PROPOSED REHABILITATION OF A SECTION OF THE EXISTING ROAD D684, AND THE PROPOSED CONSTRUCTION OF A NEW ACCESS ROAD TO LINK THE R104 AND THE D684, NEAR THE SIKHULULIWE VILLAGE, SITUATED 28KM EAST OF MIDDELBURG IN THE MPUMALANGA PROVINCE.

Terrestrial Biodiversity Ecological and Impact Surveys

Prepared for:

JG Afrika
P.O. Box 1109,
Sunninghill, 2157,
South Africa

Report authors: Dr Mathew Ross (*Pr Sci Nat*); Dr Tahla Ross
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EnviRoss *CC*
CK 2007/051532/23
VAT: 4810234999
PO Box 369, Wendywood, 2144.
Cell: 082 293 5752
Email: admin@enviross.co.za

DECLARATION

PROJECT: Proposed rehabilitation of a section of the existing road D684, and the proposed construction of a new access road to link the R104 and the D684, near the Sikhululiwe Village, situated 28km east of Middelburg in the Mpumalanga Province: Terrestrial Ecosystems Ecological Report

This report has been prepared according to the requirements of the Environmental Impact Assessments Regulations (GNR 982) in Government Gazette 38282 of 4 December 2014, and DWAF (2008) Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas. We (the undersigned) declare the findings of this report free from influence or prejudice.

Report Authors:

Dr Mathew Ross *Pr Sci Nat* (Ecological Sciences) 400061/09
MSc (Aquatic Health) (RAU)
PhD (Aquatic Health), (University of Johannesburg).

Field of expertise:
Fish ecology, fishway evaluations, biomonitoring and wetland evaluations, aquatic ecology, aquatic and terrestrial fauna and flora.

Dr M Ross (*Pr Sci Nat*)

Date: 25 July 2021

Dr Tahla Ross
PhD (Zoology) (RAU)

Field of expertise:
Biomonitoring and wetland evaluations, aquatic ecology, aquatic and terrestrial fauna and flora.

Dr T Ross

Date: 25 July 2021

CONSULTANT QUALIFICATIONS AND EXPERTISE

Dr Mathew Ross (*Pr Sci Nat*) from EnviRoss CC acted as lead ecological consultant for the ecological surveys pertaining to this project.

A summary of qualifications, affiliations and expertise is provided below:

- BSc Biological Sciences (Botany and Zoology) completed in 2000.
- BSc Hons (Aquatic Health) completed in 2001.
- MSc Aquatic Health completed in 2004.
- PhD Aquatic Health completed in 2015.
- Registered as a Professional Natural Scientist under the South African Council for Natural and Scientific Professionals (SACNASP) in the fields of ecological sciences.
- SASS5 accredited practitioner.
- Actively worked as a specialist ecological consultant for 16 years and have authored more than 500 ecological survey reports within 14 countries.
- Founder Member and Principal Scientist at EnviRoss CC.
- Expertise includes terrestrial fauna and flora biodiversity, habitat evaluations, red data listed species evaluations, vegetation ecological surveys, exotic vegetation management, avifaunal impact studies, aquatic ecological surveys, aquatic biomonitoring, specialist fish and aquatic macro-invertebrate surveys, fish migrations and fishway development, wetland ecological and delineation surveys.
- Experience in the mining, wastewater treatment, overhead powerline (transmission and distribution), pipeline, renewable energy (solar and hydropower), residential estate development and instream infrastructure development sectors.
- Proficient in GIS modelling and analysis.

Dr Tahla Ross from EnviRoss CC co-authored the survey report – providing the role of project management, scientific review, and support.

A summary of qualifications, affiliations and expertise is provided below:

- BSc Biological Sciences (Botany and Zoology) completed in 2000.
- BSc Hons (Zoology – Biodiversity and Conservation) completed in 2001.
- MSc (Zoology Biodiversity and Conservation) completed in 2002.
- PhD (Zoology Biodiversity and Conservation) completed in 2006.
- Expertise includes terrestrial fauna and flora biodiversity, habitat evaluations, red data listed species evaluations, vegetation ecological surveys, exotic vegetation management, avifaunal impact studies, aquatic ecological surveys, and aquatic biomonitoring.

DISCLAIMER, ASSUMPTIONS AND LIMITATIONS

The findings of the survey provided within this report, together with the results and general observations, and the conclusions and recommendations provided upon completion of the survey are based on the best scientific and professional knowledge of the field specialists. This is also dependent on the data and resources available at the time. The report is based on survey and assessment techniques that are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.

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ABBREVIATIONS, ACRONYMS AND DEFINITIONS

TERM	EXPLANATION
ADU	Animal Demographic Unit.
CE	Critically endangered. A conservation status provided to a species.
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora.
DARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs.
DD	Data deficient. A conservation status provided to a species.
DETEA	Department of Economic Development, Tourism and Environment Affairs for the Free State Province.
DFFE	Department of Forestry, Fisheries and the Environment.
DHSWS	Department of Human Settlements, Water and Sanitation.
DWA	Department of Water Affairs. An outdated an unofficial name for the present DHSWS but which remains relevant for literature and policy referrals.
DWAF	Department of Water and Forestry. An outdated an unofficial name for the present DHSWS but which remains relevant for literature and policy referrals.
DWS	Department of Water and Sanitation. An outdated an unofficial name for the present DHSWS but which remains relevant for literature and policy referrals.
ECO	Environmental Control Officer. A suitably qualified person appointed to oversee the construction procedures to ensure environmental compliance (also sometimes referred to as the Environmental Compliance Officer).
EIA	Environmental Impact Assessment.
EN	Endangered. A conservation status provided to a species.
EX	Extinct (in the wild). A conservation status provided to a species.
FIAO	FitzPatrick Institute of African Ornithology. An online resource for background distribution records for biodiversity utilised for this survey.
GIS	Geographic Information System.
GPS	Global Positioning System.
I&AP	Interested and Affected Party.
IUCN	International Union for Conservation of Nature.
LC	Least concern. A conservation status provided to a species.
NFEPA	National Freshwater Ecosystem Priority Areas
NT	Near Threatened. A conservation status provided to a species.
PES	Present Ecological State.
Pioneer species	A floral species that is typically the first to colonize a disturbed area as part of the plant succession process. Characteristically hardy to sustain harsh environmental conditions, it then provides more favourable conditions for other floral species to establish.
Plagioclimax species	A floral species that represents the climax stage of veld succession but is not the natural climax species for the vegetation unit. It therefore is indicative of historical disturbance impacts.
RDL	Red Data Listed. A referral to the conservation status of species, categorized as EX, CE, EN, VU.
SABAP2	South African Bird Atlas Project, version 2.
SANBI	South African National Biodiversity Institute.
VU	Vulnerable. A conservation status provided to a species.

EXECUTIVE SUMMARY

Introduction and Background

It is the intention of the Mafube Coal on behalf of the Mpumalanga Department: Public Works, Roads and Transport to upgrade a section of the existing Provincial Road D684, and to construct a new access road to link the existing Provincial R104 and the D684, near the Sikhululiwe Village, situated approximately 31.6km east of Middelburg in the Mpumalanga Province. Enviross CC was requested to undertake the terrestrial ecosystem surveys for the project area and to rate the overall impacts to the ecological features associated with the road rehabilitation development. This report details the findings of the field survey undertaken during May 2021.

Methods and Materials

DESKTOP SURVEY

Prior to the field survey, the desktop survey was undertaken to gather relevant ecological processes data for the survey area. Sources included available online data, Geographic Information Systems (GIS) databases, aerial imagery, and topographical maps. Biodiversity data was sourced from available online sources, as well as publications, field guides, and the databases developed by EnviRoss CC from field surveys undertaken within the same vicinity.

FIELD SURVEY

A walk through of the survey area, with focus being on areas that may support high levels of biodiversity, was undertaken. Observations on habitat type, quality and the identification of pressures and drivers of ecological change throughout the project area allowed for the refinement of the data that were formulated during the desktop review process.

Impact significance ratings were then applied to pertinent ecological features that are then a function of evaluating the expected impacts associated with a development of this nature and how that would be expected to impact the habitat units that it is associated with. Screening of the impacts of existing infrastructure within the area forms part of this process.

Results and Discussions

The desktop review indicated the land use within the area to be dominated by formal cultivation and mining. Wetland units do occur within the project area, but the ecological functionality of the wetland units had been historically altered through transformation of the natural surface water drainage, which was altered through earth berms, excavated trenches and linear foundations associated with railways, roads, and other infrastructure. This has led to a comparatively diminished wetland functional area than what would have historically existed. This would be an important habitat feature that would support a high level of biodiversity. The loss of ecological function of the wetland units has led to the decline of biodiversity richness within the area.

Cross-referencing the distribution records of faunal and floral species with the habitat type, availability and ecological status resulted in the project area offering support to a limited level of biodiversity. The proposed project activities are to be largely confined to the existing road footprint and associated road reserves. Limited destruction of natural habitat is therefore envisioned. This therefore has limited relevance to the ongoing support of biodiversity within the area.

No RDL faunal or floral species were noted to occur within the proposed development's expected impact area. Habitat features within this area were also noted to be unsuitable for supporting RDL species.

Conclusions and Recommendations

Following the field survey of the proposed development area, the following salient recommendations can be proposed to aid in the conservation of the overall ecological integrity of the terrestrial habitat ecosystems within the region:

- Wetland habitat units were noted to be associated with the proposed development. An indication of the extent of the wetland habitat features associated with the project is presented in Figure 8.
- The proposed new road section was shown to have an association with a wetland unit (Figure 9). Although not considered a fatal flaw due to the wetland unit having already suffered a major loss of ecological functionality, the

overall ecological integrity of the immediate area would benefit from a minor alignment shift within this area to accommodate the wetland unit and its associated buffer zone.

- The development is associated with an existing roadway and therefore construction activities will be largely confined to existing impact areas. Minimal impact significance is expected to occur as the road rehabilitation procedures couple to an existing road.
- The impact significance of the potential impacting features showed low overall significance, with many impacts rendered insignificant with the application of the proposed mitigation measures.
- No RDL faunal or floral species were noted during the survey. The development is not thought to impact on RDL species conservation within the region in any significant way.
- Erosion control measures and avoidance of indiscriminate habitat destruction outside of the ultimate construction footprint are regarded as the most pertinent mitigation measures.
- Culvert development sites must be suitably reinstated and landscaped to avoid erosion formation.
- Culverts should be spread over the width of the watercourse so that the surface water flows are not constricted. Designing of culvert placement, numbers and capacities must take into consideration flood flow volumes. Constriction of the watercourse will result in erosion within the channel at the downstream side of the culvert and will also reduce the lateral extent of the associated wetland. As the wetland areas are considered to have the greatest potential of supporting the greatest levels of biodiversity, it is essential that the project activities do not impact on the functionality of the wetland features.
- The overall ecological impact significance of the proposed development activities is expected to be low and therefore no justifiable reasons for opposing the development can be offered.

