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DRAFT BASIC ASSESSMENT REPORT FOR:

PROPOSED UPGRADE OF NOSITHA ROAD IN WARD 27 WITHIN RAY NKONYENI LOCAL MUNICIPALITY (FORMERLY HIBISCUS COAST LOCAL MUNICIPALITY), UGU DISTRICT MUNICIPALITY, KWAZULU NATAL

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

Submitted on behalf of: Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality)

DOCUMENT INFORMATION

Document Name	Draft Basic Assessment Report
Title	Proposed Upgrade of Nositha Road in Ward 27 Within Ray Nkonyeni Local Municipality (Formerly Hibiscus Coast Local Municipality), Ugu District Municipality, KwaZulu Natal
Client/Proponent	Ray Nkonyeni Local Municipality (Formerly Hibiscus Coast Local Municipality)
Project Manager	SPK Engineers cc
Environmental Assessment Practitioner's Organisation	Afzelia Environmental Consultants (Pty) Ltd
Compiled by	Pene Solomon Fataki
Issue Date	27/03/2017

REVIEW OF THE DRAFT BASIC ASSESSMENT REPORT

This Draft Basic Assessment Report is available for commenting for a period of **30 days** (excluding public holidays) from **Monday 27/03/2017 until Tuesday 02/05/2017**. A copy of the Basic Assessment Report is available at strategic public places within the project area and upon request from Afzelia Environmental Consultants (Pty) Ltd.

The report is available for viewing at the following Public place:

- Nositha Community Creche
- Afzelia website: www.afzelia.co.za.

Please send your comments and queries before **02/05/2017** to:

Company	Afzelia Environmental Consultants (Pty) Ltd
Address	PO Box 37069, Overport, 4067
Contact Person	Solomon Fataki
Telephone Number	031 303 2835
Fax Number	086 692 2547
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ACRONYMS AND ABBREVIATIONS

DCP	Dynamic Cone Penetrometer
DEA	Department of Environmental Affairs
DoL	Department of Labour
DoH	Department of Health
DAFF	Department of Agriculture, Forestry and Fisheries
COGTA	Department of Cooperative Governance and Traditional Affairs
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
SIP	Strategic Integrated Projects
EMF	Environmental Management Framework
SADC	South African Development Community
PI	Plasticity Index
MOD	Modified
AASHTO	American Association of State Highway and Transportation Officials
CBR	California bearing ratio
VPH	Vehicles Per Hour
SAQA	South African Qualifications Authority
LA21	Local Agenda 21
LaRSSA	Land Rehabilitation Society of Southern Africa
ELA	Environmental Law Association
IAP2 SA	International Association for Public Participation Southern Africa
IAIAsa	International Association for Impact Assessment South Africa
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DMOSS	Durban Metropolitan Open Space System
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control officer
EIA	Environmental impact Assessment
EIS	Ecological Impact and Assessment
EMPr	Environmental Management Programme
EPWP	Expanded Public Works Program
DCP	Dynamic Cone Penetrometer
TRH	Technical Recommendations for Highways
KM	Kilometre
GG	Government Gazette
GIS	Geographic information System

GIS	Geographic Information System
GN	Government Notice
HGM	Hydrogeomorphic Unit
I&AP	Interested and Affected Parties
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
NEMA	National Environmental Management Act (107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act (No 36 of 1998)
PAHs	Polycyclic Aromatic Hydrocarbons
PES	Present Ecological State
PPP	Public Participation Process
SABS	South African Bureau of Standards
SANS	South African National Standards
SDF	Spatial Development t framework
SUDS	Sustainable Urban Drainage Systems
SWMP	Storm water Management Plan
TWQR	Target Water Quality Range
VOCs	Volatile Organic Compounds
WULA	Water Use License Application

EXECUTIVE SUMMARY

Introduction and Background

Afzelia Environmental Consultants (Pty) Ltd has been appointed by SPK Engineers cc, on behalf of the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Local Municipality) to undertake an Environmental Impact Assessment (EIA) in the form of a Basic Assessment (BA) process, as well as a Water Use License Application (WULA) for the proposed upgrade of Nositha Road.

Consequently, Ray Nkonyeni Local Municipality, in view of the importance of this route to local residents, has decided to improve the living standards of the communities of Nositha Ward 27 by providing, among other services, improved access road infrastructure.

Summary of principal objectives

This report constitutes the Draft Basic Assessment Report (DBAR) which details the assessment of key environmental issues and impacts associated with the development, and document Interested and Affected Parties (I&AP) issues and concerns. Furthermore, it provides background motivation, details of the proposed project and describes the public participation undertaken.

Description of Proposed Activity

The upgrading project will start where the road changes from black top to gravel at approximately 30°50'30.0"S 30°19'56.1"E; and ends at 30°49'16.8"S 30°18'44.7"E. The existing road length is 4.4km and will be resurfaced to black top (formal asphalt surfacing) with associated base course and sub base pavement layers. Stormwater drainage management installations such as culverts and concrete side drains infrastructure will also form part of the proposed upgrade.

The road will ultimately be a 5m wide black top surface with a road reserve of 10 to 15m and with full surface drainage, including kerb, channel and concrete lined v-drains.

The design speed will be 60km/hr as the alignment is situated in a rural area with wandering livestock and children and a crèche situated close to the road.

The construction of gabion baskets is recommended at inlet and outlet structures to prevent any erosion. Gabion baskets will be constructed at outlets to prevent eroding of the side slopes.

The construction of box and pipe culverts will occur at seven (7) different positions of existing stormwater infrastructures at the following coordinates shown in the below:

Table 1: Position of stormwater infrastructures

Installation Type	Chainage	GPS Co-ordinates	
Bridge (Existing pipe culverts to be replaced with box culvert)	1 510.0m	30⁰49'46.3" S	30⁰20'01.3" E
Culvert 1 (Existing pipe culvert to be replaced with bigger one)	138.0m	30⁰50'25.8" S	30⁰19'55.1" E
Culvert 2 (Existing pipe culvert to be replaced with bigger one)	1 450.0m	30⁰49'47.0" S	30⁰20'2.6" E
Culvert 3 (Existing pipe culvert to be replaced with bigger one)	1 823.0m	30⁰49'46.5" S	30◦19'50.6" E
Culvert 4 (Existing pipe culvert to be replaced with bigger one)	2 384.0m	30⁰49'47.4" S	30⁰19'31.5" E
Culvert 5 (Existing pipe culvert to be replaced with bigger one)	2 756.0m	30⁰49'46.4" S	30⁰19'18.4" E
Culvert 6 (Existing pipe culvert to be replaced with bigger one)	4 226.0m	30⁰49'21.3" S	30⁰18'50.4" E

The construction work for this road upgrade project will entail:

- Search and locate existing services (water, sewer, and electrical services).
- Alterations to existing services if required.

- The construction of 4.4km of surfaced roads, the width is 5m.
- Bulk Earthworks to achieve specified levels.
- Construction of pavement layers as specified below.
- Construction of stormwater infrastructure (bridge culvert and stormwater pipes).
- Furnish the roads with mountable kerbs on either side.
- Asphalt or Seal Surfacing.
- Road Markings.
- Erection of all required road signage and road marking.
- Finish off all sidewalks or walkways as required.

The main works according to the method statement for culvert construction provided by SPK Engineers for the upgrade of Nositha Road will consist of the following activities:

- Setting out by use of pegs to mark points on the ground,
- Temporary diversion where the streams are flowing to allow the water to continuing flowing during construction,
- Excavations by use of the excavator,
- Surface preparation to maintain the required levels as per the original construction drawings,
- Blinding the base to the specified thickness using materials complying with specifications and of approved mix design,
- Reinforcement,
- Formwork,
- Batching and mixing by means of concrete mixer and concrete casted and compacted using poker vibrator
- Quality control,
- Placing of culverts lifted by the Crane or Excavator and placed on top of constructed floor slab,
- Curing and backfilling and
- Finishing off: diversion will be closed off and material will be compacted to acceptable standard.

Legislation and Regulatory Requirements

The proposed Nositha Road upgrade project triggers Listed Activities as stipulated in the EIA Regulations (2014) promulgated in terms of the NEMA, 1998 (Act 107 of 1998) as amended under Government Notice No. 982, 983 and 985 of 04 December 2014 (DEA, 2014). The activities contained in Listing Notice 1 of the EIA Regulations 2014 (GN R. 983, dated 04 December 2014), promulgated in terms of the National Environmental Management Act, must be subjected to a Basic Assessment.

The following table provides a summary of the Listed Activities in terms of the EIA Regulations 2014 that are triggered by the proposed project:

Government Notice Number	Activity number	Description of each listed activity
No. R. 983 of December 2014 (Listing Notice 1)	9	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.
No. R. 983 of December 2014 (Listing Notice 1)	12	The development of - (iii) bridges exceeding 100 square metres in size; (vi) bulk stormwater outlet structures exceeding 100 square metres in size where such development occurs (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.

No. R. 983 of December 2014 (Listing Notice 1)	19	The infilling or depositing of any material of cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse.
No. R. 983 of December 2014 (Listing Notice 1)	24	The development of- (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.

Due to the proposed project occurring within the 1:100 year floodline of a watercourse and within 500m radius of a wetland, a Water Use Authorisation Application must be submitted to the Department of Water and Sanitation (DWS) in terms of Section 21 (c) or (i) in accordance with the NWA. The proposed road upgrade requires a water use authorisation in terms of Section 21 (c) or (i); in accordance with the provisions of the National Water Act 1998 (Act No. 36 of 1998).

The following table provides a summary of water uses that apply to this upgrade:

Activity Number	Water Use	Description
Section 21 (a) of NWA of 1998	taking water from a water resource	• Taking water from a water resource means abstracting or pumping of water from underground or from any other water resource such as a stream, a river, dam, spring, pan, aquifer, wetland, lake or estuary or from a borehole.
Section 21 (c) of NWA of 1998	Impeding or diverting the flow of water in a watercourse	• Impeding flow means the temporary or permanent obstruction or hindrance to the flow of water into a watercourse by structures built either fully or partially in or across a watercourse. • Diverting flows means a temporary or permanent structure causing the flow of water to be re-routed in a watercourse for any purpose.
Section (i) of NWA of 1998	Altering the bed and banks of a watercourse or characteristics of a watercourse	• Altering the bed and banks means any change affecting the resource quality of the watercourse (the area within the riparian habitat or 1:100 year floodline, whichever is greatest).

Alternatives

No alternative sites and layout plans have been assessed.

There is no other possible route except this existing route as identified as the other land is occupied for residential area. The proposed location of the Nositha road and associated stormwater infrastructures is the preferred site as it upgrades an existing road alignment and crossings within an existing road reserve. Site alternatives other than the location of the current road alignment and associated stormwater infrastructures have not been assessed as this would have meant realigning the existing road which would inevitably have a greater net economic and biophysical impact on the environment, namely streams, riparian, wetland and residential areas.

The no-go alternative would leave the existing Nositha Road in its current state. The no-go alternative will not require any construction works or create negative impacts on the existing environment (stream, wetlands, vegetation, surrounding land owners and residents) as a result of construction. However, the threat to agricultural resources, biodiversity and water resources as a result of soil erosion, sedimentation and encroachment of alien invasive species will remain. No temporary job opportunities or skill development will occur for the local communities during the construction phase.

Specialist Studies

The following specialist studies were conducted for the proposed causeway project and are included within the Appendices of this Final Basic Assessment Report (fBAR):

- Wetland assessment and rehabilitation plan;
- Aquatic ecological assessment;

- Vegetation assessment;
- Desktop heritage and paleontological assessment; and
- Geotechnical Investigation.

KEY CONCERNS

The primary key concerns with regard to the biophysical environment identified for the proposed development, which will require careful management, are:

- Direct impacts to wetlands;
- Direct impacts to aquatic habitat;
- Direct impacts to terrestrial and riparian vegetation;
- Hydrological impacts (flow-related modifications);
- Increase stormwater flows of the new hardened surface
- Erosion and sedimentation risk including bank instability;
- Water pollution/contamination risk during construction; and
- Alien plant infestation post-disturbance.

Public Participation Process

A pre-application meeting for the Water Use Licence Application process was held with the DWS Regional Office on the 25th of July 2016.

The Heritage Impact Assessment Study and Background Information Document (BID) were uploaded into the AMAFA website on the purpose of this application for comment in terms of section 38(8) of the National heritage legislation and NEMA. A comment from AMAFA regarding this application was received on the 17th November 2016 and it has been included in the comment and response report**.**

A background information document (BID) was sent to the key stakeholders via email. Background information documents were also erected to the pole at the start of the proposed road upgrade and left at the Inkanyezi "spaza" shop.

A total of five (5) site notices were erected along the proposed road route which displayed the details of the proposed project, location and application process. The Environmental Assessment Practitioners details were also displayed. These notices served to inform I&AP's of the project and afforded them the opportunity to comment.

The draft BAR will be available for Authority and public review for a total of 30 legislated days from **27 March 2017** to **02 May 2017** and upon request from the EAP. In order to distribute the information regarding the proposed development to the broader public and to ensure that all potential I&AP's are given the opportunity to comment. A commenting period of 30 days has been given with regards to the Draft Basic Assessment process and 60 days for the water use license application processes.

The report has been made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Public Place: Nositha Road Community Creche; and
- Afzelia Environmental Consultants website: www.afzelia.co.za

Proposed Monitoring and Auditing

Monitoring and auditing schedules have been proposed in this report for each phase of the development to address how identified impacts and mitigation will be monitored and/or audited by an independent Environmental Control Officer (ECO) with relevant experience and knowledge for vegetation and rehabilitation.

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1. DETAILS OF THE CORE PROJECT TEAM

1.1 Contact Details of the Proponent / Applicant and Project Manager

Table 2: Contact details of Proponent and Project Manager

Proponent	Ray Nkonyeni Local Municipality				
Contact person	Mr Richard Dlamini				
Physical address	10 Connor Street, Port Shepstone, 4240				
Postal address	PO Box 5, Port Shepstone, 4240				
Email	sabatha.dlamini@rnm.gov.za	**Fax**	0865297095	**Tel**	0396882137
Project Manager	SPK Engineers				
Contact person	Mr Ramofubedu Samuel Makubo				
Physical address	Suite 25, Calypso Centre, Kruger Rand Street, Richards Bay, 3900				
Postal address	Same as above				
Email	samuelm@spkengineers.co.za	**Fax**	035 789 4970	**Tel**	083 3927941

1.2 Name and Contact Details of Environmental Assessment Practitioner (EAP)'s Organisation

Table 3: Contact details of EAP's Organisation

Contact details of the EAP's organisation	
Business Name	Afzelia Environmental Consultants (Pty) Ltd
Physical Address	76 Valley View Road, Morningside, Durban, 4001
Postal Address	PO Box 37069, Overport, Durban, 4067
Telephone	031 303 2835
Fax	086 692 2547
Email	solomon@afzelia.co.za

1.3 Names and details of expertise of the EAP involved in the preparation of the report

Table 4: Contact details of EAPs and their expertise

Name of the EAP	Education Qualifications	Professional Affiliations	Experience at Environmental Assessments (yrs)
Mr Solomon Fataki	BSc. Environmental Management: Botany stream	IAIAsa, IAP2 SA	3

1.4 Names and details of expertise of each specialist that has contributed to the report

Table 5: Contact details of Specialists and their expertise

Name of Specialist	Educations Qualifications	Field of Expertise	Title of Specialist Report/s as attached in the Appendices
Sachen Harrichandparsad	BSc. Engineering	Geotechnical Assessments	Geotechnical Report
Frederick Volbrecht	M. Eng		
Wayne Jackson	BSc. Hydrology, soil science	Soils, Wetlands & Surface Water Assessments	Wetland Delineation and Functional Assessment & Rehabilitation Plan
Andrew Husted ((Peer Review)	MSc. Aquatic Health		
Jacob Schrijvershof	MSc Zoology	Aquatic Assessments	Baseline Aquatic Biodiversity and Risk Assessment
Andrew Husted (Peer Review)	MSc. Aquatic Health		
Gavin Anderson	M. Phil (archaeology & social psychology) Science	Heritage Assessments	Desktop Heritage Impact Assessment
Astika Bugheloo	MSc Environmental Sciences	Botanical Assessments	Botanical Assessment
Lorainmari den Boogert (Peer Review)	Master of Science Plant Science		

SECTION B: ACTIVITY INFORMATION

1. INTRODUCTION

1.1 Activity Background

Afzelia Environmental Consultants (Pty) Ltd has been appointed by SPK Engineers cc, on behalf of the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Local Municipality) to undertake an Environmental Impact Assessment (EIA) in the form of a Basic Assessment (BA) process, as well as a Water Use License Application (WULA) for the proposed upgrade of Nositha Road.

The description of the site outlined below, has been extracted from the geotechnical report (Ground Africa Consulting Geotechnical Engineers cc, Geotehnical Investigation, 2015). The existing 4.4 Km long gravel road is heavily utilised by motor vehicles and pedestrians. The general directional heading of the road is from south-east (Chainage 0.0m) to north-west (Chainage 4 400.0m). The proposed Nositha Road runs through an area which is predominately rural with subsistence farming, and the cultivation of sugarcane and banana palms.

The starting point (Chainage 0.0m) of the proposed road upgrade is marked by the transition from an asphalt surfaced road to one which has a gravel wearing course. The road follows a northerly heading until chainage 330m where the roadway deviates to the right at a partial Y-junction. From 0m to approximately 607m, the road is densely lined with tall vegetation consisting mainly of trees at the edge of the road section. The roadway in this area has been cut into the side of a moderately steep hill side to chainage 626.0m.

From 607m, residential houses appear, and these continue ad hoc along the length of the road. From chainage 626m the road follows a steep decline until a chainage of 1 012.0m. The road surface along this section was noted to be narrow in places and has some rutting[1]. Homesteads, shops, municipal water main as well as Eskom powerlines are present in close proximity to the road reserve. The levelled cut platforms on which these structures are situated border directly against the edge of the road in places. The roadway follows a steep slope from chainage 1 012.0m in a north-easterly direction down towards a chainage of 1 500.0m.

Nositha Road crosses a small unnamed stream, a tributary to the Vungu River, flowing from south to north at approximately 1.5km along the road. The directional heading of the road changes from a northerly heading to a westerly heading and passes over a single carriage way concrete bridge at this point. The river bridge observed at chainage 1 500.0m is approximately 19.0m long and 3.6m wide. The bridge can only accommodate single vehicle traffic due to width restrictions. Erosion barriers, comprising of gabions, have been used to line the bridge wing walls. The stream bed was noted to be lined with sandstone boulders. The base of the bridge which is elevated above the stream bed has circular concrete drainage pipes in order to accommodate periods of high water flows. The bridge abutments could not be viewed.

The bridge crossing marks the lowest point of the road alignment with a moderately steep incline being experienced thereafter, until a chainage of 2 176.0m. Owing to the extremely steep incline which follows a hair-pin bend located at chainage 2 868.0m, the road alignment along this inclining section is overlain with concrete surfacing from chainage 2 176.0m to 2 949.0m. A concrete side drain has been constructed along the northern shoulder of the road which feeds into a culvert in the lower section. Hard rock sandstone exposures are present in the road cut faces along this steep road section.

The roadway continues in a northerly direction from chainage 2 868.0m to a chainage of 3 010.0m. Thereafter, the directional heading of the road changes to the west. The road surface was noted to be rutted in some places and concrete side drains have been installed along the western shoulder of the road in order to accommodate stormwater flow.

The roadway follows a moderate slope in a westerly direction until chainage 3 470.0m. Sandstone rock was noted to outcrop at the surface in close proximity to the road. A T-junction is present at chainage 3 470.0m with the earmarked alignment bending right in a northerly direction until chainage 3 774.0m. The western border of the roadway is marked by the Mbumbazi Nature Reserve.

The directional heading of the roadway follows a westerly direction to a chainage of 3 774.0m and deteriorates to a gravel track at chainage 4 100.0m. The eroded gravel track continues to the end chainage of 4 400.0m and there are large open spaces of grassland towards the end of the road. The track appears to be used frequently by vehicles.

Stormwater culverts were observed at seven (7) locations along the proposed road alignment which assist in draining surface runoff from the one side of the road to the other where the water is discharged into natural drainage channels. The existing culverts observed on site were found to have 450.0mm diameter concrete drainage pipes which pass under the road into lower lying areas. Some culverts were noted to have formal brickwork housings around their entry and exit points, whereas others have merely been placed beneath the existing roadway. The performance of the culverts appears to have been hindered by blockages through sedimentation. Refer to the **photos 1 to 8** below showing existing conditions of the road.

Consequently, Ray Nkonyeni Local Municipality, in view of the importance of this route to local residents, has decided to improve the living standards of the communities of Nositha Ward 27 by providing, among other services, improved access road infrastructure.

