



IDS

Geographical Information Systems
and Environmental Consulting Services

**DRAFT BASIC ASSESSMENT REPORT FOR THE
PROPOSED ROAD UPGRADE OF THE NATIONAL
ROUTE (N1) SECTION 17 BETWEEN WESTLEIGH AND
HEININGSPRUIT, FEZILE DABI DISTRICT
MUNICIPALITY, FREE STATE PROVINCE.**

DATE: MARCH 2021

Geographical Information Systems and Environmental Consulting Services





**SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED
(SANRAL)**

**THE UPGRADING OF NATIONAL ROUTE 1 SECTION 17 BETWEEN
WESTLEIGH (KM 77.8) AND HEUNINGSPRUIT (KM 101.6) -
14/12/16/3/3/1/2225**

DRAFT BASIC ASSESSMENT REPORT

MARCH 2021

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EXECUTIVE SUMMARY

The South African National Roads Agency SOC Ltd (SANRAL) appointed WorleyParsons RSA (Pty) Ltd for the Consulting Engineering Services for the upgrading of National Route 1 Section 17 from Westleigh (km 77.8) to Heuningspruit (km 101.6) in the Free State Province. The need for the project arose from increased traffic volumes on the N1-17 route and declining Levels of Service on the existing 3-lane carriageway facility. The existing road pavement also requires some rehabilitation measures at this stage. The upgrading of the N1 route to a 4-lane dual carriageway is presently under construction on the southern side of Kroonstad, whilst the N1 route further north from the Koppies Interchange to the Kroonvaal Toll Plaza already exists as a 4-lane undivided carriageway since its original construction in the 1980's.

The Applicant's main objectives with the current project are to provide future traffic capacity by upgrading the existing section of the N1-17 to a either as a 4-lane undivided single carriageway with a median barrier. A 4-lane divided dual carriageway road has been motivated for the proposed development.

The proposed road upgrade is associated with the following developments;

- Proposed upgrade to a four (4) lane facility;
- Realignment of the eastern ramps of the diamond interchange to tie in with the proposed upgrading of the road to a 4-lane facility;
- Widening of the one (1) road-over-rail bridge (rail underpass) and two (2) road-over-river bridges (river underpasses);
- Extension and construction of precast drainage culverts, as well as eight (8) major culverts;

Information Decision Systems has been appointed by WorleyParsons RSA (Pty) to provide independent Environmental Consulting Services for the proposed project by conducting a Basic Assessment (BA) Study in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (as amended in April 2017), promulgated under the National Environmental Management Act (NEMA) (Act No. 107 of 1998)(as amended). The upgrading of National Route 1 Section 17 from Westleigh (km 77.8) to Heuningspruit (km 101.6) triggers the EIA Listed Activities and therefore requires an Environmental Authorisation prior to the commencement of the upgrade activities.

This BAR follows the legislative process prescribed in the Environmental Impact Assessment (EIA) Regulations 2014 (as amended in 2017). This report constitutes the consultative Basic Assessment Report (cBAR) which details the environmental outcomes, impacts and residual risks of the proposed activity. The report aims to assess the key environmental issues and impacts associated with the development, and to document Interested and Affected Parties' (I&APs) issues and concerns.

Furthermore, it provides background information of the proposed project, a motivation and details of the proposed project, and describes the public participation undertaken to date.

The objective of this report is to provide the project's I&APs, stakeholders, commenting authorities, and the Competent Authority (CA), with a thorough project description and BA process description. The outcome being to engender productive comment/input, based on all information generated to date and presented herein.

In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of significant portions of environmental legislation that were taken into consideration during this study and are elaborated on in this report.

The Department of Environment, Forestry and Fisheries (DEFF) is the Competent Authority for this BA process and the development needs to be authorised by this Department.

This consultative BAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. Having duly considered the project, in the Environmental Assessment Practitioner's (EAP's) opinion, the project does not pose a significant detrimental impact on the receiving environment and its inhabitants and can be mitigated significantly. The Applicant must be bound to stringent conditions to maintain compliance and ensure a responsible execution of the project.

The impacts identified and assessed by way of risk ratings, have been extensively reported herein. The report at hand (i.e. Amended BAR) is now available for additional comments and review following the introduction of new technical information i.e. the geotechnical and traffic impact assessment report. According to Regulation 19 (1)(b) of the EIA Regulations, 2014, as amended, revised reports or EMPr or, where applicable, a closure plan must be subjected to another public participation process of at least 30 days."

The Draft BAR report will, together with a comprehensive issues trail, the final draft of the EMPr, and all addenda as referred to, will be submitted to the DEFF for decision making. The draft BAR report will thus be a cumulation of scientific specialist studies' findings, public contribution via formal comment, and the drawing of conclusions by the EAP as the environmental specialist.

ABBREVIATIONS

ACRONYM	DESCRIPTION
BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
DEFF	Department of Environmental, Forestry & Fisheries
DMR	Department of Mineral Resources
DHSWS	Department of Human Settlements, Water and Sanitation
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
ESA	Ecological Support Area
FDDM	Fezile Dabi District Municipality
FS	Free State
GA	General Authorisation
HIA	Heritage Impact Assessment
IDP	Integrated Development Plan
IDS	Information Decision Systems
IEM	Integrated Environmental Management
MLM	Moqhaka Local Municipality
MPRDA	Mineral and Petroleum Resources Development Act
N1	National Route 1
NEM:AQA	National Environmental Management: Air Quality Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Priority Areas
NHRA	National Heritage Resources Act
NWA	National Water Act
S&EIR	Scoping & Environmental Impact Report
SACNASP	South African Council of National Science Professions
SAMRAD	South African Mineral Resources Administration
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency SOC Limited
SDF	Spatial Development Framework
WMA	Water Management Area

1 INTRODUCTION

The study area is located on National Route 1 Section 17 immediately north of Kroonstad in the Free State Province. The road to be upgraded stretches for 23.8 km towards Kroonstad. The road largely falls within the Mochaka LM, although the last few kilometres north towards Heuningspruit are situated within Ngwathe LM. The start point of the project is at the end of the existing dual carriageway just north of the R34 Koppies Interchange, from where only one carriageway (future north-bound carriageway) with a 3-lane system (alternative passing lanes) was constructed beyond the end of the project at km 101.6, which is also the end of Section 17 and the beginning of Section 18. The existing road is situated within an 80m road reserve.

The SANRAL's main objectives with the current project are to provide future traffic capacity by upgrading the existing section of the N1-17 to four lanes.

Two (2) options have been investigated in the Concept Design Stage, namely;

- Four (4)-lane undivided single carriageway with a median barrier, or
- Four (4)-lane divided dual carriageway road.

As it was found that a 4-lane dual carriageway road is the economically preferred option and also has a number of other important advantages, it was recommended that this option be further developed in the preliminary and detail design phases of the project. Consequently, the 4-lane dual carriageway road is the preferred option in this BA process. Motivation for this recommendation is therefore detailed:

- As far as capacity is concerned, a 4-lane facility will be adequate for the medium traffic growth scenario of 3-4% over the chosen design period.
- The HDM4 Economic Analysis of the project alternatives proved that there is a definite economic benefit for the proposed 4-lane dual carriageway over the alternative option of upgrading the road to a 4-lane undivided single carriageway with a median barrier.
- An important conclusion from the safety analysis is that the potential risk for crashes will be reduced significantly with a 4-lane facility, particularly if the upgrade is to a dual carriageway with total physical separation of traffic streams in both directions. The dual carriageway also provides a recovery area in the median.
- Accommodation of traffic can be done much safer if the Dual Carriageway option is implemented, with less disruption of existing traffic flow, less congestion and lower road user costs during construction.
- The N1 route immediately south of Kroonstad is presently being upgraded to a 4 lane dual carriageway. It is a logical conclusion that traffic will eventually increase further northwards towards Gauteng and the same type of facility will be appropriate as far as route continuity is concerned.
- The recommended 4-lane Dual Carriageway can be implemented without any changes to existing overpass bridges required as far as opening widths underneath the bridges are concerned.

In addition to the upgrade of the existing carriageway, the following has been included on the scope of works;

- Realignment of the eastern ramps of the diamond interchange to tie in with the proposed upgrading of the road to a 4-lane facility;
- Widening of the one (1) road-over-rail bridge (rail underpass) and two (2) road-over-river bridges (river underpasses); and

- Extension and construction of precast drainage culverts, as well as eight (8) major culverts;

The construction period is anticipated to be 36 months and should commence around January 2023.

1.1 Project Locality

The table below describes the central point of the study area for location purposes.

Table 1: Activity geographic coordinates

	Latitude (S)	Longitude (E)
Starting Point	27°36'31.73"S	27°15'38.60"E
Middle point	27°30'42.19"S	27°18'56.26"E
End Point	27°25'22.47"S	27°22'36.09"E

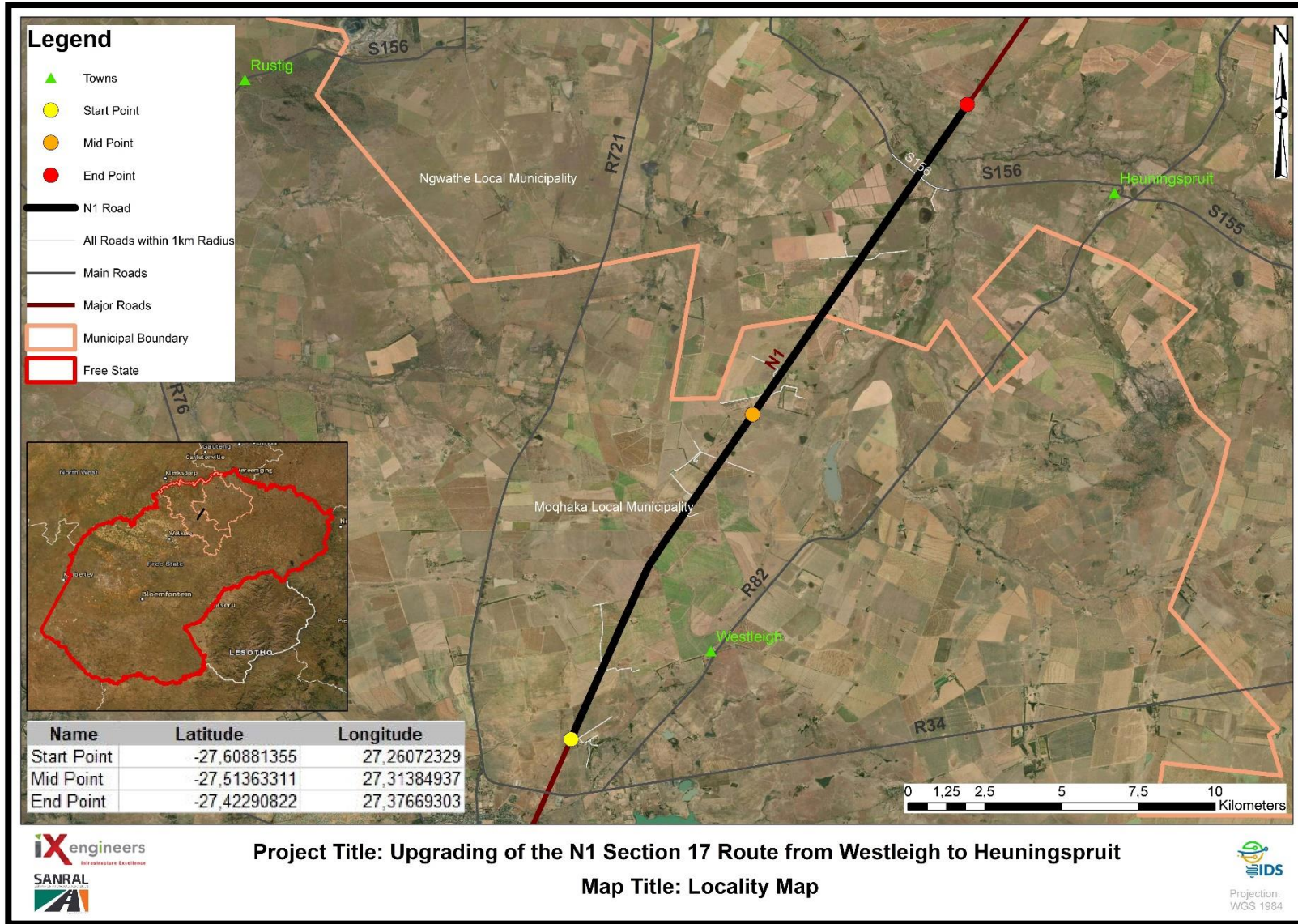


Figure 1: Locality Map

1.2 Approach to the study

1.2.1 Pre-application Consultation

A pre-application meeting was held with the Department of Environment, Forestry and Fisheries on the 11th February 2019. Minutes of the meeting is included as **Appendix E** of this BAR

1.2.2 Basic Assessment Study

A Basic Assessment (BA) study is the level of environmental assessment applied to activities listed in Listing Notices 1 and 3. This study is applied to activities that are considered less likely to have significant environmental impacts and, therefore, unlikely to require a detailed Environmental Impact Assessment (EIA) study. The Basic Assessment Report (BAR) is a more concise analysis of the environmental impacts of the proposed activity/development than a Scoping and EIA Report. The BAR aims to achieve the following:

- Determine the policy and legislative context within which the proposed activity is undertaken and how the activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed project;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Undertake an impact and risk assessment process inclusive of cumulative impacts (where applicable).

The focus being; determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the project and the risk of impact of the proposed activity on these aspects to determine the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and the degree to which these impacts:

- Can be reversed;
- May cause irreplaceable loss of resources; and
- Can be avoided, managed or mitigated.

This BAR has been compiled in accordance with the stipulated requirements in **Appendix 1** of GNR 982 of the EIA Regulations 2014 (as amended in 2017), which outlines the legislative BA process and requirements for assessment of outcomes, impacts and residual risks of the proposed development.

An Environmental Management Programme (EMPr) has been compiled according to **Appendix 4** of GNR the EIA Regulations 2014 (as amended in 2017) for the construction and operational phases of the project. The EMPr has been compiled as a stand-alone document from the BAR and will be submitted to the DEFF along with the BAR. The EMPr provides the actions for the management of identified environmental impacts emanating from the project and a detailed outline of the implementation programme to minimise and/or eliminate any anticipated negative environmental impacts and to enhance positive impacts. The EMPr provides strategies to be used to address the roles and responsibilities of environmental management personnel on site, and a framework for environmental compliance and monitoring.

1.2.3 Structure of the BAR

Section	Description
1	Introduction – Provides the background to the project as well as details of the specialist studies conducted and contact details for the project proponent and EAP.
2	Environmental Legislative Context – Details the pertinent environmental legislation and the applicability to the project
3	Description of Project activities & Motivation – Provides the site locality, project description and need and desirability of the project
4	Project Alternatives – Describes the alternatives considered, including the 'no-go' option
5	Description of the Baseline Environment – Describes the pre-development context of the site
6	Public Participation Process – Explains the public consultation undertaken
7	Impact Assessment – Details the impact assessment methodology and quantifies the impacts anticipated
8	Conclusion & Recommendations – Provides the EAP opinion and summarises the impact assessment as well as the recommendations.
9	EAP Declaration

1.2.4 Specialist Assessment

The BAR further incorporates the findings and recommendations of the following specialist studies;

- Freshwater Ecological Assessment including wetland delineation; and
- Risk Assessment.
- Agricultural Impact Assessment
- Avifauna Assessment
- Socio-economic Assessment
- Visual Impact Assessment
- Heritage Impact Assessment
- Palaeontological Impact Assessment: Phase 1 Field study
- **Geotechnical Assessment**
- **Traffic Impact Assessment**

The recent studies have been highlighted above for your attention.

1.2.5 Other environmental authorisations, licences and permits

According to the National Water Act (NWA), 1998 (Act No.36 of 1998), the proposed development requires a Water Use Licence Application as per the following regulations:

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

The Water Use Licence Application (WULA) has been lodged with the DWS. A pre-application meeting has been conducted on the 4th August 2020 with the Free State Department of Water and Sanitation. The minutes of the meeting have been attached under **Appendix F** of this report. IDS is currently busy compiling the technical information requested as per pre-application meeting held. This includes a comprehensive hydrocensus report with the aim of identifying possible water sources for the construction phase of the proposed development.

1.3 Project Team

PROJECT TEAM



Project Manager
South African National Roads Agency
SOC Limited
Mr Trevor Zumani

Applicant
South African National Roads Agency SOC Limited
Mr Dumisani Nkabinde

Environmental Officer
South African National Roads Agency
SOC Limited
Ms Thobile Duma



Project Managers and consulting engineers
iX Engineers
Mr Braam Marais



Environmental Assessment Practitioners (EAP)
Information Decision Systems
Mr Graeme Engelbrecht (Pr.Sci.Nat)

1.3.1 Applicant

The Applicant is the South African National Roads Agency (SANRAL) and the details of the responsible person are listed in **Table 2** below.

Table 2: Applicant details


Applicant	SANRAL
Contact Person	Mr Dumisani Nkabinde
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Email	nkabinded@nra.co.za

1.3.2 Consulting Engineers

The Consulting Engineers and the details of the responsible person are listed in **Table 3** below.

Table 3: Consulting Engineers

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Contact Person	Braam Marais
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Cell	+27 (0) 82 789 6875
Fax	+27 (0) 12 745 2001
Email	braam.m@ixengineers.co.za




1.3.3 Environmental Assessment Practitioner

The environmental team of Information Decision Systems have been appointed as an independent Environmental Assessment Practitioner (EAP) by the iX Engineers, on behalf of SANRAL, to undertake the appropriate environmental studies for this proposed project.

The Environmental Assessment Practitioner and the details of the responsible person are listed in **Table 4** below.

Table 4: Environmental Assessment Practitioner

Firm	Information Decision Systems
Contact Person	Graeme Engelbrecht
Designation	Environmental Consultant
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Telephone	087 353 2576
Cell	083 321 0119
Fax	086 685 7767
Email	graeme@ids-cc.co.za



2 APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations:

Table 5: Applicable legislation, policies and/or guidelines

Title of legislation, policy or guideline:	Administering authority:	Promulgation Date:	Applicability to the proposed project
The Constitution (Act 6 of 1996)	RSA Government	1996	The Constitution states that everyone has the right to an environment that is not harmful to their health or well-being, and to have the environment protected through reasonable legislative and other measures to prevent pollution and ecological degradation; promote conservation and ensure ecologically sustainable development and use of natural resources.
National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998)	National Department of Environmental Affairs	1998	The Basic Assessment is undertaken in accordance with the requirements of Government Notice R326 of April 2017
National Water Act (Act No 36 of 1998)	Department of Water and Sanitation	1998	The triggered sections within the NWA for the proposed development are: <ul style="list-style-type: none"> ▪ Section 21 (a): abstraction of water ▪ Section 21(c): impeding or diverting the flow of water in a watercourse. ▪ Section 21(i): altering the bed, banks, course or characteristics of a watercourse. A General Authorisation is applicable for the project.
National Environmental Management: Biodiversity Act 2004 (Act 10 of 2004)	National Department of Environmental Affairs	2004	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project in proper management of the sensitive area (watercourse) identified on site.

Title of legislation, policy or guideline:	Administering authority:	Promulgation Date:	Applicability to the proposed project
National Environmental Management: Waste Act (Act No. 59 of 2008)	National Department of Environmental Affairs – lead authority for regulating hazardous waste.	2008	No waste license activities are applicable to this project. The developer will however be required to store and manage waste in accordance with the requirements of this Act and associated Standards.
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	National Department of Environmental Affairs	2004	While no permitting or licensing requirements arise from this legislation for the site, this Act will find application during the construction phase of the project. The implementation of dust mitigation measures are included as part of the project EMPr and will continue to apply throughout the life cycle of the project. Dust control regulations promulgated in November 2013 may require the implementation of a dust management plan.
National Heritage Resource Act, 1999 (Act No. 25 of 1999)	South African Heritage Resources Association (SAHRA) The Provincial Heritage Resources Authority Gauteng (PHRAG)	1999	No identified heritage sites were reported on site. However, should any heritage sites be unearthed during excavations, a permit would be required to be obtained from SAHRA.
Promotion of Access to Information Act, 2000 (Act No 2 of 2000):	National Department of Environmental Affairs	2000	No permitting is required. The act finds applicability during the public participation process phase of the Basic Assessment process.
Occupational Health and Safety Act No. 85 of 1993:	Department of Labour	1993	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project. Health and safety precautions measures must be put in place for the construction crew and the general public. E.g. Protection of workers on site through provision of Personal Protective Equipment's; Training and other health and safety amenities.

2.1 Activities being applied for

In terms of these Regulations (Government Notice R. 326, Government Gazette No. 40772 of 07 April 2017, under sections 19, and 44, of the National Environmental Management Act, 1998; Act No.107 of 1998), as amended; a Basic Assessment is required for this project as per the following listed activities:

Table 6: Activities being applied for

Government Notice No:	Activity No (s) (relevant notice): e.g. Listing notices 1, 2 or 3	Describe each listed activity as per the wording in the listing notices:	Applicability
GNR 327	LN1; Activity 12	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse	The proposed development involves the construction of culverts in support of the existing stormwater infrastructure. A list of proposed structures has been attached in Appendix C .
GNR 327	LN1; Activity 19	The infilling or depositing of any material of more than [5] 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than [5] 10 cubic meters from [— (i)] a watercourse;	The proposed development will involve the upgrade and construction of major culverts crossing watercourses. It is anticipated that the removal and depositing of material within the watercourse will be undertaken.
GNR 327	LN1; Activity 56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) Where the existing reserve is wider than 13.5 metres.	The proposed development constitutes the upgrade of an existing road to a four (4) lane facility; realignment of the eastern ramps of the diamond interchange to tie in with the proposed upgrading of the road to a 4-lane facility; widening of the one (1) road-over-rail bridge (rail underpass) and two (2) road-over-river bridges (river underpasses).
GNR 324	LN3; Activity 12	The clearance of an area of 300 square meters or more of indigenous vegetation; b. Free state ii. within critical biodiversity areas identified in bioregional plans;	The clearance of an area of 300 square meters or more of indigenous vegetation is anticipated during construction.

Government Notice No:	Activity No (s) (relevant notice): e.g. Listing notices 1, 2 or 3	Describe each listed activity as per the wording in the listing notices:	Applicability
		iv. areas within a watercourse or wetland or within 100 metres from the edge of a watercourse or wetland	
GNR 324	LN3; Activity 14	<p>The development of – (ii) infrastructure or structures with a physical footprint of 10 square metres or more; Where such development occurs – (a) within a watercourse; and/or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p>b. Free state</p> <p>ii. within critical biodiversity areas identified in bioregional plans;</p> <p>iv. areas within a watercourse or wetland or within 100 metres from the edge of a watercourse or wetland</p>	The proposed development involves the construction of culverts in support of the existing stormwater infrastructure. A list of proposed structures has been attached in Appendix C .
GNR 324	LN3; Activity 18	<p>The widening of a road by more than 4 metres or the lengthening of a road by more than 1 kilometre.</p> <p>b. Free State</p> <p>i. Outside urban areas</p> <p>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>(hh) areas within watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland</p>	Applicable to the proposed road upgrade within CBAs and watercourse.
GNR 324	LN3; Activity 23	The expansion of (xii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;	Applicable to the upgrade of major culverts in close proximity to a watercourse.

Government Notice No:	Activity No (s) (relevant notice): e.g. Listing notices 1, 2 or 3	Describe each listed activity as per the wording in the listing notices:	Applicability
		<p>Where such expansion occurs-</p> <ul style="list-style-type: none"> (a) Within a watercourse; (b) If no development setback has been adopted within 32 metres of a watercourse measured from the edge of a watercourse. <p>b. Free state</p> <ul style="list-style-type: none"> i. Outside urban areas <p>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p>	

2.2 Environmental Management Principle

It is extremely important for effective environmental management that the Applicant be aware of the general principles upon which sound environmental management is based and that these principles are considered in all aspects of the prospecting operation. NEMA has established a general framework for environmental law, in part by prescribing national environmental management principles that must be applied when making decisions that may have a significant impact on the environment. These principles are briefly summarised in the sections that follow.

2.2.1 Holistic principle

The Holistic principle, as defined by NEMA (Section 2(4)(b) requires that environmental management must be integrated, acknowledging that all elements of the environment are linked and inter-related and it must take into account the effect of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option (defined below). Holistic evaluation does not mean that a project must be looked at as a whole. It rather means that it must be accepted that there is a whole into which a project introduced. If the indications are that the project could have major adverse effects, the project must be reconsidered and where appropriate re-planned or relocated to avoid an adverse impact or to ensure a beneficial impact.

2.2.2 Best practicable environmental option

When it is necessary to undertake any action with environmental impacts, the different options that could be considered for the purpose must be identified and defined. The Best Practicable Environmental Option (BPEO) is defined in NEMA as “the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.” Other guidelines typically used for environmental management in terms of other legislation include: BPM which is the Best Practicable Means and BAT which is the Best Available Technology.