It should be noted that, to conserve the ecological structures within the region, a holistic habitat conservation approach should be adopted. This includes keeping general habitat destruction and construction footprints to an absolute minimum within the terrestrial habitat as well. Conserving the habitat units will ultimately conserve the species communities that depend on it for survival. This can only be achieved by the efforts of the contractor during the various processes of the construction phase.

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1. INTRODUCTION

1.1. Background & Project Description

It is the intention of the Mafube Coal on behalf of the Mpumalanga Department: Public Works, Roads and Transport to upgrade a section of the existing Provincial Road D684, and to construct a new access road to link the existing Provincial R104 and the D684, near the Sikhululiwe Village, situated approximately 31.6km east of Middelburg in the Mpumalanga Province. The project falls within the Nkangala District Municipality, and the Steve Tshwete Local Municipality within Wards 7 and 9 and is situated approximately 31.6 km west of Middelburg, and approximately 38.2 km southwest of Belfast. The locality of the site is presented in Figure 1.

The existing Provincial Road D684 runs to the east of the Mafube Coal and the Sikhululiwe Village, in a north-south direction. The D684 is an existing gravel road with a varying width (approximately 6 m minimum), and a road reserve width of 25 m. The D684 is linked to R104 via a gravel road approximately 1.8 km long, which runs adjacent to the railway line after the railway crossing before joining the R104. The R104 runs to the south of the Mafube Coal, in an east-west direction, and joins the N11 in Middelburg with the N4, to the southwest of Belfast.

The existing D684 provides access to the Sikhululiwe Village, which is situated to the south of the existing Mafube Coal operations. The proposed access road to link the D684 to the R104 is situated to the southwest of the Village.

Rehabilitation of a Section of the existing D684

This project involves the rehabilitation of a 3.19 km section of the existing D684 gravel road. The upgrade will involve the resurfacing of this section of the road. The road will consist of two 3.5 m surfaced lanes with 1.5 m unsurfaced shoulders. A road reserve width of 30 m will be applicable where space allows. The current road and road reserve width, as well as the alignment of the D684, will remain unchanged as follows:

- 7 m wide surfaced cross section, with a 1.5 m unsurfaced gravel shoulder,
- Existing reserve of varying widths along existing property boundaries,
- Will remain a single carriageway with one lane in either direction.
- New minor culverts may be required along this section to be upgraded. No bridges will be constructed along this section.

New Access Road

The new proposed access road will be 0.21 km long and will link the R104 with the existing D684. The proposed new access road cross section will have 3.5 m wide surfaced lanes with 1.5 m unsurfaced gravel shoulders. The road reserve will be 30 m wide. This road will be a single carriageway with one lane in either direction.

Upgrade of drainage infrastructure

Various points along the road alignment have been identified where free drainage of surface water would have to be catered for with the implementation of culverts of varying capacities. The localities and design specifications are provided within Table 1. The localities of these points are presented in Figure 8.

Table 1: As part of the road rehabilitation, six new culverts (as per the details below) will be constructed.

Culvert	Culvert Size	Decimal Degrees (WGS84)	
		Lat_S	Lon_E
0+037 New access road	1 x 600 x 450 BC	-25.7793	29.7618
0+085 D684-A	1 x 600 x 450 BC	-25.7684	29.7806
0+994.900 D684-B	2 x 1500 x 900 BC	-25.7689	29.7803
1+050.000 D684-B	2 x 1200 x 900 BC	-25.7783	29.7635

Culvert	Culvert Size	Decimal Degrees (WGS84)	
		Lat_S	Lon_E
Village Road 1	750 diam PC	-25.7664	29.7812
Village Road 2	750 diam PC	-25.7628	29.7828

The sections of the road that are to be rehabilitated have an association with wetland habitat units. EnviRoss CC was commissioned to undertake the surface water ecosystems ecological, delineation, and impact surveys, to ascertain the overall ecological value of the habitat units, and to offer mitigation measures to abate negative ecological impacts emanating from the proposed development activities. This report details the findings of the surface water ecosystems survey that reflects the findings of the field survey undertaken during May 2021.

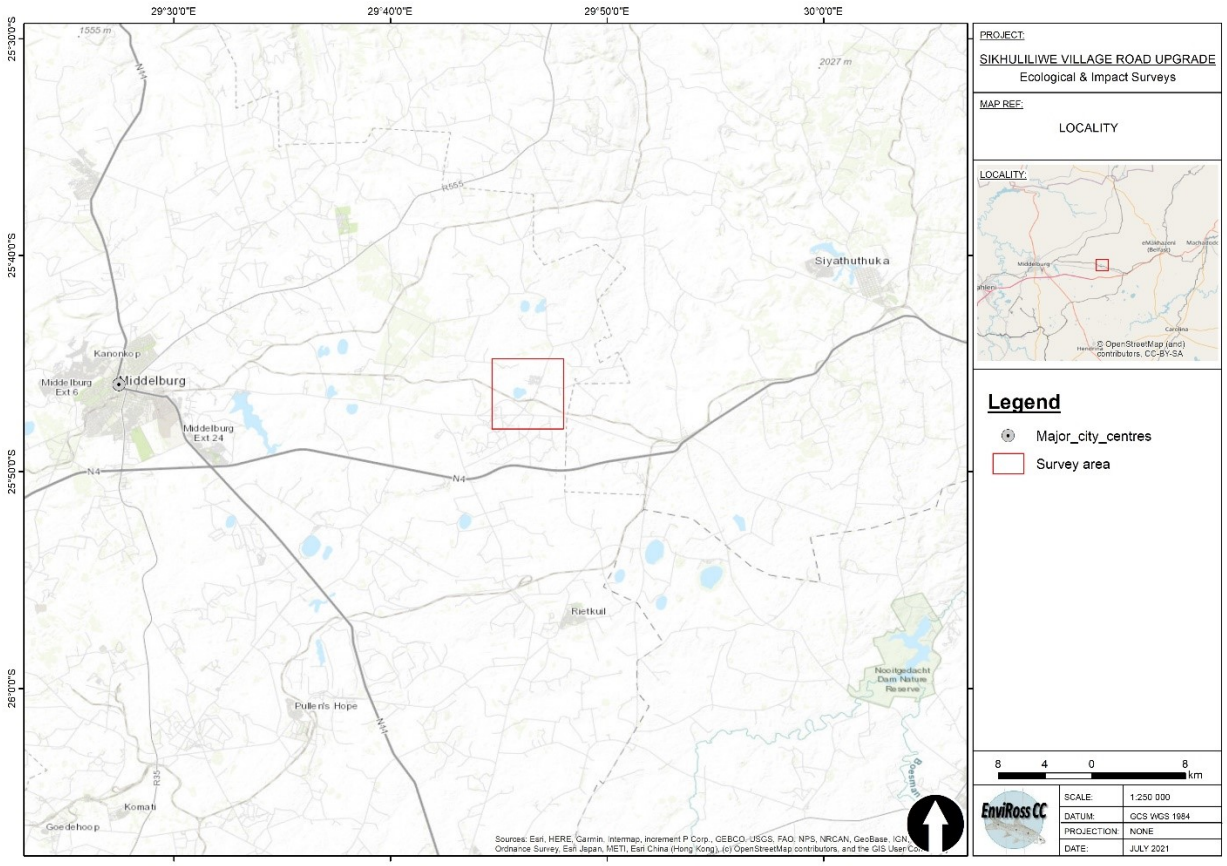

Figure 1: Locality of the survey area.

1.2. Scope of Work

The Scope of Work for the ecological survey encompasses the following aspects:

- Desktop survey, making use of available GIS databases, aerial imagery, and catchment data, to gain an understanding of the regional land use, the pressures and drivers of ecological change, catchment condition and to establish areas of focus,
- Field survey to ground-truth the information gathered during the desktop review. This includes accounts of the dominant floral species for the area and the habitat availability and condition to support biodiversity (with emphasis on species of conservational significance and species that would be dependent on habitat units),
- An impact evaluation of the proposed development activities through the various phases of the road construction and rehabilitation process, and,
- To make recommendations to allow for reduction of the overall ecological impacts emanating from the proposed development.

1.3. Assumptions & Limitations

The following conclusions to the overall perceived impacts have been based on a desktop survey that was reiterated by ground-truthing through a single field survey of the area encompassing the proposed development. Due to this, the species and community structures that are mentioned within the report allude to the assessment of overall ecological health and functionality of the survey area or for the purposes of rating the significance of the ecological impacts and to allow for the objective presentation of the significance of the ecological impacts and the level of practical mitigation. Floral species accounts therefore do not represent a comprehensive account of the species that occur within the scope of the project area.

1.4. Aims & Objectives

The objective of this report is to indicate the present ecological state of the habitat units encompassed within the development impact zones and to highlight the ecologically sensitive and relevant areas to be avoided, if possible, by the proposed development activities. Mitigation measures are provided for abating the overall significance of the impacts associated with the proposed development activities where those impacts are determined to be unavoidable through possible alternative alignment routes. This information can then be utilised as supporting documentation for the design and construction teams of the proposed development activities.

1.5. Aims and Objectives

The objective of this report is to indicate the present ecological state of the habitat units encompassed within the development impact zones and to highlight the ecologically sensitive and relevant areas to be avoided, if possible, by the proposed alternative routes. Mitigation measures are provided for abating the overall significance of the impacts associated with the proposed development activities where those impacts are determined to be unavoidable through alternative alignment routes. This information can then be utilised as supporting documentation for the design and construction teams of the proposed development activities.

1.6. Applicable Legislation

Legislation pertaining to environmental resources, the use and conservation thereof, is regulated by a multitude of inter-disciplinary laws. Only the pertinent laws (Acts) are discussed below.

