Neutral	Local	Medium	Definite	Medium
No supporting of local businesses through local procurement of materials, equipment & services	Neutral	Local to Sub-regional	Medium	Highly probable	Medium
Levels and trends of crime remain unchanged	Neutral	Local	Unknown	Highly probable	Unknown
No contribution upgraded roads in the area	Neutral	Local	Medium-high	Definite	Medium-high
No visual impact of construction activities	Neutral	Local	Low-Medium	Definite	Low
No visual impact of the development over the long term	Neutral	Local	Medium	Definite	Low
No noise associated with increased construction-related traffic or construction activities	Neutral	Local	Low--medium	Definite	Low-medium
No increase in ambient noise levels	Neutral	Local	Low	Definite	Low
No precedent for further development in the area	Neutral	Local – sub-regional	Unknown	Definite	Unknown

7. IMPACT ASSESSMENT METHODOLOGY

Impacts – whether anticipated or already experienced – were scored on the following basis:

- **Status:**
  - *Positive* – the proposed project will have a positive impact in terms of the particular parameter;
  - *Negative* – the proposed project will have a negative impact in terms of the particular parameter;

- *Neutral* – the proposed project will have neither a positive nor a negative impact in terms of the particular parameter.

- **Extent:**
  - *Site-bound* – the impact will be felt only on the site itself;
  - *Local* – the impact is to be felt on the site and in its immediate surroundings, up to a radius of 50km from the site);
  - *Sub-regional* – the impact is to be felt at a distance of up to 100km from the site;
  - *Regional* – the impact is to be felt in the KwaZulu Natal Province; - *National* – the impact is to be felt across provincial boundaries.

- **Duration:**
  Refers to the period of time over which impacts can be expected to be experienced.

  - *Short term* – 0 to 5 years;
  - *Medium term* – more than 5 years, up to 15 years;
  - *Long term* – more than 15 years;
  - *Permanent* – the impact is irreversible.

- **Magnitude:**
  Refers to the intensity of the potential impact, if it is experienced.

  - *Negligible* – the impact will barely be felt, if at all. No mitigation required;
  - *Low* – the parameter will only be affected to a small extent by the proposed project. No mitigation required, but monitoring is recommended;
  - *Medium* – the parameter will be affected by the proposed project, but functions in terms of the parameter can still continue. Mitigation and monitoring required;
  - *High* – functioning in terms of the parameter will be significantly affected by the impact. Extensive mitigation and long-term monitoring required.

- **Likelihood:**
  - *Improbable* – it is unlikely that the impact will be experienced;

- *Possible* – the impact may be experienced. Monitoring required; mitigation may also be required based on the type of impact and its significance;
- *Highly probable* – the impact will most likely be experienced. Monitoring and mitigation required based on the type of impact and its significance in order to reduce the probability of the impact occurring and/or to reduce the magnitude of the impact;
- *Definite* – the impact will be experienced or has already been experienced. Monitoring and mitigation required based on the type of impact and its significance in order to reduce the probability of the impact occurring and/or to reduce the magnitude of the impact.

- **Significance:**

  Significance is based on a consolidation of the anticipated extent, duration, magnitude and likelihood of the potential impact.

  - *Negligible* – The impact will barely be felt, if at all. No mitigation required;
  - *Low* – The parameter will only be affected to a small extent by the proposed project. No mitigation required, but monitoring is recommended;
  - *Medium* – The parameter will be affected by the proposed project, but functions in terms of the parameter can still continue. Mitigation and monitoring required;
  - *High* – Functioning in terms of the parameter will be significantly affected by the impact. Extensive mitigation and long-term monitoring required.
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8. RECEIVING ENVIRONMENT: BIOPHYSICAL ASPECTS

8.1. Climate & Weather

The Nquthu Local Municipality is located at an elevation of 1356.03 meters (4448.92 feet) above sea level, Nqutu has a Marine west coast, warm summer climate (Classification: Cfb). The yearly temperature is 24.48°C (76.06°F) and it is 3.26% higher than South Africa's averages. Nqutu typically receives about 114.18 millimeters (4.5 inches) of precipitation and has 171.04 rainy days (46.86% of the time) annually.

8.1.2. Impacts on climate and weather

The project is **not** anticipated to impact upon climate.

Table 8.1: Impacts in terms of climate

IMPACTS LIKELY EXPERIENCED DURING CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Cleared areas will be more susceptible to landslides and/or soil erosion in heavy rainfall events.	Negative	Local	Short term	Medium	Highly probable	Low
OPERATIONAL PHASE						
Increased soil erosion due to hardened surfaces	Negative	Local	Long term	Low	Possible	Very low

8.2. Soils, Geology and topography

The study area is situated within a landscape which contains significant geographical features, such as sandstone hills or koppies, sections of flat undulating grassland, rivers and wetlands. The highly heterogenic landscape provides an opportunity plant species to form a variety of different communities, such thornveld, grassland and alluvial plant communities. The presence of rocky outcrops and rocky grassland plains (although only distantly included in the study area) provide a unique landscape setting, which is used by an abundance of different plant, and faunal species.

Regionally the study area contains sandstones and shale of the Madzaringwe Formation (Ecca Group of Karoo Supergroup) supporting poorly drained sandy soils, mostly of the Glenrosa form. Most important land types include Ca, Bb and Fb (Mucina and Rutherford, 2006). Soils with the study area were found to be largely clay like in texture, and dark brown to grey in colour.

8.2.1. Impacts Soils, Geology and topography

The topography will be slightly altered through the excavation of soil from for the road upgrade, establishment of culverts and low lying bridge which is expected to be of low impact on to the topography. Acceleration of soil erosion likely occurred on a

short-term basis during the construction phase. Geology will not be impacted by the project.

Table 8.2: Impacts in terms of topography, soils and geology.

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Increased soil erosion	Negative	Local	Short term	Medium	Highly probable	Medium
OPERATIONAL PHASE						
Increased soil erosion due to hard surfaces and increased peak storm water flow	Negative	Local	Long term	Low	Possible	Low

8.3. Terrestrial Ecology

The information in this section was gleaned from the Ecological Specialist report conducted by Afzelia Environmental Consultants (2022) for the proposed project.

8.3.1. Project site Status qua

The study area is located within four (4) national vegetation types (Refer to Figure 8.1), with the KwaZulu-Natal Highland Thornveld and Income Sandy Grassland being the most prominent within the landscape. Northern KwaZulu-Natal Moist Grassland and the Thukela Thornveld are only partially affected, and the remaining vegetation types found nearby (Thukela Valley Bushveld and Low Escarpment Moist Grassland) will remain unaffected by the proposed upgrades.

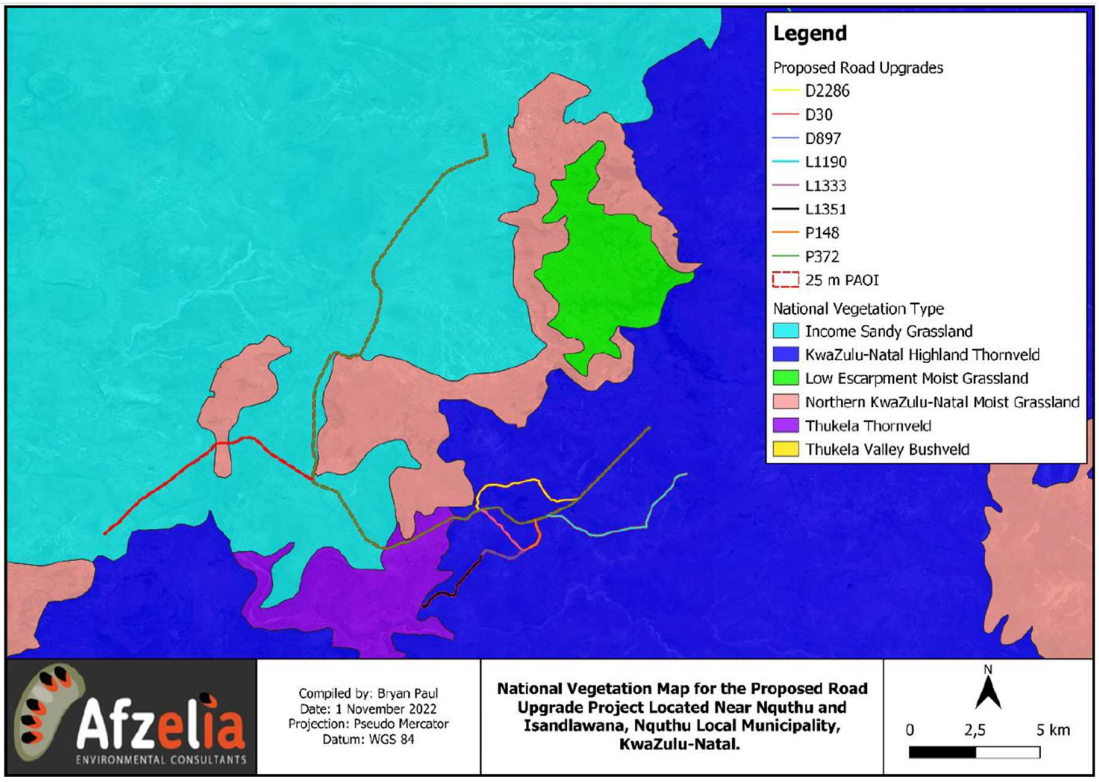


Figure 8.1: Vegetation types associated with the study area (Mucina and Rutherford, 2018)

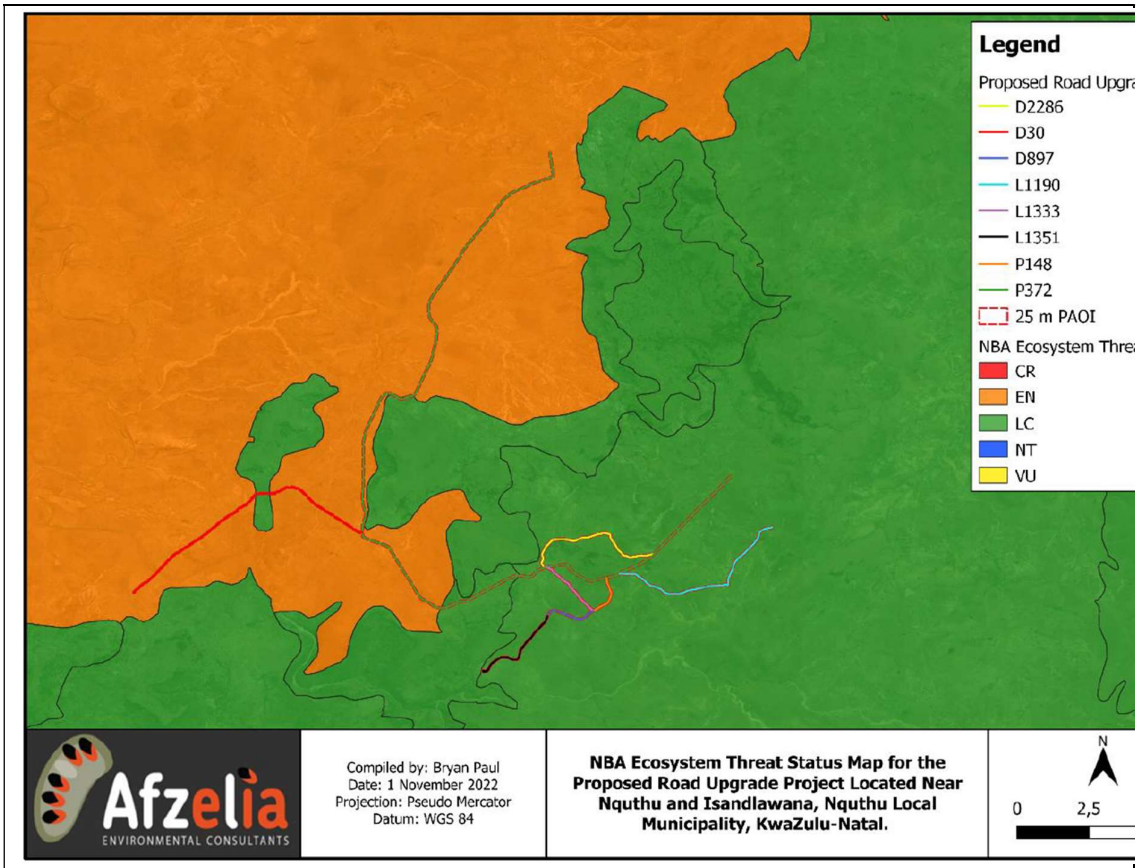


Figure 8.2: *Ecosystem Threat Status associated with the study area (Mucina and Rutherford, 2018)*

The following table (Table 8.1) provides additional key characteristics of the main vegetation types found within the study area and which may be used to define these vegetation types.

Feature	Description
Kwazulu- Natal Highland Thornveld (Gs 6)	
Distribution	KwaZulu-Natal Province: A series of several patches in the central-northern regions of KwaZulu-Natal, where it occurs on both dry valleys and moist upland. The most extensive area is found in the region from Ladysmith, Winterton, Estcourt and Colenso, between Mooi River and Greytown, between Pomeroy and Babanago, and further north in a triangle between Vryheid, Paulpietersburg and Louwsburg as well as a large patch around Newcastle. Altitude 920–1 440 m.
Vegetation and Landscape Features	Hilly, undulating landscapes and broad valleys supporting tall tussock grassland usually dominated by Hyparrhenia hirta, with

Feature	Description
	occasional savannoid woodlands with scattered Acacia sieberiana var. woodii and in small pockets also with A. karroo and A. nilotica.
Important Taxa	**Small Trees:** *Acacia sieberiana var. woodii, A. natalitia, A. nilotica, Cussonia spicata, Ziziphus mucronata.* **Tall Shrub:** *Dichrostachys cinerea.* **Low Shrubs:** *Barleria obtusa, Anthospermum rigidum subsp. pumilum, Chaetacanthus setiger, Gymnosporia heterophylla.* **Semiparasitic Shrub:** Thesium costatum. **Graminoids:** *Abildgaardia ovata, Andropogon eucomus, Aristida bipartita, A. congesta, Chloris virgata, Cynodon dactylon, Elionurus muticus, Eragrostis capensis, E. chloromelas, E. plana, E. racemosa, E. superba , Heteropogon contortus, Hyparrhenia hirta, Setaria sphacelata, Themeda triandra, Tristachya leucothrix, Andropogon appendiculatus, Brachiaria serrata, Cymbopogon caesius, C. marginatus, C. pospischilii, Cyperus obtusiflorus var. obtusiflorus, Digitaria monodactyla, D. tricholaenoides, Diheteropogon amplectens, Eragrostis curvula, E. gummiflua, E. patentissima, Harpochloa falx, Microchloa caffra, Panicum natalense, Setaria nigrirostris, Sporobolus africanus, S. pyramidalis.* **Herbs:** *Hermannia depressa, Becium filamentosum, Chamaecrista mimosoides, Euryops transvaalensis subsp. setilobus, Haplocarpha scaposa, Helichrysum rugulosum.* **Herbaceous Climber:** *Rhynchosia totta.* **Geophytic Herb:** *Haemanthus montanus.* **Succulent Herbs:** *Aloe dominella, A. greenii, Orbea woodii.*
Conservation	Least Concern (Skowno et. al, 2019) and Least Concern (Jewitt, 2018)
Northern KwaZulu-Natal Moist Grassland	
Distribution	KwaZulu-Natal Province: Northern and northwestern regions of the Province, where it forms a discontinuous rim around the upper Thukela Basin and is situated almost entirely within the catchment of the Thukela River. It lies between the drier Gs 6 KwaZulu-Natal Highland Thornveld and the moist upland vegetation of mainly Gs 3

