FEN CONSULTING

Freshwater Assessment

AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED 132KV OVERHEAD POWERLINE ASSOCIATED WITH THE EXISTING WOLF, SKILPAD AND GRASSRIDGE SUBSTATIONS, NEAR KARIEGA AND KIRKWOOD IN THE EASTERN CAPE PROVINCE

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EXECUTIVE SUMMARY

A 132 kV overhead powerline is proposed to be developed and linked to the existing Eskom Grassridge, Skilpad and Wolf substations for a distance of approximately 90 km. The proposed overhead powerline will be routed adjacent to the existing 132 kV overhead powerline which will then be decommissioned in the future once the proposed overhead powerline has been developed. The proposed powerline will traverse several watercourses including major river systems such as the Kariega, Holbak and Bezuidenhouts Rivers, ephemeral tributaries with riparian vegetation associated with these major river systems and ephemeral drainage lines (with and without riparian vegetation) of the Coega River system.

It was determined that the proposed powerline will have a Low risk significance on the watercourses with the implementation of mitigation measures. The Low risk significance is based on the premise that all powerline support structures will be located at least 32 m from a watercourse and any grading of existing roads (no formal upgrading or expansion of road crossings), particularly those that traverse watercourses (should it be required) is only undertaken during the driest period of the year. The impact significance for the construction and operation for these components can be considered low with mitigation.

Based on the findings of the assessment, no fatal flaws in terms of freshwater ecological aspects were identified. With adherence to cogent, well-conceived and ecologically sensitive construction plans and the implementation of the mitigation measures provided in this report, and provided that general good construction practice is adhered to, the proposed powerline is considered acceptable from a freshwater conservation perspective.

MANAGEMENT SUMMARY

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to conduct a specialist freshwater ecological assessment as part of the Environmental Authorisation (EA) and Water Use Authorisation (WUA) processes for the proposed 132 kV overhead powerline routed from the existing Wolf to Skilpad substations, ands from the Skilpand to Grassridge substations north of Kariega and West of Kirkwood in the Eastern Cape Province (hereafter referred to as the 'proposed overhead powerline'). The proposed overhead powerline will be routed for a distance of approximately 90 km adjacent to the existing 132 kV overhead powerline which will then be decommissioned in the future once the proposed overhead powerline has been developed.

The purpose of this report is to provide a description and assessment of the ecology of the watercourses associated with the proposed overhead powerline including mapping of the natural watercourses, defining areas of increased Ecological Importance and Sensitivity (EIS), and defining the Present Ecological State (PES). The Department of Water and Sanitation (DWS) Risk Assessment Matrix as promulgated in Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) was applied to determine the significance of the impacts associated with the proposed overhead powerline and mitigatory measures were identified which aim to minimise the potential impacts.

A desktop study was conducted, in which the watercourses were identified prior to the on-site investigation, and relevant national and provincial databases were consulted. The results of the desktop study are contained in Section 4 of this report.

A field assessment took place from the 7th to the 11th of February 2022. The watercourses identified to be traversed by the powerline development and those identified within the investigation area include watercourses associated with the Wolwefonteinspoortspruit, Kariega, Holbak, Bezuidenhouts and Coega River systems. More specifically, the proposed overhead powerline will traverse the Kariega, Holbak and Bezuidenhouts Rivers along its central portion. Several ephemeral tributaries with riparian vegetation and episodic drainage line without riparian vegetation (EDLs) of the Wolwefonteinspoortspruit, Kariega, Holbak, Bezuidenhouts and Coega River systems, mostly located within the western portion of the proposed overhead powerline, will be traversed by the proposed overhead powerline. Drainage lines identified as ephemeral drainage lines with and without riparian vegetation located within the south eastern portion of the proposed overhead powerline, will be

traversed by the proposed overhead powerline. The proposed overhead powerline will also traverse other drainage features not considered true watercourses, namely preferential surface flow paths (PFP).

The results of the ecological assessment of the watercourses are discussed in Section 5 of this report is summarised in the table below.

Table A: Summary of results of the ecological assessment as discussed in Section 5.

Watercourse	Present Ecological State (PES)	Ecoservices	Ecological Importance and Sensitivity (EIS)	Recommended Ecological Category (REC), Recommended Management Objective (RMO) and Best Attainable State (BAS)
Kariega and Holbak Rivers	D (Largely modified)	Very Low to Moderate	Moderate	REC: Category D (Largely modified) (Maintain)
Bezuidenhouts River	C (Moderately modified)	Very Low to Moderately High	Moderate	REC: Category C (Moderately modified) (Maintain)
Ephemeral riparian tributaries of the Wolwefonteinspoortspruit, Kariega, Holbak and Bezuidenhouts River systems	D (Largely modified)	Very Low to Moderate	Moderate	REC: Category C (Largely modified) (Maintain)
Ephemeral drainage lines of the Coega River system	C (Moderately modified)	Very Low to High	High	REC: Category B/C (Largely natural to moderately modified)) (Improve)

The proposed overhead powerline will traverse several of the assessed watercourses. The support structures will be constructed outside the 32 m zone of regulation (ZoR) in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998), as far as feasible, but will still be located within the 100 m ZoR in accordance with Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998). The DWS Risk Assessment was applied to ascertain the significance of perceived impacts on the key drivers and receptors (hydrology, water quality, geomorphology, habitat and biota) of the assessed watercourses, and assuming that the support structures are installed outside the 32 m NEMA ZoR, as far as possible. A summary of the outcome of the risk assessment is provided in Table B.

Table B: Summary of the outcome of the DWS Risk Assessment for the proposed overhead powerline (with the implementation of mitigation measures).

	Impact and Aspect	Risk
Construction Phase	Site preparation prior to construction activities. • Vehicular movement (transportation of construction materials). • Soil and stormwater contamination from oils and hydrocarbons originating from construction vehicles. • Removal of vegetation and associated disturbances to tosoil, and access to the site, including grading of existing informal farm roads (if required).	**Low**
	Installation of the support structures (further than 32 m but within 100 m of the delineated watercourses) and spanning of the proposed overhead powerline: • Excavation of areas leading to stockpiling of soil. • Potential movement of construction equipment and personnel in the areas surrounding watercourses. • Mixing and casting of concrete for foundations.	**Low**
Operational Phase	Operation and maintenance of the powerline: • Potential indiscriminate movement of maintenance vehicles within the watercourses or within close proximity to the watercourses. • Increased risk of sedimentation and/or hydrocarbons entering the watercourses via stormwater runoff from the access roads.	**Low**

No fatal flaws in terms of freshwater ecological aspects were identified. Should all the powerline support structures be located at least 32 m (as far as possible or feasible) from the delineated extent of a watercourse and the recommended mitigation measures be implemented, it is the opinion of the freshwater specialist that the risk significance of the proposed overhead powerline can be considered Low. All mitigation measures as provided must be implemented to prevent any negative edge effects from occurring on the watercourses. It is also recommended that no construction activities take place within the identified EDLs as this may have severe impacts to the larger downstream watercourses to which these features are connected too. Development within the PFP is considered acceptable with the implementation of mitigation measures, with specific mention of erosion and sediment control. Water Use Authorisation by means of General Authorisation (GA) in terms of Section 21(c) and (i) water uses may potentially be obtained in consultation with the Department of Water and Sanitation (DWS). However, the DWS, the custodian of water resources in South Africa, must be consulted with regards to the outcome of this assessment.

Based on the findings of the freshwater ecological assessment and the results of the risk assessment, it is the opinion of the ecologist that the proposed overhead powerline poses a **low risk to the integrity of the watercourses** in the project area provided that adherence to cogent, well-conceived and ecologically sensitive construction plans are implemented and the mitigation measures provided in this report as well as general good construction practices are adhered to, the proposed 132kV powerline is considered acceptable.

DOCUMENT GUIDE

The table below provides the specialist report requirements for the assessment and reporting of impacts on aquatic biodiversity in terms of Government Notice 320 as promulgated in Government Gazette 43110 of 20 March 2020 in line with the Department of Environment, Forestry and Fisheries screening tool requirements, as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as well as for the Environmental Impact Assessment (EIA) Regulations 2014 (as amended) requirements for Specialist Reports (Appendix 6).

No.	Requirements	
2.1	Assessment must be undertaken by a suitably qualified SACNASP registered specialist	Cover Page and Appendix G.
2.2	Description of the preferred development site, including the following aspects-	
2.2.1	a. Aquatic ecosystem type b. Presence of aquatic species and composition of aquatic species communities, their habitat, distribution and movement patterns	Section 4.1: Table 1 and Section 4.2
2.2.2	Threat status, according to the national web based environmental screening tool of the species and ecosystems, including listed ecosystems as well as locally important habitat types identified	Section 4: Table 1
2.2.3	National and Provincial priority status of the aquatic ecosystem (i.e. is this a wetland or river Freshwater Ecosystem Priority Area (FEPA), a FEPA sub- catchment, a Strategic Water Source Area (SWSA), a priority estuary, whether or not they are free-flowing rivers, wetland clusters, etc., a CBA or an ESA; including for all a description of the criteria for their given status	Section 4: Table 1
2.2.4	A description of the Ecological Importance and Sensitivity of the aquatic ecosystem including: a. The description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); b. The historic ecological condition (reference) as well as Present Ecological State (PES) of rivers (in-stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel, flow regime (surface and groundwater)	Section 5:
2.3	Identify any alternative development footprints within the preferred development site which would be of a “low” sensitivity as identified by the national web based environmental screening tool and verified through the Initial Site Sensitivity Verification	Section 7
2.4	Assessment of impacts – a detailed assessment of the potential impact(s) of the proposed overhead powerline on the following very high sensitivity areas/ features:	
2.4.1	Is the development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	Yes, with implementation of the proposed mitigation measures
2.4.2	Is the development consistent with maintaining the Resource Quality Objectives for the aquatic ecosystems present?	
2.4.3	How will the development impact on fixed and dynamic ecological processes that operate within or across the site, including: a. Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); b. Change in the sediment regime (e.g. sand movement, meandering river mouth/estuary, changing flooding or sedimentation patterns) of the aquatic ecosystem and its sub-catchment; c. The extent of the modification in relation to the overall aquatic ecosystem (i.e. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.) and d. Assessment of the risks associated with water use/s and related activities.	Section 5
2.4.4	How will the development impact on the functionality of the aquatic feature including:	Section 7

	a. Base flows (e.g. too little/too much water in terms of characteristics and requirements of system); b. Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over abstraction or instream or off-stream impoundment of a wetland or river); c. Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchanneled valley-bottom wetland to a channelled valley-bottom wetland); d. Quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); e. Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and f. Loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peatsoil, etc).	
2.4.5	How will the development impact on key ecosystem regulating and supporting services especially Flood attenuation; Streamflow regulation; Sediment trapping; Phosphate assimilation; Nitrate assimilation; Toxicant assimilation; Erosion control; and Carbon storage.	Section 5
2.4.6	How will the development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Section 5
2.4.7	In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: size of the estuary; availability of sediment; wave action in the mouth; protection of the mouth; beach slope; volume of mean annual runoff; and extent of saline intrusion (especially relevant to permanently open systems).	NA – Closest estuary is approximately 180 km south of the study area
3.	The report must contain as a minimum the following information:	
3.1	Contact detail of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	Appendix G
3.2	A signed statement of independence by the specialist.	Appendix G
3.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	Section 3.1
3.4	The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant.	Section 3, Appendix C and Appendix D
3.5	A description of the assumptions made, any uncertainties or gaps in knowledge or data.	Section 1.3
3.6	The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant.	Section 6
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3.14	A motivation must be provided if there were development footprints identified as per paragraph 2.3 for reporting in terms of Section 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) that were identified as having a “low” aquatic biodiversity and sensitivity and that were not considered appropriate.	Section 7
3.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed overhead powerline and if the proposed overhead powerline should receive approval or not.	Section 8
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GLOSSARY OF TERMS

Alien vegetation:	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome -usually international in origin.
Biodiversity:	The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Buffer:	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment:	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flow into a river, wetland, lake, and ocean or contributes to the groundwater system.
Delineation (of a wetland):	To determine the boundary of a wetland based onsoil, vegetation and/or hydrological indicators.
Ecoregion:	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Episodic drainage lines	Highly flashy systems that flow or flood only in response to extreme rainfall events, usually high in their catchments. May not flow in a five-year period or may flow only once in several years.
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas
Hydromorphicsoil:	Asoil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobicsoil).
Indigenous vegetation:	Vegetation occurring naturally within a defined area.
Mottles:	Soil with variegated colour patterns are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.
Obligate species:	Species almost always found in wetlands (>99% of occurrences).
Perennial:	Flows all year round.
RDL (Red Data listed) species:	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Seasonal zone of wetness:	The zone of a wetland that lies between the Temporary and Permanent zones and is characterised by saturation from three to ten months of the year, within 50cm of the surface
Temporary zone of wetness:	The outer zone of a wetland characterised by saturation within 50cm of the surface for less than three months of the year.
Watercourse:	In terms of the definition contained within the National Water Act, 1998 (Act No. 36 of 1998) a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes, where relevant, its bed and banks.
Wetland Vegetation (WetVeg) type:	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soil, which may in turn have an influence on the ecological characteristics and functioning of wetlands.