1.6.1. National Environmental Management Act 107 of 1998

The National Environmental Management Act 107 of 1998 (NEMA) is the principal legislation governing Environmental Impact Assessments (EIAs), under the authority of the Department of Forestry, Fisheries and the Environment (DFFE), and is applicable to both water resources and terrestrial habitat units. The NEMA makes provisions for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of the State, and to provide for matters connected therewith. Section 2 of the NEMA establishes a set of principles which apply to the activities of all organs of state that may significantly affect the environment. These include the following:

- Development must be sustainable,
- Pollution must be avoided or minimised and remedied,
- Waste must be avoided or minimised, reused or recycled,
- Negative impacts must be minimised and positively enhanced; and responsibility for the environmental health and safety consequences of a policy, project, product, or service exists throughout its entire life cycle.

1.6.2. National Environmental Management Act: Biodiversity Act 10 of 2004

The National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA) (G-26436) operates in conjunction with the National Environmental Management: Protected Areas Act 57 of 2003 (NEM:PA) and amendment No 15 of 2009 (G32404). Both Acts emerge from the recommendations of the White Paper on the Conservation and Sustainable Use of South Africa's Biodiversity (1998) and were originally conceived of as one Act.

Within the framework of the NEMA, to provide for:

- The management and conservation of biological diversity within the Republic and of the components of such biological diversity,
- The use of indigenous biological resources in a sustainable manner,
- The fair and equitable sharing among stakeholders of benefits arising from bioprospecting involving indigenous biological resources,
- To give effect to ratified international agreements relating to biodiversity which are binding on the Republic, and
- To provide for co-operative governance in biodiversity management and conservation; and to provide for a South African National Biodiversity Institute (SANBI) to assist in achieving the objectives of the Act.

The NEMBA provides specifically for the issuing of permits. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. Regulations may be made pertaining to various matters regulated by the NEMBA, offences and penalties are provided for, and consultation processes are prescribed. Should Red Data species be directly affected by the proposed project, then the necessary permits will be required to be applied for. A list of the protected species that fall under the auspice of the NEMBA was published within the Government Gazette No 30568, under Government Notice No R 1187 issued on 14 December 2007.

1.6.3. National Forest Act 84 of 1998

The National Forest Act 84 of 1998 (NFA) was promulgated to provide for the sustainable management and development of forests for the benefit of all and to promote the sustainable use of these forests. In addition to this function the NFA also provides for the protection of trees which are threatened. A protected tree list was published in GN 33566 of 23 September 2010 and will need to be consulted during the preconstruction phase. Should a protected tree species occur within the proposed development footprint area that will require removal, authority will have to be sought in accordance with the NFA.

1.6.4. Mpumalanga Nature Conservation Act No 10 of 1998

The Mpumalanga Nature Conservation Act (No 10 of 1998) (MNCA), which came into commencement from 1 January 1999, provides a legislative guideline pertaining to biodiversity conservation at the provincial level. The MNCA provides a list of prohibited activities pertaining to collecting, hunting (including fishing), and/or destroying biodiversity and natural resources. It provides reference lists of fauna and flora species that (amongst others) are protected due to conservational concerns, trade limitations, collection pressure, habitat transformation and other drivers of ecological change.

2. MATERIALS AND METHODS

2.1. Desktop Review

The purpose of the desktop review process is to provide an overview of the associated ecological processes, the ecological descriptors and habitat units, and the important ecological and conservational features that have been identified at both the national and provincial level that are relevant to the project area. Review of the applicable resources pertaining to ecological aspects of the project area allows for a planned and targeted field survey that then allows for ground truthing of the pertinent areas identified through the desktop review process.

2.1.1. Environmental Screening Tool Assessment

Regulations stipulated by the DFFE require the submission of a report that is generated by the National Environmental Screening Tool in terms of section 24(5)(h) of the NEMA and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended, forms part of the initial desktop review process. The survey area as well as a 1 km buffer zone was subject to the screening assessment to determine the level of sensitivity for the various themes and therefore provides an indication of the level of detail that is required during the analysis of the various ecological themes associated with the project area. The screening tool is an online resource that is available at https://screening.environment.gov.za/screeningtool.

2.1.2. Literature and Data Sources

Data at the provincial level are provided within the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) Biodiversity Sector Plan (BSP) (Ferrar & Lötter, 2007) and the accompanying a GIS spatial dataset (Lötter, 2006). These data identify those areas of ecological significance from the region that provide varying levels of biodiversity support and therefore require focused attention for the aspects identified to be associated with the project area.

Lists of protected species relevant to the province were sourced from the Mpumalanga Nature Conservation Act (No 10 of 1998). Listed species relevant to conservation concerns listed within these ordinances were cross referenced to species distribution records, known habitat associations and other references to determine their applicability to the project.

The identification of the vegetation units and associated characteristics in terms of climatic data, topographical features, general geological and soil characteristics, defining floral species identified as being diagnostic of the vegetation unit, conservation status of the vegetation unit, and other relevant data are provided by SANBI (2006), together with the accompanying GIS spatial datasets (updated in 2012) that indicate the extent of the vegetation units at the national level.

The most recent as well as historical aerial imagery from Google Earth ® Pro was utilised to evaluate the project area. Digital 1:50,000 topographical maps and topographical mapping GIS spatial datasets (Chief Directorate Surveys and Mapping, Department of Land Affairs) and GIS datasets from ongoing GIS dataset development within EnviRoss CC. Spatial resources pertaining to surface water ecosystems were sourced through the National Freshwater Ecosystem Priority Areas (NFEPA) mapping datasets (Nel *et al*, 2011).

Faunal and floral species identification was supported by various printed field guides, digital field guides and other taxa-specific resources, as well as experience and knowledge of the field consultants undertaking the surveys. The conservation status of relevant species was obtained through www.redlist.sanbi.org, and published red data books and conservation assessments of specific taxa. Online resources included the FitzPatrick Institute of African Ornithology (FIAO) for biodiversity lists for various taxa. The avifaunal list for the region was obtained from the South African Bird Atlas Project (version 2) (SABAP2), which is facilitated by the Animal Demographic Unit (ADU). Where gaps in distribution records were noted for the quarter degree square (QDS) areas (2529DD), the areas were expanded to include the degree square area (2529).

All desktop-based review and background data were subject to a ground-truthing field survey, where habitat type availability, habitat quality and overall ecological integrity were assessed and allowed for the refining of the species of fauna and flora applicable to the project.

2.2. Field Survey

The desktop review allowed for the identification of pertinent habitat features that would be expected to support the highest level of biodiversity as well as those areas that have been subject to largescale transformation and degradation (such as actively cultivated land, infrastructure development, etc). The field survey then focuses on ecologically sensitive habitat areas, with a lesser significance being placed on degraded and transformed areas. Even if ecological integrity and functionality of an area is reduced, degraded areas still need to be assessed as ecological processes that occur within these areas (such as erosion, exotic vegetation recruitment, etc.) could influence the greater area. Degraded areas therefore are also included within the field assessment, albeit at a lower level of intensity.

Floral species that are found to be dominant within specific habitat areas are identified and the ecological processes represented by the floral species community structures are noted. This could include the dominance of pioneering floral species, dominance of exotic species, active recruitment, and invasion of a habitat type by exotic species, bush encroachment within grassland areas, etc. It should be noted that the purpose of the field survey is to identify species dominance and species community structures, it is not to provide a full account of floral species along the entire pipeline routes.

2.3. Area Mapping, Habitat Unit Characterisation and Ecological Sensitivity Analysis

The ground-truthing field survey allows for the identification of the pressures and drivers of ecological change that influence the ecological processes that are associated with the survey area. This, in turn, allows for the identification and demarcation of the project area according to the various land uses that take place within the area. Aerial imagery is used to support this process. Once the land use and the associated drivers of ecological changes are separated out from the natural areas, then a meaningful impact evaluation can be undertaken for the road development.

2.4. Ecological Impact Evaluations

Once the various alternatives if (if applicable) have been assessed against the present land use, the associated pressures and drivers of ecological change, the interactions with natural areas and the ecological integrity of both the disturbed and natural areas have been established, then the process of the impact evaluation can take place according to the standard procedures outlined in Appendix 6 of the EIA Regulations (GNR 982) – Specialist reports.

3. RESULTS & DISCUSSIONS

3.1. Desktop Review

3.1.1. Screening Tool Assessment

As part of the desktop review process, regulations stipulated by the DFFE, there is a requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended. The survey area as well as a 1 km buffer zone was subject to the screening assessment to determine the level of analysis for the site for various themes. All ecological themes associated with this survey are included as there is an interplay between the surface water ecosystems and aspects of the plant and

animal themes that are supported by them. The designated sensitivity of each theme and notes associated with each are presented in Table 2.

Table 2: The results of the DFFE screening tool analysis for the survey area, including a 1 km buffer zone.

Theme	Screening Tool Classification		Survey Observations
Aquatic biodiversity	*Very high* designated to main wetland zones. Remainder designated as low.		Applicable to only one crossing point along the road alignment.
Terrestrial biodiversity	All areas designated as *very high.*		Area is ecologically open and offers an expanse of habitat, but infrastructure development and land use has led to a degree of habitat fragmentation and transformation.
Animal species	Wetland areas designated as *high*. Remainder of the area designated as *medium*.		Area is ecologically open and offers an expanse of habitat, but infrastructure development and land use has led to a degree of habitat fragmentation and transformation. The areas offering the greatest potential to support animal species are associated with the surface water habtiat units. The project would impact on one crossing point of the wetland unit running from east to west.
Plant species	Wetland areas designated as *medium*. The remaining areas designated as *low*.		Historically, the grasslands of the project area were utilised for livestock grazing. Other areas were used for formal cultivation. The present land use continues to have a deleterious impact on the ecological features of the project area. Transformation of the floral species structures is therefore expected as a general impact throughout the area. Wetland zones still tend to offer the greatest potential for supporting floral diversity.

3.1.2. Mpumalanga DARDLEA Biodiversity Sector Plan

The Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) provides a biodiversity sector plan (M-BSP), which is a conservation framework that provides a spatial assessment that indicates the conservation significance of areas to terrestrial features at the provincial level. The project area falls within an area that is largely classified as “no natural habitat remaining”, with the major wetland areas associated with the area being noted as “least concern” (Figure 2). This tends to reiterate the results from the Screening Tool Analysis (Section 3.1.1.) in that it highlights the importance of the surface water habitat units to biodiversity maintenance.

Figure 2: The Mpumalanga DARDLEA C-Plan for the terrestrial assessment for the region pertaining to the project area.

