A Vegetation and Wetland Baseline & Risk Assessment for the proposed Gumede Bridge Upgrade Project

Umdoni, KwaZulu-Natal

July 2021

CLIENT

EnAq Consulting
ENVIRONMENT, CIVIL, WATER & EARTH CONSULTANTS

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Report Name	**Gumede Bridge Flora and Wetland Impact Assessment**
Reference	**Gumede Bridge**
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Report Writer (Biodiversity Assessment)	**Rudolph Greffrath**  Rudolph is a terrestrial ecology specialist with 14 years of experience in biodiversity baseline assessments, biodiversity action planning design and development, biodiversity off-set design and implementation, biodiversity strategy design, conservation management planning and implementation, IFC performance standards best practice, ecological restoration, ecosystems services and environmental impact assessments, across Africa. He is Pr Sci Nat registered (400018/17) in the following fields of practice, Conservation Science.
Reviewer	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2014 (amended in 2017). We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

DECLARATION

I, Rudolph Greffrath, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Rudolph Greffrath

Biodiversity Specialist

The Biodiversity Company

July 2021

DECLARATION

I, Andrew Husted, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Andrew Husted

Freshwater Ecologist

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July 2021

Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 Background

The Biodiversity Company was appointed to conduct a vegetation (flora) and wetland baseline and also impact assessment in support of an environmental and water uses authorisation processes for the proposed upgrade of the Gumede bridge. The project is situated within Ugu District Municipality under the administration of Umdoni Municipality in Scottburgh.The Gumede bridge project will entail:

- Demolishing of existing collapsed portal culvert bridge and construction of a new portal culvert bridge that measures approximately 7.12 m long and 6.1 m wide;
- Construction of bridge approaches with a total length of about 240 m and width matching a standard 5 m wide road with gravel wearing course finish and
- Adequate stormwater management system and earth retaining structures in the form of gabions are to be provided as necessary. Specialist support services such as topographical survey also form part of the works.

This study approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation”. The National Web based Environmental Screening Tool has characterised the terrestrial sensitivity of the Gumede bridge project area as “very high” with small portions of “low” sensitivity.

The purpose of the specialist studies is to provide relevant input into the EIA process and to provide a report for the proposed activities associated with the project. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.2 Scope of Work

The aim of the assessment is to provide information to guide the proposed activity with respect to the receiving natural environment by elucidating the current state and functioning of the ecosystems potentially impacted by the proposed activity. This was achieved through the following:

- Wetland assessment which comprised of:
    - The identification, delineation and characterisation of wetlands;
    - Ecological assessment;
    - The digitising of the required buffer zones; and
    - A wetland risk assessment;
- Flora assessment which comprised of:

- Desktop assessment to identify the reference vegetation types within the landscape;
- Desktop assessment to identify possible Species of Conservation Concern (SCC), i.e. threatened or protected species that occur within the landscape;
- Field survey to record flora species within the surrounding landscape, especially SCC;
- Delineate the habitat types that may be influenced by the proposed activity and allocate the respective habitat sensitivity based on the presence of SCC as well as ecosystem processes and services; and
- A flora risk assessment.

- The prescription of mitigation measures and recommendations for identified risks.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the location provided by the client and any alterations to the location and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The wetland/flora assessment was based on the results of a single survey only, due to time constraints, and information provided should be interpreted accordingly;
- Only wetlands that were likely to be impacted by proposed development activities were assessed in the field;
- As per the scope of work, the fieldwork component of the assessment comprised one assessment only and therefore, this study has not assessed any temporal trends. Comprehensive desktop data reviews, analysis and processing was undertaken to address this limitation;
- The field survey was undertaken in winter and therefore the probability of detection of certain species will be lowered as:
  - Not all angiosperm species will be flowering, which is generally required for identifying certain geophytes, epiphytes and lithophytes; and
  - Deciduous and annual species will be dormant.
  - Consequently, this may negligibly affect the sensitivity rating of the habitats surveyed and delineated as part of this assessment.

1.4 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements relevant to biodiversity and conservation in KwaZulu-Natal

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 43110 (March 2020)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Environmental Management Air Quality Act (No. 39 of 2004)
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	KwaZulu-Natal Nature Conservation Ordinance (Ordinance 15 of 1974)
	KwaZulu-Natal Nature Conservation Management Act (Act 9 of 1997)

2 Methods

2.1 Project Area

The project is situated within Ugu District Municipality under the administration of Umdoni Municipality in Scottburgh, KwaZulu Natal. The project site can be accessed by proceeding from Scottburgh take Dududu road and head northwest for about 7.5 km and taking the right turn onto a gravel road for about 1.6km to arrive at the bridge, (Figure 2-1).

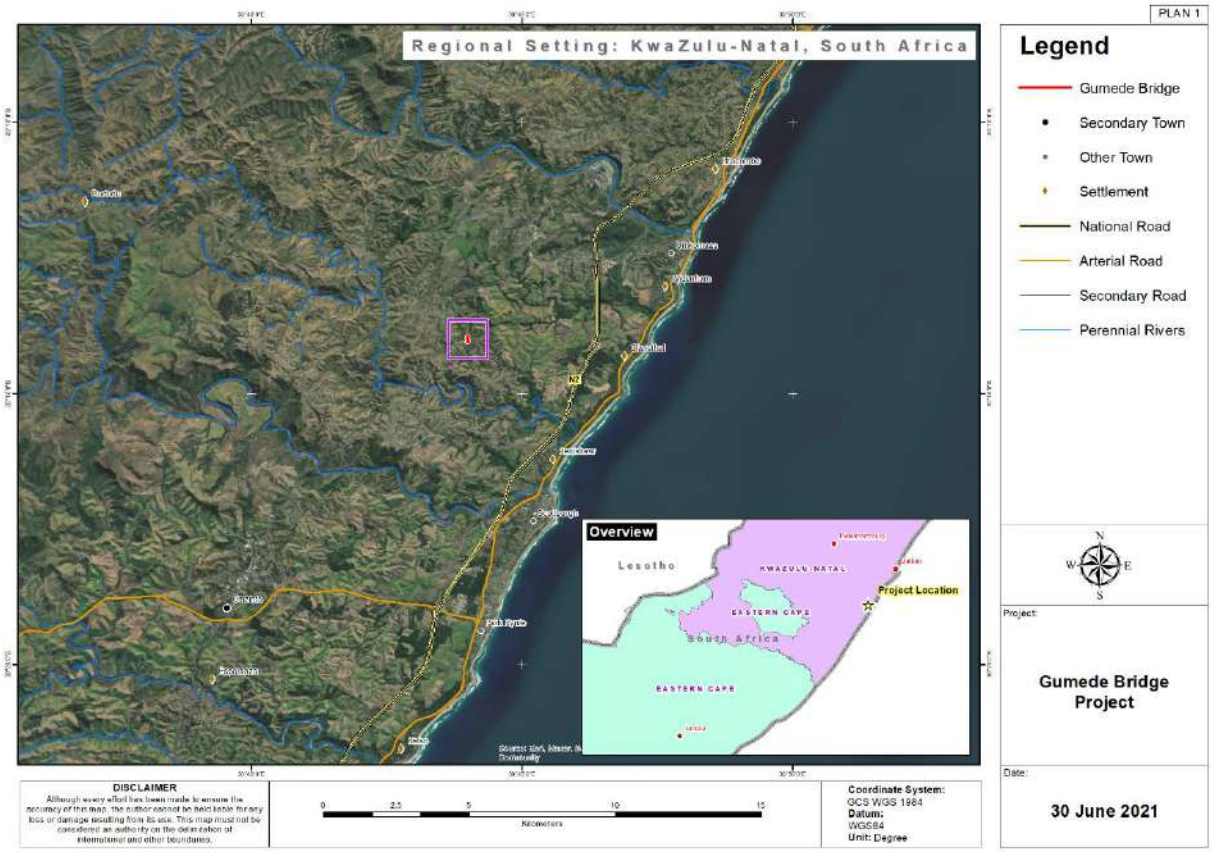

Figure 2-1 Map illustrating the location of the proposed Gumede bridge.

2.2 Wetland Assessment

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and also then includes structural features at the lower levels of classification (Ollis, *et al.* 2013).

2.2.1 Desktop Assessment

Existing data layers were incorporated into a Geographic Information Systems (GIS) to establish how the proposed project interact with these important entities. Emphasis was placed around the following spatial datasets which are generally the most recent and also recognizable datasets to be considered:

- Aerial imagery (Google Earth Pro);

- Land Type Data (Land Type Survey Staff, 1972 - 2006);
- National Biodiversity Assessment (Van Deventer *et al.,* 2019) – Ecosystem Threat Status (ETS) of river ecosystem types is based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), with CR, EN and VU ecosystem types collectively referred to as 'threatened'.; and
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al*., 2018) - This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released with the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018; and
- Contour data (5 m).

2.2.2 Field Assessment

The wetland survey was conducted in June 2021, which will be considered a dry season survey. Position in the landscape as well as indicator species presence were the primary wetland presence tools used. Only the wetlands directly impacted on and within 100 m of the proposed activity were assessed in the field.

2.2.2.1 Wetland Delineation

The wetland areas are delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 2-2. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

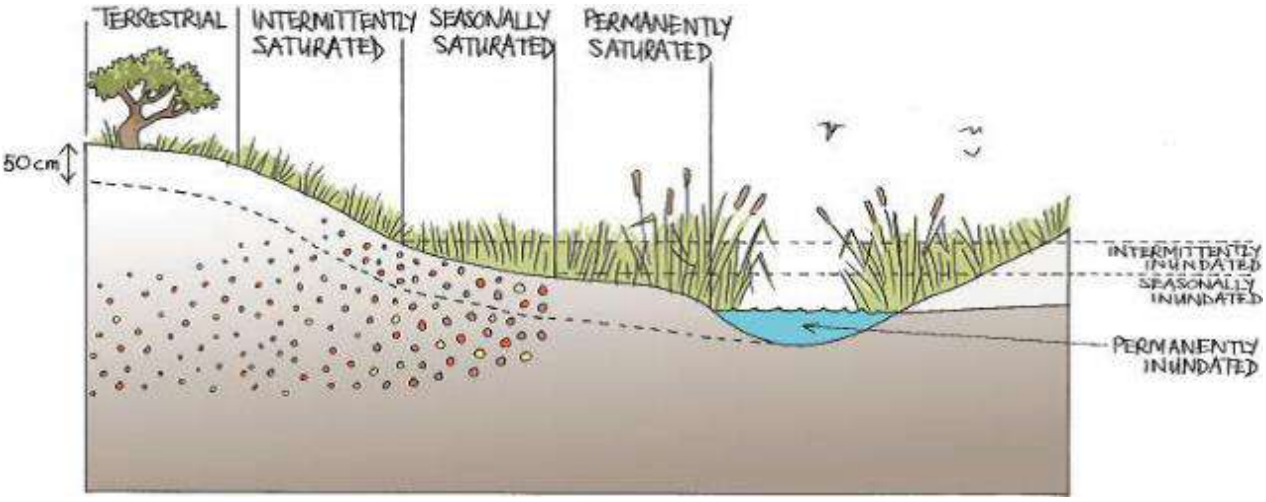

Figure 2-2 Diagram illustrating a cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis, et al. 2013)

2.2.2.2 Present Ecological State

The wetlands health is split into three components namely, the hydrological, the geomorphological and the vegetational components below (Macfarlane, *et al*. 2019 draft report). These are defined below:

- ***Hydrology*** is defined in this context as the distribution and movement of water through a wetland and its sediments. This component focuses on ***(i)*** changes in water inputs that result from human alterations to the catchment which affect water inflow quantity and pattern, and ***(ii)*** modifications within the wetland itself that alter the water distribution and retention patterns of the wetland (e.g. artificial drainage channels). These aspects are then integrated into a composite score that reflects the overall change in wetland hydrology.

- ***Geomorphology*** in this context is assessed by assessing changes to ***(i)*** geomorphic processes and ***(ii)*** the geomorphic structure of the wetland. Geomorphic processes in this context, refers to those physical processes that are currently shaping and modifying wetland form and evolution, whilst geomorphic structure refers to the three-dimensional shape of sediment deposits on which wetland habitat is established. Whilst catchment drivers (similar to those assessed in the hydrology module) are integrated as part of the assessment, impacts are ultimately assessed based on an understanding of the degree to which within-wetland geomorphic processes and the associated structure of the wetland have been altered by anthropogenic activities. The component also accounts for differences in geomorphic processes in wetlands characterised by clastic (minerogenic) sedimentation and those characterised by organic sediment accumulation (peat).

- ***Vegetation*** is defined in this context as the structural and compositional state of the vegetation within a wetland. This component evaluates changes in vegetation composition and structure as a consequence of current and historic on-site transformation and/or disturbance. Whilst the assessor needs to have some knowledge of vegetation in a particular region, the method does not require the assessor to be able to identify all wetland plant species. The emphasis is rather on identifying alien and ruderal (weedy) species that indicate disturbance and assessing

their occurrence relative to common naturally occurring indigenous species, including those that are naturally dominant in the wetland.

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a PES score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The impact scores and PES categories are provided in Table 2-1.

Table 2-1 Summary of wetland Present Ecological State (PES) categories (Macfarlane, et al. 2009)

Impact Category	Description	Impact Score Range	Present Ecological State (PES) Category
None	Unmodified, natural	0 to 0.9	A
Small	**Largely Natural** with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	**Moderately Modified.** A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	**Largely Modified.** A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	**Seriously Modified.** The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	**Critical Modification.** The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

2.2.2.3 Ecosystem Services

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze, *et al*. 2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 2-2).

Table 2-2 Classes for determining the likely extent to which a benefit is being supplied (Kotze, et al. 2009)

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

2.2.2.4 Importance & Sensitivity

The importance and sensitivity of water resources is determined in order establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category as listed in Table 2-3.

Table 2-3 Description of ecological Importance and Sensitivity (IS) categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	A
High	2.1 to 3.0	B
Moderate	1.1 to 2.0	C
Low Marginal	< 1.0	D

2.2.2.5 Buffer Determination

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane, *et al.,* 2014) was used to determine the appropriate buffer zone for the proposed activity.

2.2.3 Risk Assessment

The risk assessment will be completed in accordance with the requirements of the DWS General Authorisation (GA) in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 2016). The significance of the impact is calculated according to Table 2-4.

Table 2-4 Description of Department of Water and Sanitation (DWS) significance ratings matrix

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s)impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

2.3 Flora Assessment

2.3.1 Desktop Assessment

The desktop assessment was principally undertaken using a GIS to access the latest spatial datasets to develop digital cartographs and species lists. These datasets and their date of publishing are provided below.

2.3.1.1 Ecological Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- Critical Biodiversity Areas (EKZNW 2016a) –CBAs are natural or near-natural features, habitats or landscapes that include terrestrial, aquatic and marine areas that are considered critical for:
    - meeting national and provincial biodiversity targets and thresholds;
    - safeguarding areas required to ensure the persistence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or

- conserving important locations for biodiversity features or rare species.

Conservation of these areas is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017);

- National Biodiversity Assessment 2019 (Skowno *et al*, 2019) – The purpose of the National Biodiversity Assessment (NBA) is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:
  - Ecosystem Threat Status – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition;
  - Ecosystem Protection Level – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems; and
- Protected areas (EKZNW 2016b).