ACRONYMS

°C	Degrees Celsius
AC	Alternating Current
BA	Basic Assessment
BAR	Basic Assessment Report
BGIS	Biodiversity Geographic Information Systems
CBA	Critical Biodiversity Area
CBANC	Critical Biodiversity Areas of the Northern Cape
DC	Direct Current
DEFF	Department of Environment, Forestry and Fisheries
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Ecological Class or Electrical Conductivity (use to be defined in relevant sections)
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Ecological Management Class
EMP	Environmental Management Program
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Areas
GA	General Authorisation
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HGM	Hydrogeomorphic
IHI	Index of Habitat Integrity
kV	Kilovolt
m	Meter
MAP	Mean Annual Precipitation
MC	Management Classes
NAEHMP	National Aquatic Ecosystem Health Monitoring Programme
NBA	National Biodiversity Assessment
NEMA	The National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act, 1998 (Act No. 36 of 1998)
NWCS	National Wetland Classification System
O&M	Operation and Maintenance
PEMC	Present Ecological Management Class
PES	Present Ecological State
REC	Recommended Ecological Category
REDZ	Renewable Energy Zones
REIPPPP	Renewable Energy Independent Power Producer Procurement Program (REIPPPP)
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SARERD	South African Renewable Energy Resource Database
SAS	Scientific Aquatic Services
SQR	Sub-quaternary catchment reach

subWMA	Sub-Water Management Area
WetVeg Groups	Wetland Vegetation Groups
WMA	Water Management Areas
WULA	Water Use Licence Application
WRC	Water Research Commission
ZOR	Zone of Regulation

1 INTRODUCTION

1.1 *Background*

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to conduct a specialist freshwater ecological assessment as part of the Environmental Authorisation (EA) and Water Use Authorisation (WUA) processes for the proposed 132 kV overhead powerline routed from the existing Wolf to Skilpad substations, and from the Skilpad to Grassridge substations north of Kariega and West of Kirkwood in the Eastern Cape Province (hereafter referred to as the 'proposed overhead powerline') (Figures 1 and 2). Please refer to Section 2 for the project description.

In order to identify all watercourses that may potentially be impacted by the proposed overhead powerline, a 500 m "zone of investigation" was implemented around the proposed overhead powerline, in accordance with Government Notice (GN) 509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) (NWA), in order to assess possible sensitivities of the receiving freshwater environment. This area – i.e., the 500 m zone of investigation around the proposed overhead powerline - will henceforth be referred to as the 'investigation area'.

The purpose of this report is to provide a description and assessment of the ecology of the watercourses associated with the proposed overhead powerline including mapping of the natural watercourses, defining areas of increased Ecological Importance and Sensitivity (EIS), and defining the Present Ecological State (PES). The Department of Water and Sanitation (DWS) Risk Assessment Matrix as promulgated in Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998), and an impact assessment as provided by the proponent, were applied to determine the significance of the impacts associated with the proposed overhead powerline and mitigatory measures were identified which aim to minimise the potential impacts.

This study further aims to provide detailed information to guide the proposed overhead powerline in the vicinity of the watercourses, to ensure the ongoing functioning of the ecosystems, such that local and regional conservation requirements and the provision of ecological services in the local area are supported while considering the need for sustainable economic development. This report, after consideration of the above, must guide the proponent, by means of a reasoned opinion and recommendations, as to the viability of the proposed overhead powerline from a watercourse management perspective.

1.2 *Structure of this report*

This report investigates the impact significance of the proposed overhead powerline, as explained the National Water Act, 1998 (Act No. 36 of 1998) (NWA) by means of the DWS Risk Assessment Matrix. The following structure is applicable to this report:

Section 1: Introduction
Provides an introduction, the structure of this report, the assumptions and limitations.

Section 2: Project Description
Provides the location of the proposed overhead powerline as well as a brief summary of the proposed activities associated with the proposed overhead powerline.

Section 3: Assessment Approach
Provides the relevant methodology and definitions applicable to this report, a description of the sensitivity mapping and the risk assessment approach.

Section 4: Desktop Assessment Results
Reports on the findings from the relevant national, provincial and municipal datasets (such as the National Freshwater Ecosystem Priority Areas [NFEPA], 2014 database and the Eastern Cape Biodiversity Conservation Plan (2018), and National Biodiversity Assessment (NBA) 2018 was undertaken to aid in defining the PES and EIS of the watercourses.

Section 5: Site Based Watercourse Assessment Results (Terms of Reference)

This section reports the following:

- A description and delineation of all watercourses associated with the proposed overhead powerline according to "Department of Water Affairs and Forestry (DWAF)[1] (2008)[2]: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones";
- Delineation of all watercourses (using desktop methods) within 500 m of the proposed overhead powerline in accordance with Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to activities as stipulated in Section 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998);
- The classification of the watercourses according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis *et al*., 2013);
- The Ecological assessment of the watercourses utilised the following methodologies:
  - The EIS of the watercourses according to the method described by DWAF (1999);
  - The services provided by the watercourses associated with the proposed overhead powerline were assessed according to the method of Kotze *et al.* (2009);
  - The PES of the watercourses was assessed according to the resource directed measures guideline as advocated by Macfarlane *et al.* (2008) and the River Eco Classification: Index of Habitat Integrity (IHI) as advocated by the Water Research Commission (WRC) and DWAF (2008), as applicable; and
- The allocation of a suitable Recommended Ecological Category (REC), Recommended Management Objective (RMO) and Best Attainable State (BAS) to the watercourse based on the results obtained from the PES, Ecoservices and EIS assessments.

Section 6: Legislative Requirements
Provides the applicable legislative requirements based on the findings from Section 5 and indicates any applicable zones of regulation that may trigger various enviro-legal authorisation requirements.

Section 7: Risk Assessment and Impact
Provides the outcomes from the DWS Risk Assessment Matrix and Impact Assessment as provided by the Environmental Assessment Practitioner (EAP), which highlight all potential impacts and that may affect the surrounding watercourses. Management and mitigation measures are provided which should be implemented during the various proposed overhead powerline activities (planning, construction and operational phases) in order to assist in minimising the impact on the receiving environment.

[1] The Department of Water Affairs and Forestry (DWAF) was formerly known as the Department of Water Affairs (DWA). At present, the Department is known as the Department of Water and Sanitation (DWS). For the purposes of referencing in this report, the name under which the Department was known during the time of publication of reference material, will be used.

[2] Although an updated manual is available since 2008 (Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas). This is still considered a draft document currently under review.

Section 8: Conclusion
Summarises the key findings and recommendations based on the impact assessment outcomes and legislative requirements.

1.3 *Assumptions and Limitations*

- The ground-truthing and verification of the delineated extent of the watercourses are confined to a single site visit undertaken from the 7th to the 11th of February 2022 of the proposed overhead powerline. All watercourses identified within the investigation area were delineated in fulfilment of Government Notice 509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) using various desktop methods with limited field verification including the use of topographic maps, historical and current digital satellite imagery and aerial photographs;
- At the time of this assessment, the positions for the powerline support structures were not available as the outcome of this assessment will guide the placement of these structures;
- Due to access limitations to some of the properties where watercourses occur and the landscape in some areas being rugged and very undeveloped, some reaches of the identified watercourses were inaccessible. Therefore, verification points for specific watercourses were located at points as close to the watercourse reach that needed verification and, where necessary the conditions at the exact point required were inferred or extrapolated;
- Due to the majority of the watercourses being ephemeral within the region, very few areas were encountered that displayed more than one watercourse characteristic as defined by the DWAF (2008) method (such as containing alluvial or inundated soil, or hosts riparian vegetation adapted to saturated conditions). As a result, identification of the outer boundary of the temporary watercourse zones and marginal riparian zones proved difficult. In some areas and, in particular, in the areas where watercourse conditions and riparian zones are marginal, delineations were augmented with the use of digital satellite imagery. Nevertheless, the watercourse delineations as presented in this report are regarded as a best estimate of the watercourse boundaries based on the site conditions present at the time of assessment and the results obtained are considered sufficiently accurate to allow informed planning and decision making to take place;
- Global Positioning System (GPS) technology is inherently somewhat inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. However, the delineations as provided in this report are deemed accurate enough to fulfil the environmental authorisation requirements as well as the implementation of the mitigation measures provided;
- Watercourses and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the watercourse boundaries may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results; and
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, it is expected that the watercourses have been accurately assessed and considered, based on the field observations and the consideration of existing studies and monitoring data in terms of riparian and wetland ecology.

2 PROJECT DESCRIPTION

The proposed 132 kV overhead powerline will be routed from the existing Grassridge substation in a general north-westerly direction to the Skilpad and Wolf substations for a distance of approximately 90 km (Figures 1 and 2). The proposed overhead powerline will be routed adjacent to the existing 132 kV overhead powerline which will be decommissioned in the future once the current proposed overhead powerline has been developed. The proposed overhead powerline forms part of the works required to connect the proposed Wolf Wind Energy Facility (WEF) near Wolwefontein to the national grid, which will also prevent potential future capacity issues and failure of infrastructure.

A monopole 132 kV support structure/pylon design will likely be used for the proposed overhead powerline to allow sufficient clearance for birds. The type of support structures to be used for the proposed overhead powerline is yet to be confirmed but will either be wooden or lattice structure monopole towers. The positions of the powerline support structures were not available at the time of this assessment as the outcome of this assessment will guide the placement of these structures. The proposed overhead powerline will be accessed via existing access/farm roads and/or a jeep track for construction and operation (new or existing in some cases) will run underneath the powerline.