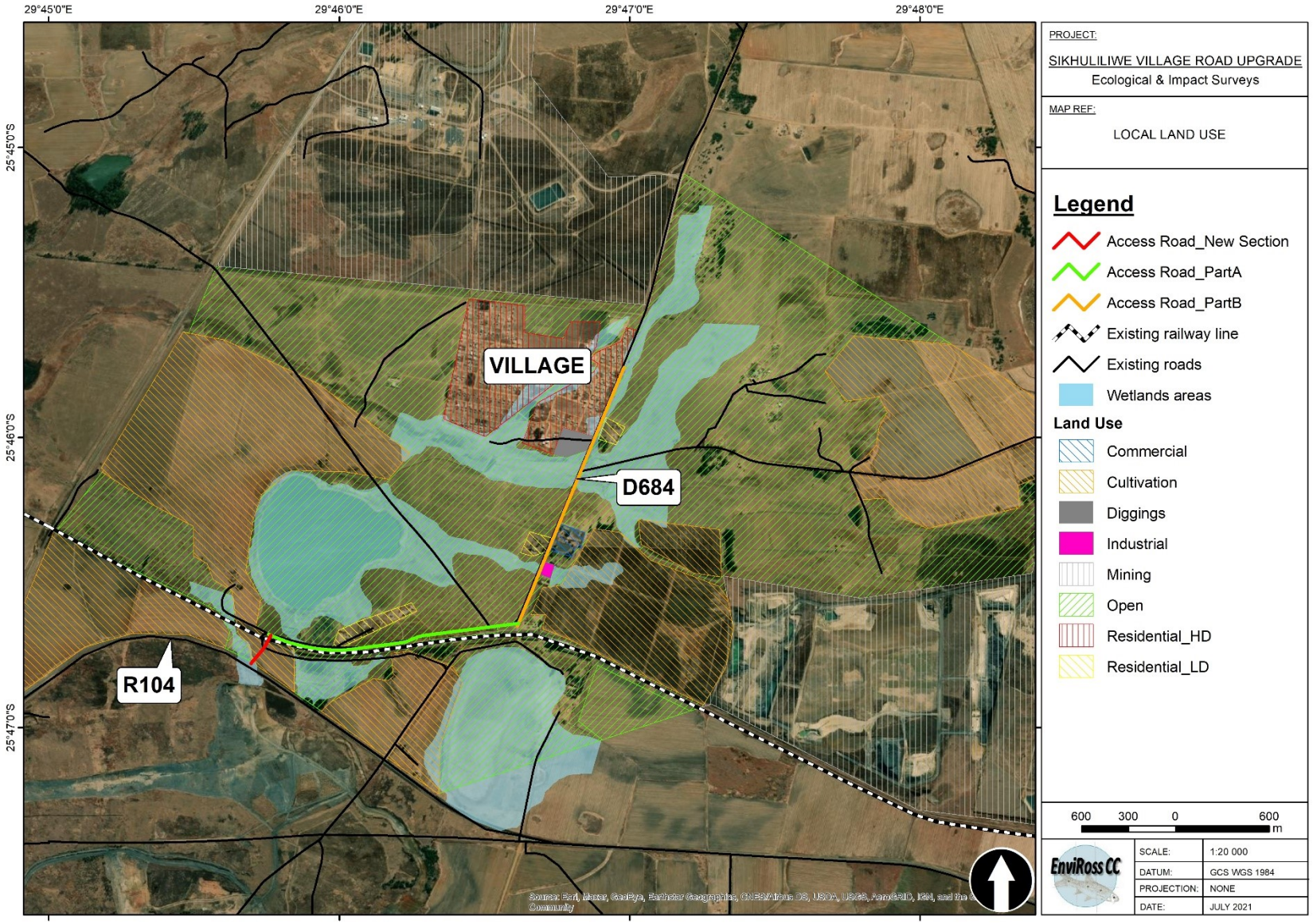

Figure 3: Local land use details, and how the land uses associate with the road alignment route within the project area.

3.2. Land use

The dominant land use within the area is agriculture, with active cultivation and raising of livestock being a prominent feature. The area is associated with a railway line and associated railway station infrastructure. Gravel roads are also a prominent feature, with sporadic residential areas along the roadway also occurring. The Sikhululiwe Village area located toward the northern section of the road alignment has been developed more recently. There is also a growing mining sector within the area, with much of the historical farmlands now forming part of actively mined areas. Open grassland areas still do occur that have been utilised for grazing purposes. The grasslands could be classified as improved grasslands, which are regarded as being transformed because of the land use. Details of the land use within the project area are shown in Figure 3. Various views of the project area are presented in Figure 4.

A section of the road to be rehabilitated.

Typical characteristics of the open areas, which can be classified as improved grasslands (ie grassland areas that are improved to increase grazing value).

Formal cultivation is a prominent driver of ecological change within the project area.

An existing gravel road that runs parallel to the existing railway, which is used largely as a service road as well as an access for the agricultural sector.

 Excavated trenches are commonplace within the project area that have been historically established to control surface water runoff patterns and to prematurely drain wetland areas.	 Earth berms are commonplace within the project area that have been historically established to increase the cultivation potential of the agricultural sector.
 Existing bridge/culverts. This allows surface water drainage beneath the existing railway.	 Another trench that was established to manipulate surface water drainage, which has prematurely drained the wetland units within many areas. Land use and the resultant alteration of the hydrological features of the wetland units are regarded as a dominant driver of ecological change.
 An impoundment captures surface water runoff before it enters the large depression wetland unit.	 Another section of the roadway that is to be rehabilitated.

Part of the road section to be rehabilitated. The village can be seen in the distance on the left side of the road.

Areas along the roadway to be rehabilitated that associate with residential buildings where exotic trees have been purposefully cultivated.

The main wetland watercourse within the survey area that runs from east to west.

The bridge design of the main watercourse, showing the series of side-by-side culvert pipes.

Grazing pressure as a driver of ecological change within the wetland areas becomes more prominent with proximity to the village area.

An area to the south of the village where excavations resulting from sand winning and/or historical borrow pits that has resulted in transformation of wetland zones.

	
Another view of the excavated area showing the level of landscaping.	A section of the road that was constructed within wetland habitat that has completely altered the functionality of the wetland area. Wetland seepage still occurs within some areas to drain within the road reserve.
	
Wetland seepage zones occur along the eastern side of the existing road, but ecological function within this section of wetland has been lost.	A view of the road section looking to the south. Vegetated wetland zones can be seen on the eastern side (left) and seep zones within the road drain can be seen in the distance.

Figure 4: Various views of the project area.

3.3. Floral features

3.3.1. Floral endemism

The survey area does not fall within or near any centres of plant endemism (van Wyk and Smith, 2001).

3.3.2. Vegetation types and floral community structures

The dominant vegetation unit associated with the project area is Eastern Highveld Grassland, which forms part of the Mesic Highveld Grassland bioregion within the Grassland biome. Established wetland units within the region support an azonal freshwater wetlands vegetation type typically found embedded within the Highveld grasslands, namely Eastern Temperate Freshwater Wetlands of the Freshwater Wetlands biome (Figure 5). Eastern Highveld Grasslands, as a vegetation unit, is regarded as conservationally *Endangered*, with the main drivers being identified as transformation of the unit to accommodate cultivation and mining and the lack of substantial areas representing primary vegetation features

within protected areas. Eastern Temperate Freshwater Wetland is regarded as conservationally *Least Concern* (SANBI, 2006).

The proposed project is the rehabilitation procedure of an existing road as well as the establishment of a small section of a new link road. The existing road and the associated road reserves and the zones abutting the road reserves do not support any zones that remain representative of primary and/or natural vegetation features that are identified as Eastern Highveld Grassland. The proposed new section of road also moves through an existing cultivated area, making for total transformation of the vegetation unit. An analysis of the vegetation structures is therefore deemed of little value in an assessment of the ecological status of the vegetation unit.

Representative vegetation features tend to only be encountered within the larger established wetland areas that have not been transformed for cultivation. These are generally isolated in occurrence as these wetland units are largely surrounded by roads or other delineating features. Excepting for one point where the existing road crosses over a valley bottom wetland unit, these features tend to occur some distance from the road and therefore, again, are thought to have limited relevance to the project.