2.3.1.2 Desktop Botanical Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) was used in order to identify the vegetation type that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Botanical Database of Southern Africa (BODATSA) was accessed to compile a list of expected flora species within the proposed development area and surrounding landscape (Figure 2-3). The Red List of South African Plants (Raimondo *et al.,* 2009) was utilized to provide the most current national conservation status of flora species.

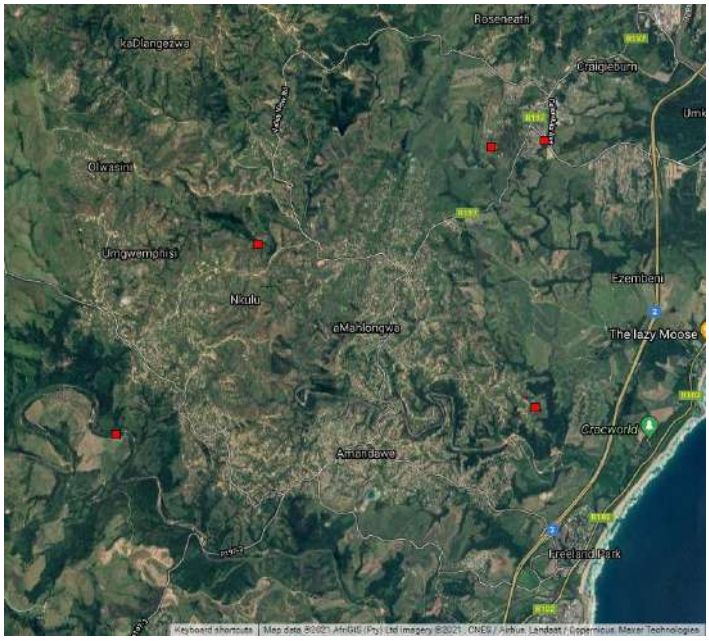

Figure 2-3 Map illustrating extent of area used to obtain the expected flora species list from the BODATSA database

2.3.2 Field Assessment

A single field survey was undertaken on the 21st June 2021 (Winter) to confirm the presence of SCC, as well as any sensitive habitat features. The survey was undertaken 50 m on either side of the present bridge and dirt road based on the GIS analysis incorporating the latest applicable biodiversity datasets available prior to the fieldwork. The sampling effort was focused within the area perceived as ecologically important. The reasoning behind this was that the biotic components of these areas will be more susceptible to environmental change arising from the proposed activity. Effort was made to cover all the different habitat types within the limits of time and access. During the survey, notes were made regarding current impacts, recording of dominant vegetation species and any sensitive or important features (e.g. wetlands, rock outcrops, termite mounds etc.).

2.3.3 Botanical Assessment

The botanical assessment encompassed an array of the vegetation units and habitat types within the project area. This primarily involved meandering through habitat types and identifying all species observed and particularly locating any species of conservation concern.

Relevant field guides and texts consulted for identification purposes in the field during the survey included the following:

- Pooley's Trees of Eastern South Africa – A Complete Guide (Boon, 2010);
- A Field Guide to Wildflowers – KwaZulu-Natal and the Eastern Region (Pooley, 1998);
- Orchids of South Africa – A Field Guide (Johnson and Bytebier, 2015);
- Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions (Fish *et al.,* 2015); and
- Problem Plants and Alien Weeds of South Africa (Bromilow, 2010).

3 Results & Discussion

The section below details the results of the assessment and is divided into the wetland and flora components.

3.1 Wetland Assessment

3.1.1 Desktop Assessment

3.1.1.1 Terrain Analysis

A National Aeronautics and Space Administration (NASA) Shuttle Radar Topography Mission (SRTM) (V3.0, 1 arcsec resolution) Digital Elevation Model (DEM) was obtained from the United States Geological Survey (USGS) Earth Explorer website. Basic terrain analysis was performed on this DEM using the SAGA GIS software that encompassed slope and channel network analyses to detect catchment areas and potential drainage lines, respectively.

Figure 3-1 illustrates that the road and associated bridge is in the lower portion of the landscape which is predominantly the midslope to valley bottom landscape positions. The dominant hydrological response is generally runoff. This area as shown in the wetland delineation is also a wetter section. The topographical elevation model (Figure 3-1) shows the areas that will most likely result in wetland conditions (green to light brown in map). A likely drainage direction analysis was overlaid to illustrate the hydrological drainage of the area, as well as areas of convergence of flows, the lowerlying wetland area consists of a slope of between 0 and 12 degrees (Figure 3-2).

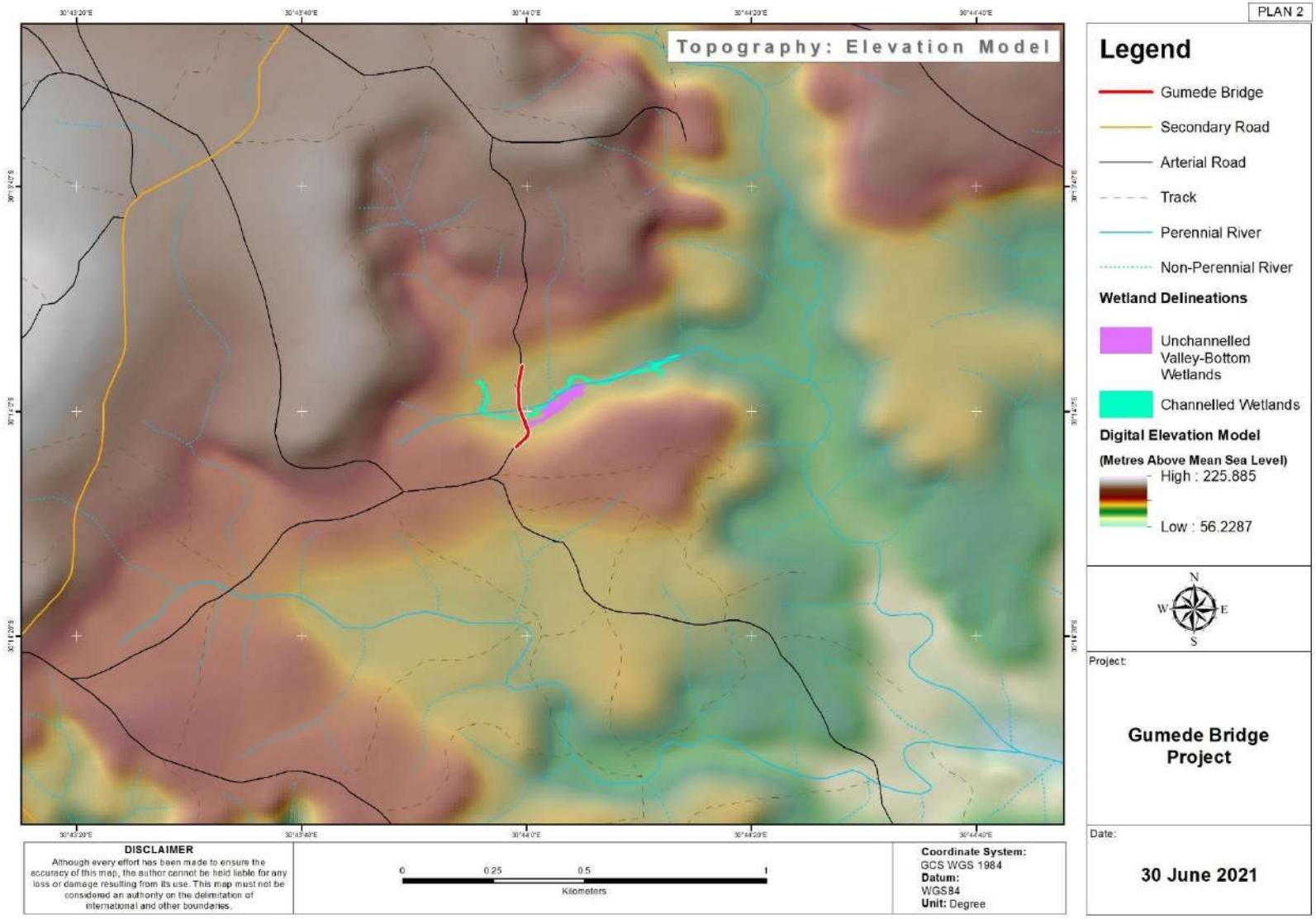

Figure 3-1 Map illustrating the relief and drainage for the landscape surrounding the Gumede bridge project

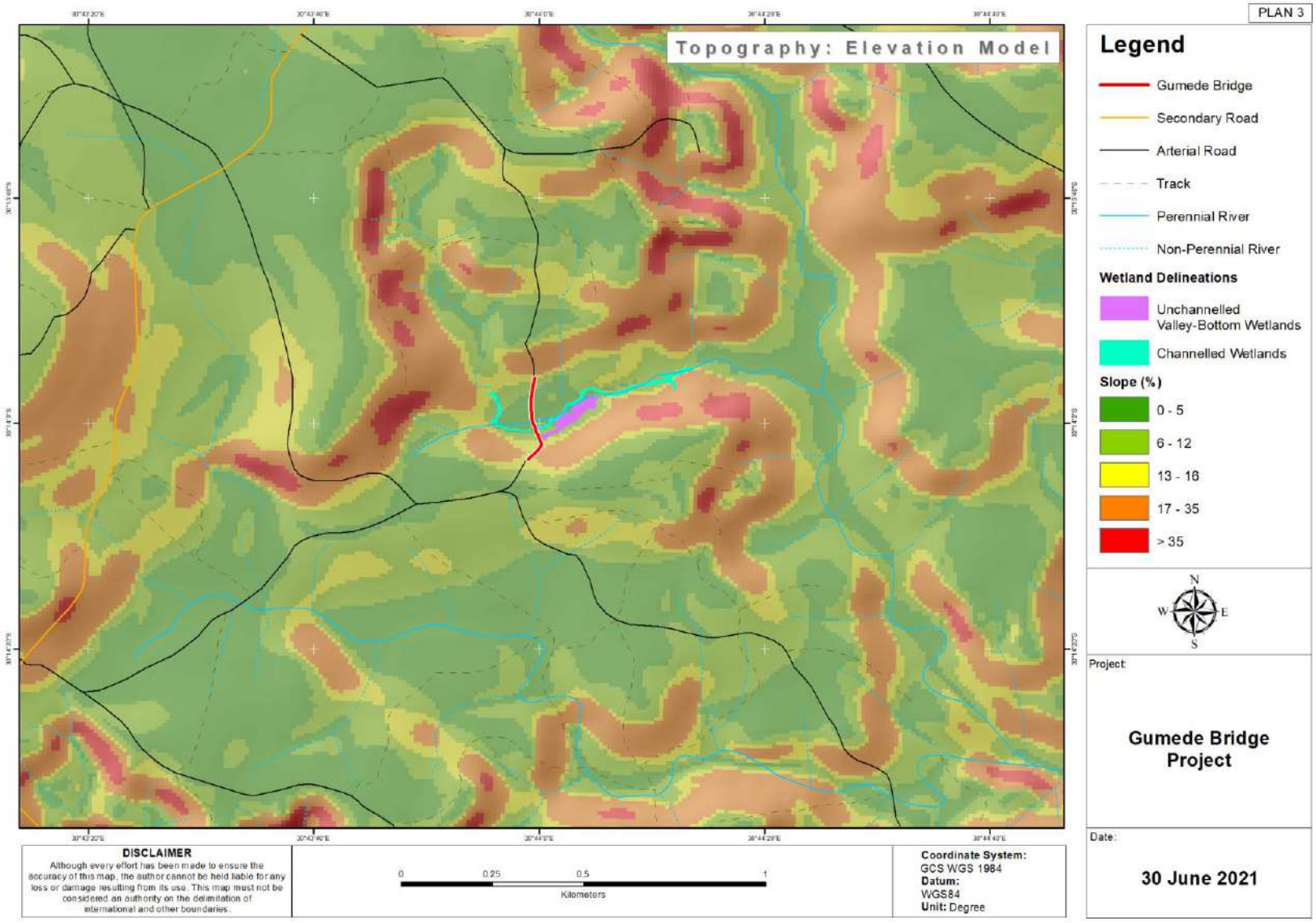

Figure 3-2 Map illustrating the slope and likely drainage map for the landscape surrounding the Gumede bridge project

3.1.1.2 National Biodiversity Assessment (NBA)

According to the spatial dataset the wetlands in the region are classified as critically endangered (CR). According to the spatial dataset the wetlands in the region are classified as not protected (NP).

3.1.1.3 South African Inventory of Inland Aquatic Ecosystems

Based on the SAIIAE spatial data, the assessment area:

- Does not intersect any NFEPA wetlands;
- Does not intersect with a Ramsar site.

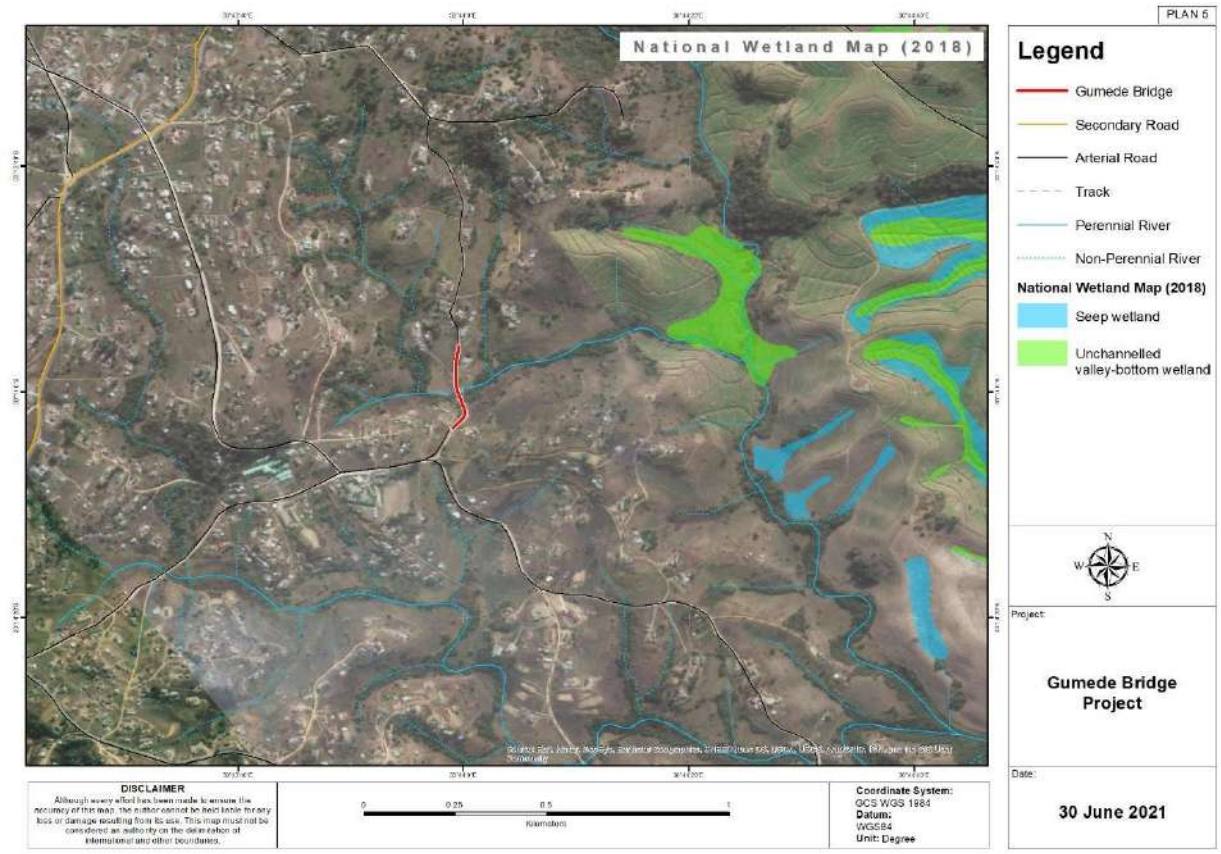

Figure 3-3 Map illustrating the location of NFEPA rivers and wetlands proximal to the Gumede bridge project.