Feature	Description
	Low Escarpment Moist Grassland to the north and Gs 10 Drakensberg Foothill Moist Grassland to the west. The most extensive areas are in the vicinity of Winterton, Bergville, Fort Mistake, Dannhauser, Dundee, north of Ladysmith and west of Newcastle. At higher altitudes this unit is usually surrounded by Gs 3 Low Escarpment Moist Grassland in the north and Gs 10 Drakensberg Foothill Moist Grassland in the west and south. At lower altitudes Gs 6 KwaZulu-Natal Highland Thornveld and SVs 2 Thukela Thornveld usually occur to the east. Altitude 1 040–1 440 m.
Vegetation and Landscape Features	Hilly and rolling landscapes supporting tall tussock grassland usually dominated by Themeda triandra and Hyparrhenia hirta. Open Acacia sieberiana var. woodii savannoid woodlands encroach up the valleys, usually on disturbed (strongly eroded) sites.
Important Taxa	**Graminoids:** *Alloteropsis semialata subsp. eckloniana, Aristida congesta, Cynodon dactylon, Digitaria tricholaenoides, Elionurus muticus, Eragrostis patentissima, E. racemosa, Harpochloa falx, Hyparrhenia hirta, Themeda triandra, Tristachya leucothrix, Abildgaardia ovata, Andropogon appendiculatus, A. eucomus, A. schirensis, Aristida junciformis subsp. galpinii, Brachiaria serrata, Cymbopogon caesius, C. pospischilii, Cynodon incompletus, Digitaria monodactyla, D. sanguinalis, Diheteropogon amplectens, D. filifolius, Eragrostis chloromelas, E. plana, E. planiculmis, E. sclerantha, Festuca scabra, Heteropogon contortus, Hyparrhenia dregeana, Melinis nerviglumis, Microchloa caffra, Panicum natalense, Paspalum scrobiculatum, Setaria nigrirostris, Sporobolus africanus.* **Herbs:** *Acanthospermum australe, Argyrolobium speciosum, Eriosema kraussianum, Geranium wakkerstroomianum, Pelargonium luridum, Acalypha peduncularis, Chamaecrista mimosoides, Dicoma anomala, Euryops transvaalensis subsp. setilobus, Helichrysum caespititium, H. rugulosum, Hermannia depressa, Ipomoea crassipes, Pearsonia grandifolia, Pentanisia prunelloides subsp. latifolia, Sebaea grandis, Senecio inornatus, Thunbergia atriplicifolia, Zaluzianskya microsiphon.* **Geophytic Herbs:** *Chlorophytum haygarthii, Gladiolus aurantiacus, Asclepias aurea, Cyrtanthus tuckii var. transvaalensis, Gladiolus crassifolius, Hypoxis colchicifolia, H. multiceps, Moraea brevistyla, Zantedeschia rehmannii.* **Succulent Herbs:** *Aloe ecklonis, Lopholaena segmentata.*

Feature	Description
	Low Shrubs: *Anthospermum rigidum subsp. pumilum, Erica oatesii, Hermannia geniculata.* **Succulent Shrub:** *Euphorbia pulvinata.*
Conservation	Least Concern (Skowno et. al, 2019) and Vulnerable (Jewitt, 2018).
Income Sandy Grassland (Gs 7)	
Distribution	KwaZulu-Natal Province: In a large triangle between Newcastle, Vryheid and Dundee and larger polygon in the Wasbank area in northern KwaZulu-Natal. Altitude 880–1 340 m (mainly 1 120–1 240 m).
Vegetation and Landscape Features	Very flat extensive areas with generally shallow, poorly drained, sandy soils supporting low, tussock-dominated sourveld forming a mosaic with wooded grasslands (with Acacia sieberiana var. woodii) and on well-drained sites with the trees A. karroo, A. nilotica, A. caffra and Diospyros lycioides. On disturbed sites A. sieberiana var. woodii can form sparse woodlands. Aristida congesta, Cynodon dactylon and Microchloa caffra are common on shallow soils (Camp 1999c).
Important Taxa	**Graminoids:** Andropogon appendiculatus (d), Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Eragrostis curvula, E. gummiflua, E. plana, E. racemosa, Heteropogon contortus, Hyparrhenia hirta, Loudetia simplex, Paspalum scrobiculatum, Tristachya leucothrix, Alloteropsis semialata subsp. eckloniana, Andropogon eucomus, A. schirensis, Aristida congesta, A. junciformis subsp. galpinii, Cymbopogon caesius, Diheteropogon amplectens, D. filifolius, Elionurus muticus, Eragrostis capensis, E. chloromelas, E. planiculmis, E. sclerantha, Harpochloa falx, Melinis repens subsp. repens, Microchloa caffra, Monocymbium ceresiiforme, Panicum natalense, Perotis patens, Pogonarthria squarrosa, Setaria nigrirostris, Sporobolus africanus, Stiburus conrathii, Themeda triandra, Trichoneura grandiglumis. **Herbs:** Helichrysum rugulosum, Berkheya onopordifolia var. glabra, B. setifera, Chamaecrista mimosoides, Dicoma anomala, Euryops transvaalensis subsp. setilobus, Helichrysum caespititium, H. cephaloideum, H. simillimum, Hermannia depressa, H. transvaalensis, Kohautia amatymbica, K. virgata, Macledium zeyheri subsp. argyrophylum, Pentanisia prunelloides subsp. latifolia, Senecio coronatus, Zornia capensis. **Herbaceous Climber:** Rhynchosia totta.

Feature	Description
	Geophytic Herb: Hypoxis rigidula var. pilosissima. **Low Shrubs:** Anthospermum rigidum subsp. pumilum, Stoebe plumosa.
Conservation	Endangered (Skowno et. al, 2019) and Vulnerable (Jewitt, 2018).
Thukela Thornveld (SVs 2)	
Distribution	KwaZulu-Natal Province: Upper Thukela River basin fringing the SVs 1 Thukela Valley Bushveld on its upper border in a series of discontinuous patches. Largest area east of Estcourt–Colenso and including Ladysmith. Also some outliers on slopes south of Dundee. Altitude 900–1 300 m.
Vegetation and Landscape Features	The dominant landscape features are valley slopes to undulating hills. Vegetation is Acacia-dominated bushveld of variable density (ranging from wooded grassland to dense thickets) with dense grassy undergrowth.
Important Taxa	**Small Trees:** *Acacia natalitia (d), A. nilotica (d), A. sieberiana var. woodii, A. tortilis subsp. heteracantha, Allophylus melanocarpus, Boscia albitrunca, Clausena anisata, Cussonia spicata, Dais cotinifolia, Ziziphus mucronata.* **Low Shrubs:** *Barleria obtusa, Justicia flava.* **Tall Shrubs:** *Coddia rudis, Buddleja saligna, Clerodendrum glabrum, Euclea crispa subsp. crispa, Heteromorpha arborescens var. abyssinica, Hibiscus calyphyllus, Lippia javanica, Pachystigma macrocalyx, Rhus pentheri, R. rehmanniana.* **Soft Shrub:** *Peristrophe cernua.* **Graminoids:** *Eragrostis curvula (d), Hyparrhenia hirta (d), Melinis repens (d), Panicum maximum (d), Themeda triandra (d), Tristachya leucothrix (d), Aristida congesta, Digitaria eriantha subsp. eriantha, Elionurus muticus, Eragrostis chloromelas, E. superba, Heteropogon contortus, Setaria sphacelata, Sporobolus pyramidalis.* **Woody Succulent Climber:** *Senecio brachypodus.* **Herb:** *Osteospermum muricatum.* **Geophytic Herb:** *Sansevieria hyacinthoides.* **Succulent Herb***:*

Feature	Description
	Aloe mudenensis.
Conservation	Least Concern (Skowno et. al, 2019) and Least Concern (Jewitt, 2018).

8.3.2. Land Cover

It is noted by Afzelia that as per the national landcover data from 2022 (DEA, 2020), a total of six (6) classes appears to be most prominent within the greater landscape of the project site, and have been listed below.

- Natural Grassland;
- Open Woodland;
- Other Bare;
- Subsistence Annual Crops;
- Fallow Land & Old Fields (Grass); and
- Residential Formal (low veg / grass).

During the field assessment undertaken by Afzelia Environmental Consultants, it was confirmed that all of landcover classes were identified, and current persist within the study area. However, open woodland was not considered natural and associated with relic or invading patches of *Acacia mearnsii* (Black Wattle).

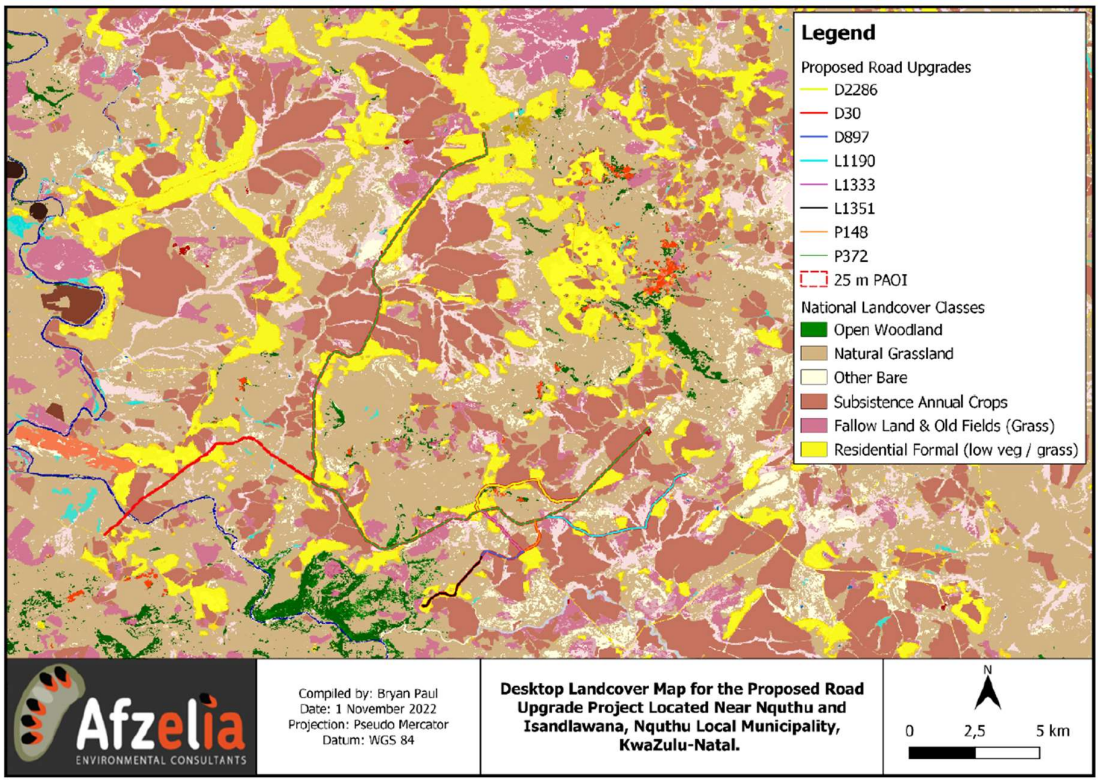


Figure 8.3: National Landcover Map of the study area (DEA, 2020)

8.3.3. Result of the site investigation

The proposed development footprint and the Project Area of Influence (a 25-meter radius around the footprint) were both explored on foot by the ecological specialist during fieldwork that took place between November 1 and November 2, 2022. The specialist confirms that the assessment was conducted during the start of spring, which is considered to be the "wet season."

8.4.3.1. Floral Assessment

During the desktop assessment, a plant species list was generated (full list attached as Appendix A of the Terrestrial Biodiversity Specialist report attached as Appendix D1) for the proposed site and nearby surrounds. This list was generated using the South African National Biodiversity Institute's (SANBI) Plants of South Africa (POSA) database of all plants collected and recorded from specific locations throughout South Africa and contained 167 individual species recorded within the greater surrounds. Figure 8.4 below provides a visual illustration of the area which was assessed using the POSA species database, and which explores areas with mixed habitat types.

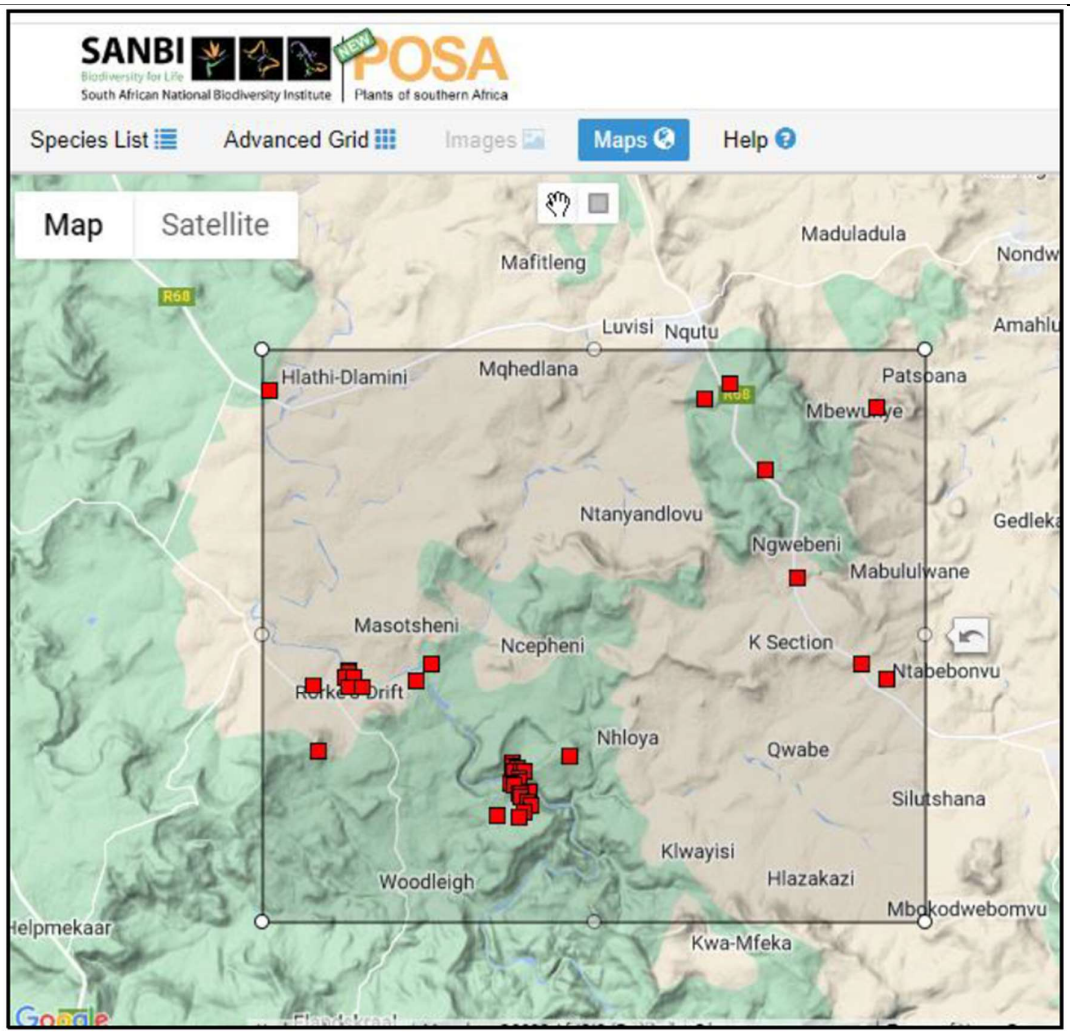


Figure 8.4: Illustration of the areas included in the POSA species search for the study area.

According to the database search, the following plant families were noted to be most prominent:

1. Asteraceae (Daisy Family) – 21 species (3 endemic species);

2. Fabaceae (Pea Family) – 14 species (1 endemic species); and

3. Poaceae (Grass Family) – 19 species (no endemic species).

8.4.3.1.1. Habitat Analysis

According to the national vegetation dataset (Mucina and Rutherford, 2006 version 2018), the study area was situated within four (4) vegetation types, namely the

Northern KwaZulu-Natal Moist Grassland, KwaZulu-Natal Highland Thornveld, Income Sandy Grassland and the Thukela Thornveld.

During the field assessment it was confirmed by the Afzelia Environmental Consultants, that the existing roads meander through a combination of grassland, thornveld, wetlands, rivers and disturbed areas representative of secondary vegetation and the existing road surface. On average the roads were linked to disturbed roadside vegetation (approximately 5 to 10 m in extent) before extending into more natural areas. Grasslands as a whole were the most dominant habitat and were linked to significant levels of biodiversity.

i. Erosion Gullies / Drainage Channels and Rivers

As a result of historic land uses such a grazing and natural alterations in the landscape large gullies or erosion "dongas" are also common features within the landscape. Erosion gullies have presumably been worsened by the poor drainage from nearby roads and overgrazing and trampling by livestock, which has led to most of the banks being devoid of vegetation and often bare. Although the assessment of freshwater ecosystems (delineation and impact assessment) falls outside the scope of a Terrestrial Biodiversity Impact, the presence of freshwater ecosystems is critical in determining the presence of certain species within the study area.