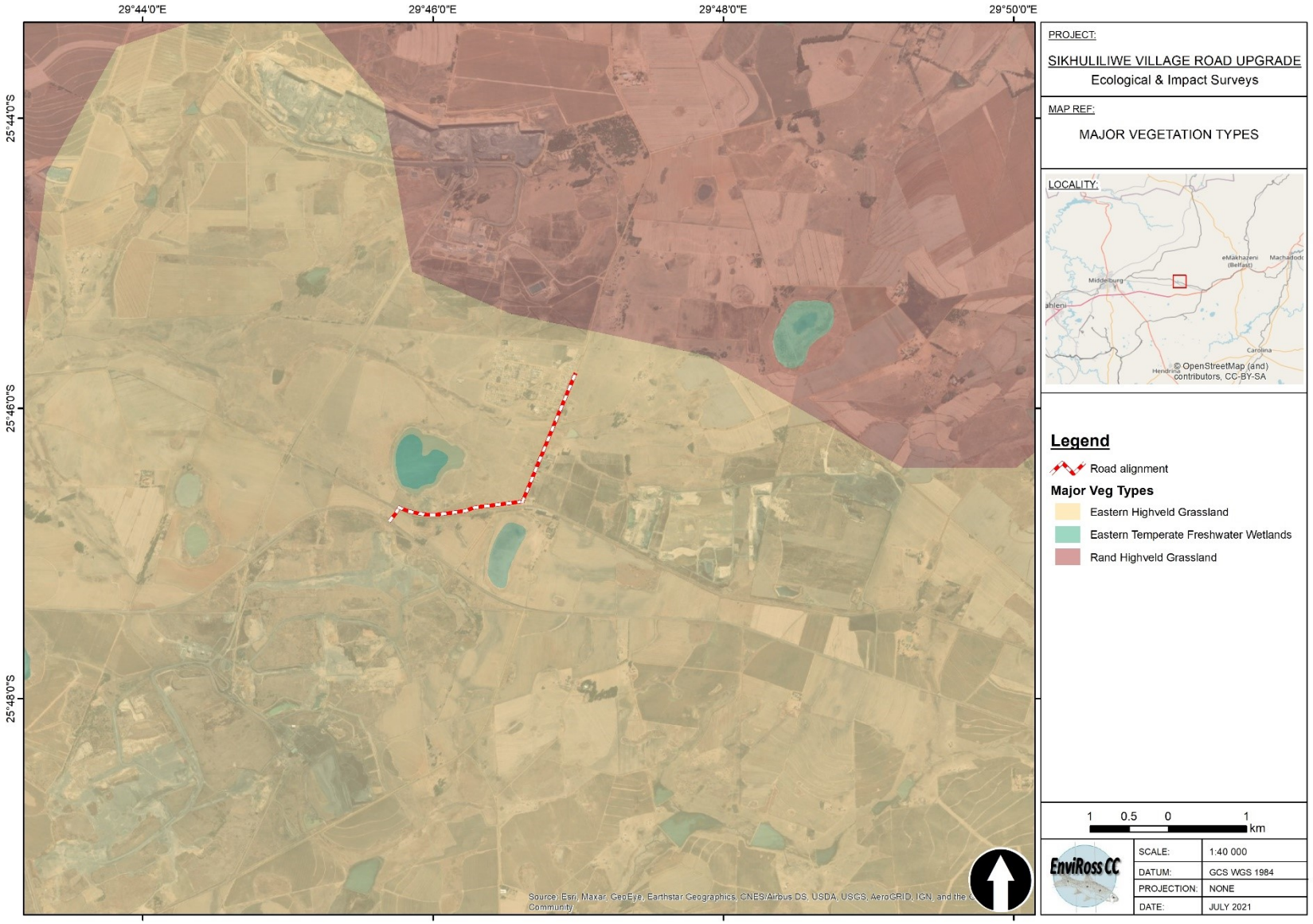

Figure 5: Vegetation mapping of the region associated with the project area.

The area where the new link road is to be developed remains largely vegetated, although a lot of the area is under active cultivation. An account of the dominant floral species noted during the field survey within this area is presented in Table 3.

Table 3: Floral species noted within the area where the new link road is to be constructed.

Species	Common name	Growth form
Cynodon dactylon	Couch grass	Grass
Hyparrhenia hirta	Common thatching grass	Grass
Hyparrhenia tamba	Blue thatching grass	Grass
Urochloa mosambicensis	Bushveld signal grass	Grass
Melinis repens	Natal red top	Grass
Eragrostis chloromelas	Narrow curly leaf	Grass
Aristida congesta	Tassel three-awn	Grass
Typha capensis	Bulrush	Reed
Paspalum urvillei	Vasey grass	Grass
Imperata cylindrica	Cotton wool grass	Grass
Eleocharis dregeana	Finger sedge	Reed
Schoenoplectus corymbosus	Common sedge	Reed
Arudinella nepalensis	River grass	Grass
Pennisetum clandestinum	Kikuyu	Grass
Tagetes minuta	Common kakieweed	Annual weed
Cosmos bipinnata	Cosmos	Annual weed
Verbena bonariensis	Common verbena	Shrub
Gomphocarpus fruticosus	Narrow-leaf cotton bush	Shrub
Asparagus laricinus	Bushveld asparagus	Shrub

Figure 6: The site characteristics of the area where the new link road is to be established.

3.4.3. Floral species of conservational concern and protected species

Floral species of conservational concern are categorised according to their conservation status. Red Data Listed (RDL) species are those classified as *Critically Endangered* (CE), *Endangered* (EN) or *Vulnerable* (VU). Species are regarded as being Orange Listed if they fall into the categories of *Near Threatened* (NT), *Rare* (Ra), *Declining* (Decl) or *Data Deficient* (DD). *Data Deficient* species are further categorised into Data deficient – insufficiently known (DDD) or Data deficient – taxonomically problematic (DDT) (IUCN Redlist, 2021).

The Mpumalanga Nature Conservation Act (No 10 of 1998) provides a list of protected floral species at the provincial level. The field survey focused on determining the occurrence of the listed species as well as determining the overall habitat suitability for supporting those listed species. None of the listed species were noted during the field survey. Barring one small area where a new road will be established, the extent of the proposed development activities is to be limited to an existing road and associated road reserve. The extent of historical disturbance factors associated with the exiting road and road reserves, as well as the zones immediately abutting the road reserves, means that the occurrence of any floral species of conservational significance is highly unlikely. The area where the new section of road is to be developed is currently utilised for agriculture (cultivation). There is an association with a wetland unit within this area as well. The historical transformation of this area, including that of the wetland unit, is such that limited natural habitat remains. The vegetation structures outside of the cultivated zones tend to be dominated by exotic species, with kikuyu (*Pennisetum clandestinum*) dominating the earth berm that was established within the wetland zones to impound the watercourse. The further domination of grasses such as *Hyparrhenia tamba, Cynodon dactylon, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Urochloa mossambicensis* and *Eleusine coracana*, together with annual weeds such as *Tagetes minuta*, *Bidens pilosa, Cosmos bipinnatus*, and *Schkuhria bipinnata*, all indicated a transformation of the area, thereby lowering the likelihood of any floral species of conservational significance being supported there.

The Grassland biome is considered a conservationally *Vulnerable* ecosystem, with Eastern Highveld Grassland, as a vegetation unit, also being considered *Vulnerable* (SANBI, 2006, 2011 & 2013). Although the project activities will take place within the grassland unit, the extent of the proposed activities (being limited to existing road surfaces and road reserves) means that the transformation of any significant sections of natural grasslands will not take place and is therefore largely irrelevant to the project.

The SANBI POSA database was utilised to see if any protected tree species (that are nationally protected under the NFA) have been recorded from the survey area. It should be noted that a permit to remove or destroy protected species must be sought from the national authority (DFFE) prior to the removal or destruction of these species. There were no species indicated or noted during the field survey.

3.4.4. Exotic floral species

The NEMBA classifies exotic species according to their threat level and invasive potential. Restrictions and regulations apply to species within the different categories, which are outlined in Table 4.

Table 4: The NEMBA categories for exotic species.

NEMBA Category	Definitions and Restrictions
Category 1a	Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
Category 1b	Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
Category 2	Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy, or accept as a gift any plants listed as Category 2 plants. In riparian zones or wetlands all Category 2 plants become Category 1b plants.

NEMBA Category	Definitions and Restrictions
Category 3	These are invasive species that can remain in your garden. An individual plant permit involving a Category 3 species is required to undertake any of the following restricted activities: import, possess, grow, breed, move, sell, buy, or accept as a gift. In riparian zones or wetlands all Category 3 plants become Category 1b plants.

The project activities are to take place within the footprint of existing road surfaces and road reserves. Vegetated areas are therefore largely irrelevant to the project. The historical land use, such as the railway station and residential areas, saw the purposeful cultivation of exotic trees along the road edge in some areas for aesthetic purposes. Species such as Patula pine (*Pinus patula*), Eucalyptus (*Eucalyptus globulus* cf), Canary Island date palm (Phoenix canariensis), Chinese wax-leaved privet (*Ligustrum lucidum*), Century plant (*Agave americana*), various fruit trees and other garden ornamentals were generally common, but largely confined to localised and controlled areas.

Annual weed species commonly associated with the agricultural sector were also noted. These included *Datura stramonium, Datura ferox, Tagetes minuta, Schkuhria bipinnata,* and *Conyza bonariensis* were all notably common.

Figure 7: Avenues of cultivated exotic trees along the road edge were noted. Other occurrences of exotic trees and shrubs were also noted further afield from the road area.

The species noted during the field survey are presented in Table 5. The overall extent of exotic vegetation associated with the project is not seen as problematic. Wetland zones were not subject to active invasion by exotic species, with only annual weeds associated with the agricultural sector being noted within wetland areas.

Table 5: Exotic floral species noted within the project area.

Species	Common name	Growth form and type	Status
Pennisetum clandestinum	Kikuyu	Grass	-
Pinus patula	Patula pine	Tree Invader	Category 2
Eucalyptus camaldulensis	Red river gum	Tree Invader	Category 2
Phoenix canariensis	Canary Island date palm	Tree	-
Ligustrum lucidum	Chinese wax-leaved privet	Tree Invader	Category 1b
Acacia mearnsii	Black wattle	Tree Invader	Category 2
Opuntia ficus-indica	Prickly pear	Succulent weed	Category 1b
Argemone ochroleuca	White-flowered Mexican poppy	Shrub	Category 1B
Datura stramonium	Common thorn apple	Annual weed	Category 1B
Datura ferox	Large thorn apple	Annual weed	Category 1B
Schkuhria pinnata	Dwarf marigold	Annual weed	-
Agave americana	Century plant		-
Conyza bonariensis	Fleabane	Annual weed	-
Conyza canadensis	Fleabane	Annual weed	-
Bidens pilosa	Common blackjack	Annual weed	-

Species	Common name	Growth form and type	Status
Cosmos bipinnatus	Cosmos	Annual weed	-
Tagetes minuta	Tall khaki weed	Annual weed	-

Exotic species noted within the survey area were not regarded as being highly invasive and their occurrence remaining relatively localised. Riparian zones are particularly prone to exotic vegetation invasion due to the presentation of favourable growth conditions. Exotic species recruitment and invasion, especially within the riparian and wetland zones, has the potential to become problematic. As exotic vegetation tends to respond by rapid recruitment following disturbance impacts, any impact zones should be rehabilitated, and site management must include a plan to control exotic vegetation if an emerging concern is noted.

3.4. Faunal features

The survey area falls within a region historically dominated by formal agriculture, with cultivation having transformed a large portion of the natural vegetation. The presently increasing mining sector within the area is also a considerable cause of habitat transformation. Ecological transformation is therefore a general feature of the surrounding region, which has resulted in limiting the potential extent of faunal diversity that occurs within the region. Therefore, even though there are habitat features that could support sensitive biodiversity (such as the wetlands), the impacts associated with the land use means that the potential for the site to support a community of sensitive biodiversity, or species of conservational significance, is considered low.

3.4.1. Mammals

The potential mammalian species list was sourced from historical records of both observed occurrences as well as inferred distributions as noted by Friedmann & Daly (2004). From this, there are 108 mammalian species with distribution records that include the project area. Many of these species presently have restricted distributions due to fences and other migratory barriers, which sees most larger species being confined to conserved areas and would not be realistically expected to occur within the project area (for example: lions, elephants, buffalo, and other larger game species). Active hunting (mainly for subsistence) has also led to the decline of many species to the point that the naturally occurring species thought to still inhabit the project area are limited to the those smaller, adaptable, and mobile species. Many of these species are also nocturnal and cryptic in habit. These data were then cross-referenced to the records of ADU (2021) for confirmation purposes. Taking these factors into consideration, an expected species list could then be derived from the data, which resulted in a list of 59 mammalian species that had the possibility of occurring within the project area. Only one species, namely Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), listed as Vulnerable, is thought to occur within the vicinity of the project area. The last formal recording of this species, however, was in 1907 (ADU, 2021).