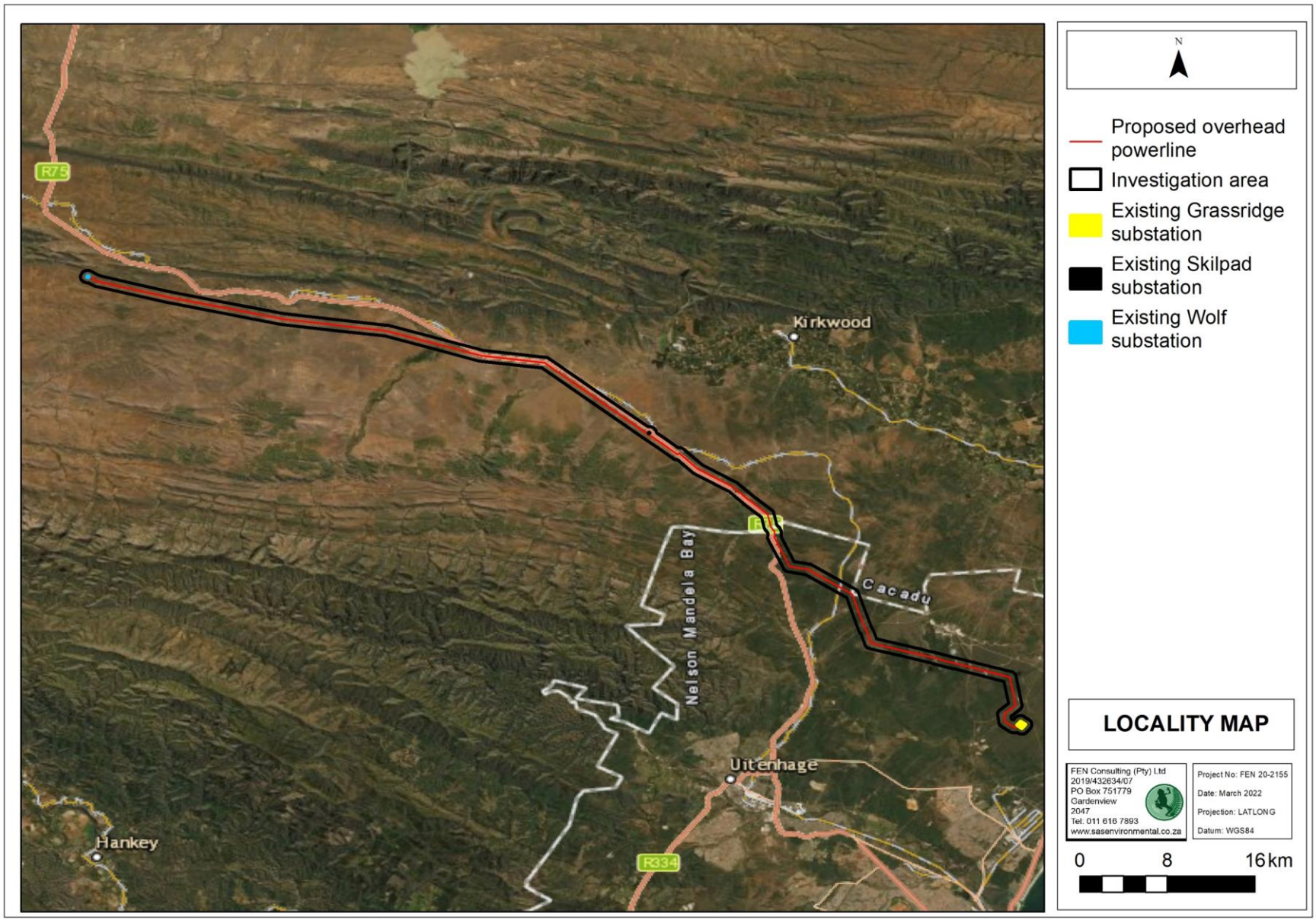


Figure 1: Digital satellite image depicting the proposed overhead powerline and the investigation area in relation to its surroundings.

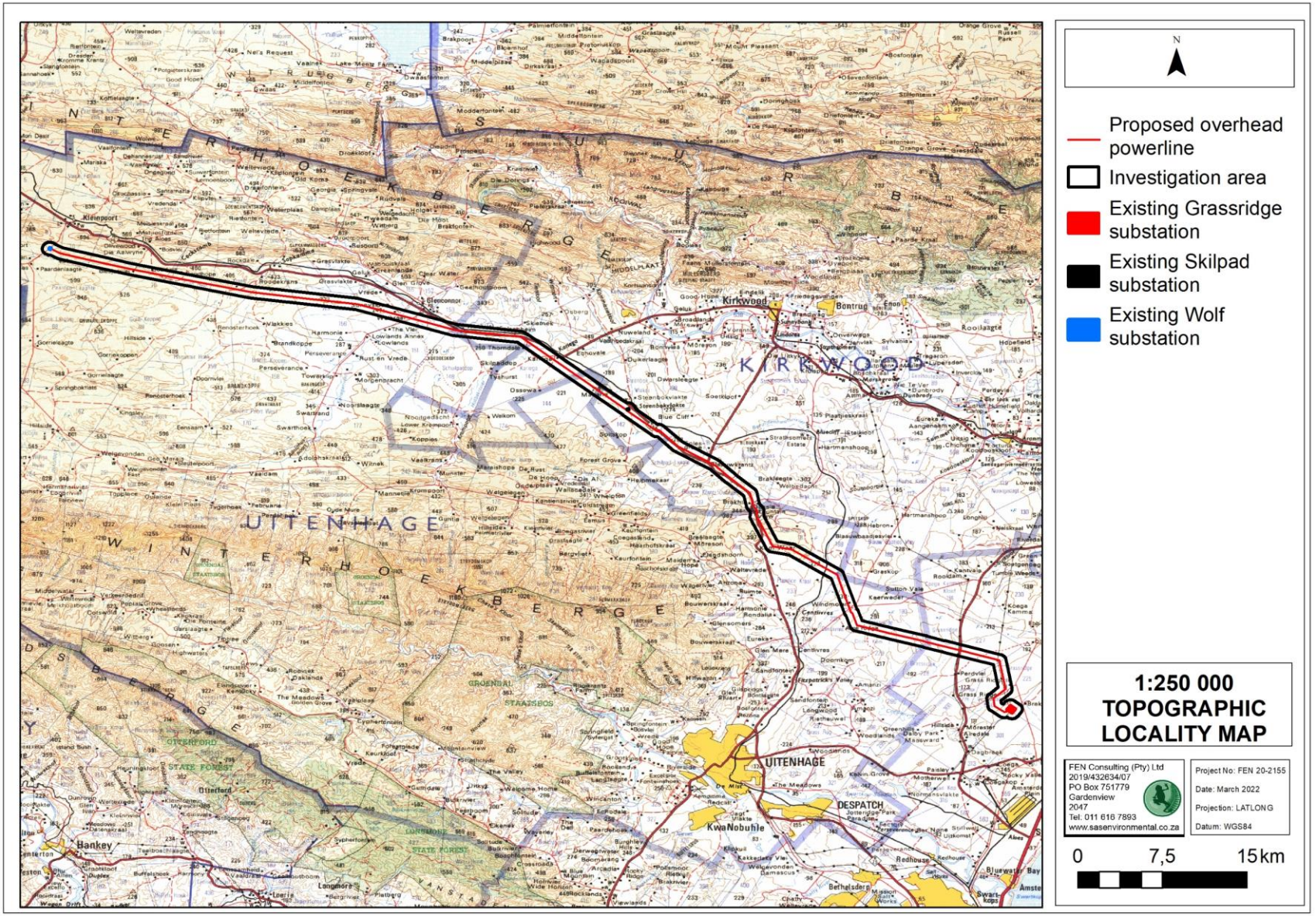


Figure 2: Location of the proposed overhead powerline and the investigation area depicted on a 1:50 000 topographical map in relation to surrounding areas.

3 ASSESSMENT APPROACH

3.1 *Watercourse Field Verification*

As part of this assessment, the following definitions, as per the National Water Act, 1998 (Act No. 36 of 1998) are of relevance:

Watercourse means-

(a) A river or spring;
(b) A natural channel in which water flows regularly or intermittently;
(c) A wetland, lake or dam into which, or from which water flows; and
(d) Any collection of water, which the Minister may, by notice of the Gazette, declare a watercourse.

Wetland habitat is "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

Riparian habitat includes the physical structure and associated vegetation of areas associated with a watercourse which are commonly characterised by alluvial soil, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

A field verification was undertaken from the 7th to the 11th of February 2022 (summer season[3]) during which the presence of any watercourse characteristics as defined by DWAF (2008) or wetlands as defined by the National Water Act, 1998 (Act No. 36 of 1998) were noted (please refer to Sections 5 and 6 of this report). In addition to the delineation process, detailed assessment of the delineated watercourses was undertaken, at which time factors affecting the integrity of the watercourses were taken into consideration and aided in the determination of the functioning and the ecological and socio-cultural services provided by the watercourses. A detailed explanation of the methods of assessment undertaken as listed in Section 1.1 is provided in **Appendix C** of this report.

The watercourse delineation took place according to the method presented in the "Updated manual for the identification and delineation of wetland and riparian resources" (DWAF, 2008). The foundation of the method is based on the fact that watercourses have several distinguishing factors including the following:

- Landscape position;
- The presence of water at or near the ground surface;
- Distinctive hydromorphic soil;
- Vegetation adapted to saturated soil; and
- The presence of alluvial soil in stream systems.

[3] Site surveys are recommended to take place during a seasonal period where the probability of detecting an identifiable life history stage of vegetation species (such as facultative vegetation species) is highest and in the rainy period to ensure optimised conditions for the identification of seasonal watercourses, which may otherwise be overlooked. Although the ideal time for the field assessment would have been in the wet season, the local area hasn't received decent rainfall in the last two years. Thus, the site conditions at the time of the field assessment, though not ideal, sufficed for the purposes of this study.

3.2 *Sensitivity Mapping*

All watercourses associated with the proposed overhead powerline were delineated with the use of a Global Positioning System (GPS). Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps. The sensitivity map presented in Section 6 should guide the design, layout and management of the proposed overhead powerline.

3.3 *Risk and Impact Assessment and Recommendations*

Following the completion of the assessment, a risk assessment (DWS Risk Assessment) and impact assessment as provided by the EAP, were conducted (please refer to **Appendix D** for the method of approach) and recommendations were developed to address and mitigate impacts associated with the proposed overhead powerline. These recommendations also include general management measures, which apply to the proposed construction and operational/maintenance activities. The detailed mitigation measures are outlined in Section 7 of this report, while the general management measures which are considered best practice mitigation applicable to this project, are outlined in **Appendix F**.

4 DESKTOP ASSESSMENT RESULTS

4.1 *National and Provincial Datasets*

The following section contains data accessed as part of the desktop assessment and presented as a “dashboard-style” report below (Table 2). The dashboard report aims to present concise summaries of the data on as few pages as possible in order to allow for integration of results by the reader to take place. Where required, further discussion and interpretation are provided.

It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics associated with the proposed overhead powerline at the scale required to inform the environmental authorisation and/or water use authorisation processes. Given these limitations, this information is considered useful as background information to the study, is important in legislative contextualisation of the risks and impacts, and was thus used as a guideline to inform the assessment and to focus on areas and aspects of increased conservation importance during the field survey. It must, however, be noted that site verification of key areas may potentially contradict the information contained in the relevant databases, in which case the site verified information must carry more weight in the decision-making process.

Table 1: Desktop data (from desktop databases only) relating to the characteristics of the proposed overhead powerline and its associated investigation area.