2.2.3 Preventative principles

The preventative principle is fundamental to sustainable development and requires that the disturbance to ecosystems and the pollution, degradation of the environment and negative impacts on the environment be avoided, or, where they cannot be altogether avoided, are minimised and remedied.

2.2.4 The precautionary principles

The precautionary principle requires that where there is uncertainty, based on available information, that an impact will be harmful to the environment, it is assumed, as a matter of precaution, that said the impact will be harmful to the environment until such time that it can be proven otherwise. The precautionary principle requires that decisions by the private sector, governments, institutions and individuals need to allow for and recognise conditions of uncertainty, particularly with respect to the possible environmental consequences of those decisions. In South Africa, the DWA (then DWAF, now DWS) adopted a BPEO guideline in 1991 for water quality management and in 1994 in the Minimum Requirements document for waste management.

In terms of DWAF Minimum Requirements for the Handling and Disposal of Hazardous Waste, 1994, the precautionary principle is defined as, “Where a risk is unknown; the assumption of the worst case situation and the making of provision for such a situation.” Here the precautionary principle assumes that a waste or an identified contaminant of a waste is “both highly hazardous and toxic until proven otherwise.”

In the context of the EIA process in South Africa, the precautionary principle also translates to a requirement to provide sound, scientifically based, information that is sufficient to provide the decision

making authority with reasonable grounds to understand the potential impacts on the environment, the extent thereof and how impacts could be mitigated. If such information is not adequate for this purpose, the relevant authority cannot be satisfied as is required and then the authority should require that further information be collected and provided.

2.2.5 Duty of care and cradle to grave principle

In terms of the NEMA Section 28, “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 reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.”

By way of example, the principle of “duty of care” in terms of waste management emphasises the responsibility to make sure that waste is correctly stored and correctly transported, as it passes through the chain of custody to final point of disposal. This means that waste must always be stored safely and securely. The company removing and disposing of waste also holds the responsibility to hold the relevant licenses, and that waste is transported alongside the necessary paperwork. “Cradle to Grave” refers to the responsibility a company takes for the entire life cycle of a product, service or program, from design to disposal or termination. In terms of the DWAF Minimum Requirements for the Handling and Disposal of Hazardous Waste, 1994, “any person who generates, transports, treats or disposes of waste must ensure that there is no unauthorised transfer or escape of waste from his control. Such a person must retain documentation describing both the waste and any related transactions. In this way, he retains responsibility for the waste generated or handled.” This places responsibility for a waste on the Generator, by the “Cradle to Grave” principle, according to which a “manifest” accompany each load of Hazardous Waste until it is responsibly and legally disposed of. This manifest is transferred from one transporter to the next along with the load, should more than one transporter be involved. Once the waste is properly disposed of at a suitable, permitted facility, a copy of the manifest must be returned to the point of origin.” Duty of Care offers one strategy to implement sustainable development.

2.2.6 Polluter pays principle

The “polluter pays principle” holds that the person or organisation causing pollution is liable for any costs involved in cleaning it up or rehabilitating its effects. It is noted that the polluter will not always necessarily be the generator, as it is possible for responsibility for the safe handling, treatment or disposal of waste to pass from one competent contracting party to another. The polluter may therefore not be the generator, but could be a disposal site operator or a transporter. Through the ‘duty of care’ principle, however, the generator will always be one of the parties held accountable for the pollution caused by the waste. Accordingly, the generator must be able to prove that the transferral of management of the waste was a responsible action. The polluter pays principle acceding to NEMA dictates that “the cost of remedying pollution, environmental degradation and consequent adverse effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.”

2.2.7 Sustainable Development

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

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- The disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- Waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;

2.2.8 Climate Change Consideration

The proposed project will take into account energy efficient technologies and consider international best practice in terms of the construction methodologies and management of finite resources. Since climate change concerns include unpredictability and severity in weather patterns, the provision of basic human needs, such as fresh water supply, is considered critical.

3 DESCRIPTION OF PROJECT ACTIVITIES & MOTIVATION

3.1 Description of project activities

The SANRAL's main objectives with the current project are to provide future traffic capacity by upgrading the existing section of the N1-17 to four lanes.

Two (2) options have been investigated in the Concept Design Stage, namely;

- Four (4)-lane undivided single carriageway with a median barrier, or
- Four (4)-lane divided dual carriageway road.

As it was found that a 4-lane dual carriageway road is the economically preferred option and also has a number of other important advantages, it was recommended that this option be further developed in the preliminary and detail design phases of the project.

Motivation for this recommendation is the following:

- As far as capacity is concerned, a 4-lane facility will be adequate for the medium traffic growth scenario of 3-4% over the chosen design period.
- The HDM4 Economic Analysis of the project alternatives proved that there is a definite economic benefit for the proposed 4-lane dual carriageway over the alternative option of upgrading the road to a 4-lane undivided single carriageway with a median barrier.
- An important conclusion from the safety analysis is that the potential risk for crashes will be reduced significantly with a 4-lane facility, particularly if the upgrade is to a dual carriageway with total physical separation of traffic streams in both directions. The dual carriageway also provides a recovery area in the median.
- Accommodation of traffic can be done much safer if the Dual Carriageway option is implemented, with less disruption of existing traffic flow, less congestion and lower road user costs during construction.
- The N1 route immediately south of Kroonstad is presently being upgraded to a 4 lane dual carriageway. It is a logical conclusion that traffic will eventually increase further northwards towards Gauteng and the same type of facility will be appropriate as far as route continuity is concerned.
- The recommended 4-lane Dual Carriageway can be implemented without any changes to existing overpass bridges required as far as opening widths underneath the bridges are concerned.

In addition to the upgrade of the existing carriageway, the following has been included on the scope of works;

- Realignment of the eastern ramps of the diamond interchange to tie in with the proposed upgrading of the road to a 4-lane facility;
- Widening of the one (1) road-over-rail bridge (rail underpass) and two (2) road-over-river bridges (river underpasses); and
- Extension and construction of precast drainage culverts, as well as eight (8) major culverts;

The applicable design drawings are attached to this report in **Appendix C**.

3.1.2 Lesser Drainage Structures

Existing culverts are generally in good condition and can be retained in most instances. Implementing the 4-lane dual carriageway, will however require the extension of the existing culverts.

As a result, the following is proposed with regard to lesser culverts:

- Seventeen (17) existing culvert crossings to be extended to suit the proposed road prism;
- Three (3) of above-mentioned existing culverts to be replaced as result of problems with sufficient cover and free drainage at outlets; and
- Three (3) additional culverts crossings to be added for increase in hydraulic capacity for a Class 1 road category.

As far as surface drainage is concerned, all the existing concrete side drains have adequate flow capacity to accommodate the 1:20 year peak flow within the concrete cross section, as specified in the Drainage Manual for a Class R1 (Rural Principal Arterial) road. Any damaged side drains will be replaced with the same drain size as the existing, where applicable.

Due to the marginally exceeded 6mm maximum flow depth over a very small area and expensive possible geometric road improvements to reduce the flow depth, it is recommended that the current slopes and super-elevation development be retained.

It is proposed that the installation of a subsoil drainage system be considered wherever it may be required to prevent the ingress of water into the road prism, especially in areas where pavement distress can be attributed to the absence of such drains.

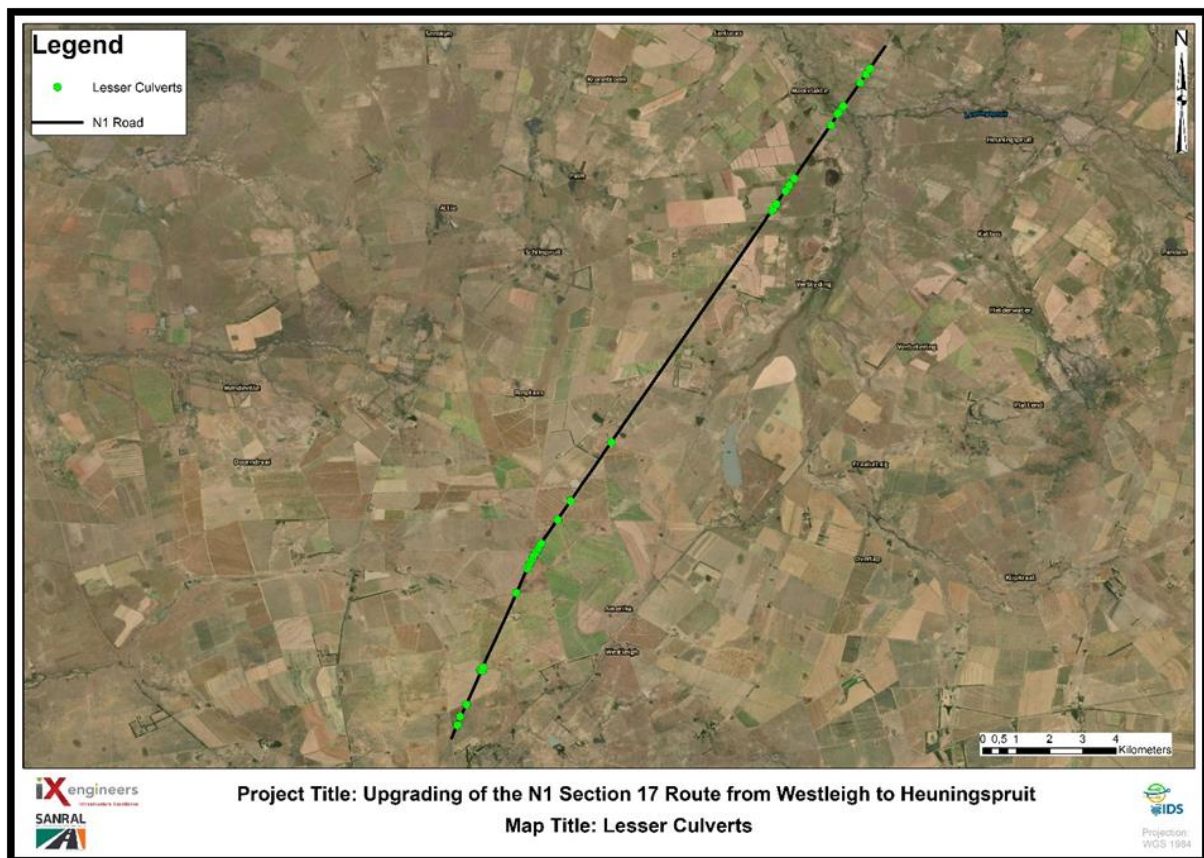


Figure 3: Lesser structures location

3.1.3 Structures

There are six (6) bridge overpasses on the project, of which four (4), namely at Schoongezicht, Tweespruit, Brakfontein and Verblyden, are 5,5m wide agricultural overpasses. A regional road crosses the N1 at Tweespruit with a 10,8m wide deck, whilst the deck width at the Nooitgedacht Diamond interchange is 12,2m.

The elevations on all these structures are similar, comprising a single-span strutted frame with clear span lengths sufficient for the accommodation of a four (4) - lane dual carriageway, although the standard profile is slightly impinged at the top of the struts, requiring guardrails to be installed. It was found that these structures will not require any form of structural modification. Some of the bridges also have slight vertical under-clearance, but as a clearance in excess of 5 100mm is achieved for all overpass bridges, it will not be necessary to re-grade the roads.

Road-over-rail Bridge

The Road-over-Rail Bridge at Westleigh will need to be widened for the proposed 4-lane dual carriageway. By adopting a continuous, haunched deck for the new bridge, the reduction in deck thickness achieved is sufficient to allow for the construction of the new deck in the same plane as the existing deck without impinging on the required vertical rail clearance. It is proposed that the existing parapet be demolished and the new deck cast against the existing deck, with an 800mm traffic barrier provided on the centre line between the carriageways. The joint between the decks will be a toggled joint not required to be sealed for drainage purposes.

Road-over-river Bridge

There are two Road-over-River Bridges on the project, consisting of a four 6,0m x 6,0m spans over the Heuningspruit (km 99,800) and four 5,0m x 3,0m spans over the Heuningspruit Tributary (km 99,400). Furthermore, there are eight (8) major culverts, all of which comprise single or multiple barrels of up to 5m span. Structures having spans of 3m or more were cast in-situ, whilst the structures having spans of 2,1m or less comprise precast concrete culverts. Except for one five-barrelled 2,1m x 2,1m culvert (km 100,118), which has rectangular precast culvert sections, the balance of the culverts has haunched precast profiles which are no longer produced. All these structures will be extended for the proposed widening of the road to a 4-lane dual carriageway. With the exception of a few of the lesser culverts, the earth cover over the extended culverts will be satisfactory. In the case of the lesser culverts where such cover will be insufficient in some instances, appropriate solutions are presented in this preliminary design report.

Overpass Bridges

All of the overpass bridges are in good to excellent condition. The concrete structures are sound; the joints are in good condition with the seals generally in place, the surfaces to the overpasses are in good condition and the guard rails are in place. As with the overpasses, the river bridges are in very good condition. In the case of the Heuningspruit River Bridge, the trapped water within the structure is a reflection of the very flat contours in the area and the need for some form of channelization downstream if the ponding is to be avoided. Similarly, all the major and lesser culverts are also in a good condition.

The activities described above have been aligned to activities that would trigger environmental authorisation for working within 32m of watercourses.

The table below details all new structures proposed inclusive of lesser and major culverts. Details of the affected properties, dimensions, geographic coordinates and the affected water course are also provided.

Table 7: New water uses crossing watercourse

Activity	Name of Water Resource	Quaternary Catchment	Property Description	Dimensions	Co-ordinates
C003 Lesser box culvert at km 79+279	W01-Depression W02-Seep W03- Unchannelled Valley Bottom	C60D	Farm 2464 Portion 1	L=1200mm W=900 mm	27°35'51.60"S 27°15'56.09"E
C007 Major box culvert at km 82+338	W04- Unchannelled Valley Bottom	C60G	Farm 2462 Portion 10	L=3000mm W=2500 mm	27°34'19.18"S 27°16'37.35"E
C024 Major box culvert at km 86+752	W06- Unchannelled Valley Bottom wetland	C70G	Farm 386 Portion 2	L=2x1300mm W= 650mm	27°32'12.99"S 27°17'52.09"E
C027 Major box culvert at km 88+418	W07-Seep W08- Seep W09- Unchannelled Valley Bottom	C70G	Farm 386 Portion 2	L=3000mm W= 2500mm	27°31'27.02"S 27°18'23.98"E
C028 Major box culvert at km 89+699	W10-Seep W11- Unchannelled Valley Bottom	C70G	Farm 532 Portion 1	L=2500mm W= 2500mm	27°30'51.56"S 27°18'48.58"E
C029 Major box culvert at km 91+518	W12- Unchannelled Valley Bottom wetland W13-Seep W14- Unchannelled Valley Bottom	C70G	Farm 532 Portion 1	L=3000mm W= 2500mm	27°30'1.29"S 27°19'23.37"E
C031 Major box culvert at km 96+202	W17- Unchannelled Valley Bottom	C70G	Farm 357 Portion 2	L=3x1500mm W= 1000mm	27°27'51.83"S 27°20'53.12"E
C032 Major box culvert at km 96+260	W17- Unchannelled Valley Bottom	C70G	Farm 357 Portion 2	L=3x1500mm W=1000mm	27°27'50.25"S 27°20'54.22"E
C037 Lesser box culvert at km 99+210	W20-Floodplain	C70G	Farm 509 Portion 1	L=1800mm W= 600mm	27°26'28.78"S 27°21'50.65"E
C038 Lesser pipe culvert at km 99+580	W20-Floodplain	C70G	Farm 509 Portion 1	D=300mm	27°26'18.05"S 27°21'57.03"E

C039 Major box culvert at km 99+210	W20-Floodplain	C70G	Farm 509 Portion 1	L=4x6000mm W= 6000mm	27°26'17.93"S 27°21'58.14"E
C040 Lesser pipe culvert at km 99+620	W20-Floodplain	C70G	Farm 509 Portion 1	D=300mm	27°26'16.96"S 27°21'57.62"E
C041 Lesser pipe culvert at km 99+820	W20-Floodplain	C70G	Farm 509 Portion 1	D=300mm	27°26'11.75"S 27°22'1.49"E
C042 Bridge at km 99+210	W20-Floodplain	C70G	Farm 509 Portion 1	L=25200mm W= 6600mm	27°26'11.44"S 27°22'2.65"E
C043 Lesser pipe culvert at km 99+870	W20-Floodplain	C70G	Farm 509 Portion 1	D=300mm	27°26'10.21"S 27°22'2.68"E
C044 Major box culvert at km 100+118	W20-Floodplain	C70G	Farm 509 Portion 1	L=5x2200mm W= 2100mm	27°26'3.59"S 27°22'8.09"E
C045 Major box culvert at km 100+420	W20-Floodplain	C70G	Farm 509 Portion 1	L=5x2200mm W= 2100mm	27°25'55.30"S 27°22'13.83"E
C046 Lesser box culvert at km 100+698	W20-Floodplain	C70G	Farm 509 Portion 1	L=1200mm W= 600mm	27°25'47.57"S 27°22'19.19"E
C047 Lesser box culvert at km 101+000	W20-Floodplain	C70G	Farm 509 Portion 1	L=1200mm W= 600mm	27°25'39.26"S 27°22'24.90"E
C048 Lesser box culvert at km 101+200	W20-Floodplain	C70G	Farm 509 Portion 1	L=1200mm W= 600mm	27°25'33.71"S 27°22'28.72"E

The table below details structures within 500m of a wetland. The 32m buffer has therefore been accommodated within the 500m buffer. Details of the affected properties, dimensions, geographic coordinates and the affected water course are also provided.

Table 8 New Water Uses within 500m of a wetland

Activity	Name of Water Resource	Quaternary Catchment	Property Description	Dimensions	Co-ordinates
C001 Lesser box culvert at km 78+617	W01-Depression W02-Seep W03- Unchanneled Valley Bottom	C60D	Farm 2464 Portion 1	L=1200mm W=900 mm	27°36'11.60"S 27°15'47.18"E
C002 Lesser pipe culvert at km 78+880	W01-Depression W02-Seep W03- Unchanneled Valley Bottom	C60D	Farm 2464 Portion 1	D=600mm	27°36'3.26"S 27°15'49.70"E
C003 Lesser box culvert at km 79+279	W01-Depression W02-Seep W03- Unchanneled Valley Bottom	C60D	Farm 2464 Portion 1	L=1200mm W=900 mm	27°35'51.60"S 27°15'56.09"E
C007 Major box culvert at km 82+338	W04- Unchannelled Valley Bottom	C60G	Farm 2462 Portion 10	L=3000mm W=2500 mm	27°34'19.18"S 27°16'37.35"E
C008 Lesser box culvert at km 82+875	W04- Unchannelled Valley Bottom wetland	C60G	Farm 2462 Portion 12	L=3x1750mm W=650 mm	27°34'3.12"S 27°16'44.51"E
C010 Lesser pipe culvert at km 83+736	W05- Depression wetland	C60G	Farm 2462 Portion 12	D=300mm	27°33'37.26"S 27°16'56.16"E
C011 Lesser pipe culvert at km 83+812	W05- Depression wetland	C60G	Farm 2462 Portion 12	D=300mm	27°33'34.98"S 27°16'57.27"E
C012 Lesser pipe culvert at km 83+888	W05- Depression wetland	C60G	Farm 2462 Portion 12	D=300mm	27°33'32.75"S 27°16'58.43"E
C013 Lesser pipe culvert at km 83+961	W05- Depression wetland	C60G	Farm 2462 Portion 12	D=300mm	27°33'30.59"S 27°16'59.57"E

C014 Lesser pipe culvert at km 84+037	W05- Depression wetland	C60G	Farm 2462 Portion 12	D=300mm	27°33'28.41"S 27°17'0.76"E
Road over Rail Bridge	W05- Depression wetland	C60G	Farm 2462 Portion 12	L=36.23m W=15.07m	27°33'26.47"S 27°17'1.51"E
C015 Lesser pipe culvert at km 84+118	W05- Depression wetland	C70G	Farm 2462 Portion 11	D=300mm	27°33'26.14"S 27°17'2.05"E
C016 Lesser pipe culvert at km 84+196	W05- Depression wetland	C70G	Farm 2462 Portion 11	D=300mm	27°33'23.84"S 27°17'3.43"E
C017 Lesser pipe culvert at km 84+272	W05- Depression wetland	C70G	Farm 2462 Portion 11	D=300mm	27°33'21.64"S 27°17'4.72"E
C018 Lesser pipe culvert at km 84+346	W05- Depression wetland	C70G	Farm 2462 Portion 11	D=300mm	27°33'19.46"S 27°17'6.08"E
C019 Lesser pipe culvert at km 84+421	W05- Depression wetland	C70G	Farm 2566 Portion 1	D=300mm	27°33'17.43"S 27°17'7.46"E
C020 Lesser pipe culvert at km 84+497	W05- Depression wetland	C70G	Farm 2566 Portion 1	D=300mm	27°33'15.29"S 27°17'8.86"E

C022 Lesser pipe culvert at km 85+980	W06- Unchannelled Valley Bottom wetland	C70G	Farm 386 Portion 2	D=600mm	27°32'33.81"S 27°17'37.35"E
C023 Lesser pipe culvert at km 85+980	W06- Unchannelled Valley Bottom wetland	C70G	Farm 386 Portion 2	D=850mm	27°32'33.69"S 27°17'37.17"E
Road over road bridge	W06- Unchannelled Valley Bottom wetland	C70G	Farm 386 Portion 2	L=57,7m W= 5,5 m	27°32'33.38"S 27°17'37.35"E
C024 Major box culvert at km 86+752	W06- Unchannelled Valley Bottom wetland	C70G	Farm 386 Portion 2	L=2x1300mm W= 650mm	27°32'12.99"S 27°17'52.09"E
C025 Major culvert at km 86+970	W06- Unchannelled Valley Bottom wetland	C70G	Farm 386 Portion 2	D=850mm	27°32'7.03"S 27°17'56.22"E
Road over Road Bridge	W07- Seep W08- Seep W09- Unchannelled Valley Bottom	C70G	Farm 386 Portion 2	L= 58,3m W= 10,2 m	27°31'36.89"S 27°18'16.20"E
C026 Major box culvert at km 88+058	W07- Seep W08- Seep W09- Unchannelled Valley Bottom	C70G	Farm 386 Portion 2	L=2x1500mm W= 900mm	27°31'36.90"S 27°18'17.11"E
C027 Major box culvert at km 88+418	W07- Seep W08- Seep W09- Unchannelled Valley Bottom	C70G	Farm 386 Portion 2	L=3000mm W= 2500mm	27°31'27.02"S 27°18'23.98"E

C028 Major box culvert at km 89+699	W10-Seep W11- Unchannelled Valley Bottom	C70G	Farm 532 Portion 1	L=2500mm W= 2500mm	27°30'51.56"S 27°18'48.58"E
Road over Road Bridge	W12- Unchannelled Valley Bottom wetland W13-Seep W14- Unchannelled Valley Bottom	C70G	Farm 532 Portion 1	L=58,1 m W=5,5m	27°30'27.85"S 27°19'4.55"E
C029 Major box culvert at km 91+518	W12- Unchannelled Valley Bottom wetland W13-Seep W14- Unchannelled Valley Bottom	C70G	Farm 532 Portion 1	L=3000mm W= 2500mm	27°30'1.29"S 27°19'23.37"E
C030 Major box culvert at km 95+658	W17- Unchannelled Valley Bottom	C70G	Farm 2461 Portion 13	L=2300mm W= 1600mm	27°28'6.96"S 27°20'42.61"E
Road over Road Bridge	W17- Unchannelled Valley Bottom	C70G	Farm 2461 Portion 13	L=58,1 m W=5,5m	27°28'3.76"S 27°20'44.44"E
C031 Major box culvert at km 96+202	W17- Unchannelled Valley Bottom	C70G	Farm 357 Portion 2	L=3x1500mm W= 1000mm	27°27'51.83"S 27°20'53.12"E
C032 Major box culvert at km 96+260	W17- Unchannelled Valley Bottom	C70G	Farm 357 Portion 2	L=3x1500mm W=1000mm	27°27'50.25"S 27°20'54.22"E
C033 Major box culvert at km 96+440	W17- Unchannelled Valley Bottom	C70G	Farm 357 Portion 2	L=3x1500mm W=1000mm	27°27'45.35"S 27°20'57.72"E

C034 Major box culvert at km 96+900	W17- Unchannelled Valley Bottom	C70G	Farm 357 Portion 2	L=1200mm W=600mm	27°27'32.66"S 27°21'6.45"E
C035 Lesser box culvert at km 97+100	W17- Unchannelled Valley Bottom	C70G	Farm 357 Remaining Extent	L=1500mm W= 600mm	27°27'27.08"S 27°21'10.28"E
C036 Lesser box culvert at km 97+340	W17- Unchannelled Valley Bottom	C70G	Farm 357 Portion 2	L=1500mm W= 600mm	27°27'20.51"S 27°21'14.86"E
Heuningspruit Road over Road Bridge	W18- Depression W19- Depression	C70G	Farm 509 Portion 1	L=61.0m W= 12.2m	27°26'37.62"S 27°21'44.24"E
C037 Lesser box culvert at km 99+210	W20-Floodplain	C70G	Farm 509 Portion 1	L=1800mm W= 600mm	27°26'28.78"S 27°21'50.65"E
C038 Lesser pipe culvert at km 99+580	W20-Floodplain	C70G	Farm 509 Portion 1	D=300mm	27°26'18.05"S 27°21'57.03"E
C039 Major box culvert at km 99+210	W20-Floodplain	C70G	Farm 509 Portion 1	L=4x6000mm W= 6000mm	27°26'17.93"S 27°21'58.14"E
C040 Lesser pipe culvert at km 99+620	W20-Floodplain	C70G	Farm 509 Portion 1	D=300mm	27°26'16.96"S 27°21'57.62"E

C041 Lesser pipe culvert at km 99+820	W20-Floodplain	C70G	Farm 509 Portion 1	D=300mm	27°26'11.75"S 27°22'1.49"E
C042 Bridge at km 99+210	W20-Floodplain	C70G	Farm 509 Portion 1	L=25200mm W= 6600mm	27°26'11.44"S 27°22'2.65"E
C043 Lesser pipe culvert at km 99+870	W20-Floodplain	C70G	Farm 509 Portion 1	D=300mm	27°26'10.21"S 27°22'2.68"E
C044 Major box culvert at km 100+118	W20-Floodplain	C70G	Farm 509 Portion 1	L=5x2200mm W= 2100mm	27°26'3.59"S 27°22'8.09"E
C045 Major box culvert at km 100+420	W20-Floodplain	C70G	Farm 509 Portion 1	L=5x2200mm W= 2100mm	27°25'55.30"S 27°22'13.83"E
C046 Lesser box culvert at km 100+698	W20-Floodplain	C70G	Farm 509 Portion 1	L=1200mm W= 600mm	27°25'47.57"S 27°22'19.19"E
C047 Lesser box culvert at km 101+000	W20-Floodplain	C70G	Farm 509 Portion 1	L=1200mm W= 600mm	27°25'39.26"S 27°22'24.90"E
C048 Lesser box culvert at km 101+200	W20-Floodplain	C70G	Farm 509 Portion 1	L=1200mm W= 600mm	27°25'33.71"S 27°22'28.72"E

3.2 Extent of Activity

It is proposed that the existing vertical alignment of Road N1-17 be retained in order to utilize the pavement structure of the existing north-bound carriageway as far as possible. The design will only allow for minimum clearances of 5,100m on existing road sections and 5,200m on newly constructed road sections, whereby adjustments of the road vertical alignment at overpass bridges will not be required.