Other mammalian species relevant to the project area include small carnivores, such as mongoose, serval, weasel, and polecat. Small rodents (rats and mice), and small insectivorous species, including shrews, elephant shrews and musk shrews are still assumed to be associated with the project area. Those species that are thought to have a high probability (>85% chance) of occurring within the project area are Black-backed jackal (*Canis mesomelas*), Common Duiker (*Sylvicapra grimmia*), Scrub Hare (*Lepus sexangularis*), Water Mongoose (*Atilax paludinosus*), Common Molerat (*Cryptomys hottentotus*), Springhare (*Pedetes capensis*) and a variety of mice and rat species. No mammalian species, however, are thought to rely on the habitat types directly associated with the area that would be impacted by the proposed development activities.

To effectively mitigate the negative impacts relating to mammalian species in general that occur within the project area, attention needs to be given to reducing the general impacts on the habitat units (i.e. minimising the construction footprints, etc.). Even though disturbance factors will play a role in displacing certain more sensitive species, the proposed development activities are not thought to pose significant long-term impacts on the conservation of these species provided that appropriate rehabilitation measures are put in place.

3.4.2. Avifauna

From the SABAP2 (Brooks & Ryan, 2021), there are 236 avifaunal species presently on record for the region defined by the quarter degree square (QDS) area of 2529DD. Of these, 12 (5.1%) are listed as being of conservational concern (Birdlife SA, 2021). Table 6 presents a summary of the avifaunal species of conservational concern that have been historically recorded from the project area. The conservation status of each species is provided (Birdlife SA, 2021). The conservational *regional* status (first denotation) is more relevant to the project than the *global* status (second denotation) and therefore will be used as the conservation status for this project. The Probability of Occurrence (POC) for each species of conservational significance has been allocated according to habitat type and availability, as well as the recorded sightings from the SABAP2 database.

Table 6: Avifaunal species of conservational concern pertaining to the project area.

Ref	Species	Common name	Cons. Status^	Habitats*			POC#
				Gr	Wa	Fa	
79	*Ciconia nigra*	Black Stork	VU, LC	0	1	1	PS
82	*Geronticus calvus*	Southern Bald Ibis	VU, VU	1	0	1	IM
86	*Phoenicopterus roseus*	Greater Flamingo	NT, LC	0	1	0	HP
87	*Phoeniconaias minor*	Lesser Flamingo	NT, NT	0	1	0	PR
105	*Sagittarius serpentarius*	Secretarybird	VU, EN	1	0	1	HP
106	*Gyps coprotheres*	Cape Vulture	EN, EN	1	0	1	IM
114	*Falco biarmicus*	Lanner Falcon	VU, LC	0	0	1	IM
214	*Balearica regulorum*	Grey Crowned Crane	EN, EN	1	1	1	IM
216	*Grus paradisea*	Blue Crane	NT, VU	1	0	0	PR
219	*Neotis denhami*	Denham's Bustard	VU, NT	1	0	0	IM
222	*Eupodotis senegalensis*	White-bellied Bustard	VU, LC	1	0	1	PS
223	*Eupodotis caerulescens*	Blue Korhaan	LC, NT	1	0	1	PS

#POC Ratings (Probability of Occurrence): HP-Highly Probable (>85%); PR - Probable (61-85%); PS - Possible (21-60%); IM - Improbable (<20%).
^Conservation status (Regional, Global) www.birdlife.org.za.
****Habitat types: Wa – Water/wetlands; Fa – Farmlands; Gr – Grasslands (1 = Relevant; 0 = Not relevant).***

Endangered species such as Cape Vulture (*Gyps coprotheres*) have an improbable likelihood of occurrence. The last formal recording of this species within the QDS was in 2014. Another Endangered species, namely Grey Crowned Crane (*Balearica regulorum*), has an improbably POC. It was last formally recorded during 2017 and therefore has limited relevance to the project. Avifaunal species with a POC rating of high probability (>85%) include Greater Flamingo (*Phoenicopterus roseus*). This species would be limited to the open expanse of water associated with the depression wetland unit, and the nearest association that the proposed road development project has to this wetland unit is 185 m away. This is therefore also deemed an insignificant factor to the project.

A species that is thought relevant to the project is the Secretarybird (*Sagittarius serpentarius*), listed as Vulnerable. This species inhabits open grasslands and farmlands whilst foraging for prey. It is not thought to best within the project area due to habitat disturbance factors, such as cattle, and subsistence hunters that utilise dogs for prey flushing and capture.

As per the habitat descriptions from Gibbon (2002), there three broad habitat types relevant to the project area. Wetlands and inland water, collectively termed as water (Wa) is a habitat type that is offered by the large depression-type wetland unit (located some distance from the road alignment), and the wetland habitat offered by the main watercourse that runs from east to west that the road intersects with. The depression wetland unit does not support peripheral reedbeds and thick vegetation that wetland-associated avifaunal species would typically utilise for refuge and nesting. The less established wetland units tend to be representative of grassland habitat rather than water-type habitat. Farmlands (Fa) is mostly limited to the cultivated fields that occur within the survey area. This is a habitat unit that is subject to seasonal transformation according to the cultivation strategies of the farmers and therefore can vary from bare soil to croplands that offer a high level of refuge and food source. This is a habitat unit that is not utilised for breeding purposes but rather for opportunistic foraging by many species. The use of agrochemicals and routine disturbance factors typical of farmlands tends to limit the ecological value of this habitat type. The grasslands (Gr)

habitat unit includes a diversity of sub habitat types that range from cultivated grasslands, rocky grasslands, montane and other high-altitude grasslands, grassland-dominated seasonal wetland units, etc. and therefore tends to include a high number of habitat generalist species. Grassland habitat relevant to the project area includes open grasslands that have been utilised for livestock grazing, many of which are termed "improved grasslands" as farmers would typically supplement growth by using fertilisers, enhance grazing through methods such as spraying with molasses to make less palatable grass species more attractive to livestock, and supplement by planting and cultivating certain species of grass that offer superior nutritional value. Much of the natural grasslands have been transformed through physical disturbance factors as well as overgrazing, which has transformed the grassland unit to a karroid-type vegetation structure. Low shrubby species such as *Stoebe vulgaris* are common within the grassland habitat, which is an indication of disturbance impacts.

Many of the RDL avifaunal species that have been historically recorded from the region have not been recorded within the last five years. This can be attributed to the pressures and drivers of ecological change brought about by a change in land use. The region was historically a predominantly agricultural area. Although active cultivation did see largescale habitat transformation, disturbance impacts tended to be relatively low. Open expansive grassland habitat also formed a dominant habitat feature (livestock activity would have limited breeding of ground-dwelling species though). The relatively recent establishment of the Sikhululiwe Village and the growing mining sector can be attributed to the displacement of many avifaunal species.

The proposed development activities will remain largely confined to the existing roadway, with only a small section that would represent the construction of a new road. The associated limited habitat transformation associated with the road development project due to it being confined to existing infrastructure footprints means that the project has limited significance to avifaunal conservation within the region.

Avifaunal conservation is largely dependent on habitat availability and habitat integrity, which includes connectivity to surrounding habitat. That is why it is generally favourable to undertake development activities where impacting features already exist. For example, it is usually favourable to align new linear developments along the alignments of other established linear developments that have already resulted in habitat transformations. This includes roads that remove all vegetation features, and powerline alignments where the corridor is subject to routine management of the vegetation. The development activities do propose to remain within the confines of the existing roadway, which limits the overall significance of the impact.

3.4.3. Reptiles

A reference distribution list of reptiles for the region was gained through using the degree square area of 2529DD (ADU, 2021). This allowed for a reference list of 15 reptilian species that have been known to occur within the project area. The project area tends to have limited reptilian distribution data associated with the project area, which seemingly coincides with relatively poor accounts of species, which may be due to a general lack of concentrated surveys having been undertaken within the area. None of the species recorded for the project area are of conservational significance.

Reptilian species noted during the field survey included *Agama atra* (Southern Rock Agama), *Chamaeleo dilepis* (Common Flap-neck Chameleon), *Pachydactylus affinis* (Transvaal Gecko), and *Trachylepis punctatissima* (Speckled Rock Skink). None of these species are of conservational significance and are relatively common within their respective distribution ranges.

The open grasslands and wetland areas, which offer habitat and refuge for prey species, tend to have the highest potential of supporting the greatest diversity of reptilian species. Many reptilian species are opportunistic and are therefore found in association with buildings that offer rock-like surfaces, rock piles, and residential areas that are attractive to rats and mice that present a source of prey to snakes.

Again, the proposed development is to be confined to the existing road surface and road reserve areas. Therefore, limited destruction of natural habitat will occur, meaning that the proposed development will have a seemingly insignificant impact to reptilian species conservation within the area.

3.4.4. Amphibians

Habitat loss, in all its many forms, was cited as the most pervasive threat facing amphibians and was listed for all species during the analysis for the frog atlas project (Harrison *et al*, 2001 and Minter *et al,* 2004) and therefore habitat destruction should be limited to the absolute minimum throughout the survey area. This is especially pertinent to riparian and wetland habitat units. Amphibians have been shown to be steadily declining as a world-wide phenomenon. Care should therefore be practised in conserving all suitable habitats to aid in abating declines in amphibian numbers and diversity.

There are 27 amphibian species recorded from the degree square area of 2529 (ADU, 2021). One species is regarded as being of conservational concern, namely the Near Threatened Giant bullfrog (*Pyxicephalus adspersus*). This species is known to overwinter in grassland (and to a lesser extent, savanna) habitat associated with wetland units, especially depression wetlands embedded within the grassland biome (Minter *et al*, 2004; du Preez and Carruthers, 2009). The wetland habitat units within the project area should be observed as an ecologically sensitive habitat feature to support amphibian diversity in general and it is assumed that the Giant Bullfrog would utilise the larger depression wetland for breeding purposes. The wetlands associated with the project area remain particularly relevant to amphibian conservation within the area and, as such, should be treated as ecologically sensitive features.

3.4.5. Fish

Due to the lack of suitable habitat directly associated with the project area, fish surveys were not included within this survey.