Aquatic ecoregion and sub-regions in which the investigation area is located			**Detail of the investigation area in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database**	
Ecoregion (Figure 3)	Southern Folded Mountains; and South Eastern Coastal Belt		FEPACODE (Figure 6)	The western and central portions of the investigation area are located within a sub-quaternary catchment considered important in terms of fish or freshwater ecological conservation (FEPACODE = 1). River FEPAs are important for achieving biodiversity targets for river ecosystems and threatened fish species and should therefore remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources. The remaining south-eastern portions of the investigation area are located in a sub-quaternary catchment classified as an upstream management catchment which is required to be managed to prevent downstream degradation of FEPAs and fish support areas (FEPA CODE = 4).
Catchment (Figure 4)	Gamtoos; Sundays; and Swartkops			
Quaternary Catchment (Figure 4)	L70E; N40B; N40E; M30A; and M30B			
WMA	Fish to Tsitsikamma			
subWMA (Figure 5)	Gamtoos; Sundays; and Algoa			
Dominant characteristics of the Southern Folded Mountains and South Eastern Coastal Belt Level II (19.01) (Kleynhans *et al*., 2007)				
Level II Code	19.01	20.01		
Dominant primary terrain morphology	Low mountains, Lowlands with parallel hills, Parallel hills, Low mountains	Plains, Dune Hills with parallel Crests and Lowlands	NFEPA Wetlands (Figure 7)	According to the NFEPA database (2011), one natural channelled valley bottom wetland is located within the western portion of the investigation area. This wetland will not be traversed by the proposed overhead powerline and is considered to be in a largely natural ecological condition (Class AB) with only a few modifications. However, several artificial wetlands are indicated as being traversed by the proposed overhead powerline. These artificial wetlands include channelled and unchanneled valley bottom wetlands considered to be in a heavily to critically modified ecological condition (Class Z3). These artificial features were identified to be artificial impoundment associated with agricultural activities during the site assessment.
Dominant primary vegetation types	Grassy Fynbos, Eastern Thorn Bushveld, Afromontane forest, Valley Thicket, Spekboom Succulent Thicket, Great Nama-Karoo, South and South-west coast Renosterveld, Mountain fynbos, Little Succulent Karoo, Central mountain Renosterveld.	Limestone fynbos, South and South-west Coast Renosterveld, Dune Thicket		
Altitude (m a.m.s.l)	100 - 1300	0 – 300	Wetland Vegetation Type (Figure 8)	The majority of the investigation area is located in the Albany Thicket Valley Wetland Vegetation type (Critically Endangered). Scattered portions within the eastern extent of the investigation area are located within the Albany Thicket Bontveld Wetland Vegetation type (Least Threatened). The threat status of the Wetland vegetation types is per Mbona *et al.* (2015).
MAP (mm)	0 - 400	300 – 500		
The coefficient of Variation (% of MAP)	25 - 40	25 - 35		
Rainfall concentration index	<15 - 45	<15 - 30		
Rainfall seasonality	Winter, All year	All year	NFEPA Rivers (Figure 7)	As per the NFEPA database (2011), the Kariega River and its unnamed tributary are located within the central to western portion of the investigation area and will be traversed by the proposed overhead powerline. The Holbak River will be traversed by the central portion of the proposed overhead powerline. The Bezuidenhouts River is located within the central to eastern portion of the investigation area and will be traversed by the proposed overhead powerline. All the identified rivers and the unnamed tributary of the Kariega River are considered to be in a largely natural ecological condition (Class AB) with only a few modifications but are considered to be in a largely modified (Class D) ecological condition by the PES 1999 dataset.
Mean annual temp. (°C)	14 - 18	16 – 18		
Winter temperature (July)	0 - 20	6 - 20		
Summer temperature (Feb)	10 – 32	14 - 28		
Median annual simulated runoff (mm)	<5 - 150	10 - 80		
Importance of the investigation area according to the Eastern Cape Biodiversity Conservation Plan (ECBCP) (2018) (Figure 9)				
According to the Eastern Cape Biodiversity Conservation Plan (2018), a portion of the eastern extent of the investigation area is located within an area classified as a Critical Biodiversity Area (CBA) 1 of aquatic importance, while the majority of the investigation area located within an area classified as CBA 2 of aquatic importance. CBAs are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. Areas classified as CBA 1 of aquatic importance include critical rivers (main stem) of high irreplaceability and an associated 32 m buffer. This includes fish sanctuaries and free flowing / flagship rivers. When it comes to wetlands, CBA 1 of aquatic importance include critical wetlands such as the Umzimvubu Wetland Complex, Karst/Limestone wetlands, additional oxbow wetlands, dune and dune bypass wetlands. Areas classified as CBA 2 of aquatic importance include important rivers including the DWS/DWAF main stem rivers of high irreplaceability plus a 32 m buffer that fall within fish corridors and other selected catchments (wetland clusters) to achieve connectivity. CBA 2 of aquatic importance also considered all remaining wetlands following those classified as CBA 1 of aquatic importance. Sections along the western, central and eastern portions of the investigation area are located in areas classified as a conservation areas, namely the Blaawbosch Game Farm, Schuilpatdop Game Farm, and Grassridge Private Nature Reserve, respectively.				

National Web Based Environmental Screening Tool (2020): Aquatic Biodiversity sensitivity	
The screening tool is intended for pre-screening of sensitivities in the landscape to be assessed within the EIA process. This assists with implementing the migration hierarchy by allowing developers to adjust their proposed overhead powerline footprint to avoid sensitive areas.	The western portion and the majority of the central to eastern portions of the investigation area are located in an area considered to be of very high aquatic biodiversity sensitivity. This is due to the presence of rivers and the area being located within FEPA quaternary catchments as identified by the NFEPA (2011) database. The area of high aquatic biodiversity sensitivity is also located in in a Strategic Water Source Area, more specifically, the Coega TMG Aquifer Ground Water Strategic Water Source Area.
National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (National Wetland Map 5 is included in the NBA) (see Figure 10)	
According to the NBA 2018: SAIIAE, a natural depression wetland will be traversed by the central to western portion of the proposed overhead powerline. This depression wetland is affected by roads and considered to be in a largely to seriously modified ecological condition (Class DEF). The depression wetland is considered endangered according to the Ecosystem Threat Status (ETS) and poorly protected according to the ecosystem protection level (EPL). Two more natural depression wetlands are located within the eastern portion of the investigation area and will not be traversed by the proposed overhead powerline. These depression wetlands range from being considered to be in a largely natural (Class AB) to moderately modified (Class C) ecological condition. Two natural wetland flats are also indicated within the eastern portion of the investigation area, adjacent to the depression wetlands. The wetland flats are considered to be in a largely natural (Class AB) ecological condition. The natural depression wetlands and wetland flats indicated in the investigation area are considered to be endangered according to the ETS and poorly protected according to the EPL. The Kariega River and its unnamed tributary are located within the central to western portion of the investigation area and will be traversed by the proposed overhead powerline. The Holbak River will be traversed by the central portion of the proposed overhead powerline. The Bezuidenhouts River is located within the central to eastern portion of the investigation area and will be traversed by the proposed overhead powerline. All the identified rivers and the unnamed tributary of the Kariega River are considered to be in a largely natural ecological condition (Class AB) with only a few modifications. The Kariega and the Bezuidenhouts Rivers are considered endangered according to the ETS, while the unnamed tributary of the Kariega River and Holbak River are considered least threatened according to the ETS. All rivers and the unnamed tributary of the Kariega River are considered moderately protected according to the EPL, per the NBA dataset.	

EI = Ecological Importance; ES = Ecological Sensitivity; ESA = Ecological Support Area; EN = Endangered; m.a.m.s.l = Metres above mean sea level; MAP = Mean Annual Precipitation; NFEPA = National Freshwater Ecosystem Priority Area; OESA = Other Ecological Support Area; PES = Present Ecological State; WMA = Water Management Area.

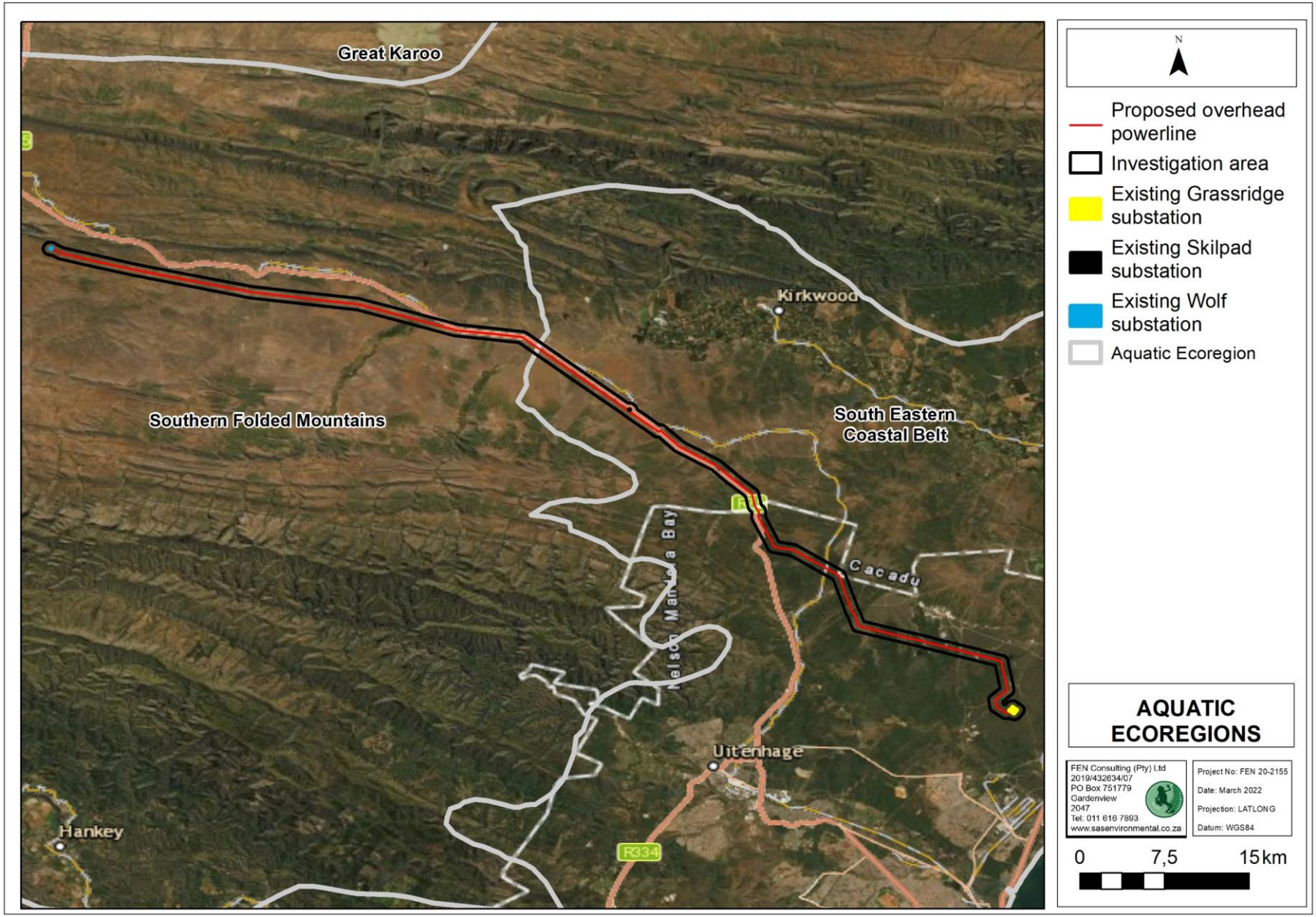


Figure 3: Aquatic ecoregions associated with the proposed overhead powerline and investigation area.

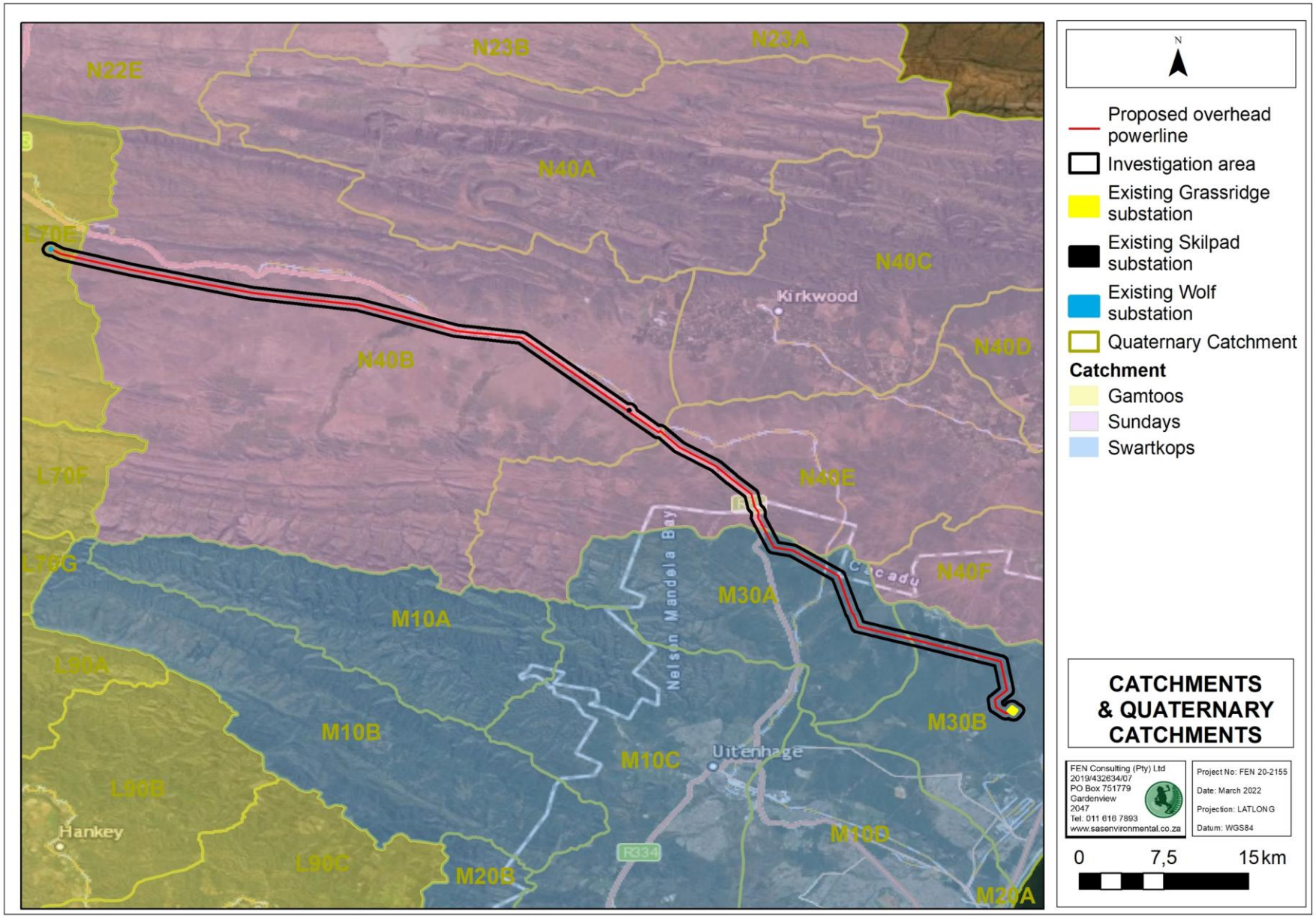


Figure 4: Catchments and quaternary catchments associated with the proposed overhead powerline and investigation area.