[1] a depression or groove worn into a road by the travel of wheels.

Photograph 1: Shows the existing condition of the start of the Nositha Road.

Photograph 2: Shows the existing condition of Nositha Road with dense vegetation along the edges, particularly in the beginning of the road.

Photograph 3: Shows the existing condition of Nositha Road. Note, no storm water management system has been provided.

Photograph 4: Shows the existing condition of Nositha Road with storm water drains for 561m along the inner edge.

Photograph 5: Shows the close proximity of a "spaza" shop along the road.

Photograph 6: Shows the existing condition of Nositha Road. Note, alien vegetation lines the road, and Eskom powerlines are in close proximity to the road reserve.

Photograph 7: Shows the erosion at the end of Nositha Road.

Photograph 8: Shows the erosion at the end of Nositha Road.

1.2 Purpose of the BA Report

The main purpose of this report is to:

- Determine the policy and legislative context within which the activity is located and how the activity complies with and responds to said policy and legislative context;
- Identify the alternatives or motivations considered, including the activity, site location, and layout alternatives;
- State the need and desirability of the proposed activity;
- Provide a description of the receiving environment that would be affected by the proposed activity;
- Identify the preferred site through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of the identified preferred alternatives focusing on the geographical, physical, biological, social, economic and cultural aspects of the environment;
- Provide a summary of the specialist studies conducted as part of the BA process;
- Determine the significance, duration and probability of the impacts occurring to inform the technology and micro-siting of the activity on the site;
- Identify the most compatible micro-siting for the activity;
- Identify, assess and rank the significant impacts and risks the activity will impose on the preferred site through the lifetime of the activity;
- Identify suitable measures to avoid, reverse, mitigate or manage identified impacts;
- Identify residual risks that need to be managed and monitored;
- Describe the public participation process that was undertaken; and
- Make recommendations for decision-making (DEA, 2014).

1.3 Regional Setting and Location of Activity

The proposed road to be upgraded is situated in the Nositha rural area Ward 27 within Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Local Municipality), Ugu District Municipality, KwaZulu Natal. The proposed site falls under the jurisdiction of Mavundla Traditional Authority and is found within the Quarter Degree Grid Square 3030CD and is located approximately 4.0km west of the coastal town of Margate. Refer to **Figure 1** for the Locality Map and **Figure 2** for the Aerial Maps.

The geographical co-ordinates of the proposed road upgrade are shown in table 5 below:

Table 6: Coordinates of the proposed site

	START POINT		END POINT		LENGTH
	LATITUDE	LONGITUDE	LATITUDE	LONGITUDE	
Nositha Road	30° 50’ 30.0”	30° 19’ 56.1”	30° 49' 16.8"	30° 18' 44.7"	4.4 KM

1.4 Property Description

The properties affected by the proposed upgrade of Nositha Road are reflected in Table 6 below.

Table 7: Properties associated with Nositha road

Property Name	Surveyor-General Cadastral Code No.	Diagram Deed Reference	Owner
Farm 15845 of Alfred Native Location No. 5	N0ET00000001584500000	Vol. fol. 5 Grant No 4666	Ingonyama Trust Board
Farm 14136 of HOHELUFT	N0ET00000001413600000	SG No. 4359/1954	Ingonyama Trust Board
Portion 21 of Farm No. 15357	N0ET00000001535700018		Ingonyama Trust Board

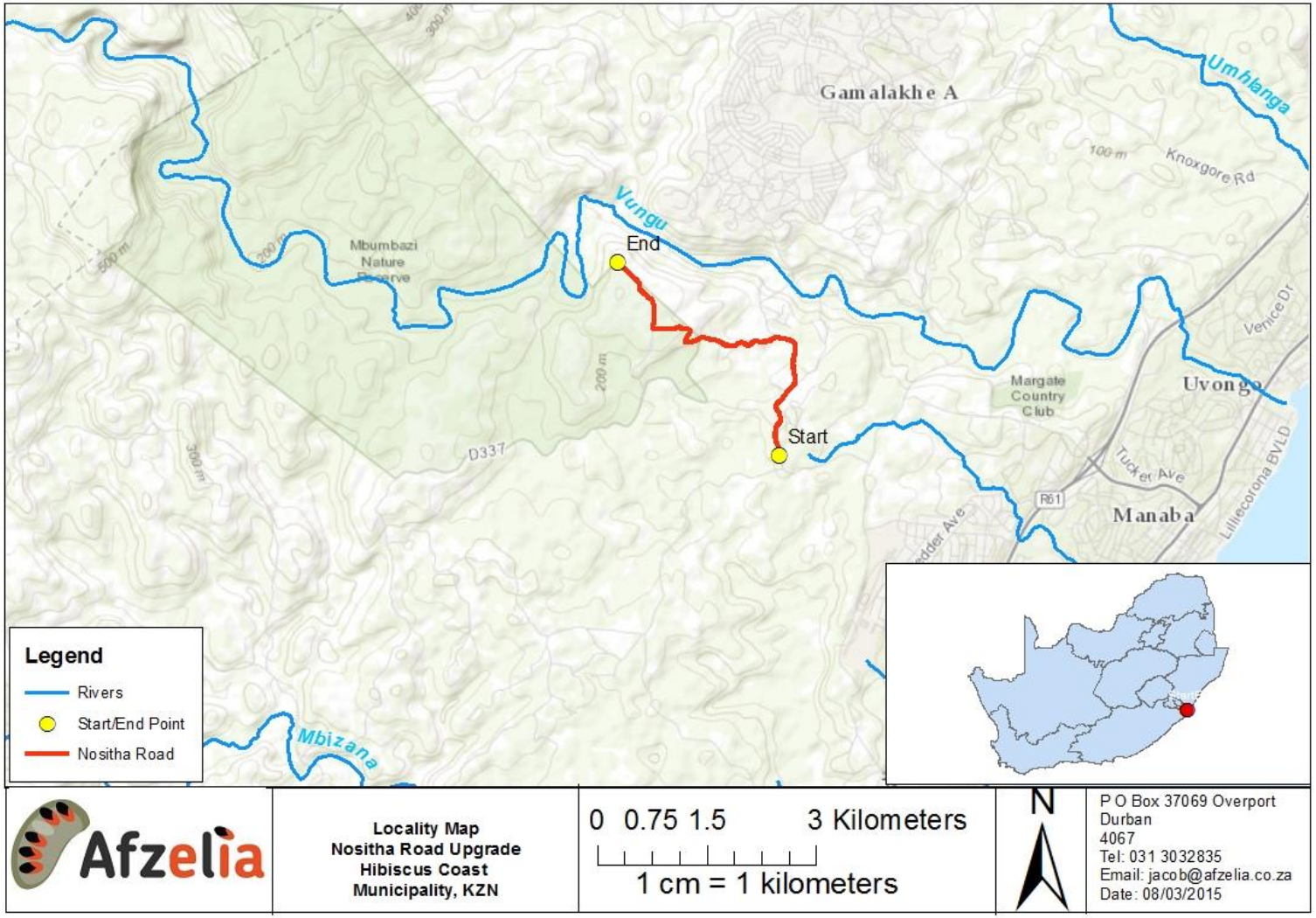

Figure 1: Locality Map

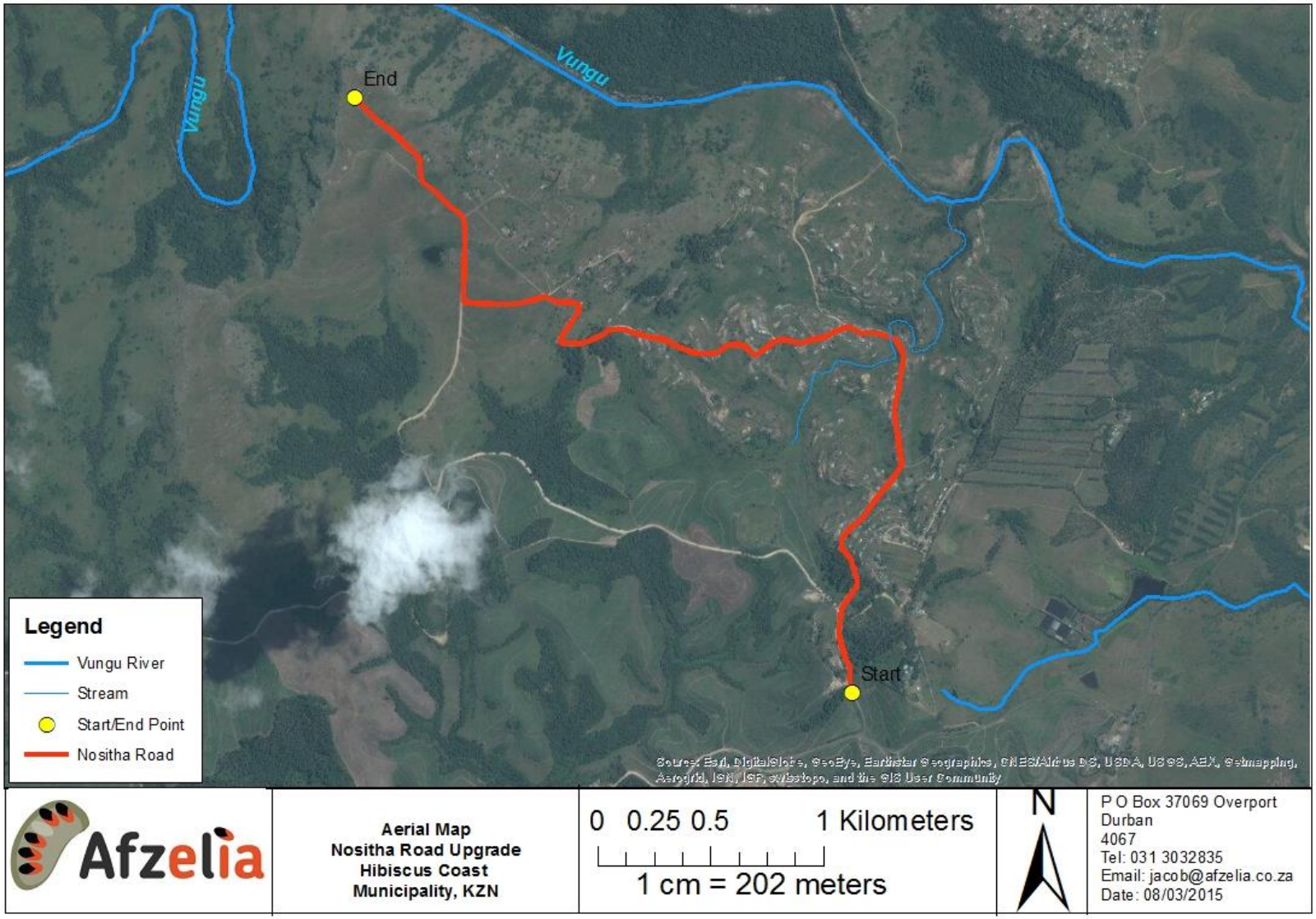

Figure 2: Aerial Map

2. CONCEPTUALISATION OF ACTIVITY

2.1 Project Description

According to the preliminary engineering report attached in **Appendix D6** compiled by SPK Engineers for the upgrade of Nositha Road (SPK Engineers cc, Preliminary Design report, 2015), the road upgrade is proposed as follows:

The upgrading project will start where the road changes from black top to gravel at approximately 30°50'30.0"S 30°19'56.1"E; and ends at 30°49'16.8"S 30°18'44.7"E. The existing road length is 4.4km and will be resurfaced to black top (formal asphalt surfacing) with associated base course and sub base pavement layers. Stormwater drainage management installations such as culverts and concrete side drains infrastructure will also form part of the proposed upgrade.

The road will ultimately be a 5m wide black top surface with a road reserve of 10 to 15m and with full surface drainage, including kerb, channel and concrete lined v-drains.

The design speed will be 60km/hr as the alignment is situated in a rural area with wandering livestock and children and a crèche situated close to the road.

The construction of gabion baskets is recommended at inlet and outlet structures to prevent any erosion. Gabion baskets will be constructed at outlets to prevent eroding of the side slopes.

The construction of box and pipe culverts will occur at seven (7) different positions of existing stormwater infrastructures at the following coordinates shown in the **table7** below and **Figure 3**:

Table 8: Position of stormwater infrastructures

Installation Type	Chainage	GPS Co-ordinates	
Bridge (Existing pipe culverts to be replaced with box culvert)	1 510.0m	30⁰49’46.3” S	30⁰20’01.3” E
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Culvert 2 (Existing pipe culvert to be replaced with bigger one)	1 450.0m	30⁰49’47.0” S	30⁰20’2.6” E
Culvert 3 (Existing pipe culvert to be replaced with bigger one)	1 823.0m	30⁰49’46.5” S	30◦19’50.6” E
Culvert 4 (Existing pipe culvert to be replaced with bigger one)	2 384.0m	30⁰49’47.4” S	30⁰19’31.5” E
Culvert 5 (Existing pipe culvert to be replaced with bigger one)	2 756.0m	30⁰49’46.4” S	30⁰19’18.4” E
Culvert 6 (Existing pipe culvert to be replaced with bigger one)	4 226.0m	30⁰49’21.3” S	30⁰18’50.4” E

The construction work for this road upgrade project will entail:

- Search and locate existing services (water, sewer, and electrical services).
- Alterations to existing services if required.
- The construction of 4.4km of surfaced roads, the width is 5m.
- Bulk Earthworks to achieve specified levels.
- Construction of pavement layers as specified below.
- Construction of stormwater infrastructure (bridge culvert and stormwater pipes).
- Furnish the roads with mountable kerbs on either side.
- Asphalt or Seal Surfacing.
- Road Markings.
- Erection of all required road signage and road marking.
- Finish off all sidewalks or walkways as required.

According to the method statement for culvert construction provided by SPK Engineers for the upgrade of Nositha Road attached in **Appendix D7**, the main works will consist of the following activities:

- Setting out by use of pegs to mark points on the ground,
- Temporary diversion where the streams are flowing to allow the water to continuing flowing during construction,
- Excavations by use of the excavator,
- Surface preparation to maintain the required levels as per the original construction drawings,
- Blinding the base to the specified thickness using materials complying with specifications and of approved mix design,
- Reinforcement,
- Formwork,
- Batching and mixing by means of concrete mixer and concrete casted and compacted using poker vibrator

- Quality control,
- Placing of culverts lifted by the Crane or Excavator and placed on top of constructed floor slab,
- Curing and backfilling and
- Finishing off: diversion will be closed off and material will be compacted to acceptable standard.

2.2 Key Activity Related Processes and Products

According to the preliminary engineering report compiled by SPK Engineers for the upgrade of Nositha Road (SPK Engineers cc, Preliminary Design report, 2015), the roads design will be implemented in accordance with the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality) requirements. The designs will also be executed in accordance with "The Guidelines for Human Settlement Planning and Design" (the new red book). The Technical Recommendations for Highways (TRH) series, relevant SABS/SANS codes and Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Program (EPWP) to ensure a high standard of workmanship.

The design standards which are assumed to be applicable to the roads are summarised in the table below.

Table 9: The applicable design standards

SERVICE	ITEM	CRITERIA
Ligthly trafficked rural roads, strategic roads.	Road Category	Category C
	Traffic Class	ES3(3 x 10^6 E80's)
	Surfaced widths	5.0 meters

The geometric design is summarised in the table below.

Table 10: The geometric design

CRITERIA		ROAD CLASS
		Rural Main
Roadways		Single
Functional Capacities (one way) vph		25
Pedestrian Facilities		Road Shoulders
Parking		Road Shoulders
Reserve Width m (Nominal)		10 to 15
Roadway way width (m)		5m
Dwelling units served		20 up to 300
Design Speed km/h		60
Min Radius (m)		30
Vertical Curve K (Min)	Crest	16
	Sag	16
Stopping sight Distance m		80

Pavement Layer Design Criteria

Roadbed:

- Material to conform to the requirements of a G7 material in accordance with the TRH 4.
- Scarify 150 mm and re-compact to 93% mod ASSHTO density.
- Design California bearing ratio (CBR) of the sub-grade/roadbed must not be less than 15% at 93% Mod AASHTO.

Sub-base:

- Material to conform to the requirements of a G4 material in accordance with the TRH 4.
- Construct 150 mm deep sub-base with G4 material.
- Compact layer to 98% mod ASSHTO density.
- Design CBR of the sub-base not less than 80 at 98% Mod AASHTO Density.
- Material must have a maximum plasticity index (PI) of 6.
- A maximum swell 0.2 % at 100% of modified AASHTO Density.
- Maximum size 53 mm of layer thickness.

Base:

- Material to conform to the requirements of a G2 material in accordance with the TRH 4.
- Construct 150mm thick base with G2 material.
- Compact layer to 98% of modified ASSHTO density.
- The material must have a maximum plasticity index (PI) of 6.

Wearing Course:

- 40 mm Thick Asphalt

Kerbs, guardrails and bellmouths:

- It is proposed that mountable kerbs be placed on either side of the road to avoid or prevent chipping and erosion.
- Bellmouths will be constructed to a standard 8m radius and will be extended to the end curve inside the adjacent road.

Road marking and signage:

- To be designed in accordance with the South African Development Community (SADC) 3rd edition.

Stormwater:

The stormwater network was undertaken in accordance with the following design codes:

- Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development, NHB, Pretoria, 1994
- The Guidelines for Human Settlement Planning and Design, CSIR, Pretoria, 2000 UTG4, and
- Guidelines for Urban Stormwater Management, CUTA, Pretoria, 1991

The following designs standards were employed:

- A 1:50 years flood return period.
- 2100x1800mm box culvert to be Class 75S in the case of road crossings.
- 1:50 minimum pipe grade.
- 900mm diameter (minimum pipe size.) Pipes to be Class 50D and in the case of road crossings Class 75D.
- 1:50 minimum pipe grade.
- A minimum cover of 600mm in the road reserve and 1000mm in the roadway.

The sub-base and base material will be imported from commercial sources.

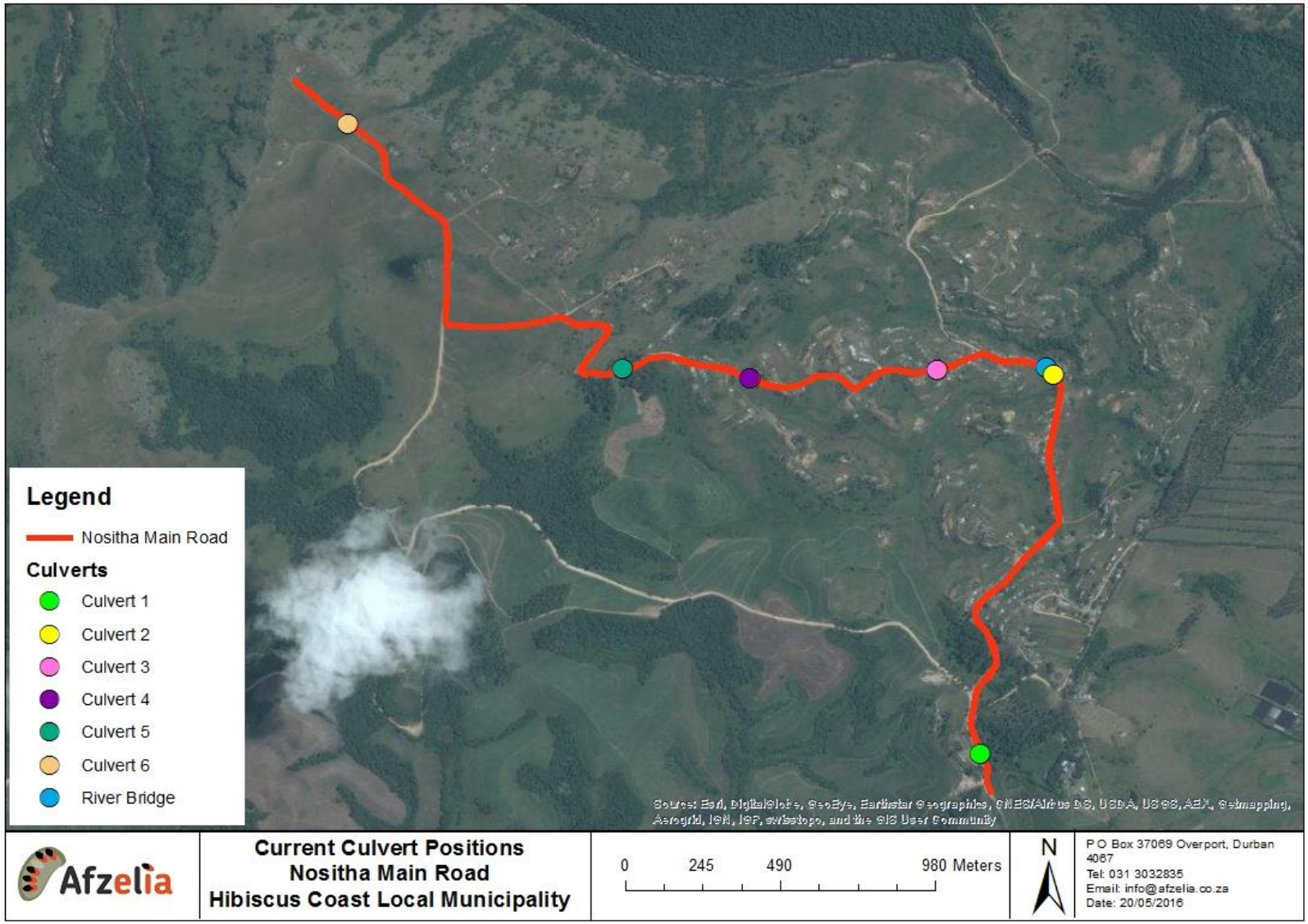


Figure 3: Position of current culverts along Nositha road

2.3 Analysis of Alternatives

Alternatives are defined in the Regulations as "different means of meeting the general purpose and requirements of the activity which may include alternatives to the property on which or location where the activity is proposed to be undertaken, type of activity to be undertaken, design or layout of the activity, technology to be used in the activity; or operational aspects of the activity and includes the option of not implementing the activity" (DEA, 2014). In terms of the NEMA EIA Regulations (2014) alternatives must be assessed and evaluated by the EAP at a scale and level that enables adequate comparison with the proposed development. The EAP must provide opportunities for stakeholder input in terms of the identification and evaluation of alternatives. When considering alternatives, the criterion to be taken into account is "any feasible and reasonable alternatives to the activity and any feasible and reasonable modifications or changes to the activity that may minimise harm to the environment".