3.1.2 Field Assessment

3.1.2.1 Wetland Delineation

The field survey yielded two (2) wetland types (Figure 3-4). The wetland types identified, were channelled valley bottom, and unchannelled valley bottom. These were then grouped into HGM units as presented in Table 3-1. The location and extent of the wetlands delineated is illustrated in Figure 3-6.

Figure 3-4 ***Photographs illustrating wetland types identified within the assessment area of the Gumede bridge. A and C) HGM 1 - channelled valley bottom, B and D) HGM 2 – unchannelled valley bottom.***

Table 3-1 ***Wetland classification as per SANBI guideline (Ollis et al. 2013).***

HGM No.	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion	SAIIAE Wet Veg Group	Landscape Unit	4A (HGM)	4B	4C
1	Inland	South Eastern Uplands	Sub-Escarpment Savannah	Valley Floor	Channelled Valley Bottom	N/A	N/A
2				Valley Floor	Unchannelled Valley Bottom	N/A	N/A

The seasonality of the survey severely restricted the ability to identify wetland plants and as a result only these were identified (Figure 3-5), namely, *Sporobolus pyramidalis, Cyperus digitatus, Setaria sphacelata, Juncus effusus* and *Coix lacryma-jobi*.

Figure 3-5 ***Wetland indicators at the Gumede Bridge project. A) Imperata cylindrica, B) Cyperus digitatus, C) Channel in Valley Bottom, D) Imperata cylindrica and E) Sporobolus pyramidalis F) Coix lacryma-jobi, G) Channel in Valley Bottom, Cyperus digitatus.***

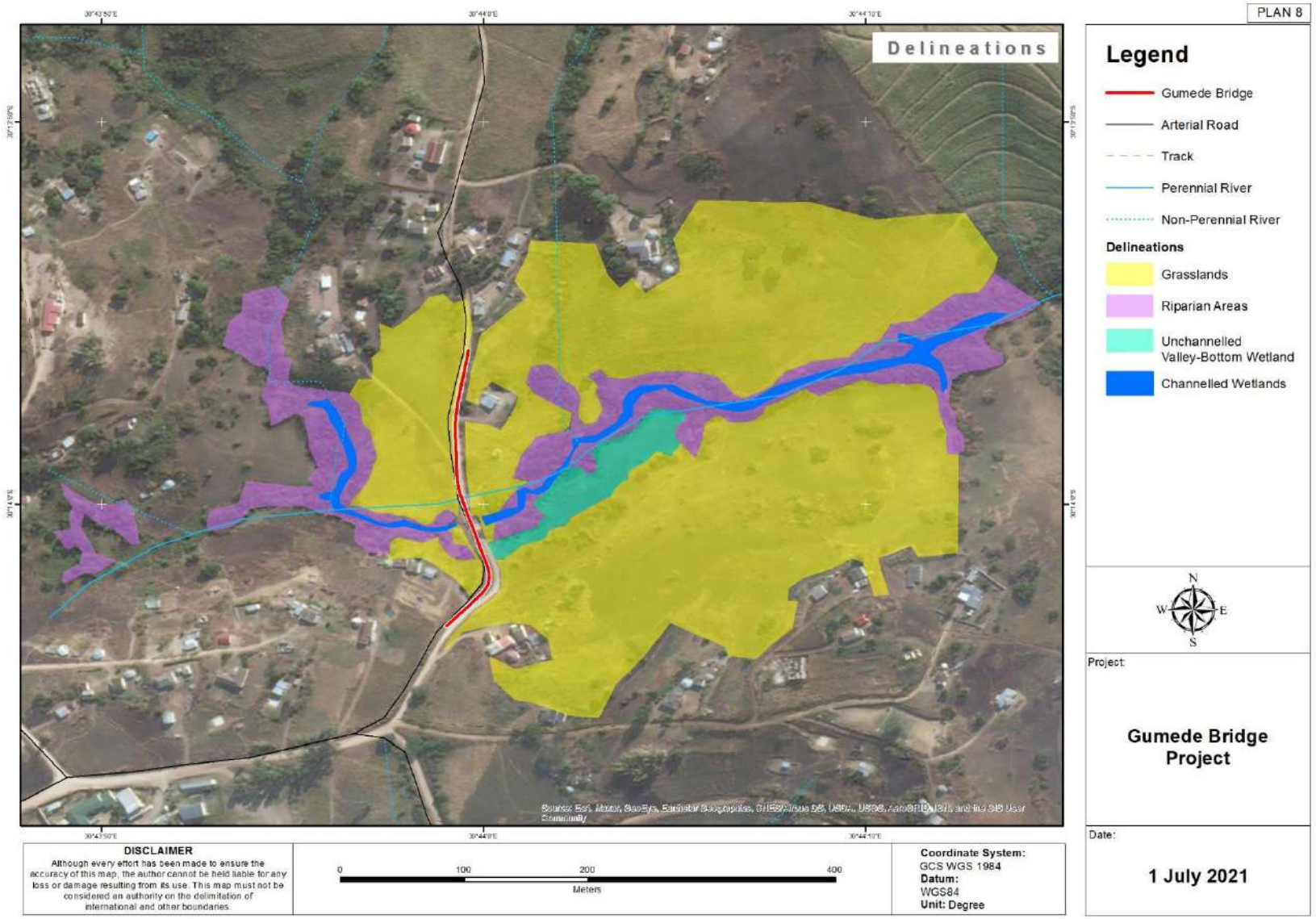

Figure 3-6 Map illustrating the location and extent of wetlands delineated within the assessment area of Gumede bridge project

3.1.2.2 Wetland Unit Setting

As aforementioned, two wetland types were identified during the field assessment and these are described in further detail below.

Channelled valley bottom wetlands are characterised by their location on valley floors, the absence of characteristic floodplain features and the presence of a river channel flowing through the wetland (Ollis *et al*. 2013). This has been illustrated in Figure 3-7.

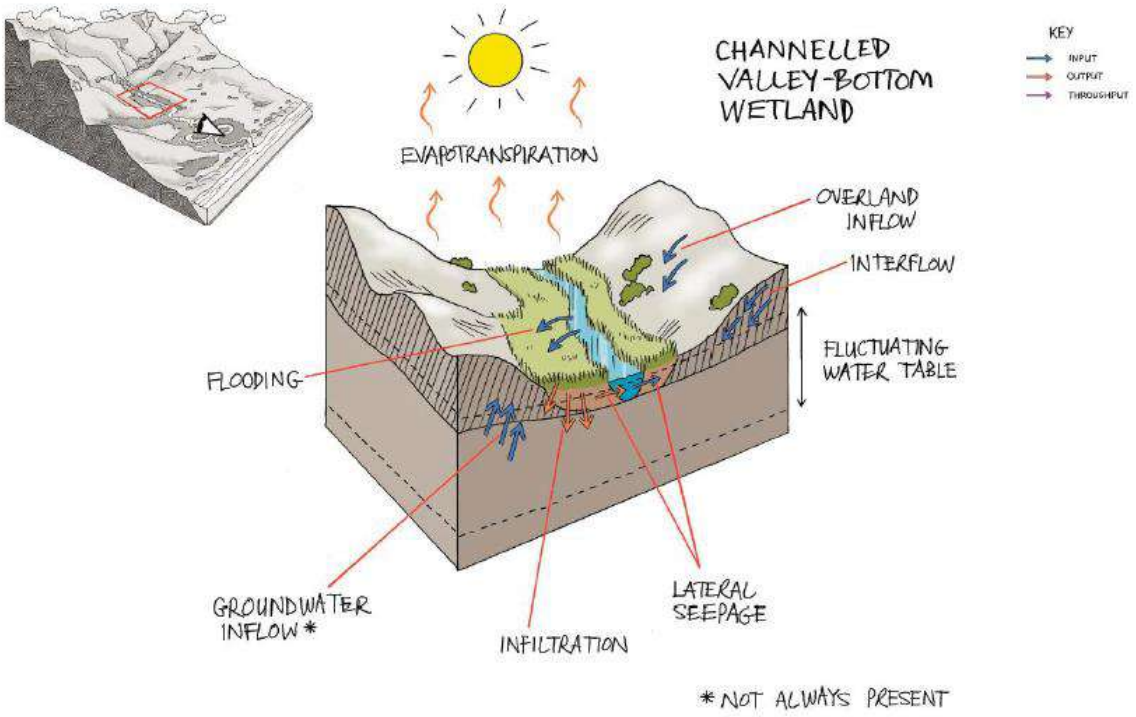

Figure 3-7 Illustration of channelled valley bottom flow dynamics (Ollis et al. 2013)

Unchannelled valley bottom wetland is a valley bottom wetland without a river channel running through it. Unchannelled valley bottom wetlands are characterised by their location on valley floors, an absence of distinct channel banks, and the prevalence of diffuse flows (Ollis *et al*. 2013). This has been illustrated in Figure 3-9.

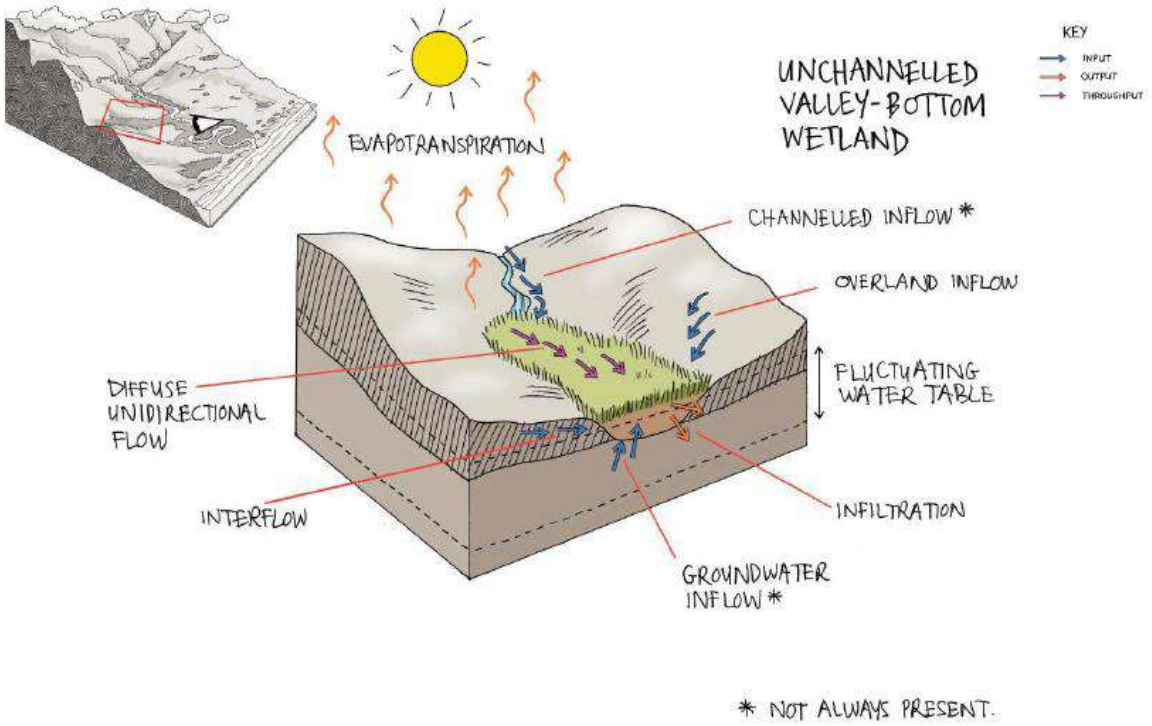

Figure 3-8 Illustration of unchannelled valley bottom flow dynamics (Ollis et al. 2013)

3.1.2.3 Present Ecological State (PES)

The PES is determined by using the WET-Health guidelines set out (Macfarlane, *et al*.) in 2009. The PES for the assessed HGM units is presented in Table 3-2 to Table 3-3. The overall PES ratings for the HGM units ranged from largely natural (class B) to moderately modified (class C).

Table 3-2 Summary of the Present Ecological State (PES) scores for HGM unit 1

Component	PES Rating	Description
Hydrology	C	**Moderately Modified:** The River catchment is within a rural setting. There are hardened surfaces associated with urbanization. These increase surface runoff into stormwater systems which ultimately lead to the valley bottom locations. Increasing erosion potential.
Geomorphology	C	**Moderately Modified:** The changed hydrological inputs cause erosion deepening channels through erosion. The erosion increases sedimentation into valley bottom systems altering the shape of the wetlands. The crossing structures also impede wetland throughflows and reduce wetland width at those locations.
Vegetation	C	**Moderately Modified:** The alien vegetation within the disturbed areas have encroached into wetland zones. Livestock have also grazed within the wetland areas reducing the coverage.
Overall	C	**Moderately Modified:** A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.

Table 3-3 Summary of the Present Ecological State (PES) scores for HGM unit 2

Component	PES Rating	Description
Hydrology	B	**Largely Natural**: The channelled valley bottom is situated adjacent to unchannelled valley bottoms, the unchannelled valley bottom changed to the channelled valley bottom predominantly based on the increased slope. The hydrological changes are based on reduced vegetation cover due to livestock grazing. This is limited in severity though.
Geomorphology	B	**Largely Natural**: The only alteration to the wetland shape has occurred at the road crossing point, which narrowed wetland edges and altered wetland structure in the direct up- and downslope areas.

Vegetation	**C**	**Moderately Modified:** There is some alien vegetation at the crossing point, as well as reduced natural vegetation as a result of the crossing infrastructure.
Overall	**C**	**Moderately Modified:** A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.

3.1.2.4 Wetland Ecosystem Services

Channelled valley bottoms provide an important link between the upper slopes of a catchment and the floodplains of the lower catchment. These wetlands are often on steeper gradients and play a moderate role in flood attenuation and erosion control. The assimilation of phosphates, nitrates and toxicants can be significant if the wetlands are in a healthy state. They provide a link within the landscape for fauna as these areas are often the only areas that have not been transformed.

Unchannelled valley bottoms play a significant role in streamflow regulation and erosion control. These wetlands are on flatter slopes and flow velocity is reduced. Water often moves laterally in the soil vadose zones assimilating various nutrients and toxicants in the process. They are also often cultivated due to an increased fertility through sediment trapping and a water source close to the surface (subsistence agriculture).