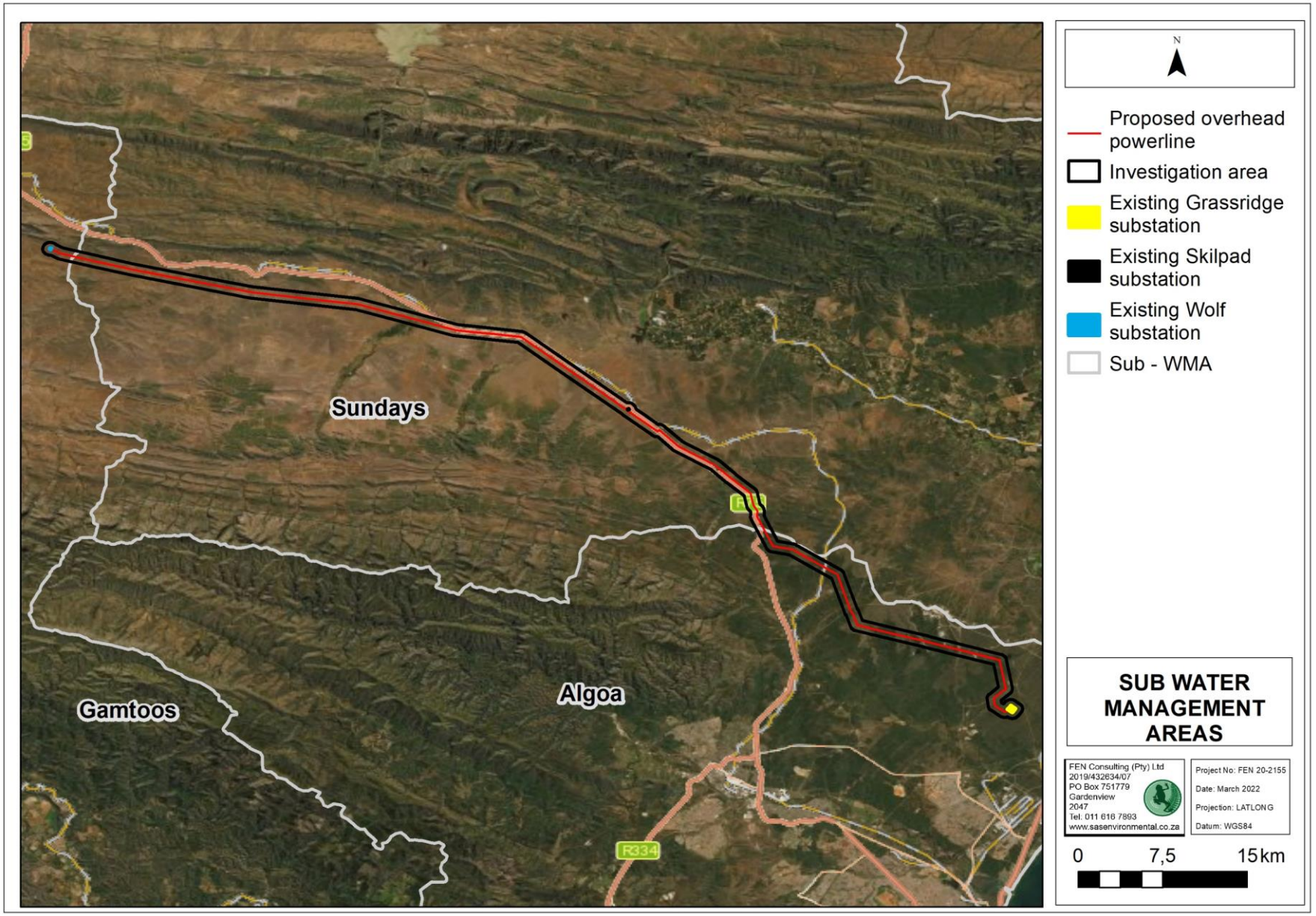


Figure 5: Sub-water management areas associated with the proposed overhead powerline and investigation area.

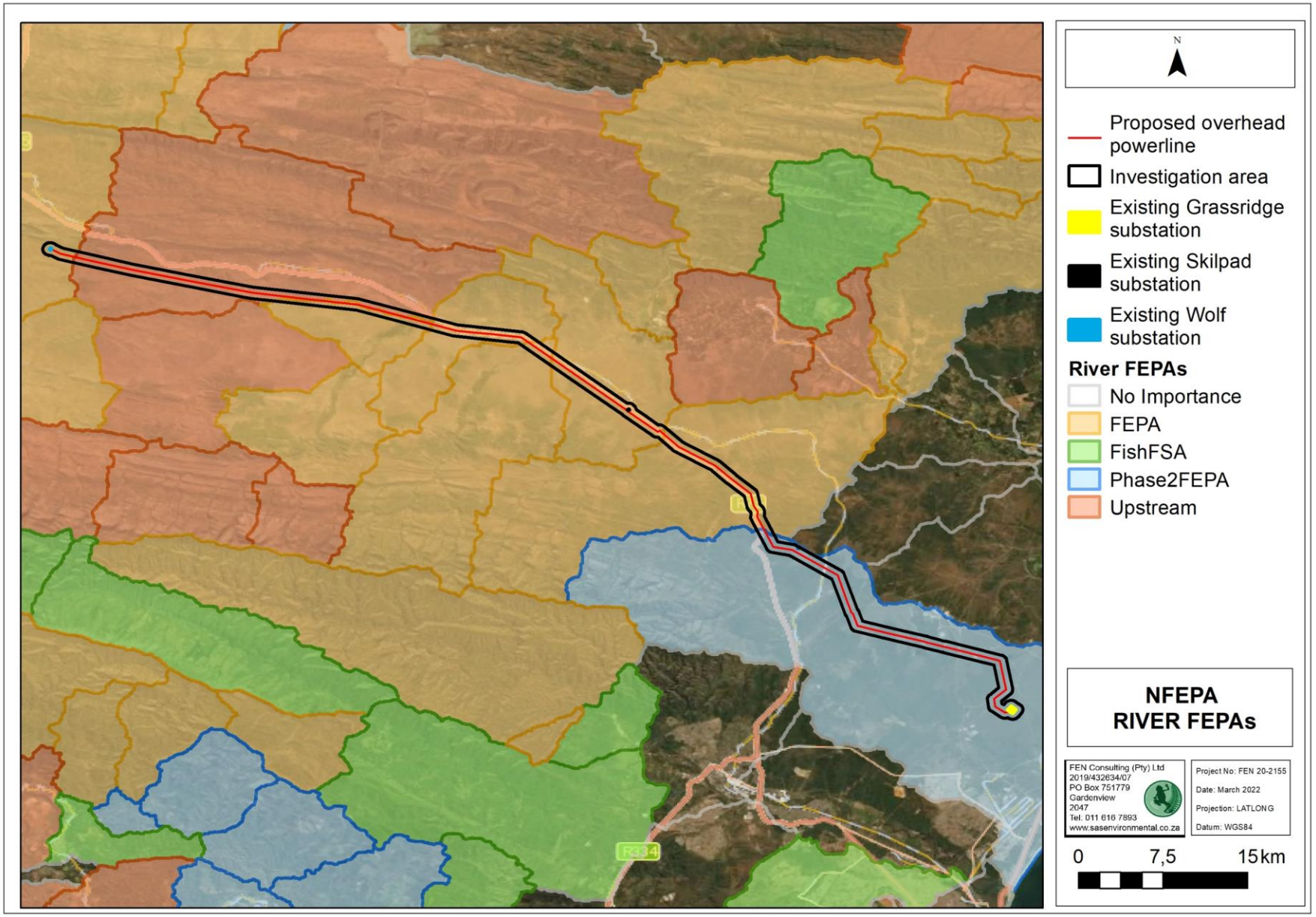


Figure 6: FEPA associated with the proposed overhead powerline and investigation area, according to the NFEPA database (2011).

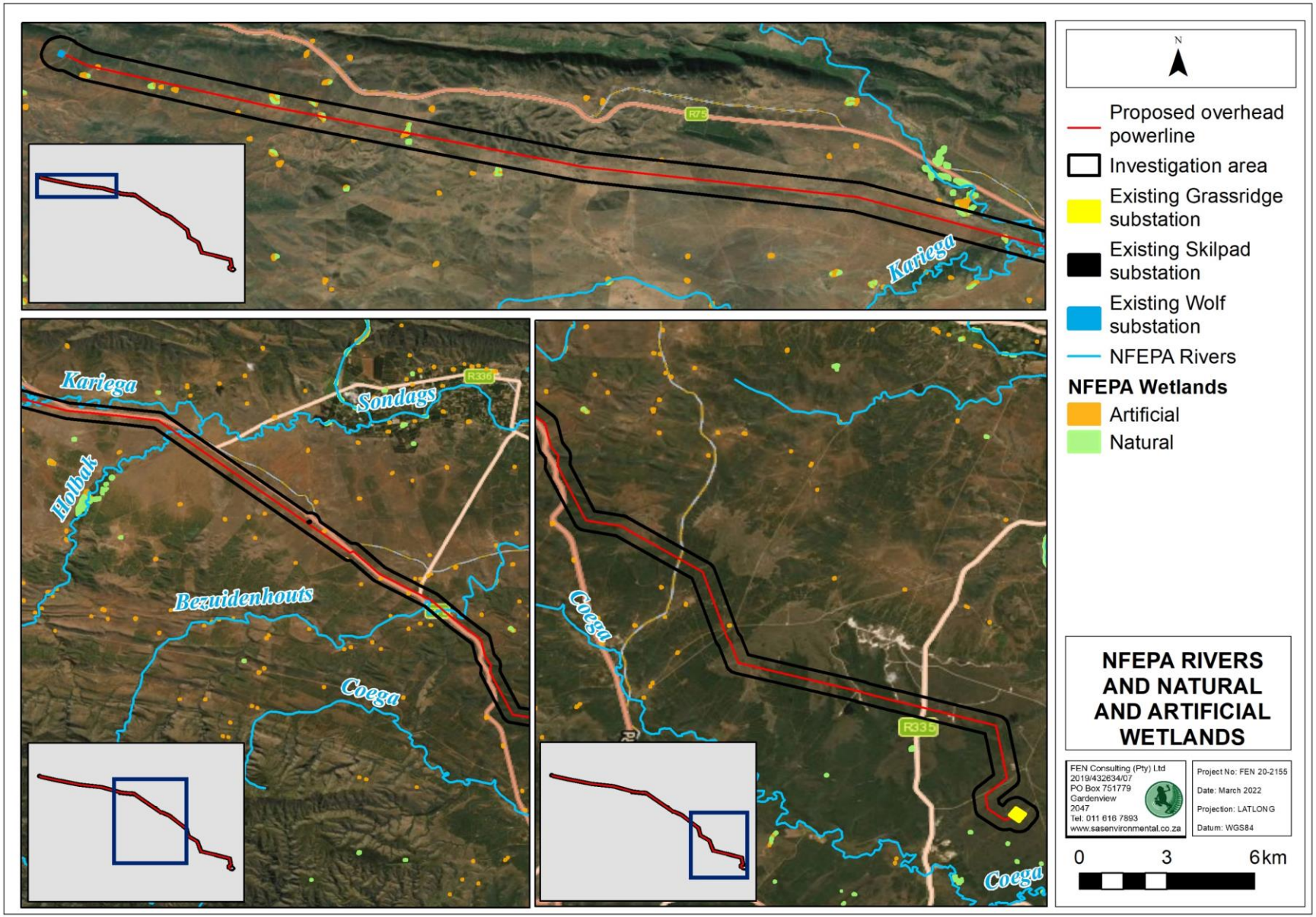


Figure 7: Rivers, natural and artificial wetlands associated with the proposed overhead powerline and investigation area, according to the NFEPA database (2011).