2.3.1 Site Alternative

There is no other possible route except this existing route as identified as the other land is occupied for residential area. The proposed location of the Nositha road and associated stormwater infrastructures is the preferred site as it upgrades an existing road alignment and crossings within an existing road reserve. Site alternatives other than the location of the current road alignment and associated stormwater infrastructures have not been assessed as this would have meant realigning the existing road which would inevitably have a greater net economic and biophysical impact on the environment, namely streams, riparian, wetland and residential areas.

No alternative sites have been assessed.

2.3.2 Design or Layout Alternative

The proposed design attached in **Appendix C** offers the highest levels of biophysical and environmental benefits, as the hard surface, in conjunction with the upgraded stormwater infrastructure, will manage water movement most effectively, minimise erosion from the road and the surrounding environment, and minimise the subsequent discharge of the eroded materials into the Vungu River.

This is one of the major objectives of the project – to minimise and prevent, where possible, the continued erosion and degradation of the existing road surface by the travel of wheels and reduce the impact of this erosion on the surrounding environment

No alternative layout plans have been assessed other than layout attached in **Appendix C**.

2.3.3 No-Go Alternative

The existing road drainage system is unable to cope with the high intensity runoff of water on steep gradients where the road surface has been concretised. In addition where the road surface is gravel, and poorly maintained, excessive scour, rutting and gravel loss has occurred. Generally, gravel roads constructed on steep gradients are more difficult to maintain which may lead to intermittent closure of the road due to road safety. and contribute significantly to environmental degradation through sediment loaded run-off and erosion.

The existing stormwater pipes and culverts will remain in the same positions and will continue to be inefficient. Due to the size of the existing stormwater infrastructures and their condition, the stormwater flow emanating from the hardened areas in particular is impaired as in most cases the stormwater pipes are either broken or silted up.

The no-go alternative would leave the existing Nositha Road in its current state. The no-go alternative will not require any construction works or create negative impacts on the existing environment (stream, wetlands, vegetation, surrounding land owners and residents) as a result of construction. However, the threat to agricultural resources, biodiversity and water resources as a result of soil erosion, sedimentation and encroachment of alien invasive species will remain.

No temporary job opportunities or skill development will occur for the local communities during the construction phase.

2.4 The Need and Desirability for the Proposed Activity

The Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 – GN 891 issued in October 2014 in Government Gazette 38108 has been used to inform and provide structure for this Need and Desirability section.

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

The following policies, statues and documents were interrogated:

1. National Spatial Development Perspective (NSDP) (2003 and updated in 2006);
2. The New Growth Path (2010);
3. The National Development Plan 2030;
4. The Integrated Development Plans (IDP) for the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality);
5. The Spatial Development Framework (SDF) for the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality);
6. The Environmental Management Framework (EMF) & Strategic Environmental Framework for the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality);
7. The NEMA Principals; and
8. The 18 Strategic Integrated Projects (SIPs).

The vision of the Ugu District Municipality is:

"A place where everyone benefits equally from socio-economic opportunities and services" as enumerated in the Ugu District Municipality, Integrated Development Plan. 2014/2015 Annual Review."

The need and desirability of the road upgrade must be measured against the ecological, social and economic impacts of the Municipalities IDP, SDF and EMF, the sustainable development vision, goals and objectives.

The following policies, statutes and documents were interrogated to inform the need and desirability of this project:

1. Ugu District Municipality – IDP;
2. Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality) – SDF;
3. Ugu District Municipality – EMF;

The documents are discussed as follows:

Integrated Development Plan

The core mandate for the Ugu District Municipality is to provide access to basic infrastructure and services. One of the challenges that the municipality is facing is addressing road infrastructure especially in rural areas. The upgrading of Nositha Road will assist in meeting this challenge.

Upgrading of roads within the Ugu District Municipality will also show progress in reaching the National Development Plan: 2030 based on creating jobs, expanding infrastructure and transforming urban and rural spaces.

The IDP highlights that a road in poor condition also impacts negatively on journey speed and road safety, decreasing the accessibility or desirability of the region for business. Upgrading Nositha Road will assist with remediating this negative aspect for at least a portion of a route within the area.

The EPWP is a national strategy aimed at eradicating poverty, while creating jobs and providing opportunities to the previously disadvantaged communities through the provision of temporary employment opportunities. The upgrading activities of Nositha Road will require temporary employment of individuals within close proximity of the route.

The Ugu District Strategic Development Matrix is aligned to the National, Provincial and District priorities. The upgrade of Nositha Road meets four of the 9 priorities that have been set. These are:

1. Infrastructure Investment (upgrading of a gravel road);
2. Economic and Sectoral Development (temporary employment through construction activities);
3. Education and skills development (skills development required to perform construction activities);

4. Clean Environment (hard topping and installing storm water management for the road will assist in reducing environmental impacts such as soil erosion occurring at present and therefore lead the way towards a more acceptable environment).

Spatial Development Framework

The SPD section of the IDP has identified priority road corridors for development which will promote spatial integration of the district and increase accessibility for rural communities. Although Nositha Road has not been identified as a priority road, it will assist in promoting spatial integration and will connect the Nositha community to economic and service hubs within the area.

Growth and Development Strategy

The Ugu Growth and Development Strategy commits to achieving a vision by the 2030, that the Ugu district will be a leading tourism destination and agricultural and manufacturing hub where jobs are created and everyone benefits equally from socio-economic opportunities and services.

The environmental 'thinking' and 'implementation' of the mitigation measures set out in this document will assist with ensuring that one of the six key drivers of the growth and development strategy is met. This driver is Environmental Sustainability and is explained as a commitment to reversing the environmental degradation that has taken place within the District. Implementation of the mitigation measures presented in the Impact Assessment section of this report focuses on addressing environmental impacts and degradation which has occurred throughout the Nositha Road route.

The element of temporary employment during the construction phase will assist in contributing to the growth and development of the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality) and at a broader scale the Ugu District Municipality.

A recommendation would be to create permanent jobs, such as performing maintenance along this upgraded route in order to further contribute to long term growth and development of the District.

Through the interrogation of the Ugu District Municipality's IDP and EMF and the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality) SDF it can be said that the proposed development supports the views and plans of the Ray Nkonyeni Local Municipality (formerly Hibiscus Coast Municipality) and Ugu District Municipality.

The motivation for the upgrading of the Nositha Road from a gravel to a hardened surface, all-weather road includes the following considerations:

2.5 Activity Life Description and Cost

The minimum construction phase period time is expected to be approximately six (6) months but this is likely to be exceeded.

The basis for calculating the estimated construction costs was based on an evaluation of current market prices and escalated MIG Infrastructure Industry Guideline Unit costs (Base 2005).

Table 11: Roads and stormwater installation costs

EXTENSION	Length	Unit Cost	Construction	Professional	VAT	Total Estimated
AREA	**(m)**	**R/pm**	**Costs**	**Fees**	**(14%)**	**Costs**
Service						
Roads	4400.00	1814	R 7 981 600.00		R 1 117 424.00	R 9 099 024.00
Stormwater Culvert	30.5	30000.00	R 915 000.00		R 128 100.00	R 1 043 100.00
Stormwater Pipe	48	6000.00	R 288 000.00		R 40 320.00	R 328 320.00
				R 1 285 844.00	R 180 018.16	R 1 465 862.16
Additional Services				R 304 794.00	R 42 671.16	R 347 465.16

Construction Monitoring						
Expenses and costs for duration of contract						
Total Project						**R 12 283 771.32**[2]

2.6 Assumptions and Limitations

Assumptions and limitations as addressed in this Basic Assessment Report (BAR) for the proposed Nositha Road upgrade are:

- All information provided by the Project Manager, SPK Engineers cc, to the EAP was taken to be correct and valid at the time it was provided;
- The EAP does not accept any responsibility in the event that additional information comes to light at a later stage of the process from the Project Manager or Proponent;
- The scope of work is limited to assessing the potential environmental impacts associated with the upgrading of the proposed Nositha Road and associated infrastructure, as indicated in the engineering report and shown on diagrams submitted by SPK Engineers cc; and
- The location of the construction camp site is unknown at this stage. The generic associated impacts relating to the location of a contractor's camp site have been addressed through suitable mitigation measures in the EMPr included in this report and attached in **Appendix F**. Of primary importance is that this location must be approved by the ECO prior to its establishment.

In addition to the above, assumptions and limitations were noted by the specialist team, who have clearly stated their own concerns which are considered as assumptions and limitations, namely:

The wetland specialist (Earth Water Environmental Science):

- The assessment was conducted during the dry season on the 15th of June 2016; and
- The project had a limited time frame and only one day was spent in the field.

The aquatic specialist (Afzelia Environmental Consultants):

- The dissolved oxygen (DO) probe for the *in-situ* water quality assessment malfunctioned during the time of the assessment, therefore water quality results are interpreted with caution.
- The report highlights the findings for a low flow study; therefore, the confidence in the risk assessment is limited. In addition, a high flow survey is required to ensure that the impacts associated with the Nositha Road upgrade are fully addressed.

The biodiversity specialist (Afzelia Environmental Consultants):

- Modelled biodiversity databases have limitations in terms of accuracy and have to be ground-truthed;
- A hand held Garmin 60 GPS used to delineate the channels had an accuracy of 4-6m; and
- A vegetation assessment based on a single day site visit was conducted. Vegetation assessments should ideally be conducted over differing seasons to ensure accurate identification of all bulbs and flowering specie.

3. ENVIRONMENTAL LEGAL REQUIREMENTS FOR THE PROPOSED PROJECT

3.1 National Environmental Management Act (NEMA) (Act No. 107 of 1998) as amended

The proposed Nositha Road upgrade project triggers Listed Activities as stipulated in the EIA Regulations (2014) promulgated in terms of the NEMA, 1998 (Act 107 of 1998) as amended under Government Notice No. 982, 983 and 985 of 04 December 2014 (DEA, 2014).

The following table provides a summary of the Listed Activities in terms of the EIA Regulations 2014 that are triggered by the proposed project:

[2] This is an extremely conservative estimation (EAP's comment drawn from experience with similar projects and the estimated costings)

Table 12: Summary of the Listed Activities

Government Notice Number	Activity number	Description of each listed activity
No. R. 983 of December 2014 (Listing Notice 1)	9	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.
No. R. 983 of December 2014 (Listing Notice 1)	12	The development of - (iv) bridges exceeding 100 square metres in size; (vi) bulk stormwater outlet structures exceeding 100 square metres in size where such development occurs (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.
No. R. 983 of December 2014 (Listing Notice 1)	19	The infilling or depositing of any material of cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse.
No. R. 983 of December 2014 (Listing Notice 1)	24	The development of- (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.

The abovementioned activities contained in Listing Notice 1 of the EIA Regulations 2014 (GN R. 983, dated 04 December 2014), promulgated in terms of the National Environmental Management Act, must be subjected to a Basic Assessment.

3.2 National Water Act (NWA) (Act No. 36 of 1998)

Due to the proposed project occurring within the 1:100 year floodline of a watercourse and within 500m radius of a wetland, a Water Use Authorisation Application must be submitted to the Department of Water and Sanitation (DWS) in terms of Section 21 (c) or (i) in accordance with the NWA. The proposed road upgrade requires a water use authorisation in terms of Section 21 (c) or (i); in accordance with the provisions of the National Water Act 1998 (Act No. 36 of 1998).

The NWA is a legal framework for the effective and sustainable management of water resources in South Africa.

A Water Use Authorisation is a legislative process governed by the Department of Water and Sanitation (DWS) for the authorisation of all water uses defined in section 21 of the National Water Act, 1998 (Act No 36 of 1998) (NWA).

The following table provides a summary of water uses that apply to this upgrade:

Table 13: Summary of water uses that require a water use licence

Activity Number	Water Use	Description
Section 21 (a) of NWA of 1998	taking water from a water resource	• Taking water from a water resource means abstracting or pumping of water from underground or from any other water resource such as a stream, a river, dam, spring, pan, aquifer, wetland, lake or estuary or from a borehole.
Section 21 (c) of NWA of 1998	Impeding or diverting the flow of water in a watercourse	• Impeding flow means the temporary or permanent obstruction or hindrance to the flow of water into a watercourse by structures built either fully or partially in or across a watercourse.

		• Diverting flows means a temporary or permanent structure causing the flow of water to be re-routed in a watercourse for any purpose.
Section (i) of NWA of 1998	Altering the bed and banks of a watercourse or characteristics of a watercourse	• Altering the bed and banks means any change affecting the resource quality of the watercourse (the area within the riparian habitat or 1:100 year floodline, whichever is greatest).

3.3 Other Applicable Legislation and Guidelines Considered

Other legislation that has possible bearing on the proposed Nositha Road upgrade is captured in the table below.

Table 14: Legislation related to the upgrade of Nositha Road

Title of legislation, policy or guideline	Administering authority
National Environmental Management Act of 1998 (Act 107 of 1998) as amended	Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) (Provincial and Local Authority)
Environmental Impact Assessment Regulations 2014, published in Regulation Gazette No. 38282 under GNR 982,983,984 and 985 (4 December 2014), as amended	DEDTEA (Provincial and Local Authority)
South Africa's Constitution (Act 108 of 1996), specifically the Bill of Rights (Chapter 2, Section 24)	The State
National Water Act (Act 36 of 1998)	Department of Water and Sanitation (DWS)
Water Service Act of 1997 (Act No. 108 of 1997).	DWS
Hazardous Substances Act of 1973 (Act 15 of 1973)	Department of Health (DoH)
The Occupational Health and Safety Act (Act 85 of 1998)	Department of Labour (DoL)
National Environmental Management: Waste Act (Act 59 of 2008)	National or Provincial Department of Economic Development, Tourism and Environmental Affairs
National Environmental Management: Biodiversity Act, (Act 10 of 2004)	Ezemvelo KwaZulu-Natal Wildlife (EKZNW)
Conservation of Agricultural Resources Act (Act 43 of 1983)	Department of Agriculture, Forestry and Fisheries (DAFF)
National Forests Act of 1998 (Act No. 84 of 1998)	DAFF
National Veld and Forest Fire Act of 1998 (Act No. 101 of 1998).	DAFF
National Environmental Management: Protected Areas Act of 2003 (Act No. 57 of 2003)	EKZNW
Alien and Invasive Species Regulations (2014) in terms of section 97(1) of NEMBA	Department of Environmental Affairs (DEA) & EKZNW
Animals Protection Act of 1962 (Act No. 71 of 1962)	DAFF
Natural Heritage Resources Act of 1999 (Act No. 25 of 1999)	AMAFA aKwaZulu-Natali
Spatial Planning and Land Use Management Act (Act 16 of 2013) (SPLUMA)	National Office of the Department of Rural Development & Land Reform
KwaZulu-Natal Planning and Development Act (Act 6 of 2008)	The Department of Cooperative Governance and Traditional Affairs (COGTA)
Minimum requirements for handling, classification and disposal of hazardous waste, second edition, 1998	(DWS)
Minimum requirements for waste disposal by landfill, 2nd addition, 1998.	DWS
KwaZulu-Natal Provincial Roads Act (Act No. 4 of 2001)	KZN Department of Transport (KZN DOT)
National Road Traffic Act (No. 93 of 1996)	KZN DOT
Road Traffic Act of 1989 (Act No. 29 of 1989)	KZN DOT
Ugu District Municipality IDP 2015/ 2016	Ugu District Municipality
Integrated Environmental Management (IEM) Guidelines	DEA (EDTEA)

South African Water Quality Guidelines. Volume 8	DWS

SECTION C: INFORMATION ON ASSESSMENT FACTORS

1. DESCRIPTION OF THE RECEIVING ENVIRONMENT

1.1 Climate and Rainfall

The climate in Ugu District Municipality is considered as subtropical and is characterised by summer rainfall patterns, with most rain occurring between October and April. Tropical thunderstorms occur particularly in the summer months of December, January and February. The mean annual precipitation ranges approximately between 989mm to 1075 mm of rain per annum with the lowest rainfall in June and July (15 mm) and the highest rainfall in December (113 mm). Mean maximum and minimum monthly temperatures for the area are approximately 31ºC for January and 8ºC for July respectively (Mucina & Rutherford, 2006), (Scott-Shaw & Escott, 2011).

1.2 Vegetation and topography

The proposed site falls within a region that is classified broadly as an Indian Ocean Coastal Belt biome which forms part of the the KwaZulu-Natal Coastal Belt Grassland and Pondoland-Ugu Sandstone Coastal Sourveld vegetation types. Refer to **Figure 4: Vegetation Map.**

The KwaZulu-Natal Coastal Belt Grassland is characterised by undulating coastal plains. It is comprised mainly of a mosaic of sugarcane fields, timber plantations, thickets, coastal thornveld and secondary Aristida grasslands. This vegetation type is considered endangered with approximately 50% already transformed by cultivation and urban sprawl (Mucina & Rutherford, 2006), (Scott-Shaw & Escott, 2011).