The existing horizontal and vertical alignments will be retained over the existing Road-over-Rail Bridge at km 84,050 (situated on a horizontal curve with 2% super elevation), as the minimum rail clearances can be achieved for the widened deck by a proposed reduction in deck depth for the widening of the structure. Some of the lesser drainage structures cannot be extended at their current gradient without impinging on the required earth cover.

Only one (1) horizontal curve, with a radius of approximately 5690m, is situated on the entire road length of 23, 8 km. All vertical gradients are also very flat and the maximum longitudinal gradient on the project is approximately 1, 8%.

Only one (1) interchange is situated on the project, namely the Nooitgedacht Diamond Interchange at km 98,900 where a local rural road with destinations Fraaiuitzicht / Heuningspruit is crossing over Road N1-17. According to available traffic information, the existing diamond interchange with single lane on- and off-ramps will be retained. With the proposed upgrading of Road N1-17 to a 4-lane dual carriageway, the eastern on- and off-ramps of the interchange are to be re-aligned to link up with the new southbound carriageway. No geometric upgrading of the crossroad and the ramp terminals at the crossroad is regarded as necessary.

The overall development activity is depicted in **Figure 4** below.

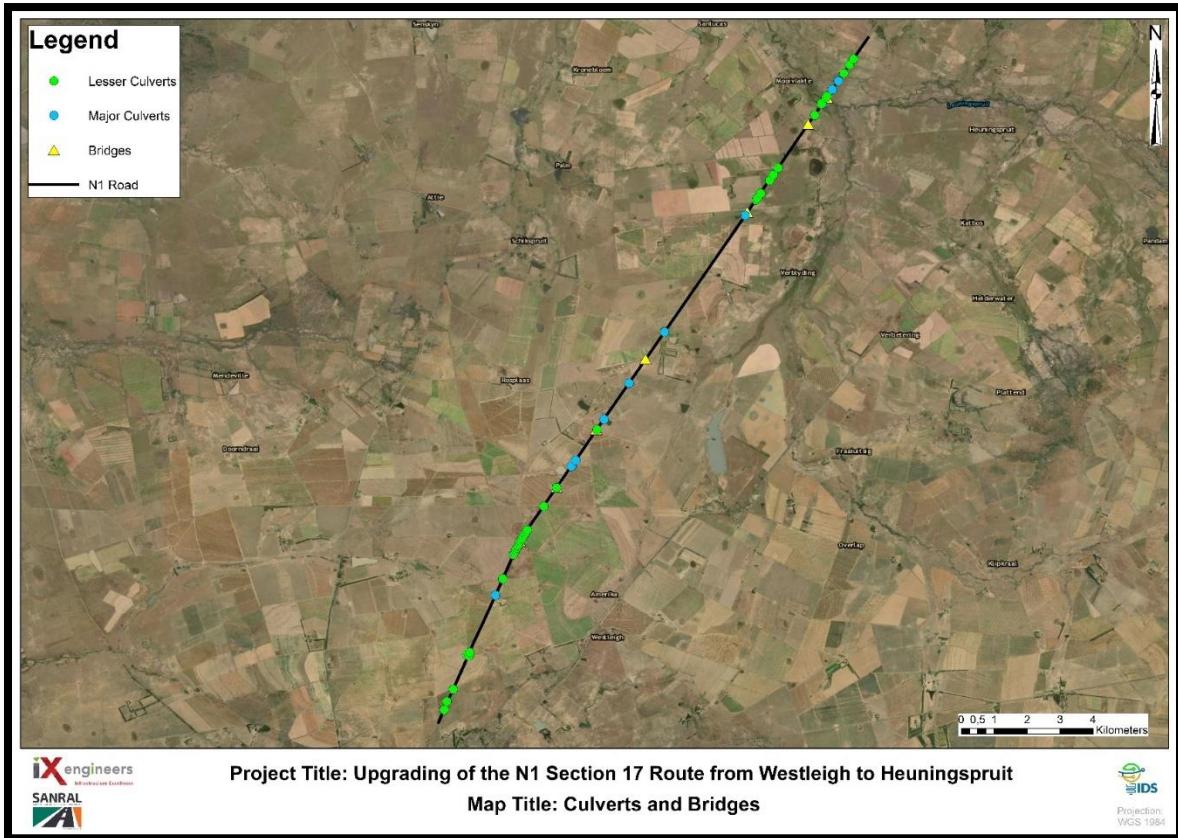


Figure 4: Proposed development

3.3 Need and Desirability

In terms of the NEMA EIA Regulations (2014, as amended), when considering an application, the competent authority must consider several aspects including “*the need and desirability of the activity*”. In terms of the Department of Environmental Affairs’ *Integrated Environmental Management Guideline: Guideline on Need and Desirability* (2017), the need and desirability for a project must be addressed by taking into account the “questions to be engaged with when considering need and desirability” included in the abovementioned guideline. These questions, together with answers relating to the proposed project, are provided in the table below.

Table 9: Integrated Environmental Management Guideline: Guideline on Need and Desirability (2017),

NO.	QUESTIONS	ANSWERS
Securing ecological sustainable development and use of natural resources		
1	How will this development (and its separate elements/ aspects) impact on the ecological integrity of the area?	Identified impacts associated with the proposed development have been assessed and are summarised in Section 7 of the BAR. The above measures have been incorporated into the Draft EMPr.
1.1	How were the following ecological integrity considerations taken into account: Threatened Ecosystems; Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure; Critical Biodiversity Areas (“CBAs”) and Ecological Support Areas (“ESAs”); Conservation Targets; Ecological drivers of the ecosystem; Environmental Management Framework; Spatial Development Framework; and Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	Refer to Response 1 above. The relevant ecological integrity considerations were considered by the specialists in their respective specialist studies. The potential impacts of the proposed development on environmental sensitivities have been considered. Refer to Appendix G for the relevant Specialist Studies.

NO.	QUESTIONS	ANSWERS
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	<p>Refer to Responses 1 and 1.1 above. The potential impacts of the proposed development on terrestrial vegetation and freshwater systems have been considered. The impact assessment tables, which summarised the proposed mitigation measures, are discussed in Section 7 of the BAR.</p> <p>The application of the mitigation hierarchy is described in more detail in Section 7.2 of the BAR.</p>
1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	<p>Refer to Responses 1, 1.1 and 1.2 above.</p> <p>It is not envisaged that the proposed development will significantly pollute/ degrade the biophysical environment if the proposed mitigation and monitoring measures are implemented. Localised degradation is expected during the construction phase when areas will be cleared/ levelled for the road upgrades and the installation of infrastructure. Such impacts are generally localised and temporary in nature and will be carried out in accordance with the EMPr [under the supervision of an ECO and/or the relevant specialist consultant(s)].</p> <p>Regular surface water monitoring for pollution will also be required.</p>
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	<p>During the construction phase, builders' rubble will be generated. Small volumes of hazardous waste (such as discarded oil) may also be generated.</p> <p>General (non-hazardous) waste generated by the proposed development will enter the municipal waste stream. Any hazardous waste will need to be collected by a private contractor for proper disposal/ recycling. All recyclable components of the waste stream should be recycled, and green waste should be composted on site for reuse on site. Recyclables must be separated at source, and either fed into the municipal recycling system or be collected by a private contractor.</p>

NO.	QUESTIONS	ANSWERS
1.5	<p>How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimize and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</p>	<p>The integrated Heritage Impact Assessment (HIA, Appendix G), which includes a Visual Impact Assessment, considers the impact of the development on the cultural landscape. The HIA found that the development proposal is congruent with the landscape character of the cultural and natural landscape context and has responded sympathetically to the combined heritage, visual and ecological site informants and the carrying capacity of the site.</p> <p>The impact assessment tables, which summarises the proposed mitigation measures, are attached in Section 7.3 of the Draft BAR.</p>
1.6	<p>How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the nonrenewable natural resources been considered?</p> <p>What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</p>	<p>Non-renewable resources will be used during the construction phase (e.g. sand for concrete and steel, precast material), but such raw materials will be sourced from licensed facilities. The impact assessment tables, which summarises the impacts and proposed mitigation measures, are attached in Section 7.3 of the BAR.</p>
1.7	<p>How will this development use and/or impact on renewable resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimize the use of resources? What measures were taken to ensure responsible and equitable use of the resources?</p>	<p>The proposed development may have impacts on the environment in which it is located.</p> <p>In order to avoid or minimise the impacts on the biophysical environment, specialist assessments have been undertaken to investigate and assess these impacts and recommend mitigation measures to avoid or minimise the impacts of the activity.</p> <p>The EMPr for the project includes measures that should be taken to protect and limit the use of resources, such as potable water, and measures to protect the natural resources of the site.</p>

NO.	QUESTIONS	ANSWERS
	<p>What measures were explored to enhance positive impacts? (1) Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (2) Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources?) (3) Do the proposed location, type and scale of development promote a reduced dependency on resources?</p>	<p>Section 7 of the BAR provides a summary of potential impacts identified to date as well as proposed mitigation measures.</p>
1.8	<p>How were risk-averse and cautious approach applied in terms of ecological impacts? What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? What is the level of risk associated with the limits of current knowledge? Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development.</p>	<p>The precautionary approach (in which the absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures) was applied.</p> <p>When considering impacts, IDS and the specialist practitioners have considered the limits of current knowledge about the consequence of decisions and actions. Gaps in knowledge, limitations, assumptions and uncertainties are outlined in Section 8 of the BAR, as well as the respective Specialist Studies (Appendix G).</p>
1.9	<p>How will the ecological impacts resulting from this development impact on people's environmental right in terms of the following: (1) Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative</p>	<p>The proposed development is located on an existing road, therefore no loss of access to resources or loss of amenity is anticipated.</p> <p>The proposed development is not anticipated to unduly or significantly impact on people's environmental rights due to the nature and location of the development. Any nuisance impacts related to noise or dust, are likely to be temporary and localized in nature.</p>

NO.	QUESTIONS	ANSWERS
	<p>impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? (2) Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?</p>	<p>Refer to Section 7 of the BAR regarding potential negative and positive impacts are considered in Appendix G of the BAR, and mitigation has been proposed to ensure impacts are within acceptable limits. I&APs have been provided with the opportunity to raise any comments and concerns relating to the Basic Assessment Process, should they feel that their environmental right is being negatively impacted.</p>
1.10	<p>Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?</p>	<p>The development site is an existing road and as such is making little direct contribution to livelihoods at present. It is not anticipated that the proposed development will impact adversely on the environment, and the Benefits that will accrue to the local community as a result of the project are summarised in Section 7 of the BAR.</p> <ul style="list-style-type: none"> i. Various type of skills required related to road construction Contractor will finalise e.g. <ul style="list-style-type: none"> Concrete work Stone pitching Gabions ii 30% work will be outsourced to local construction companies ii 10% work will be performed by local labourers iii bylaws not applicable to this project iv Specialists will be used contractor will submit for approval not known now <p>Labourers will be sourced from Kroonstad area.</p>
1.11	<p>Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/ targets/ considerations of the area?</p>	<p>It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area has been somewhat altered both historically and at present. This is predominantly due to the extensive agriculture, secondary roads, the proximity of an existing anthropogenic environment and associated human activity, including: dumping of rubble, general littering and the infringement into natural areas via footpaths and roads.</p> <p>The ecological integrity, importance and functioning of these (terrestrial) semi-natural areas provide a variety of ecological services considered beneficial, with one key service being the maintenance of biodiversity. The diversity of these systems is indicative of the importance to</p>

NO.	QUESTIONS	ANSWERS
		<p>collectively provide refugia, food and corridors for dispersal in and through the surrounding area. The preservation of these systems is the most important aspect to consider for the proposed project.</p> <p>Considering the findings of the respective studies, no fatal flaws were identified for the proposed project. Should the avoidance and mitigation measures prescribed be implemented, the significance of the considered impacts for all aspects is expected to be low. It is thus the opinion of the specialists that the project can proceed, but only if the recommended mitigation measures and recommendations are implemented.</p>
1.12	<p>Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the “best practicable environmental option” in terms of ecological considerations?</p>	<p>Refer to response 1.11 above.</p> <p>Alternatives are discussed in Section 4 of the BAR.</p> <p>Based on inputs from the engineering team, a preferred layout option has been prepared for the site to provide future traffic capacity by upgrading the existing section of the N1-17 to four lanes to a 4-lane divided dual carriageway road.</p>
1.13	<p>Describe the positive and negative cumulative ecological/ biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?</p>	<p>Refer to the specialist reports (Appendix G) for a description of the cumulative impacts identified.</p> <p>Impacts are summarized in Section 7 of the BAR.</p>
<p>Promoting justifiable economic and social development</p>		
2.1	<p>What is the socio-economic context of the area, based on, amongst other considerations, the following considerations: (1) The IDP; (2) Spatial priorities and desired spatial patterns; (3) Spatial characteristics; and (4) Municipal Economic Development Strategy?</p>	<p>The socio-economic context of the area is summarised in Section 5.9 of the BAR. Section 2 of the BAR provides a description of applicable planning documents considered for this application, including the IDP and SDF.</p>

NO.	QUESTIONS	ANSWERS
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? Will the development complement the local socioeconomic initiatives (such as local economic development (LED) initiatives), or skills development programs?	<p>The socio-economic contribution of the development include:</p> <ul style="list-style-type: none"> • Impact on economic income; • Provision of employment opportunities; <p>Potential negative socio-economic impacts identified include:</p> <ul style="list-style-type: none"> • influx of people (e.g. job seekers); • increase in local crime levels (particularly during construction phase) • and an increase in traffic during both the construction phases.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	During the PPP, IDS has taken into account the concerns raised by stakeholders with respect to the proposed development and has responded to/ address such concerns in the Amended BAR.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impacts be socially and economically sustainable in the short- and long-term?	Due to the localised nature and low-level impacts associated with of the proposed development, it is not anticipated to result in unfair impact distribution in the short or long term. The proposed development is expected to create temporary employment opportunities during the construction phase as well as permanent employment opportunities during the operational phase.
2.5	<p>In terms of location, describe how the placement of the proposed development will:</p> <p>(1) result in the creation of residential and employment opportunities in close proximity to or integrated with each other;</p> <p>(2) reduce the need for transport of people and goods;</p>	<p>(1) No residential opportunities are expected for the project. Employment opportunities are discussed in the Socio-Economic Impact Assessment Report attached as Appendix G of the BAR.</p> <p>(2) Not applicable as the proposed development is related to an upgrade of an existing road.</p> <p>(3) Public transport drop-off and pick-up areas should be demarcated on site for e-hailing vehicles, mini-bus taxis and buses.</p>

NO.	QUESTIONS	ANSWERS
	<p>(3) result in access to public transport or enable non-motorised and pedestrian transport;</p> <p>(4) compliment other uses in the area;</p> <p>(5) be in line with the planning for the area;</p> <p>(6) for urban related development, make use of underutilized land available with the urban edge;</p> <p>(7) optimise the use of existing resources and infrastructure;</p> <p>(8) opportunity costs in terms of bulk infrastructure expansions in non-priority areas;</p> <p>(9) discourage “urban sprawl” and contribute to compaction/densification;</p> <p>(10) contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs;</p> <p>(11) encourage environmentally sustainable land development practices and processes;</p> <p>(12) take into account special locational factors that might favour the specific location;</p> <p>(13) the investment in the settlement or area in question will generate the highest socioeconomic returns;</p>	<p>(4) The proposed development is congruent with then cultural and visual landscape of the area.</p> <p>(5) The development area is undertaken on land owned by the Applicant within the road reserve.</p> <p>(6) Not applicable as the proposed development is related to an upgrade of an existing road.</p> <p>(7) The existing roads is being upgraded.</p> <p>(8) Not applicable as no bulk infrastructure will be expanded.</p> <p>(9) Not applicable as the proposed development is related to the upgrade of an existing road.</p> <p>(10) Not applicable. The proposed development will not address historically distorted spatial patterns.</p> <p>(11) Not applicable as the proposed development is related to the upgrade of an existing road.</p> <p>(12) The location of the proposed upgrade will occur on an existing road, hence the specific location of the project was determined by the need for an upgrade to increase future capacity.</p> <p>(13) N/A</p> <p>(14) A Heritage Impact Assessment and Visual Impact Assessment was conducted for the project. Refer to Section Appendix G of the BAR.</p>

NO.	QUESTIONS	ANSWERS
	<p>(14) impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area; and</p> <p>(15) in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?</p>	<p>(15) Not applicable as the proposed development is related to the upgrade of an existing road.</p>
2.6	<p>How were a risk-averse and cautious approach applied in terms of socio-economic impacts?</p> <p>(1) What are the limits of current knowledge?</p> <p>(2) What is the level of risk associated with the limits of current knowledge?</p> <p>(3) Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</p>	<p>The precautionary approach was applied during the consideration of potential impacts. Gaps in knowledge, limitations and assumptions are discussed in Section J(2.4) of the BAR. Refer to the Specialist Studies included in Appendix G for the respective gaps in knowledge and assumptions and limitations for each study.</p>
2.7	<p>How will the socio-economic impacts resulting from this development impacts on people's environmental right in terms of the following:</p> <p>(1) Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</p> <p>(2) Positive impacts: What measures were taken to enhance positive impacts?</p>	<p>The BAR has identified impacts generally associated with development of this nature.</p> <ul style="list-style-type: none"> • It is not anticipated that a development of this nature or scale will unduly impact on people's environmental right. Refer to Section 7 of the BAR for the identified impacts and the EMPr (Appendix H). • Apart from localised dust and noise impacts during the construction phase, the influx of job seekers and the increased crime are potential negative socioeconomic impacts expected from the proposed development during the construction phase. • Job creation opportunities and economic income are positive impacts expected from the construction phase of the proposed development. • I&APs have been provided with an opportunity to raise any concerns relating to the proposed development, should they feel their environmental right is being negatively impacted.

NO.	QUESTIONS	ANSWERS
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts?	Refer to Response 1 and 1.10 above. In terms of livelihoods, most of the development site has been transformed by agriculture over many years. As such, the ecological impacts of the development are anticipated to be low. The proposed socio-economic impacts discussed in Response 2.2 above, are not expected to result in significant ecological impacts.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	As indicated above, the development proposal has considered the carrying capacity of the site from a visual and heritage perspective. Please refer to Appendix G of the BAR.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	It is not anticipated that adverse environmental impacts will be distributed in such a manner as to unfairly discriminate against any person. The local community will benefit from the project, as described in Section I(4) of the BAR.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	<p>It is not anticipated that the proposed development will impact adversely on the environment, and the benefits that will accrue to the local community as a result of the project are summarised in Section 7 of the BAR.</p> <ul style="list-style-type: none"> i. Various type of skills required related to road construction Contractor will finalise e.g. <ul style="list-style-type: none"> Concrete work Stone pitching Gabions ii 30% work will be outsourced to local construction companies ii 10% work will be performed by local labourers iii bylaws not applicable to this project

NO.	QUESTIONS	ANSWERS
		<p>iv Specialists will be used contractor will submit for approval not known now</p> <p>Labourers will be sourced from Kroonstad area</p>
2.12	<p>What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?</p>	<p>An EMPr has been drafted for the construction and operational phase of the development, to ensure environmental safety during construction, as well as safety of staff on site. Refer to Appendix H.</p> <p>The applicant is also to ensure, inter alia, that the working conditions throughout the project life cycle on site adhere to the minimum requirements of the Occupational Health and Safety Act (Act No. 85 of 1993).</p>
2.13	<p>What measures were taken to: (1) ensure the participation of all interested and affected parties; (2) provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation; (3) ensure participation by vulnerable and disadvantaged persons; (4) promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means; (5) ensure openness and transparency, and access to information in terms of the process; (6) ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge; and (7) ensure that the vital role of women and youth in environmental management and development were recognised and their full participation</p>	<p>The public participation process is outlined in Section 6 and Appendix E6 of this report and includes the process followed to ensure as many I&APs are reached and provided with an opportunity to comment. All comments received have been considered and responded to in a Comments and Response Table attached in Appendix E6.</p>

NO.	QUESTIONS	ANSWERS
	therein were promoted.	
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	<p>The economic benefits of employment opportunities and the associated social benefits of the project are likely to benefit various segments of the community. Benefits that will accrue to the local community as a result of the project are summarised in Section 7 of the BAR.</p> <ul style="list-style-type: none"> i. Various type of skills required related to road construction Contractor will finalise e.g. <ul style="list-style-type: none"> Concrete work Stone pitching Gabions ii 30% work will be outsourced to local construction companies ii 10% work will be performed by local labourers iii bylaws not applicable to this project iv Specialists will be used contractor will submit for approval not known now
2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or dangers of associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	<p>The EMPPr makes provision for “Tool Box Talks”, which should be held with all workers on site. The dangers associated with the job as well as their right to refuse work that is harmful to human health or the environment should be communicated to workers at this time. The applicant is also to ensure, inter alia, that the working conditions on site adhere to the minimum requirements of the Occupational Health and Safety Act (Act No. 85 of 1993).</p>
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects: (1) the number of temporary versus permanent jobs that will be created; (2) whether the labour available in the area will be able to take up the job	<ul style="list-style-type: none"> i. Various type of skills required related to road construction Contractor will finalise e.g. <ul style="list-style-type: none"> Concrete work Stone pitching Gabions ii 30% work will be outsourced to local construction companies

NO.	QUESTIONS	ANSWERS
	opportunities (i.e. do the required skills match the skills available in the area); (3) the distance from where the labourers will have to travel; (4) the location of job opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits; and (5) the opportunity costs in terms of job creation.	<ul style="list-style-type: none"> ii 10% work will be performed by local labourers iii bylaws not applicable to this project iv Specialists will be used contractor will submit for approval not known now Labourers will be sourced from Kroonstad area
2.17	What measures were taken to ensure: (1) that there were intergovernmental coordination and harmonization of policies, legislation and actions relating to the environment, and (2) that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	(1) Section 2 of the BAR summarises the legal and policy context applicable to the proposed development. (2) A list of organs of state that have been notified and provided with an opportunity to comment on the BAR. IDS is not aware of any current conflicts of interest between organs of state that are required to be resolved.
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Several specialist studies were commissioned to inform the initial site layout of the development on the properties. Factors such as the agricultural potential, vegetation condition and presence/ absence of surface water resources were used to inform the preferred site layout, and realistic mitigation measures are proposed to reduce or enhance impacts. As such the "measures" that will be taken include the consideration of various specialist inputs to ensure that the best practicable environmental option (BPEO) is assessed and submitted to the DEFF for approval.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	The mitigation measures proposed must be realistic and implementable for the outcome of the impact assessment to be reliable. It is the opinion of IDS that the recommended mitigation and monitoring measures put forward by specialist practitioners are realistic given the nature and scale of the proposed development.