The HGM units were assessed for the current levels of services provided (Table 3-4). The overall levels of service for both HGM units were rated as being Intermediate. The channelled valley bottom only provides a moderately high service for the provisioning of harvestable resources. The water quality enhancement properties for HGM 2 were all rated as moderately high. The unit also provides some flood attenuation benefits. HGM 2 also provides moderately high levels of service for the maintenance of biodiversity. The unit displayed sufficient habitat as well as the presence of some unique species.

Table 3-4 The EcoServices provided by the wetlands within the assessment area of the Gumede bridge project

Wetland Unit					HGM 1	HGM 2
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation		2.0	2.1
			Streamflow regulation		1.5	1.8
			Water Quality enhancement benefits	Sediment trapping	2.0	2.1
				Phosphate assimilation	1.9	2.1
				Nitrate assimilation	1.7	2.3
				Toxicant assimilation	2.0	2.1
				Erosion control	1.9	2.5
			Carbon storage		1.7	2.3
	Direct Benefits	Biodiversity maintenance			1.9	2.5
		Provisioning benefits	Provisioning of water for human use		1.6	1.6
			Provisioning of harvestable resources		2.4	2.4
			Provisioning of cultivated foods		1.0	1.4
		Cultural benefits	Cultural heritage		1.0	1.0
			Tourism and recreation		0.7	1.1
			Education and research		0.8	0.8
Overall					24.9	28.1

Average	**1.7**	**1.9**

3.1.2.5 Importance & Sensitivity

The IS assessment was applied to the HGM units described in the previous section in order to assess the levels of sensitivity and ecological importance of the wetlands. The results of the assessment are shown in Table 3-5.

The wetland ETS and EPL are discussed in the desktop section and shows that the wetlands in this region are generally critically endangered (CR) and not protected (NP).

The EIS for the channelled valley bottom (HGM 1) was calculated to be High (class B) importance. This rating can be attributed to the ecological importance of the drainage system and functionality. The unchannelled valley bottom (HGM 2) were also rated as having a High importance based on the presence of unique species (crane spotting).

The Hydrological Functionality of all the HGM units were rated as Moderate (class C) and High (class B) importance for HGM 1 and HGM 2 respectively. The Direct Human Benefits were calculated to have a Low (class D) importance.

Table 3-5 The ecological Importance & Sensitivity assessment results for the wetlands within the assessment area

Wetland Importance and Sensitivity	HGM 1	HGM 2
Ecological Importance & Sensitivity	**B**	**B**
Hydrological/Functional Importance	**C**	**B**
Direct Human Benefits	**D**	**D**

3.1.2.6 Buffer Determination

According to Ezemvelo KZN Wildlife (EKZNW, 2013) a minimum recommended buffer size of 30 m is required for wetlands within the province. The wetland buffer zone tool (Macfarlane, *et al.,* 2014) was used to calculate the appropriate buffer required for the construction of an access road. According to the buffer guideline (Macfarlane, *et al.,* 2017) a high-risk activity would require a buffer that is 95% effective to reduce the risk of the impact to a low-level threat. The risks were then reduced to Low with the prescribed mitigation measures and therefore the recommended buffer was calculated to be 16 m (Table 3-6) for the construction and operational phases.

Table 3-6 Post-mitigation wetland buffer requirement

Required Buffer after mitigation measures have been applied	
Construction Phase	**16 m**
Operational Phase	**16 m**

The buffer was calculated to be 16 m as the model shows that the largest threat (High) posed during the construction phase is that of “increased sediment inputs and turbidity” (Table 3-12). During the operational phase a moderate risk is posed by the possible inputs of toxic heavy metal contaminants and nutrients. The risks were then reduced to Low with the prescribed mitigation measures (Table 3-7) and therefore the recommended buffer was calculated to be 16 m for the construction and operational phases.

The buffer zone will not be applicable for areas of the project that traverse wetland areas, however, for all secondary activities such as laydown yards, storage areas and camp sites, the buffer zone must be implemented.

Table 3-7 The risk results from the wetland buffer model for the proposed Gumede bridge project

Threat Posed by the proposed land use / activity		Specialist Threat Rating	Description of any additional mitigation measures	Refined Threat Class
Construction Phase	1. Alteration to flow volumes	Very Low		Very Low
	2. Alteration of patterns of flows (increased flood peaks)	Low		Low
	3. Increase in sediment inputs & turbidity	Very High	There is an existing road over the watercourses and the proposed project will reduce the risk of sedimentation because of the improved designs. Dry season construction is preferable. Implement stormwater management measures, these include the deployment of silt traps and managed stockpiles. Minimise the disturbance to riparian areas. Prioritise the upgrade of crossing areas during the low flow period.	Medium
	4. Increased nutrient inputs	N/A		N/A
	5. Inputs of toxic organic contaminants	Very Low		Very Low
	6. Inputs of toxic heavy metal contaminants	Low		Very Low
	7. Alteration of acidity (pH)	Very Low		Very Low
	8. Increased inputs of salts (salinization)	N/A		N/A
	9. Change (elevation) of water temperature	N/A		N/A
	10. Pathogen inputs (i.e. disease-causing organisms)	N/A		N/A
Operational Phase	1. Alteration to flow volumes	Very Low		Very Low
	2. Alteration of patterns of flows (increased flood peaks)	Low		Low
	3. Increase in sediment inputs & turbidity	High	Based on the fact that this is a gravel road the risk is anticipated, however there is an existing track with no engineering designs, the engineered layout and mitigation measures will reduce the risks and improve the likelihood of controlling sedimentation and nutrient inputs.	Low
	4. Increased nutrient inputs	Medium		Low
	5. Inputs of toxic organic contaminants	Very Low		Very Low
	6. Inputs of toxic heavy metal contaminants	Very Low		Low
	7. Alteration of acidity (pH)	N/A		N/A
	8. Increased inputs of salts (salinization)	Very Low		Very Low
	9. Change (elevation) of water temperature	N/A		N/A
	10. Pathogen inputs (i.e. disease-causing organisms)	N/A		N/A

3.2 Flora Assessment

3.2.1 Desktop Assessment

3.2.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed development to ecologically important landscape features are summarised in Table 3-8.

Table 3-8 Summary of relevance of the proposed Gumede bridge project to ecologically important landscape features.

Desktop Information Considered	Relevant/Not relevant	Section
Ecosystem Threat Status	The project area is situated within an ecosystem that is listed as CR	3.2.1.2
Ecosystem Protection Level	The project area is rated as *Normally Protected*.	3.2.1.3
Protected Areas	The project area is 12 km from the Vernon Crookes Nature Reserve	-
KZN Corridors	Irrelevant – Further than 16 km to the closest officially classified corridor area	-
Critical Biodiversity Area	The project area overlaps with the area classified as: Irreplaceable.	3.2.1.4
NPAES Focus Areas	Irrelevant – Further than 20 km to the closest focus area	3.2.1.5

3.2.1.2 Ecosystem Threat Status

According to the spatial dataset the proposed development is located within Irreplaceable ecosystem (KZN 18).

3.2.1.3 Ecosystem Protection Level

The proposed development is located within a Normally protected ecosystem.

3.2.1.4 Critical Biodiversity Areas (CBAs)

The proposed development is located adjacent to an Irreplaceable CBA (Figure 3-9).

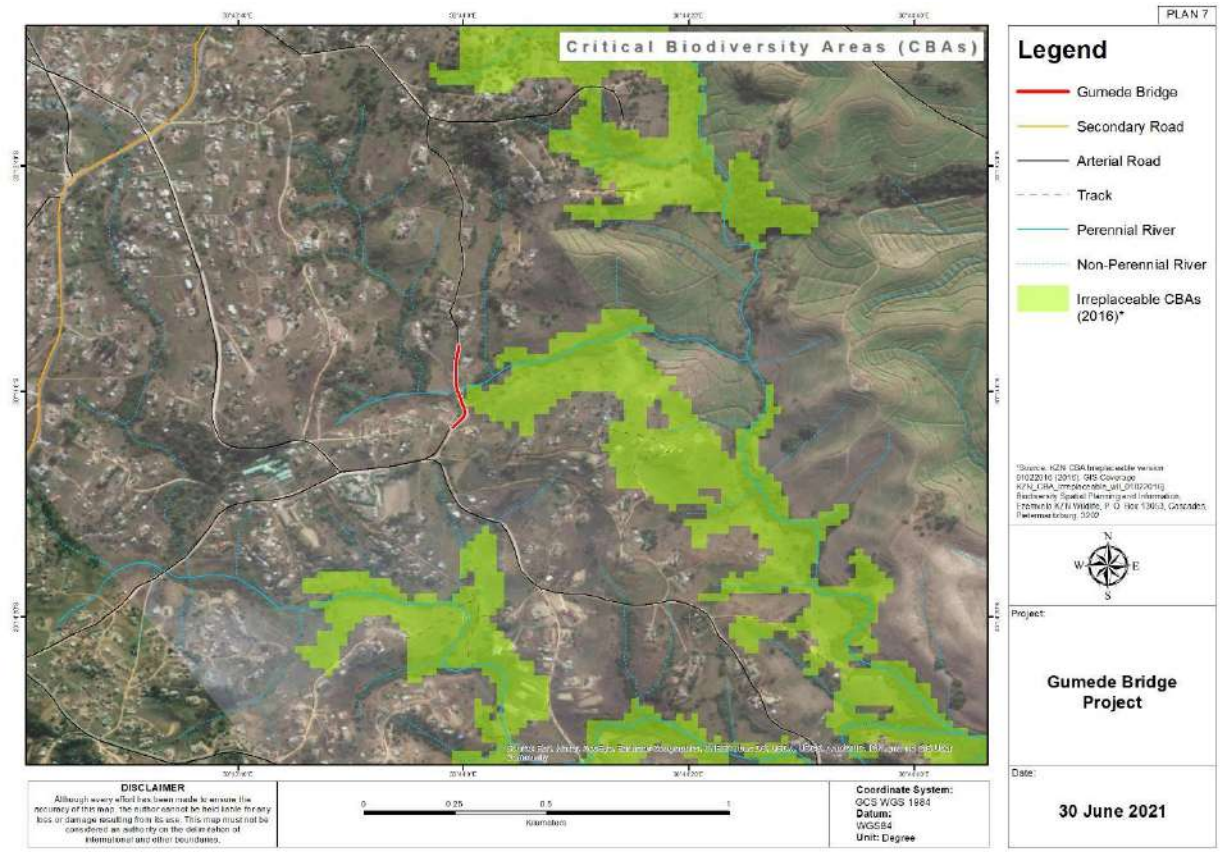

Figure 3-9 Map illustrating the locations of Irreplaceable Biodiversity Areas proximal to the Gumede bridge project

3.2.1.5 Flora Assessment

This section is divided into a description of the vegetation type expected under natural conditions and the expected flora species.

3.1.1.1.1 Vegetation Type

The project area is situated within the Indian Ocean Coastal Belt Biome. The vegetation consists of tall dense thickets on dunes mainly outside the influence of salt spray, dominated by stunted trees, shrubs, abundant lianas and spare herbaceous and grassy undergrowth (Mucina & Rutherford 2006).

The development footprint is situated across one vegetation type, the KwaZulu-Natal Coastal Belt Grassland.

3.2.2 Biome

The project area is situated within the Indian Ocean Coastal Belt biome. This region occurs as an almost 800 km long coastal strip between the South African border with Mozambique as far south as the mouth of the Great Kei River. This high-level vegetation unit comprises a dominant forest cover interrupted by edaphically or hydrologically controlled areas of grassland, with at least a significant part of the belt being open to dense savanna vegetation, interspersed with many areas of forest and grassland. The overwhelmingly large extent of transformation of the coastal belt outside the existing strips and patches of embedded forest represents significant loss of evidence of its prior condition.

The project area is situated in the KwaZulu-Natal coastal belt grassland vegetation type according to SANBI (2018) (Figure 3-10).

KwaZulu-Natal coastal belt grassland

This vegetation type occurs in the KwaZulu-Natal Province. This is a long and in places broad coastal strip along the KwaZulu-Natal coast, from near Mtunzini in the north, via Durban to Margate and just short of Port Edward in the south. Altitude ranges from about 20–450 m.

Important Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are important in the KwaZulu-Natal coastal belt grassland:

Graminoids: *Aristida junciformis subsp. galpinii (d), Digitaria eriantha (d), Panicum maximum (d), Themeda triandra (d), Alloteropsis semialata subsp. eckloniana, Cymbopogon caesius, C. nardus, Eragrostis curvula, Eulalia villosa, Hyparrhenia filipendula, Melinis repens*.

Herbs: *Berkheya speciosa subsp. speciosa (d), Cyanotis speciosa (d), Senecio glaberrimus (d), Alepidea longifolia, Centella glabrata, Cephalaria oblongifolia, Chamaecrista mimosoides, Conostomium natalense, Crotalaria lanceolata, Dissotis canescens, Eriosema squarrosum, Gerbera ambigua, Hebenstretia comosa, Helichrysum cymosum subsp. cymosum, H. pallidum, Hibiscus pedunculatus, Hybanthus capensis, Indigofera hilaris, Pentanisia prunelloides subsp. latifolia, Senecio albanensis, S. bupleuroides, S. coronatus, S. rhyncholaenus, Sisyranthus imberbis, Stachys aethiopica, S. nigricans, Vernonia galpinii, V. oligocephala*.

Geophytic Herbs: *Bulbine asphodeloides, Disa polygonoides, Hypoxis filiformis, Ledebouria floribunda, Pachycarpus asperifolius, Schizocarphus nervosus, Tritonia disticha*.

Low Shrubs: *Clutia pulchella, Gnidia kraussiana, Phyllanthus glaucophyllus, Tephrosia polystachya*.

Woody Climbers: *Abrus laevigatus, Asparagus racemosus, Smilax anceps*.

Small Trees & Tall Shrubs: *Bridelia micrantha (d), Phoenix reclinata (d), Syzygium cordatum (d), Acacia natalitia, Albizia adianthifolia, Antidesma venosum*.

Biogeographically Important Taxa (Coastal belt element, Southern distribution limit) Graminoids: *Cyperus natalensis, Eragrostis lappula*.

Herbs: *Helichrysum longifolium, Selago tarachodes, Senecio dregeanus, Sphenostylis angustifolia*.

Geophytic Herbs: *Kniphofia gracilis, K. littoralis, K. rooperi, Pachystigma venosum, Zeuxine africana*.

Low Shrubs: *Helichrysum kraussii (d), Agathisanthemum bojeri, Desmodium dregeanum*.

Megaherb: *Strelitzia nicolai* (d).

Geoxylic Suffrutices: *Ancylobotrys petersiana, Eugenia albanensis, Salacia kraussii*.

Small Trees & Tall Shrubs: *Anastrabe integerrima (d), Acacia nilotica subsp. kraussiana*.

Endemic Taxa

Herb: *Vernonia africana* (extinct).

Geophytic Herb: *Kniphofia pauciflora*.

Low Shrub: *Barleria natalensis* (extinct).

Conservation Status

According to Mucina & Rutherford (2006), this vegetation type is classified as Endangered. The national target for conservation protection for both these vegetation types is 25%, with a very small part statutorily conserved in Ngoye, Mbumbazi and Vernon Crookes Nature Reserves. About 50% of the vegetation type is transformed for cultivation, by urban sprawl. Aliens include *Chromolaena odorata, Lantana camara, Melia azedarach* and *Solanum mauritianum*. Erosion is low and moderate.