Freshwater ecosystems are associated with high levels of biodiversity, and offer habitat heterogeneity, recruiting species to the away both permanently and seasonally. Often species occurring within these systems are not commonly observed, and therefore difficult to avoid (e.g. fossorial frog species like the African Bull Frog). During the assessment, it was not possible for wetlands to be determined, as many potential wetlands observed may be associated with the affects of poor drainage and impounding of water, causing long-terms pooling of water, which would without soil sampling be deceptive as they were often associated with hydrophilic plants found within temporary or seasonally wet areas. However, regardless of whether a wetland is natural or artificial, dams and areas which are prone to pooling of water will offer temporary habitat for a number of species (predominantly birds and frogs). Caution should therefore be taken when upgrading each road surface adjacent to any one of these features.

ii. Transformed Areas

Transformed areas are portions of the site which have already been modified and contain little, to no remaining vegetation. As the upgrade will be situated along an existing roadway, this landcover is one of the most common and repeated throughout. During the field assessment the following landuses fall under this category:

- Existing gravel roads, bridges and gabion walls;
- Homesteads, livestock enclosures, gardens, bare ground and exotic plantations.

During the field assessment, it was observed that much of the land which surrounds the existing road surface has been transformed. This finding should allow for the proposed upgrades to take place along most of the routes without significantly impacting natural veld, like grasslands or thornveld. Much of the plant communities are tolerant towards the impacts associated with roads, such frequent dust and pooling of water after heavy rainfall. In terms ecological significance, the Transformed Areas may still be occupied by fauna, but only for brief periods to preform maintenance behaviours or dust bathing on the shoulder of the roads. Birds of prey may also be associated with the sides of the road, commonly found atop poles or trees to ambush prey in the shorter grass found within these areas. Species like the *Lophaetus occipitalis* (Long-crested Eagle) are a typical example of a species which the Contractor will frequently see. It is likely that any species found in these areas however, will move away from the active Workfront, and find more suitable hunting grounds elsewhere.

Construction activities whilst unlikely to cause direct impacts to the receiving environment, may lead to indirect impacts, resulting from spillages, poorly managed stormwater and excess sediment entering stormwater drains and leading to impacts taking place outside of the study area.

iii. *Secondary Vegetation*

Secondary habitat loosely refers to habitat which is not considered primary vegetation, but which is a combination of both exotic and common indigenous plant species not representative of the benchmark vegetation types for this area. In most cases secondary habitat contains a few species, or is dominated by a single species especially within subsistence cropland.

Throughout the route, medium-sized stands of *Eucalyptus sp.* or *Acacia mearnsii* may be observed. This is a typical sight within larger geographical area and is linked to historic plantations. Other parts of the study area are occupied by residential gardens, verges and landscaped gravel driveways, which offer limited habitat and have been planted for their aesthetical appeal, for food (much as mango trees) or as food for livestock. Although much of the secondary vegetation would consisted poor natural habitat, certain species will not differentiate between natural and exotic cover an as most of the exotic species found within these species provide food or refuge, may be attracted into these areas. During the field assessment (as illustrated in Figure 8.5) bird Species of Conservation Concern (SCC) were found within secondary vegetation, foraging for nesting material. This sighting is linked to the presence of a nearby nesting

colony, and suitable habitat located less than 300 m away from the proposed upgrade (along P372).

Figure 8.5: Illustration of the secondary habitat located within the study area.

iv. Grassland Habitat

Grassland is one of the most dominant landscape features, occupying most of the greater surrounds. From ecological perspective, grasslands are key habitat for a number species, specifically grassland dwelling birds which flourish within this area and a largely not affected by species diversity, but rather grassland height and cover. As most of the natural grassland falls outside of the proposed development footprint, impacts to this habitat should be limited. Where construction activities spill-over, rehabilitation will be key in restoring function to the fringe areas to prevent proliferation of noxious weeds or alien invasive plant species. During the field assessment grassland habitat found within the study area (mostly PAOI) was representative of the Income Sandy Grassland for the most part and notable strips of moist grassland habitat found along D30 and the mountainous landscape of D2286.

v. Rocky Otcrops

During the field assessment, large geological features may be found throughout the study area. As such, rocky material such boulders are frequent and, in some instances, rocky hillsides are traversed by the proposed upgrade. Rocky outcrops are significant features, especially for reptiles and certain plant species. The rocky outcrops found along the direct footprint however, were linked to a relatively low biodiversity, especially when compared to the much larger and more significant sandstone cliffs found more than 300 m away from P372, or the Isandlwana Mountain.

vi. Thornveld

Thornveld, indicative of KwaZulu-Natal Highland Thornveld may be found in sporadic strips along the proposed upgrade route and often associated with a hill and meander river system. Plant species diversity was relative low, being dominated a few thorn being species like *Vachellia natalitia* and *Vachellia tortilis,* significantly interspersed by *Aloe maculata* in the west (predominantly along D30 and L1351) and *Aloe marlothii* throughout this landcover. The availability of both open and closed thornveld provides significant habitat diversity along the route, and good foraging and nesting opportunities for a number species occurring within the area.

8.4.3.1.2. Plant Species of Conservation (SCC)

During the field assessment, no Red List species were identified within the study area. However, six (6) species (predominantly aloes) were found and are protected in terms of the Natal Nature Conservation Ordinance. Most of these species are protected as they are sought after horticulturally and therefore must not be further persecuted by this industry. Due to the sheer number of individuals observed during the field assessment, it recommended that once the road footprint has been surveys and pegged out by the Contractor, a pre-construction walkthrough is undertaken by the ECO or suitably qualified professional. This survey will be used to identified the protected species during an appropriate season, mark the affected individuals safe removal and apply for the correct permits with Ezemvelo KZN Wildlife.

The following is a list of the protected species observed during the survey:

- *Aloe maculata (Soap Aloe)*
- *Aloe arborescens (Krantz aloe)*
- *Aloiampelos tenuior (Fence aloe)*
- *Aloe marlothii (Mountain aloe)*
- *Ledebouria ovatifolia subsp. ovatifolia (Flat-leaved African hyacinth)*
- *Hypoxis angustifolia var. angustifolia*

8.4.3.1.3. <u>Ecological Drivers and Ecological Connectivity</u>

Habitat loss may lead to the fragmentation of habitat, which will have an impact on the ability of habitat to support faunal species and promote ecological connectivity within the greater area. As such, the fieldwork undertaking for this assessment was not restricted to the project footprint and PAOI but was extended into the great surrounds to better understand the functioning of the habitat present on site.

During the field assessment the proposed upgrade site was found within a highly heterogeneous landscape, consisting of natural wetlands, river systems, small stream, rocky outcrops and grassland ecosystems. Connectivity within the greater surrounds will be largely unlimited and high. The existing road surface however, is well used and

associated with many large bare open spaces or deep erosion gullies which have formed as a result of poor drainage off the existing road network. The proposed upgrade of the existing roads will have limited influence on connectivity and may temporarily encourage species to move away from the immediate vicinity of the active construction sites, and then re-occupy the same area ones construction has been concluded. However, the upgrading of any culverts or bridge structures may be an area of particular concern, if no adequately mitigated against. Poor stormwater control measures, coupled with inadequate silt screening may smother nearby wetlands with silt or wash-way soil after heavy rainfall in the area. In saying this, improved culvert structures will in the long term will ensure better connectivity and prevent failed flooding as a result of failed structures which are already in place.

As discussed previously, the study area contains wetland, riparian habitat and natural grasslands, which are mosaicked throughout the landscape. Grasslands are associated with several key ecological processes, such as grazing, seed dispersal, animal-plant interactions and fire. During the field assessment, it was evident that regular burns take place within the grasslands, encouraging new growth and maintaining the health of the ecosystem. Although the upgrade will encroach in to grassland, the clearing activities within these habitats will be minimal and largely restricted to boundaries or fringes of natural grassland overlapping within an existing road reserve. Fragmentation of these ecosystems are therefore unlikely, and the existing processes which take place within these habitats are likely to persist and respond well to rehabilitation and alien plant species control.

8.4.3.2. Faunal Species Assessment

The Ecological specialist assessment of the available micro-habitats was conducted in conjunction with the most recent faunal species distribution data. Whilst the objectives of the specialist report focus specifically on Red Data Species, it must be noted that non-red data species will also be affected by the development and thus will benefit greatly from the mitigation techniques provided by the ecological specialist.

8.4.3.2.1. Mammals

Based on the field assessment conducted by Afzelia Environmental Consultants, no mammal species were identified, and all spoor observed was from either livestock or domestic animals that roam freely throughout the study area.

According to the records found on the Animal Demography Unit (2022) database for the two (2) QDSs (2830BC & 2830BA) and the DFFE Screening Tool, a total of 17 species

have been recorded and may occur within the greater surrounds. An analysis of this data confirmed that only three (3) of the species recorded, were mammal Species of Conservation Concern (SCC) (Refer to the full list in Terrestrial Specialist Report attached as Appendix D1).

8.4.3.2.2. Herpetafauna

Based on the field assessment conducted by Afzelia Environmental Consultants herpetofaunal species were observed, although it is likely that a number of species (both frogs and reptiles) are found commonly throughout the study area.

Based on the information extracted from the Animal Demography Unit (ADU, 2022) the study area is expected to have a moderate herpetofauna diversity with approximately 48 individual species known to occur within the QDS 2839BA and 2830BC. Of the recorded species recorded however, none of these species were Herpetofaunal SCC. However, *Pyxicephalus adspersus* (African Bullfrog) may be found within the study area and is a TOPS species.

8.4.3.2.3. Avifauna

A baseline avifauna assessment was conducted within the proposed development footprint, PAOI and nearby habitat. A desktop assessment, in combination with a mixed survey approached (vantage point, driven transect & walked transect) was used by the species to assess the presence or absence of certain species recorded nearby.

During the fieldwork, two (2) bird Species of Conservation Concern (SCC) were observed, namely *Sagittarius serpentarius* (Secretary Bird) and *Geronticus calvus* (Southern Bald Ibis). The Secretary Bird was observed outside of the study area, however, is known to occur within the study area having been seen by the specialist in 2010 (near the Isandlawana Battlegrounds) and confirmed breeding sites of *Geronticus calvus* (Southern Bard Ibis) were recorded by the specialist.

According to data abstracted from the Southern African Bald Atlas Project (SABAP2, 2022) a total of 201 bird species (Refer to the full list in the Terrestrail Report attached as Appendix D1) have been recorded within locus 2820_3040, 2820_3035 and 2820_3035. Of these species, thirteen (13) were bird SCC and two (2) were TOPS species.

8.3.4. Site Ecological Importance and Sensitivity

Vegetation has been used as a common biological indicator to identify the Present Ecological State (PES) or ecological health of ecosystems, given their overall ability to respond rapidly to disturbance. Conservative plant species are the most commonly

affected species given their high conservatism status, high sensitivity, narrow distribution ranges and low tolerance to disturbance, these species are the first to be eradicated in disturbed conditions (Rocchio, 2007). The following table (Table 14) provides a summary of the Site Ecological Importance (SEI), which was assessment using the latest assessment methodology prescribed by SANBI (2020).

Table 8.2: Summary of the Site Ecological Importance (SEI) assessment Habitat Conservation Importance (CI) Functional Integrity (FI) Biodiversity

Habitat	Conservation Importance (CI)	Functional Integrity (FI)	Biodiversity Importance (BI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
Erosion Gullies / Drainage Channels and Rivers	High	High	High	Medium	High
Grassland	High	High	High	Medium	High
Secondary Vegetation	Medium	Low	Low	High	Very Low
Transformed Areas	Very Low	Very Low	Very Low	Very High	Very Low
Rocky Outcrop	High	Medium	Medium	Low	High
Thornveld	Medium	High	Medium	Medium	Medium

8.3.5. Potential Fauna and Flora Impact

The following impacts are expected in terms of the fauna and flora of the proposed area for development.

- **Impact 1: Loss of Vegetation Communities**

It is envisioned that the initial clearing activities will result in the permanent removal of vegetation to make way for the larger road surface and associated structures like sidewalks and drains. Furthermore, only small portions of the construction footprint will be rehabilitated at the end of construction, which will lead to the permanent loss of plant species along the route.

The vegetation found within the immediate vicinity of the existing road surface is largely transformed and the natural vegetation communities on average start more than 5 to 10 m from the existing road surface. As such mitigation measures, like reducing the overall footprint within more sensitive environments such as wetland, rivers and grassland habitats, and maximise the use of the existing road servitude will prove effective at achieving a no net-loss in biodiversity when completing in addition to rehabilitation.

Table 8.3: Impact Assessment for the loss of vegetation communities within the study area

Impact	Nature	Effect			Probability	Total Score	Significance
		Extent	Duration	Magnitude			
Without mitigation	Direct	3	5	6	5	70	High -
With mitigation	Direct	1	5	4	3	30	Medium -

Mitigations	➢ The construction and operational footprint must remain as small as possible, and Contractor must not exceed the surveyed areas pegged out at the beginning of Construction. ➢ The Construction of temporary access roads must be kept to a minimum, and where possible the existing road surface must be used when accessing or upgrade section of the existing roadway. ➢ Where possible highly sensitive habitats must be avoided, and all upgrade activities should take place within areas which have been afforded very low and medium sensitivity ratings.

➢ **Impact 2 Loss of Plant Species of Conservation Concern (SCC) and Threatened or Protected Species (TOPS)**

During the field assessment conducted, no plant SCC was found within the project ares. However, six (6) species protected in terms of the KwaZulu-Natal Conservation Ordinance (KZNCO) were recorded previously and will be directly impacted upon by the development. In order to reduce the anticipated impact, it is recommended that a pre-construction site walkthrough is conducted, to determine the exact number and location of each protected species. All impacted species are likely to respond were to translocation, and therefore should be removed and relocated to suitable habitat located nearby. seasonally. The field assessment confirmed that two (2) species occur within habitat present within the study area, namely *Sagittarius serpentarius* (Secretary Bird) and *Geronticus calvus* (Southern Bald Ibis). Other species like *Bucorvus leadbeateri* and *Ourebia ourebi* may also be found.

Table 8.4: *Impact Assessment for the loss of plant SCC within the study area*

Impact	Nature	Effect			Probability	Total Score	Significance
		Extent	Duration	Magnitude			
Without mitigation	Direct and Indirect	2	5	6	4	52	High -
With mitigation	Direct and Indirect	1	2	2	2	10	Low -

Mtigations	➢ A search and rescue operation must be undertaken prior to the commencement of construction on site, and once the surveyor has pegged out the footprint.

	➢ A temporary nursery may be considered during construction, so that plant species may be used during the rehabilitation. All plants kept within the nursery must be maintained and not allowed to die or be subjected to excessive stress outside of the norm. ➢ No plant species (SCC or common) should be harvested or removed from site without approval from the ECO or Applicant in writing. ➢ If any protected plant species are found within the construction footprint, permits (Ezemvelo KZN Wildlife) must be applied for and received before the onset of construction on site.

➢ Impact 3: Loss of Faunal Species of Conservation Concern (SCC)

Based on the findings of the Environmental Screening Report (DFFE, 2022) and the desktop assessment conducted by the specialist confirmed that the study area had the potential to house a number of faunal SCC either permanently or only As the roads are already in existence, and frequently used by a resident, it is envisioned that these species either avoid these sections already, or will simply avoid the active Work fronts at the time of construction, with unrestricted access more suitable habitat nearby. The careful application of mitigation techniques, in conjunction with sufficient monitoring by an ECO and the appointed supervisors (foreman) and site management will be key in preventing the aforementioned impacts. Furthermore, rehabilitation of the affected areas will contribute significantly to the reduction in both direct and indirect impacts to faunal species of conservation concern, which may occur within the area.

Table 8.5: Impact Assessment for the loss of faunal SCC

Impact	Nature	Effect			Probability	Total Score	Significance
		Extent	Duration	Magnitude			
Without mitigation	Direct and Indirect	2	3	8	3	39	Medium -
With mitigation	Direct and Indirect	1	2	2	3	15	Low -

Mitigations	➢ No killing of fauna must be tolerated. ➢ All embankments must be supported, and any excavation activities must not allow sediment to fall into adjacent sensitive areas, such grasslands, thornveld, wetlands or riparian habitats. ➢ An appropriate, site-specific stormwater management plan must be compiled for this project, to deal with stormwater relate issues during construction. ➢ Environmental awareness training must be conducted by the ECO before any new staff commences with work on site. ➢ Any excavations or holes must be checked regularly for fauna that either may have occupied the area or may fall in accidentally. The

Table 8.5: Impact Assessment for the loss of faunal SCC	
	design of deep excavations should consider nearby fauna (especially frogs and reptiles). ➢ No fencing should be erected within wetland or riparian habitat where possible. ➢ No blasting activities may take place within 300 m of the mountain range found along Road P372 or D2286. All blasting activities along P372 and D2286 should not take place during any important breeding season (August to December).