NO.	QUESTIONS	ANSWERS
2.20	<p>What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?</p>	<p>Section 28 of NEMA (Duty of Care) holds every person who causes, has caused, or may cause significant pollution and degradation of the environment accountable. As such, the mechanisms provided for in the NEMA could be used by any person or the responsible authority(ies) to hold those responsible for pollution and degradation of the environment accountable.</p> <p>The necessary rehabilitation measures are incorporated into the EMP, which will require that the applicant be responsible for the costs of remedying environmental degradation (e.g. erosion of topsoil or pollution of groundwater) that may occur during the construction phase.</p>
2.21	<p>Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?</p>	<p>The Socio-Economic considerations, which include such aspects as: sense of place, impact on the cultural landscape, scenic routes and impact on farming operations are described in BAR.</p> <p>The pre-application public participation phase, and inputs from the engineers and specialists, will contribute to ensuring that the “best practicable environmental option” both in terms of the environment and socio-economic conditions is put forward for approval. Potential impacts have been assessed in Section 7.</p>
2.22	<p>Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?</p>	<p>Influx of job seekers</p> <p>With any development there is the possibility of an influx of people into the area. Such an impact is often related to the development or upgrading of road networks, as projects like these tend to provide employment opportunities for several months or even years. With this project, one may see an increase in job-seekers especially around labour-sending areas such as Kroonstad. However, the significant of this would be low, as employment opportunities will need to be advertised through the LMs and appropriate Human Resources (HR) policies will need to be followed. Employment should be prioritised for the local, youthful population. Labour accommodation will also not be provided, which means that people should be less inclined to move to the area in search of jobs.</p> <p>The potential concerns with an influx of job-seekers would related competition over job opportunities in the area, as work is already very limited. More importantly, it is important to note that an influx of job-seekers (such as contractors) are often associated with an</p>

NO.	QUESTIONS	ANSWERS
		<p>increase in risky sexual behaviours or even sex work. This could cause a spike in sexually transmitted diseases, such as HIV/Aids.</p> <p>Specialist workers attracted to the area during the construction phase might encourage practices such as prostitution, which are often fuelled by promiscuous sexual relationships, usually driven by financial incentives.</p> <p>Conflicts can be stirred as a result of many other factors. Some of these include conflict (but are not limited to):</p> <ul style="list-style-type: none"> • An increase in economic disparities between those with jobs and those without; • Changes in values and changes in 'way of life' of those with jobs; • Changes in power relations between employed youth and elders; • Perceived unfair recruitment strategies; and/or • Perceived preferential procurement strategies. <p>It should be noted that, as with most social impacts, in-migration may also have a positive impact in terms of providing locals with small business opportunities due to an increased demand for local produce and other goods, as well as opportunities for cultural exchange. It is the specialist' opinion that it is highly unlikely for these concerns to be realised, however, as the project will not provide labour accommodation and as labour will be sourced through the LMs in the PACs.</p> <p>Unrestricted Access of Construction Vehicles/Workers onto Farm Land and Adjacent/Surrounding Areas</p> <p>The SIA noted that there are several privately-owned farms adjacent to the N1. Although these farms should not be affected by the upgrade of the road, one has to understand that the continuous influx of workers along the road on a daily basis and unrestricted vehicular access do render farmers more vulnerable from a health and safety perspective. Many farm-owners were concerned that this could facilitate unrestricted vehicular access onto their farms, possibly even intruders, without farmers knowing or providing permission. If not managed and controlled, this could potentially worsen this impact.</p> <p>In is anticipated that this impact would have the highest significance during the construction period, as construction vehicles and contractors would have access to particular sections of the road on a continuous basis. This impact would become less significant during the</p>

NO.	QUESTIONS	ANSWERS
		<p>operational phase of the project, as the road would have been completed and hence fewer inspection vehicles, crews and contractors would be required.</p> <p>Potential Increase in Crime This impact is a potential increase in crime is highly likely the result of unrestricted vehicle and/or worker access on surrounding farms.</p> <p>Many farm-owners expressed concern that the upgrading of the road might possibly increase levels of crime. In the specialist' own experience, an influx of job-seekers or "outsiders" can certainly cause a rise in crime levels. This could either be crime that is introduced by outsiders, but also crime that is taught to local residents (especially youth members) by outsiders.</p> <p>General crime (especially livestock theft), but also farmer attacks in the past, have been referred to in the report. Due to the rural nature of these farms, police surveillance is also challenging. A possible increase in crime levels not only puts farm owners in a vulnerable position, but also their farm workers and children who walk in the area or to the nearest bus stops.</p> <p>Fire As the area is dominated with grassland, and as many of the crops planted on the farms along the road to be upgraded are highly flammable, fire hazard is an obvious impact during the construction phase. With crops fields, livestock and farmer/worker housing surrounding the N1 to be upgraded, such a fire could have a very significant impact on terms of health and safety considerations, but also economic losses.</p> <p>Employing Local Labour Although little information is currently available on the number of jobs to be created, it is anticipated that most of these jobs would be available during the construction period. Fewer workers would be needed during route operational phase maintenance work; workers who might also be more highly skilled professionals.</p> <p>The importance of employing local residents cannot be overstated. Not only does employment afford an income to households that are highly deprived thereof, additional benefits to may include:</p> <ul style="list-style-type: none"> • Reducing crime rates;

NO.	QUESTIONS	ANSWERS
		<ul style="list-style-type: none"> • Reducing alcohol and drug-abuse rates; and • Reducing intra-household violence. <p>Skills Training and Further Training Opportunities</p> <p>There is a strong possibility that the local residents might not have the skills required to perform the work needed. It is therefore advised that the proponent initiates programmes aimed at ensuring that a number of local residents are provided with appropriate education and skills training to allow them to perform the work needed, or through a community trust mechanism, is afforded the opportunities and access to further education.</p> <p>Sufficient skills and further training opportunities should be created for several reasons. The first reason is that this should be seen by SANRAL as an investment for future construction-related work in the area. Training local youth members in becoming familiar with the work required would allow the residents to apply for similar positions elsewhere too. It should also ensure that, for future maintenance work required, SANRAL has a steady labour supply. Another reason is that more local skilled residents could be absorbed, reducing the need for expats from other provinces.</p> <p>Contributing to Local and Regional Businesses</p> <p>SANRAL is encouraged to invest in the labour-sending communities (PACs) and especially to stimulate the development of SMMEs. Many local industries could benefit from this upgrade, especially during the construction phase. Prior to and during construction, local construction-related suppliers could be amongst those who will enjoy benefits, whilst local retailers could stand to benefit the most. Benefits during construction are likely to be more localised. For example, there might be more buying power from local people in the area as result of the proposed activity.</p> <p>Provision of Basic Social Services: Road Upgrade</p> <p>The proposed project is ultimately a very positive development in the region. As indicated in the report, upgrading the N1 is essential as elevated traffic volumes have been recorded. Some key informants also referred to an increase in traffic-related accidents on the three-lane carriageway.</p> <p>Many of these accidents seem to be related to vehicles driving irresponsibly by taking chances to overtake other vehicles in dangerous sections of the road. Therefore, upgrading this road is not only important nationally (as this is the N1 and a key route of South Africa), but also locally in terms of reducing road accidents.</p>

NO.	QUESTIONS	ANSWERS
		<p>Mitigation measures are not applicable under this impact. As indicated below, it is believed that the general impact for the No-Go Option (i.e. should the road not be upgraded) would be high negative, as the road traffic, but most importantly road accidents, would most certainly increase.</p>

4 PROJECT ALTERNATIVES

In terms of the EIA Regulations 2014 (as amended in 2017), feasible alternatives are required to be considered as part of the environmental investigations. In addition, the obligation that alternatives are investigated is also a requirement of Section 24(4) of the NEMA (Act No. 107 of 1998) (as amended). An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity which may include alternatives to:

- The property on which or location where it is proposed to undertake the activity;
- The type of activity to be undertaken;
- The design or layout of the activity;
- The technology to be used in the activity;
- The operational aspects of the activity; and
- The option of not implementing the activity.

4.1 Site Alternatives

The project involves the upgrade of the National Route 1 Section 17 from Westleigh (km 77.8) to Heuningspruit (km 101.6); therefore, no off-site or other site-specific alternatives have been investigated.

4.2 Layout/Route Alignment Alternatives

As the project proposes to upgrade the National Route 1 Section 17 from Westleigh (KM 77.8) to Heuningspruit (KM 101.6), the existing layout or alignment will be followed.

4.3 Design Alternatives

Two (2) options have been investigated in the Concept Design Stage, namely a 4-lane undivided single carriageway with a median barrier, or a 4-lane divided dual carriageway road. As it was found that a 4-lane dual carriageway road is the economically preferred option and also has a number of other important advantages detailed below;

- As far as capacity is concerned, a 4-lane facility will be adequate for the medium traffic growth scenario of 3-4% over the chosen design period.
- The HDM4 Economic Analysis of the project alternatives proved that there is a definite economic benefit for the proposed 4-lane dual carriageway over the alternative option of upgrading the road to a 4-lane undivided single carriageway with a median barrier.
- An important conclusion from the safety analysis is that the potential risk for crashes will be reduced significantly with a 4-lane facility, particularly if the upgrade is to a dual carriageway with total physical separation of traffic streams in both directions. The dual carriageway also provides a recovery area in the median.
- Accommodation of traffic can be done much safer if the Dual Carriageway option is implemented, with less disruption of existing traffic flow, less congestion and lower road user costs during construction.
- The N1 route immediately south of Kroonstad is presently being upgraded to a 4 lane dual carriageway. It is a logical conclusion that traffic will eventually increase further northwards towards Gauteng and the same type of facility will be appropriate as far as route continuity is concerned.
- The recommended 4-lane Dual Carriageway can be implemented without any changes to existing overpass bridges required as far as opening widths underneath the bridges are concerned.

4.4 NO-GO Alternative

The need for the project arose from increased traffic volumes on the N1-17 route and declining Levels of Service on the existing 3-lane carriageway facility. SANRAL's main objectives with the current project are to provide future traffic capacity by upgrading the existing section of the N1-17 to four lanes. Should the project not be approved, traffic congestion will be a challenge for road users. In addition, the structures would continue to remain in a degraded state and it is currently in need of repair and rehabilitation. Thus, should the proposed project not proceed as planned, safety risks associated with road use will increase. The NO-GO option is therefore, not preferred.

5 DESCRIPTION OF THE BASELINE ENVIRONMENT

5.1 Property Description

The proposed development is located on various properties within the Moqhaka and Ngwathe Local Municipality as detailed by the table below;

Table 10: Property description

Property SG Code	Geographic coordinates		Municipality
	Longitude (E)	Latitude (S)	
F0200000000038600002	-27,5334386	27,30024147	Moqhaka
F02000000000256600001	-27,55154371	27,28772097	Moqhaka
F02000000000246200011	-27,55629407	27,2845182	Moqhaka
F02000000000246400001	-27,60171516	27,26381215	Moqhaka
F02000000000246200010	-27,58247486	27,27239554	Moqhaka
F02000000000246200012	-27,56236697	27,28141399	Moqhaka
F0200000000053200001	-27,50601895	27,31927434	Moqhaka
F0200000000005400001	-27,48865364	27,33132728	Moqhaka
F02000000000246100012	-27,47981766	27,33742466	Ngwathe
F02000000000246100013	-27,47088247	27,3436456	Ngwathe
F02000000000035700004	-27,46282802	27,34920803	Ngwathe
F02000000000035700003	-27,45502539	27,35461261	Ngwathe
F02000000000050900001	-27,43928254	27,36545871	Ngwathe
F02000000000035700002	-27,46399458	27,33813632	Ngwathe
F02000000000035700000	-27,45691036	27,3380767	Ngwathe
F02000000000224700001	-27,4218233	27,37725071	Ngwathe
F02000000000046000231	-27,61585624	27,25750902	Moqhaka
F02000000000224700000	-27,41416107	27,37334374	Ngwathe

5.2 Land acquisition

For the proposed upgrading to a 4-lane dual carriageway, no additional land is required for the road reserve of the main line and cross roads, as well as for the upgrading of the existing Nooitgedacht Interchange at Heuningspruit (km 98, 9).

According to the strategy for the accommodation of traffic during the construction of the proposed 4-lane dual carriageway, no additional land will be required for temporary deviations.

The figure below depicts the affected properties.

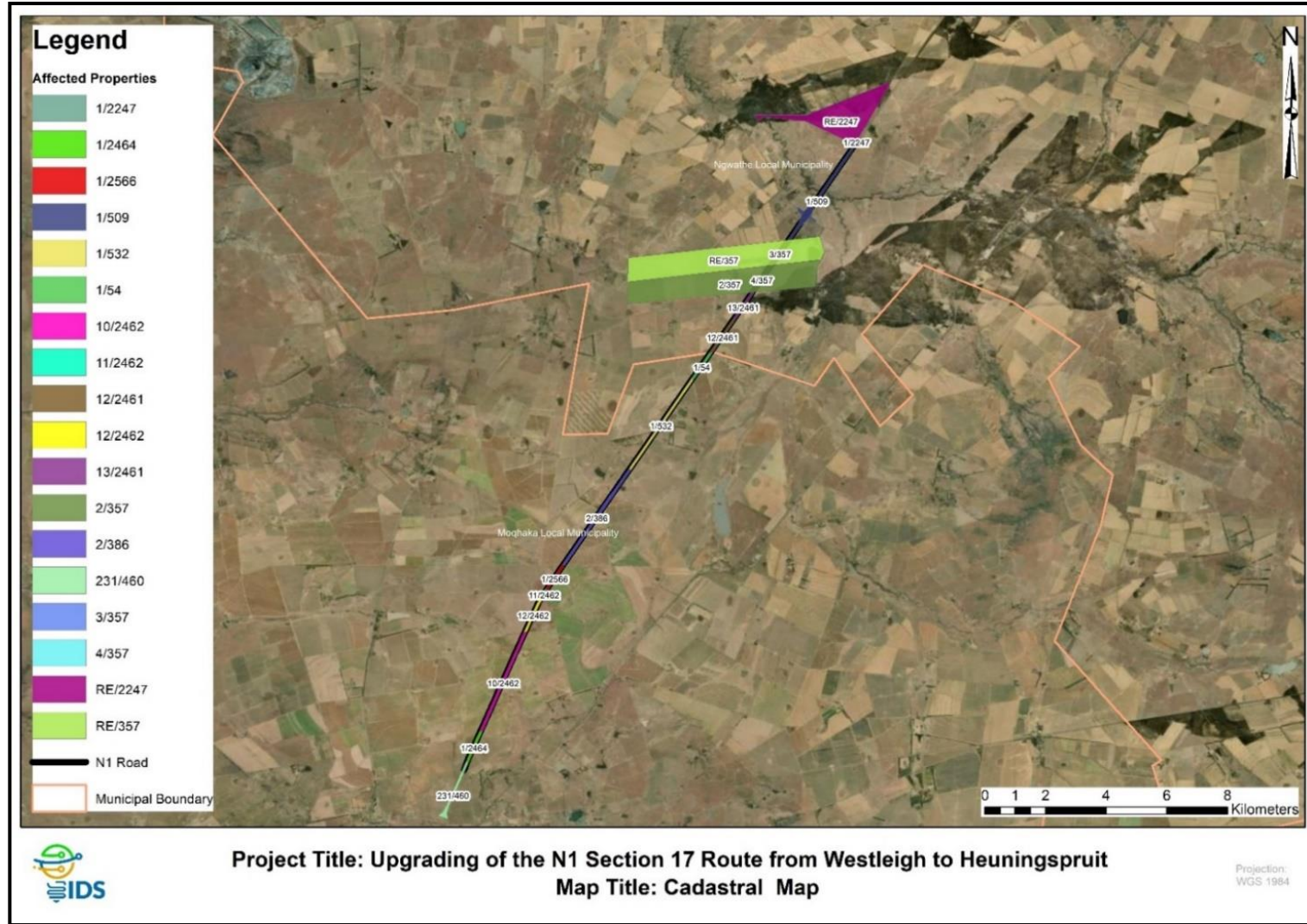


Figure 5: Cadastral map

5.3 Socio-Economic Context

5.3.1 Demographic Profile of Moqhaka and Nqwanthe Local Municipalities

According to the most recent South African Community Survey of 2016, the DM of Fezile Dabi has a total population of just under half a million residents (494,777 people) (GoSA, 2017a). The 2011 South African Census estimated the district's population at 488,036 people, which means that the area has seen a slow population growth rate of just over 1% of its 2011 figures. This is a low population growth rate, as the general South African growth rate between 2011 and 2020 can be appraised at just under 20% of its 2011 figures. Considering the two affected LMs, Moqhaka LM has a population of 154,732 people (2016 figures), which is approximately 31% of the DM's population.

Referring to data from the 2011 census, the municipality's IDP for 2017-2022 confirms that the municipality experienced a population decrease of around 4% of its 2011 population figure. The same negative population growth rate has been experienced by the Ngwathe LM, which currently houses around 118,907 people (2016 figure; GoSA, 2017c). As referred to by its IDP for 2017-2022, the Ngwathe LM similarly experienced a negative population growth rate of around 1% of its 2011 population figures. Data confirms, however, that most of the residents in both LMs are mainly born in the Free State, whilst just under 100% of the area's residents are South Africans (Wazimap, 2016a & b).

In summary, this data indicates that the study area is experiencing a population decrease, as people are out-migrating to larger urban centres for work opportunities. In fact, the area is largely urbanised, with 78% of the population in the Moqhaka LM who are located in urban areas, as opposed to rural ones (GoSA, 2017b). Such migration is confirmed in other data sources for the district, where it is noted that the area is experiencing a rural-to-urban migration trend with some areas in the district, such as Moqhaka, becoming significantly less urbanised (GoSA, 2020).

Both LMs have a combined number of 94,511 households with an average household size of between two and three members (GoSA, 2017b & c). In terms of a racial classification, Black Africans are in the majority in both municipalities at approximately 90% of the population, followed by Coloureds (just under 3%), Indian and White citizens (ibid.). Considering gender, both municipalities have slightly more women than men, with Ngwathe LM's female population outnumbering its male counterparts at 52.5% of the population (ibid.). The two major languages of the study area are Sesotho and Afrikaans (approximately 80% speak Sesotho and 11% Afrikaans in both LMs) (Wazimap, 2016a & b).

Another important aspect of a demographic assessment to consider is the age-spread of the population. This is important as a project such as this will provide employment opportunities which are highly needed if the majority of the population is aged within the working-age bracket. **Table 11** provides the population breakdown for the district as a comparison between the 2011 Census and 2016 Community Survey data in South Africa.

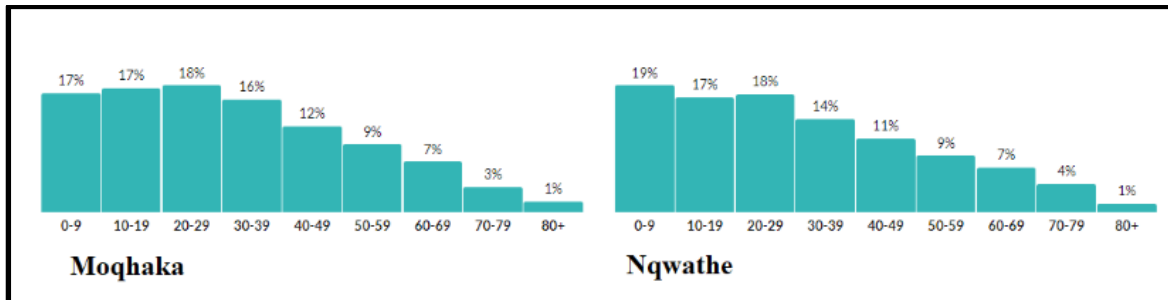
Table 11: Age distribution

	2016	2011
Population	494 777	488 036
Age Structure		
Population under 15	25.50%	28.10%
Population 15 to 64	67.50%	65.80%
Population over 65	7.00%	6.10%

As indicated in **Table 11**, the working-age population (between 15 and 65) seems to comprise around 67.50% of the district's population, which is slightly higher than the 2011 figure of 65.80%.

This obviously indicates that, although the area experienced a population decrease, more people are aged within the working-age population today. The age-spread data for the two affected LMs are displaced in **Table 10** below.

Table 12: Distribution of the Fezile Dabi District Municipality



As illustrated in **Table 12**, both municipalities seem to have a similar age-spread which is very much reflecting the data of the DM. For example, both municipalities have around 60% of people who are aged between 18 and 64 (57% and 60% for Nqwathe and Moqhaka respectively) (Wazimap, 2016 a & b).

Education is another important aspect of population demographics to consider, especially as the upgrading project might require some semi-skilled labourers. This data is presented in **Table 13** below.

Table 13: Educational Status of the Fezile Dabi District Municipality

	2016	2011
Education (aged 20 +)		
No schooling	6.70%	7.30%
Matric	31.40%	27.50%
Higher education	7.80%	9.00%

(Source: GoSA, 2017a: p.10)

According to the 2016/2017 annual report of the Fezile Dabi DM, around 31% of those aged 20 years or older have matric, followed by 7.8% of these residents who have higher education and 6.7% who have no education. The data illustrates that there has been an increase in matric completion rates since 2011. This data for the two affected LMs are presented in **Figure 6** below.

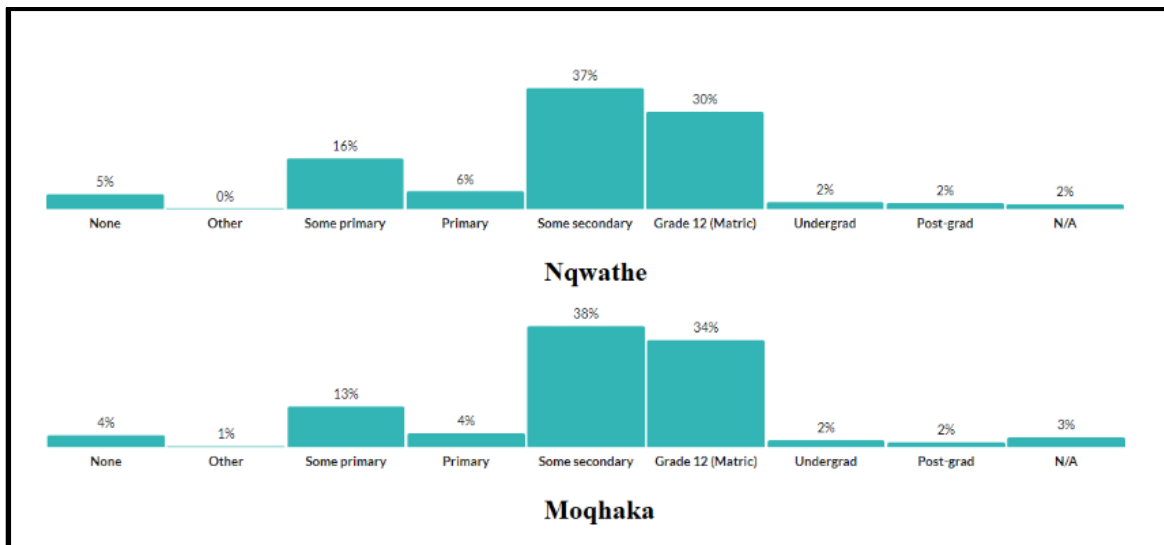


Figure 6: Educational Status in the Ngwathe and Moqhaka Local Municipalities (source: Wazimap, 2016)

As illustrated in **Figure 6**, both LMs follow similar trends in terms of household education statuses, with both having around 30% of its residents who completed matric (30% and 34% for Ngwathe and Moqhaka respectively). This data is aligned with the data for the district (31.40%).

The dependency ratio is another key statistic which is used to define an area’s demographic profile. This ratio measures the pressure on an area’s productive population, and is a measurement of the number of household dependents aged 0-14 and those 65 or older, compared to an area’s total population between 15 to 64. For the Ngwathe LM, this ratio was appraised at 60.2% in 2011, whereas for Moqhaka this was 50.5% (StatsSA, 2011a & b). In comparison, the dependency ratio for South Africa was appraised in 2018 at 52.43% (Indexmundi, 2020).