3.4.6. Invertebrates

The invertebrate taxa that are of conservational concern include Mygalomorph spiders (baboon and trapdoor spider species from the Infraorder Mygalomorphidae), scorpions, certain butterfly (Order: Lepidoptera) and dragonfly and damselfly (Order: Odonata) species.

Mygalomorph spiders are all generally sedentary in habit. The females establish variations of burrows where they tend to remain throughout their lifetime unless displaced. Males, especially during mating season, are generally free roaming. The females are therefore especially vulnerable to habitat destruction and transformation, as disturbances that destroy burrows often destroy the inhabitant, or, if displaced from the burrow, the females have difficulty in establishing new burrows or finding adequate refugia. Conservation of this taxon therefore relies on intact habitat functionality. Care should therefore be practised to minimise the construction footprint and to not cause undue destruction of habitat outside of the ultimate construction footprint area. Mygalomorph spiders inhabit virtually all the habitat types that are represented throughout the survey area, including transformed habitat. General habitat conservation is therefore the most viable mitigation measure to abate undue impacts on these species – as is applicable to all biodiversity within the region. Mygalomorph spiders within the degree square area of 2529 include representatives of the Theraphosidae family (baboon spiders), and include *Augacephalus junodi*, *Brachionopus* sp, *Harpactira hamiltoni*, and *Idiothele* sp.

Again, the limited transformation of the natural habitat expected to occur because of the proposed development procedures will result in an insignificant impact to the conservation of invertebrates of conservational significance within the area.

4. SENSITIVITY MAPPING

Sensitivity mapping of the project area coincides with the wetland areas that have been zoned as having retained ecological function. These are set apart from those areas that have lost general function due to land use features.

These zones are indicated in Figure 8. (See also the surface water ecosystems ecological survey report undertaken for the project).

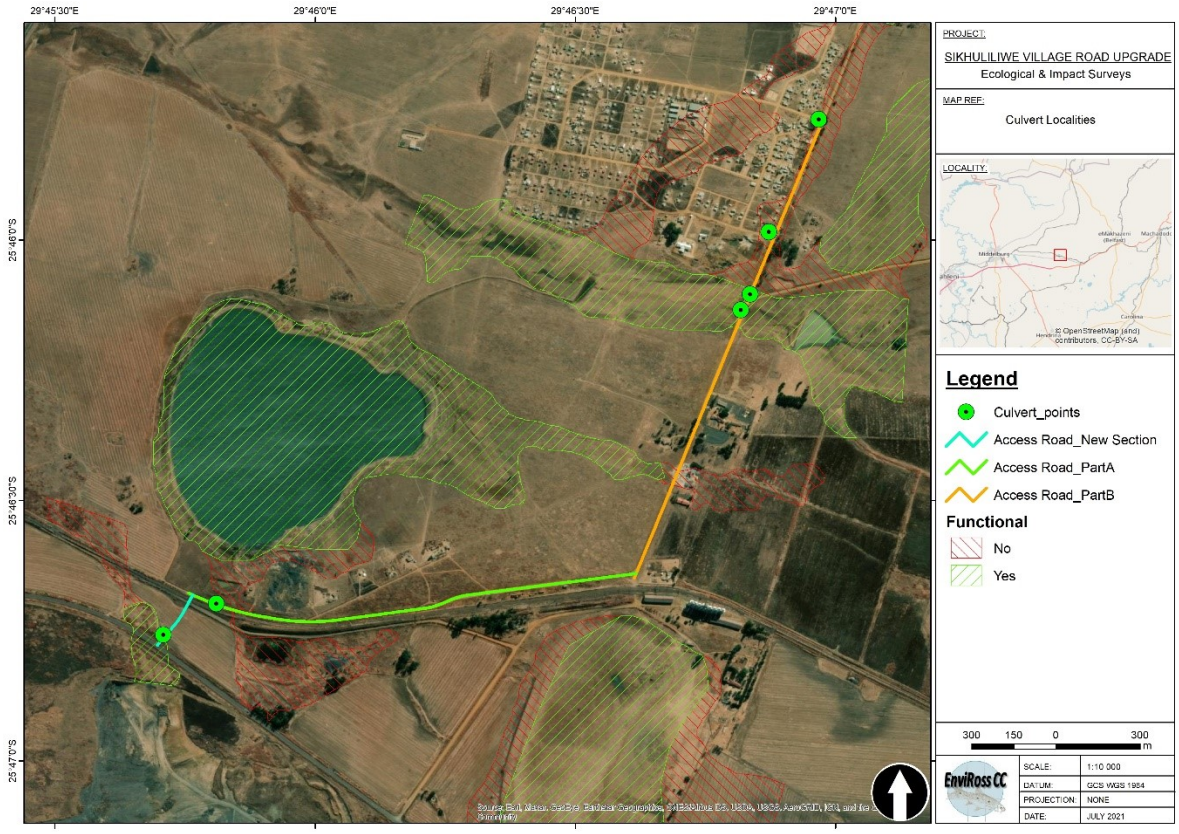

Figure 8: The localities of the proposed culvert upgrade points and how these points are associated with the wetland units within the project area. An indication of the wetland zones where ecological function has largely been lost due to transformations induced by the land use has been provided to aid in the ratings of the risk assessment matrix and impact significance ratings.

Figure 9 presents a more detailed account of the interaction that the proposed new section of road (showing the 30 m road reserve) has with the wetland features identified at the site. Although overall ecological functionality would benefit from a shift of the alignment to outside of the wetland features and associated buffers, the extent to which the wetland unit has lost ecological function due to historical land use and infrastructure development means that the development of the new road within this area would impose an impact of little significance to the feature.

Figure 9: Details of the proposed new section of road and how it interacts with the wetland features identified within the immediate area.

5. SIGNIFICANCE RATINGS OF PERCEIVED ENVIRONMENTAL IMPACTS

A detailed account of the impact analysis and the associated mitigation measures is presented in Table 7. This section provides for an elaboration of ecological impacts and recommended mitigation measures that are indicated within the impact analysis.

Many of the impacts and the associated mitigation measures are applicable to terrestrial habitat areas. These have been included here as these all contribute to catchment management, which ultimately also impacts on the surface water ecosystems within the project area.

5.1. Outline of the Construction Processes

The proposed development activities are aimed primarily at the rehabilitation of an existing roadway and the establishment of a small new connecting road. The rehabilitation procedures of the existing road include the widening of certain sections as well as refurbishment and upgrading of existing culvert drains where necessary. The existing roadway tends to already have suitable foundation materials and therefore minimal foundation materials will have to be imported to the site, excepting for the smaller connection road at the south of the alignment. No deep excavations will be needed. The largest impacting features would be associated with the culvert sites, where excavations would be required. These will coincide with existing culvert points, so natural habitat features will not be impacted excepting for some fringe effects at the sites. These can be readily mitigated to reduce the significance of the impacts.

Road reserve areas that are designed to drain surface water will carry silts and sediments toward the watercourses. This is true for all sloped road surfaces and therefore construction activities that take place within terrestrial habitat areas may induce impacting features that manifest within the nearby wetlands and watercourses.

5.2.1. Construction Phase

Table 7: The ecological impact analysis and significance ratings for the impacts associated with the road rehabilitation project development.

ACTIVITY/IMPACT TYPE	**Destruction of sensitive habitat within areas designated as high ecological sensitivity.**			
PHASE	CONSTRUCTION			
IMPACT TYPE	DIRECT IMPACT Wetland units that have retained natural vegetation are considered sensitive and ecologically important habitat features. Destruction of ecologically sensitive habitat units will lead to undue destruction of natural biodiversity, impact on water quality and impact on the resource.			
RATINGS	**WITHOUT MITIGATION**		**WITH MITIGATION**	
	Extent	1 (local)	Extent	1 (local)
	Intensity	1 (low)	Intensity	1 (low)
	Duration	3 (long term)	Duration	1 (short term)
CONSEQUENCE RATING	5 (LOW)		3 (VERY LOW)	
PROBABILITY	Possible (40-70% chance)		Improbable (<40% chance)	
CUMULATIVE	HIGH		HIGH	
OVERALL SIGNIFICANCE	VERY LOW		INSIGNIFICANT	
STATUS OF IMPACT	NEGATIVE		NEGATIVE	
MITIGATION MEASURES	The ecologically sensitive features have been delineated and mapped. Conservation buffer zones have also been designated to these areas. Indiscriminate habitat destruction to be avoided and the proposed development should remain as localised as possible (including support areas and services).			
ACTIVITY/IMPACT TYPE	**Destruction of sensitive habitat within areas designated as low to medium ecological sensitivity, including the terrestrial areas.**			
PHASE	CONSTRUCTION			
IMPACT TYPE	DIRECT IMPACT Destruction of natural areas will lead to displacement and destruction of natural biodiversity, and overall ecological degradation.			
RATINGS	**WITHOUT MITIGATION**		**WITH MITIGATION**	
	Extent	1 (local)	Extent	1 (local)
	Intensity	1 (low)	Intensity	1 (low)
	Duration	3 (long term)	Duration	1 (short term)
CONSEQUENCE RATING	5 (LOW)		3 (VERY LOW)	
PROBABILITY	Possible (40-70% chance)		Improbable (<40% chance)	
CUMULATIVE	HIGH		HIGH	
OVERALL SIGNIFICANCE	VERY LOW		INSIGNIFICANT	
STATUS OF IMPACT	NEGATIVE		NEGATIVE	
MITIGATION MEASURES	Indiscriminate habitat destruction to be avoided and the proposed development should remain as localised as possible (including support areas and services). The ecological integrity of the wetland unit associated with the proposed new road section would benefit from a minor shift in the road alignment to accommodate the feature and associated buffer zones.			