➢ **Impact 4: Fragmentation, Loss of Ecosystem Function and Edge Effects**

During the field assessment, existing levels of fragmentation and loss of ecosystems function were observed. However, key natural features such as a grassland, thornveld, rivers and wetlands do still exist but are likely to remain insignificantly affected by the proposed upgrade, if undertaken in a responsible and sustainable manner.

The proposed upgrade therefore should aim to reduce the overall footprint, make use of these existing disturbed areas for development and for the selection of laydown sites and the site office and ensure that connectivity, especially within nearby grasslands, thornveld, wetland and riparian habitat is allowed to persist throughout both the construction and operational phase of the development.

Figure 8.6: Impact Assessment for the likely fragmentation and edge effects within the study area

Impact	Nature	Effect			Probability	Total Score	Significance
		Extent	Duration	Magnitude			
Without mitigation	Direct and Indirect	2	3	6	3	33	Medium -
With mitigation	Direct and Indirect	1	2	2	2	10	Low -

Mitigation	➢ All areas outside of the upgrade footprint must be regarded as no-go area, unless required to complete the upgrade, such as access roads or material stockpiling areas. ➢ The upgrade footprint must be kept as small as possible and ensure that all non-operational areas are rehabilitate to a suitable condition. ➢ Rehabilitation must extend into the impacted sections of the PAOI and not only the proposed upgrade footprint. ➢ Where possible rehabilitation should use indigenous plant species, which occur naturally geographically (approximately 10km radius) or are already found within the study area.

- **Impact 5: Invasion of Alien Invasive Plant Species (AIPS)**

Alien Invasive Plant Species (AIPS) were found sporadically throughout the study area and were not seen as a significant threat to the existing plant communities and were somewhat limited / or controlled. If the appointed Contractor does not implement control AIPS control measures at the onset of construction however, AIPS will begin to proliferate and influence areas outside of the footprint which could be devastating not only to the more sensitive habitat found on site, but also downstream from the site or within less disturbed grassland habitat found nearby. The systematic application of an AIPS control programme is regarded as a sufficient tool for dealing with the threat of IAPS. An ECO should be appointed to monitor the application of this plan throughout the construction phase, and until the defect's liability period. Special precaution should be taken when applying herbicides and where possible chemicals should only be used as a last option where mechanical applications are no longer successful.

Table 8.7: *Impact Assessment for the invasion of alien plant species*

Impact	Nature	Effect			Probability	Total Score	Significance
		Extent	Duration	Magnitude			
Without mitigation	Direct and Indirect	3	4	6	3	39	Medium -
With mitigation	Direct and Indirect	1	2	4	2	14	Low -

Mitigation	➢ An Alien Invasive Plant Species Control Plan must be developed by the Contractor and include both construction and operational phase requirements. ➢ No dumping of cleared alien vegetation must be allowed on site. All cleared material must be appropriately disposed of at a registered landfill. ➢ Alien invasive plant control regimes must include the entire site and PAOI.

8.4. Wetland and Riparian Assessment

The information in this section was adapted from the wetland and riparian habitat impact assessment report compiled by Afzelia Environmental Consultants (2022) for the proposed project. The report is attached as Appendix D2.

8.4.1. Quaternary Catchment and Drainage Setting

The development site falls within quaternary catchments V33A, V33B and W21E (see Figure 8.5) which forms part of the Greater Pongola-Mtamvuna water management area (WMA). The Buffels River was identified as the main collecting river within catchments V33A and V33B whilst the Nondweni River was identified as the main collecting river within catchment W21F. Runoff from the majority of the development area flows directly into the Buffels River and its right-bank tributaries namely Batshe

and Ngxobongo Rivers whilst a small area of the development site feeds Ngwebini River, a tributary of the Nondweni River (Figure 8.6).

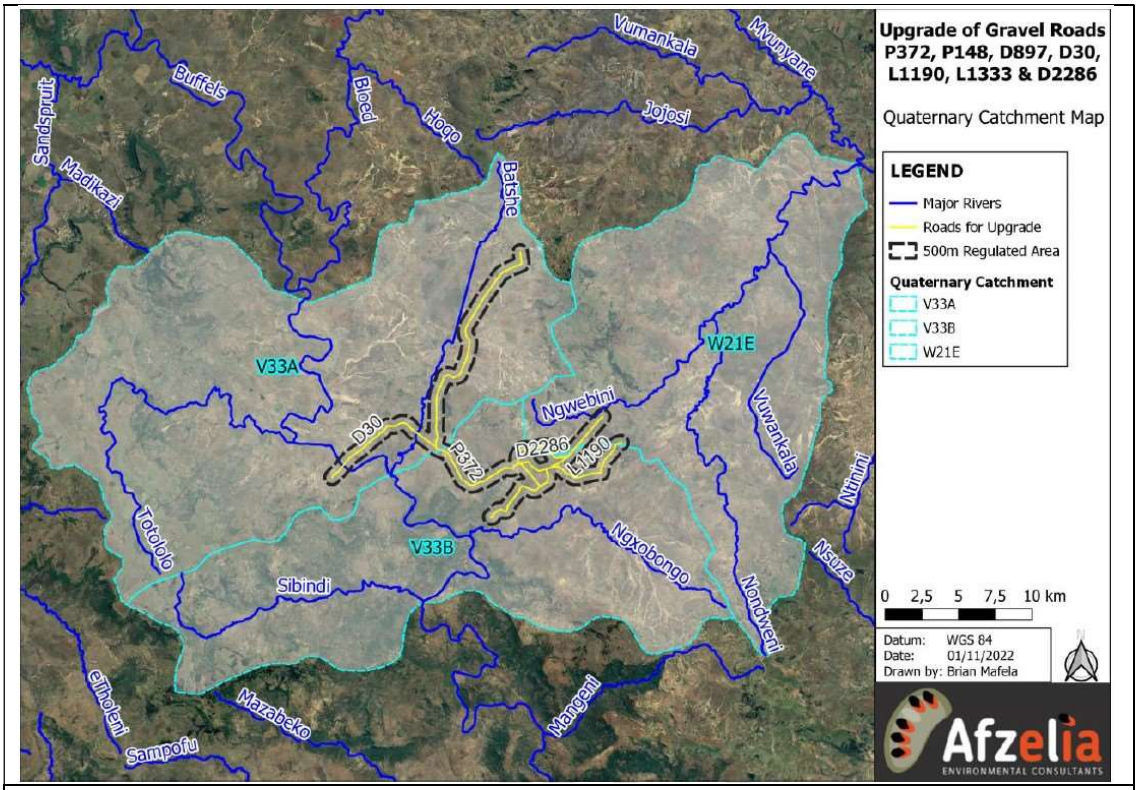


Figure 8.5: Quaternary catchment of the study area.

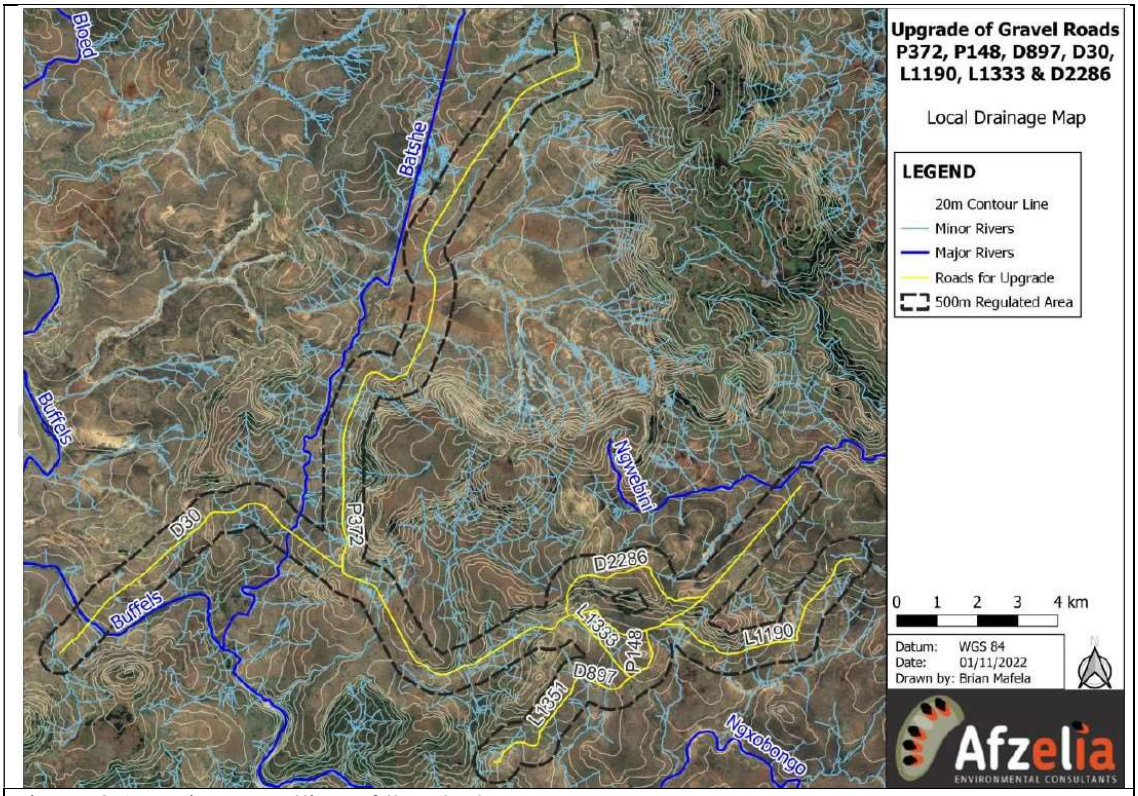


Figure 8.6: Drainage setting of the study area

8.4.2. Watercourse Habitat Delineation

On September 24, 2022, the specialist undertook a ground truthing exercise after completing the desktop delineation exercise. This required the identification of in-field wetland and riparian areas using techniques for sampling soil and plant, as well as the documenting of diagnostic topographic features including breaks in slope, riverbanks, bedrock outcrops, etc. Numerous soil samples and topographic features were recorded using a handheld GPS device and used to delineate watercourses and develop a map of onsite watercourses. Delineated watercourses were then sub-divided and classified into hydrogeomorphic (HGM) units as per Ollis *et al.* (2013).

Infield sampling of the soil and vegetation supplemented by desktop delineation confirmed the presence of thirty-seven (37) watercourses within the impact zone of the road upgrade. These include 14 wetlands and 23 riparian zones. The 14 wetlands were classified into 3 HGM units which include Channelled Valley Bottom Wetlands, Unchannelled Valley Bottom Wetlands and Seep Wetlands. Maps showing the spatial location of all infield delineated watercourses are provided as Figure 8.7– 8.9.

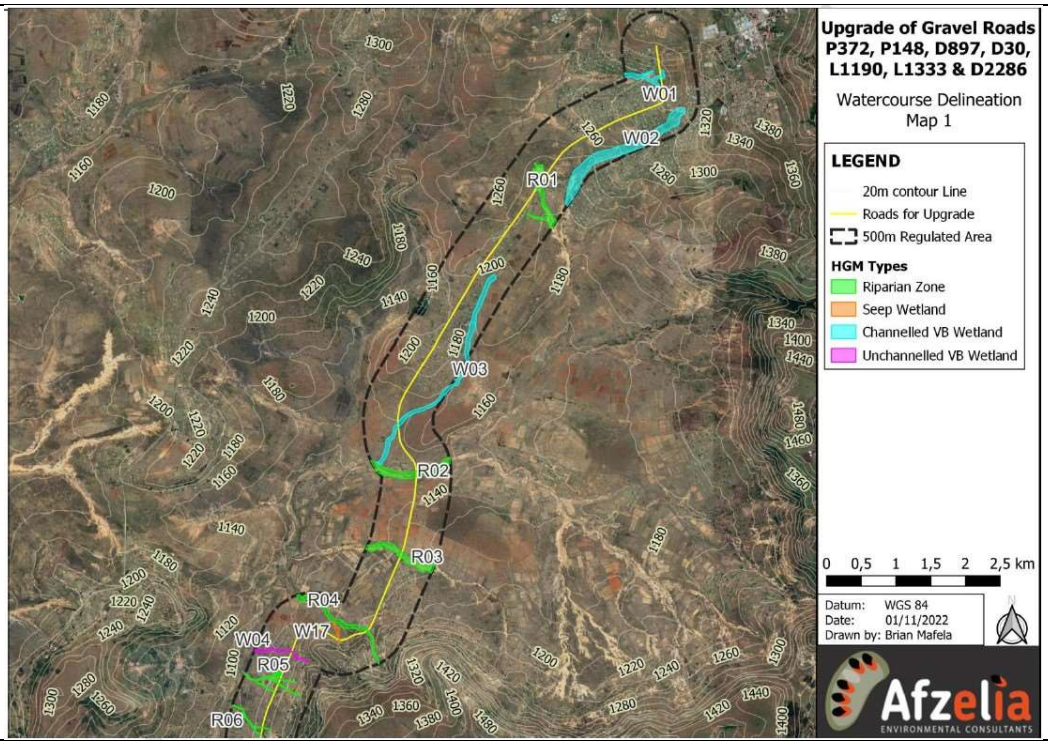


Figure 8.7: Watercourse delineation and classification map (Map 1).

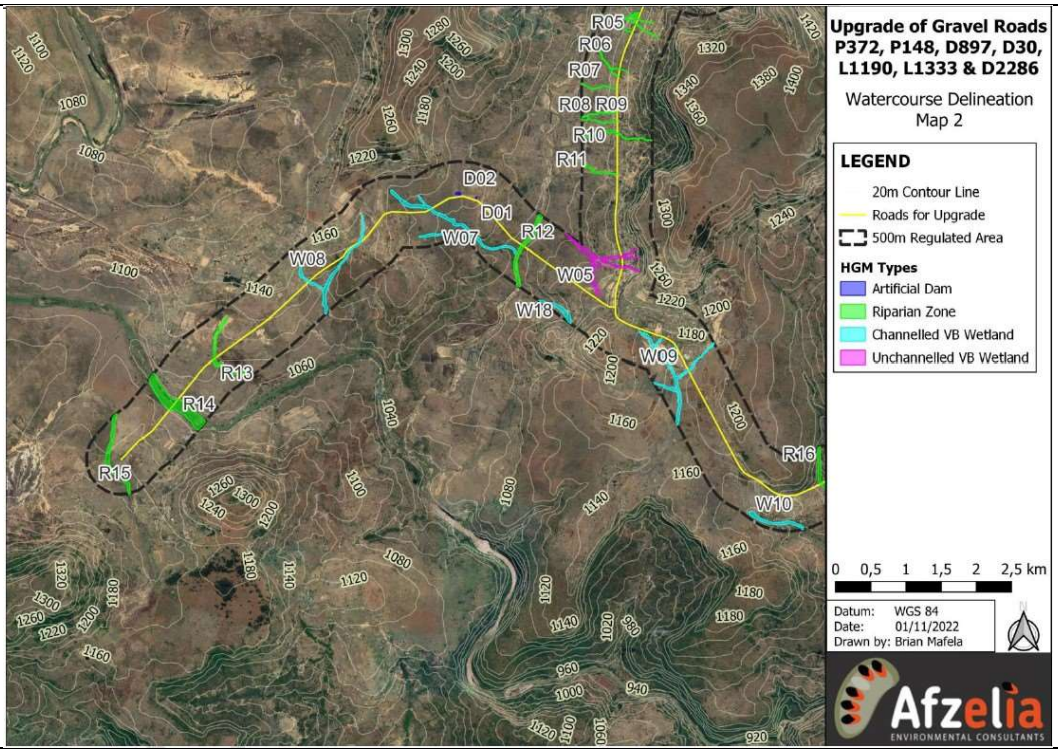


Figure 8.8: Watercourse delineation and classification map (Map 2).