Lastly, in terms of housing status, around 70% of households in the DM own their houses (2016 figures), which is higher compared to approximately 60% in 2011 (GoSA, 2016a). In 2016, exactly 85.60% of these households lived in formal dwelling structures, which is also higher compared to 83.3% who lived in formal dwellings in 2011 (ibid.). These figures are confirmed by main dwelling and tenure status data provided in the IDP for the Moqhaka LM (2017-2022), which are provided in **Figure 7** below.

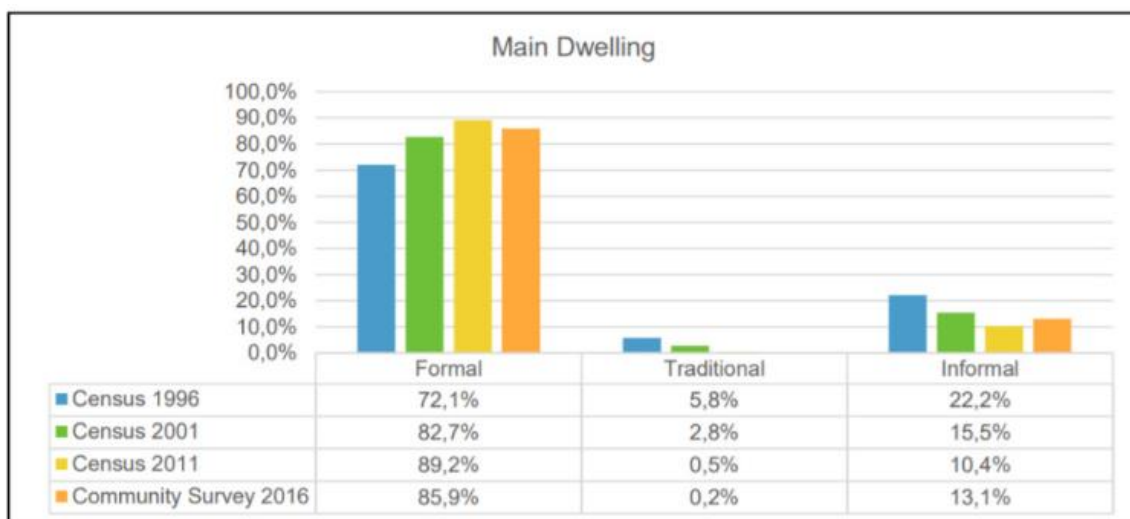


Figure 7: Main Dwelling Type in the Moqhaka Local Municipality (source: GoSA, 2017b: p.36)

As illustrated in **Figure 7**, 85.9% of households in the Mqoqaka LM consist of formal dwellings, which is slightly lower than the same data obtained in 2011 (89.2% of households). What the figure further illustrates is an increase in informal dwellings from 10.4% of households in 2011 to 13.1% in 2016. Therefore, one may assume that, although the population in the study area has been on the decrease, households living in informal dwellings have increased with around 2.7% since 2011. For the LM of Ngwathe, the 2016 data indicates that around 81% of households currently live in a formal dwelling, followed by 13% of households who live in informal shacks (Wazimap, 2016a). Ngwathe LM has actually seen a decrease in people living in informal shacks from 17% in 2011.

5.4 Topography

The topography (elevation and slope) of the surrounding area is represented in **Figure 8** and **Figure 9**. The slope of the surrounding area was derived from the Digital Elevation Model (DEM). The slope of the area ranges from ridges to valleys. Sections represented by red on the slope map reflect high lying areas (ridges), whereas sections represented by the colour green reflect low-lying/ flat areas (valleys). As seen from the map, the slope immediately surrounding the area can be classified as being relatively flat. Along the N1, a large portion of the road is adjacent to a flat-low lying slope/plain. The middle section of the N1 road is predominantly adjacent to higher lying slopes.

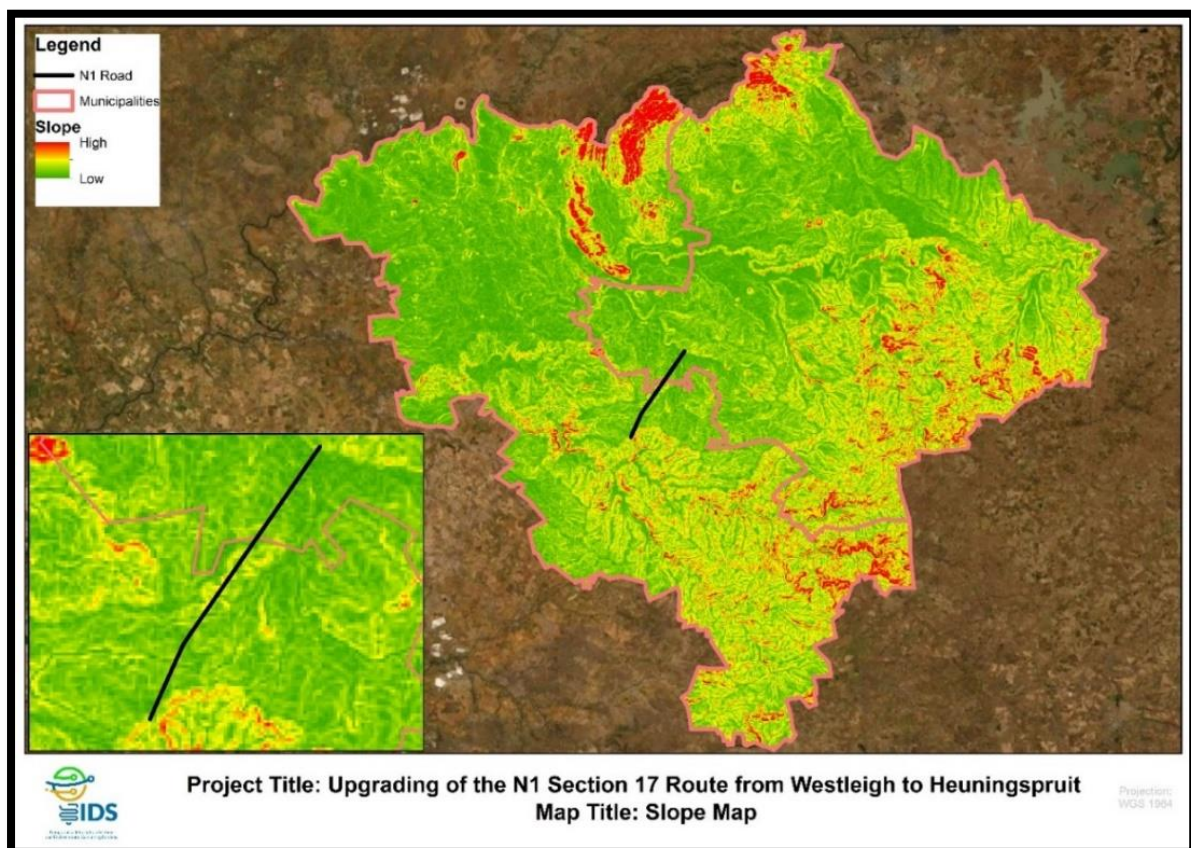


Figure 8: Slope map

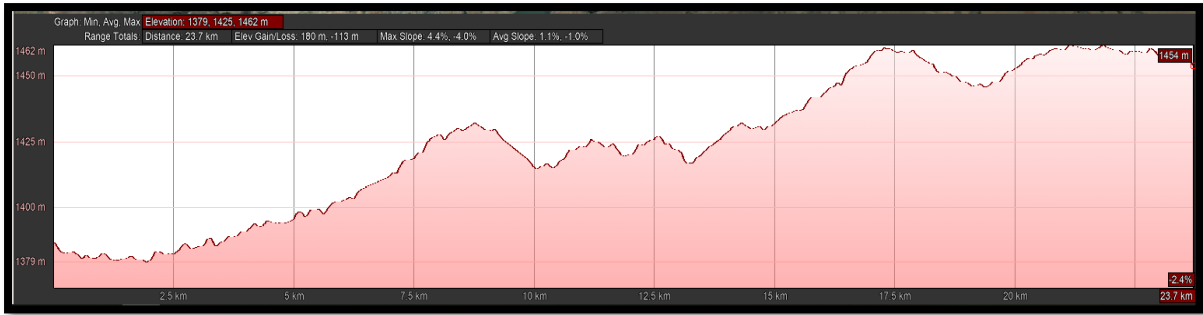


Figure 9: Elevation Profile

5.5 Parent Material

The parent material of the soils (**Figure 10**) is mainly derived from the Ecca Group (Geological Survey, 1981). Sandstone and shale of the Volksrust Formation occurs in the north-east, with mudstone of the Beaufort Formation in the south.

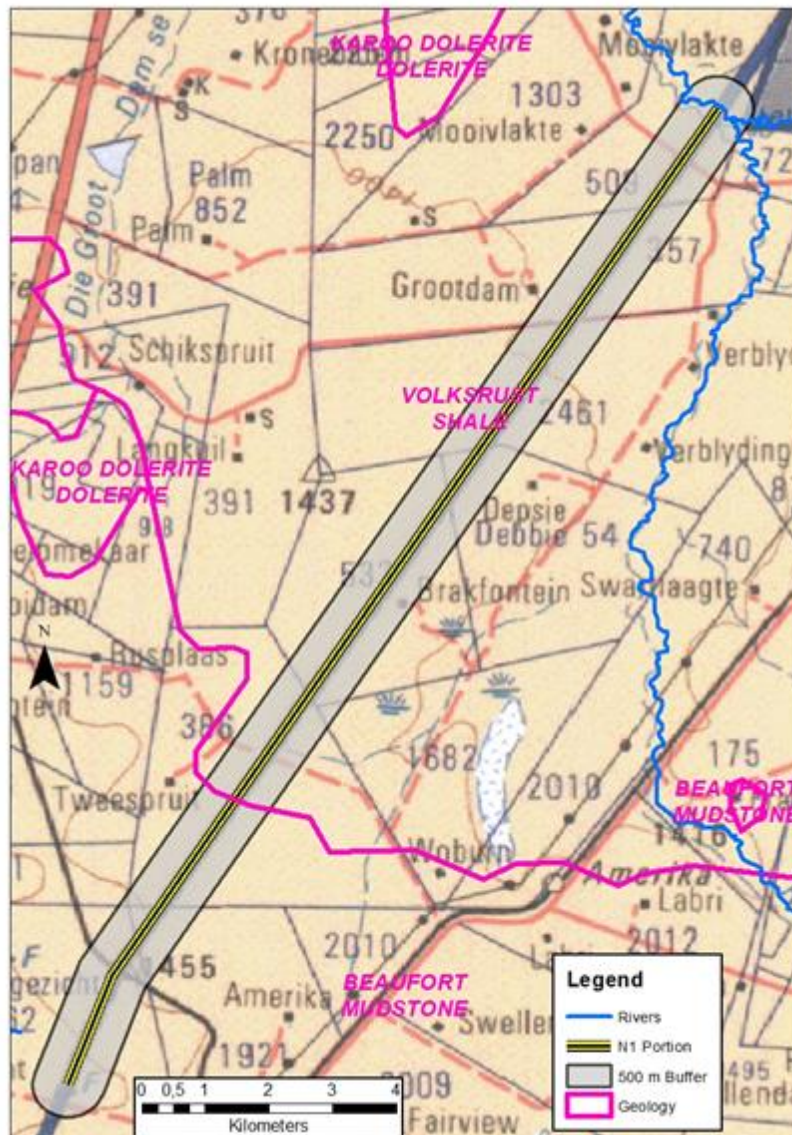


Figure 10: Geology Map

5.6 Soils

A summary of the dominant soil characteristics of the various land types is given in **Table 14** below.

Table 14: Soil types

Land Type	Dominant Soils	Depth (mm)	Description	Agric. Pot. (%)
Bd21	Av36 (41%)	900-1100	Yellow-brown, structureless, sandy clay loams on mottled soft plinthite	High: 49.1 Mod: 42.0 Low: 8.9
	We12/13 (25%)	400-600	Grey-brown, sandy clay loam topsoils on mottled soft plinthite	
	Va/Sw/Bo 40/41 (16%)	500-1200	Brown, moderately structured, sandy clay to clay soils	
Dc11	Va/Sw/Bo41 (58%)	500-1200	Brown, moderately structured, sandy clay to clay soils	High: 1.1 Mod: 70.9 Low: 28.0
	Rg20/Wo21 (11%)	600-1000	Dark grey to black, structured clay soils with signs of wetness	
	Rock & lithosols (14%)	100-450	Various brown to dark brown sandy clay loam topsoils on rock, with surface rock outcrops	

The distribution of soils with high, medium and low agricultural potential within the land type is also given, with the dominant class shown in **colour**.

5.7 Surface Water Assessment

A Water Resource Assessment was conducted by The Biodiversity Company dated May 2019 to inform the condition and impacts of the proposed development to the water resource on site.

5.7.1 NFEPA's for sub-quaternary catchment C70G-2259

The project area is located in an Upstream Water Management area (**Figure 11**), a sub-quaternary catchment in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas. Upstream Management Areas do not include management areas for wetland FEPAs, which need to be determined at a finer scale. Further, several river NFEPAs are listed for the Heuningspruit SQR.

Table 15: NFEPAs listed for the C70G-2259 SQR

Type of FEPA map category	Biodiversity features
Number of wetland clusters	3 WetCluster FEPAs
Wetland ecosystem type	Dry Highveld Grassland Group 3_Depression
Wetland ecosystem type	Dry Highveld Grassland Group 4_Depression
Wetland ecosystem type	Dry Highveld Grassland Group 4_Flat
Wetland ecosystem type	Dry Highveld Grassland Group 4_Floodplain wetland
Wetland ecosystem type	Dry Highveld Grassland Group 4_Valleyhead seep

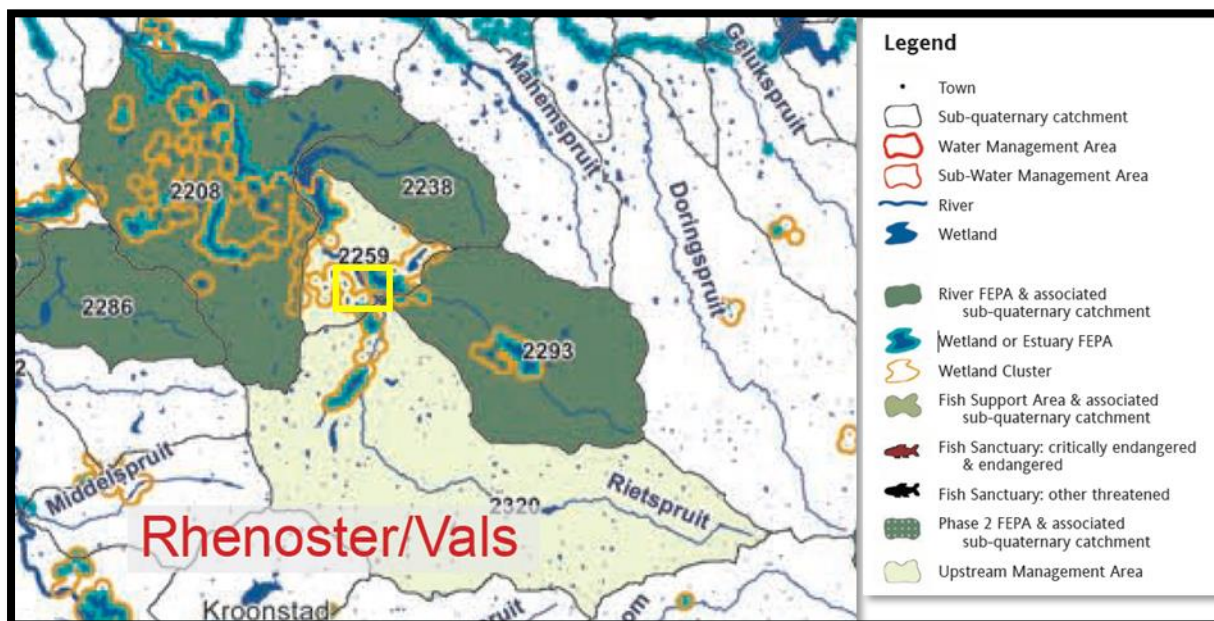


Figure 11: Illustration of NFEPAs associated with the project area, indicated by a yellow square

5.7.2 Status of sub-quaternary reach C70G-2259

The study area falls under the Heuningspruit sub-quaternary reach (SQR). The reach spans approximately 19 km of the Heuningspruit River. The Present Ecological Status (PES) category of the reach is classed as moderately modified (class C).

The Ecological Importance (EI) of the reach is classified as moderate. The Ecological Sensitivity (ES) is categorised as moderate due to the presence of macroinvertebrate taxa that are considered to be sensitive to flow and physico-chemical water modifications.

Anthropogenic impacts identified within the sub-quaternary catchment included instream dams, low water crossings, abstraction for irrigation, and agriculture.

Table 16 : Summary of the status of sub-quaternary reach C70G-2259

Present Ecological Status	Moderately modified (class C)
Ecological Importance	Moderate
Ecological Sensitivity	Moderate

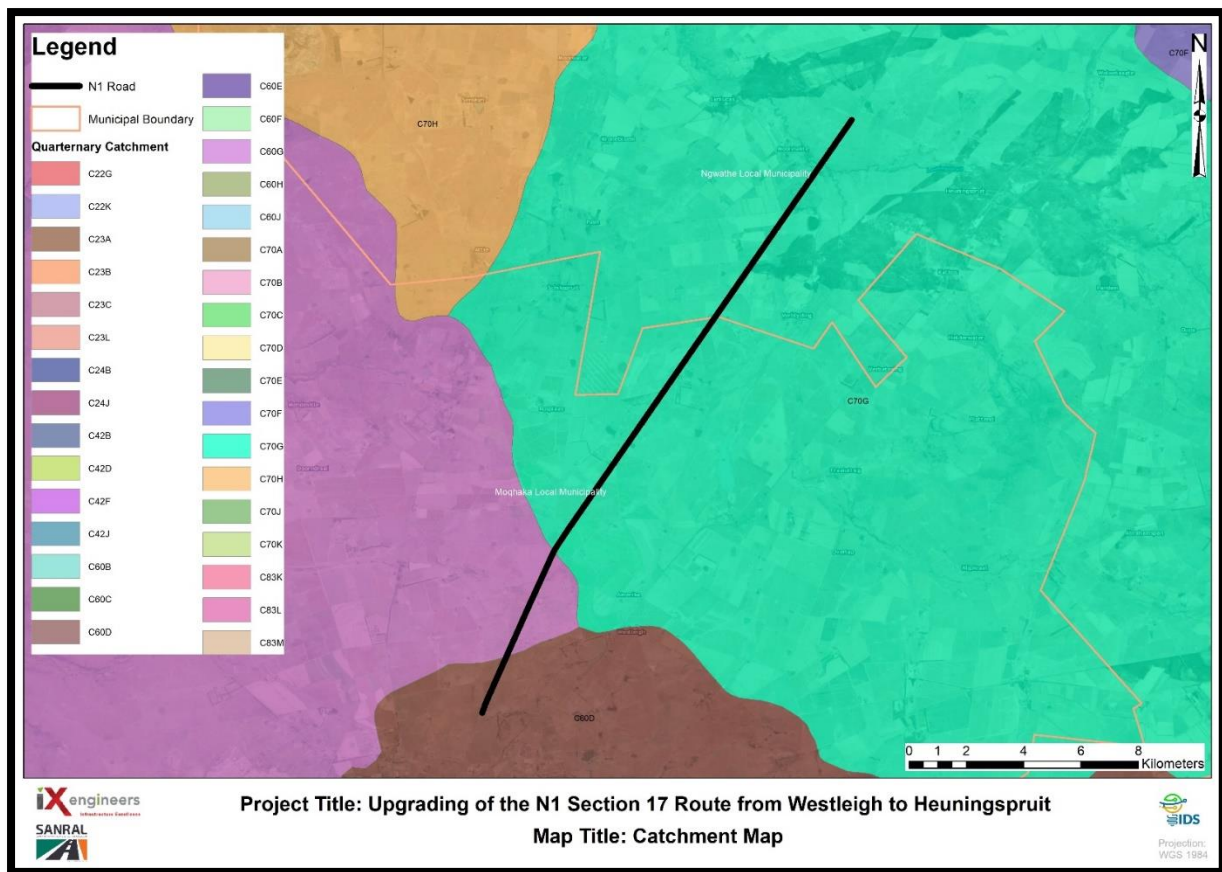


Figure 12: Illustration of Surrounding Catchments

5.7.3 Wetland Assessment

Due to the extent of the 500m regulated area for this project and the limitations associated with gaining access to the entire area, desktop data beyond the 40m road corridor has been regarded as true and accurate. The NFEPA dataset was the primary information source considered for this, but there are known inaccuracies with the dataset. As many NFEPA areas as possible were ground-truthed to validate the data. This desktop data has therefore also been considered as a preliminary indication of wetland areas within the 40m road corridor. This desktop data has therefore either been adopted or refined for the 40m corridor, and only wetlands within this corridor have been delineated and assessed for this project.

The wetland areas were delineated in accordance with the DWAF (2005) guidelines. In addition to the identification and delineation of wetland areas, a number of drainage lines were also identified. These systems are ephemeral (A Section) and contain storm water and form part of a first order and sometime second order streams or rivers. These drainage lines are almost never (or very seldom) in connection with a zone of saturation and they consequently never have base flows (DWAF, 2005).

In accordance with the delineation guidelines, a combination of soil and plant species could be identified to assist with the identification and delineation of wetland areas. Photographs of soils and common wetland plants identified for the project are presented in Error! Reference source not found. and Error! Reference source not found. respectively. Some of the wetland plant species identified for the project include *Setaria pumila*, *Leersia hexandra*, *Persicaria lapathifolia*, *Paspalum dilatatum*, *Typha capensis* and *Cyperus longus*. The extent of the delineated wetland areas is presented below. The figure presents the wetlands in relation to the road, with three (3) zoomed in sections depicting delineated (or ground-truthed) wetlands in relation to the project aspects.

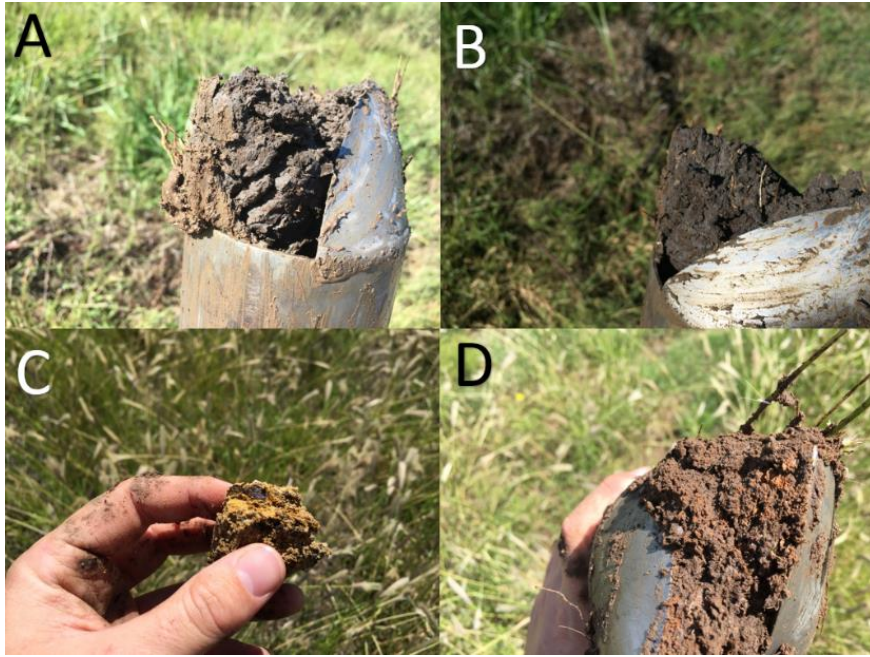


Figure 13: Photographs of common soil characteristics: A) G horizon. B) Orthic-A horizon; C) Soft plinthic B horizon; D) Mottles



Figure 14: Photographs of wetland plants: Persicaria lapathifolia (Left), Paspalum dilatatum (Right)

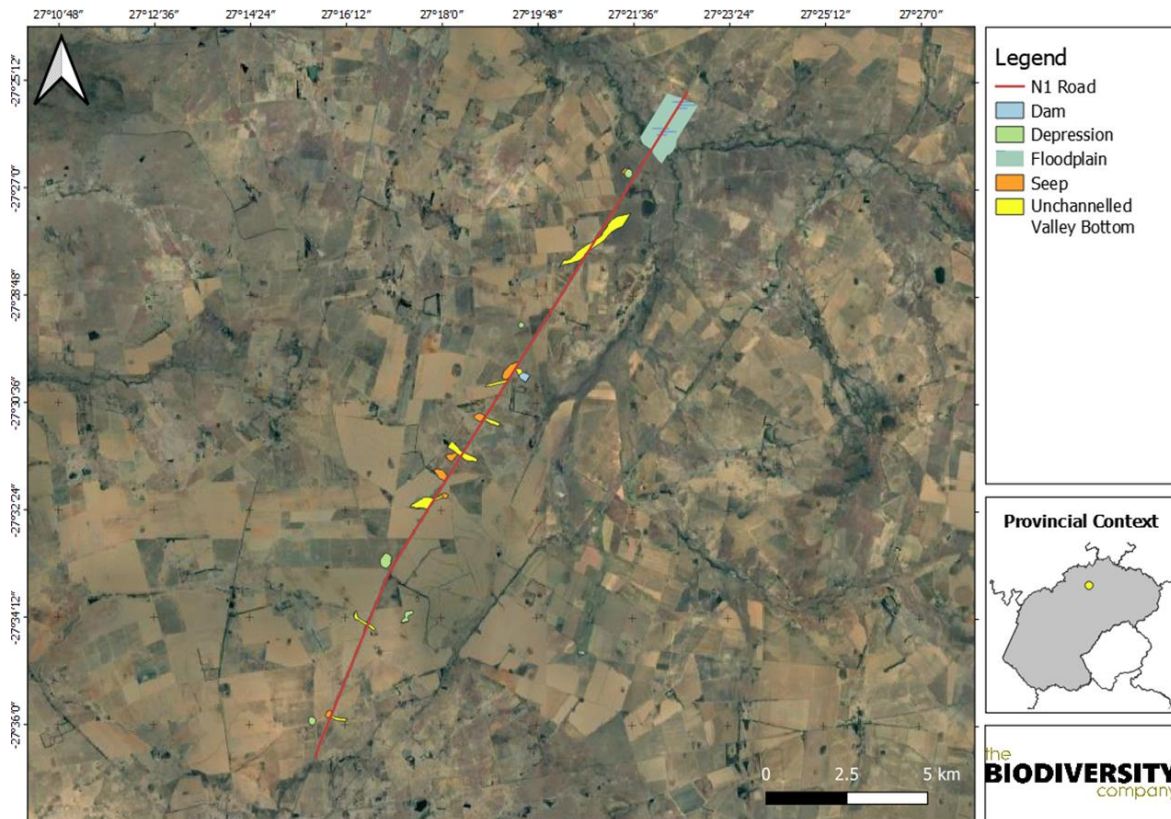


Figure 15: The delineated wetland areas for the project area

5.7.3.1 Wetland Unit Identification

A total of five (5) HGM types were identified and delineated for this project. The wetland classification as per SANBI guidelines is presented in **Table 17**.