The Pondoland-Ugu Sandstone Coastal Sourveld vegetation type is characterised by coastal peneplains, undulating hills and steep slopes of river gorges. This vegetation type is considered to be highly vulnerable. Only 7% is statutorily conserved in nature reserves (Mucina & Rutherford, 2006).,

The topography and landforms of the surrounding area comprise of generally steep hilly terrain, side slope of hill or mountain, open valley, undulating plain and low hills, plateau and ridgelines with a number of inter-leading river courses. The general gradient of the site varies approximately 1:5 – 1:2 to steeper than 1:5. Refer to **photographs 1-4** below:

Photo 1

Photo 2

Photo 3

Photo 4

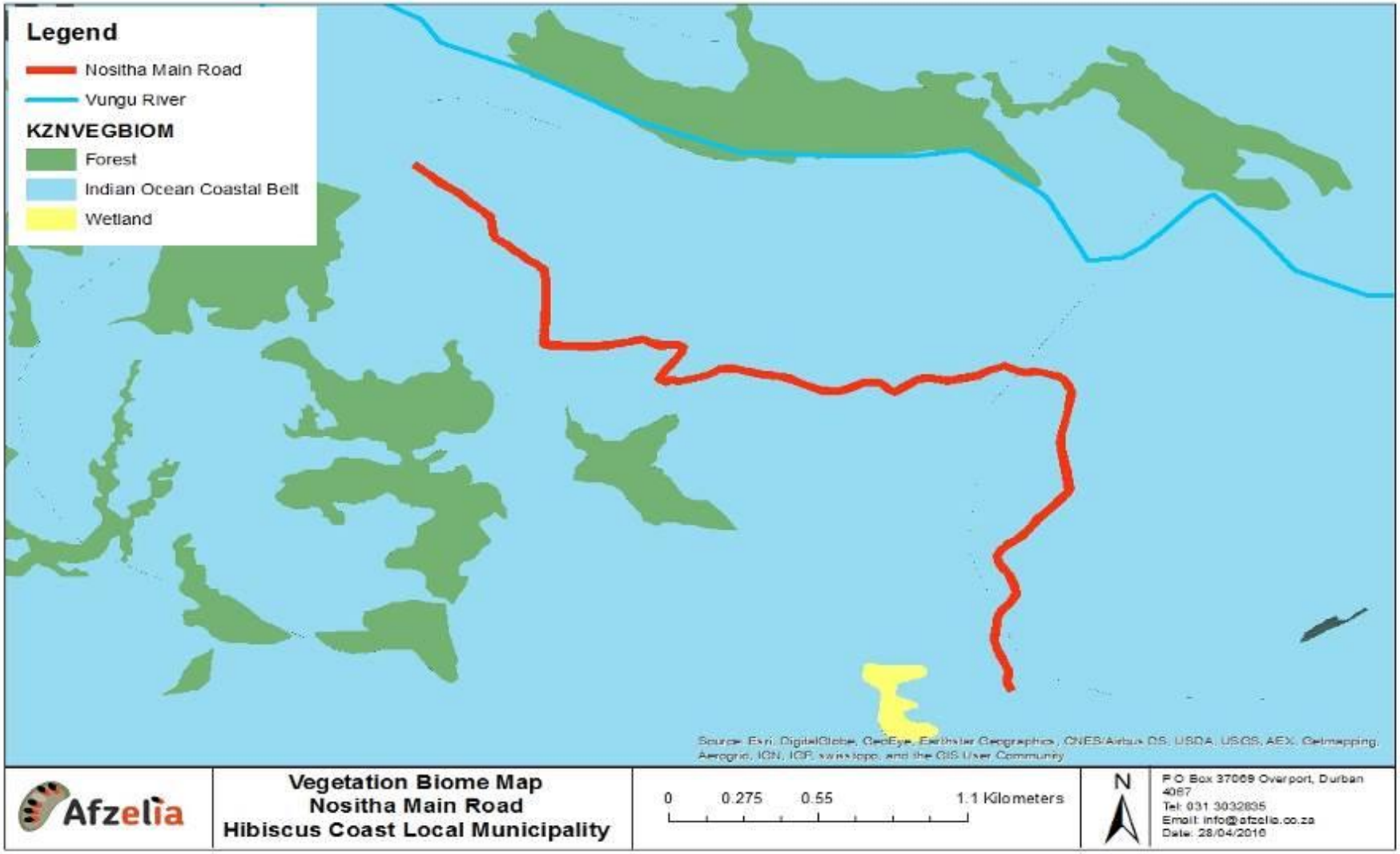


Figure 4: Vegetation map for Nositha Road

1.3 Geology and Soil

Dominant rock types associated with the site include sandstones of the Natal Group and the Msikaba Formation, Dwyka tillite, Ecca shale and Mapumulo gneiss; with small areas of granite in the low lying areas (Mucina & Rutherford, 2006).

According to the land type database, it is expected that, the dominant soils in the crest and midslope positions are Cartref, Glenrosa, and Mispah soil forms. The wetland survey which was conducted on the 15th of June 2016 by Earth Water Environmental Science observed that the soils were fairly sandy and shallow with Mispah and Oakleaf forms dominating the footslopes and Katspruit soils, Westleigh soils dominating the valley bottoms and depression (Earth Water Environmental Science, Wetland Assessment, 2016).

According to the geological mapping presented on geotechnical investigation report compiled by Ground Africa and attached in **Appendix D2** (Ground Africa Consulting Geotechnical Engineers cc, Geotehnical Investigation, 2015); the site is underlain by sedimentary rock of the Natal Group, Karoo Supergroup. The Natal Group comprises of arenaceous, reddish brown arkosic sandstones which have high feldspar contents and are interbedded with mudrock and conglomerates. The sandstone rock was found to be highly to moderately weathered beneath the site with outcrops predominantly being observed in the higher north western section of the site as well as in the south eastern section near chainage 0.0m.

Metamorphic, medium grained charnockite and leucocratic garnet-biotite augen-gneiss of the Natal Metamorphic Province was noted to be present in the lower sections of the road alignment between chainages 650.0m and 2 560.0m. The metamorphic rock appears to have been used as a wearing course material during previous road improvement. The metamorphic rock observed along this road section was found to be completely weathered with the majority of the near surface ground horizons comprising residual soils with relic rock joint lines (Ground Africa Consulting Geotechnical Engineers cc, Geotehnical Investigation, 2015).

1.4 Watercourses and Catchment Characteristics

The proposed project area falls within the quaternary drainage region T40G which is part of the Mvoti to Umzimkulu Water Management Area (WMA). The major rivers within the catchment are the Umgeni, Mvoti, Umkomazi and Umzimkulu Rivers. These rivers experience significant levels of high water demand related stress, particularly during drought seasons. Many of the surrounding communities rely on fresh water from these rivers throughout the year (Afzelia Environmental Consultants, Aquatic assessment, 2016).

The Nositha Road lies approximately 600m (at it closest point) North/North-west of the Vungu River which flows from the north to north-east, and ends into the Indian Ocean at Uvongo, KwaZulu-Natal. The unnamed stream over which Nositha Road crosses at chainage 1 500.0m confluences withthe Vungu River, approximately 1.5 km downstream (Earth Water Environmental Science, Wetland Assessment, 2016).

Desktop analysis of the National Wetland Map, 2004 produced by the South African National Biodiversity Institute (SANBI) indicates that there was only one (1) Freshwater Ecosystem Priority Areas (FEPA) wetland identified within the 500m buffer of the road upgrade as shown in **Figure 4:** NFEPA wetlands within 500m of the proposed Nositha Road Upgrade. Refer also to **Appendix A**: NFEPA Wetlands. The FEPA wetland was classified as a bench flat according to its position in the landscape on the top of the hill. During the field investigation conducted by Earth Water Environmental Science on the 15th of June 2016, the FEPA wetland was confirmed to be a depression and not a “bench-flat”. (Earth Water Environmental Science, Wetland Assessment, 2016).

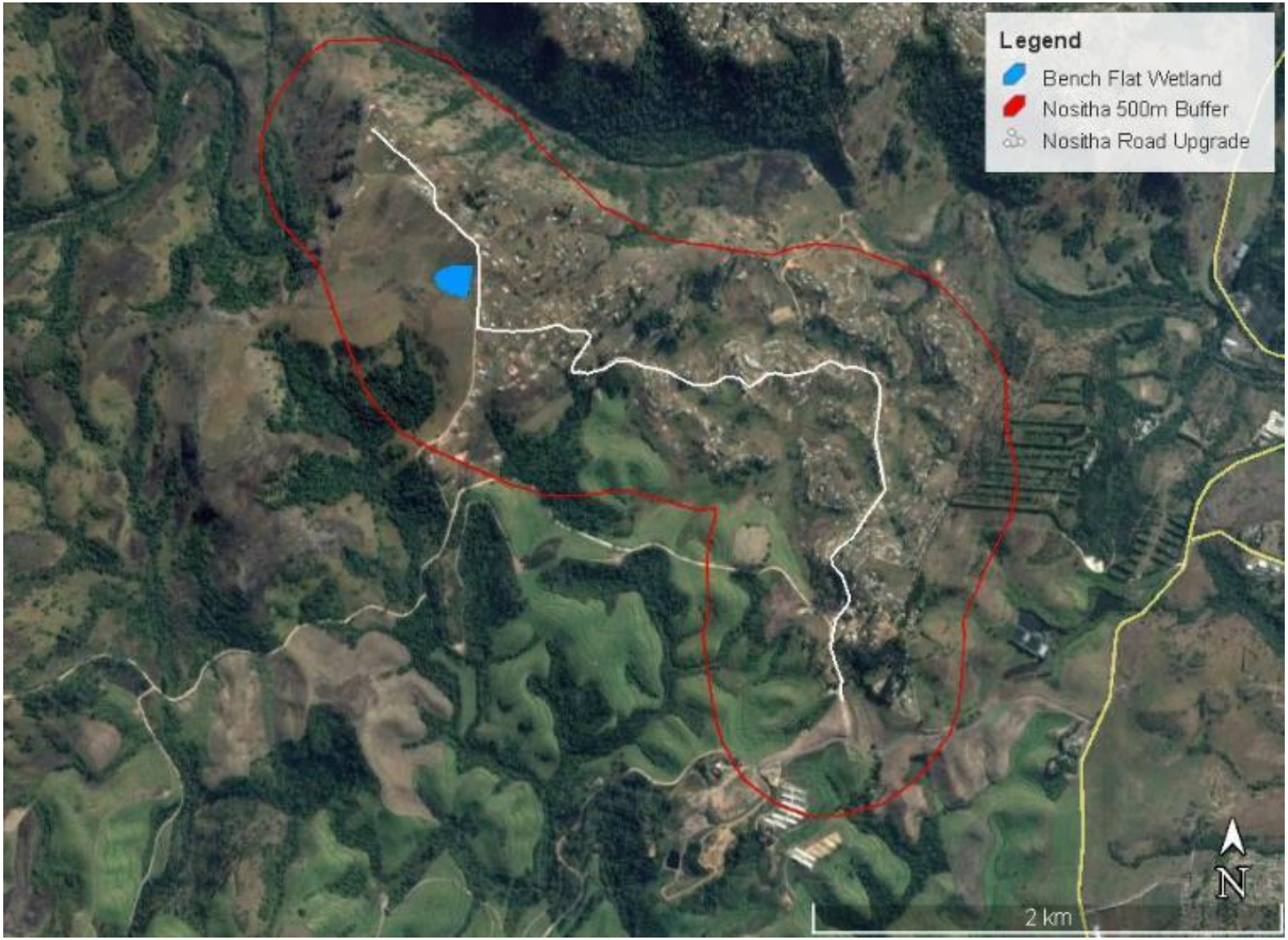


Figure 5: Bench Flat NFEPA wetland within 500m of the proposed Nositha road upgrade (as extracted from Wetland Report)

2. SOCIO-ECONOMIC ASPECT OF THE RECEIVING ENVIRONMENT

2.1 Current Land Use / Character of Surrounding Area

The dominant land use around Nositha Road is rural residential housing, rural road development, subsistence farming / vegetable gardens and *Eucalytus* plantations. Small informal shops are found along Nositha Road and in close proximity to or within the road reserve, also a crèche, primary school and the "Eco Centre Hall". Refer to **photographs 1-4** below:

Photo 1

Photo 2

Photo 3

Photo 4

Residents near the proposed road upgrade site will be affected by the increase in dust and noise levels; visual impacts, and construction related traffic delays during the construction phase. The anticipated positive impacts of the activities during both its construction and operational phase will be employment opportunities and eventually improved access and road safety, and reduced dust and erosion risks. Care and control measures must be taken during construction to ensure safety of school children and pedestrians; increased dust and noise levels from construction activities must be managed to an acceptable level.

Some house fences are found in close proximity of the road reserve. These may be affected during the road construction. Any required expropriation of the land must be managed by the Proponent (Ray Nkonyeni Local Municipality) in consultation with the affected parties **prior** to commencement of construction activities.

The existing gravel road is heavily utilised by motor vehicles and pedestrians. The road is bordered by houses, subsistence cropping, a crèche and alien invasive vegetation. The Vungu River lies approximately 600m north to north-west; the road crosses a tributary to the rive (confluence 1.5km away).

The wetland survey conducted by Earth Water Environmental has identified six (6) HGM units within a 500m buffer of the proposed Nositha road upgrade. Some of the wetlands occur within an 80m buffer from the proposed Nositha road upgrade. Please refer to **photographs 1-4** below and **Figure 6 Wetland Delineation Map within 500m and 80m buffer**. Section 3

findings of the specialist under point 3.5.1 Present Wetland Health of this DBAR provides a detailed information on the general condition of these wetlands. The road will have a direct impact on the water sources (the stream- HGM 5)

Photo 1

Photo 2

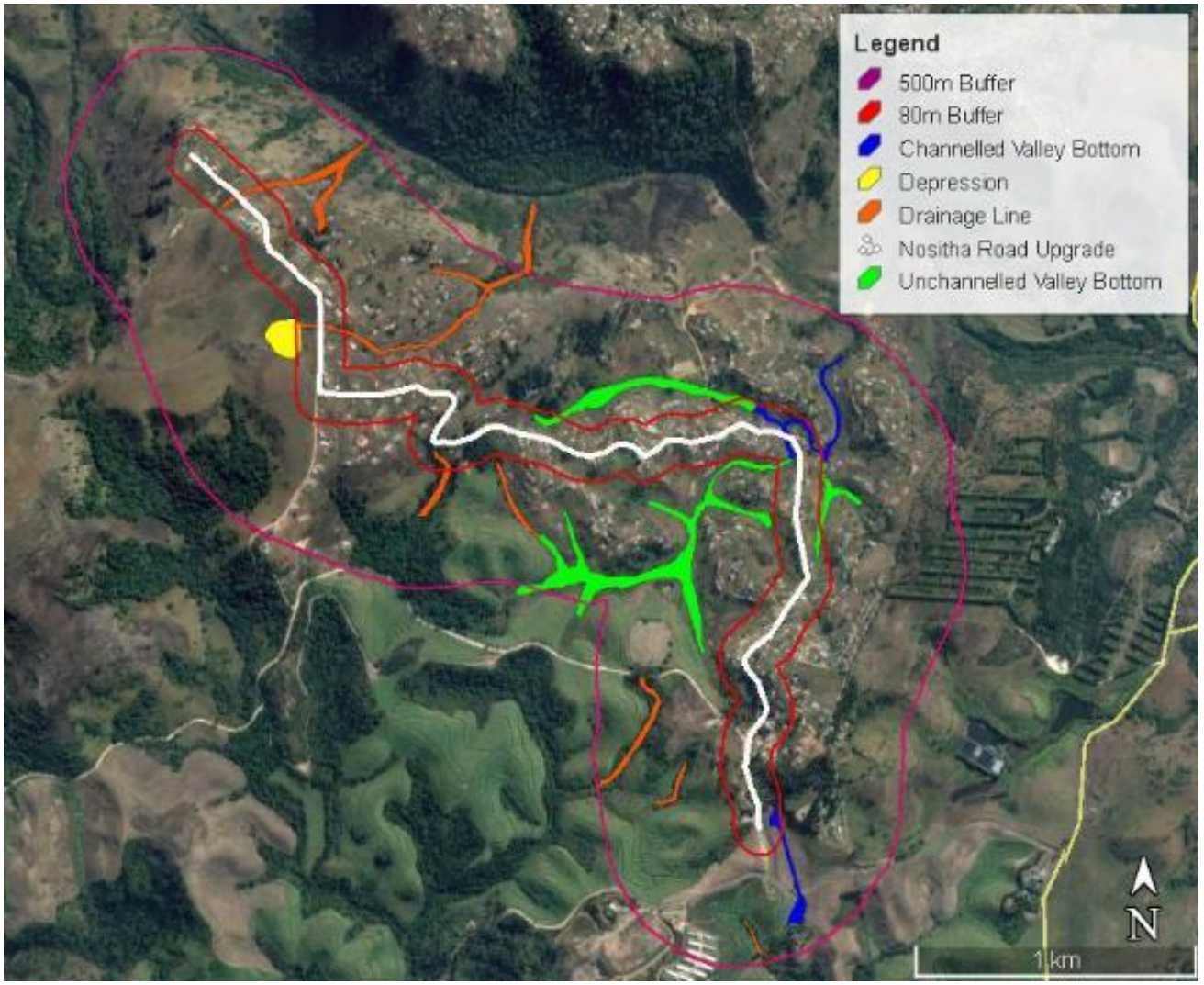
Photo 3

Photo 4

There is a potential threat or risk that the road upgrade will pose to the wetlands in the area as a result proposed change from the unpaved road to paved road, resulting in increased hardened surface.

Sections of the road are densely lined with tall vegetation consisting of trees (predominantly Eucalyptus spp) at the edge of the road section. The vegetation within the site is highly transformed by Eucalyptus plantations and alien invasive species and in other sections of the road, it is relatively intact and consist of good quality secondary grassland (Afzelia Environmental Consultants, Vegetation assessment, 2016)

Eskom powerlines are in close proximity to the road. Consultation with Eskom must be conducted prior to construction activities should any relocation of these powerlines be required.



(Source: Earth Water Environmental Science – 2016)

Figure 6: Wetland Delineation Map within 500m and 80m buffer

2.2 Waste, Effluent, Emission and Noise Management

2.2.1 Dust Emissions – wrong place for this

There will be increased dust levels as a result of construction activities of Nositha Road which will cause nuisance on the surrounding. However, this is expected to be within acceptable limits and measures to reduce dust will be contained in the EMPr attached in **Appendix F** and must be adhered to. Dust suppression must be used by dampening with water or spraying from a water tanker to control the amount of dust created and released into the atmosphere and working environment. Potable or treated water must not be used for dust suppression.

2.2.2 Noise Consideration

Noise levels in the area will be increased during the construction phase due to the operation of heavy machinery, by the use of construction equipment and the movement of large trucks transporting concrete, rock, sand and gravel to the site. However, measures to reduce noise will be contained in the EMPr; attached in **Appendix F** and relevant legislation guideline levels as per SANS 10103 regarding noise levels must be adhered to. The measurement and assessment of environmental noise with respect to annoyance and speech communication is found in the table below:

Table 15: Rural noise level limits as per SANS 10103: 2008

	OUTDOORS		INDOORS	
RURAL	DAY	NIGHT	DAY	NIGHT
	45 dB(A)	35 dB(A)	35 dB(A)	25 B(A)

2.2.3 Solid Waste Management

Extensive rubbish dumping has been observed along the road and within the channel watercourse. This may cause pollution within the tributary of the Vungu River. The different types of waste which will be generated during the construction activities may include:

- Solid waste – e.g. Plastics, metal, wood, stone, construction rubble, concrete, discarded stormwater pipes and general domestic waste.
- Chemical waste – e.g. Petrochemicals, resins, paints and herbicides
- Sewage and waste water:
    - Chemical toilets have the potential to contaminate the environment if not appropriately managed. Portable chemical toilets must be provided along the working route and within the construction camp site. An independent registered chemical waste company, such as Justloo or SANITECH is to be used to service and remove waste from chemical toilets at least weekly on site. Certificates of service must be retained as proof.
    - Wastewater from construction activities may be contaminated and can result in the pollution of the surrounding environment. This would mainly relate to storm water potentially contained within bunded areas where spillages may have occurred. Contaminated water associated with construction activities must be contained in separate bunded areas and must not be allowed to enter into the natural drainage system.

Facilities for solid waste collection are to be provided by the appointed contractor on site. The construction solid waste must be collected in skips which must be placed within the construction camp. Solid waste containers must be made available where and when required along the construction front, and these must be taken to the construction camp at the end of each day. These are to be at least 200 litre drums and clearly identified as the point for waste disposal. These waste receptacles with suitable covers or lid must be provided and conveniently placed to prevent wind-blown rubbish and scavenging by people and animals. All the waste receptacles must be removed from the site for disposal at a commercial facility licensed for this purpose.
Under no circumstances is waste to be buried or burnt.

Solid waste, hazardous waste and wastewater must be disposed of at a nearest licensed and operational municipal landfill site or municipal waste stream collection areas. The nearest landfill that accepts both hazardous and non-hazardous (domestic)

waste is Oatlands landfill site which is situated in Margate. Any hazardous waste must be separated from the non-hazardous waste before being disposed of. Waybills for all such disposal are to be kept by the Contractor on site for record purpose and review.

The Contractor is to implement a daily litter collection programme. The collected waste is to be disposed of regularly and proportionately to its generation at a site designed for waste disposal. Communication and education material on the waste management system must be part of site induction program and weekly toolbox talks. Solid Waste Management has been addressed adequately in the EMPr attached in **Appendix F**.

The following recommendations are made to reduce the amount of waste needing disposal:

1. Existing road surfaces must be re-milled and reused as much as possible.
2. Old materials such as dilapidated stormwater pipes to be returned to Ray Nkonyeni Local Municipality prior to completion of construction activities.
3. Excess old road material must be offered to the Local Authorities for them to reuse where needed.
4. Materials sourced from the site (top soil) will be used for the site rehabilitation and landscaping post construction.
5. Recycling must be undertaken where possible to reduce the amount of waste sent to the landfill site.

PLEASE NOTE: NO SPOIL SITES ARE TO BE USED FOR THE DISPOSAL OF WASTE MATERIAL OR EXCESS MATERIAL GENERATED BY THIS PROJECT

3. FINDINGS OF THE SPECIALIST ASSESSMENT

Specialists were consulted during the completion of this section. The full reports are attached in **Appendix D**.