ACTIVITY/IMPACT TYPE	**Destruction of habitat that may impact on the ability of the project area to support RDL species.**			
PHASE	CONSTRUCTION			
IMPACT TYPE	DIRECT IMPACT Destruction of natural areas will lead to displacement and destruction of natural biodiversity, and overall ecological degradation. This is of limited relevance as the prosed development is to remain largely within the confines of the existing road surface and road reserves and therefore limited impacts to natural areas are expected take place. No faunal or floral species of conservational significance were noted to occur within the project impact area.			
RATINGS	**WITHOUT MITIGATION**		**WITH MITIGATION**	
	Extent	1 (local)	Extent	1 (local)
	Intensity	1 (low)	Intensity	1 (low)
	Duration	3 (long term)	Duration	1 (short term)
CONSEQUENCE RATING	5 (LOW)		3 (VERY LOW)	
PROBABILITY	Possible (40-70% chance)		Improbable (<40% chance)	
CUMULATIVE	HIGH		HIGH	
OVERALL SIGNIFICANCE	VERY LOW		INSIGNIFICANT	
STATUS OF IMPACT	NEGATIVE		NEGATIVE	
MITIGATION MEASURES	Indiscriminate habitat destruction to be avoided and the proposed development should remain as localised as possible (including support areas and services).			
ACTIVITY/IMPACT TYPE	**Soil erosion**			
PHASE	CONSTRUCTION			
IMPACT TYPE	DIRECT IMPACT Soil erosion will take affect any unprotected soils that have suffered disturbances, including unprotected stockpiles of stored topsoil. Drainage features established within the road reserve areas will also induce erosion impacts. Soil stripping, soil compaction and vegetation removal will increase rates of erosion and entry of sediment into the general environment and surrounding watercourses.			
RATINGS	**WITHOUT MITIGATION**		**WITH MITIGATION**	
	Extent	1 (local)	Extent	1 (local)
	Intensity	1 (low)	Intensity	1 (low)
	Duration	3 (long term)	Duration	1 (short term)
CONSEQUENCE RATING	5 (LOW)		3 (VERY LOW)	
PROBABILITY	Possible (40-70% chance)		Improbable (<40% chance)	
CUMULATIVE	HIGH		HIGH	
OVERALL SIGNIFICANCE	VERY LOW		INSIGNIFICANT	
STATUS OF IMPACT	NEGATIVE		NEGATIVE	
MITIGATION MEASURES	Erosion must be strictly controlled through the utilization of silt traps, silt fencing, Gabions, etc. This is especially pertinent within areas of steeper gradients. Topsoil stockpiles should be protected from erosion through the utilization of silt traps, silt fencing, Gabions, etc.			

ACTIVITY/IMPACT TYPE	Impacts to water quality within surface water ecosystems that will result in impacts to the biodiversity supported by them.			
PHASE	CONSTRUCTION			
IMPACT TYPE	DIRECT IMPACT Impacts to water quality include accidental fuel/oil spills from poorly maintained equipment, accidents, or container failure, and poorly managed and/or non- bunded fuelling stations. Water quality impacts will also occur because of unabated soil erosion.			
RATINGS	WITHOUT MITIGATION		WITH MITIGATION	
	Extent	1 (local)	Extent	1 (local)
	Intensity	3 (high)	Intensity	1 (low)
	Duration	3 (long term)	Duration	1 (short term)
CONSEQUENCE RATING	7 (HIGH)		3 (VERY LOW)	
PROBABILITY	Possible (40-70% chance)		Improbable (<40% chance)	
CUMULATIVE	HIGH		HIGH	
OVERALL SIGNIFICANCE	MEDIUM		INSIGNIFICANT	
STATUS OF IMPACT	NEGATIVE		NEGATIVE	
MITIGATION MEASURES	No fuel to be stored at or near watercourses or waterbodies; Equipment to be properly maintained and serviced; Fuel storage and pump areas to be bunded to avoid accidental leakage; No refuelling should be done within the riparian zones (exceptions are made for stationery motors i.e. pumps); Accidental spills must be reported and cleaned immediately. Contaminated soils must be removed and disposed of at a registered disposal site. Soil erosion must be managed as an ongoing concern throughout the development process.			

5.2.2. Operations Phase

Table 8: The ecological impact analysis and significance ratings for the impacts associated with the road rehabilitation project.

ACTIVITY/IMPACT TYPE	Soil erosion			
PHASE	OPERATIONS			
IMPACT TYPE	INDIRECT IMPACT Soil erosion will impact any unprotected soils that have suffered disturbances, including unprotected stockpiles of stored topsoil. Soil stripping, soil compaction and vegetation removal will increase rates of erosion and entry of sediment into the general environment and surrounding watercourses.			
RATINGS	**BEFORE MITIGATION**		**AFTER MITIGATION**	
	Extent	2 (regional)	Extent	1 (local)
	Intensity	2 (medium)	Intensity	1 (low)
	Duration	3 (long term)	Duration	1 (short term)
CONSEQUENCE RATING	7 (HIGH)		3 (VERY LOW)	
PROBABILITY	Possible (40-70% chance)		Improbable (<40% chance)	
CUMULATIVE	HIGH		HIGH	
OVERALL SIGNIFICANCE	MEDIUM		INSIGNIFICANT	
STATUS OF IMPACT	NEGATIVE		NEGATIVE	
MITIGATION MEASURES	Erosion must be strictly controlled through the utilization of silt traps, silt fencing, Gabions, etc. This is especially pertinent within areas of steeper gradients. Topsoil stockpiles should be protected from erosion through the utilization of silt traps, silt fencing, etc.			

5.2. Impact Analysis

Table 7 presents the significance ratings of the potential ecological impacts for the construction phase and Table 8 presents those associated with the operational phase of the project. The ratings are calculated and presented for the scenarios for both before and after the implementation of mitigation measures. This was done to show how the degree of impacts can be reduced by careful planning and the following of relatively simple mitigation measures. A rating for cumulative impacts is also provided. The full methodology for the scoring criteria is presented in Appendix A.

6. PREFERRED ALTERNATIVES

No alignment alternatives were presented for analysis at the time of the survey. As the new road section has been shown to impinge on a wetland unit (as shown in Figure 9), the ecological functionality of the wetland unit would benefit from a slight shift in alignment to accommodate this feature. The alignment as presented does not, however, constitute a fatal flaw as the wetland unit has suffered a considerable loss of function due to historical land use and infrastructure development.

7. CONCLUSIONS AND RECOMMENDATIONS

Following the field survey of the proposed development area, the following salient recommendations can be proposed to aid in the conservation of the overall ecological integrity of the terrestrial habitat ecosystems within the region:

- Wetland habitat units were noted to be associated with the proposed development. An indication of the extent of the wetland habitat features associated with the project is presented in Figure 8.
- The proposed new road section was shown to have an association with a wetland unit (Figure 9). Although not considered a fatal flaw due to the wetland unit having already suffered a major loss of ecological functionality, the overall ecological integrity of the immediate area would benefit from a minor alignment shift within this area to accommodate the wetland unit and its associated buffer zone.
- The development is associated with an existing roadway and therefore construction activities will be largely confined to existing impact areas. Minimal impact significance is expected to occur as the road rehabilitation procedures couple to an existing road.
- The impact significance of the potential impacting features showed low overall significance, with many impacts rendered insignificant with the application of the proposed mitigation measures.
- No RDL faunal or floral species were noted during the survey. The development is not thought to impact on RDL species conservation within the region in any significant way.
- Erosion control measures and avoidance of indiscriminate habitat destruction outside of the ultimate construction footprint are regarded as the most pertinent mitigation measures.
- Culvert development sites must be suitably reinstated and landscaped to avoid erosion formation.
- Culverts should be spread over the width of the watercourse so that the surface water flows are not constricted. Designing of culvert placement, numbers and capacities must take into consideration flood flow volumes. Constriction of the watercourse will result in erosion within the channel at the downstream side of the culvert and will also reduce the lateral extent of the associated wetland. As the wetland areas are considered to have the greatest potential of supporting the greatest levels of biodiversity, it is essential that the project activities do not impact on the functionality of the wetland features.
- The overall ecological impact significance of the proposed development activities is expected to be low and therefore no justifiable reasons for opposing the development can be offered.

It should be noted that, to conserve the ecological structures within the region, a holistic habitat conservation approach should be adopted. This includes keeping general habitat destruction and construction footprints to an absolute minimum within the terrestrial habitat as well. Conserving the habitat units will ultimately conserve the species communities that depend on it for survival. This can only be achieved by the efforts of the contractor during the various processes of the construction phase.

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APPENDIX A – METHODOLOGY TO ASSESS THE IDENTIFIED IMPACTS

The EIA impact assessment will focus on the direct and indirect impacts associated with the project. All impacts will be analysed with regard to their extent, intensity, duration, probability and significance. The significance of potential impacts that may result from the proposed project will be determined to assist decision-makers (typically by a designated authority or state agency, but in some instances, the proponent). The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur. The criteria used to determine impact consequence are presented in the table below:

Rating	Definition of Rating	Score
Extent - the physical extent or spatial scale of the impact.		
Local	Confined to project or study area or part thereof (e.g. the development site and immediate surrounds)	1
Regional	The region (District Municipality or Quaternary catchment)	2
National	Nationally or beyond	3
Intensity - the impact would be destructive or benign.		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
Duration – the timeframe which the impact would occur.		
Short Term	Up to 2 years and reversible	1
Medium Term	2 to 15 years and reversible	2
Long Term	More than 15 years and irreversible	3

The combined score of these three criteria corresponds to a Consequence Rating, as follows:

Combined Score	3-4	5	6	7	8-9
Consequence Rating	Very Low	Low	Medium	High	Very High

Once the consequence was derived, the probability of the impact occurring was considered, using the probability classifications presented in the table below:

Probability – likelihood of the impact occurring	
Improbable	<40% Chance of occurring
Possible	40% - 70% chance of occurring
Probable	<70% - 90% chance of occurring
Definite	>90% chance of occurring

The overall significance of impacts was determined by considering consequence and probability using the rating system prescribed in the table below:

		Probability			
		Improbable	**Possible**	**Probable**	**Definite**
Consequences	**Very Low**	Insignificant	Insignificant	Very low	Very low
	Low	Very low	Very low	Low	Low
	Medium	Low	Low	Medium	Medium
	High	Medium	Medium	High	High
	Very high	High	High	Very High	Very High

Finally, the impacts were also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below:

Status of Impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, Hatch's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **Insignificant**: the potential impact is negligible and will not have an influence on the decision regarding the proposed activity/development.
- **Very low**: the potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity/development.
- **Low**: the potential impact may not have any meaningful influence on the decision regarding the proposed activity/development.
- **Medium**: the potential impact should influence the decision regarding the proposed activity/development.
- **High**: the potential impact will affect the decision regarding the proposed activity/development.
- **Very high**: The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended, and impacts are rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential**: measures that must be implemented and are non-negotiable; and
- **Best Practice**: recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented.

The assessment of impacts adheres to the minimum requirements in the EIA Regulations, 2014 and considers applicable official guidelines. The issues raised by I&APs will also be addressed in the assessment of impacts.