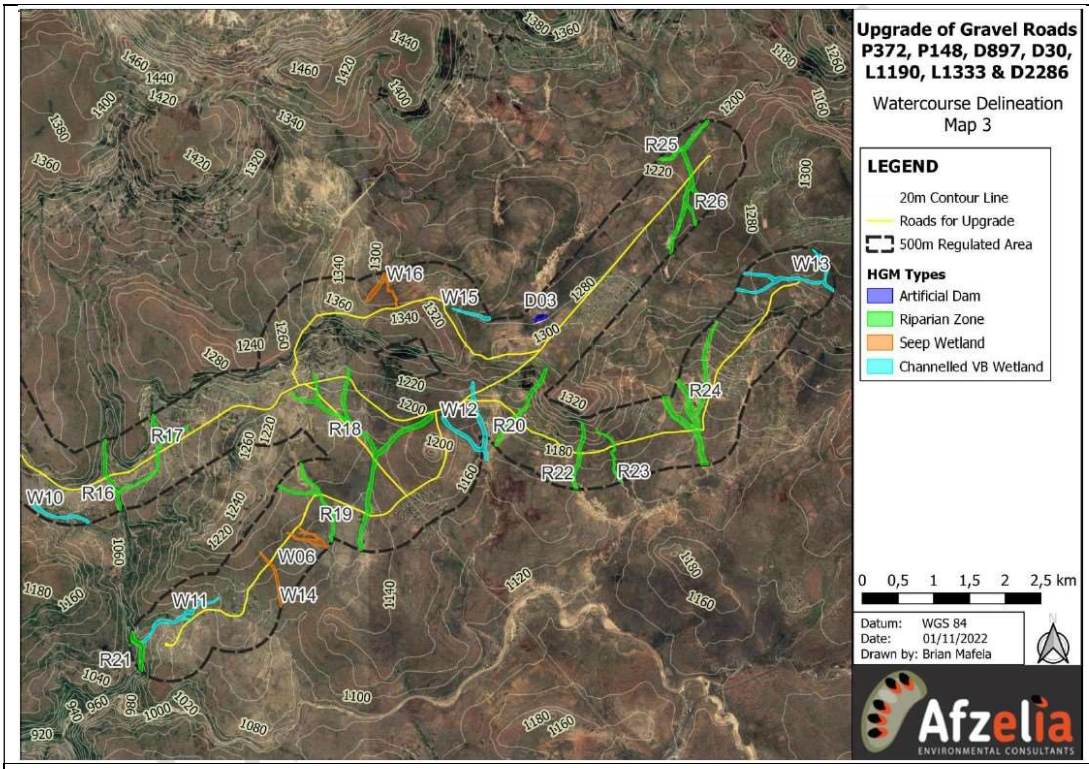


Figure 8.9: Watercourse delineation and classification map (Map 3)

Afzelia's wetland study discovered that the proposed road upgrade could have a negative impact on 37 watercourses. Table 3.3 of the wetland assessment report attached as Appendix D2 provides a summary of each watercourse's general characteristics and classification.

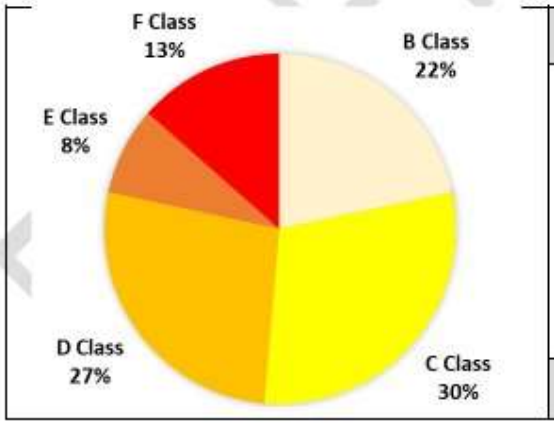
8.4.3. Ecological Condition Assessments

According to the PES Assessment, 22% of watercourses were found to be Largely Natural (B PES Class), 30% Moderately Modified (C PES Class), 27% Largely Modified (D PES Class), 8% Seriously Modified (E PES Class) and 14% Critically Modified (F PES Class). The results of the PES assessment are summarised using a pie chart (Figure Table 8.8).

The following impacts were identified as key drivers of the PES ratings:

i. Poor management and general disturbance of watercourses which has resulted in major erosion problems within watercourses.
ii. Concentration of flows by culvert and bridges resulting in major erosion problems.
iii. Impounding of flows by instream dams.

Table 8.8: PES assessment results for all watercourses.



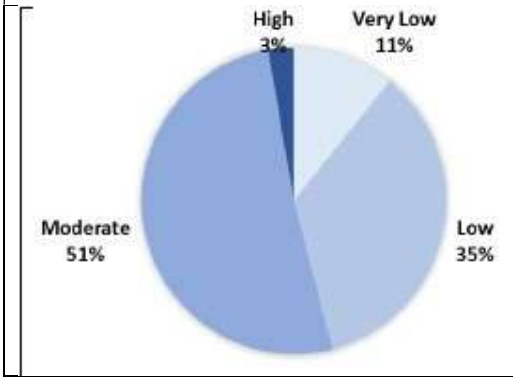
PES Rating	No. Units	Percentage
B Class	8	22
C Class	11	30
D Class	10	27
E Class	3	8
F Class	5	14
Total	**37**	**100%**

8.4.4. Ecological Importance and Sensitivity Assessments

The EIS assessment confirmed 11% of watercourses to be of very low EIS, 35% of low EIS, 51% of moderate EIS and 3% of high EIS (Table 8.9). Key factors driving the EIS ratings include the following:

i. Extensive habitat degradation of watercourse habitat owing to gully erosion.
ii. Most watercourses are characterised by ephemeral flows which support few aquatic biodiversity.
iii. Most watercourses are characterised by a degraded vegetation community which supports fewer aquatic biodiversity.

Table 8.9: EIS assessment results for all watercourses.



EIS Rating	No. Units	Percentage
Very Low	4	11
Low	13	35
Moderate	19	51
High	1	3
Total	**37**	**100%**

8.4.5. Ecosystem Service Assessments

Fourteen (14) wetland HGM units were placed into 3 groups and then evaluated for their provisioning of ecosystem services. Group 1 supplied most services at a very low to low level whilst Group 2 supplied most services at a moderately low to moderate level and Group 3 supplied most services at a low to moderately low level. A summary of the assessment results is provided in Table 8.10 below.

Table 8.10: Ecoservices assessment results for all wetland units

Ecosystem Services		Wetland Unit and Supply Ratings		
		Group 1 (W01, W09 & W12)	Group 2 (W03, W07 & W13)	Group 3 (W08, W06, W14, W04, W05, W16, W17 & W11)
Regulating and Supporting Services	Flood attenuation	L	M	M
	Stream flow regulation	L	M	ML
	Sediment trapping*	L	M	M
	Erosion control*	ML	M	M
	Nutrient trapping	VL	MH	ML
	toxicant trapping	L	MH	ML
	Carbon storage	L	M	ML
	Biodiversity maintenance	L	ML	ML
Provisioning Benefits	Water supply	L	M	ML
	Harvestable natural resources	VL	L	L
	Food for livestock	VL	ML	ML
	Cultivated foods	L	ML	ML
Cultural Benefits	Cultural significance	L	L	L
	Tourism & recreation	L	ML	L
	Education and research	VL	L	L

***Key to supply ratings**: **VH** – Very high, **H** – High, **MH** – Moderately-high, **M** – Moderate, **ML** – Moderately-low, **L** – Low, **VL** – Very low.*

8.4.6. Summary of the PES and EIS Results

The PES and EIS ratings for all watercourses are summarised in Table 8.11 below:

Table 8.11: PES and EIS assessment results for all watercourses

No.	HGM ID	HGM Type	PES	EIS
1.	W01	Channelled Valley Bottom Wetland	E Class (Seriously Modified)	Low EIS
2.	R01	Riparian Zone	F Class (Critically Modified)	Very Low EIS
3.	W03	Channelled Valley Bottom Wetland	C Class (Moderately Modified)	Moderate EIS
4.	R02	Riparian Zone	C Class (Moderately Modified)	Moderate EIS
5.	R03	Riparian Zone	C Class (Moderately Modified)	Low EIS
6.	R04	Riparian Zone	C Class (Moderately Modified)	Moderate EIS
7.	W04	Unchannelled Valley Bottom Wetland	B Class (Largely Natural)	Moderate EIS
8.	R05	Riparian Zone	E Class (Seriously Modified)	Low EIS
9.	R06	Riparian Zone	E Class (Seriously Modified)	Low EIS
10.	R07	Riparian Zone	D Class (Largely Modified)	Low EIS
11.	R08	Riparian Zone	D Class (Largely Modified)	Low EIS
12.	R09	Riparian Zone	D Class (Largely Modified)	Moderate EIS
13.	R10	Riparian Zone	D Class (Largely Modified)	Low EIS
14.	R11	Riparian Zone	D Class (Largely Modified)	Low EIS
15.	W05	Unchannelled Valley Bottom Wetland	C Class (Moderately Modified)	Moderate EIS
16.	R12	Riparian Zone	B Class (Largely Natural)	Moderate EIS
17.	W07	Channelled Valley Bottom Wetland	B Class (Largely Natural)	Moderate EIS
18.	W08	Channelled Valley Bottom Wetland	C Class (Moderately Modified)	Moderate EIS
19.	R13	Riparian Zone	D Class (Largely Modified)	Low EIS
20.	R14	Riparian Zone	B Class (Largely Natural)	High EIS
21.	W09	Channelled Valley Bottom Wetland	F Class (Critically Modified)	Low EIS
22.	R16	Riparian Zone	D Class (Largely Modified)	Low EIS
23.	R17	Riparian Zone	D Class (Largely Modified)	Low EIS
24.	R18	Riparian Zone	C Class (Moderately Modified)	Moderate EIS
25.	R19	Riparian Zone	C Class (Moderately Modified)	Moderate EIS
26.	W06	Seep Wetland	B Class (Largely Natural)	Moderate EIS
27.	W14	Seep Wetland	B Class (Largely Natural)	Moderate EIS
28.	W11	Channelled Valley Bottom Wetland	C Class (Moderately Modified)	Moderate EIS
29.	W12	Channelled Valley Bottom Wetland	F Class (Critically Modified)	Very Low EIS
30.	R20	Riparian Zone	F Class (Critically Modified)	Very Low EIS
31.	R22	Riparian Zone	B Class (Largely Natural)	Moderate EIS
32.	R23	Riparian Zone	D Class (Largely Modified)	Low EIS
33.	R24	Riparian Zone	F Class (Critically Modified)	Very Low EIS
34.	W13	Channelled Valley Bottom Wetland	C Class (Moderately Modified)	Moderate EIS
35.	R26	Riparian Zone	C Class (Moderately Modified)	Moderate EIS
36.	W16	Seep Wetland	D Class (Largely Modified)	Moderate EIS
37.	W17	Seep Wetland	B Class (Largely Natural)	Moderate EIS

8.4.7. Impact Assessment & Mitigation

All impacts to watercourses linked with the construction/upgrade and operation of gravel roads P372, P148, D897, D30, L1190, L1333 & D2286 are discussed in Table 8.12 below.

Table 8.12: Description of construction and operation phase impacts and a summary of the impact significance results.

Impact	Project Phase & Impact Description	Impact Significance	
		Poor / No Mitigation	Good Mitigation
a) Transformation of watercourse habitat	**Construction and Operational Phase:** No additional watercourse habitat will be transformed during the construction/upgrade and operational phases of the development; therefore, this impact was not assessed further.	N/A	N/A
b) Direct disturbance of watercourse habitat	**Construction Phase:** Direct disturbance of any delineated watercourses is likely to result from poor implementation or poor management of construction activities. Dumping of rubble in the watercourse, movement of construction vehicles over the watercourse habitat, construction and repair of infrastructure (culverts and bridges) within the watercourse will result in disturbance of the watercourse soil and/or vegetation community. Mixing and compaction of the soil within watercourse habitats will affect the movement of water through the soil. The study area was noted for being prone to erosion **Key Mitigation Measures:** ii. Observing No-Go areas which include the watercourses and their associated buffer. ii. Fencing off No-Go areas to prevent any accidental incursions.	38 Medium	22,5 Medium
	Operational Phase: No direct disturbance of the watercourse habitat is expected during the operational phase of the development. therefore, this impact was not assessed further.	N/A	N/A
c) Increased sediment	**Construction Phase:** Significant sediment deposition will raise the microtopography of the watercourse and thus result in alteration of the	24 Medium	18 Low

Table 8.12: Description of construction and operation phase impacts and a summary of the impact significance results.			
input in watercourses	movement of water over the watercourse habitat. Furthermore, sediment deposition has a potential to introduce IAPs and weeds in the wetland habitat. On the whole, sediment deposition will impact the hydrological, geomorphological and vegetation integrity of the affected wetland habitat. **Key Mitigation Measures:** i. Use sediment barriers to manage sediment and soil stockpiles. ii. Avoid stripping vegetation from the entire site if construction will not begin immediately.		
	Operational Phase: Poorly discharged stormwater will likely cause erosion and eroded sediment will likely be deposited in low lying areas such as watercourse. This will result in impacts similar to those discussed above. Effective management of stormwater will reduce the impact significance from medium to low. **Key Mitigation Measures:** i. Design and implement a stormwater management system that encourages infiltration and minimises soil erosion.	22,5 Medium	19,5 Low
d) Increased flood peaks in watercourses	**Construction Phase:** Poorly designed detour roads will likely increase the risk of flood peaks. This will lead to large volumes of water entering downstream watercourses often at high flow rates within a short space of time (increased flood peaks). Changes in water input patterns will lead to the following impacts: reduced infiltration and groundwater recharge (which reduces water inputs to all delineated wetlands). Furthermore, it'll increase the risk of erosion within the construction site and sedimentation of watercourse habitat. **Key Mitigation Measures:** i. Minimise unnecessary clearing of vegetation. ii. Implement a good stormwater management system during the construction phase.	22,5 Medium	16.3 Low

Table 8.12: Description of construction and operation phase impacts and a summary of the impact significance results.			
	Operational Phase: If stormwater generated by the road is discharged into the environment without any attenuation it will result in impacts similar to those of the operational phase. The reader is referred to the above description for details. **Key Mitigation Measures:** i. Design and implement a stormwater management system that encourages infiltration and minimises soil erosion.	44 Medium	19,5 Low
e) Increased nutrient input in watercourses	**Construction Phase:** Key sources of nutrients (nitrates) during the construction phase include mishandling of sewage from chemical toilets. If poorly managed, nutrients may be released into the environment, and they will make their way to watercourses. An increase in nutrients within watercourses will increase the risk of nutrient loving plants outcompeting indigenous plants resulting in a change in the species composition which is interpreted as degradation of the indigenous wetland vegetation community. **Key Mitigation Measures:** i. Ensure effective management of all sources of nutrients (e.g. chemical toilets).	15 Low	10 Low
	Operational Phase: Increased nutrient input during the operational phase is unlikely, therefore, this impact was not assessed further.	N/A	N/A
f) Increased input of toxic contaminants in watercourses	**Construction Phase:** During the construction phase there is a likelihood that toxic contaminants such as hydrocarbons, oils, paint etc. will be released by accident into the environment. Once released into the environment, precipitation will wash toxic contaminants into watercourses. Once in the watercourse they will increase the toxicity level of water which will lead to the mortality of aquatic biota (plants, microorganisms and potentially small animals) sensitive to water quality changes. The significance of the impact will	16 Low	12 Low

Table 8.12: Description of construction and operation phase impacts and a summary of the impact significance results.

	depend on the type and quantity of contaminants release into the environment. **Key Mitigation Measures:** i. Effective management and handling of contaminates.		
	Operational Phase: Upgrade of the road will not result in increased input of toxic contaminants in watercourses; therefore, this impact was not assessed further.	N/A	N/A
g) Weeds and invasive alien plant proliferation in watercourses	**Construction Phase**: Any temporary removal of vegetation during the construction phase will increase the likelihood of IAP invasion. The colonization of areas by weeds and IAPs poses a risk to indigenous plant communities in each watercourse habitat. IAPs can have far reaching detrimental effects on native biota because they change the species composition, species richness and vegetation structure. Such changes are considered degradation of the native vegetation community. **Key Mitigation Measures:** i. Control IAPs throughout the construction phase. ii. Rehabilitate all disturbed areas adequately.	30 Medium	17,5 Low
	Operational Phase: If disturbed areas are not adequately rehabilitated IAPs could spread during the operational phase and compromise the vegetation integrity of the watercourse habitat. Details on the impact are provided in the description above. Key Mitigation Measures: i. Control IAPs throughout the operational phase of the project. ii. Rehabilitate all disturbed areas adequately.	30 Medium	16,5 Low

8.4.7.1. Other Mitigation Measures

8.4.7.1.1. Finalisation of Designs and Plans

The following plans will need to be completed and approved prior to commencement of construction:

i. An EMPr must be compiled for the construction phase by an environmental assessment practitioner and the EMPr must incorporate all of the below listed mitigation measures.
ii. A detailed method statement for the construction of any infrastructure (culverts and stormwater infrastructure) within and / or across the watercourse must be compiled by the contractor and Wetland Ecologist prior to commencement of construction.