3.1 Geotechnical Investigation

A centreline and materials investigation to determine the general ground conditions underlying the existing gravel road and to give insight to geotechnical concerns which may be present were carried out by Ground Africa Consulting Engineers on the 21st of October 2015. The Dynamic Cone Penetrometer (DCP) Tests were undertaken to assess the consistency of the wearing course and natural soil horizons underlying the section of investigated road alignment (Ground Africa Consulting Geotechnical Engineers cc, Geotehnical Investigation, 2015). The full report is attached in **Appendix D1**. The main findings of the geotechnical investigation report have been summarised below:

3.1.1 Fieldwork Results

Soil profiling indicates that the existing road alignment is underlain by two dominant subsurface ground profiles, which are:

- relatively deeper residual soils found on the lower southern section of the road and
- near surface sandstone rock found on the higher northern section of the road.

The findings of the Southern Section Profile (chainage 650m to 2 560m) are summarised as follow:

- Soil profiling of the road alignment shows this portion of the site is underlain by relatively deep residual soils which are expected to grade into completely weathered rock with increasing depth.
- A thin granular wearing course horizon (0.10m to 0.20m thick) covers the majority of the existing road surface.
- The wearing course layer is generally light pinkish beige to olive brown in colour and underlain by a colluvial horizon comprising fine grained clayey silty sand to silty clayey sand colluvial horizon which is dark brown to black in colour.
- The material was found to comprise of sandstone and gneiss gravel with some cobbles contained within a fine grained very slightly silty sand matrix.
- The colluvium was found to extend to depths of between 0.30m and 0.90m below present ground level.
- An upper residual horizon which is olive orange to orange in colour with black streaks underlies the colluvium layer and comprises of a fine to medium grained slightly clayey silty sand to sandy clayey silt.

- The lower residual horizon is pale orange with white blotches and comprises of a clayey sandy gravel with some zones of interlocking material.
- No weathered rock was intersected and no ground water was encountered.

The findings of the Northern Section Profile (chainage from 2 560m to 4 400m) are summarised as follow:

- The sandstone rock material was noted to outcrop at surface in places with some large hard rock boulders also being observed.
- The gravel wearing course layer was noted to vary in both composition and thickness and have been categorised as wearing course A and B.
- Wearing course A is similar to the material which has been used to surface the road from chainage 0.0m to a chainage of 2 560.0m. The material is light olive beige in colour, comprising of sandstone and gneiss gravel within a medium to coarse grained, very slightly clayey sand matrix.
- Wearing course A was noted to be present from a chainage of 2 949.0m to a chainage of 3 150.0m.
- An old wearing course horizon was noted to be present beneath the existing surfacing material for the identified chainage interval.
- Wearing course B was noted to be present from a chainage of 3 150.0m to a chainage of 4 100.0m. The material is brown to dark brown with orange blotches and comprises sub-angular to sub-rounded gravel (sandstone and ferricrete nodules) within a fine to medium grained sand matrix.
- A natural colluvium horizon was intersected beneath wearing course A and B. The colluvium is dark brown to orangey brown in colour and extends to depths of between 0.40m and 0.63m below present ground level. The colluvium comprises of fine grained silty clayey sand to sandy clayey gravel material.
- Residual sandstone soils were intersected beneath the colluvium horizon. The residual sandstone, comprises of fine grained, silty clayey sand material which is orange with dark brown streaks and maroon patches. Some gravel was noted to be present within this soil horizon.
- Sandstone rock was intersected beneath the residual horizon and was encountered at depths of between 0.40m and 0.63m below present ground level. The rock material is orange to pinkish orange in colour and is in a completely to highly weathered state. The sandstone is medium to coarse grained and is generally soft to medium hard.

Dynamic Cone Penetrometer Tests conducted along the proposed road alignment indicate the following:

- The horizon is generally of a medium dense to dense consistency with some dense zones.
- The intersection of the colluvium soils which extend to depths of between 0.30m and 0.90m below present ground level is generally marked by an increase in the penetration rate with increasing depth. The colluvium layer is medium dense at surface and becomes loose at the base of the layer.
- The consistency of the residual soil layer varies spatially across the road alignment. The residual soils can be described as having a medium dense to loose consistency with very loose intermittent zones being present in places.
- DCP test conducted in the higher north western section of the site were noted to refuse on the sandstone rock material at a depth of 0.55m which is prevalent in the area.

3.1.2 Laboratory Test Results

Tests in order to determine the soils' clay content, plastic properties, particle size distribution, grading, moisture or density relationships and California Bearing Ratios for material strength verification, have provided the following summarised results:

- Testing of light pinkish beige to olive brown mixture of present and older wearing course material indicates that the material is classified as being of a G7 quality for road building materials. The wearing course material is classified as having a low heave potential which is a result of the lack of fines. The material is deemed suitable for re-use as a sub base horizon and can be stockpiled during the initial road construction stage.
- Testing conducted on the wearing course material which comprises of sub-angular to sub-rounded gravel within a fine to medium grained sand matrix yielded a quality rating of G9 and as such has been classified as having a low heave potential.

3.1.3 Site Specific Project Recommendations

The following recommendations are provided:

Excavations:

The degree of excavation effort will vary along the road alignment and be determined by the underlying geology.

- Along the first southern section of the road, excavation effort is anticipated to be easy. In this section, excavation can be undertaken by a standard sized TLB, with little hard rock excavation anticipated.
- Along the northern section of the road will necessitate the use of relatively larger excavation plant such as a 20ton excavator, should depths significantly greater than 1m be required. It is strongly suggested that allowance for a hydraulic boom mounted rock hammer be made for the localised areas where near surface, hard rock sandstone is encountered.

Stormwater Drainage and Groundwater:

A number of erosion gullies were found to be prevalent along steep hillsides within the general area surrounding the proposed road upgrade. The residual soils overlying the metamorphic rocks seem to be highly erosive and in some places slightly dispersive. The erosion is a natural and common occurrence in the metamorphic geology and steep topography of this area which is further exacerbated with over-grazing by domestic cattle.

- It is suggested that where water is collected and directed off and under the road through stormwater culverts, the use of concrete lined drainage channels be installed along the edges of the road pavement to mitigate the damaging effects of erosion on road pavement layers.
- It is imperative that water flow retarders or baffle structures be placed along the steep sections of drainage channels. These baffle structures could comprise of simplistic measures such as placing piles of cobbles and boulders at regular intervals below a stormwater outfall. These structures will assist in hindering the speed and erosive power of rainwater runoff from the road surface.

Culvert Foundations:

- It is recommended that where new culverts are constructed, that culvert foundations be keyed in to the underlying sandstone horizons where present at or near surface.
- Where no rock is intersected, it is recommended that foundations be placed a minimum of 1.0m below present ground level within the residual soil horizons. This is going to fuck up a few wetlands!!
- The base of the foundation excavations must be scarified and compacted to 95% MOD AASHTO in order to remove any localised soft spots which may be present.
- It is further recommended that 0.2m of bedding material of at least G5 quality be introduced in 100mm layers and compacted to 98% MOD ASSHTO at 2% of optimum moisture content.
- Excavations must be wide enough to accommodate either a hand operated roller compactor or whacker compacter.
- Erosion mattresses and wing walls must be provided to mitigate the expected erosion of the exposed sides of the drainage channels.
- It is imperative that a geotechnical engineer be allowed to inspect the foundation excavations prior to the placement of the culvert footings to ensure the correct depth, natural rock horizon and material strength has been obtained.

Road Construction:

- It is recommended that where the horizontal and vertical alignment of the road is improved during the upgrading process, that the majority of overlying colluvium materials and existing gravel wearing course are removed so that the natural residual soils are exposed where possible.
- The existing gravel wearing course material must be stockpiled for use as a sub base layer for the new asphalt road.
- Prior to the placement of the new asphalt surfacing, the new pavement layers, comprising of sub base and base course, must be placed and compacted on top of the residual soil horizon or weathered rock layers.
- These exposed residual soil horizon or weathered rock layers must be scarified and compacted prior to the placement of the overlying granular pavement layers to remove any localised soft spots.

- It is imperative that where existing cuttings are reshaped and new cuttings created, that the slopes be cut back to gentle slopes of no more than 1V:2.5H.
- In addition, summit and toe drains must be placed around all cuttings to ensure long term slope stability. It is suggested that gabions be placed along the toe of all cuttings greater than 2.0m in height.

3.2 Heritage and Palaeontological Assessment

A desktop heritage survey and desktop Palaeontological Impact Assessment was undertaken by Umlando: Archaeological Surveys and Heritage Management during May 2016 and the full report is attached in **Appendix D5** (Umlando: Archaeological Surveys and Heritage Management, Desktop heritage assessment, 2016). The main findings of this report and recommendations have been summarised below:

- The archaeological database indicates that there is only one archaeological site in the general area which is an open Middle Stone Age site of low significance.
- No national monuments, battlefields, archaeological sites or historical cemeteries are known to occur in the study area.
- The 1937 aerial photographs indicate that there are 10 settlements and one building within approximately 50m of the road. None of these features occur within 20m of the road reserve and will not be affected. A 50m sensitivity buffer must be placed around each co-ordinate of these settlements and noted for the potential occurrence of human remains.\
- The road falls into a low to insignificant palaeontological sensitivity zone. No further palaeontological work is required.
- The road upgrade should be exempt from further HIA studies. If any graves do occur near the road, then these would be known to the community and must be treated accordingly.

3.3 Vegetation Assessment

Afzelia Environmental Consultants (Pty) Ltd undertook the vegetation assessment for this project on the 08th of April 2016 and the full report has been included in **Appendix D4** (Afzelia Environmental Consultants, Vegetation assessment, 2016). It must be noted that this was a one day field assessment undertaken at the end of the growing season in late autumn.
The main findings of this vegetation report have been summarised below:

- A field survey was conducted to determine the vegetation types and species present within the study area. The dominant vegetation type in the study area is the KwaZulu-Natal Coastal Belt Grassland vegetation type.
- The majority of site was highly transformed by *Eucalyptus* plantations and thickets of alien invasive plant species. However, the north western portion of the study site is comprised of grassland that is considered to be sensitive.
- Possible impacts that may occur as a result of this road upgrade include the loss of indigenous vegetation, fragmentation of vegetation communities, the proliferation of alien invasive species and the loss of species of conservation concern.
- Of particular concern is the adverse impact the proposed road upgrade will have on the good quality grassland habitat. Construction activities in this area must be strictly controlled such that the work servitude must be restricted to the eastern portion of the existing road alignment and must be limited to 10m in width.
- Sustainable Urban Drainage Systems must be incorporated into the design of the road as this will aid in mitigating some of the expected negative impacts.
- All mitigation measures stated in the vegetation report must be included in the Environmental Management Programme and must be implemented fully and effectively during the construction and operations phase to minimise impacts that will be caused by the road and infrastructure upgrade.

3.4 Aquatic Ecological Assessment

In addition, an Aquatic Ecological Assessment was undertaken by Afzelia Environmental Consultants (Pty) Ltd in accordance with the requirements for a Water Use Licence application on the 11th April 2016 (Afzelia Environmental Consultants, Aquatic assessment, 2016) – a summary thereof is listed below. The full report has been included in **Appendix D3.**

3.4.1 Health Status and Importance:

- The scope of this assessment was to delineate and classify any streams and its riparian areas associated with the Nositha Road upgrade.
- The riparian vegetation was assessed according to the Riparian Vegetation Response Assessment Index (VEGRAI) methods. The unnamed tributary of the Vungu River was found to be **largely modified** (**PES D**).
- The habitat assessments that were used to evaluate the instream and riparian habitat of the study site. revealed that the stream was in a **moderately modified** (**PES C**) according to the IHIA and **inadequate** according to the IHAS findings.
- The *in situ* water quality levels were found to be within acceptable range.
- From the diatom analysis, it was clear that the unnamed tributary of the Vungu River had a high sediment load and was found to be in a **moderate** ecological state with the most abundant being pollution tolerant species.
- The macroinvertebrates assessment was found to be in a **largely modified** state (PES D) according to the SASS scores, however the MIRAI scores were found to be moderately modified (Class C) for the stream.
- The overall PES resulted in a **D-class** rating; this indicates a **moderate Ecological Importance Sensitivity** (EIS) rating. This is attributed to the extensive alien invasive vegetation, erosion along stream banks area and pollution from the existing rural settlements (general litter of plastics).

3.4.2 Potential Impacts and Recommendations:

- A number of potential impacts relating to erosion and sedimentation, pollution and the possible spread of alien invasive species will potentially occur as a result of the proposed Nositha Road upgrade.
- Mitigation measures, aimed at minimising the abovementioned impacts, include (but are not limited to):
  - design and implementation of a suitable storm water systems;
  - rehabilitation of the disturbed areas;
  - limiting instream sedimentation;
  - minimising pollutants entering the watercourse; and
  - Implement a programme for the clearing/eradication of alien species including long term control of such species.
- Mitigation measures provided in the Aquatic Ecological Assessment report must be incorporated into an Environmental Management Programme (construction and operational) for the proposed project.

3.5 Wetland Assessment

A wetland functionality assessment was undertaken by Earth Water Environmental Science on the 15th of June 2016 to assess all the wetland indicators and Present Ecological State (PES) or health of the wetland, the wetland's ability to provide goods and services (Eco-Services) and the Ecological Importance and Sensitivity (EIS) of the wetlands. The full report has been included in **Appendix D2.** The main findings of this wetland report have been summarised below (Earth Water Environmental Science, Wetland Assessment, 2016):

3.5.1 Present Wetland Health

Six HGM units (with their respective delineated areas within the 500m assessment buffer) were identified namely (See **Figure 7 Wetland Delineation Map**):

- Wetland Flat/Depression (HGM 1) (1.0ha);
- Unchannelled Valley Bottom (HGM 2) (2.4ha);
- Unchannelled Valley Bottom (HGM 3) (6.0ha);
- Unchannelled Valley Bottom (HGM 4) (0.8ha);
- Channelled Valley Bottom (HGM 5) (1.0ha); and
- Channelled Valley Bottom (HGM 6) (0.8ha).

The Present Ecological State (PES) of these wetlands are outlined below:

HGM 1: The overall PES score for the wetland flat depression was that of an **E** (**Seriously Modified**). The hydrological component of the HGM unit was categorised as an **F in that it has** been **critically modified**, as a result of the earthen dam

that has been constructed in the relatively small catchment, as well as the increase surface runoff and runoff velocity which increases the risk of erosion. The geomorphology of the wetland was categorised as an **E** (**Seriously Modified**) as a result of the earthen dam within the wetland and increased runoff. The vegetation component was categorised as an **F** (**Critically Modified**), as a result of the grazing activities.

HGM 2: The overall PES category for the unchanneled valley bottom wetland system was that of a **C** (**Moderately Modified**). The hydrological component of the HGM unit was categorised as a **D** (**Largely Modified**), as a result of the increased water inputs from altered surface roughness (hardened) factors in the catchment, such as grazing. The geomorphology of the wetland was categorised as a **C** (**Moderately Modified**), as a result of the altered hydrological inputs and increased runoff. The vegetation component was categorised as a **C** (**Moderately Modified**), as a result of the limited subsistence cropping and the Eucalyptus plantations on the edge of the wetland.

HGM 3: The overall PES category for the unchanneled valley bottom wetland system was that of a **C** (**Moderately Modified**). The hydrological component of the HGM unit was categorised as a **D** (**Largely Modified**), as a result of the altered water inputs and the presence of Eucalyptus and commercial sugarcane farming. The geomorphology of the wetland was categorised as a **C** (**Moderately Modified**) mainly as a result of the altered water inputs. The vegetation component was categorised as a **D** (**Largely Modified**) primarily as a result of the commercial plantations and sugarcane farming taking place on the edge of the wetland.

HGM 4: The overall PES category for the unchanneled valley bottom wetland system was that of a **D** (**Largely Modified**). The hydrological component of the HGM unit was categorised as a **C (Moderately Modified**), as a result of the altered water inputs and the presence of subsistence agriculture and hardened surfaces. The geomorphology of the wetland was categorised as a **C** (**Moderately Modified**) mainly as a result of the altered water inputs. The vegetation component was categorised as a **D** (**Largely Modified**) primarily as a result of the subsistence agriculture taking place in and around the wetland.

HGM 5: is the location of the unnamed tributary of the Vungu River crossing. The overall PES category for the channelled valley bottom wetland system was that of a **D** (**Largely Modified**). The hydrological component of the HGM unit was categorised as an **E** (**Seriously Modified**), as a result of the deeply eroded channel banks and some alien vegetation within the channel. The geomorphology of the wetland was categorised as a **D** (**Largely Modified**), as a result of the modified hydrology and the presence of the existing bridge crossing. The vegetation component was categorised as a **D** (**Largely Modified**), as a result of the alien vegetation and the erosion of the banks.

HGM 6: The overall PES category for the channelled valley bottom wetland system was that of an **E** (**Seriously Modified**). The hydrological component of the HGM unit was categorised as an **F** (**Critically Modified**), as a result of the two small earthen dams as well as the road crossing. The geomorphology of the wetland was categorised as an **E** (**Seriously Modified**), as a result of the modified hydrology and the presence of the two dams and road culvert. The vegetation component was categorised as an **E** (**Seriously Modified**), as a result of the Eucalyptus plantation at the head of the wetland and the extensive banana plantation in the wetland.

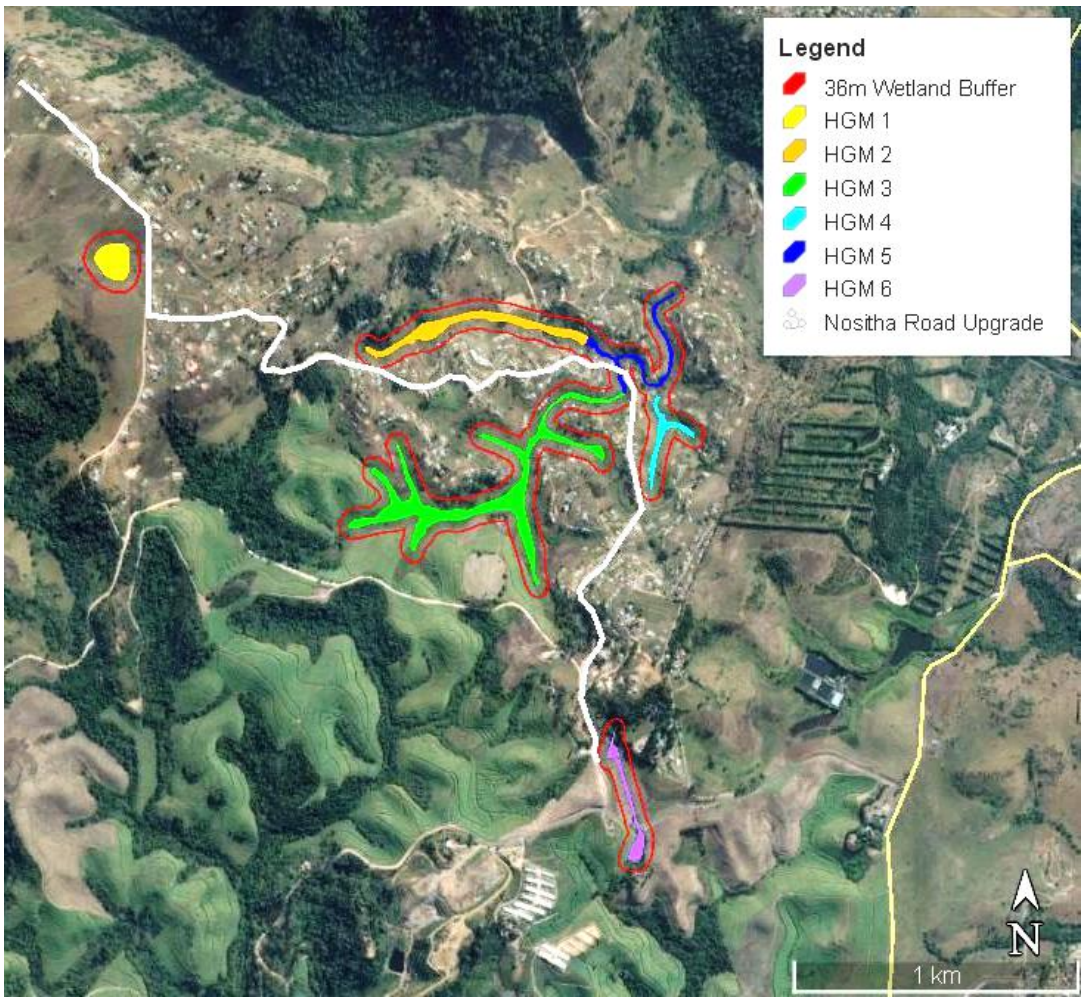
HGM1 provides moderately high indirect benefits through flood attenuation and the assimilation of sediments, nutrients, phosphates, and toxins. The direct benefits provided are also moderately high.

HGM 2, HGM 3, and **HGM 4** are all unchanneled valley bottom wetlands. These wetlands all provide similar services and had moderately high benefits to streamflow regulation and the assimilation of nutrients, phosphates and toxins. They provide a high benefit to humans through harvestable resources and cultivation.