Table 17: Wetland classification as per SANBI guideline

Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s		NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)
Inland	Highveld	Dry Highveld Grassland	Valley Floor	Floodplain	Floodplain flat	N/A
Inland	Highveld	Dry Highveld Grassland	Valley Floor	Channelled Valley-Bottom	N/A	N/A
Inland	Highveld	Dry Highveld Grassland	Valley Floor	Unchannelled Valley-Bottom	N/A	N/A
Inland	Highveld	Dry Highveld Grassland	Slope	Depression	Endorheic	Without Channelled Outflow
Inland	Highveld	Dry Highveld Grassland	Slope	Hillslope Seep	Without channelled outflow	N/A

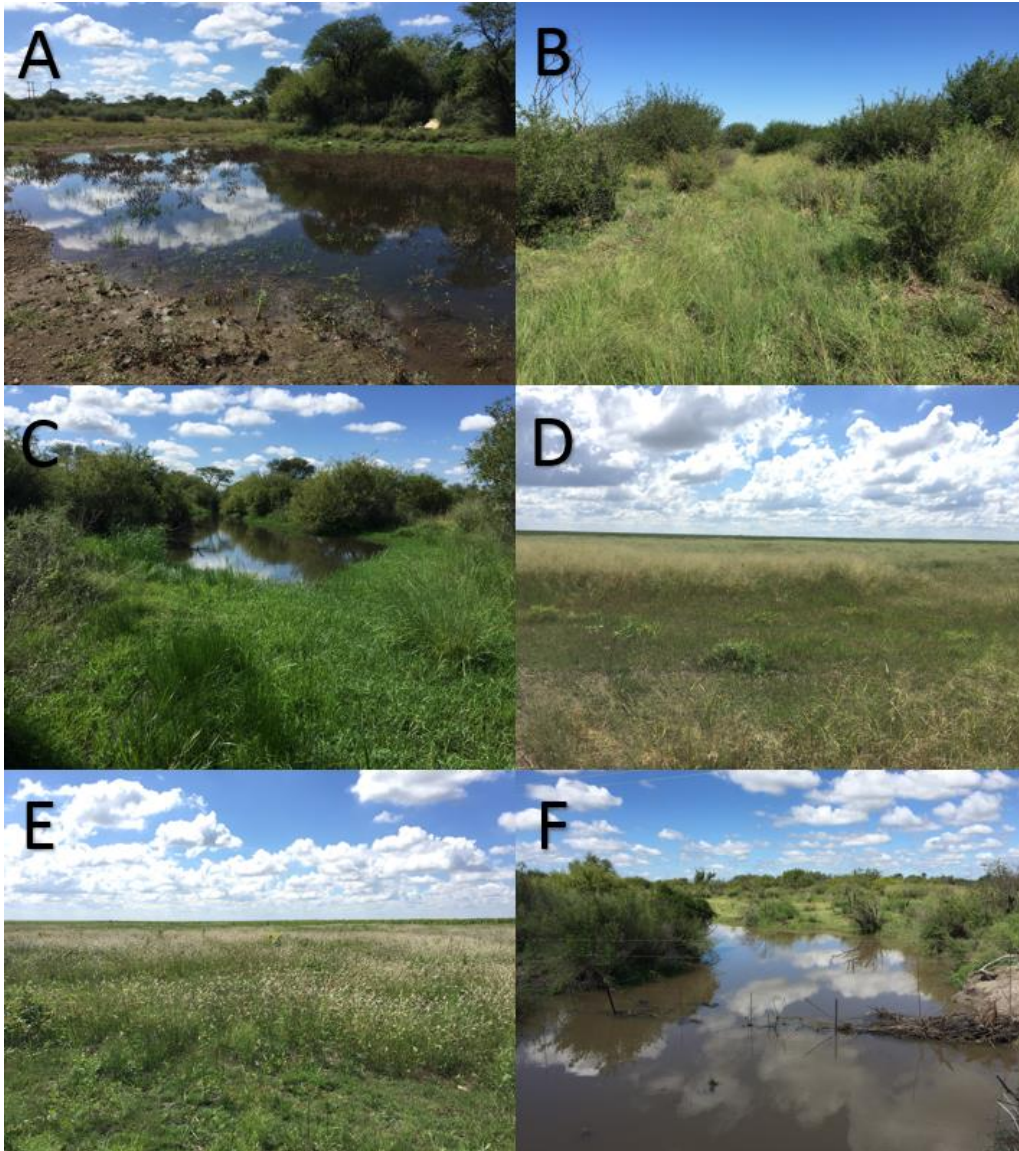






Figure 16: Photographs of wetland types identified for the project area: A) Dam (artificial); B) Unchannelled valley bottom; C) Floodplain; D) Depression; E) Seep; F) Channelled valley bottom

5.7.4 Aquatic Assessment

The N1-17 Road upgrade is situated in the C70G quaternary catchment, within the Vaal Water Management Area (WMA) (NWA, 2016) and Highveld - Lower Ecoregion. Several culverts occur along the proposed upgrade, however, a single river crossing was sampled for aquatic biota, water quality and habitat assessments. Due to safety concerns of sampling adjacent to the N1, a reach downstream of the crossing point was sampled (**Table 18** and **Figure 17**). The aquatic assessment was conducted at a low-level river crossing over the Heuningspruit River (**Figure 17**). Site photographs and GPS coordinates are provided in **Table 18**.

Table 18 :Site photographs and GPS Coordinates for the Heuningspruit River crossing

Upstream	Downstream
N1 Crossing Point	
	
GPS Coordinate	
27°25'56.48"S 27°21'44.77"E	
Sampling Point (S1)	
	
GPS Coordinate	
27°25'56.48"S 27°21'44.77"E	

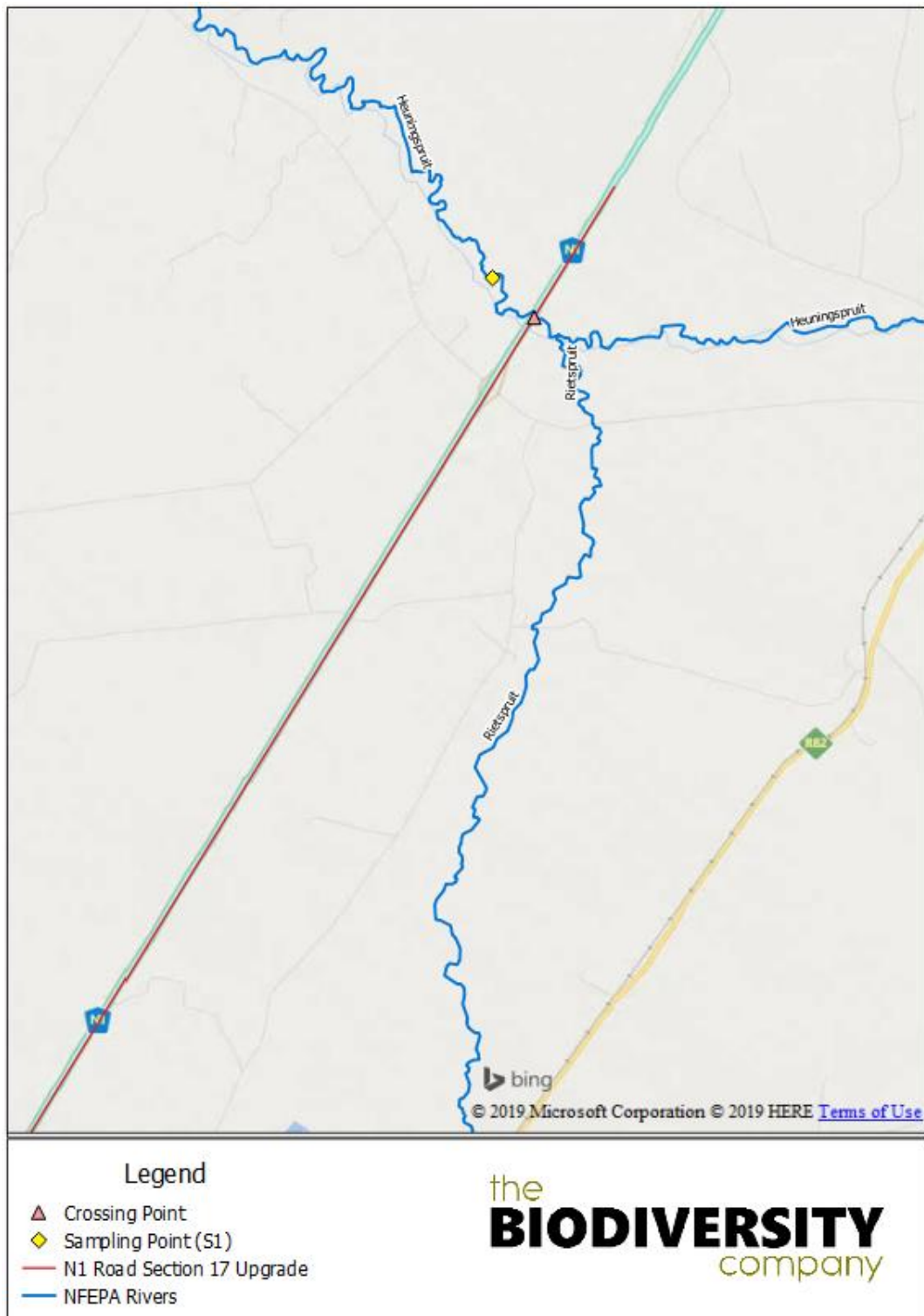


Figure 17: Illustration of sampling point on the Heuningspruit River

5.7.4.1 In situ water quality

In situ water quality analysis was conducted at the site. These results are important to assist in the interpretation of biological results due to the direct influence water quality has on aquatic life forms. The results of the survey are presented in **Table 19**.

Table 19: In situ water quality results for the high flow survey (April 2019)

Site	pH	Conductivity (µS/cm)	DO (mg/l)	Temperature (°C)
TWQR*	6.5-9.0	-	>5.00	5-30
S1	7.22	129	5.56	23.8

*Target Water quality Range;

In situ water quality analysis of the Heuningspruit River **indicate good water quality** conditions during the high flow survey (**Table 19**). The pH, Electrical Conductivity (EC), Dissolved Oxygen (DO) and water temperatures fell within the Target Water Quality Range (TWQR) and would not present adverse conditions to local aquatic biota.

5.7.5 Fish Assessment

Expected Fish Species

The list of expected fish species is presented in **Table 20**. Based on this, a total of eight fish species are expected to occur in the project area.

It should be noted that these expected species lists are compiled on a SQR basis and not on a site specific basis. It is therefore unlikely that all of the expected species will be present at every site in the SQR with habitat type and availability being the main driver of species present. Therefore, **Table 20** should be viewed as a list of potential species rather than an expected species list. No species of conservation concern are expected to occur within the project area. A total of six species were collected during the study (**Table 21**). Electrofishing was conducted within the reach, with all available cover features and biotopes sampled. High abundances of *Clarias gariepinus* and *Labeo umbratus* juveniles were collected at site S1, indicating recent spawning of both species. *Labeobarbus aeneus* was notably absent from the site, however, migration barriers and low water levels prior to the high rainfalls contribute to the absence of the species. The results indicate the fish community is intact. Images of fish collected during the survey are presented in **Table 21**.

Table 20: Expected species list for the Heuningspruit sub-quaternary catchment

Scientific name	Common name	IUCN Status	S1
<i>Clarias gariepinus</i>	Sharptooth catfish	LC	√
<i>Enteromius anoplus</i>	Chubbyhead barb	LC	√
<i>Enteromius paludinosus</i>	Straightfin barb	LC	√
<i>Labeobarbus aeneus</i>	Smallmouth yellowfish	LC	-
<i>Labeo capensis</i>	Mudfish	LC	-
<i>Labeo umbratus</i>	Moggel	LC	√
<i>Tilapia sparrmanii</i>	Banded tilapia	LC	√
<i>Pseudocrenilabrus philander</i>	Southern mouthbrooder	LC	√
Total number of species		8	6

LC - Least Concern;

NT - Near Threatened

Table 21: Photographs of selected fish species collected during the survey



Clarias gariepinus



Enteromius anoplus



Labeo umbratus



Tilapia sparrmanii

Table 22: Fish Response Assessment Index for the Heuningspruit River

FRAI% (Automated)	81
EC FRAI	class B/C

The results of the FRAI derived a moderately to largely natural state (class B/C) fish community. The absence of key species from the survey site in this river reach resulted in the reduced fish community score. Absent key fish species included *Labeo capensis* and *Labeobarbus aeneus*

5.8 Vegetation Assessment

The project area is situated across two biomes, the grassland biome (majority of the project area) and azonal vegetation biome (small northern section). This grassland biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes. Major macroclimatic traits that characterise the grassland biome include:

- a) Seasonal precipitation; and
- b) The minimum temperatures in winter.

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

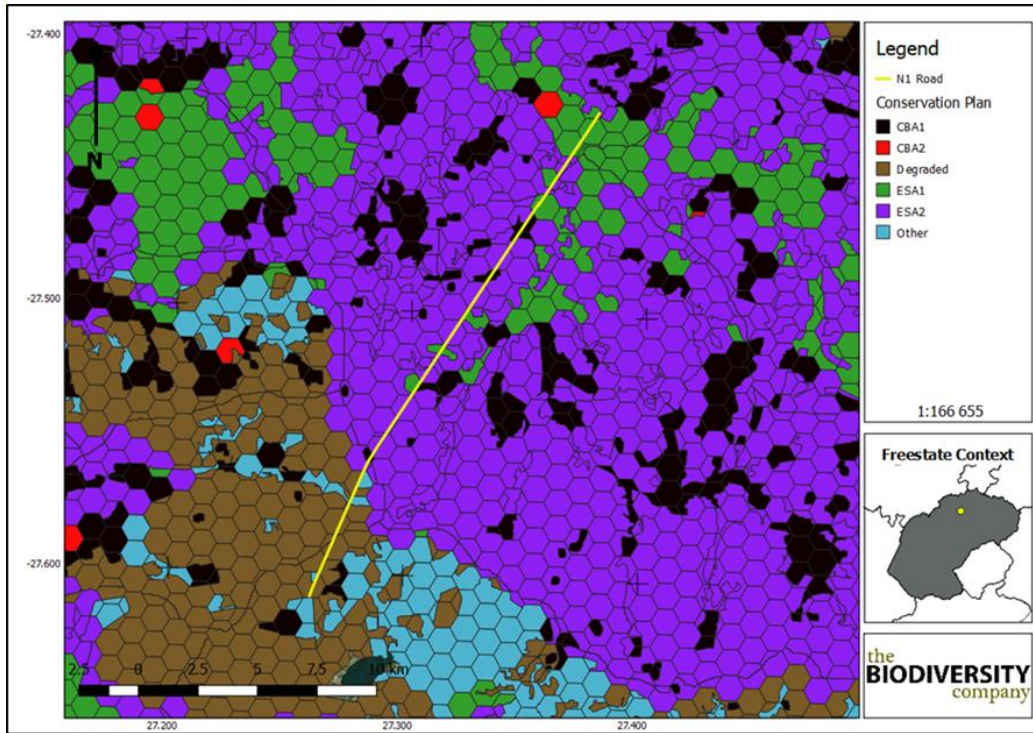


Figure 18: Free State CBA dataset

5.8.1 Vegetation Types

The project area occurs within three different vegetation types: Central Free State Grassland, Highveld Salt Pans and Vaal-Vet Sandy Grassland, according to Mucina & Rutherford (2006) (Figure 19).

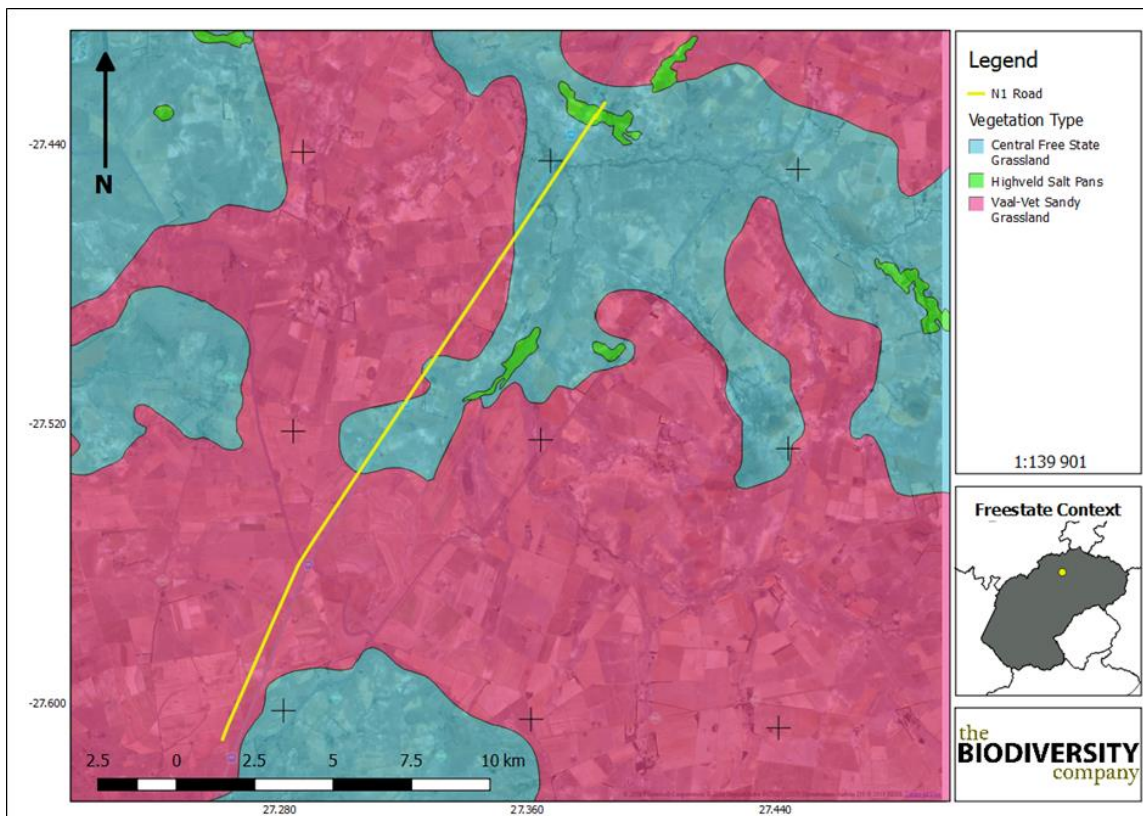


Figure 19: Vegetation types associated with the study area

5.8.1.1 Central Free State Grassland

Central Free State Grassland is undulating plains supporting short grassland, in natural condition dominated by *Themeda triandra* while *Eragrostis curvula* and *E. chloromelas* become dominant in degraded habitats.

5.8.1.2 Vaal Vet Sandy Grassland

This vegetation type is a plains-dominated landscape with some scattered, slightly undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element occurs here. Dominance of *Themeda triandra* is an important feature of this vegetation unit. Locally low cover of *T. triandra* and the associated increase in *Elionurus muticus*, *Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall.

5.8.1.3 Highveld Salt Pans

This vegetation type is mainly depressions in plateau landscape containing temporary water bodies. Central parts of the pans often seasonally inundated and sometimes with floating macrophyte vegetation or the vegetation cover develops on drained bottoms of the pans and forms typical concentric zonation patterns. On the pan edges open to sparse grassy dwarf shrubland may develop, especially when the pan is under heavy grazing pressure.

5.8.2 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 537 plant species are expected to occur in the area (**Figure 20**).

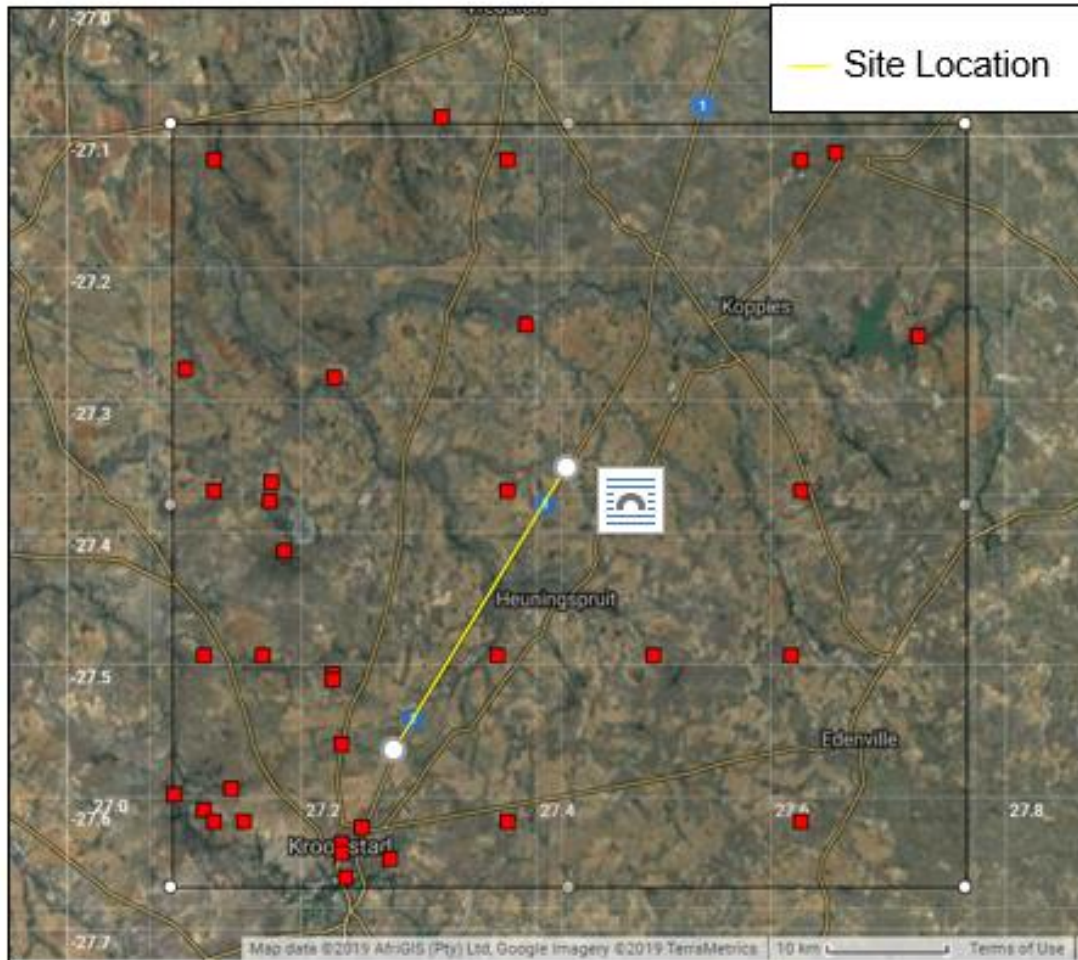


Figure 20: Map showing the grid drawn in order to compile an expected species list (BODATSA-POSA, 2016)

5.9 Agriculture

ARC-Soil, Climate and Water (ARC-SCW) was contracted by IDS Consulting to undertake a soil investigation along a portion of the N1 highway north of Kroonstad in the northern Free State Province.