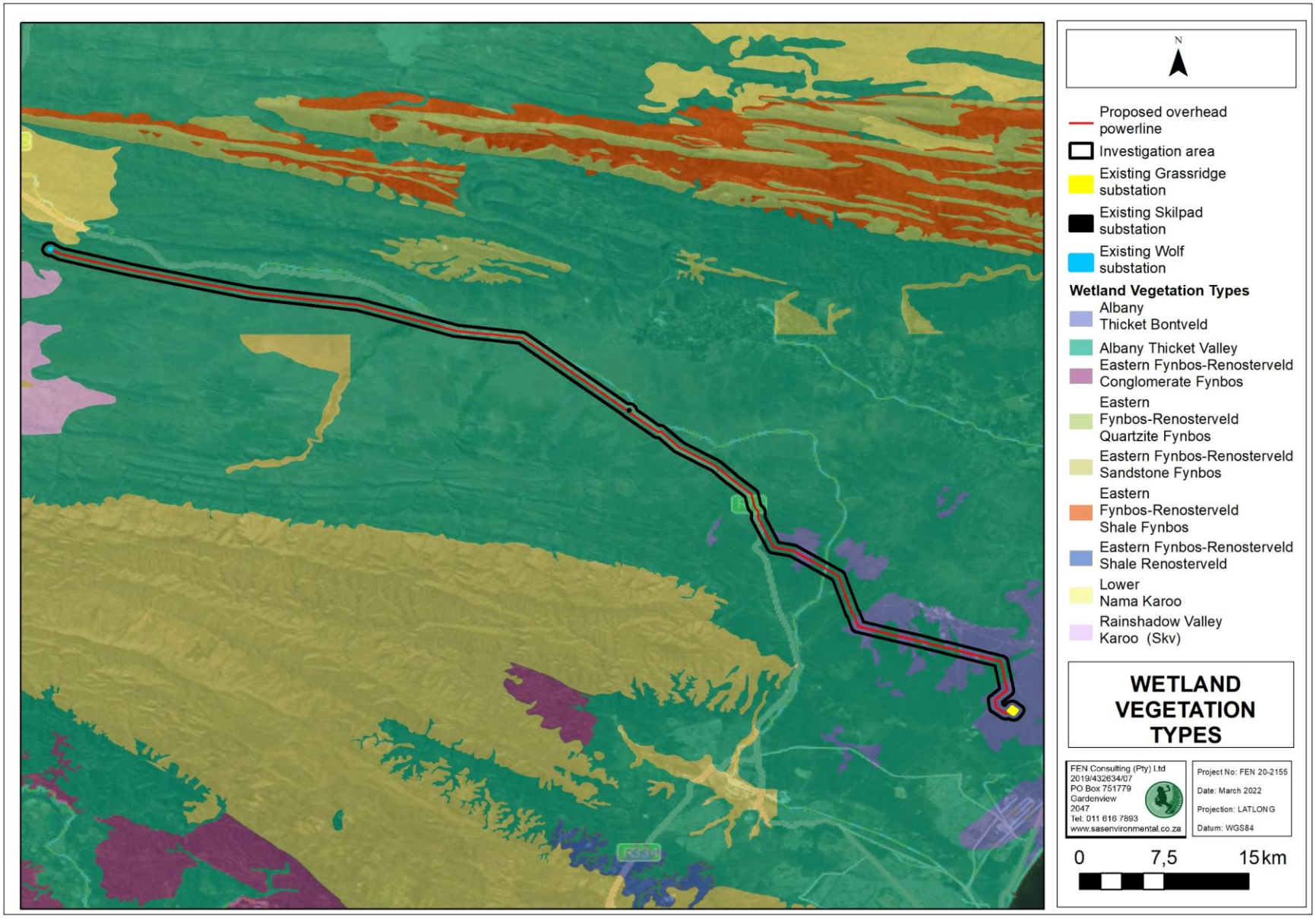


Figure 8: Wetland vegetation types associated with the proposed overhead powerline and investigation area, according to the NFEPA database (2011).

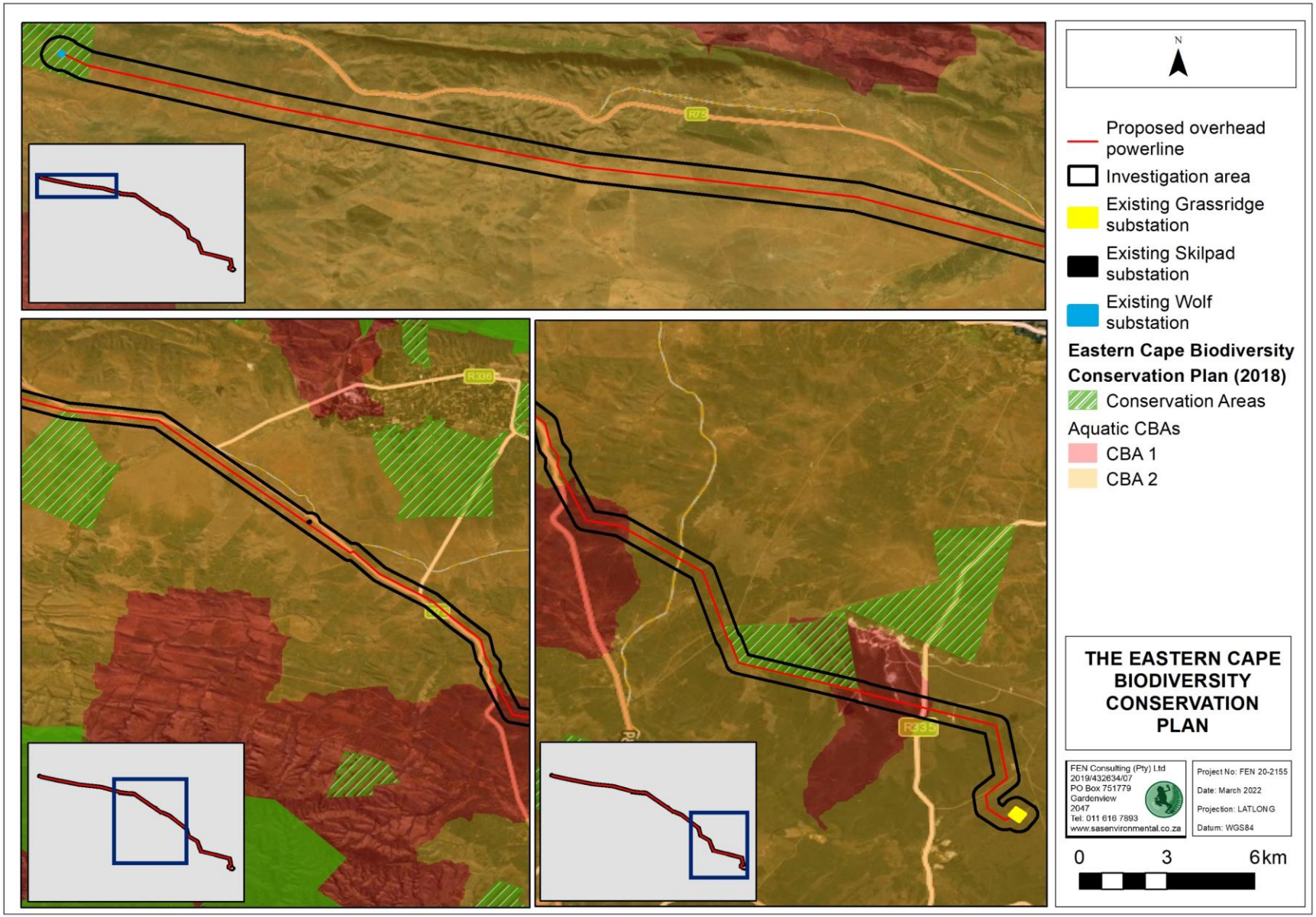


Figure 9: Areas of biodiversity importance associated with the proposed overhead powerline and investigation area, according to the Eastern Cape Biodiversity Conservation Plan (2018) database.

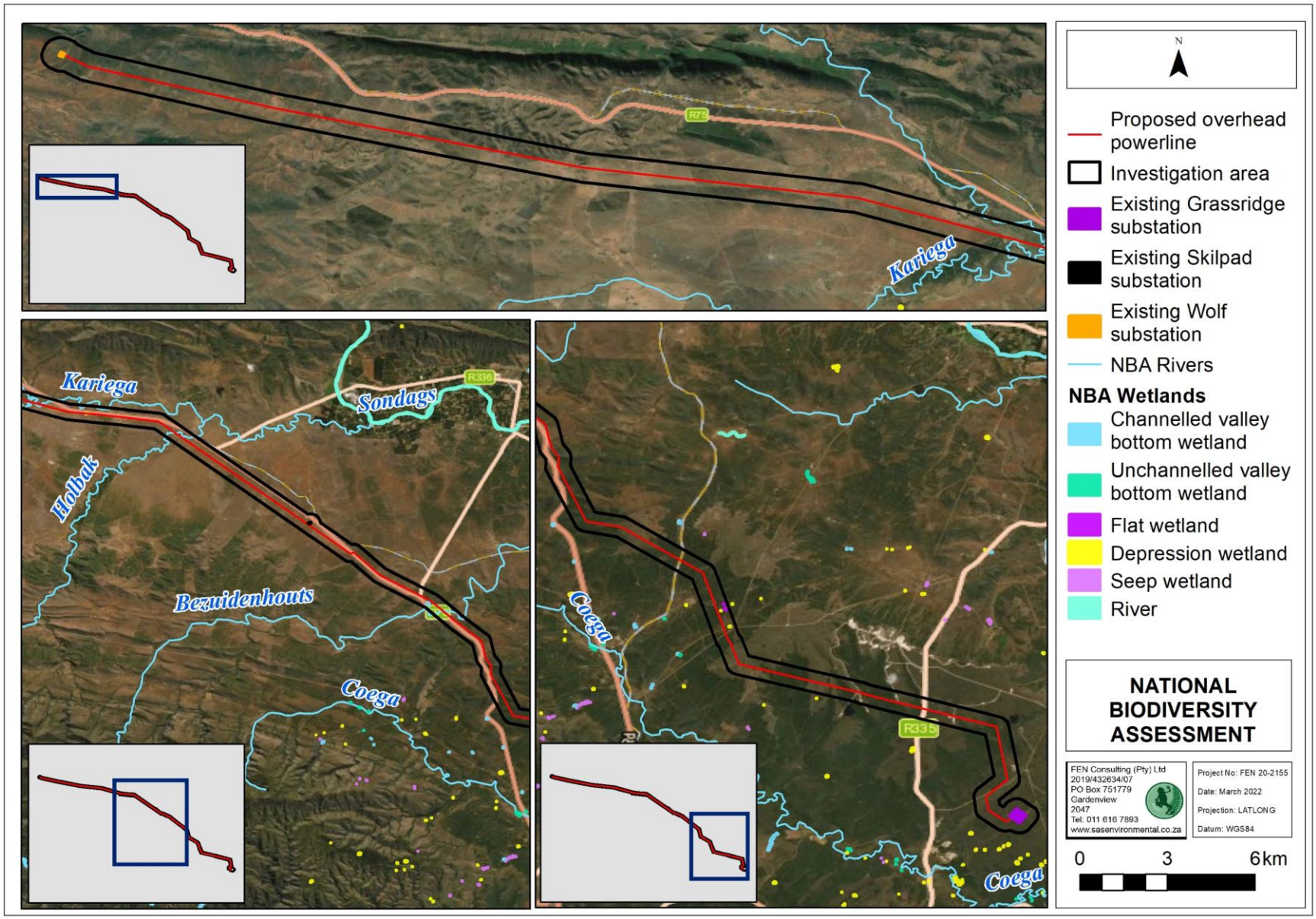


Figure 10: Wetland hydrogeomorphic units (HGM) units and rivers associated with the proposed overhead powerline and investigation area as depicted by the National Biodiversity Assessment (2018).