8.4.7.1.2. Construction Footprint Limit & Demarcation

i. Prior to commencement of construction at each culvert, the construction footprint within the affected watercourse must be demarcated to prevent work being undertaken outside of the development footprint.
ii. The demarcation must be signed off by the Environmental Control Officer (ECO).
iii. The demarcation must be maintained construction is completed at each crossing.

8.4.7.1.3. Soil Erosion Control Measures

i. Prior to commencement of construction at each culvert, a silt fence / curtain must be installed within the watercourse just downstream of the construction footprint.
ii. The silt fence / curtain must be maintained regularly to ensure that they function effectively.
iii. The silt fence / curtain must be maintained regularly to ensure that they function effectively.

8.4.7.1.4. Soil Management

i. Prior to commencing with earthworks, the topsoil must be stripped and stockpiled separately from subsoil.
ii. Topsoil must be kept for use during rehabilitation of landscaped areas. Topsoil must be stockpiled in stockpiles not exceeding 2m in height.
iii. All stockpiles must be kept free of weeds and invasive alien plants.

iv. If soil stockpiles are at risk of being eroded, they must be secured with sandbags around the base of the stockpile.

v. All stockpiles must be established outside the 30m buffer of all watercourses and on flat ground.

8.4.7.1.5. Temporary River /Stream Diversion

i. A method statement must be compiled by a Wetland Ecologist in conjunction with the appointed contractor to guide the river diversion process from start to finish.

ii. Use of coffer dams and gravity flume pipes is recommended for the project. A whole section of the river channel is isolated using barriers that span the full width of the river. This keeps a stretch of the river dry and the water is transferred downstream of the works area through gravity fed flumes/pipes. The flume is normally placed on the bed of the watercourse through the works area and outfalls at the downstream barrier, if present, or far enough downstream to prevent the water backing up into the work area.

iii. Safety requires that every cofferdam, and every component thereof, shall be of robust design and construction, of suitable and sound materials and of sufficient strength and capacity for the site conditions in which it is used.

iv. Proper construction of the cofferdam, verification that the structure is being constructed as planned, monitoring the behaviour of the cofferdam and surrounding area, provision of adequate access, light and ventilation, and attention to safe practices on the part of all workers and supervisors is required.

v. The cofferdam construction shall be properly maintained.

vi. Diversions shall be temporary in nature and no permanent walls, berms or dams may be installed.

vii. Under no circumstance shall a new channel or drainage canals be excavated to divert water away from construction activities.

viii. Upon completion of the construction at the site, the diversions shall be removed to restore natural flow patterns, and the channel and riparian zone rehabilitated/restored to their original configurations as soon as practically possible.

ix. If excess debris and sediment has collected upstream of the structure, remove the material before the dam is removed and dispose of the material properly.

8.4.7.1.6. Pollution Prevention Measures

i. Any soil contaminated by hydrocarbons (fuel and oils), asphalt, bitumen, binding agents, concrete and/or any other chemical must be removed, and the affected area rehabilitated immediately.
ii. Chemical toilets must be provided to workers during the construction phase. A single chemical toilet must be provided for every 10 employees.
iii. Chemical toilets must be serviced regularly by a registered service provider and waybills must be retained as proof of servicing.
iv. Fuel must be stored in a bunded structure with a roof. The bund must be able to contain at least 110% of the volumes of fuel.
v. Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface.
vi. Drip trays should be utilised at all dispensing areas.
vii. A chemical spill kit must be present onsite at all times and once used it must be disposed of at a registered hazardous landfill site.
viii. All solid waste must be collected and placed in bins.

8.4.7.1.7. Dust Control and Suppression

i. The control and suppression of dust emanating from the construction zone is of critical importance.
ii. Watering of the constructed road surface must take place several times during the day to keep the topsoil most and minimise the flocculation of dust from the construction site.
iii. The movement of heavy vehicles should be kept to a minimum and only when necessary.
iv. Care must be taken to not apply excessive water to the road surface during dust suppression exercises, to ensure that sediment run-off and erosion of the road surface is kept to a minimum.

8.4.7.1.8. Invasive Alien Plant Control

i. The control and eradication of a listed invasive alien species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs in.
ii. All invasive alien plants must be removed from the construction area.
iii. Mechanical control methods such as digging, hoeing, pulling out of weeds and invasive plants are recommended.

iv. Use of chemical treatment methods must be kept to a minimum.
v. Where chemical treatment methods are used, the contractor must ensure that he uses watercourse friendly herbicides.
vi. The methods employed to control and eradicate a listed invasive species must also be directed at the new growth, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

8.5. Heritage Assessment

The information in this section was gleaned from the Heritage Assessment Report (2022) by the Umlando for the proposed project.

8.5.1. Heritage Baseline Assessment

i. Desktop Assessment

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. The general area is known for its archaeological and Anglo-Boer War sites. The archaeological sites consist of the whole range of sites from the Stone Ages, Rock Art and Iron Ages. The main two Anglo-Zulu War sites near the road upgrade are Rorke's Drift and Isandlwana (1879 ACE). Colonial Period houses also occur in the general area.

In their previous study, Gaigher (2015) recorded four family grave sites and two stone walls. Prins (2015) surveyed the area around KwaNyoni and did not find any heritage sites. Prins (2016) proceeded to record eleven graves in his study area. There is thus a strong possibility of unknown, or unmarked graves, from the Battle of Isandlwana occurring near some of the proposed road
upgrades. This would be especially true for the relevant part of the P372, D897, L1333 and L1351.

ii. Palaeontological Sensitivity

The area is in an area of medium palaeontological sensitivity (fig. 8.5). A desktop

PIA was undertaken by Dr Alan Smith (Appendix A). There are four mains geological

groupings:

1. Alluvium:

a. This is water-borne sediment and will not be fossiliferous.

2. Dwyka Group (green)

   a. Vertebrate fossils are not common in this region of the planet during the world-wide Late Palaeozoic (Dwyka) Glaciation. Trace fossils are found but these are not of great palaeontological interest.

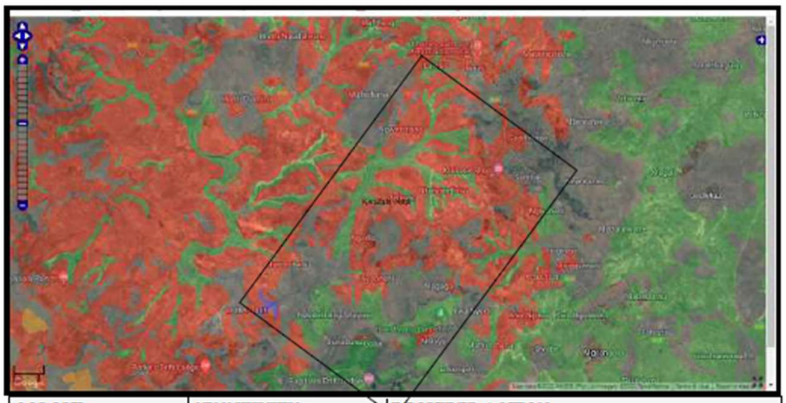
3. Pietermaritzburg Formation (Green)

   a. The Pietermaritzburg Formation may contain scattered, fragmentary plant fossils and invertebrate trace fossils, some of whichare diagnosticc of marine conditions. The chance of finding Palaeontological Material is very low, but not zero

4. Vryheid Formation (Red)

   a. The Vryheid Formation as a Very High Palaeo sensitivity Zone. In practise, no vertebrate fossils have been recorded from the Vryheid Formation in this area, however, invertebrate trace fossils are common

5. Karoo Dolerite
   a. This is an intrusive igneous rock and by definition cannot be fossiliferous.



COLOUR	SENSITIVITY	REQUIRED ACTION
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 8.10: Palaeontological Sensitivity Map

iii. Field Survey

A field survey was undertaken on the 21 May 2022.

During the assessment, the road margin up to the fences was considered to be the footprint for the road upgrades; however, graves within 50m of the road were noted. All graves are of high significance and automatically rated as 3A on the SAHRIS system. For the purpose of this report, one to four to six graves within a homestead is referred to as a 'grave'. A cemetery is more than four to six graves outside of a homestead's boundaries. The cemetery is a communal burial area whereas the graves are related to a specific family.

8.5.2. Results of Heritage investigations

The following heritage sites have been observed during the field assessment along the roads:

- *9 cemetry sites*
- *29 graves*
- 2 stone-walled features
- 5 kraals
- Isandlwana Museum
- 5 Places of Worship (Shembe Tempels)

All graves and stone walled features within 20m of any upgrade need to be clearly demarcated before construction begins. Demarcation would be in the form of high visibility netting or tape. The community should be made aware that this demarcation will occur at each household or cemetey. The demarcation needs to be 5m from the edge of the last grave. If the grave is within 10m of the proposed upgrade, then the type of upgrade needs to be noted and the site re-assessed in terms of buffering and distance. Grave 18 (-28.341442900 30.686616300) requires the road to be re-aligned so that it no longer affects the graves. Grave 22 (-28.345347800 30.685484600) has the possibility of being eroded from the side of the road cutting. It is recommended that this section of the road is reinforced with backfill to prevent the grave collapsing.

Access to Shembe Temples should not be restricted. There is no formal viewing platform along the D2286 for the Battle of Isandlwana. Current guides use a few select areas to explain the on wave of attack. The new road design should not restrict these areas. Alternatively, the road design
should make on area a viewing platform after consultation with local tour guides. This could be a more formal viewing platform.

The D897 and L1351 follow the border of the Battle of Isandlwana. In a few areas war graves occur within 30m of the road. This means that artefacts relating to the Battle of Isandlwana could still occur in the ground. A metal detector survey should be undertaken along those sections. The person undertaking the metal detector survey should be accompanied by a member of KZNARI based at the Isandlwana Museum. This would be to confirm finds and interact with community members.

8.5.3. Heritage Impacts Table

Table 8.13: Heritage Impacts Table

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Impacts on graves	Negative	Local	Long-term	Moderate	Possible	High
Damage of the kraals with construction machinery	Negative	Local;	Short-term	Low	Possible	Low
Interference with access to Shembe Temples	Negative	Local	Short – term	Moderate	Highly possible	High
OPERATIONAL PHASE						
None Anticipated						

Mitigation Measures

- The graves need to be clearly demarcated before construction begins along the road. At least 10m buffer needs to occur between the grave and any roadworks.
- No road works should occur on the battlefield side of the road without being approved. Any excavations or cutting may need mitigation in the form of a metal detector survey.
- The kraal needs to be clearly demarcated before construction begins.

8.6. Agricultural Impact Statement

The information in this section was gleaned form the impact statement report compillled by Agricultural, Agribusiness and Environmental Consultant, following the specialist protocols stipulated by the web-based screening report.

8.6.1. Desktop Study

Available soils data was extracted from Mucina and Rutherford map no. 779 and cross referenced to the ISCW Landtype Survey: Broad Soil Patterns. Soil Parent Material data could not be obtained from the Council for GeoScience map no 2830 as the scale was too large (1:250 000) and too crowded to be able to accurately locate the site.

The following standard soil classification texts were used in order to determine site specific Soil Forms.
The physical properties of the Soil Forms expected to be encountered and the management thereof was based on:

- *Identification and Management of the Soils of the South African Sugar Industry*: SA Sugar Research Institute. (Sugar book)
- *Soil Classification*: *A Taxonomic System for South Africa*: Soil Classification Working Group, 1991 McVicar et al, ARC-ISCW (Blue book)
- *Soil Classification*: A Natural and Anthropogenic System for South Africa: Soil Classification Working Group, 2018, Turner, Paterson et al (Brown Book)*Soils of South Africa*: Martin fey

Land Capability Class (LCC) was determined and tabled on a scale of I to VIII and Agricultural Theme Sensitivity Classification on a scale of 1 to 15 (Refer to Appendix D3: Agricultural Impact Statement Report).

8.6.2. Site verification

i. soil data

Table 8.14 below provides a descriptive summary of the main features of the Soil Forms encountered at the site in layman's language.

Table 8.14: Description of Site Soil Families

Soil Family	Features
Arcadia	This Soil Form is usually found along the banks of rivers, streams, permanent drainage lines and the fringes of wetland areas. It is easily identified by a black or reddish cracking blocky clay topsoil over heavy yellow clay. It often has wet feet or is standing in a permanently wet area The clay is often used by young boys to make clay oxen and by housewives to make ceramic pots for domestic use or for sale .
Bonheim	Bonheim soils are characterised by black blocky clay (Melanic A-horizon) topsoil over yellow-brown or red blocky clay with variegated colours (Pedocutanic B-Horizon). These soils are usually found on the lower slopes and footslopes.
Estcourt	This soil form is one of many that are not arable due to a bleached grey porous subsoil commonly referred to as an E Horizon. It has very poor physical and chemical properties. It highly susceptible to severe soil erosion and difficult to repair once eroded
Inhoek	This is a good, high yield potential soil in every respect. The topsoil consists of dark grey to black blocky clay. The subsoil is recent stratified alluvium or olive- brown weakly structured clay
Glenrosa	Glenrosa soils are frequently found in close proximity to Mispah soils where there has been more rapid weathering of subsurface rock. Topsoil, comprising of grey loamy sand to clay is typically 200mm to 400mm deep. However, tongues of soil do penetrate into a substrate of weathering rock, thus permitting some root, moisture and nutrient penetration to a deeper level. They carry a high erosion hazard.
Mispah	Also highly erodible, exceptionally good surface water management required. Topsoil depth is often less than 200mm, covering a stratum of densely bedded shale or solid rock. Mispah soils also carry a high erosion hazard.
Shortlands	The Shortland soil is in common with most of the soil systems in the Hutton Soil Form, constitute the best agricultural soils in South Africa. Apart from having good physical and chemical properties, these soils frequently have topsoil depths of more than 1m.

ii. Land Capability Class Determination

Once the relevant soil profile and topographic data had been recorded, the next step was to compile and record the Land Capability Class for each soil profile assessed. This is the fundamental step in assessing all the individual components that determine the physical capability and crop yield potential of a particular soil at a particular site.

Table 8.10 below defines the qualities of each of the eight nationally recognized Land Capability Classes. The values attached to each determinant of an LCC also provide a useful management guide e.g. Texture, rooting depth, permeability etc.

- Only soils complying with Land Capability Classes I to III (LCCI to LCCIII) are readily acceptable for arable crop cultivation. LCC IV soils may be cultivated under certain stringent and well-managed conditions.
- LCC V usually refers to wetlands and LCC VI to non arable land that can be used only for long term crops due to steepness, soil depth and so forth
- LCC VII and VIII soils are limited to domestic livestock and wild game. The profiles studied fell into LCCVII LCC VI.

Table 8.15: Description of Land Capability Classes

Class	Concepts
I	Land in Class I has few limitations that restrict its use; it may be used safely and profitably for cultivated crops; the soils are nearly level and deep; they hold water well and are generally well drained; they are easily worked, and are either fairly well supplied with plant nutrients or are highly responsive to inputs of fertilizer; when used for crops, the soils need ordinary management practices to maintain productivity; the climate is favourable for growing many of the common field crops.
II	Land in Class II has some limitations that reduce the choice of plants or require moderate conservation practices; it may be used for cultivated crops, but with less latitude in the choice of crops or management practices than Class I; the limitations are few and the practices are easy to apply.
III	Land in Class III has severe limitations that reduce the choice of plants or require special conservation practices, or both; it may be used for cultivated crops, but has more restrictions than Class II; when used for cultivated crops, the conservation practices are usually more difficult to apply and to maintain; the number of practical alternatives for average farmers is less than that for soils in Class II.
IV	Land in Class IV has very severe limitations that restrict the choice of plants, require very careful management, or both; it may be used for cultivated crops, but more careful management is required than for Class III and conservation practices are more difficult to apply and maintain; restrictions to land use are greater than those in Class III and the choice of plants is more limited.
V	Land in Class V has little or no erosion hazard but has other limitations which are impractical to remove that limit its use largely to pasture, range, woodland or wildlife food and cover. These limitations restrict the kind of plants that can be grown and prevent normal tillage of cultivated crops; it is nearly level; some occurrences are wet or frequently flooded; others are stony, have climatic limitations, or have some combination of these limitations.
VI	Land in Class VI has severe limitations that make it generally unsuited to cultivation and limit its use largely to pasture and range, woodland or wildlife food and cover; continuing limitations that cannot be corrected include steep slope, severe erosion hazard, effects of past erosion, stoniness, shallow rooting zone, excessive wetness or flooding, low water-holding capacity; salinity or sodicity and severe climate.
VII	Land in Class VII has very severe limitations that make it unsuited to cultivation and that restrict its use largely to grazing, woodland or wildlife; restrictions are more severe than those for Class VI because of one or more continuing limitations that cannot be corrected, such as very steep slopes, erosion, shallow soil, stones, wet soil, salts or sodicity and unfavourable climate.
VIII	Land in Class VIII has limitations that preclude its use for commercial plant production and restrict its use to recreation, wildlife, water supply or aesthetic purposes; limitations that cannot be corrected may result from the effects of one or more of erosion or erosion hazard, severe climate, wet soil, stones, low water-holding capacity, salinity or sodicity.