The primary objectives of the study were;

- To obtain baseline soil information and
- To assess present land use, agricultural potential and land capability.

5.9.1 Agricultural Potential

Agricultural potential reflects the ability of the soil to sustainably perform certain functions in order to produce crops under cultivation. The factors that help to determine this include the effective (rooting) depth, soil texture, structure and natural drainage. Where any one of these is restrictive, the agricultural potential will be reduced.

In addition, when the climate of the area is taken into consideration with a long term annual average of 560 mm rainfall, the dryland (rain-fed) agricultural potential is not high. Within most growing seasons,

and very often from year to year, there will be significant variation in rainfall, with annual, seasonal and intra-seasonal drought periods and occasionally times of excess. Under these circumstances, sustainable crop production may be problematic.

This was confirmed in a previous soil survey in the area when a commercial farmer conversation (Mr. George Leonard, near Voorspoed mine) said that the Avalon soils which cover much of the Bd21 land type are only of use for arable cultivation if they are deeper than 900 mm and if the rainfall is normal or above the long-term average. Otherwise, it is difficult just to break even when considering maize production. Consultation with local experts (Mr P.J. Botha, Agricultural Consultant, Kroonstad: personal communication) suggested that in normal to good rainfall years, the deeper soils will perform well, but the shallower soils (such as shallow Avalon or Westleigh soils with an effective depth of 600 mm or less) will be affected by excessive wetness in the profile. In drier years, the shallower soils will at least provide a yield, while the deeper soils will dry out. Other sources confirm that expected yields on the Avalon soils, under normal conditions, will be 3.6 t/ha yr⁻¹ or more, while the yields on the shallower soils fall to around 2.6 t/ha yr⁻¹.

As mentioned previously, confirmed long-term rainfall in the vicinity is around 550 mm per annum, which is just feasible for dryland cultivation, but does not make allowance for the expected variability between years and within any season. In terms of long term sustainability, one would probably need to look at scenarios and agricultural risk profiles, including cost-benefit analysis and input costs.

Land type Bd21 (Figure 3) has a significant proportion of relatively deep, structureless soils with high potential, but still has a lot of structured, shallower soils which are marginal for arable production.

Land type Dc11 has mostly clay soils, some of which will have moderate potential, but also some shallow, clay soils, as well as occasional rock.

If the soils cannot be sustainably cultivated, the best option (especially for the structured soils) is to place them under pasture for grazing of livestock. The grazing capacity of this area is reasonably good, between 7 and 10 ha/LSU (ARC-ISCW, 2004).

5.10 Land Cover

The surrounding area of the proposed site is represented by a land cover map in **Figure 21**. The surrounding area of the proposed can be categorized as agricultural land, as illustrated on the map, a large portion of the surrounding area is cultivated land. The land surrounding the proposed site is mainly used for agricultural purposes. Much of the surrounding area is also occupied by grasslands, forested land and waterbodies. Towards the southern section of the study area, the land is mainly comprised of built up area. The region in which the road is located in comprises of extensive transformed habitat that

resulted from agricultural activity, rendering remaining habitat fragmented and isolated and ultimately relatively sensitive.

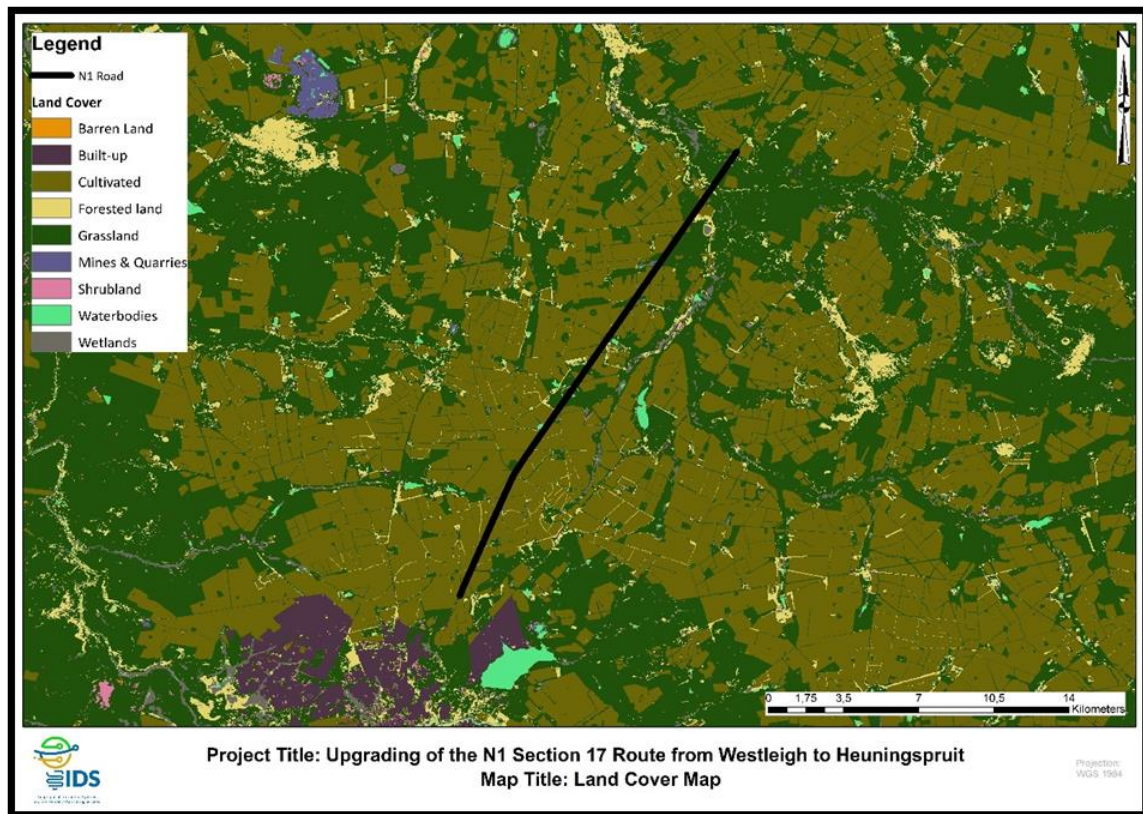


Figure 21: Land Cover Map

5.11 Heritage and Palaeontological considerations

5.11.1 Heritage Impact Assessment

Legal requirements

For this proposed project, the assessment has determined that no sites, features or objects of heritage significance occur in the study area. If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

Reasoned opinion as to whether the proposed activity should be authorised:

- From a heritage point of view, it is recommended that the proposed development be allowed to continue on acceptance of the proposed mitigation measures and the conditions proposed below.
- Conditions for inclusion in the environmental authorisation:
- The Palaeontological Sensitivity Map (SAHRIS) indicate that the study area has a varied sensitivity of fossil remains to be found and therefore palaeontological assessment is required.
- Should archaeological sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

5.11.2 Palaeontological Impact Assessment

- There is no objection (see Recommendation B) to the development, but it was necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity of the shale is VERY HIGH and MODERATE. A Phase 2 Palaeontological Mitigation is only required if the Phase 1 Paleontological Assessment identified a fossiliferous formation (Karoo Supergroup) and fossils or if fossils are found during construction or mining. Protocol is attached.
- This project may benefit the economy, the life expectancy of the community, the growth of the community and social development in general.
- Preferred choice: No Alternatives are possible.

The following should be conserved: if any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a paleontologist should be called in to determine proper mitigation measures. A sample of shale/mudstone should be set aside if mined.

6 PUBLIC PARTICIPATION (SECTION 41)

Public participation is a process that is designed to enable all interested and affected parties (I&APs) to voice their opinion and/or concerns which enables the practitioner to evaluate all aspects of the proposed development, with the objective of improving the project by maximising its benefits while minimising its adverse effects.

I&APs include all interested stakeholders, technical specialists, and the various relevant organs of state who work together to produce better decisions.

The primary aims of the public participation process are:

- To inform I&APs and key stakeholders of the proposed application and environmental studies;
- To initiate meaningful and timeous participation of I&APs;
- To identify issues and concerns of key stakeholders and I&APs with regards to the application for the development (i.e. focus on important issues);
- To promote transparency and an understanding of the project and its potential environmental (social and biophysical) impacts (both positive and negative);
- To provide information used for decision-making;
- To provide a structure for liaison and communication with I&APs and key stakeholders;
- To ensure inclusivity (the needs, interests and values of I&APs must be considered in the decision-making process);
- To focus on issues relevant to the project, and issues considered important by I&APs and key
 - stakeholders; and to provide responses to I&AP queries.

The public participation process must adhere to the requirements of Chapter 6 of the EIA Regulations 2014 (as amended in 2017) promulgated under the NEMA (as amended), as well as Public Participation Guideline documents published by the Competent Authority.

In order to achieve a higher level of engagement, a number of key activities have taken place and will continue to take place. These included the following:

- The identification of stakeholders is a key deliverable at the outset, and it is noted that there are different categories of stakeholders that must be engaged, from the different levels and categories of government, to relevant structures in the non-governmental organisation (NGO) sector, to the communities of wards of residential dwellings which surround the works;
- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The fielding of queries from I&APs and others, and providing appropriate information;
- The convening of specific stakeholder groupings/forums as the need arises;
- The preparation of reports based on information gathered throughout the BA via the PPP and feeding that into the relevant decision-makers;
- The PPP includes distribution of pamphlets or Background Information Documents (BIDs) and other information packs; and
- Where appropriate site visits may be organised, as well as targeted coverage by the media.

The PPP has entailed the following activities. It is important to note that the public participation process has been conducted as per Public Participation Plan approved by the Department of Environment, Forestry and Fisheries (DEFF).

6.1 Authority Consultation

The competent authority, the DEFF, is required to provide an EA (whether positive or negative) for the project. The DEFF was consulted from the outset of this study, and has been engaged throughout the project process. Authority consultation included the following activities:

- A pre-application meeting was held with the Department of Environment, Forestry and Fisheries on the 11th February 2019. Minutes of the meeting is included as **Appendix E** of this BAR.

6.2 Consultation with Other Relevant Stakeholders

Consultation with other relevant key stakeholders were, and will continue, to be undertaken through telephone calls and written correspondence in order to actively engage these stakeholders from the outset and to provide background information about the project during the BA process.

Relevant key stakeholders were consulted and sent pamphlets or BIDs and other information packs (where requested). All relevant stakeholders will be allowed an opportunity to comment on the draft Consultation Basic Assessment Report (BAR).

6.3 Site Notification

The EIA Regulations 2014 (as amended in 2017) require that a site notice be fixed at a place visible to the public at the boundary or on the fence of the site where the activity to which the application relates and at points of access or high through traffic. The purpose of this is to ensure that the I&APs were identified primarily from responses received from the notices erected and notify the public of the project as well as to invite the public to register as stakeholders and inform them of the PP Process.

IDS has erected a number of notices at various noticeable locations along the N1 road and points of interest.

See attached **Appendix E1**.

6.4 Identification of Interested and Affected Parties

E-mails were sent to key stakeholders and other known I&APs, informing them of the application for the project, the availability of the draft Consultation BAR for review and indicating how they could become involved in the project. The contact details of all identified I&APs are updated on the project database. This database will be updated on an on-going basis throughout the BA process.

6.5 Background Information Document

A BID for the proposed project was compiled in English and Afrikaans and distributed to key stakeholders. The aim of this document is to provide a brief outline of the application and the nature of the development. It is also aimed at providing preliminary details regarding the BA process, and explains how I&APs could become involved in the project. The briefing paper was distributed to all identified I&APs and stakeholders, together with a registration/comment sheet inviting I&APs to submit details of any issues, concerns or inputs they might have with regards to the project.

See attached **Appendix E2**.

6.6 Advertising

In compliance with the EIA Regulations 2014 (as amended in 2017), a notification of the commencement of the BA process for the project will be advertised in a local newspaper i.e. *Kruunus* and *Parys*. I&APs were requested to register their interest in the project and become involved in the BA

process. The primary aim of these advertisements was to ensure that the widest group of I&As possible was informed and invited to provide input and questions and comments on the project.

See attached **Appendix E3**.

6.7 Issues Trail

Issues and concerns raised in the public participation process during the BA process have been and will continue to be compiled into an Issues Trail together with the responses thereof.

See attached **Appendix E6**.

6.8 Public Review of the Amended BAR

The draft BAR was made available for public review from the 24th August 2020 to the 25th September 2020. Additional information has been provided and therefore the public participation period had to be extended. It is for this reason that the Amended BAR will be made available for authority and public review for a total of 30 day. The report will be made available on social media platforms and sent via emails to all registered I&As in compliance with the COVID-19 regulations.

6.9 Final Consultation BAR

The final stage in the BA process entails the capturing of responses and comments from I&As on the BAR in order to refine the BAR, and ensure that all issues of significance are addressed. The final BAR (i.e. fBAR) will be the product of all comments and studies, before being submitted to DEFF for review and decision-making.

Section	Description
Identifying Stakeholders	Stakeholders were identified and a database of all I&As were compiled.
Publishing Newspaper Adverts	In compliance with the EIA Regulations 2014 (as amended in 2017), a notification of the commencement of the BA process for the project will be advertised in a local newspaper.
Distribution of a BID	BIDs were distributed electronically and by hand to I&As.
Erection of Site Notices	A number of A2 site notices were erected on the perimeter of the site.
Preparation of an on-going IssuesTrail	Comments, issues of concern and suggestions received from stakeholders thus far have been captured in an Issues Trail.
Release of Draft Report	The draft BAR has been advertised and made available for a period of 30 days for public review and comment. This draft BAR was available for review for a 30 day commenting period.
Release of Amended Draft Report	The amended BAR will be available for a period of 30 days for public review and comment.
Release of final Report	The final BAR (i.e. fBAR) will be the product of all comments and studies, before being submitted to DEFF for review and decision-making.

7 IMPACT ASSESSMENT

7.1 Methodology in assessing potential impacts

The method used to determine the significance of impacts associated with the development was motivated by the Department of Environmental Affairs Series 5 of Impact Significance. This method is known as the systematic method which follows the criteria that include;

- extent or spatial scale of the impact;
- intensity or severity of the impact;
- duration of the impact;
- mitigatory potential;
- acceptability;

in description, the criteria is defined:

- **Nature:** A brief written statement of the environmental aspect being impacted upon by a particular action or activity;
- **Extent:** The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;
- **Duration:** Indicates what the lifetime of the impact will be;
- **Intensity:** Describes whether an impact is destructive or benign;
- **Probability:** Describes the likelihood of an impact actually occurring; and
- **Cumulative:** In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

The criteria to be used for the rating of impacts are provided in **Table 23**.

Table 23: Criteria to be used for the rating of impacts

Score	Rating	Description
Consequence Descriptors		
Severity or Intensity – defines the magnitude of the impact		
5	High	Natural, cultural and social functions and processes are altered to extent that they permanently cease
4	Moderately High	Natural, cultural and social functions and processes are altered to extent that they are severely impaired and may temporarily cease
3	Moderate	Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way
2	Moderately Low	Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a slightly modified way
1	Low	Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
Extent – relates to the extent of the impact		
5	Entire system	Entire habitat unit / Entire system/ > 2000ha impacted / Linear developments affected >3000m
4	Regional	Regional within 5 km of the site boundary / < 2000ha impacted / Linear developments affected < 3000m
3	Local	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear developments affected < 1000m

2	Larger site boundary	Development specific/ within the site boundary / < 100ha impacted / Linear developments affected < 100m
1	Immediate site	Activity specific/ < 5 ha impacted / Linear developments affected < 100m
Duration – relates to the duration of the impact		
5	Permanent	The impact will continue indefinitely and is irreversible
4	Long term	Life of operation
3	Medium term	One year to five years
2	Medium short	One month to one year
1	Short term	One day to one month
Likelihood Descriptors		
Probability – relates to the likelihood of the impact occurring		
5	Definite	More than 75% chance of occurrence. The impact is known to occur regularly under similar conditions and settings
4	Highly likely	The impact has a 41 - 75% chance of occurring and thus is likely to occur. The impact is known to occur sporadically in similar conditions and settings
3	Likely	The impact has a 10 - 40% chance of occurring. This impact may / could occur and is known to occur in low frequencies under the similar conditions and settings
2	Possible	The possibility of the impact occurring is low with less than 10% chance of occurring. The impact has not been known to occur under similar conditions and settings
1	Highly unlikely	The possibility of the impact occurring is negligible and only under exceptional circumstances
Severity of Impact		
5	Natural, cultural, social aspect very highly sensitive/important	
4	Natural, cultural, social aspect highly sensitive/important	
3	Natural, cultural, social aspect moderately sensitive/important	
2	Natural, cultural, social aspect limited sensitivity/importance	
1	Natural, cultural, social aspect not sensitive/important	

Significance is determined through a synthesis of impact characteristics (**Table 22**). Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact. Impact significance is expressed as:

$$\text{Significance} = \text{Likelihood (Frequency of the activity + Frequency of impact)} \times \text{Consequence (Severity + Extent + Duration)}$$

Table 24 : Significance rating matrix

		CONSEQUENCE (Severity + Spatial Scope + Duration)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LIKELIHOOD (Frequency of activity + Frequency of impact)	1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	2	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	3	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	4	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	5	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
	6	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
	7	14	28	42	56	70	84	98	112	126	140	154	168	182	196	210
	8	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
	9	18	36	54	72	90	108	126	144	162	180	198	216	234	252	270
	10	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300

Table 25: Impact significance categories

Significance Rating	Value	Impact Management Recommendation	Positive Impact Management Recommendation
Very High	126-150	Critically consider the viability of proposed projects. Improve current management of existing projects significantly and immediately	Maintain current management
High	101-125	Comprehensively consider the viability of proposed projects. Improve current management of existing projects significantly	Maintain current management
Medium-high	76-100	Consider the viability of proposed projects. Improve current management of existing projects.	Maintain current management
Medium-low	51-75	Actively seek mechanisms to minimise impacts in line with the mitigation hierarchy.	Maintain current management and/or proposed project criteria and strive for continuous improvement
Low	25-50	Where deemed necessary seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Very Low	1-25	Maintain current management and/or proposed project criteria and strive for continuous improvement.	Maintain current management and/or proposed project criteria and strive for continuous improvement
Neutral	/	Impact is neither positive or negative	

7.2 Mitigation Measures

The mitigation actions provided below are important to consider with other specialist assessment. These mitigation measures should be implemented in the Environmental Management Programme (EMPr) should the project go-ahead. The mitigation hierarchy proposed by Macfarlane *et al.*, (2016) was considered for this study.

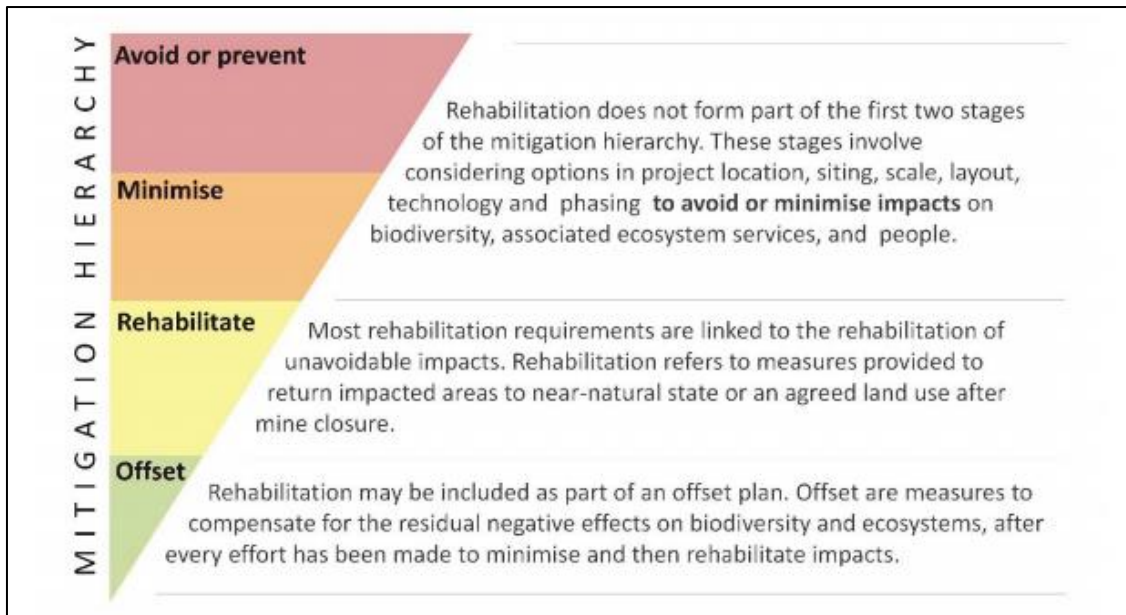


Figure 22: The Mitigation Hierarchy (Macfarlane et al., 2016)

7.3 Impacts that may result from the construction and operational phase of the proposed upgrade of National Road 1 Section 17

Table 26: Summary of impacts

Phase	Impact	Mitigation	Significance
Construction	<ul style="list-style-type: none"> Displacement of faunal community due to habitat loss, direct mortalities and disturbance (noise, dust and vibration). 	Without	96 (-) Medium-high
		With	Low
	<ul style="list-style-type: none"> Destruction, further loss and fragmentation of the vegetation community (including portions of an EN vegetation type). 	Without	63 (-) Medium-low
		With	Low
	<ul style="list-style-type: none"> Alteration of catchment hydrology 	Without	96 (-) Medium
		With	Low
	<ul style="list-style-type: none"> Alteration of catchment water quality 	Without	96 (-) Medium
		With	Low
	<ul style="list-style-type: none"> Direct loss of riparian vegetation 	Without	63 (-) Medium-low
		With	Low
	<ul style="list-style-type: none"> Direct loss of wetland habitats 	Without	63 (-) Medium-low
		With	Low
	<ul style="list-style-type: none"> Waste generation 	Without	96 (-) Medium-high
		With	Low
	<ul style="list-style-type: none"> Reduction of Air Quality 	Without	36 (-) Low
		With	Very Low
	<ul style="list-style-type: none"> Influx of job seekers 	Without	70 (-) Medium low

Phase	Impact	Mitigation	Significance
		With	Low
		Without	110 (-) High
	<ul style="list-style-type: none"> Unrestricted Access of Construction Vehicles/Workers onto Farm Land and Adjacent/Surrounding Areas 	With	Medium-high
		Without	110 (-) High
	<ul style="list-style-type: none"> Potential Increase in Crime 	With	Medium-high
		Without	70 (-) Medium low
	<ul style="list-style-type: none"> Fire 	With	Low
		Without	110 High (+)
	<ul style="list-style-type: none"> Employing Local Labour 	With	Very High (+)
		Without	80 Medium High (+)
	<ul style="list-style-type: none"> Skills Training and Further Training Opportunities 	With	High (+)
		Without	30 (-) Low (+)
	<ul style="list-style-type: none"> Contributing to Local and Regional Businesses 	With	High (+)
		Without	150 Very High(+)
	<ul style="list-style-type: none"> Provision of Basic Social Services: Road Upgrade 	With	Very High(+)
		Without	70 (-) Medium-low
	<ul style="list-style-type: none"> Noise Pollution 	With	Low
		Without	Very Low 10 (-)
	<ul style="list-style-type: none"> Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries Indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment 	With	Very Low
		Without	150 Very High(-)
<ul style="list-style-type: none"> Disturbance of Karoo Supergroup 	With	Very Low	

Phase	Impact	Mitigation	Significance
	NO GO: The current condition of the road will worsen overtime with expected increase in traffic volume.	Without	150 (-) Very High
		With	Very Low
Operations	<ul style="list-style-type: none"> Continued encroachment and displacement of the natural vegetation community due to alien invasive plant species, particularly in previously disturbed areas. 	Without	70 (-) Medium-low
		With	Low
	<ul style="list-style-type: none"> Continued displacement and fragmentation of the faunal community, particularly the disruption of natural faunal movement corridors. 	Without	96 (-) Medium-high
		With	Low
	<ul style="list-style-type: none"> Increased anthropogenic disturbances (noise, human presence, litter and poaching/snaring). 	Without	96 (-) Medium-high
		With	Low
	<ul style="list-style-type: none"> Loss of faunal species due to road mortalities and vehicle collisions 	Without	96 (-) Medium-high
		With	Low
	<ul style="list-style-type: none"> Pollution (including chemical pollution (run-off), light pollution (vehicle lights and roadside lights and noise pollution (traffic). 	Without	70 (-) Medium-low
		With	Low
	<ul style="list-style-type: none"> Alteration of catchment hydrology 	Without	80 (-) Medium
		With	Medium-low
	<ul style="list-style-type: none"> Alteration of catchment water quality 	Without	80 (-) Medium
		With	Medium-low
	<ul style="list-style-type: none"> Direct loss of riparian vegetation 	Without	80 (-) Medium
		With	Low
	<ul style="list-style-type: none"> Direct loss of wetland habitats 	Without	80 (-) Medium
		With	Medium-low
Cumulative Impacts	<ul style="list-style-type: none"> Hydrology and water quality modifications 		70 (-) Medium-low
			Low

7.4 Mitigation Measures

The focus of mitigation measures is to reduce the significance of potential impacts associated with the development and thereby to:

- As far as possible, reduce the negative fragmentation effects of the linear development and enable safe movement of faunal species; and
- Prevent the direct and indirect loss and disturbance of faunal species and community (including potentially occurring species of conservation concern).