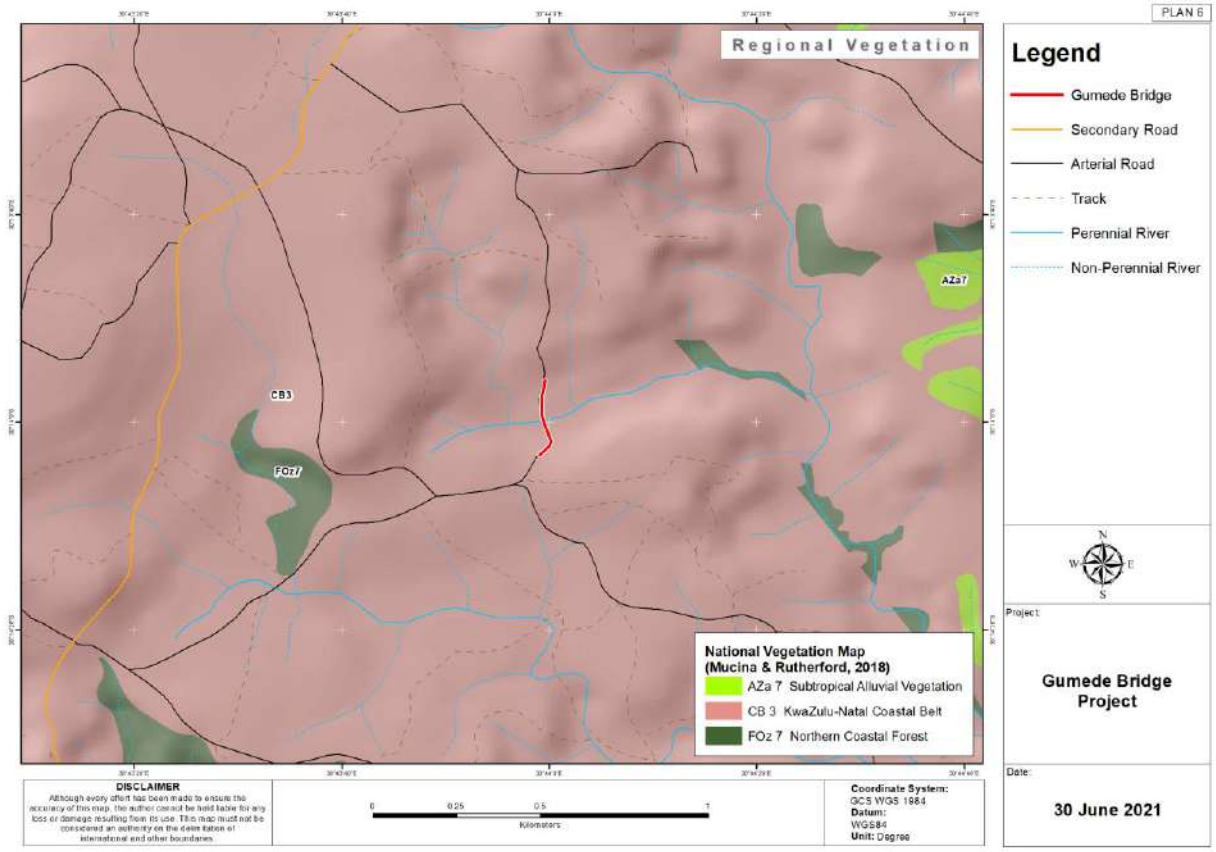

Figure 3-10 Map illustrating the vegetation type within Gumede bridge project area and surrounding landscape based on the Vegetation Map of South Africa, Lesotho & Swaziland.

3.1.1.1.2 Expected Flora Species

The BODATSA database indicates that 283 species of indigenous plants are expected to occur within the landscape. Appendix A provides the list of species and their respective conservation status and endemism. Eight species of conservation concern based on their conservation status are expected to occur within the proposed development area and are provided in Table 3-9 below. None of these species were recorded.

Table 3-9 Flora species of conservation concern that are expected to occur within the assessment area associated with the Gumede bridge. CR = Critically endangered; EN = Endangered; VU = Vulnerable and NT = Near Threatened

Family	Genus	Species	SA Status	IUCN Status
Apocynaceae	*Brachystelma*	*gerrardii*	Indigenous	EN
Agavaceae	*Chlorophytum*	*cooperi*	Indigenous	NT
Rhamnaceae	*Colubrina*	*nicholsonii*	Indigenous; Endemic	VU
Fabaceae	*Eriosema*	*latifolium*	Indigenous; Endemic	VU
Amaryllidaceae	*Haemanthus*	*deformis*	Indigenous; Endemic	VU
Apocynaceae	*Riocreuxia*	*flanaganii*	Indigenous; Endemic	CR
Anacardiaceae	*Searsia*	*rudatisii*	Indigenous; Endemic	EN
Lamiaceae	*Stachys*	*comosa*	Indigenous; Endemic	VU

Species identified by the environmental screening tool (https://screening.environment.gov.za/screeningtool) are shown in Table 3-10.

Table 3-10 Flora species identified by the Environmental screening tool within the assessment area associated with the Gumede bridge.

Sensitivity	Feature
Low	Low Sensitivity
Medium	Sensitive species 1252
Medium	*Aspalathus gerrardii*
Medium	Sensitive species 89
Medium	*Dahlgrenodendron natalense*
Medium	*Eriosemopsis subanisophylla*
Medium	*Helichrysum pannosum*
Medium	Sensitive species 150
Medium	Sensitive species 686
Medium	*Cassipourea gummiflua var. verticillata*
Medium	Sensitive species 1083
Medium	Sensitive species 814
Medium	Sensitive species 1185
Medium	Sensitive species 1176
Medium	Sensitive species 535
Medium	*Oxygonum dregeanum subsp. streyi*
Medium	Sensitive species 649
Medium	*Mystacidium aliceae*
Medium	*Diaphananthe millarii*
Medium	Sensitive species 1221
Medium	*Disperis woodii*
Medium	*Eugenia simii*
Medium	*Senecio dregeanus*

Medium	Sensitive species 944
Medium	Sensitive species 191
Medium	*Prunus africana*

3.2.3 Field Assessment

The following sections provides the results from the field survey for the proposed development that was undertaken during the 21st July 2021.

3.2.3.1 Vegetation Assessment

This section is divided into two components:

- Indigenous flora; and
- Invasive Alien Plants (IAPs).

3.1.1.1.3 Indigenous Flora

Sixty-one (61) species of indigenous flora were recorded within the assessment area (Table 3-11, Figure 3-19). One (1) species recorded within the assessment area is protected under legislation, namely *Sideroxylon inerme.* This species is protected under the South African National Tree list. None of the species recorded were regarded as threatened.

Table 3-11 Summary of indigenous flora species recorded within the assessment area associated with the Gumede bridge project and their respective growth form and conservation status. Species in bold are listed as protected under legislation.

Scientific Name	Growth Form	Grassland	Riparian
Abutilon sonneratianum	Shrub		x
Acacia nilotica	Tree	x	
Acacia robusta	Tree	x	
Albizia adianthifolia	Tree		x
Aneilema aequinoctiale	Shrub		
Antidesma venosum	Tree		x
Aristida junciformis	Grass	x	
Asparagus racemosus	Shrub		x
Asparagus virgatus	Shrub		x
Berkheya bipinnatifida	Shrub	x	
Bridelia micrantha	Tree		x
Celtis africana	Tree		x
Chamaecrista mimosoides	Shrub		x
Chlotis virgata	Grass	x	
Clerodendrum glabrum	Tree		x
Commelina africana	Herb		x
Croton sylvaticus	Tree		x
Cyperus dives	Shrub		x
Cyperus digitatus	Shrub		x

Dalbergia obovata	Tree		x
Dichrostachys cinerea	Shrub	x	
Digitaria erianthra	Grass		
Diospyros lycioides	Shrub		x
Eragrostis curvula	Grass	x	
Erythrina lysistemon	Tree	x	x
Euclea natalensis	Tree		x
Gerbera ambigua	Herb	x	
Gymnosporia glaucophylla	Shrub		x
Helichrysum nudifolium	Herb	x	
Imperata cylindrica	Grass		x
Indigofera frutescens	Tree		x
Lagenaria sphaerica	Creeper		x
Leonotis leonurus	Shrub	x	
Lotus discolor	Shrub	x	
Melinis repens	Grass	x	
Nidorella auriculata	Herb	x	
Panicum maximum	Grass	x	
Paspalum urvillei	Grass		x
Persicaria decipiens	Herb		x
Phoenix reclinata	Tree	x	x
Sideroxylon inerme	Tree		x
Priva cordifolia	Herb	x	
Protorhus longifolia	Tree		x
Pseudarthria hookeri	Shrub		x
Pteridium aquilinum	Herb	x	x
Pupalia lappacea	Herb	x	
Rhoicissus tridentata	Shrub		x
Searsia chirindensis	Tree		x
Senecio deltoideus	Shrub	x	
Setaria megaphylla	Grass		x
Sida cordifolia	Shrub		x
Sporobolus africanus	Grass	x	
Sporobolus pyramidalis	Grass		x
Strelitsia nicolai	Tree		x
Tephrosia polystachya	Herb	x	
Trema orientalis	Tree		x
Trimeria grandifolia	Shrub		x
Triumfetta rhomboidea	Shrub		x
Typha capensis	Grass		x

Vepris lanceolata	Tree		x

Sideroxylon inerme, (Figure 3-11) is a Least Concern tree and is not threatened but is listed as a protected tree in the Protected Tree list of South Africa. A small to medium evergreen tree, which grows to a height of 10-15 m. The tree has a sturdy trunk that is normally 600mm in diameter, and a large, dense, rounded crown. The bark is normally grey brown to black. Young branches are always covered with fine hairs. The leaves are leathery and spirally arranged, dark green above and dull beneath. Fine hairs are also found on young leaves.

The tree has small greenish white flowers with a strong, unpleasant smell. It flowers during summer and autumn (November to April). Fruits are purplish black, small, round and fleshy and like the leaves, contain milky latex, and are present from late summer to spring (February to September).

Figure 3-11 Sideroxylon inerme is a Protected South African Tree

Figure 3-12 ***Photographs illustrating a portion of the indigenous flora recorded within the assessment area associated with the proposed Gumede bridge project. A) Phoenix reclinata, B) Aristida junciformis grassland, C) Riparian thickets D) Albizia adianthifolia, E) Grasslands and Thickets, F) Strelitsia nicolai.***

3.1.1.1.4 Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The National Environmental Management: Biodiversity Act (NEMBA) is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- 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. No permits will be issued for Category 2 plants to exist in riparian zones; and
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing;
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;
    - The relevant invasive species management programme developed in terms of regulation 4; and

- Any directive issued in terms of section 73(3) of the Act.

Eighteen (18) IAP species were recorded within the project area with 9 categorised as Category 1b and one (1) as Category 2 (Table 3-12, Figure 3-28), and must therefore be controlled by implementing an alien invasive plant management programme in compliance of section 75 of the Act as stated above.

Table 3-12 Summary of Invasive Alien Plants (IAPs) recorded within the assessment area associated with the proposed Gumede bridge project

Scientific Name	Growth Form	Category
Agave sisalana	*Shrub*	2
Ageratina adenophora	*Shrub*	1b
Arundo donax	*Reed*	1b
Canna indica	*Shrub*	1b
Cardiospermum grandiflorum	*Shrub*	1b
Chromolaena odorata	*Shrub*	1b
Ipomoea purpurea	*Herb*	3
Lantana camara	*Shrub*	1b
Melia azedarach	*Tree*	1b
Pennisetum purpureum	*Grass*	2
Psidium guajava	*Tree*	2
Ricinus communis	*Shrub*	2
Senna didymobotrya	*Shrub*	1b
Solanum mauritianum	*Shrub*	1b
Sphagneticola trilobata	*Shrub*	1b
Tecoma stans	*Shrub*	1b
Verbena brasiliensis	*Herb*	1b
Xanthium strumarium	*Herb*	1b

The following monitoring framework should be implemented to ensure that IAPs are continually monitored, and progress pertaining to their control is recorded (Table 3-13). The monitoring of the area throughout the process is crucial in order to prevent IAPs growing and spreading out of control, thereby threatening the wellbeing of indigenous flora.

Table 3-13 Proposed monitoring framework for the control of invasive alien plants within the assessment area associated with the proposed Gumede bridge project

Metric	Frequency	Method	Response
How effective are the control methods	4-6 months after every operation	Survey the cleared areas and look for regrowth. Before and after photographs are effective for this. Observe for non-target effects of herbicide application.	If the survey reveals that the control methods are effective, e.g. low levels of re-sprouting, continue following the herbicide mixtures and control methods. If non-target plants are dying off where herbicides were applied, ensure appropriate training for herbicide applicators, demonstrate the off-target effects to herbicide applicators to ensure they are using the correct methods and herbicides. (If the results show that the control methods are not effective, adapt by e.g. cutting lower above ground or changing herbicides or timing of herbicide application.
Do the infestation levels decrease	Annually	Survey the cleared areas and record species, densities and size.	If the infestation levels are not decreasing, reconsider clearing intervals and look at clearing methods. If infestation levels are decreasing, then continue the current control method.

		Before and after pictures are very effective.	
Quantity of herbicides used	During every operation	Keep track of cost and ensure no wastage. Record herbicide usage	Track usage over time, it will reveal a certain trend in quantities for different infestation levels. Less herbicides should be used when the infestation levels are lower. Record herbicide cost.
Does the indigenous vegetation recover in the cleared areas?	Annually	Survey the cleared areas and look out for indigenous species variety and presence. Before and after pictures are effective.	If there is recovery of indigenous vegetation, then continue the current control method. If there is no recovery, consider rehabilitation with local indigenous species.
How many jobs were created	After every operation	Timesheets	Job creation figures are useful when asking for landowner assistance from WFW or to demonstrate contributions to jobs and socio-economic conditions
How many person days (PD) were spent per operations	After every operation	Timesheets	Keep track of cost and assist with planning and budgeting. Determine cost per person per day (PD)

Figure 3-13 ***Photographs illustrating a portion of the Invasive Alien Plants (IAPs) recorded within the assessment area associated with the Gumede bridge Project. A) Ageratina adenophora, B) Melia azedarach, C) Lantana camara and D) Solanum mauritianum.***

4 Impact Assessment

4.1 Wetland Risk Assessment

The impact/risk assessment considered both direct and indirect impacts, if any, wetlands associated with the project area. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 4-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, sitting, scale, layout, technology and phasing to avoid impacts.