HGM 5 provides moderately high services in terms of the assimilation of nutrients and phosphates, as well as some benefits to the community. The EIS was a **low (D**).

HGM 6 has been significantly altered, yet still provides a moderately high benefit to flood attenuation as a result of the earthen dams. The wetland also scored moderately high for harvestable material and cultivated food benefits.

All the HGM units have a **low (D)** ecological importance and sensitivity and all have moderate ratings **(C**) for the hydrological functioning and importance and for direct human benefits.



(Source: Earth Water Environmental Science – 2016)

Figure 7: Nositha road wetland delineation map

3.5.2 Potential Impacts and Recommendations

During the construction phase vegetation and topsoil will be cleared for the widening of the road as well as during the construction of the culverts. This will lead to increased turbidity and sedimentation in the wetlands as well as altered flow patterns. The machinery used has a risk of hydrocarbon spills into the wetland. These risks have all been rated as moderate.

The road upgrade however will improve the current condition of road and culvert design. It will also lower the current risk of sediment load to the wetlands as the present dirt road will be a black top road instead.

The impact assessment shows that the biggest impact will occur during the construction phase with medium-high impacts predicted as a result of cleared areas. This will increase the sediment load after a rain event as well as the deposition of toxic contaminants into the wetlands.

The impact assessment findings, that have major concerns, in relation to the proposed construction activities are as follows:

- Increased sedimentation and turbidity during the construction phase;
- The increased flood volumes that will occur as a result of cleared areas; and
- The increase of toxic contaminants.

In as far as the operational phase impacts, the road upgrade will facilitate safer and easier traffic movement. However, the increase in hardened surfaces will result in a concomitant increase stormwater flows which will have an cumulative impact on the receiving environment (wetlands) in allow more traffic to move through the area as well as increase the hardened surface. This impacts on the (rain fall) flow patterns to the wetlands as well as possibly increased pollution levels. The operational phase has medium-high environmental risk rating but a high positive social impact rating.

During the operational phase, there is a medium-high risk due to the increased traffic that will occur on the road. This will increase the risk of toxic hydrocarbons being washed into the wetland areas. The increased area of hardened surfaces will increase flow volumes/ flood-peaks leading to increased erosion potential.

Mitigation measures provided in the Wetland Assessment report must be incorporated into an Environmental Management Programme (construction and operational) for the proposed Nositha road upgrade project. Please see **Appendix F**.

3.6 Rehabilitation Plan

The rehabilitation plan focuses on the only road crossing associated with the road upgrade. This crossing forms part of HGM 5 (channelled valley bottom wetland). The PES for this unit is a (**D**) and this rating must be maintained or improved through management by the Proponent (Ray Nkonyeni Local Municipality) during the operational phase of the project.

3.6.1 The rehabilitation objectives

The priority is the assurance that the banks of the stream and the quality of the system do not deteriorate during and after the construction. The objectives for the watercourse rehabilitation, re-vegetation and erosion control measures are:

- To ensure that the PES remains a D or is improved to a C;
- Ensure that the concrete support walls are long enough and at a suitable angle so that side cutting does not occur;
- Ensure the banks are properly supported with the appropriate structures;
- Removal of rubble from the watercourse;
- Best management practice of the activities during construction;
- Minimise the construction pollution by correct storage methods, rubbish facilities, ablutions and spill management;
- Clear rubbish from the riparian/wetland areas;
- Search and rescue activities for important indigenous species;
- Alien Plant Control must be conducted in consultation with a vegetation specialist;
- Manage eroded areas along the road development, particularly in the wetlands;
- Place sediment traps that will prevent wash down the into the wetlands and prevent any culverts from becoming blocked;
- Plant a suitable grass that will assist in stabilising the banks; and
- Consider geo-textiles to stabilise the banks of the channel and provide a suitable medium for vegetation to establish.

3.6.2 Rehabilitation Measures / Guidelines

Soil Management, Alien Plant Management, Re-establishment of Vegetation

The following points have been provided for use with the rehabilitation actions:

- Preservation and management of top-soil stockpiles must be implemented from the start of the road upgrade to ensure effective rehabilitation.
- Consider stone packs/walls and alternative barriers.
- Soil stripping must be done in stages; topsoil (0 – 30cm) stripped and stockpiled separately from the remaining sub-soil.
- Top- and subsoil stockpiles (used for road levelling and bank lifting) must not be stockpiled within 100m or within the 1:100 year floodplain of a water course.
- Naturally occurring vegetation removed by site clearance operations may be grubbed in with the topsoil for stockpiling.
- The topsoil must not be buried or impacted upon in any other way that would render it inappropriate for rehabilitation use.
- Topsoil stripping (in widening and realignment areas) must not occur in wet weather and during stripping and stockpiling, the topsoil must not be subject to a compaction force greater than 1 500kg/m² and must not be pushed for more than 50m.
- Topsoil must also only be handled twice, once to strip and stockpile, and secondly to replace, level, shape and scarify if necessary.

- Top soil stockpiles must be protected against erosion and a record kept of all top soil quantities and should there be shortfalls of topsoil required for rehabilitation, adequate replacement material from commercial sources should be obtained as approved by the Engineer and ECO (preferably from areas identified with sourced excess topsoil).
- Equally, excess topsoil must be landscaped and stabilized in accordance to the requirements of the Engineer, ECO and in consultation with the Land Rehabilitation Specialist.
- Topsoil stockpiles must not be stockpiled for longer than 6 months. If this can't be avoided, the stockpiles must be enriched or upgraded prior to rehabilitation. The Contractor must consult with the Engineer and ECO with regards to matching preconstruction conditions or existing adjacent conditions.
- All stockpiles left for extended periods of time must be stabilised using approved vegetation cover or other erosion control measures.
- Any excess subsoil must be removed from the road fringe once back filling is completed, and taken to a licensed landfill site.
- Invasive plants must be managed.
- Contractors using herbicides must have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947).

Re-vegetation planting must be undertaken in spring if possible to ensure that establishment is successful and the following species may be included, as they are commercially available;

- *Eragrostis tef* 3kg/ha
- *Digitaria eriantha* 6kg/ha
- *Panicum maximum* 4 kg/ha
- *Chloris gayana* 6kg/ha
- *Cynodon dactylon* 6kg/ha

In order to adequately implement the re-vegetation component, the following general planting guidelines have been adopted to drive the rehabilitation process:

- Non-woody areas must be returned to either hygrophilous vegetation (sedges, bulrushes) or to graminoid assemblages which favour relevant specific habitats.
- Wherever alien woody vegetation is removed, indigenous trees must be planted back.
- At least 50% of the trees introduced should be indicative of the surrounding indigenous riparian or wetland species with the remainder derived from species which may favour more terrestrial environments.
- All plantings in riparian and wetland areas must occur in consultation with the relevant wetland and vegetation specialist, to ensure identification and best placement, within the wetland or riparian areas.

Other techniques of rehabilitation may include Hydraulic seeding / hydro seeding, use of plugs, hand seeding and Geotextiles such as BioJute$_{TM}$, which is produced by a company called *Maccaferri* and Geojute® which is produced by a company called Geotextiles Africa.

SECTION D: PUBLIC PARTICIPATION PROCESS

1. OVERVIEW

It is stated in the Environmental Impact Assessment Regulations (2014) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended; that a public participation process must be conducted as part of the basic assessment process. Public participation is currently being carried out in accordance with Section 24J of the National Environmental Management Act as amended in the EIA regulations, 2014.

The primary objectives of the public participation process are to:

- Inform and notify potentially Interested and Affected Parties (I&APs) of the proposed application (explain steps that were taken to achieve this);
- Initiate or promote meaningful and timeous participation of I&APs by providing proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;
- Maintain a list of all persons, organisation and organs of state that were registered as interested and affected parties in relation to the application;
- Identify issues and concerns of key stakeholders and I&APs with regards to the application for the proposed project;
- Provide a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues; and
- Provide responses to I&AP queries.

2. AUTHORITY CONSULTATION

The competent authority which is the KZN DEDTEA - Environmental Impact Assessment (Ugu District) is required to provide an environmental authorisation (either positive or negative) for the project. The KZN DEDTEA will be consulted throughout the BA process for a pre-application meeting and guidance for this project.

A pre-application meeting for the Water Use Licence Application process was held with the DWS Regional Office on the 25th of July 2016. The pre-application meeting requirement record and attendance register are attached in **Appendix E6.**

The Heritage Impact Assessment Study and Background Information Document (BID) were uploaded into the AMAFA website on the purpose of this application for comment in terms of section 38(8) of the National heritage legislation and NEMA. A comment from AMAFA regarding this application was received on the 17th November 2016 and it has been included in the comment and response report and **Appendix E5.**

3. IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

Afzelia Environmental Consultants (Pty) Ltd has developed an initial I&AP's database comprising of key stakeholders, I&AP's and Organ of States. This database has been maintained and updated throughout duration of the public participation process of the project. **Table 15** below lists all the key stakeholders, I&AP's and Organ of States identified.

Table 16: Key stakeholders identified with respect to the PPP

NAME	ORGANISATION
Mavis Padayachee	KwaZulu Natal Department of Economic Development, Tourism & Environmental Affairs
Melissa Puckree	KwaZulu Natal Department of Economic Development, Tourism & Environmental Affairs
Nonhlanhla Myeni	Department of Agriculture, Environmental Affairs and Rural Development
Karen Moodley	Department of Agriculture, Forestry & Fisheries
Bernadet Pawandiwa	AMAFA AkwaZulu Natali
Dominic Wieners	Ezemvelo KZN Wildlife
Zwelakhe Khanyile	Department of Water and Sanitation
Michelle Smidt	KZN Department of Transport
Dheevashnee Pillay	Provincial Department of Co-operative Governance & Traditional Affairs– Professional Town and Regional Planner
Pravesh Manipersadh	Ingonyama Trust Board
Richard Dlamini	Ray Nkonyeni Local Municipality - HOD
Siyabonga Zama	Ray Nkonyeni Local Municipality - Departments Planning and Economic Development
Noloyiso Walingo	Ugu District Municipality
Michelle Nicol	Eskom
Jos Summer	Eskom
Mdumseni Innocent Cele	Ward 27 - Councillor
Dumisani Frederic Mavundla	Mavundla Traditional Tribal Authority

NAME	ORGANISATION
Paddy Norman	WESSA

4. PUBLIC NOTICES / SITE NOTICES, ADVERTISEMENTS AND BID

Interested and Affected Parties (I&AP's) were notified of the project through the following ways:

- Fixing a notice board at a place conspicuous to and accessible by the public the route of Nositha Road;
- Written notice has been given to I&AP's, property and business owners, persons in control of and occupiers of land adjacent to the proposed site*, municipal councillors, municipality, applicable government departments. This has been done through email and hand delivered notices;
- Placing of an English and isiZulu newspaper advertisements in local newspapers.

The notices put up and information given out include the following information:

- Details of the proposed application / project;
- What procedure is being undertaken, i.e. Basic Assessment and Water Use License;
- The nature and location of the proposed activity;
- Where further information on the application can be obtained; and
- Contact details for the person whom represents the applicant/Proponent.

A background information document (BID) was sent to the key stakeholders via email. Background information documents were also erected to the pole at the start of the proposed road upgrade and left at the Inkanyezi "spaza" shop.

**Note: Due to the type and number of residential properties, notices were not left at each property (no post boxes exist).*

A total of five (5) site notices were erected along the proposed road route which displayed the details of the proposed project, location and application process. The Environmental Assessment Practitioners details were also displayed. These notices served to inform I&AP's of the project and afforded them the opportunity to comment and are attached in **Appendix E2**.

5. PUBLIC AND AUTHORITY REVIEW OF THE DRAFT BASIC ASSESSMENT REPORT

The draft BAR will be available for Authority and public review for a total of 30 legislated days from **27 March 2017** to **02 May 2017** and upon request from the EAP. In order to distribute the information regarding the proposed development to the broader public and to ensure that all potential I&AP's are given the opportunity to comment. A commenting period of 30 days has been given with regards to the Draft Basic Assessment process and 60 days for the water use license application processes.

The report has been made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Public Place: Nositha Road Community Creche; and
- Afzelia Environmental Consultants website: www.afzelia.co.za

6. COMMENTS AND RESPONSE REPORT (ISSUES TRAIL)

The purpose of this Comments and Responses Report is to record comments received from Organs of State and Interested and Affected Parties (I&APs) during the initial public participation process undertaken for the proposed Nositha Road upgrade project. Comments and issues received during the initial public participation process have been captured, presented and responded to in this report. See **table 16** below and **Appendix E5**:

Table 17: Interest and Affected Parties Issues and Concerns

Method of response - = Letter/Fax = E-mail = Public meeting

NO.	ISSUE	NAME	METHOD & DATE	COMMENT	RESPONSE
1	Registration as an I&AP and general comment	**Jennifer** *Nositha Community Creche*	8/04/2016	We appreciate the proposed road upgrade project but ensure that this does not destroy the bridge and register me as an I&AP.	Nositha Community Creche have been registered as an I&AP for the Nositha road upgrade project and will keep them informed throughout the Environmental Authorisation process.
2	Registration as an I&AP	**Pravesh Manipersadh** *Ingonyama Trust Board*	11/04/2016	Provided personal details to register as an I&AP.	Ingonyama Trust Board have been registered as an I&AP for the Nositha road upgrade project and will keep them informed throughout the Environmental Authorisation process.
3	General comments during the application process	**Zwelakhe Khanyile** *DWS*	11/04/2016	Asked for the commenting period for the WULA to be placed in the BID.	Thank you for your response. Afzelia acknowledges your comment and has updated the BID.
4	General comments during the application process	**Jos Summer** *ESKOM*	13/04/2016	Requested a site visit with Afzelia to discuss the powerlines which run across Nositha Road.	Site visit was organised for the 18/4/2016. Eskom did not show. Another site visit was requested by Afzelia for the week of 23/4 – 26/4/2016. Eskom did not respond. Another meeting will be scheduled with Eskom prior to the submission of the FBAR.
5	Impacts on heritage resource in terms of KZN Heritage Act no. 4 (2008) and the National Heritage Resources Act No 25 of 1999	**Bernadet Pawandiwa** *AMAFA/Heritage KwaZulu Natal*	17/11/2016	Since it is indicated that the development entails road upgrade and refurbishing of existing storm water culverts it is not anticipated that the development will encroach beyond the existing footprint, therefore AMAFA has no objection to the development provided that the developer operates within the prescribed parameters. The Heritage Desktop Study highlights that while historical maps indicate that several settlements and/or buildings occur within 50m of the proposed road, most of these have been destroyed and/or built over. It also stresses that some will not be affected by the road upgrade and fall outside of the road reserve. These homestead sites could harbour graves and should be treated as sensitive areas. All graves outside formal cemeteries are generally protected by heritage legislation and should not be	Noted Noted Noted

NO.	ISSUE	NAME	METHOD & DATE	COMMENT	RESPONSE
				disturbed, damaged, altered or exhumed and relocated without a permit from AMAFA and written permission of relatives or concerned families in this community. In the event that the developer considers road widening beyond the existing footprint, a phase 1 HIA is triggered and the developer should engage the services of a Heritage practitioner to conduct a field based assessment involving mapping out sensitive zones including graves as some homesteads are abandoned and are not necessarily known and protected by community members. The map should be used by the construction team to avoid inadvertent damage to graves and sensitive areas. You are also required to adhere to the below-mentioned standard conditions: 1. AMAFA should be contacted if any heritage objects are identified during earthmoving activities and all development should cease until further notice. 2. No structures older than sixty years or parts thereof are allowed to be demolished altered or extended without a permit from AMAFA. 3. No activities are allowed within 50m of a site, which contains rock art. 4. Sources of all natural materials (including topsoil, sands, natural gravels, crushed stone, asphalt, etc.) must be obtained in a sustainable manner and in compliance with the heritage legislation. Failure to comply with the requirements of the National Heritage Resources Act and the KwaZulu Natal Heritage Resources Act could lead to legal action being instituted against the applicant.	Noted Noted. This will be adhered to. Noted. This will be adhered to. This will be adhered to. These measures have been put in place in the EMPr attached in **Appendix F**. Noted

SECTION E: IMPACT ASSESSMENT AND MITIGATION

1. OVERVIEW

This section focuses on the environmental impacts that could potentially be caused by the proposed upgrade of Nositha Road during the pre-construction, construction and operational phases of the project. The decommissioning of the stormwater structures and bridge is not an anticipated event in the foreseeable future. Maintenance of infrastructure is addressed as part of the operational phase impact assessment.

Impact assessment must take account of the interactions between all aspects and associated activities of the project nature, scale and duration of effects on the environment, whether such effects are positive (beneficial) or negative (detrimental). Each issue or impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase.

The Impact Assessment of the project's activities is determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental impacts. The significance scoring of this environmental impact assessment is focussed only on the Construction and Operational Phase.

2. IMPACT ASSESSMENT METHODOLOGY USED FOR THE RISK ASSESSMENT

The potential environmental impacts associated with the project have been evaluated according to the description of the scoring process outlined below.

2.1 Calculation and interpretation of the overall significance of impacts and mitigation

The significance score assesses and predicts the significance of environmental impacts through the evaluation of the following factors; probability of the impact; duration of the impact; extent of the impact; and magnitude of the impact. The significance of environmental impacts is then assessed taking into account any proposed mitigations. The significance of the impact **"without mitigation"** is the prime determinant of the nature and degree of mitigation required[3]. Each of the below impact factors have been used to assess each potential impact using ranking scales.

Significance Scoring is calculated based on the following formula:

Significance Scoring (SS) = (Magnitude + Duration + Scale) x Probability

The significance of the impact is calculated according table 17 below.

Table 18: Significance ratings used for each potential impact

Probability	***Duration***
1 - very improbable	1 – Immediate (very short term)
2 - improbable	2 - Short Term (0-5 years)
3 - probable	3 - Medium Term (5-15 years)
4 - highly probable	4 - Long Term (>15 years) (ceases with operation life)
5 - definite	5 – Permanent / Unknown

[3] Impact scores given "with mitigation" are based on the assumption that the mitigation measures recommended in this assessment are implemented correctly and rehabilitation of the site is undertaken. Failure to implement mitigation measures during and after construction will keep the impact at an unacceptably high level.

Scale / Extent	*Magnitude*
1 - limited to the site only (Site)	2 – Minor
2 - limited to the local area (Local)	4 – Low
3 - limited to the region (Regional)	6 – Moderate
4 - National	8 – High
5 - International	10 – Very high / Don't know

The interpretation of the overall significance of impacts is presented in table 18 and 19 below.

Table 19: Significance rating of negative impact results.

Low significance (<30 significance points)	Low environmental significance	Impacts with real little effect and which should not have an influence on or require modification of the project design.
Medium significance (31-59 significance Points)	Moderate environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless mitigated.
High significance (>60 significance points)	High environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.

Table 20: Significance rating of positive impact results

Low significance (<30 significance points)	Low environmental significance	Impacts with real little positive effect and which should not have an influence on or require modification of the project design.
Medium significance (31-59 significance Points)	Moderate environmental significance	A positive impact or benefit which is sufficiently important to which could have an influence on the decision taking into consideration set mitigation measures.
High significance (>60 significance points)	High environmental significance	A positive impact which could influence the decision in a positive way about whether to proceed with the project regardless taking into consideration set mitigation measures.

2.2 Precautionary Principle

The significance scoring follows the Precautionary Principle. The Precautionary Principle is based on the following statement: *When the information available to an evaluator is uncertain as to whether or not the impact of a proposed development on the environment will be adverse, the evaluator must accept as a matter of precaution, that the impact will be detrimental. It is a test to determine the acceptability of a proposed development. It enables the evaluator to determine whether enough information is available to ensure that a reliable decision can be made.*

In addition, the Proponent is obliged to adhere to the requirements of Section 28 of the NEMA (Duty of Care and Remediation of Environmental Damage) which states that:

Duty of care and remediation of environmental damage: "(1) Every person who causes has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from

occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot be reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment".

For the purpose of this assessment, the impact significance for each identified impact was evaluated according to the following key criteria outlined in the sub-sections below.

3. POTENTIAL IMPACTS AND SIGNIFICANCE AND PROPOSED MITIGATIONS

The following sections will provide a description of the potential impacts as identified by the specialists, EAP and through the PPP as well as the assessment according to the criteria described from **Table 17** to **Table 19**. All potential impacts associated with the proposed Nositha Road upgrade through the construction and operation of the project life-cycle have been considered and assessed in the following sections including mitigation measures.

As the infrastructure is expected to be permanent, the decommissioning phase impacts have not been considered.