7.4.1 Mitigation Measures for Faunal Communities

Recommended mitigation and rehabilitation measures for faunal community's hinge largely on protecting their habitats and ensuring it remains intact.

- As far as possible, the proposed alignment should be placed in areas that have already been disturbed (road reserve area), and no further loss of secondary vegetation should be permitted. Areas to be developed must be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon;
- The number (and size) of laydown, storage and staff facilities (ablutions / waste) must be kept to a minimum during the construction phase of the project. These areas must be designated in already disturbed areas, adhering to the avoidance of highly sensitive areas and the prescribed buffer widths;
- The areas rated as highly sensitive in the project area as defined in this report should be treated as such and the movement of construction vehicles and construction workers within these areas should be strictly prohibited, unless required for the project (controlled access);
- Where possible, existing access routes and walking paths must be made use of, and new routes limited;
- The working area and laydown/storage areas must be restricted to the existing road and adjacent road reserve only; and
- A qualified environmental control officer must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna/flora that is found during construction (including all reptiles and amphibians).
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species; and
- Compilation of and implementation of an alien vegetation management plan for the entire site.

7.4.2 Mitigation Measures for Amphibians

- Construction activities must be timed to so as to minimise disturbance to fauna during sensitive life history stages. Preferably construction should be planned to take place during winter;
- If active nests are found, avoidance procedures must be implemented on a case-by-case basis. Avoidance procedures may include the implementation of buffer zones, or seasonal avoidance. If buffers are created, a no disturbance zone must be created around active nests during the breeding season by a suitably qualified Zoologist; and
- Any individuals found should be relocated to a suitable area that is undisturbed, such as the nearby reserves mentioned.

In additional to this the following measures are recommended:

- If any faunal SSC are recorded during construction, activities should temporarily cease, and time permitted for the species to move away. In the event the species does not move away (voluntarily), the species must be removed safely from the area and relocated to a suitable area that will not be directly disturbed by the project;
- During vegetation clearance, methods should be employed to minimize potential harm to fauna species. Clearing has to take place in a phased and slow manner, commencing from the interior of the site progressing outwards towards the boundary to maximize potential for mobile species to move to adjacent areas;
- Prior to and during vegetation clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery;
- Fauna species such as frogs and reptiles that have not moved away should be carefully and safely removed to a suitable location beyond the extent of the development footprint by a suitably qualified ECO trained in the handling and relocation of animals;
- Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site;
- No trapping, killing or poisoning of any wildlife is to be allowed;
- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process;
- Construction activities and vehicles could cause spillages of lubricants, fuels and construction material which could then be transported to the wetland and riparian areas, impacting on the water quality and potentially the functioning of the systems. All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the wetland and riparian areas;
- All existing farm fences must remain to prevent fauna from access the working area, and also from crossing the road; and
- The intentional killing of any animals including snakes, insects, lizards or other animals should be strictly prohibited.

7.4.3 Mitigation Measures for Birds

- Construction activities must be timed to so as to minimise disturbance to fauna during sensitive life history stages (particular with regards to Little Swift nesting. Preferably construction should be planned to take place during winter when breeding activity is lowest for most species. Little Swifts are double brooded with egg laying and incubation typically taking place during summer, peaking September through December;
- It is likely that construction activities will result in the loss of Little Swift nests. It is recommended that an avifaunal specialist be appointed to monitor the re-establishment of nesting colonies. This would require a count of nests prior to construction and then a period of monitoring following project completion to gauge recruitment of new nests;
- The Maccoa Duck observed just north of the study area appeared relatively accustomed to the road noise (observed sleeping on water near the road). As such it is unlikely that construction activities would pose a disturbance risk to this species. Instead, mitigation may be best achieved by simply avoiding any disturbances to the two large open waterbodies demarcated as sensitive within the project area. This may be achieved by temporarily fencing these areas on the side closest to the N1, marking them as environmentally sensitive areas and prohibiting walking, driving or the establishment of lay down zones within these areas;
- No more than two weeks in advance of vegetation clearance that will commence during the breeding season (1 September – 1 March) a qualified Zoologist must conduct a pre-

construction survey of all potential special-status bird nesting habitat in the vicinity of the project area, and in the project areas;

- If active nests are found, avoidance procedures must be implemented on a case-by-case basis. Avoidance procedures may include the implementation of buffer zones, relocation of birds, or seasonal avoidance. If buffers are created, a no disturbance zone must be created around active nests during the breeding season by a suitably qualified Zoologist; and
- Any individuals found should be relocated to a suitable area that is undisturbed, such as the nearby reserves mentioned.

Recommendations

The following recommendations are prescribed for the project:

- Implementation of an ecological rehabilitation plan, which is to be implemented from the onset of the project; and
- Construction should be planned to take place during winter when breeding activity is lowest for most species. Little Swifts are double brooded with egg laying and incubation typically taking place during summer, peaking September through December. It is recommended that an avifaunal specialist be appointed to monitor the re-establishment of nesting colonies. This would require a count of nests prior to construction and then a period of monitoring following project completion to gauge recruitment of new nests.

Water Resources

Mitigation Measures for Watercourses

The establishment of a clearly marked buffer zone, which is defined as a region of natural vegetation between the rivers/wetlands and the proposed activity, is the primary management action that should take place. Literature suggests that a buffer zone can reduce aquatic habitat and water quality impacts of large developments, making this management action of particular importance.

According to WRC (2014) the efficacy of a buffer is related to the distance between the water resource and the zone of disturbance. Therefore, by increasing the length of a buffer, the potential modification related to the proposed activity is reduced. According to the buffer zones guidelines (Macfarlane and Bredin, 2017), the prescribed buffer for (worst case) transportation infrastructure a 15m buffer is the minimum recommended buffer zone. However, for the purposes of this project a generic buffer width of 100m is recommended. A 100m buffer width is prescribed in the Free State Provincial Spatial Development Framework. This width is described as a Category B buffer area, identified for rivers and wetland FEPAs and fish support areas, measured from the top of bank of the river and from the outside edge of the wetland.

The designated buffer zones should then be demarcated to prevent unnecessary and non-authorised encroachment into these areas. No laydown yards or stockpiles are to be kept within the wetland/riverine buffers.

The removal of vegetative cover, as well as the construction of roads has been recognised as being responsible for increased runoff, sedimentation and subsequent water and habitat quality degradation in downstream portions of river systems. As such the careful management of vegetation removal and sedimentation control should take place. This can be achieved through the brief points below:

- Minimise the removal of vegetation in the infrastructure footprint area;
- Re-vegetation of the construction footprint as soon as possible;
- Where storm water enters systems, sediment/silt and debris trapping, as well as energy dissipation control measures must be put in place;

- Storm water must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of storm water flow;
- Sequential removal of the vegetation (not all vegetation immediately); and
- The vegetation of unpaved roadsides.

Roadway Wetland and Watercourse Mitigation Actions

During the various phases of the proposed project, waste generated and stored can result in the runoff and seepage of contaminated water from the various activities which can cause degradation of the wetland and riverine areas. In order to prevent this, the compilation of a storm water management plan is advised, this would typically form a component of the surface water assessment. The use of diversion and containment management is of significant importance. This can be achieved through effective surface water management.

- Diversion trench and berm systems which diverts clean storm water around pollution sources and convey and contain dirty water to central pollution control impoundments (this is applicable for laydown yards);
- The upgrade and construction of crossing structures from the existing road / route;
- Existing storm water systems must be upgraded to accommodate flows (and faunal migration). These structures must also be monitored and managed to prevent blockages during the operational phase of the project;
- Where storm water enters systems from disturbed sites, sediment and debris trapping, as well as energy dissipation control measures must be put in place; and
- The crossing points should be stabilised to reduce the resulting erosion and downstream sedimentation;
- Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years;
- The indiscriminate use of heavy vehicles and machinery within the instream and riparian habitat will result in the compaction of soils and vegetation and must be controlled;
- Erosion prevention mechanisms such as gabions must be employed to ensure the sustainability of all structures to prevent instream sedimentation;
- The crossing points should be unobtrusive to prevent the obstruction and subsequent habitat modification of downstream portions;
- Diversion trenches and berms should convey dirty water to temporary ditches so as to contain runoff;
- Soils adjacent to the watercourses that have been compacted must be loosened to allow for germination;
- Stockpiling of removed soil and sand must be done outside the 1:100 flood line or delineated watercourses (whichever is greater). This will prevent solids from washing into the river; and
- Where storm water enters river systems from disturbed sites, sediment and debris trapping, as well as energy dissipation control measures must be put in place; and
- The regular monitoring and removal of trapped debris at crossing points.

Roadway Watercourse Mitigation Actions

During the various phases of the proposed project, waste generated and stored can result in the runoff and seepage of contaminated water from the various activities which can cause degradation of the wetland and riverine areas. In order to prevent this, the compilation of a storm water management plan is advised, this would typically form a component of the surface water assessment. The use of diversion and containment management is of significant importance. This can be achieved through effective surface water management.

- Diversion trench and berm systems which diverts clean storm water around pollution sources and convey and contain dirty water to central pollution control impoundments (this is applicable for laydown yards);
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- Where storm water enters systems from disturbed sites, sediment and debris trapping, as well as energy dissipation control measures must be put in place; and
- The crossing points should be stabilised to reduce the resulting erosion and downstream sedimentation;
- Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years;
- The indiscriminate use of heavy vehicles and machinery within the water resources will result in the compaction of soils and vegetation and must be controlled;
- Erosion prevention mechanisms such as gabions must be employed to ensure the sustainability of all structures to prevent instream sedimentation;
- The crossing points should be unobtrusive to prevent the obstruction and subsequent habitat modification of downstream portions;
- Soils adjacent to the watercourses that have been compacted must be loosened to allow for germination;
- Stockpiling of removed soil and sand must be done outside the 1:100 flood line or delineated watercourses (whichever is greater). This will prevent solids from washing into the river; and
- Where storm water enters river systems from disturbed sites, sediment and debris trapping, as well as energy dissipation control measures must be put in place; and
- The regular monitoring and removal of trapped debris at riverine crossing points.

The following recommendations are prescribed for the project:

- Adherence to a 30m water resource buffer for all services, aspects and activities not required for the proposed crossing and road upgrades. These include laydown and storage areas, staff facilities and service areas.

Monitoring Requirements

An annual monitoring study must be implemented for the delineated water resources, including biomonitoring of the Heuningspruit. The aim of the monitoring will be to identify significant perturbations to the integrity and functioning of the wetlands, and also the instream ecology during the construction phase. Following the completion of the construction phase, a final wetland and riverine assessment of the effected watercourses should be completed.

The monitoring of the water resources must be undertaken bi-annually during the construction phase of the project, with final (annual) assessment of the systems during the first year of the operational phase of the project.

The environmental monitoring plan is provided in **Table 27**. It is noted that the mitigation actions provided in this assessment must make use of the proposed mitigation actions as an Environmental Management Plan.

Table 27: Environmental Monitoring Programme

Location	Monitoring objectives	Frequency of monitoring	Parameters to be monitored
Current aquatic sites used in this study.	Overall PES	Bi-annual	Standard River Ecosystem Monitoring Programme (Ecstatus) methods

Wetland systems within the 40m corridor	PES, EIS and ecoservices	Bi-annual	WET-Management series and EIS
Current sites used in this study.	Determine if water quality deterioration is occurring.	Annual	SASS5 scores should not decrease as and be related to mining activities.
Current sites used in this study.	Determine if water/habitat deterioration is occurring.	Bi-annual	Monitor for presence of fish.

Agriculture and soil

Possible impacts could include erosion of the topsoil by water, where vegetation is removed. Here, care should be taken to avoid excessive excavations and to avoid creating any bare soil surfaces in steeply sloping terrain. In addition, re-vegetation of such areas should be undertaken as soon as is possible. Standard engineering measures (cut-off drains, culverts, berms etc.) should be implemented, under the supervision of qualified engineers, and these measures should be monitored at regular intervals (approximately six-monthly) to ensure no soil degradation or erosion development.

Palaeontological

If any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a palaeontologist should be called in to determine proper mitigation measures. A sample of shale/mudstone should be set aside if mined.

It is further suggested that a Section 37(2) agreement of the Occupational, Health and Safety Act 85 of 1993 is signed with the relevant contractors to protect the environment (fossils) and adjacent areas as well as for safety and security reasons.

Socio-Economic

Table 28 below provides a summary of all the mitigation and/or enhancement measures proposed

Table 28: Socio economic mitigation measures

Overall Issue	Mitigation/Enhancement Measure
Health and Safety	<ul style="list-style-type: none"> ▪ A Community Health and Safety Plan and policy must be developed; ▪ All the project employees must be subject to a health and HIV/Aids awareness educational programme; ▪ Establishing a community policing forum could be considered, with PAF members playing an active role in this forum; ▪ Changes in crime patterns will need to be monitored; ▪ Traffic in and out of the project area must be strictly monitored. The PAFs must be part of such monitoring mechanism either through a WhatsApp group or forum; ▪ A grievance mechanism must be developed for the PAFs and/or their labourers to report any complaints to the relevant authorities. SANRAL must investigate and mitigate these issues to the best of their abilities; ▪ All PAFs and their labourers must be consulted well in advance prior to any construction activity and mitigation

Overall Issue	Mitigation/Enhancement Measure
	<p>measures must be discussed during these meetings for any possible social impact, including those listed in this report;</p> <ul style="list-style-type: none"> ▪ Traffic must be controlled and regulated through speed limits and safety regulations; ▪ Emergency Preparedness Plan must be developed; and ▪ Fire-fighting equipment must be kept on site.
Stimulation of Economic Growth	<ul style="list-style-type: none"> ▪ A Preferential Procurement Policy must be drafted that favours employing local residents; ▪ A Recruitment and Influx Management Plan must be developed. This should include information dissemination strategies, recruitment and supply chain transparency principles, and influx management and security arrangements; ▪ An SEP should be drafted and implemented; ▪ As far as possible, security personnel should be recruited from the surrounding communities; ▪ A code of conduct must be developed for the use of security personnel; ▪ All the PAC members and PAF owners need to be informed about the roles and responsibilities of the security personnel; ▪ A Skills Development Programme must be drafted in consultation with relevant community trusts or forums. This should include the allocation of community bursaries (at least one per year); ▪ An Employment Equity Plan must be drafted; and ▪ SANRAL must consider establishing a labour desk/employment committee to manage and implement labour recruitment policies.

Visual

Mitigation measures is aimed at assisting in the mitigating the visual impact of the project on its surrounding area.

Table 29: Visual Impact Assessment: Mitigation Measures

ENVIRONMENTAL ASPECT	POTENTIAL IMPACT	MITIGATION MEASURES
Construction area	Highly significant visual impact	<ul style="list-style-type: none"> • Little can be done about reducing the effect since the works can neither be screened nor moved.
Surrounding landscape	Visually prominent project components	<ul style="list-style-type: none"> • Appoint Landscape Architect during the design phase to integrate the project components with the surrounding landscape to ensure that the project blends in physically and aesthetically with environment. • All existing large trees that fall outside the construction area must be retained. These will assist in softening the forms of the structures and obscure views to them. • Additional trees can be planted to ensure visual sensitivity to the site is reduced. • All bridges, stream crossings, culverts and road side protection barriers should be constructed of materials that reflect the texture and colours of the surrounding landscape.
Surrounding landscape	Visually obtrusive vegetation stripping	<ul style="list-style-type: none"> • Vegetation stripping should be undertaken in a manner where the edges are organic (non- geometric) or curvilinear rather than straight or sharp-edged. When disturbances in the landscape are viewed from a distance, those with irregular lines, rather than straight lines, appear to blend in with the natural configuration and lines in the landscape
Construction area and road reserve	Degradation and soil erosion	<ul style="list-style-type: none"> • A detailed landscape and rehabilitation plan should be developed by the landscape architect together with the flora specialist. The general roadside landscaping shall reflect the existing surrounding landscape. • Effective rehabilitation of the construction area and road reserves. These specifications must be explicit and detailed and included in the contract documentation (Environmental Management Plan) so that the tasks can be costed and monitored for compliance and result. • All areas beyond the works area must also be rehabilitated. This includes areas such as temporary access roads, construction campsites, workers campsites, lay down areas, etc. • The vegetation programme should be monitored and managed to ensure that problems (e.g. erosion, die back and lack of grass cover) are identified early so that corrective measures can be taken.
Road user	Scenic views not utilised	<ul style="list-style-type: none"> • Attention must be given to provide the road user the opportunity to optimise the visual attributes of the scenic landscape.

ENVIRONMENTAL ASPECT	POTENTIAL IMPACT	MITIGATION MEASURES
Topsoil	Loss of natural topsoil	<ul style="list-style-type: none"> The special conditions of contract must include the stripping and stockpiling of topsoil from the construction areas for later re-use. The areas to be cleared of topsoil should all be areas that will be covered by roads and construction camps. The presence of degraded and disused areas left over after development that are not rehabilitated, could present a high perceptual visual impact. These areas should be top-soiled and re-vegetated.
Construction areas	Visual impact from dust	<ul style="list-style-type: none"> All areas that will be affected by construction activities and where dust will be generated will require dust suppression by regular wetting, possibly by means of a water bowser or by means of a soil binding compound. The importance of suppressing the visual aspects of dust cannot be overstressed since the visibility will generate the impression of a polluting industry.
Overall visual impact	Visual mitigation measures not complied with	<ul style="list-style-type: none"> During construction the detailed requirements that would have been set during the design phase and incorporated in the contract documentation, must be monitored for compliance.

8 CONCLUSION AND RECOMMENDATIONS

The Basic Assessment Process for the proposed project has been undertaken in accordance with EIA Regulations published in Government Notice 982 to 985 of 4 December 2014 (as amended in 2017), in terms of the National Environmental Management Act (NEMA; No107 of 1998). The Basic Assessment Process is aimed at ensuring informed decision-making and environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA (No 107 of 1998), the commitment to sustainable development is evident in the provision that “development must be socially, environmentally and economically sustainable and requires the consideration of all relevant factors”.

NEMA also imposes a duty of care, which places a positive obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA’s preventative principle, potentially negative impacts on the environment and on people’s environmental rights (in terms of the Constitution of the Republic of South Africa, Act 108 of 1996) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of “reasonable measures”.

In assessing the environmental feasibility of the proposed project, the requirements of all relevant legislation has been considered, including inter alia:

- The Constitution of South Africa (No. 108 of 1996);
- National Environmental Management Act (Act No. 107 of 1998) (as amended) and EIA Regulations 2014 (as amended in 2017);
- National Environmental Management: Waste Act (Act No. 59 of 2008) (as amended);
- National Environmental Management Biodiversity Act (Act No. 10 of 2004);
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004);
- National Water Act (Act No. 36 of 1998) (as amended);
- National Heritage Resources Act (Act No. 25 of 1999);
- Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)(as amended);
- Hazardous Substance Act (Act No. 15 of 1973) and Regulations; and
- Occupational Health and Safety Act (Act No. 85 of 1993).

8.1 Description of any assumptions, uncertainties and gaps in knowledge

The EIA Regulations, 2014 outline specific requirements that a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures must be provided in the EIR.

The assessments undertaken are based on conservative methodologies and these methods attempts to determine potential negative impacts that could occur on the affected environmental aspects.

These impacts may however be of smaller magnitude than predicted, while benefits could be of a larger extent than predicted.

This section outlines various limitations to the specialist studies that have been undertaken and indicates, where appropriate, the adequacy of predictive methods used for the assessment. This has

been done to provide the authorities and interested and affected parties with an understanding of how much confidence can be placed in this impact assessment.

Freshwater Assessment

The following limitations should be noted for the study:

- As per the scope of work, the fieldwork component of the assessment comprised one assessment only, that was conducted during the wet season. This study has not assessed any temporal trends for the respective seasons;
- The spatial data might not be accurate or based on outdated features; ground truthing has been performed to try and increase the accuracy thereof;
- Access to selected areas was limited, and in these instances a comprehensive desktop assessment with extrapolations from survey results was undertaken for these areas;
- Only directly affected water resources have been assessed for this project, with the location and extent of the remaining water resources indicated (only);
- Wetlands located within the 500m regulated area but not in a position within the landscape to be measurably affected by the developments were not considered as part of this assessment;
- Field assessments were completed to assess as much of the site as possible with focus on the proposed directly impacted and downstream areas;
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side;
- Only defined watercourses at the Sub Quaternary Reach level were considered in the aquatic ecology study; and
- Conditions Heuningspruit observed during the survey were typical of those of recently inundated system. High rainfall prior to the site survey resulted in high flows within the system. These conditions do not allow for the correct Present Ecological State determination of the system, however, the results obtained should be used as baseline conditions with correct interpretation.

Terrestrial Assessment

The following limitations should be noted for the study:

- As per the scope of work, the fieldwork component of the assessment comprised one assessment only, that was conducted during the wet season. This study has not assessed any temporal trends for the respective seasons;
- The spatial data might not be accurate or based on outdated features; ground truthing has been performed to try and increase the accuracy thereof;
- Access to selected areas was limited, and in these instances a comprehensive desktop assessment with extrapolations from survey results was undertaken for these areas; and
- Field assessments were completed to assess as much of the site as possible with focus on the proposed directly impacted areas.

Socio-economic Assessment

The SIA is subject to the following assumptions

- Not all the farm owners were present or available for meetings at the time of study. One farm owner, for example, hesitantly requested more information about the upgrading project before he claimed he would have felt comfortable to have an interview. This is unfortunately a limitation of this study. Therefore, inferences had to be drawn and generalisations made. However, the specialist is confident that the owners who were interviewed were generally a representative spread of all the direct PAFs;

- At the time of writing the report, the client could not provide the exact number of employment opportunities to be provided. This is a serious limitation to the assessment in terms of providing an accurate impact rating;
- As already explained, although the specialist attempted to contact all the stakeholders and I&As in the database and sent out emails to all of those with email addresses, many stakeholders (especially at municipality-level) could not be reached. The specialist can provide such email correspondences as proof upon request; and
- Many of the owners could not anticipate the future impacts of the BPs or quarry on their land. It is therefore reasonable to assume that people's perceptions of the project might change once the mining activities commence. It should be noted that the draft EIA report will still be disclosed to the direct PAFs and PACs.

Visual Impact Assessment

The following assumptions and limitations are applicable to this study:

- The study area has been limited to a 10 km radius of the site because the visual impact of the road beyond this distance is assumed to be of such a reduced scale that it can be considered of no significance;
- The assessment is based on assumed demographic data. No detailed study was done to determine accurate data on potential viewers of the project components.

The EIA has investigated the potential impact on key environmental media relating to the specific environmental setting for the site. A number of specialist studies were undertaken and result thereof and are presented in this report. The information provided in this BAR and EMPr is therefore considered sufficient for decision-making purposes.

8.2 Recommendations

8.2.1 Reasoned opinion as to whether the proposed activity should or should not be authorized

According to the impact assessment undertaken for the proposed project, the key impacts of the project are on soils, natural vegetation and land owners/occupiers. The project will also have positive impacts due to the employment to be created although for a short term.

The public has been requested for their comments. All comments received during the Public Participation Process has been included in this BAR and EMPr. These comments have been addressed as far as possible to the satisfaction of the interested and affected parties. The management of the impacts identified in the impact assessment for all phases of the proposed project will be undertaken through a range of programmes and plans contained in the EMPr. Consideration of the programmes and plans contained within the EMPr, layouts and method statements compiled for the project, which is assumed will be effectively implemented, there will be significant reduction in the significance of potential impacts.

Based on the above, it is therefore the opinion of the EAP that the activity should be authorised.

8.2.2 Period for which the Environmental Authorisation is required.

The construction period is 36 months and should commence around January 2023. The Applicant requires the Environmental Authorisation to be valid for a period of five years.

9 CONTACT

Should you require further information regarding the above, please do not hesitate to contact me.



10 EAP DECLARATION