4.2 *Ecological Status of Sub-Quaternary Catchments [Department of Water and Sanitation (DWS) Resource Quality Services (RQS) PES/EIS Database]*

The PES/EIS database, as developed by the DWS RQIS department was utilised to obtain additional background information on the project area. The information from this database is based on information at a sub-quaternary catchment reach (SQR) level. Descriptions of the aquatic ecology is based on information collated by the DWS RQIS department from available sources of reliable information, such as the South Africa River Health Programme (SA RHP) sites, Ecological Water Requirements (EWR) sites and Hydro Water Management System (WMS) sites.

Key information on invertebrates and background conditions associated with the SQRs L70E-08442 (Wolwefonteinspoortspruit), N40B-08596 (Kariega River), N40E-08678 (Bezuidenhouts River), and M30A-08796 (Coega River) as contained in this database and pertaining to the PES and EIS are tabulated in Tables 2 and 4 and visually represented in Figure 11 that follows.

The EI data for SQRs L70E-08442 (Wolwefonteinspoortspruit), N40B-08596 (Kariega River), N40E-08678 (Bezuidenhouts River), and M30A-08796 (Coega River) indicates that the following fish species are expected to occur at these sites:

Table 2: Fish species expected at the SQR monitoring points.

Macro-Invertebrates	L70E-08442 (Wolwefonteinspoort spruit)	N40B-08596 (Kariega River)	N40E-08678 (Bezuidenhouts River)	M30A-08796 (Coega River)
Anguilla marmorata	X	X	X	X
Anguilla mossambica				X
Barbus anoplus	X	X	X	X
Barbus pallidus				X
Gilchristella aestuaria				X
Glossogobius callidus			X	X
Labeo umbratus			X	X
Monodactylus falciformis				X
Mugil cephalus				X
Myxus capensis				X
Oreochromis mossambicus	X		X	X
Pseudobarbus asper	X			
Sandelia capensis				X

The EI data for SQRs L70E-08442 (Wolwefonteinspoortspruit), N40B-08596 (Kariega River), N40E-08678 (Bezuidenhouts River), and M30A-08796 (Coega River) indicates that the following macro-invertebrate taxa are expected to occur at these sites:

Table 3: Invertebrates previously collected from or expected at the SQR monitoring points.

Macro-Invertebrates	L70E-08442 (Wolwefonteinspoort spruit)	N40B-08596 (Kariega River)	N40E-08678 (Bezuidenhouts River)	M30A-08796 (Coega River)
Aeshnidae		X	X	
Ancylidae	X	X	X	
Baetidae 1 sp	X		X	
Belostomatidae	X			
Caenidae	X	X	X	X
Ceratopogonidae	X	X	X	
Chironomidae	X	X	X	X
Coelenterata			X	
Coenagrionidae	X	X	X	
Corixidae	X	X	X	X

Macro-Invertebrates	L70E-08442 (Wolwefonteinspoort spruit)	N40B-08596 (Kariega River)	N40E-08678 (Bezuidenhouts River)	M30A-08796 (Coega River)
Culicidae	X	X	X	
Dytiscidae	X	X	X	
Ecnomidae			X	
Elmidae/dryopidae	X			
Ephydridae			X	
Gerridae	X	X	X	X
Gomphidae	X	X		X
Gyrinidae	X	X	X	X
Hydracarina	X	X	X	X
Hydraenidae	X			
Hydropsychidae 1 sp			X	
Hydropsychidae 2 sp	X			
Hydroptilidae	X			
Leptoceridae		X	X	X
Leptophlebiidae	X			
Libellulidae	X	X	X	
Muscidae		X		
Naucoridae	X		X	
Notonectidae	X	X	X	
Oligochaeta	X	X		X
Planorbinae		X		
Philopotamidae	X		X	X
Pleidae			X	
Potamonautidae	X	X	X	X
Simuliidae	X	X	X	X
Synlestidae/chlorolestidae	X			
Tabanidae	X	X	X	
Tipulidae	X			
Tricorythidae	X			
Turbellaria	X	X		X
Veliidae/mesoveliidae	X	X		

Table 4: Summary of the ecological status of the sub-quaternary catchment (SQ) reaches associated with the proposed overhead powerline based on the DWS RQS PES/EIS database.

	L70E-08442 (Wolwefonteinspoortspruit)	N40B-08596 (Kariega River)	N40E-08678 (Bezuidenhouts River)	M30A-08796 (Coega River)
Synopsis				
PES Category Median	Largely Natural	Largely Natural	Largely Natural	Largely Modified
Mean EI class	High	Moderate	High	Moderate
Mean ES class	High	Moderate	Moderate	Moderate
Length	27.74	14.88	53.71	72.92
Stream order	1	12	1	1
Default EC[4]	B (High)	C (Moderate)	B (High)	C (Moderate)
PES Details				
Instream habitat continuity MOD	Small	Moderate	Moderate	Large
RIP/wetland zone continuity MOD	Small	Small	Small	Serious
Potential instream habitat MOD activities	Small	Small	Small	Large
Riparian/wetland zone MOD	Small	Small	Small	Serious
Potential flow MOD activities	Small	Moderate	Small	Moderate
Potential physico-chemical MOD activities	None	None	Small	Large
EI Details				

Fish spp/SQ	4	2	5	12
Fish average confidence	2.00	1.00	2.60	2.83
Fish representivity per secondary class	Low	Very Low	Low	Very High
Fish rarity per secondary class	Low	Moderate	High	Very Low
Invertebrate taxa/SQ	32	24	26	13
Invertebrate average confidence	2	1.00	1.08	1.15
Invertebrate representivity per secondary class	High	Moderate	High	Very high
Invertebrate rarity per secondary class	Very High	Very high	Very high	Very low
EI importance: riparian-wetland-instream vertebrates (excluding fish) rating	Low	Low	Low	Low
Habitat diversity class	High	Low	Very high	Very high
Habitat size (length) class	Moderate	Low	Very high	Very high
Instream migration link class	Very High	High	High	Moderate
Riparian-wetland zone migration link	Very High	Very high	Very high	Low
Riparian-wetland zone habitat integrity class	Very High	Very high	Very high	Low
Instream habitat integrity class	Very High	Very high	Very high	Moderate
Riparian-wetland natural vegetation rating based on percentage natural vegetation in 500m	Very High	Very high	Very high	Very high
Riparian-wetland natural vegetation rating based on expert rating	Low	Low	Low	Low
ES Details				
Fish physical-chemical sensitivity description	High	Moderate	Moderate	High
Fish no-flow sensitivity	Very high	Moderate	Moderate	High
Invertebrates physical-chemical sensitivity description	High	Moderate	High	High
Invertebrates velocity sensitivity	Very high	High	Very high	Very high
Riparian-wetland-instream vertebrates (excluding fish) intolerance water level/flow changes description	Low	Low	Low	Low
Stream size sensitivity to modified flow/water level changes description	High	Low	High	High
Riparian-wetland vegetation intolerance to water level changes description	Low	Low	Low	Low

[1] PES = Present Ecological State; confirmed in database that assessments were performed by expert assessors;

[2] EI = Ecological Importance;

[3] ES = Ecological Sensitivity

[4] EC = Ecological Category; default based on median PES and highest of EI or ES means.

[4] EC = Ecological Category; default based on median PES and highest of EI or ES means.

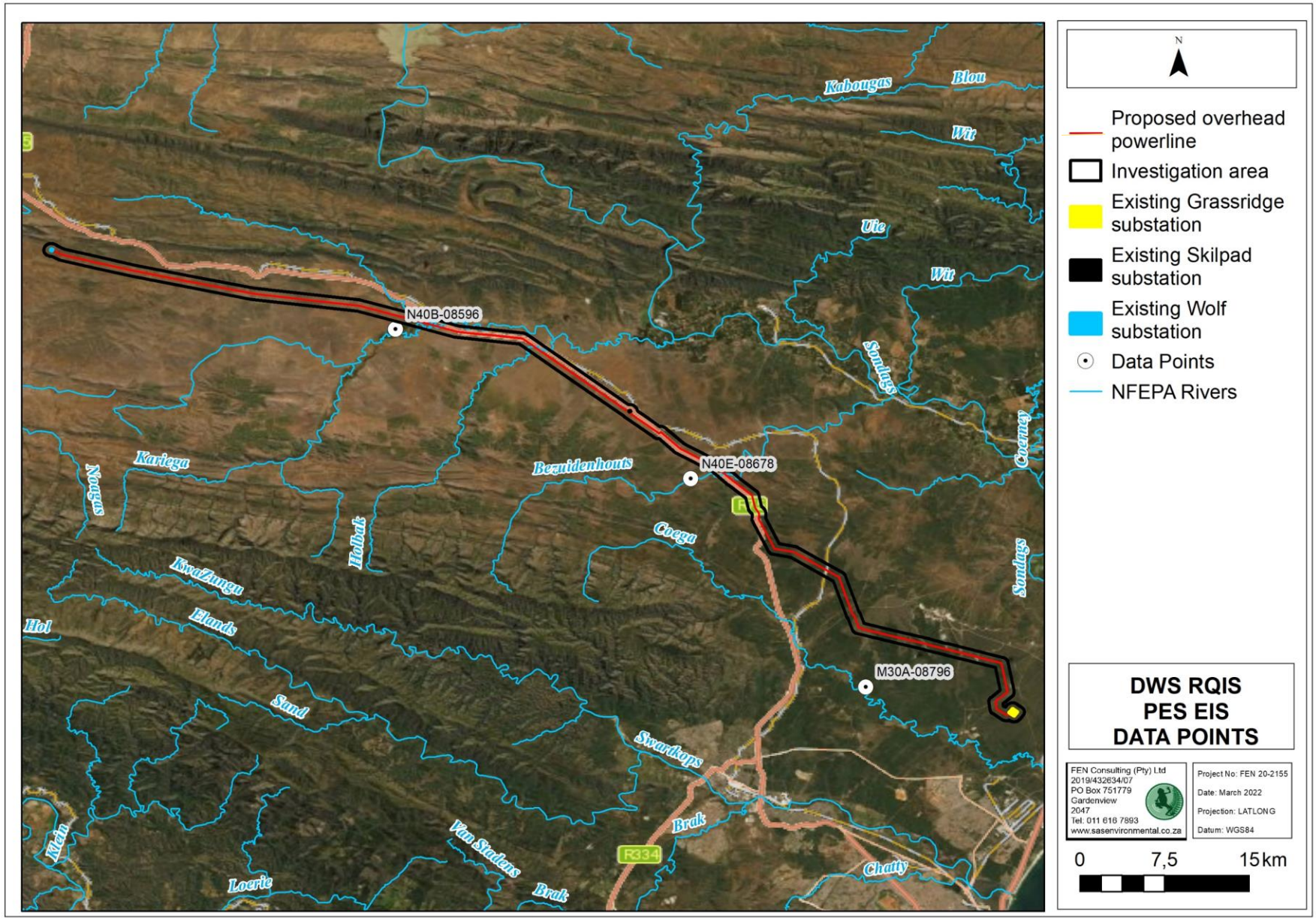


Figure 11: DWS RQIS PES/EIS sub-quaternary catchment reaches (SQRs) indicated relative to the proposed overhead powerline and investigation area.