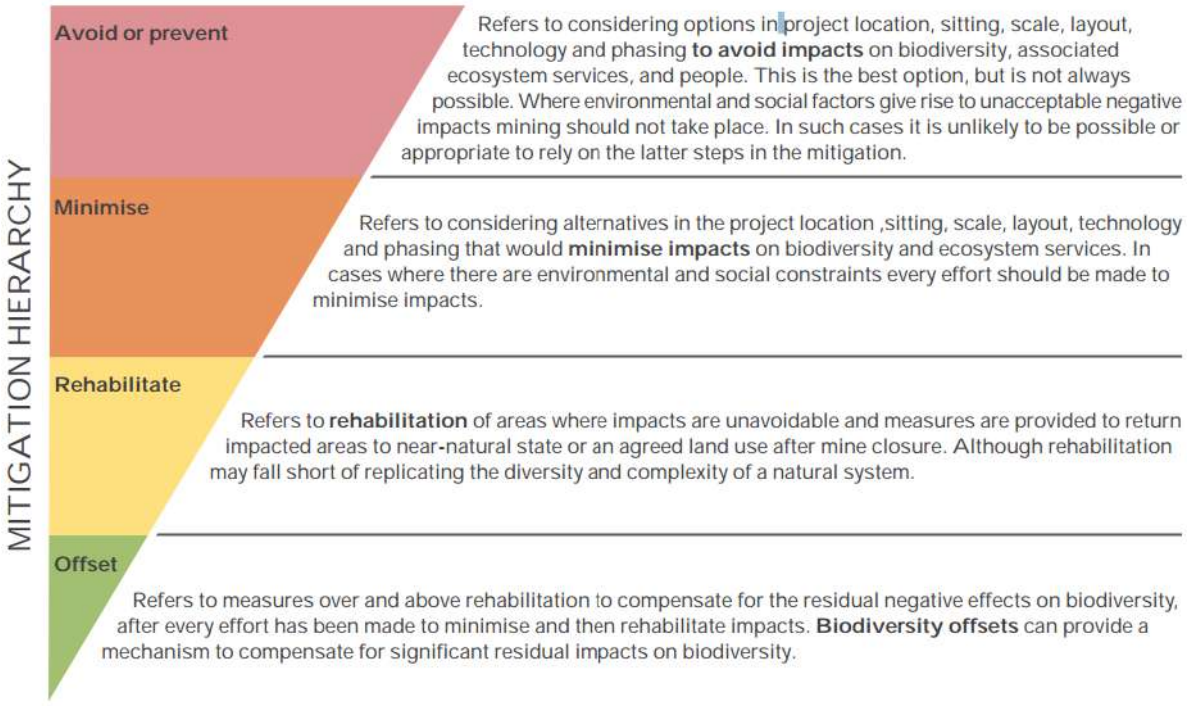

Figure 4-1 The mitigation hierarchy as described by the DEA (2013)

The project entails the upgrade of the bridge and approaches to accommodate light to medium weight traffic across the Gumede River.

Gumede Bridge Project will entail:

- Demolishing of existing collapsed portal culvert bridge and construction of a new portal culvert bridge that measures approximately 7.12 m long and 6.1 m wide;
- Construction of bridge approaches with a total length of about 240 m and width matching a standard 5 m wide road with gravel wearing course finish; and
- Adequate stormwater management systems and earth retaining structures in the form of gabions are to be provided as necessary.

Based upon the design developed, the works can be summarized as follows:

- The bridge to measure 6.1 m wide × 7.12 m long × 1.8 m high;

- To comprise: 2no. × 6.1 m long × 1.8 m high × 1.8 m wide portals + 1no. × 6.1 m long × 1.8 m high × 2.4 m wide portals, 200 mm thick deck slab and 200 mm thick base slab on micro piles, Gabion wing walls, 200 mm thick approach slabs and 300 mm high × 1 m long guide block;
- 5 m wide × 0.24 km long approach road finished by 150 mm layer of Gravel wearing course on at least 150 mm layer of G7 selected subgrade/fill material;
- Associated stormwater management by means of side drains, mitre drains and culverts; and
- Fill protection and slope stability mechanisms by use of gabions baskets.

4.1.1 Present Impacts to Water Resources

The present impacts to water resources observed within the assessment include:

- The extensive and intensive growth of AIPs (Figure 4-2A);
- Livestock grazing and trampling (Figure 4-2B);
- River crossings, (Figure 4-2B); and
- Rubbish dumping and erosion (Figure 4-2C and D).

Due to the fact that there is an existing road/track, this project now has the opportunity to address some of the identified impacts resulting from the existing road/track and crossing structures.

Figure 4-2 ***Photographs illustrating impacts pertaining to water resources within the assessment area associated with the proposed Gumede Bridge. Clockwise from top left – A) Alien vegetation, B) Livestock grazing and trampling, B) formal road crossings, C) rubbish dumping, erosion and E) Erosion.***

4.1.2 Risk Assessment Results

A variety of risks have been identified for the proposed project (Table 4-1). The risk rating assessment for the proposed activity is provided in Table 4-2 below. Only a few notable Moderate risks (without mitigation) were identified. These Moderate risks are anticipated as the proposed project will be for the construction (or upgrade) of a bridge. This will improve the current situation by formalising stormwater and culvert designs.

Moderate risks identified for the construction phase of the project are associated with changes to the drainage of the system and the installation of culverts, resulting from the upgrade of the crossing area. This will have a direct impact on the local watercourse, impeding the flow of water and water quality impairment. The Moderate risks for the installation of the stream crossing (which includes the operation of heavy machinery) will be reduced to a Low risk level with the successful implementation of mitigation measures. The Moderate risks associated with drainage during the construction phase were lowered to Low should adequate mitigation measures be implemented.

Moderate risks (pre-mitigation) were also identified for the operational phase of the project, specifically stormwater management. This is largely a result of the longevity of the project and the potential for erosion within the reach and impacts to downstream instream habitat. No aspects are considered to pose a Moderate risk with the implementation of mitigation measures.

Table 4-1 Potential risks to water resources associated with the proposed activity

Andrew Husted	**Pr. Sci. Nat. 400213/11**	
Activity	**Aspect**	**Impact**
Construction of the bridge and road	Drainage patterns change due to road extent and levels.	Impeding the flow of water. Loss of aquatic habitat. Loss of indigenous vegetation. Modification of riparian zone Loss of aquatic biota. Siltation of watercourse. Erosion of the watercourse. Flow sediment equilibrium change. Water quality impairment.
	Drainage patterns change due to crossing	
	Installation of culverts	
	Clearing of areas for infrastructure	
	Excavations & foundations	
	Operation of equipment and machinery	
	Waste and ablutions	
Operation of road	Drainage patterns change due to road extent and levels.	Impeding the flow of water. Altered flow dynamics. Impaired water quality.
	Drainage patterns change due to crossing	
	Traffic	

Table 4-2 Risk rating assessment for the possible impacts to water resources due to the proposed activity

Aspect	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
Construction Phase																
Drainage patterns change due to road extent and levels.	3	2	2	1	2	1	1	4	2	2	1	2	7	28	**Low**	**Low**
Drainage patterns change due to crossing	3	2	2	2	2.25	1	3	6.25	3	3	5	1	12	75	**Moderate***	**Low**
Installation of culverts	4	4	3	4	3.75	2	2	7.75	2	4	5	1	12	93	**Moderate**	**Low**
Clearing of areas for infrastructure	2	3	3	2	2.5	1	2	5.5	2	3	1	2	8	44	**Low**	**Low**
Excavations & foundations	2	4	3	2	2.75	1	2	5.75	2	4	1	1	8	46	**Low**	**Low**
Operation of equipment and machinery	1	3	2	2	2	1	1	4	2	4	1	3	10	40	**Low**	**Low**
Waste and ablutions	1	3	2	3	2.25	1	2	5.25	2	1	1	2	6	31.5	**Low**	**Low**
Operational Phase																
Drainage patterns change due to road extent and levels.	3	2	2	1	2	1	4	7	2	1	1	3	7	49	**Low**	**Low**
Drainage patterns change due to crossing	2	2	2	2	2	1	4	7	2	1	1	2	6	42	**Low**	**Low**
Traffic	1	2	2	2	1.75	1	4	6.75	4	2	1	2	9	60.75	**Moderate***	**Low**
Stormwater management	2	2	2	2	2	2	4	8	4	1	1	2	8	64	**Moderate***	**Low**

(*) denotes - In accordance with General Notice 509 “Risk is determined after considering all listed control / mitigation measures. Borderline Low / Moderate risk scores can be manually adapted downwards up to a maximum of 25 points (from a score of 80) subject to listing of additional mitigation measures detailed below.”

4.1.3 Wetland Mitigation Measures

The focus of mitigation measures is to reduce the significance of potential impacts associated with the proposed activity. The prescribed mitigation measures for the proposed activity are provided in the respective sections below.

4.1.3.1 Road construction mitigation measures

The following road construction specific mitigation measures are provided:

- To minimise the impact on both surface water flow and interflow, portions of the road must include a coarse rock layer that has been specifically incorporated to increase the porosity and permeability of the sub-layers of the road;
- Concrete pipes must be strategically positioned under the road to drain surface water, this will ensure the road prism does not act as a barrier to water flow;
- The footprint area of the road should be kept at a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas;
- All construction activities and access must make use of the existing dirt road;
- Exposed road surfaces awaiting gravel must be stabilised to prevent the erosion of these surfaces. Signs of erosion must be addressed immediately to prevent further erosion of the road;
- Silt traps and fences must be placed in the preferential flow paths along the road to prevent sedimentation of the watercourse;
- Temporary stormwater channels should be filled with aggregate and/or logs (branches included) to dissipate flows;
- The contractors used for the project must have spill kits available to ensure that any fuel or oil spills are cleaned up and discarded correctly; and
- A suitable stormwater plan must be compiled for the road. This plan must attempt to displace and divert stormwater from the road and discharge the water into adjacent areas without eroding the receiving areas. It is preferable that run-off velocities be reduced with energy dissipators and flows discharged into the local watercourses.

4.1.3.2 Culvert construction mitigation measures

The bridge construction has specific culvert mitigation measures. The following culvert construction specific mitigation measures are provided:

- It is critical to spread flows across the water resource, avoiding incisions in the landscape caused by concentrated flows. Temporary stormwater channels should be filled with aggregate and/or logs (branches included) to dissipate flows;
- It is recommended that the material surrounding and holding the culverts in place include a coarse rock layer that has been specifically incorporated to increase the porosity and permeability to accommodate flooding and very low flows;

- The culverts used in the design should be as large as possible, partially sunken and energy dissipating material must be placed at the discharge area of each culvert to prevent erosion of these areas;
- The use of larger culverts will prevent the build-up of debris by allowing the free movement of debris through the large culverts;
- Culverts should avoid inundation (damming) of upstream areas by facilitating streamflow and catering properly for both low flows and high flows;
- Surface run-off from the roads flowing down the embankments often scours the stream banks on the sides of the culvert causing sedimentation of the channel. This should be catered for with adequate concreted stormwater drainage depressions and channels with energy dissipaters that channel these flows into the river in a controlled manner;
- The culvert installations should further consider the scouring action of high flows and gabion structures or similar should be placed on both sides of the culvert on the embankments both upstream and downstream. This will serve as retention of the soils from scouring around and underneath the culvert structures aiding in the protection of the structure (Figure 4-3); and
- Large aggregate outsourced or from the project area (if available) can be used for energy dissipation in the channel downstream of the culverts to reduce the likelihood of scouring the riverbed and sedimentation of the catchment. It is preferable that larger aggregate be used to avoid flows removing material from the site.

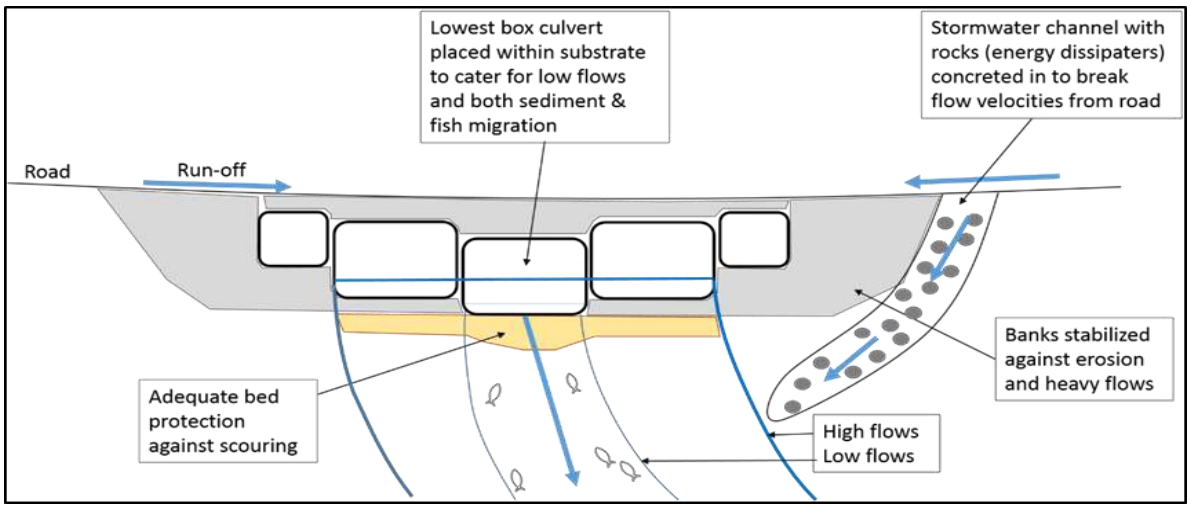

Figure 4-3 Illustration of correct culvert construction to conserve ecological integrity of rivers

- The downstream side of the culvert should be at the same level as the riverbed to allow for upstream migration of fish and other biota and not form a barrier to upstream migration. Alternatively, stacking rocks in layers to serve as a fish ladder may assist in this regard.

4.2 Flora Risk Assessment

Anthropogenic activities drive habitat destruction causing displacement of fauna and flora and possibly direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area.

Potential impacts were evaluated against the data captured during the desktop and field assessment to identify relevance to the study area. The relevant impacts associated with the proposed construction of the development were then subjected to a prescribed impact assessment method.

4.2.1 Present Impacts to Flora

Considering the anthropogenic activities and influences within the area, several negative impacts to flora were observed within the assessment area. These include:

- Homesteads, Alien plant species (Figure 4-4A)
- Erosion and Litter (Figure 4-4B);
- Homesteads and Litter (Figure 4-4C);
- Littering (Figure 4-4D);
- Vegetation clearing (Figure 4-4E);
- Roads and associated vehicle traffic;
- Domestic dogs; and
- Possible persecution.

Figure 4-4 ***Photographs illustrating impacts to flora within the assessment area of the proposed Gumede bridge Project. A) Homesteads, Alien plant species, B) Erosion and Litter, C) Homesteads and Litter, D) Littering and E) Vegetation clearing.***

4.2.2 Identification of Additional Potential Impacts

The potential impacts during the construction and operational phase of the proposed activity are presented in Table 4-3.

Table 4-3 Summary of potential impacts to biodiversity associated with the proposed activity

Main Impact	Project Activities	Secondary Impacts Anticipated
Loss and/or degradation of surrounding vegetation types	● Physical removal of vegetation ● Dust precipitation ● Spilling of hazardous waste ● Water and wastewater leakages ● Dumping of waste products ● Random events such as fire (cooking fires or cigarettes)	● Displacement/loss of flora (including possible SCC) ● Increased potential for soil erosion ● Habitat fragmentation ● Increased potential for establishment of invasive alien vegetation
Spread and/or establishment of invasive alien species	● Vegetation removal ● Vehicles potentially spreading seed ● Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents ● Vehicles potentially spreading seed ● Unsanitary conditions surrounding infrastructure	● Habitat loss for native flora (including SCC) ● Alteration of flora assemblages due to habitat modification
Reduced dispersal of flora	● Removal of vegetation	● Loss of ecosystem services ● Reduced plant seed dispersal

4.2.3 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. The mitigation actions required to lower the risk of the impact are provided in Section of this report.