8.6.3. Impact Assessment

As the entire exercise is aimed at an upgrade of existing, established and well used roads the impact will be minimal. If anything, the impact could be beneficial as road surfaces will now be stabilised, thus limiting the risk of damage from storm water runoff at unplanned localities as the roadbed deepens as a result of grading. This deepening can cause storm water to accumulate volume and velocity which will eventually run off the road in a solid stream, thus creating an erosion hazard.

The main threat is the risk of erosion arising from temporary service roads running parallel to road under upgrade. Topsoil should be removed and stockpiled nearby until the upgraded section is completed. The service road can then be resurfaced using the stockpiled topsoil. In addition to grass seed stored in the stockpile pioneer grasses such as Natal Red Top (Melinis Repens) will soon establish themselves.

conclusions and recommendation

In view of the terrain and generally poor soils found along most of the roads, the permanent hardening of road surfaces will not only eliminate nuisance dust but also contribute towards minimising the risk of the accumulative impact of volume and velocity of storm water by maintaining road surfaces at a uniform level with surrounding veld, thus contributing significantly to storm water runoff from the road surface being kept at a minimal risk of causing soil erosion.

8.7. Aquatic Impact Assessment

The information in this section was gleaned aquatic assessment report compiled by Afzelia Environmental Consultants (2022) for the proposed project. The report is attached as Appendix D5.

8.7.1. NFEPA Wetlands and Rivers

According to Figure 8. 11 below no NFEPA Prioritised Wetlands are located within the 500m regulated area. This is to be confirmed by the wetland specialist field verification. The proposed roads will however intersect multiple NFEPA rivers at different points. These include the Batshe and Buffels rivers. The vast majority of the roads also occur within an important upstream water management area which means that human activities need to adequately be managed to prevent degradation of downstream river FEPAs and Fish Support Areas. The western road portion occurs in an important fish corridor. These are areas required for migration between required habitats, usually between mainstem and tributary habitat.

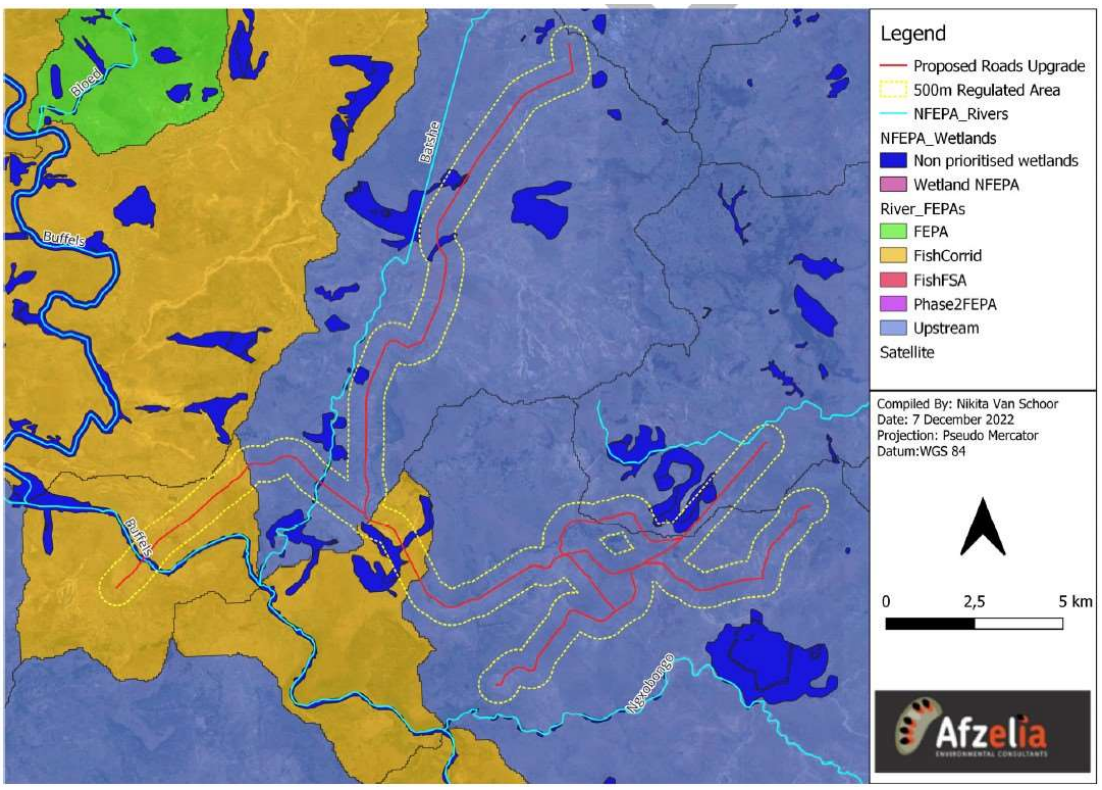


Figure 8.11: Aquatic and Wetland FEPA and River FEPA coverage within proximity to the study

8.7.2. Site Sensitivity

The DFFE Screening Tool has indicated that the area of the proposed road upgrades falls within very high Aquatic Biodiversity Combined Sensitivity (Figure 8.12). The very high sensitivity is linked to the Important Upstream Management Area and Fish Corridor Areas. The proposed project is unlikely to impact the Strategic Water Source Area.

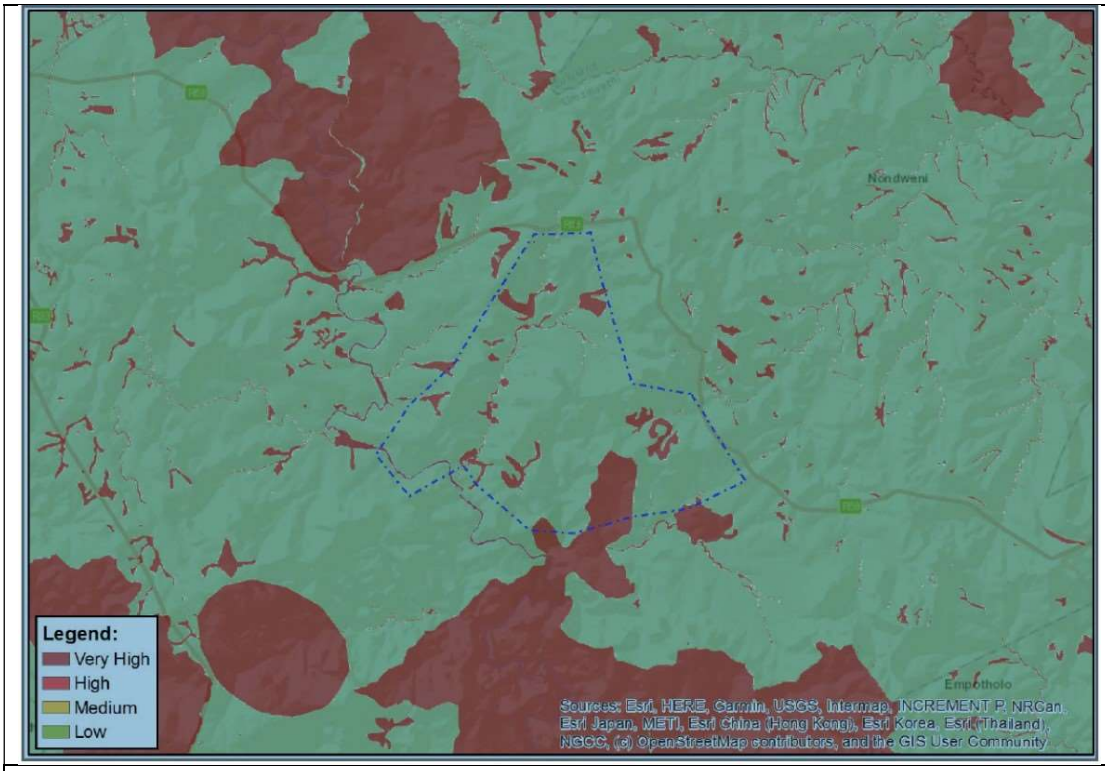


Figure 8.12: Aquatic site sensitivity according to the DFFE screening tool

8.7.3. Present Ecological State

The aquatic constraints of the wider study area are shown below in Figure 8.13. The Buffels watercourse and its associated floodplain have a Present ecological category "C" and are deemed to be of high aquatic ecological sensitivity and importance. Impacts to this watercourse include surrounding villages, rad crossings, sub farming and overgrazing. The Batshe watercourse and floodplain is in a poorer ecological condition (has a Present ecological category "D") and is also deemed to be of high aquatic ecological sensitivity and importance. Surrounding land cover and associated activities which are impacting on this watercourse are villages, cultivation, roads, erosion in the tributaries and banks, overgrazing and sand mining.

The reference species list for fish known to occur within similar habitats within the general study area is provided in Table 8.16 below. The list includes a diverse range of fish species such as eels, various barbs, yellowfish and tilapia.

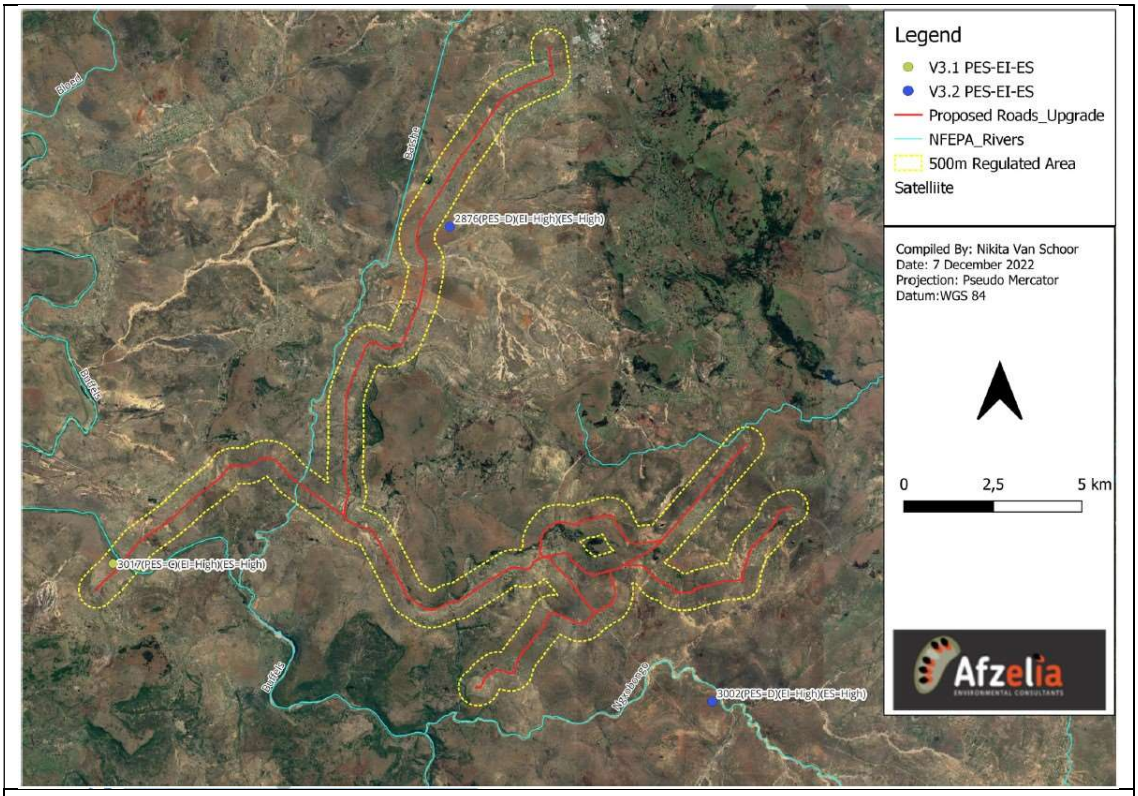


Figure 8.13: Ecological State of the catchment rivers

Table 8.16: Table 0.2: Summary of the potential fish species present within the study area based on historic sampling as part of the River Health Programme and reference data for local SQRs (DWAF, 2007; DWS, 2014). Note that cells marked with a 'dash' indicate no species caught.

Scientific Name	Common Name
Anguilla mossambica	Longfin Eel
Barbus anoplus	Chubbyhead barb
Barbus natelensis	Scaly
Barbus pallidus	Goldie barb
Barbus paludinosus	Straightfin barb
Barbus vivoparus	Bowstripe barb
Clarious gariepinus	Sharptooth catfish
Labeo molybdinus	Leaden labeo
Labeo rubromaculatus	Tugela labeo
Oreochromis mozambicus	Mozambique tilapia
Tilapia sparrmanii	Banded Tilapia

8.7.4. Aquatic Impact Assessment

Direct Impacts to the Watercourse

During the construction phase of the proposed road upgrades and new road construction, there will be definite impacts imposed onto the watercourses, namely through excavations, general road construction activates (e.g. foundation and road surface placement, etc), and destruction of the stream bank. Many of the culverts which presently transverse the streams are old and dilapidated. These culverts will need to be place and or repaired. The culverts, in turn, will inevitably impact the geomorphology and flow of surface water, leading to further habitat loss and a potential loss of aquatic biodiversity. These impacts have potential far reaching consequences for downstream users, such as farmers requiring water for irrigation purposes. The summarised results are provided in Table 8.17., overleaf.

Table 8.17: Summarised impact significance results for direct impacts to the watercourse

Impact	Construction Phase		Operational Phase	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Transformation of watercourse habitat	12 (Low)	12 (Low)	NA	NA
Direct disturbance of watercourse habitat	32 (Moderate)	18 (Low)	NA	NA
Increased flood peaks in watercourses because of stream bed alteration	28(Moderate)	18 (Low)	33 (Moderate)	15 (Moderate)

Soil Erosion and sedimentation

Key construction activities likely to result in degradation of the watercourse habitats include (i) undertaking bulk earthworks, (ii) increased run-off from compacted/hard surfaces, and (iii) bank erosion during higher flows, all of which may lead to scouring and erosion of the instream and riparian habitat.

During the operation phase, poor placement or design of stormwater control infrastructure, along with continued road-side disturbance by vehicles could further cause increased erosion and sedimentation into the watercourse. The significance of the impact was estimated as a 'moderate' impact significance for the construction phase of the project because of the placement of the roads crossing the watercourse and the inherent constant disturbance that can be associated with frequent road use. The impact risk potential even with mitigation measures remains "moderate'. Summarised results are provided in Table 8.18., below.

Table 8.18: Summarised impact significance results for the degradation of freshwater habitat.

Impact	Construction Phase		Operational Phase	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Increased sediment input and increased run-off into watercourses	45 (Moderate)	20 (Low)	30 (Moderate)	27 (Moderate)

Water and Soil Pollution Impacts

Potential construction phase contaminants include hydrocarbons, oils and grease, bitumen, cement and other binding agents associated with road construction. These may enter the nearby watercourse as surface runoff, directly into the watercourse during construction of the watercourse crossing or through inadequately designed/maintained stormwater management infrastructure. Hydrocarbons and volatile compounds (e.g. bitumen) are particularly toxic to aquatic ecosystems, which ultimately significantly negatively affects the integrity/quality of the receiving riparian vegetation and aquatic ecosystem.