3.1 POTENTIAL ENVIRONMENTAL IMPACTS DURING THE CONSTRUCTION PHASE

Physical Impacts

Soil and Geology

Activity

- Stripping of topsoil
- Excavation & Bulk Earthworks
- Roadbed preparation
- Compacting of the gravel layer
- Pavement layers of gravel material
- Culvert foundation

Nature of potential impact

- Physical disturbance of soil.
- Soil loss
- Soil compaction
- Disturbance of surface geology.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Soil and geology	5	3	3	8	**70 High**	5	2	2	6	**50 Moderate**

Mitigation Measures –

- Along the first southern section of the road, excavation must be undertaken by a standard sized TLB, with little hard rock excavation anticipated.
- Excavation on along the northern section of the road will necessitate the use of relatively larger excavation plant such as a 20ton excavator, should depths significantly greater than 1m be required. It is strongly suggested that allowance for a hydraulic boom mounted rock hammer be made for the localised areas where near surface, hard rock sandstone is encountered.
- It is imperative that a geotechnical engineer be allowed to inspect the foundation excavations prior to the placement of the culvert footings to ensure the correct depth, natural rock horizon and material strength has been obtained.
- It is recommended that where new culverts are constructed, that culvert foundations be keyed in to the underlying sandstone horizons where present at or near surface.
- Where no rock is intersected, it is recommended that foundations be placed a minimum of 1.0m below present ground level within the residual soil horizons.

- The base of the foundation excavations must be scarified and compacted to 95% MOD AASHTO in order to remove any localised soft spots which may be present.
- It is further recommended that 0.2m of bedding material of at least G5 quality be introduced in 100mm layers and compacted to 98% MOD ASSHTO at 2% of optimum moisture content.
- The construction working servitude must be restricted to the eastern portion of the existing road alignment and must be limited to 10m in width.
- Implement effective topsoil management practices (stripping 200m of topsoil, stockpiling and reuse during rehabilitation of disturbed areas).
- Topsoil[4] must be stockpiled separately from subsoil[5].
- Depending on the depth of the topsoil, a recommendation is made to remove between 100 and 200 mm of topsoil and stockpile it in small mounds.
- Strip topsoil from all areas where permanent or temporary structures, or new access tracks and stockpile areas are to be established.
- Make sure that at no time is topsoil mixed with subsoil, spoil, and building rubble.
- All topsoil must be stored in berms not more than 2000mm high, located on an area of level ground that will not be in the path of runoff water during a storm, away from the working area, drainage lines, areas of valuable vegetation or on the bases of banks. A mulch cover or hessian sheets must be used to protect this soil from erosion – either by wind or water.
- Topsoil must be handled twice only – once to strip and stockpile, and secondly to replace, level, shape and scarify/cut.
- Maintain topsoil stockpiles in a weed free condition.
- Avoid handling soils when wet as this may result in the loss of soil structure and lead to compaction.
- subsoil must be removed to a depth instructed by the Engineer and stored separately to the topsoil if not used on rehabilitation of the site. This soil must be replaced in the excavation in the original order that it was found.
- It is recommended that where the horizontal and vertical alignment of the road is improved during the upgrading process, that the majority of overlying colluvium materials and existing gravel wearing course are removed so that the natural residual soils are exposed.
- The existing gravel wearing course material must be stockpiled for use as a sub base layer for the new asphalt road.
- Prior to the placement of the new asphalt surfacing, the new pavement layers, comprising of sub base and base course, must be placed and compacted on top of the residual soil horizon or weathered rock layers.
- These exposed residual soil horizon or weathered rock layers must be scarified and compacted prior to the placement of the overlying granular pavement layers to remove any localised soft spots.
- It is imperative that where existing cuttings are reshaped and new cuttings created, that the slopes be cut back to gentle slopes of no more than 1V:2.5H.

Erosion and Sedimentation

Activity

- Bringing fill material to site
- Depositing fill material

[4] Topsoil is defined as the A horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often darker in colour, due to the organic fraction. Where topsoil is referred to, it is deemed to be both the soil and grass/ground cover fraction. Subsoil is defined as the B horizon of the soil profile.

[5] Subsoil is the soil horizons between the topsoil (A horizon) and the underlying parent rock. Subsoil often has more clay-like material than topsoil. Subsoil is of less value to plants, in terms of nutrients (food) and oxygen supply, than topsoil. When subsoil is exposed it tends to erode fairly easily.

- Cut and fill embankments
- Installation of pipes and culvert for stream crossing.

Nature of potential impact

- Increased sedimentation of surrounding surface water resources
- deposition of sediment into the watercourse; posing a risk to the stream's geomorphological/functional integrity.
- Disturbance of natural fluctuations in water and sediment regimes.
- Increased erosion of stream banks
- Increase in on-site and off-site erosion

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Erosion and sedimentation	5	2	3	10	75 High	5	2	2	8	60 High

Mitigation Measures –

- Storm water management techniques must be designed and placed correctly to ensure that storm water runoff is controlled and channelled effectively to prevent soil erosion and sedimentation;
- Erosion protection measures must be installed at all pipe culverts or storm water drainage pipe outlets located along the route, this is a requirement in addition to velocity control measures. for e.g. Berms, sand bags, reno mattress and hessian sheets, erosion control blankets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells.
- Erosion mattresses and wing walls must be provided to mitigate the expected erosion of the exposed sides of the drainage channels.
- The use of sustainable drainage systems must be incorporated into the design of the road such as swales and infiltration trenches / filter drains.
- Summit and toe drains must be placed around all cuttings to ensure long term slope stability. It is recommended that gabions be placed along the toe of all cuttings greater than 2.0m in height.
- It is recommended that where water is collected and directed off and under the road through stormwater culverts, the use of concrete lined drainage channels be installed along the edges of the road pavement to mitigate the damaging effects of erosion on road pavement layers.
- Stockpiling of any materials must not occur within 50m from or adjacent to any of the channels, wetlands or stream.
- Stockpiles of material must be protected during the construction phase.
- Erosion control measures must be implemented in areas sensitive to erosion, *inter alia*, the use of sand bags, erosion control blankets, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells;
- Water must not be allowed to flow down cut or fills slopes without adequate soil erosion protection in place.
- Attenuation of stormwater from the road upgrade is important to control the velocity of runoff towards the stream. Attenuation structures must be placed between the road upgrade and the stream i.e. stormwater must not be directly deposited into the unnamed tributary of the Vungu River.
- Any construction activities within the stream must be restricted to a work servitude of 6 m.

- There must be no soil/sand excavation from the banks of the stream.
- No mining of soil / sand required for construction purposes from stream banks, channels or wetlands is allowed. Sand brought in must be stockpiled away from the stream and wetlands edge;

Hydrological impact

Activity

- Installation of road drainage
- Construction of stormwater infrastructure (bridge culvert and stormwater pipes).
- Furnish the roads with mountable kerbs on either side.
- Installation of pipes and culvert for stream crossings
- Temporary in-stream diversion

Nature of potential impact

- Physical alteration of natural water flow reaching water resources downslope/downstream.
- Increased stormwater runoff volume.
- Increased stormwater runoff velocity.
- Increase in stream velocity.
- Altered hydro-dynamics.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Hydrological impact	4	3	3	8	**56 High**	3	3	3	6	**36 High**

Mitigation Measures –

- Attenuation of stormwater from the road upgrade is important to control the velocity of runoff towards the stream. Attenuation structures must be placed between the road upgrade and the stream i.e. stormwater must not be directly deposited into the stream.
- Energy dissipaters must be constructed at any surface water outflow points.
- Water spreaders must be used to reduce the velocity of flow.
- All storm water runoff from the site must be supplemented by an appropriate road drainage system that must include open, grass-lined channels/swales rather than simply relying on underground piped systems or concrete V-drains.
- Any construction activities within the stream must be restricted to a work servitude of 6 m.
- Water diversions must be monitored, with only one diversion made at a time and the natural flow of the stream must be maintained at all time.

- It is imperative that water flow retarders or baffle structures be placed along the steep sections of drainage channels. These baffle structures could comprise of simplistic measures such as placing piles of cobbles and boulders at regular intervals below a stormwater outfall. These structures will assist in hindering the speed and erosive power of rainwater runoff from the road surface.

Impact on wetlands

Activity

- Construction of 4.4km of surfaced roads.
- Bulk Earthworks to achieve specified levels.
- Construction of pavement layers.
- Use of heavy machineries.
- Construction of stormwater infrastructure (bridge culvert and stormwater pipes).
- Construction of concrete lined v-drains with mountable kerbs on either side.

Nature of potential impact

- Further degradation of wetland areas.
- Potential loss of wetland area.
- impact on the geomorphological/functional integrity of the wetland systems
- Physical alteration of natural water flow and sediment dynamics within wetlands.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Wetland impact	5	2	2	10	**70 High**	5	2	1	8	**55 Moderate**

Mitigation Measures –

- Activities directly impacting on wetlands and channel watercourse must occur during the dry winter months (low or zero flow periods) in order to limit the potential impact linked to high runoff rates.
- Water on the road must be diverted away immediately to minimise the amount of water running directly from the road into the wetlands especially HGM 5.
- Minimise construction footprints prior to commencement of construction and control all edge effects of construction activities i.e. proliferation of alien vegetation, disturbances of soils.
- The footprint area associated with the upgrade must be minimised, avoiding the wetland areas where possible. Areas earmarked for construction must be marked to ensure a controlled disturbance footprint area.
- All soils compacted as a result of construction activities must be ripped and profiled.

- Energy dissipaters must be constructed at any surface water outflow points.
- The wetland areas must be monitored weekly for any signs of off-site siltation.
- All areas impacted by earth-moving activities must be re-shaped post-construction to ensure natural flow of runoff and to prevent ponding.
- Appropriate measures must be put in place to minimise erosion and the amount of sediment entering wetlands and channel watercourse.
- No stockpiling of any materials may take place adjacent to the wetlands and unnamed tributary of the Vungu River.
- Contractor laydown areas must be outside of wetland areas.

Biological Impacts

Impact on flora

Activity

- Removal of vegetation within the construction footprint.
- Clearance of vegetation within the riparian zone.
- Construction camp site establishment.

Nature of potential impact

- Loss of indigenous vegetation, floral habitat and ecological structure
- Loss of floral diversity and ecological integrity within the primary grassland.
- Loss of floral diversity and ecological integrity within the disturbed habitat.
- Loss of species of conservation concern.
- Disturbance of riparian zone and wetland vegetation.
- Reduction in Hydrophilic Vegetation.
- Disturbance to habitats.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Vegetation removal for construction activities	5	2	2	8	**60 High**	5	2	1	6	**45 Moderate**

Mitigation Measures –

- Detailed, colour photographs shall be taken of the proposed site before the clearing may commence. These records are to be kept by the Project Manager, appointed Contractor and ECO for consultation during the rehabilitation of the site.

- Construction activities around the area where damage to plants and natural features is likely to occur must be strictly controlled, such that the working servitude must be restricted to one side of the road only (eastern portion) and limited to 10m in width and 6m at the unnamed tributary of the Vungu River
- Once pegged, the site must be inspected by a qualified botanist to identify all conservation-important species. These species must be translocated to a suitable habitat outside of the project area, prior to any construction activities;
- Plant permits must be obtained from the relevant authorities prior to any construction activities commencing; and
- Any protected trees and plants that are removed must be replaced at a ratio of 1:10 (10 trees/plants must be planted for every 1 tree/plant removed).
- Disturbed areas must be rehabilitated immediately after construction has been completed in that area by planting appropriate indigenous vegetation species.
- Avoid clearing and excavating within the dripline (under the canopy) of large trees, as this can lead to root damage and premature death of the tree.
- Vegetation clearance must not be undertaken more than 10 days in advance of the work front. Vegetation clearing within 50m of a wetland or stream must only be undertaken when construction is actually underway and these sections must be rehabilitated within 2 weeks of initial clearing;
- Workers must be limited to areas under construction and access outside of the working servitude is prohibited.
- Harvesting and collection of any flora is strictly prohibited;
- Areas where vegetation is removed or damaged during the construction process must be suitably rehabilitated with an approximate mix of grasses and shrubs determined by a botanist or vegetation ecologist familiar with the area and riparian species. Rehabilitation must occur once work in the area has been completed and must not wait until the end of the project.
- No riparian flora outside of the direct construction boundary must be disturbed.
- Ensure that contractor laydown areas are included in the initial areas demarcated for clearing in order to minimise vegetation loss, and ensure that they do not encroach into wetland / riparian zones or their respective buffer zones.

Impact on aquatic habitat

Activity

- Construction of pavement layers.
- Construction of stormwater infrastructure (bridge culvert and stormwater pipes).
- Construction of concrete lined v-drains with mountable kerbs on either side.
- Installation of road drainage.
- Installation of pipes and culvert for stream crossings
- Temporary in-stream diversion

Nature of potential impact

- Changes to water quantity and quality.
- Short-term reduction of flow to downstream wetland/riverine habitat.
- Loss of instream flow including aquatic refugia and flow dependent taxa.
- Destruction of many aquatic faunal species or aquatic biota affecting their habitat, breeding and feeding cycles.
- Habitat alteration downstream of crossing points due to increased sediment deposition.
- Degradation of coarse riverbed habitats by the infilling of interstitial spaces and the reduction of inter-granular flow as a result of what ?????????????.
- Reductions in photosynthetic activity and primary production caused by sediments impeding light penetration.

- Reduced density and diversity in benthic invertebrate communities as a result of habitat degradation.
- Establishment of more tolerant taxa or exotic species.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Impact on aquatic habitat	5	2	3	10	75 High	5	2	2	8	60 High

Mitigation Measures –

- Disturbed area in the stream as a result of road construction must 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
- Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place.
- There must be no soil/sand excavation from the banks of the stream.
- In=steam diversion must be adequately dissipated to prevent erosion at the outlet of downstream water flow velocities by using rocks for stability.
- Turbidity curtains/screens must be erected to limit downstream impacts of in-stream construction activities.
- Ongoing aquatic biomonitoring (In situ water quality, habitat assessment, SASS 5 where/if flow conditions allow for effective sampling and Diatom analysis) must be carried out once prior to construction, once during construction and one month after construction.

Soil, Surface and Groundwater Pollution

Activity

- Construction camp site establishment.
- Construction of stormwater infrastructure (bridge culvert and stormwater pipes).
- Temporary in-stream diversion,
- Asphalt or Seal Surfacing.
- Blinding of the base to the specified thickness using materials complying with specifications and of approved mix design,
- Reinforcement and Formwork,
- Batching and mixing by means of concrete mixer and concrete casted and compacted using poker vibrator
- Placing of culverts on top of constructed floor slab,
- Curing and backfilling.
- Finishing off: diversion will be closed off and material will be compacted to acceptable standard.
- Movement of vehicles and use of construction heavy machinery.

Nature of potential impact

- Alterations of the sediment balance.

- Disturbance to aquatic habitat.
- Disturbance to many aquatic biota or faunal species.
- Inputs of organic and toxic heavy metal contaminants.
- Contamination of soil and surface water resource.
- Increase in turbidity.
- Mismanagement of waste and pollutants like hydrocarbons, construction waste and hazardous substances resulting in these substances entering and polluting sensitive natural environments either directly through surface runoff, or subsurface water movement.
- Oil / fuel leaks from vehicles and portable construction equipment such as generators will result in soil, surface / groundwater contamination.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Soil, Surface and ground water pollution	4	3	3	8	**56 Moderate**	3	3	2	6	**33 Moderate**

Mitigation Measures –

- Water in the stream must be diverted around the area of placement of culvert structures until they are completely set and do not pose a risk of water contamination.
- No washing of concrete mixing and pouring equipment or any object that is contaminated with cement in any water resource. No concrete mixing trucks must be washed on site; they must return to the supplier for cleaning out.
- Hazardous chemical substances must be stored within a bunded and roofed area to prevent spills from occurring directly on the ground / soil.
- Handling of hazardous chemical substances (i.e. re-fuelling, pouring of oil etc.) must be done on a lipped spill tray.
- Bitumen must be handled with care and uncontrolled releases must be prevented.
- Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using permitted hazardous waste landfill sites.
- Any contaminated soil must be uplifted and removed and disposed of at a permitted hazardous waste landfill site.
- Sediment traps or sediment curtains (if not commercially obtained they must be made from bidim- see EMPr) must be used between the construction activities and stream and drainage channels.
- Increases in turbidity of the stream must be monitored and controlled by sediment curtains.
- The preconstruction stream bed structure and roughness must be reinstated post construction to maintain hydrological functioning.
- Construction of the bridge culvert must be conducted during the dry or low flow season, when the volume of water in the stream is at reduced levels.
- Construction materials and equipment must be stored at least 50m away from the stream bank and riparian areas and have suitable retention and bunding structures in place to prevent spills or run-off entering the river and riparian zone.
- Re-fuelling and maintenance of equipment and vehicles must not take place within 50m of the riparian and instream areas.
- Proper management and disposal of construction waste must occur during the lifespan of the project.
- No substances (e.g. Cement, oil, fuel, paint, bitumen etc.) must be released into any stream, watercourses or wetlands.

- Do not locate the construction camp within 50m of the wetlands or within the grassland areas adjacent to Nositha Road
- The construction site and camp must be cleaned on a daily basis and all litter must be collected and disposed of in waste bins on site.
- Waste must be stored in a clearly demarcated waste area.
- An appropriate collection and disposal strategy must be implemented to ensure that waste is removed at least once per week and taken to a permitted landfill site.
- Hazardous waste must be stored separately and disposed of at a permitted hazardous landfill site at least once per week.
- Waste bins must be secured and have lids to prevent litter from being blown and spread over the area.

Disturbance of fauna

Activity

- Construction of 4.4km of surfaced roads.
- Removal of vegetation within the construction footprint.
- Bulk Earthworks to achieve specified levels.
- Movement of construction vehicles, equipment and heavy machineries.

Nature of potential impact

- Potential to destroy to disturb, harm or injure faunal species (especially species with limited mobility) inhabiting the site directly.
- Reduce habitat quality and species diversity.
- Disruption of access to grazing and crop areas.
- Poaching by construction workers.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Disturbance of fauna	5	2	1	8	**55 Moderate**	5	2	1	6	**45 Moderate**

Mitigation Measures –

- Selected workers must be given training on the possible fauna that may be encountered along the Nositha Road.
- Site workers are to be informed of any sensitive fauna on the site prior to construction activities commencing and be informed that poaching or disturbance is strictly prohibited.
- Under no circumstances shall any fauna be handled, removed, killed or interfered with by the Proponent, Project Manager, Resident Engineer, contractors, engineers, and their employees, including subcontractors or their subcontractors' employees. However, if construction activities are likely to injure, kill or interfere with any fauna encountered on the site, appropriate action must be taken to ensure their protection.
- Any fauna found within the construction corridor must be moved to the closest point of natural or semi-natural vegetation outside the construction servitude. This includes those species perceived to be vermin (such as snakes and rats). The latter species may require the services of a specialist to catch and relocate dangerous/venomous species.

Proliferation of alien invasive vegetation

Activity

- Construction of 4.4km of surfaced roads.
- Removal of vegetation within the construction footprint.
- Clearance of vegetation within the riparian zone.

Nature of potential impact

- Disturbance of indigenous vegetation.
- Alteration of habitat structure.
- Lower biodiversity.
- change nutrient cycling and productivity, and modify food webs.
- Increased water usage.
- Increased inflammable biomass with high fire intensity

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Proliferation of alien invasive vegetation species	5	2	2	8	**60 High**	5	2	1	6	**45 Moderate**

Mitigation Measures –

- An alien invasive management programme has been incorporated into Environmental Management Programme (EMPr) and must be implemented throughout the construction and rehabilitation phases of the project.
- Ongoing alien plant control must be undertaken along the road route and particularly in the disturbed wetland and riparian areas.
- Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides is strictly forbidden.
- Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas as soon as practically possible once construction ceases so as to stabilise against erosion and sedimentation.
- All disturbed soils must be rehabilitated with local plant species to ensure that alien vegetation does not invade the area.

Socio-economic Impacts

Noise Pollution

Activity

- Construction of 4.4km of surfaced roads.
- Bulk Earthworks to achieve specified levels.
- Movement of construction vehicles, equipment and heavy machineries.
- Sourcing of construction materials.

Nature of potential impact

- Noise levels along the road will increase during the construction activities due to the use of heavy machinery and vehicles.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Increase in noise	5	2	2	8	**60 High**	4	2	2	6	**40 Moderate**

Mitigation Measures –

- All machinery must be serviced at regular intervals in order to ensure that they do not emit unnecessary noise.
- Vegetation along the road servitude must not be removed unnecessarily in order to maintain a vegetative barrier which will assist with preventing noise from travelling to residents and neighbouring farms.
- During construction keep noise levels within acceptable limits in compliance with all relevant guidelines and regulations such as SANS 10103: 2008.
- All vehicles and machinery must be fitted with appropriate silencing technology that must be properly maintained.
- The use of all plant and machinery must be appropriate to the task required in order to reduce noise levels.
- Increased attention to maintenance of tools and equipment will reduce worksite noise levels.
- Use light equipment or machinery such as the hand-held (“jackhammers”) and machine breakers (” woodpeckers”).