4.2.3.1 Construction Phase

Table 4-4 summarises the significance of potential impacts associated with the proposed bridge construction on biodiversity before and after implementation of mitigation measures. The loss and/or degradation of surrounding vegetation types due to construction phase activities was rated as an impact with a ‘High’ significance but was lessened to a ‘Low’ significance with the implementation of the appropriate mitigation measures. The spread and/or establishment of invasive alien species and the disruption/alteration of species activities due to noise, vibration and/or dust, were rated as impacts with a ‘Moderately High’ significance but were reduced to a ‘Low’ impact with the implementation of mitigation measures. The reduced dispersal of flora was regarded as a ‘Moderate’ risk but reduced to a ‘Low’ significance with the implementation of the appropriate mitigation measures.

4.2.3.2 Operational Phase

Table 4-5 summarises the significance of the operational phase impacts on flora before and after implementation of mitigation measures. The impact significance of continued encroachment by alien invasive plant species into surrounding habitat that was disturbed, was rated as ‘Moderately High’ prior to mitigation. Implementation of mitigation measures reduced the significance of the impact to an ‘Absent’ level. The permanent destruction of the surrounding vegetation types due to improper waste control that occurred during the construction phase and the erosion of surrounding vegetation types due to ineffective

stormwater management measures, was rated as impacts possessing a ‘High’ significance level prior to the implementation of mitigation measures. The significance of these impacts was reduced to a ‘Low’ impact level in consideration of the implementation of mitigation measures.

Table 4-4 Assessment of significance of potential impacts on flora pertaining to the construction phase of the project

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Loss and/or degradation of surrounding vegetation types due to construction phase activities	5	3	5	4	5		0	2	4	4	1	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology highly sensitive /important	Definite	**High**	N/A	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly unlikely	**Low**
Spread and/or establishment of invasive alien species	3	2	4	4	5		3	2	4	1	2	
	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology not sensitive/important	Possible	**Low**
Reduced dispersal of flora	3	3	4	2	4		3	2	4	2	2	
	One year to five years:	Local area/ within 1 km of the site boundary / < 5000ha impacted	Great / harmful/ ecosystem structure and	Ecology with limited sensitivity/importance	Highly likely	**Moderate**	One year to five years:	Development specific/ within the site boundary / < 100 ha impacted /	Great / harmful/ ecosystem structure and	Ecology with limited sensitivity/importance	Possible	**Low**

	Medium Term	/ Linear features affected < 1000m	function largely altered				Medium Term	Linear features affected < 100m	function largely altered			

Table 4-5 Assessment of significance of potential impacts on biodiversity pertaining to the operational phase of the project

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued encroachment and establishment of IAPs into surrounding habitat that was disturbed	5	3	4	4	5		0	2	2	4	1	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**Moderately High**	N/A	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Highly unlikely	**Absent**
Destruction of surroundingvegetation type due to improper waste disposal	5	3	4	4	5		0	2	4	4	1	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	N/A	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly unlikely	**Low**
Erosion of surrounding vegetatipon types due to ineffective stormwater management measures	5	3	5	4	5		5	1	3	4	1	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology highly sensitive /important	Definite	**High**	Permanent	Activity specific/ < 5 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly unlikely	**Low**

4.2.4 Flora Management Outcomes

The purpose of the management outcomes is to allow for the mitigations associated with the impact assessment to be incorporated into the EMPr. These are provided in Table 4-6.

Table 4-6 Summary of management outcomes pertaining to impacts to Flora associated with the Gumede bridge project

Management Action	Phase	Responsible Party for Implementation
If the wetland that the *Sideroxylon inerme* specimens are located cannot be avoided, these trees must be relocated as per directive from the relevant authority. This will require permitting from the relevant authority.	Construction	Project Manager Environmental Officer
Areas rated as Verhy High and High sensitivity in proximity to the development area, must be declared as 'no-go' areas during the construction phase, and all efforts must be made to prevent access to this area from construction workers and machinery. This excludes the bridge portion of the wetlands that the road currently traverses.	Construction	Project Manager Environmental Officer
The areas to be developed must be specifically demarcated to prevent movement of workers into sensitive surrounding environments.	Construction	Environmental Officer
Borrow pits should be in areas that are regarded as transformed or wasteland. Under no circumstances should high sensitivity habitats be used as borrow pits.	Construction	Project Manager Environmental Officer
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation. This will also reduce the likelihood of encroachment by alien invasive plant species.	Construction	Project Manager Environmental Officer
It should be made an offence for any staff to bring or plant any plant species into any portion of the project area, unless undertaken in line with the required/approved rehabilitation. No plant species whether indigenous or exotic should be brought into the project area, to prevent the spread of exotic or invasive species.	Construction	Environmental Officer
An extensive alien plant management plan will be compiled to remove the alien vegetation from within the project footprint. The use of herbicide needs to be monitored and only be used by a qualified person	Construction	Environmental Officer
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;	Construction	Environmental Officer
The development areas and access roads should be specifically demarcated so that during the construction phase, only the demarcated areas may be impacted upon.	Construction	Project Manager Environmental Officer
Areas of indigenous vegetation, even secondary communities, should under no circumstances be fragmented or disturbed further or used as an area for dumping of waste.	Construction	Environmental Officer
Fire management plan must be in place for the areas surrounding the project area and the road to restrict the impact from fire on the natural flora and fauna communities. A fire expert should be consulted for suitable guidelines for the area and project requirements.	Construction	Project Manager Environmental Officer Health and Safety Officer
A site plan of the area must be made available onsite for all contractors and personnel indicating parking & storage areas, site offices and placement of ablution facilities.	Construction	Project Manager Environmental Officer
The Contractor should inform all site staff to the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities. A minimum of one toilet must be provided per 10 persons.	Construction	Health and Safety Officer Environmental Officer
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility.	Construction	Health and Safety Officer Environmental Officer
Where a registered disposal facility is not available close to the site, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site. Temporary storage of domestic waste shall be in covered waste skips.	Construction	Health and Safety Officer Environmental Officer
Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation; and	Construction	Environmental Officer

All livestock must always be kept out of the project area, especially areas that have been recently re-planted	Construction	Environmental Officer
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and dumps especially. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated. No dust is allowed, whether intentionally or otherwise, to be blown across into the surrounding areas;	Construction	Environmental Officer
All removed soil and material must not be stockpiled within the wetland/watercourse and associated buffer zone. Stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised and be surrounded by bunds.	Construction	Environmental Officer
A pest control plan must be put in place and implemented. it is imperative that poisons not be used.	Construction	Health and Safety Officer
Construction activities and vehicles could cause spillages of lubricants, fuels and waste material potentially negatively affecting the functioning of the ecosystem. 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 project area.	Construction	Project Manager Environmental Officer
Have action plans on site, and training for contractors and employees in the event of sewage spills, leaks and hazardous chemical spills to the surrounding environment. A specialist Contractor shall be used for the bioremediation of contaminated soil where the required remediation material and expertise is not available on site.	Construction	Project Manager Environmental Officer
Effective and sustainable stormwater designs must be incorporated into the road design to prevent excessive runoff into the surrounding natural environment and thereby, causing erosion.	Operational	Project Manager Contractor

5 Conclusions and Impact Statement

5.1 Conclusions

5.1.1 Wetland Assessment

The field survey yielded two (2) wetland types. The wetland types identified, were channelled valley bottoms and unchannelled valley bottoms.

The overall PES ratings for the HGM units ranged from largely natural (class B) to moderately modified (class C). The overall levels of service for all HGM units were rated as being Intermediate. The EIS for the channelled valley bottoms (HGM 1 & 3) were calculated to be High (class B) importance. This rating can be attributed to the ecological importance of the drainage system and functionality of the wetland. The remaining channelled valley bottom was smaller and less diverse and as a result was rated as having a Moderate (class C) importance. The unchannelled valley bottom was rated as having a High importance based on the water enhancing properties as well as flood attenuation services. The Hydrological Functionality of all the HGM units were rated as Moderate (class C) importance, except for the unchannelled valley bottom which were rated as having a High importance based on the water enhancing properties as well as flood attenuation services offered by the wetlands. The Direct Human Benefits were calculated to have a Moderate (class c) importance. These wetlands provided resources for food production as well as the use for grazing.

The wetland buffer zone tool was used to calculate the appropriate buffer required for the upgrade. If prescribed mitigation measures are implemented for the project, a 16 m buffer zone has been determined for the construction and operational phases.

A variety of risks have been identified for the proposed project, with only a few notable Moderate risks (without mitigation) identified. Only a few notable Moderate risks (without mitigation) were identified. These Moderate risks are anticipated as the proposed project will be for the construction (or upgrade) of a bridge. This will improve the current situation by formalising stormwater and culvert designs.

Moderate risks identified for the construction phase of the project are associated with changes to the drainage of the system and the installation of culverts, resulting from the upgrade of the crossing area. The Moderate risks for the installation of the stream crossing (which includes the operation of heavy machinery) will be reduced to a Low risk level with the successful implementation of mitigation measures. The Moderate risks associated with drainage during the construction phase were lowered to Low should adequate mitigation measures be implemented. Moderate risks (pre-mitigation) were also identified for the operational phase of the project, specifically stormwater management. This is largely a result of the longevity of the project and the potential for erosion within the reach and impacts to downstream instream habitat. No aspects are considered to pose a Moderate risk with the implementation of mitigation measures.

5.1.2 Flora Assessment

The completion of a comprehensive desktop study, in conjunction with the results from the field survey, suggest there is a high confidence in the information provided. The survey ensured that there was a suitable groundtruth coverage of the project area and major vegetation types and ecosystems were assessed to obtain a general species (flora) overview and the major current impacts were observed. It is clear from field observations that the landscape possesses vegetation types altered by anthropogenic activities, as well as natural features.

The development footprint is situated within the KwaZulu-Natal Coastal Belt Grassland. The KwaZulu-Natal Coastal Belt Grassland threat status is 'Critically Endangered' and protection status is 'Normally Protected'. The proposed activity footprint overlaps with transformed land-cover and is regarded as possessing low sensitivity, albeit the surrounding landscape comprises of sensitive habitats, including Irreplaceable Critical Biodiversity Areas. These sensitive habitats possess flora SCC, as well as provide an array of ecosystem services. *Sideroxylon inerme* specimen adjacent to the road within the wetland must be relocated as prescribed.

There are potential risks to the surrounding sensitive habitat arising from the construction of the proposed activity. It is therefore imperative that all habitats not within the development footprint regarded as possessing 'high' sensitivity be avoided and declared as 'no-go' areas.

5.2 Impact Statement

Considering the above-mentioned findings of the assessment, it is the opinion of the specialists that the rebuilding of the Gumede bridge is feasible. However, the impacts associated with the proposed development activities must be mitigated against to ensure the maintenance of ecological processes, and the concomitant delivery of ecosystem services, of nearby habitats. Careful consideration must be afforded to each of the recommendations provided herein and proven ecological (or environmental) controls and mitigation measures must be entrenched in the management framework. Due to the Low post-miigation risk ratings, a General Authorisation is permissible for the project.

6 References

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7 Appendix Items

7.1 Appendix A – Flora species expected to occur in the project area

Famiy	Genus	Species	Ecology	Red data Status (IUCN)
Euphorbiaceae	Acalypha	peduncularis	Indigenous	
Amaranthaceae	Achyranthes	aspera	Not indigenous; Naturalised	
Asteraceae	Acmella	caulirhiza	Not indigenous; Naturalised; Invasive	
Acoraceae	Acorus	calamus	Not indigenous; Cultivated; Naturalised; Invasive	
Loranthaceae	Agelanthus	gracilis	Indigenous	
Orobanchaceae	Alectra	sessiliflora	Indigenous	
Sapindaceae	Allophylus	dregeanus	Indigenous; Endemic	
Poaceae	Alloteropsis	semialata	Indigenous	
Asphodelaceae	Aloe	cooperi	Indigenous	
Asphodelaceae	Aloe	linearifolia	Indigenous	
Anemiaceae	Anemia	dregeana	Indigenous	
Rubiaceae	Anthospermum	herbaceum	Indigenous	
Fabaceae	Argyrolobium	rotundifolium	Indigenous	
Poaceae	Aristida	junciformis	Indigenous	
Poaceae	Arundinella	nepalensis	Indigenous	
Apocynaceae	Asclepias	albens	Indigenous	
Asparagaceae	Asparagus	falcatus	Indigenous	
Aspleniaceae	Asplenium	rutifolium	Indigenous	
Aspleniaceae	Asplenium	sp.		
Asteraceae	Berkheya	speciosa	Indigenous; Endemic	
Asteraceae	Berkheya	speciosa	Indigenous	
Asteraceae	Berkheya	umbellata	Indigenous; Endemic	
Asteraceae	Berkheya	erysithales	Indigenous	
Melianthaceae	Bersama	swinnyi	Indigenous; Endemic	
Poaceae	Brachiaria	serrata	Indigenous	
Apocynaceae	Brachystelma	gerrardii	Indigenous	EN
Cyperaceae	Bulbostylis	contexta	Indigenous	
Cyperaceae	Bulbostylis	humilis	Indigenous	
Cyperaceae	Bulbostylis	densa	Indigenous	
Cyperaceae	Bulbostylis	boeckeleriana	Indigenous	
Asteraceae	Callilepis	laureola	Indigenous	
Cannaceae	Canna	indica	Not indigenous; Naturalised; Invasive	
Cyperaceae	Carex	spartea	Indigenous	

Rhizophoraceae	Cassipourea	malosana	Indigenous	
Cannabaceae	Celtis	gomphophylla	Indigenous	
Apiaceae	Centella	glabrata	Indigenous; Endemic	
Apocynaceae	Ceropegia	carnosa	Indigenous	
Fabaceae	Chamaecrista	mimosoides	Indigenous	
Fabaceae	Chamaecrista	stricta	Indigenous	
Pteridaceae	Cheilanthes	hirta	Indigenous	
Pteridaceae	Cheilanthes	viridis	Indigenous	
Pteridaceae	Cheilanthes	bergiana	Indigenous	
Pteridaceae	Cheilanthes	viridis	Indigenous	
Poaceae	Chloris	gayana	Indigenous	
Agavaceae	Chlorophytum	krookianum	Indigenous	
Agavaceae	Chlorophytum	cooperi	Indigenous	NT
Agavaceae	Chlorophytum	galpinii	Indigenous	
Thelypteridaceae	Christella	gueinziana	Indigenous	
Menispermaceae	Cissampelos	torulosa	Indigenous	
Vitaceae	Cissus	fragilis	Indigenous; Endemic	
Ranunculaceae	Clematis	brachiata	Indigenous	
Rosaceae	Cliffortia	serpyllifolia	Indigenous	
Peraceae	Clutia	affinis	Indigenous	
Peraceae	Clutia	pulchella	Indigenous; Endemic	
Rhamnaceae	Colubrina	nicholsonii	Indigenous; Endemic	VU
Burseraceae	Commiphora	harveyi	Indigenous	
Rubiaceae	Conostomium	natalense	Indigenous	
Rubiaceae	Cordylostigma	virgatum	Indigenous	
Crassulaceae	Crassula	inandensis	Indigenous; Endemic	
Crassulaceae	Crassula	capitella	Indigenous; Endemic	
Crassulaceae	Crassula	ericoides	Indigenous; Endemic	
Hymenophyllaceae	Crepidomanes	melanotrichum	Indigenous	
Fabaceae	Crotalaria	virgulata	Indigenous	
Euphorbiaceae	Croton	sylvaticus	Indigenous	
Lauraceae	Cryptocarya	woodii	Indigenous	
Cucurbitaceae	Cucumis	zeyheri	Indigenous	
Amaranthaceae	Cyathula	cylindrica	Indigenous	
Thelypteridaceae	Cyclosorus	interruptus	Indigenous	
Orobanchaceae	Cycnium	tubulosum	Indigenous	
Orobanchaceae	Cycnium	tubulosum	Indigenous	
Poaceae	Cymbopogon	nardus	Indigenous	
Cyperaceae	Cyperus	pseudovestitus	Indigenous	
Fabaceae	Dalbergia	obovata	Indigenous	
Aizoaceae	Delosperma	lineare	Indigenous	
Fabaceae	Desmodium	dregeanum	Indigenous	
Fabaceae	Dichilus	reflexus	Indigenous	
Acanthaceae	Dicliptera	clinopodia	Indigenous	