Consequently, oil and/or chemical spills reduce the suitability of water for consumption (by humans and livestock) and for use in irrigation (applicable in this instance with surrounding agriculture). Toxic spills potentially result in fatalities of aquatic fauna sensitive to water quality changes, leading to a further shift in species composition, favouring tolerant species. Pollution during the operational phase will likely be experienced once road contaminants are washed off during a rainfall event and flushed into the adjacent watercourse.

The potential risk of pollution was determined to be equal during the construction and operational phases of the project, indicated by a 'moderate' impact significance rating, with and without mitigation measures. This is predominantly driven by the fact that the roads cross the watercourses in different locations, which will entail the upgrading or construction of new culverts. Proper maintenance of construction vehicles along with appropriate storage of volatile chemicals and fuels will minimise the risk potential of oil and/or chemical spills entering the riparian and instream habitats. Summarised results are provided in Table 8.19.

Table 8.19: Summarised impact significance results for oil/chemical pollution

Impact	Construction Phase		Operational Phase	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Oil/chemical spills – hydrocarbons, grease, cement, bitumen, tar, etc.	30(Moderate)	18 (Low)	NA	NA

Alien vegetation

Local alien invasive species may rapidly encroach into areas that have been disturbed by construction activities. Alien plant species generally out-compete indigenous species for water, light, space and nutrients as they are adaptable to changing conditions and easily invade a wide range of ecological niches (Bromilow, 2010). Alien invader plant species pose an ecological threat as they alter habitat structure, lower biodiversity (both number and "quality" of species), change nutrient cycling and productivity, and modify food webs (Zedler, 2004). If adequate rehabilitation is not done, alien invasive species could spread and compromise the integrity of the systems.

Table 8.20: Summarised impact significance results for the invasion of alien vegetation

Impact	Construction Phase		Operational Phase	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Alien invasive plant introductions through construction activities	32 (Moderate)	14 (Low)	39 (Moderate)	12 (Low)

MITIGATION MEASURES

The following mitigation measures are recommended for implementation during the construction and operational phases of the road upgrades:

Working in/near the Watercourses

i. All work to be done within sensitive riparian and instream habitats, if any, should be carried out at a time of low flow conditions (winter to early spring). It is prudent however to be prepared for increased flows by scheduling work according to the weather forecast and to be adequately prepared for unexpectedly large runoff from a sudden storm.
ii. During the upgrade of the culvert/road crossing infrastructure, activities within the streambed should be limited to an absolute minimum. Moreover, the movement of heavy machinery and/or vehicles within 10m of the watercourse should be limited in number and occurrence in an attempt to preserve riparian vegetation and minimise indirect impacts into the watercourse.
iii. If any volume of substrate is required to be removed from the watercourse, it should be kept to an absolute minimum.
iv. Any disturbed watercourse habitat should be rehabilitated as soon as construction in an area is complete or near complete and not left until the end of the project to be rehabilitated.
v. A conceptual riverine rehabilitation and monitoring plan with a focus on erosion and alien vegetation management should be compiled for the site of the new road crossing the watercourse.

Construction Footprint Limit & Demarcation

i. All construction activities must be limited to the construction servitude.
ii. All stockpiled soil/building material should be placed in areas where potential run-off is limited.
iii. Laydown, site offices and other storage areas must be clearly demarcated and located at least 30m from the boundary of any riverine or wetland habitat, ideally on flat surfaces. No incursions, work-related activities or placement of any infrastructure / equipment is permitted within wetland habitat.
iv. The use of existing access routes to the construction site must be prioritised as far as possible.

Soil Erosion and Sedimentation Control Measures

i. Sediment barriers should be installed in areas sensitive to erosion such as near water supply points, slopes, actively eroding streambanks or recently disturbed streambanks. These measures include but are not limited to - the use of sandbags, hessian sheets, silt fences, geotextiles, rock gabions, etc.
ii. The silt fence / curtain must be maintained regularly to ensure continual functionality during the construction phase.
iii. After every rainfall event, the contractor must check the site for erosion damage and immediately repair any damage recorded.
iv. Unnecessary clearing of natural areas should be kept to a minimum in order to make use of natural erosion suppressors such as good grassland cover.

Pollution Prevention Measures

i. Any soil contaminated by hydrocarbons (fuel and oils), grease, bitumen's, cement or any other binding agent use din road construction must be removed and the affected area rehabilitated immediately.
ii. Fuels, chemical and binding agents must be stored in a bunded structure with a roof. The bund must be able to contain at least 110% of the volumes of fuel.
iii. Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface.
iv. Drip trays should be utilised at all dispensing areas.
v. A chemical spill kit must be always present onsite and once used it must be disposed of at a registered hazardous landfill site.
vi. All solid waste must be collected and placed in bins.

Invasive Alien Plant Control

i. The control and eradication of a listed invasive species must be carried out in areas that are disturbed directly during the road construction phase, using methods that are appropriate for the species concerned and the environment within which it occurs.
ii. All invasive alien plants must be removed from the construction footprint, including the site camp.
iii. Mechanical control methods such as digging, hoeing, pulling out of weeds and invasive plants are recommended.
iv. Use of chemical treatment methods must be kept to a minimum.
v. Where chemical treatment methods are used, the contractor must ensure the utilisation of watercourse friendly herbicides.

vi. The methods employed to control and eradicate a listed invasive species must also be directed at the new growth, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

9. RECEIVING ENVIRONMENT: SOCIO-ECONOMIC ASPECTS

9.1. Socio-Economic Aspects

Information in this section was adapted from final Nquthu Municipality IDP 2021/22.

9.1.1. Location

Nquthu LM is a category B municipality located northeast of the Province of KwaZulu-Natal and seats at the northeastern boundary of Umzinyathi DM and share borders with the following local municipalities:

- eMadlangeni and Abaqulusi local municipalities on the North. Abaqulusi LM is located
- within Zululand DM while eMadlangeni is located within Uthukela DM;
- Ulundi LM on the East which is also located within Zululand DM;
- Nkandla LM on the South which is located within King Cetshwayo DM; and
- Msinga LM and Endumeni LM to the West both of which are located within Umzinyathi DM.

9.1.2. Population

The population of Nquthu is growing as it grew by around 6000 people between 2011 and 2016. Women population is more than that of man in Nquthu by a sizeable margin in the municipality. Births are given to more males than women, therefore; there are more males than women from 0 to 24 years. From 24 to 34 years there is equilibrium in numbers between males and females, but from 35 years upwards male numbers decreases dramatically which means that the mortality rate of males is higher than that of females.

9.1.3. Socio-economic conditions

Unemployment is the biggest challenge that faces the people of Nquthu. Unemployment figures in Table 9.1 below, paint a gloomy picture for people since all

needs of people require money. Unemployment is even higher among the youth and women, which make matters even worse.

Table 9.1: Unemployment rate (CS 2016)

Unemployment rate		Youth unemployment rate		Unemployed Household Head
2001	**2011**	**2001**	**2011**	**2011**
81.6%	44.4%	87.9%	53.3%	66%

Of the total population of 171 325 people, 34 849 have no schooling which represents a high illiteracy rate. The numbers show that most people have primary education and secondary education, which means most people do not have trading skills that can enhance their job finding opportunities. There is a strong need to improve access and also improve education levels in Nquthu especially with regard to post school education and skills development.

9.1.4. Infrastructure and services

Water: Nquthu is very prone to draught which exacerbates water scarcity even in areas where there is water infrastructure. While water provision is the function of Umzinyathi DM, people expect Nquthu LM to play a key role in ensuring that water is provided to them as it is the main basic need.

Sewerage: The overwhelming number of households does have sanitations with pit toilets beingthe dominant form of sanitation. There are still a sizeable number of bucket system toilets that has to be attended to and eliminated. While the number of households that do not have toilets is too small in relation to a total number of households, such situation is undesirable and is very unhealthy and may cause water contamination and break out of diseases.

Electricity: With an overwhelming number of households being already electrified in 2016, it is clear that improving access to electricity is one area where Nquthu LM has performed very well, especially taking into account the fact that there were electrification projects that were implemented after the Community Survey. Despite tremendous progress that has been made, there is a strong need to move with speed to electrify more households as a total electrification of Nquthu has become a possibility should there be sufficient funding.

Housing: Current settlement patterns Nquthu is composed largely of rural areas whereby people use land communally and own it collectively through Ingonyama Trust. In terms of the Housing Sector Plan, the initial backlog was 12 464 and has been reduce to 3 593 if housing projects that are under implementation and those that has

been approved for implementation are regarded as having a backlog reducing effect

Health care: Nquthu has 01 hospital, 15 clinics, and 04 mobile clinics to attend tofar-flungg areas.

Roads: Nquthu is a rural municipality that has a huge infrastructure backlog to address, especially with regard to roads.

Waste management: Nquthu LM is doing its utmost best to grapple with the challenge of waste management despite capacity challenges. A total of 3 228 households are serviced with refuse collection.

9.1.5. Impacts on socio- economic

The following **short-term** socio-economic impacts are expected to occur during the construction phase of the proposed project:

- Small-scale job creation and support of local job opportunities through support of local businesses in the procurement of materials, equipment and services used in the construction phase.

Long-term socio-economic impacts during the operational phase include:

- Creation of long-term job opportunities, in the business component.
- Contribution to alleviating the shortage of housing in the area.
- Contributing to the local economy through job creation and an anticipated increase in local spending, as the development is anticipated to new residents – who are likely to have disposable income – and the creation of jobs will lead to increased disposable income for the people employed in the development.

Table 9.2: Socio-economic impacts

CONSTRUCTION PHASE							
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance without mitigation**	**Significance with mitigation**
Employment creation	Positive	Local	Short term	Medium-High	Definite	Medium	Medium-High
Supporting local businesses through local procurement of materials, equipment & services	Positive	Local to Sub-regional	Short term	Medium-High	Highly probable	Medium	Medium-High
Possible increase in criminal activity and/or rowdiness	Negative	Local	Short term	Unknown	Possible	Unknown	Low-Medium
OPERATIONAL PHASE							
Job creation with the businesses to occupy the planned business sites	Positive	Local	Long term	Low-Medium	Highly probable	Low	Low-Medium
Decreasing the backlog of housing and amenities in the area	Positive	Local	Long term	Medium-high	Definite	Medium	Medium-high

9.2. , Noise and Visual Aspects

9.2.1. Noise

The proposed roads for upgrades are passes through a few villages in the Isandlwana area and the ambient noise level on the site is low, comprising mainly of vehicles using the roads, sounds associated with human habitation in the affected villages, and the limited sounds of livestock and herders.

9.2.2. Visual

The proposed roads for upgrades are passes through a few villages, water curses, and natural areas in the Isandlwana area. The routes are used mainly by locals and there are livestock that grace along the routes.

9.2.4. Potential Impacts

Construction-phase impacts are anticipated to be mainly associated with construction activities themselves, including earthworks, off-loading of material from trucks, etc., as well as with increased traffic during construction (construction vehicles and the transport of construction workers). In terms of the visual impacts construction-phase impacts are related to construction activities such as clearing of vegetation and actual construction.

Construction-phase impacts will be fairly short-term in duration, occurring only whilst construction is underway. Construction-phase noise impacts are therefore anticipated to be of low to medium significance.

<u>Operational phase</u>

Potential noise impacts during the operational phase are anticipated to relate mainly to the road users as currently before the construction phase. The operational phase visual impact of the proposed development is anticipated to be low, as the proposed developments are compatible with existing

Table 9.3: Visual and Noise impacts

CONSTRUCTION PHASE							
Potential impact	**Status**	**Extent**	**Duration`**	**Magnitude**	**Likelihood**	**Significance without mitigation**	**Significance with mitigation**
Visual and noise impacts of construction activities	Negative	Local	Short term	Medium-High	Definite	Medium-High	Medium
OPERATIONAL PHASE							
None- Expected							

9.4. cumulative impacts

As is the case for any activity, impacts are not limited to those directly or even indirectly associated with the proposed activity – potential cumulative impacts need to be considered as well, so that activities can be seen not as stand-alone entities but as part of the larger picture. Potential cumulative impacts of the proposed development consist of:

Cumulative bio-physical impacts

Considered together with other developments in the area, the proposed development will contribute cumulatively to minor habitat loss and fragmentation in the area. However, apart from the comparatively sensitive drainage channels, the area is not considered to be ecologically sensitive.

Cumulative socio-economic impacts

The proposed development is anticipated to contribute to alleviating the shortage of housing in the area as well as contributing to the local economy through job creation and an anticipated increase in local spending within Municipality.

Table 9.4: Cumulative impacts

CONSTRUCTION PHASE							
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance without mitigation**	**Significance with mitigation**
Job creation	Positive	Local	Short term	Medium	Definite	Low-Medium	Medium

Habitat loss	Negative	Local	Long term	Medium	Definite	Low-Medium	Low
OPERATIONAL PHASE							
Accessible and stable roads	Positive	Local	Long term	Medium-high	Definite	Medium-high	High
Contribution to the local economy	Positive	Local	Long term	Medium	Highly probable	Low-Medium	Medium

10. IMPACT STATEMENT

The preferred activity of upgrading roads: P372, P148, D897, D30, L1190, L1333, L1351, and D2286 and low-level bridges and culverts was determined and was assessed as part of this Basic Assessment report.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level.

The specialist findings from the EIA studies undertaken have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the development area. The mitigation measures have been recommended by the specialist for any sensitivity that occurs within the project site. The impacts that are expected to remain after the avoidance of the sensitive areas have been reduced through the recommendation of specific mitigation measures by the specialists. The minimization of the significance of the impacts is in line with tier 2 of the mitigation hierarchy.

Therefore, by putting the recommended mitigation or enhancement strategies into practice, impacts can be reduced to levels that are acceptable or increased. Both positive and negative effects are anticipated from a societal perspective.

It can be inferred from the development's assessment that upgrading of roads: P372, P148, D897, D30, L1190, L1333, L1351, and D2286 and low-level bridges and culverts won't have any detrimental impacts on the environment (subject to the implementation of the recommended mitigation measures).

11. PUBLIC PARTICIPATION

11.1. Public Notifications

The following has been done up to this date (Refer to Appendix E for proof of advertisements):

- Site notices were place on the 31st of October 2022 at the following locations:
  - Along different roads intersections of the affected roads (Refer to Appendix E1 for proof of site notices placements.
  - Nquthu Local Municipality
  - Nquthu Local Library Notice Board
  - Nquthu Community Hall along road P372
  - KwaNgendla Primary School
  - Buhlebamagwe Primary School
  - Asimbambisane Primary School
  - Corner spaza along route P372
- Distribution of background information document was done on the 31st of October 2022 (see Appendix E2 (copy of the BID) and E3 for a signed register of the people who received the BID).
- The I&AP list is attached as Appendix E5.
- The newspaper advert will be placed on the Ilanga Local Newspaper on the 20 April 2023. Proof of newspaper advert will be attached to the Final BAR.

11.1. Availability of the BAR for public review and comment

The Draft BAR is currently available for public review and comments for a period of 30 days from Thursday, 20 April 2023 to 23 Tuesday, 23 May 2023. Copies of the report are available at the Nquthu Local Library for review and electronically upon request QPoint Group from Thursday, 20 April 2023 to Tuesday, 23 April 2023. All comments received will be incorporated into the Final BAR for submission to DFFE.

12. IMPACT MITIGATION AND MONITORING

Please refer to the attached EMPR, which contains measures for the prevention, mitigation and/or monitoring of impacts related to the project.

*13. CONCLUSIONS AND RECOMMENDATIONS

It is recommended that Environmental Authorisation be granted to the applicant, SANRAL, for the proposed upgrades of roads: P372, P148, D897, D30, L1190, L1333, L1351, and D2286 Roads and low-level stream crossings upgraded in Isandlwana KZN Province, as described in this report.

It is recommended that the following conditions be included in the authorisation:

- Should any deviations from the current layout be contemplated, such changes must be communicated to DFFE and it must be determined whether the changes are allowable in terms of the EA or if amendment of the EA must be applied for first;
- No additional activities triggering the listed activities contained in the EIA Regulations may take place, unless EA is obtained first.
- The impact mitigation measures contained in the EMPR accompanying this report must be implemented to minimize and/or mitigate environmental impacts henceforth.
- Conditions that may be set by DFFE in terms of the EA must be adhered to. If it is found that it will not be possible to adhere to certain conditions, this must be communicated to DFFE ahead of time to prevent a non-compliant situation.
- Should any additional activities listed in terms of the EIA Regulations be planned on the site, the appropriate application(s) for authorisation must be lodged with the relevant authority.

14. REFERENCES

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