Elevated dust level

Activity

- Construction of 4.4km of surfaced roads.
- Bulk Earthworks to achieve specified levels.
- Movement of construction vehicles, equipment and heavy machineries.
- Sourcing of construction materials.

Nature of potential impact

- General construction activities will result in increased dust pollution.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Elevated dust level	5	2	2	8	**60 High**	5	2	1	6	**45 Moderate**

Mitigation Measures –

- Dust suppression must be implemented by dampening with water or spraying from a water tanker along the road during construction to prevent dust from being blown from the project site into neighbouring properties and from causing visibility problems for users on the road. Potable or treated water must not be used for dust suppression.
- Heavy machinery and vehicles must not exceed a speed limit of 30 km/hr along the area under construction.
- It must be ensured that, during transport, loads of loose material (such as sand, gravel etc.) on trucks is covered and/or dampened.
- Do not exceed the freeboard levels when transporting construction related materials.
- Camp construction areas / Access road / work faces –that have been stripped of vegetation must be effectively dampened to avoid excessive dust. This must apply particularly in instances of high wind speed or when dust is seen to be generated in significant quantities.
- Cover construction materials, skips and stockpiled soils if they are a source of dust.

Road safety and disturbance of traffic

Activity

- Construction of 4.4km of surfaced roads.
- Requirement of road servitude.
- Bulk Earthworks to achieve specified levels.
- Movement of construction vehicles, equipment and heavy machineries.
- Sourcing of construction materials.
- Construction of stormwater infrastructure (bridge culvert and stormwater pipes).
- Placing of culverts lifted by the Crane or Excavator and placed on top of constructed floor slab.

Nature of potential impact

- Temporary disturbance for movement of pedestrians and vehicular traffic in the area.
- There is the likelihood of disruptions to the properties boundaries in close proximity of the road reserve; possible need for expropriation of land.
- Potential relocation of Eskom powerlines within the road reserve.

- Construction activities and vehicles may pose safety risks to the people in the community.
- Site access points and construction areas will result in increased road safety issues to members of the public.
- Uncontrolled stopping and dropping of passengers by taxis and private vehicles in the vicinity of the construction works will increase the risk of accidents and delays on surrounding roads.
- Hazardous areas such as excavations and chemical storage areas pose a potential safety risk to members of the public as well as site workers.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Temporary pedestrians and vehicular disturbance	5	2	1	8	**55 Moderate**	5	2	1	6	**45 Moderate**

Mitigation Measures –

- A traffic management plan must be designed for this road during construction, this must be circulated to residents in the area.
- Warning signs regarding the construction activities must be erected to warn pedestrians and drivers in the area.
- Prior to 14 days calendar of the commencement of construction activities, notify land owners and the local communities adjacent to the construction site which will be affected.
- Adequate and safe passage for pedestrians and road users through the construction site must be provided, controlled and maintained at all times during the construction; this will decrease the risk of accidents.
- The necessary traffic safety warning signage must be erected during construction as per the engineers' specifications to warn motorists and pedestrians of the potential dangers of the construction site
- Road safety measures must be adequately defined with the necessary road warning signage or Stop/Go controls.
- Construction site workers must remain within the designated construction zone at all times unless otherwise authorised by the resident engineer and the ECO.
- Construction workers / construction vehicles to take heed of normal road safety regulations. A courteous and respectful driving manner must be maintained so as not to cause injury to livestock or people.
- Flagmen must be used to control the traffic flow.
- Additional signage must be kept in storage on the construction site for replacement of missing and damaged signage.
- Eskom powerline servitude and clearance requirements must be agreed to in writing prior to construction commencing.
- Any required expropriation of the land must be managed by the Proponent (Ray Nkonyeni Local Municipality) in consultation with the affected parties **prior** to commencement of construction activities.
- Areas used to store hazardous substances must be suitably signed, fenced and access controlled; residents living adjacent to the construction site must be notified of the existence of the hazardous storage area.
- Potentially hazardous areas such as excavated trenches or pits / storage areas are to be securely demarcated (not with hazard tape only) and made clearly visible at ALL times.

3.2 POTENTIAL ENVIRONMENTAL IMPACTS DURING THE OPERATION PHASE

Increased impervious area (Hardened surfaces)

Activity

- Operation of 4.4km of surfaced roads.
- Operation of stormwater infrastructure (bridge culvert and stormwater pipes).

Nature of potential impact

- Erosion and increase in sediment inputs & turbidity.
- Alterations in hydrological regimes as a result of increased storm water flood-peaks.
- Increased stormwater runoff volume and velocity.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Increased impervious area	4	5	3	8	64 High	3	4	2	6	36 Moderate

Mitigation Measures –

- Attenuation of stormwater from the road upgrade is important to control the velocity of runoff towards the stream. Attenuation structures must be placed between the road upgrade and the stream i.e. stormwater must not be directly deposited into the stream.
- Address increased runoff volumes at source.
- Disturbed area in the watercourse as a result of road maintenance must be rehabilitated as soon as maintenance in an area is complete or near complete and not left until the end to be rehabilitated (progressive rehabilitation).
- Bank erosion must be monitored at regular intervals during the operational phase in order to assess whether further river bank protection/stabilisation works are required.
- Ensure the stream banks are well maintained and vegetated to prevent any scouring of the supporting structures.
- The grass must be allowed to lengthen and thicken naturally to facilitate reduction in runoff velocity and volume, increase sediment deposition within the buffer zone and increase infiltration of stormwater.
- Areas sensitive to erosion must be identified, and monitored to ensure that erosion risks are minimised.
- Any erosion features must be stabilised following defection of stormwater infrastructures with soft engineering (preferred over hard engineering options) such as re-sloping and stabilising. Where risks are high, unstable/eroding banks must be reinforced/stabilised using appropriate engineering works such as gabions/rock pack/geotextile bags.

- If the runoff during operation cause erosion in the unnamed tributary of the Vungu River, the channel must be lined or flow control methods must be installed. The first choice of lining is grass as this will reduce runoff velocities and provide water quality benefits through filtration and infiltration. Should the velocity in the unnamed tributary of the Vungu River erode the grass, turf reinforcement mats, riprap, gabions or reno-mattresses must be used.
- Watercourse crossings must be regularly checked to ensure they are not being degraded or causing degradation and that, openings (under or at a culvert opening) are kept clear to avoid impeding flows to downstream areas. This minimises erosion.
- Stockpiled topsoil must be replaced following construction activities and be shaped to match the natural topography of the site. All stripped topsoil MUST be appropriately replaced on the site.
- An aquatic biomonitoring (In situ water quality, habitat assessment, SASS 5 where/if flow conditions allow for effective sampling and Diatom analysis) must be carried out one month after construction. Thereafter, every six months for the first two years if/where flow conditions allow for successful sampling, to determine any trends in the ecology of the stream.

Pollution of water resources and soil

Activity

- Operation of 4.4km of surfaced roads.
- Operation of stormwater infrastructure (bridge culvert and stormwater pipes).
- Repair and maintenance works.
- Routine maintenance inspections.
- Vegetation rehabilitation – on-going during the life-span of the project.

Nature of potential impact

- First flush effect.
- Pollutants from vehicle using the road and bridge culvert would be discharged directly into the stream.
- General waste produced by road users has the potential to pollute and contaminate the environment around the point source and further afield.
- Litter and other contaminants may enter the water system during the operation phase of the road.
- Increased inputs of organic/ heavy metal contaminants due to increased traffic on the road.
- Contamination of wetland resources through toxic organic and/or heavy metals.
- Pollution of aquatic resources.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Pollution of water resources and soil	4	4	3	8	**60 High**	3	3	2	6	**33 Moderate**

Mitigation Measures –

- Soft engineering techniques must be implemented along the entire road length to assist in capturing surface runoff and filtering out contaminants before the water reaches the water resources.
- Storm water outlet structures must be inspected on a monthly basis to ensure that littler is removed and correctly disposed of (at a permitted landfill site).
- The drainage provisions identified in design must be established early during the construction period and each provision must then be assessed after construction, and inspected after the first major storm event, to ensure there are no unexpected consequences.
- All disturbed soils must be rehabilitated with local plant species to ensure that alien vegetation does not invade the area.
- Water on the road must be diverted away to minimise the amount of water running directly from the road into wetlands especially HGM 5. Such drainage must lead the water to vegetated filter strips, which remove particles and contaminants from the water.
- Cut-off trenches must be constructed to prevent any harmful substances from entering the unnamed tributary of the Vungu River.
- It's highly recommended that litter traps are installed at all storm water outlets as to minimise litter from entering the stream. These will need to be cleaned out in accordance with a regular maintenance programme.
- Regular maintenance and checking of the infrastructure must however take place over the lifespan of the project.

Spread of Alien invasive species

Activity

- Operation of 4.4km of surfaced roads.
- Impact of stormwater infrastructure (bridge culvert and stormwater pipes).
- Repair and maintenance works.
- Routine maintenance inspections.
- Vegetation rehabilitation – on-going during the life-span of the project.

Nature of potential impact

- Infestation of alien vegetation post construction poses an ecological threat as they alter habitat structure, lower biodiversity, change nutrient cycling and productivity, and modify food webs.
- Increased water usage.
- Destruction of indigenous species; increased inflammable biomass with high fire intensity and erosion; clogging of waterways such as small streams and drainage channels causing decreased stream flows and incision of stream beds and banks.
- Overall impact on the hydrological functioning of the system.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Spread of Alien invasive species	4	5	3	8	64 High	3	4	3	6	39 Moderate

Mitigation Measures –

- An alien invasive management programme has been incorporated into an Environmental Management Programme attached in Appendix F.
- Ongoing alien plant control must be undertaken during the construction and operational phase and particularly in the disturbed areas as these areas could quickly be colonised by invasive alien species.
- Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides is strictly forbidden.
- Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas as soon as practically possible once construction ceases so as to stabilise against erosion and sedimentation.
- All disturbed soils must be rehabilitated with local plant species to ensure that alien vegetation does not invade the area.
- All areas disturbed after the completion of the construction activities must be rehabilitated to an acceptable state and must be monitored afterwards to prevent these areas from being colonised by alien invasive species.

3.3 POTENTIAL POSITIVE ENVIRONMENTAL IMPACTS

Improved transport system

Through the upgrading activities, Nositha Road will be hard topped which provides an improved transport system in this area.

Impact	During operation				
	Probability	Duration	Extent	Magnitude	Rating
Improved transport system	5	4	2	10	* 80 High

*** Positive outcome**

On-going Recommendations –

- The road must be inspected once every six months for the first 3 years and thereafter once a year to ensure that any faults with the road are reported and repaired.
- Road maintenance must occur in order to ensure that the road is maintained.
- Any reports regarding potholes or deterioration of the road must be addressed as soon as practicably possible to ensure that the positive impact created is maintained.

Reduction in soil erosion

Hardening of the road surface will reduce soil erosion experienced at present along Nositha Road. Formalised storm water management will also reduce soil erosion along the route.

Impact	Without mitigation				
	Probability	Duration	Extent	Magnitude	Rating
Reduction in soil erosion	5	4	2	10	* 80 High

* Positive outcome

On-going Recommendations –

- The road and associated storm water management must be inspected once every six months for the first 3 years and thereafter once a year to ensure that any faults with the road are reported and repaired.
- Road maintenance must occur in order to ensure that the road is maintained.
- Any reports regarding storm water management damages or deterioration of the road must be addressed as soon as practicably possible to ensure that the positive impact created is maintained.

Temporary employment and skills development

Through the need of a local workforce for the road upgrade activities, people from around the Nositha Village area have the opportunity to be employed during the construction phase. This short term employment will lead to long term skills development.

Impact	Without mitigation				
	Probability	Duration	Extent	Magnitude	Rating
Creation of temporary employment and skills development	5	2	2	6	* 50 Moderate

* Positive outcome

Reduction in air pollution (dust)

Once the road has been hard topped, dust emitted into the area and surrounding residential properties will be reduced if not eliminated.

Impact	Without mitigation				
	Probability	Duration	Extent	Magnitude	Rating
Reduction in air pollution – dust eliminated due to hard topped surface	4	4	2	8	* 56 Moderate

* Positive outcome

SECTION F: PROPOSED MONITORING, CONTROL AND AUDITING

- The National Environmental Management Act 107 of 1998 (NEMA) requires that an environmental management programme (EMPr) be submitted where an environmental impact assessment must be utilised as the basis for a decision on an application for environmental authorisation.
- An EMPr has been compiled for this application and has been attached in **Appendix F**. This EMPr is fundamental to the BA process and must ensure that commitments given at a project's planning and assessment stage are effectively implemented through the construction and operation stage.
- The following monitoring and auditing strategies are recommended for the proposed upgrade of Nositha Road:
  - An experienced and independent Environmental Control Officer (ECO) must be appointed by the Proponent prior to commencement of any construction activities to ensure that the environmental conditions are implemented and that compliance with the provisions of the EMPr attached in **Appendix F** are implemented by the Engineer and appointed Contractor.
  - The ECO must ensure that all mitigation measures are implemented and effective rehabilitation undertaken. The site mitigation and rehabilitation measures must be achieved.
  - The ECO is to be on site twice a month – once for site visit or project progress meeting and once for auditing. These visits must be two weeks apart.
  - The ECO must be able to make recommendations on the ground as the project unfolds and possible new aspects arrive
- A Geotechnical engineer must be involved in the construction process and be afforded the opportunity to inspect construction works in problematic steep areas and culvert foundations to ensure a high quality successful and long lasting road is constructed.
- Indigenous trees removed during construction must be replaced at a ratio of 1:5 (5 trees must be planted for every 1 tree removed). Protected tree species removed must be replaced at a rate of 1:10, i.e. ten trees planted for every one tree removed.
- An invasive alien control programme must be implemented to prevent the further spread of these species as per the legislative requirements specified under the Conservation of Agricultural Resources Act, 1983 amended in 2001 and the National Environmental Management: Biodiversity Act 2004 (Act No, 10 of 2004). Invasive Alien Programme (IAP) must be undertaken at least 4 times a year post-construction during the first 5 years to ensure that alien plants are actively managed and eradicated from the site and thereafter twice yearly for the lifespan of the project, with adequate monitoring and follow-up measures.
- Stormwater control measures must be implemented and monitored to ensure water running off road and the bridge does not cause erosion to the surrounding environment.
- It is required that an aquatic ecological study must be undertaken 1 month prior to construction activity commencing; once during construction of the stream crossing and approximately 2 weeks after the stream crossing has been completed.
- Thereafter an aquatic ecological assessment must be undertaken every 6 months for the first two years of the operational phase to determine any trends in the ecology of the stream. Failure to implement the abovementioned mitigation measures will result in further deterioration of the stream associated with the Nositha Road.
- The first post construction inspection must be conducted upon hand-over, and must be conducted jointly by the Municipality staff, project manager, environmental control officer and engineers responsible for design. The second inspection must take place 12 months after hand over, in order to asses:
  - the extent to which natural re-growth is possible;
  - the erosion resulting from the preceding season, taking into consideration the amount of rainfall; and
  - the need for additional erosion protection or re-vegetation.
  - Successful extirpation of alien invasive vegetation
- One (1) Environmental audit report must be submitted to the relevant DEDTEA Compliance Control Environmental Officer: Compliance Monitoring and Enforcement (CME) Component every month during construction.
- On completion of construction activities, a post construction phase audit must be conducted to ensure the rehabilitation efforts have been implemented. This audit must be conducted one month after construction and rehabilitation work has been completed.

- The Proponent is required to ensure that follow up assessments for six (6) months post construction are undertaken by an ECO, to determine the success of the re-vegetation process and to check the condition of the banks around the project site during the operation and signing off where no erosion has been observed for one (1) year during operation.
- An annual environmental audit report for the first three (3) years, post construction of Nositha Road must be submitted to the DEDTEA to ascertain the effectiveness of the rehabilitation plans and monitor the operation of the activities.

SECTION G: ENVIRONMENTAL IMPACT STATEMENT

The proposed project involves resurfacing to black top an existing road length of 4.4km and 5m wide with associated base course and sub base pavement layers. Stormwater drainage management installations such as culverts and concrete side drains, concrete kerbing, channel and concrete lined v-drains will also form part of the proposed upgrade.

The construction of gabion baskets is recommended at inlet and outlet structures to prevent any erosion. Gabion baskets will be constructed at outlets to prevent eroding of the side slopes. The construction of box and pipe culverts will occur at seven (7) different positions of existing stormwater infrastructures at the coordinates shown in the **table 7** and **Figure 3**.

No site alternatives were considered since the Nositha Road and stream crossing is restricted to this particular road alignment and crossing point on an existing gravel road.

The primary key concerns with regard to the biophysical environment identified for the proposed project, which will require careful management, are:

- Direct impacts to wetlands;
- Direct impacts to aquatic habitat;
- Direct impacts to terrestrial and riparian vegetation;
- Hydrological impacts (flow-related modifications);
- Increase stormwater flows of the new hardened surface
- Erosion and sedimentation risk including bank instability;
- Water pollution/contamination risk during construction; and
- Alien plant infestation post-disturbance.

It is the view of the Environmental Assessment Practitioner that the upgrade of Nositha Road is biophysically acceptable, socially beneficial and will maximise the purpose and the need of the application.

It is recommended that the upgrade of Nositha Road is granted authorisation.

This report is accompanied by an EMPr, which includes recommendations and mitigation measures made by the specialists. This EMPr must be approved by the DEDTEA to give it legal standing.

The proposed project will result in short term negative impacts to the stream, wetlands, vegetation, residents and surrounding land owners, however, these negative impacts are only expected during the construction phase and possibly the early stages of rehabilitation. Whilst these impacts can be rated as significant especially on the hydrological and aquatic /riverine areas they can be reduced to an acceptable level provided that the mitigation measures as proposed in this BAR, specialist reports, wetland rehabilitation report and the accompanying EMPr are effectively implemented.

The overall significance of positive socioeconomic and environmental impacts is beneficial as it should improve the safety of road users (motorists and pedestrians); increase mobility, improve access, reduce travel times and erosion risks and consequently environmental degradation.

Temporary job opportunities and skills development is expected during the construction phase of the road upgrade therefore benefiting the local communities.

SECTION H: CONCLUSION AND EAP'S RECOMMENDATION

Based on the balance of social, economic and environmental considerations, the impacts that will be caused by the proposed Nositha Road upgrade are considered to be within acceptable limits of change, as long as the appropriate mitigation measures outlined in this report and the site specific EMPr attached in **Appendix F** are effectively implemented.

The following conditions should form part of the Environmental Authorisation should a positive decision be granted by the Competent Authority/ies:

- Financial provision must be set aside prior to construction commencing for the implementation of the EMPr attached in **Appendix F** for the rehabilitation of the disturbed ecosystems after completion of construction activities including monitoring, auditing and maintenance during construction and operational phase of the proposed project.
- Any expropriation of the land must be managed by the Proponent (Ray Nkonyeni Local Municipality) in consultation with the affected parties **prior** to commencement of construction activities for all properties and house fences that are found in close proximity of the road reserve and which will be affected as a result of the road construction.
- The Proponent must appoint an independent and suitably experienced ECO for the construction and rehabilitation phases of the development to ensure compliance with the provision of the EMPr.
- Cognisance and compliance must be taken of the recommended mitigation and rehabilitation measures in the Specialist Geotechnical report, Wetland Delineation Report, Baseline Aquatic Assessment report, Vegetation Assessment report, and Wetland Rehabilitation report (See attached in Appendix D) including all the mitigation measures recommended in this report and the site specific EMPr.
- All parties involved in the construction and ongoing maintenance of the Nositha Road and associated stormwater infrastructures (including contractors, engineers, and administrators) are, in terms of NEMA's "Duty of Care" and "Remediation of Damage" requirements (Section 28), required to prevent any pollution or degradation of the environment, be responsible for preventing impacts occurring, continuing or recurring and for the costs of repair of the environment.
- Construction activity must take place during the winter months as this is the low-flow time with respect to the unnamed tributary of the Vungu River crossing and wetlands.
- Removal of alien invasive plants must occur with specific follow-up control measures, and reclamation and management of soil erosion along the proposed project site (this is an ongoing requirement in terms of national legislation).
- Surrounding landowners, business owners and I&APs must be notified of the start of the construction phase as well as the progress of the various phases of the project in order for them to make the necessary arrangements.

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