Acanthaceae	Dicliptera	cernua	Indigenous	
Scrophulariaceae	Diclis	reptans	Indigenous	
Hymenophyllaceae	Didymoglossum	reptans	Indigenous	
Ebenaceae	Diospyros	villosa	Indigenous; Endemic	
Pteridaceae	Doryopteris	concolor	Indigenous	
Salicaceae	Dovyalis	rhamnoides	Indigenous	
Caryophyllaceae	Drymaria	cordata	Not indigenous; Naturalised; Invasive	
Acanthaceae	Dyschoriste	depressa	Indigenous	
Acanthaceae	Ecbolium	glabratum	Indigenous	
Boraginaceae	Ehretia	rigida	Indigenous	
Meliaceae	Ekebergia	capensis	Indigenous	
Cyperaceae	Eleocharis	limosa	Indigenous	
Poaceae	Eragrostis	tenuifolia	Indigenous	
Poaceae	Eragrostis	curvula	Indigenous	
Eriocaulaceae	Eriocaulon	sonderianum	Indigenous	
Fabaceae	Eriosema	latifolium	Indigenous; Endemic	VU
Fabaceae	Eriosema	rossii	Indigenous; Endemic	
Ruscaceae	Eriospermum	mackenii	Indigenous	
Ruscaceae	Eriospermum	mackenii	Indigenous	
Myrtaceae	Eugenia	sp.		
Myrtaceae	Eugenia	natalitia	Indigenous	
Poaceae	Eulalia	villosa	Indigenous	
Orchidaceae	Eulophia	streptopetala	Indigenous	
Euphorbiaceae	Euphorbia	indica	Not indigenous; Naturalised	
Asteraceae	Euryops	laxus	Indigenous	
Gentianaceae	Exochaenium	grande	Indigenous	
Moraceae	Ficus	polita	Indigenous	
Cyperaceae	Fimbristylis	dichotoma	Indigenous	
Cyperaceae	Fimbristylis	complanata	Indigenous	
Cyperaceae	Fimbristylis	dichotoma	Indigenous	
Flagellariaceae	Flagellaria	guineensis	Indigenous	
Iridaceae	Freesia	laxa	Indigenous	
Cyperaceae	Fuirena	ecklonii	Indigenous; Endemic	
Family	Genus	Sp1	Ecology	
Asteraceae	Gerbera	ambigua	Indigenous	
Iridaceae	Gladiolus	longicollis	Indigenous	
Apocynaceae	Gomphocarpus	fruticosus	Indigenous	
Apocynaceae	Gomphocarpus	physocarpus	Indigenous	
Orobanchaceae	Graderia	scabra	Indigenous	
Orchidaceae	Habenaria	arenaria	Indigenous	
Amaryllidaceae	Haemanthus	deformis	Indigenous; Endemic	VU
Asteraceae	Helichrysum	cephaloideum	Indigenous	

Asteraceae	Helichrysum	pallidum	Indigenous	
Asteraceae	Helichrysum	umbraculigerum	Indigenous	
Asteraceae	Helichrysum	aureum	Indigenous	
Heteropyxidaceae	Heteropyxis	natalensis	Indigenous	
Malvaceae	Hibiscus	fuscus	Indigenous	
Malvaceae	Hibiscus	aethiopicus	Indigenous	
Asteraceae	Hilliardiella	hirsuta	Indigenous	
Asteraceae	Hilliardiella	elaeagnoides	Indigenous	
Salicaceae	Homalium	rufescens	Indigenous; Endemic	
Poaceae	Hyparrhenia	filipendula	Indigenous	
Acanthaceae	Hypoestes	forskaolii	Indigenous	
Hypoxidaceae	Hypoxis	filiformis	Indigenous	
Hypoxidaceae	Hypoxis	argentea	Indigenous	
Hypoxidaceae	Hypoxis	acuminata	Indigenous	
Fabaceae	Indigofera	setosa	Indigenous; Endemic	
Fabaceae	Indigofera	sp.		
Fabaceae	Indigofera	obscura	Indigenous	
Fabaceae	Indigofera	hilaris	Indigenous	
Acanthaceae	Isoglossa	ciliata	Indigenous	
Acanthaceae	Isoglossa	origanoides	Indigenous; Endemic	
Acanthaceae	Isoglossa	cooperi	Indigenous; Endemic	
Cyperaceae	Isolepis	prolifera	Indigenous	
Acanthaceae	Justicia	petiolaris	Indigenous	
Crassulaceae	Kalanchoe	rotundifolia	Indigenous	
Rubiaceae	Keetia	gueinzii	Indigenous	
Asphodelaceae	Kniphofia	laxiflora	Indigenous; Endemic	
Thymelaeaceae	Lasiosiphon	anthylloides	Indigenous; Endemic	
Thymelaeaceae	Lasiosiphon	macropetalus	Indigenous; Endemic	
Haloragaceae	Laurembergia	repens	Indigenous	
Fabaceae	Leobordea	pulchra	Indigenous	
Lamiaceae	Leonotis	glabrata	Indigenous	
Brassicaceae	Lepidium	didymum	Not indigenous; Naturalised; Invasive	
Lamiaceae	Leucas	lavandulifolia	Not indigenous; Naturalised; Invasive	
Lobeliaceae	Lobelia	pteropoda	Indigenous	
Capparaceae	Maerua	cafra	Indigenous	
Maesaceae	Maesa	lanceolata	Indigenous	
Maesaceae	Maesa	alnifolia	Indigenous; Endemic	
Celastraceae	Maytenus	undata	Indigenous	
Poaceae	Microchloa	caffra	Indigenous	
Asteraceae	Mikania	natalensis	Indigenous	
Lobeliaceae	Monopsis	stellarioides	Indigenous	
Myricaceae	Morella	serrata	Indigenous	

Asteraceae	Nidorella	auriculata	Indigenous	
Menyanthaceae	Nymphoides	thunbergiana	Indigenous	
Ochnaceae	Ochna	arborea	Indigenous	
Ochnaceae	Ochna	natalitia	Indigenous	
Lamiaceae	Ocimum	gratissimum	Indigenous	
Lamiaceae	Ocimum	obovatum	Indigenous	
Fabaceae	Ophrestia	oblongifolia	Indigenous; Endemic	
Poaceae	Oplismenus	hirtellus	Indigenous	
Hyacinthaceae	Ornithogalum	juncifolium	Indigenous	
Hyacinthaceae	Ornithogalum	juncifolium	Indigenous	
Hyacinthaceae	Ornithogalum	graminifolium	Indigenous	
Orchidaceae	Orthochilus	foliosus	Indigenous	
Asteraceae	Osteospermum	grandidentatum	Indigenous	
Oxalidaceae	Oxalis	semiloba	Indigenous	
Oxalidaceae	Oxalis	latifolia	Not indigenous; Naturalised; Invasive	
Apocynaceae	Pachycarpus	concolor	Indigenous	
Apocynaceae	Pachycarpus	asperifolius	Indigenous	
Poaceae	Panicum	dregeanum	Indigenous	
Passifloraceae	Passiflora	suberosa	Not indigenous; Naturalised; Invasive	
Rubiaceae	Pavetta	bowkeri	Indigenous; Endemic	
Malvaceae	Pavonia	burchellii	Indigenous	
Thymelaeaceae	Peddiea	africana	Indigenous	
Geraniaceae	Pelargonium	luridum	Indigenous	
Geraniaceae	Pelargonium	alchemilloides	Indigenous	
Poaceae	Pennisetum	unisetum	Indigenous	
Rubiaceae	Pentanisia	prunelloides	Indigenous	
Acanthaceae	Phaulopsis	imbricata	Indigenous	
Phyllanthaceae	Phyllanthus	meyerianus	Indigenous	
Phyllanthaceae	Phyllanthus	parvulus	Indigenous	
Asteraceae	Phymaspermum	acerosum	Indigenous	
Piperaceae	Piper	capense	Indigenous	
Pittosporaceae	Pittosporum	viridiflorum	Indigenous	
Pteridaceae	Pityrogramma	calomelanos	Not indigenous; Naturalised	
Lamiaceae	Plectranthus	hadiensis	Indigenous	
Lamiaceae	Plectranthus	ambiguus	Indigenous	
Lamiaceae	Plectranthus	ciliatus	Indigenous	
Lamiaceae	Plectranthus	sp.		
Lamiaceae	Plectranthus	hadiensis	Indigenous	
Polygalaceae	Polygala	virgata	Indigenous	
Polygalaceae	Polygala	amatymbica	Indigenous	
Polygalaceae	Polygala	gymnoclada	Indigenous	

Polygalaceae	Polygala	macowaniana	Indigenous; Endemic	
Potamogetonaceae	Potamogeton	octandrus	Indigenous	
Celastraceae	Pristimera	peglerae	Indigenous; Endemic	
Proteaceae	Protea	caffra	Indigenous	
Molluginaceae	Psammotropha	myriantha	Indigenous	
Fabaceae	Pseudarthria	hookeri	Indigenous	
Poaceae	Pseudechinolaena	polystachya	Indigenous	
Myrtaceae	Psidium	guajava	Not indigenous; Naturalised; Invasive	
Myrtaceae	Psidium	guineense	Not indigenous; Naturalised; Invasive	
Psilotaceae	Psilotum	nudum	Indigenous	
Fabaceae	Psoralea	glabra	Indigenous	
Fabaceae	Psoralea	pinnata	Indigenous; Endemic	
Pteridaceae	Pteris	vittata	Indigenous	
Amaranthaceae	Pupalia	lappacea	Indigenous	
Lamiaceae	Pycnostachys	reticulata	Indigenous	
Cyperaceae	Pycreus	permutatus	Indigenous	
Cyperaceae	Pycreus	flavescens	Indigenous	
Cyperaceae	Pycreus	nitidus	Indigenous	
Cyperaceae	Pycreus	rehmannianus	Indigenous	
Combretaceae	Quisqualis	parviflora	Indigenous; Endemic	
Ranunculaceae	Ranunculus	multifidus	Indigenous	
Orchidaceae	Rhipidoglossum	xanthopollinium	Indigenous	
Cactaceae	Rhipsalis	baccifera	Indigenous	
Apocynaceae	Riocreuxia	flanaganii	Indigenous; Endemic	CR
Apocynaceae	Riocreuxia	torulosa	Indigenous	
Orchidaceae	Satyrium	hallackii	Indigenous	
Amaryllidaceae	Scadoxus	multiflorus	Indigenous	
Anacardiaceae	Schinus	terebinthifolius	Not indigenous; Cultivated; Naturalised; Invasive	
Cyperaceae	Schoenus	cuspidatus	Indigenous; Endemic	
Cyperaceae	Scleria	sobolifer	Indigenous; Endemic	
Cyperaceae	Scleria	natalensis	Indigenous; Endemic	
Cyperaceae	Scleria	achtenii	Indigenous	
Salicaceae	Scolopia	sp.		
Anacardiaceae	Searsia	chirindensis	Indigenous	
Anacardiaceae	Searsia	dentata	Indigenous	
Anacardiaceae	Searsia	rudatisii	Indigenous; Endemic	EN
Anacardiaceae	Searsia	rehmanniana	Indigenous	
Anacardiaceae	Searsia	rehmanniana	Indigenous	
Anacardiaceae	Searsia	grandidens	Indigenous	
Asteraceae	Senecio	oxyriifolius	Indigenous	

Asteraceae	Senecio	glaberrimus	Indigenous	
Asteraceae	Senecio	pterophorus	Indigenous	
Asteraceae	Senecio	latifolius	Indigenous	
Fabaceae	Senna	pendula	Not indigenous; Naturalised; Invasive	
Poaceae	Setaria	sphacelata	Indigenous	
Poaceae	Setaria	sphacelata	Indigenous	
Caryophyllaceae	Silene	burchellii	Indigenous	
Rubiaceae	Spermacoce	natalensis	Indigenous	
Lamiaceae	Stachys	tubulosa	Indigenous	
Lamiaceae	Stachys	comosa	Indigenous; Endemic	VU
Gesneriaceae	Streptocarpus	haygarthii	Indigenous; Endemic	
Loganiaceae	Strychnos	usambarensis	Indigenous	
Euphorbiaceae	Suregada	africana	Indigenous	
Lamiaceae	Syncolostemon	argenteus	Indigenous	
Asteraceae	Tarchonanthus	trilobus	Indigenous; Endemic	
Fabaceae	Tephrosia	macropoda	Indigenous	
Fabaceae	Tephrosia	albissima	Indigenous	
Lamiaceae	Teucrium	kraussii	Indigenous	
Santalaceae	Thesium	sp.		
Santalaceae	Thesium	costatum	Indigenous	
Santalaceae	Thesium	racemosum	Indigenous	
Santalaceae	Thesium	natalense	Indigenous	
Acanthaceae	Thunbergia	natalensis	Indigenous	
Acanthaceae	Thunbergia	atriplicifolia	Indigenous	
Poaceae	Trichopteryx	dregeana	Indigenous	
Fabaceae	Trifolium	africanum	Indigenous	
Fabaceae	Trifolium	burchellianum	Indigenous	
Iridaceae	Tritonia	disticha	Indigenous	
Malvaceae	Triumfetta	annua	Indigenous	
Malvaceae	Triumfetta	pilosa	Indigenous	
Alliaceae	Tulbaghia	leucantha	Indigenous	
Rubiaceae	Vangueria	infausta	Indigenous	
Rutaceae	Vepris	bachmannii	Indigenous	
Fabaceae	Vigna	sp.		
Santalaceae	Viscum	triflorum	Indigenous	
Santalaceae	Viscum	obovatum	Indigenous	
Pteridaceae	Vittaria	isoetifolia	Indigenous	
Campanulaceae	Wahlenbergia	paucidentata	Indigenous	
Xyridaceae	Xyris	capensis	Indigenous	
Scrophulariaceae	Zaluzianskya	elongata	Indigenous	
Araceae	Zantedeschia	albomaculata	Indigenous	
Fabaceae	Zornia	milneana	Indigenous	