5 RESULTS: WATERCOURSE ASSESSMENT

5.1 *Field verification and delineation*

In preparation for the field assessment, aerial photographs, digital satellite imagery and provincial and national watercourse databases (as outlined in Section 4 of this report) were used to identify points of interest associated with the proposed overhead powerline at a desktop level. In this regard, specific mention is made of the following:

- Linear features: since water flows/moves through the landscape, watercourses often have a distinct linear element to their signature which makes them discernible on aerial photography or satellite imagery;
- Vegetation associated with watercourses: a distinct increase in density as well as shrub size near flow paths;
- Hue: water flow paths often showing as white/grey or black and outcrops or bare soil displaying varying chroma created by varying vegetation cover, geology and soil conditions. Changes in the hue of vegetation with watercourse vegetation often indicated on black and white images as areas of darker hue (dark grey and black). In colour imagery these areas mostly show up as darker green and olive colours or brighter green colours in relation to adjacent areas where there is less soil moisture or surface water present; and
- Texture: with areas displaying various textures, created by varying vegetation cover and soil conditions.

These points of interest were verified during the site assessment undertaken from the 7th to the 11th of February 2022. The proposed overhead powerline will traverse watercourses associated with the Wolwefonteinspoortspruit, Kariega, Holbak, Bezuidenhouts and Coega River systems. No wetlands were identified to be traversed by the proposed overhead powerline, nor were any identified within the investigation area.

5.1.1 Watercourses traversed by the proposed overhead powerline

The proposed overhead powerline will traverse the Kariega, Holbak and Bezuidenhouts Rivers along its central portion. Several ephemeral tributaries with riparian vegetation of the Wolwefonteinspoortspruit, Kariega, Holbak, Bezuidenhouts and Coega River systems, mostly located within the western portion of the proposed overhead powerline, will also be traversed. Ephemeral drainage lines located within the south-eastern portion of the investigation area, will be traversed by the proposed overhead powerline. Some of these ephemeral drainage lines were noted to host riparian vegetation, albeit limited. Though typically highly flashy systems that flow or flood for short periods of time in response to unpredictable high rainfall events, these ephemeral drainage lines host perennial woody/shrub vegetation species such *Vahellia karroo* and *Azima tetracantha*, hence considered ephemeral as opposed to highly episodic as observed from their counterparts located within the western portion of the proposed overhead powerline (see Section 5.1.2 below).

5.1.2 Other drainage features traversed by the proposed overhead powerline

Features identified as episodic[4] drainage lines (EDLs) without riparian vegetation, mostly forming part of the headwaters of the major river systems, were identified to be traversed by the proposed overhead powerline. These EDLs flow into larger ephemeral drainage lines/tributaries with riparian vegetation, which ultimately flow into the larger riverine systems. These EDLs were defined as areas where, when present, surface water flows but is not retained in the landscape for a sufficient period to encourage the establishment of a floral community that relies on an increased abundance of water within the effective rooting zone, thus functioning as flow paths compared to the identified ephemeral drainage lines with a robust vegetation cover offering habitat for floral and faunal species. It is noted that these EDLs convey catchment runoff into the larger downstream systems, and as such, do have some hydrological importance in the landscape. Although the EDLs cannot be classified as riparian watercourses in the traditional sense thereof due to the lack of saturated soils and riparian vegetation and thus no formal assessment could be undertaken, the EDLs still function as a waterway, through episodic conveyance of water. However, based on the definition of a watercourse (see Section 3.1) water flows regularly or intermittently within these EDLs, conveying water from the upgradient catchment area into the downgradient larger riparian systems. As such, the EDLs are considered to be watercourses due to their importance for hydrological functioning and therefore do enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998).

Areas hosting episodic preferential flow paths (PFP) were also identified to be traversed by the proposed overhead powerline (Figure 12). These preferential flow paths lack riparian and wetland characteristics and may potentially only convey surface water for a short period of time after rainfall events. Thus, these features are not considered of ecological importance but contribute to the hydrological functioning of the drainage systems at large. The PFP cannot be considered as watercourses (thus no ecological assessment undertaken) and may potentially only enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998) should a floodline be determined for these features. Due to the small extent of these PFPs, they were not mapped or delineated – however specific areas where extensive PFPs were noted are indicated on the delineation maps (Figure 12).

Figure 12: Photographs of preferential surface flow paths associated with the (left) Kariega and (right) Bezuidenhouts River drainage systems.

The proposed overhead powerline will also traverse artificial features along its route, such as the instream artificial impoundments associated with the identified watercourses. However, these were not assessed due their artificial nature.

The delineated extent of the identified watercourses and drainage features associated with the proposed overhead powerline is presented in Figures 13 to 15.

[4] "Highly flashy systems that flow or flood only in response to extreme rainfall events, usually high in their catchments. May not flow in a five-year period or may flow only once in several years." (Uys and O'Keeffe, 1997, in Rossouw *et. al*, 2006).

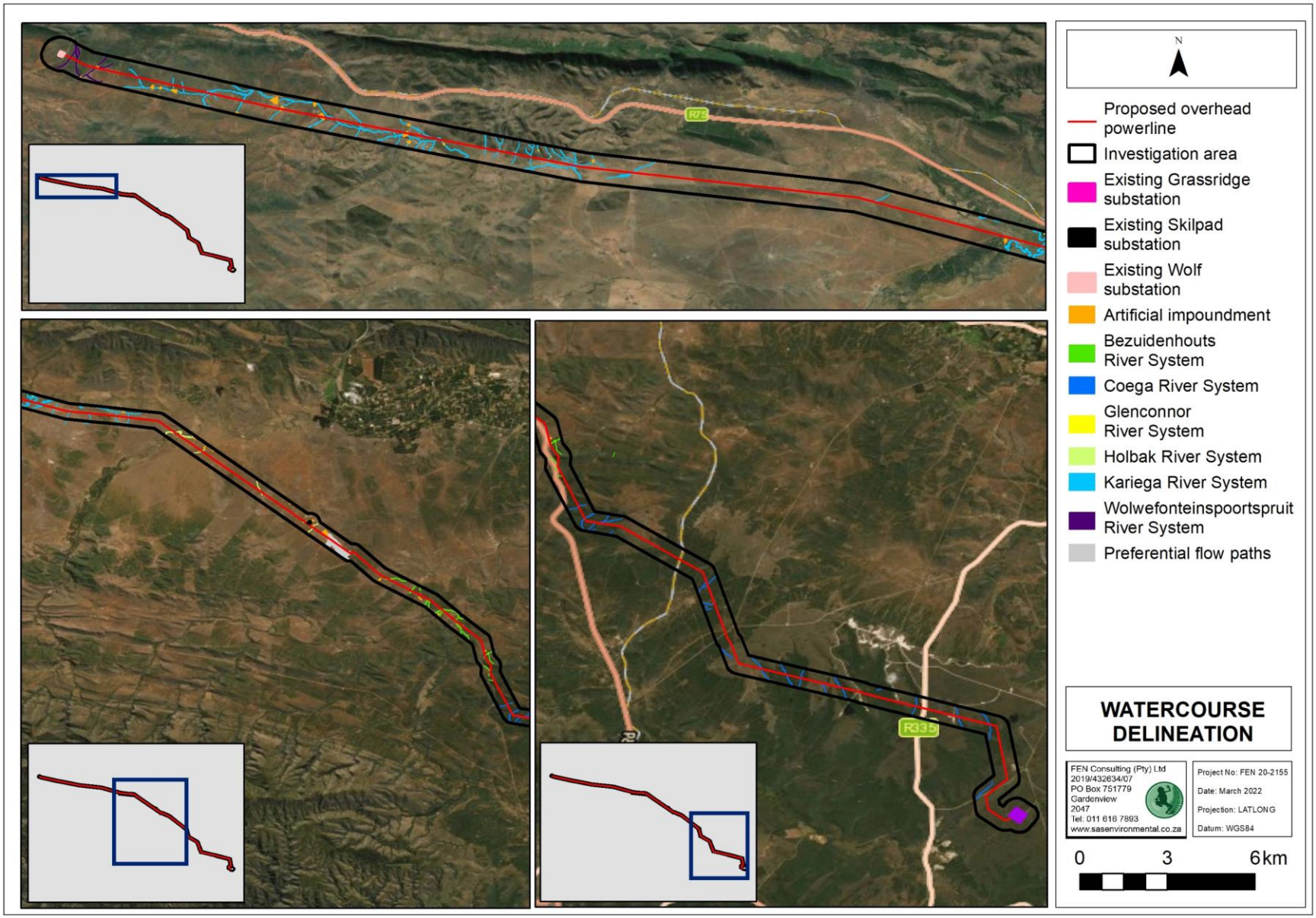


Figure 13: An overview of the locality of the delineated watercourses and their associated river systems within the proposed overhead powerline route and associated investigation area.

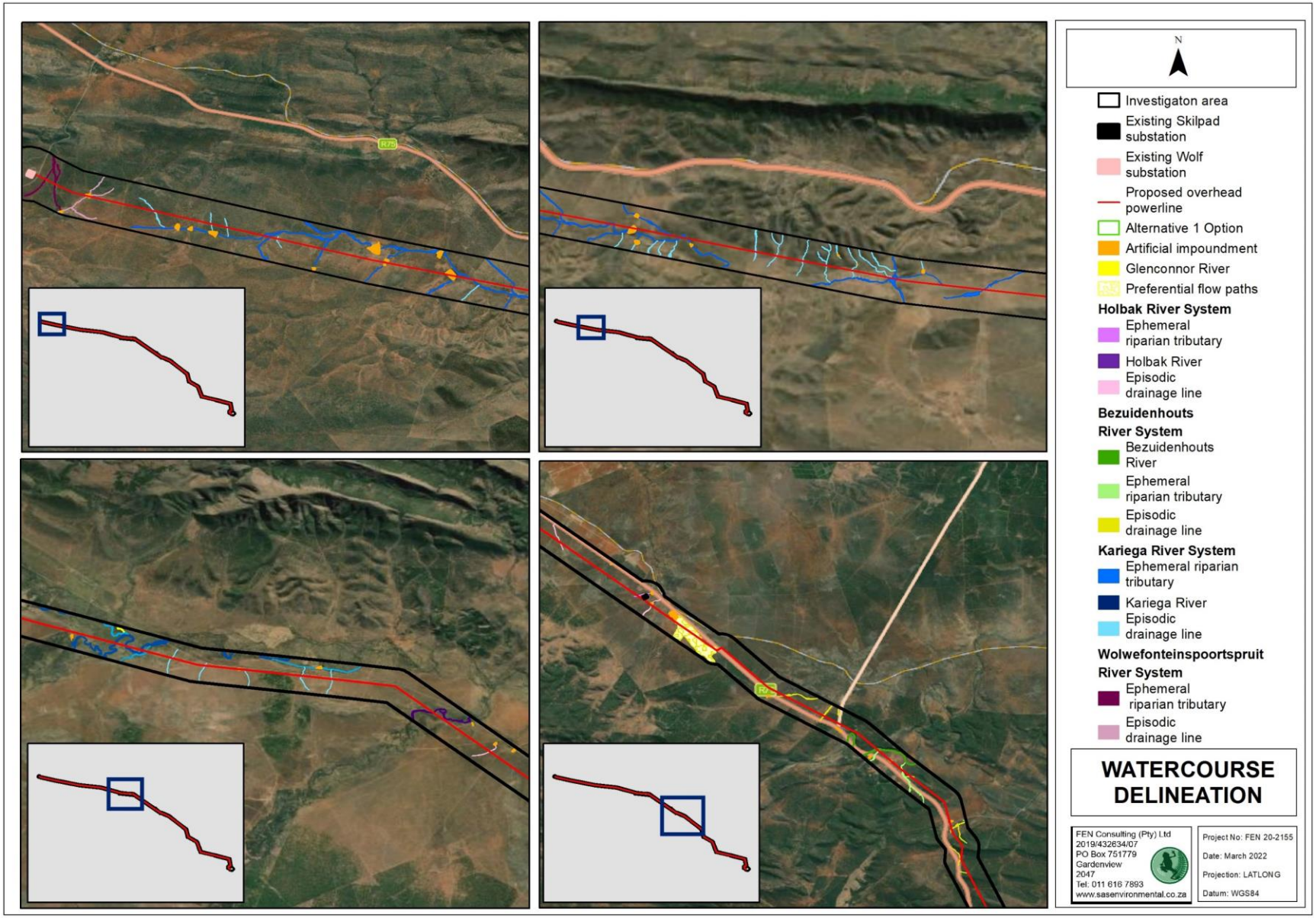


Figure 14: The locality of the delineated watercourses and their associated river systems within the central to western portion of the proposed overhead powerline route and associated investigation area.

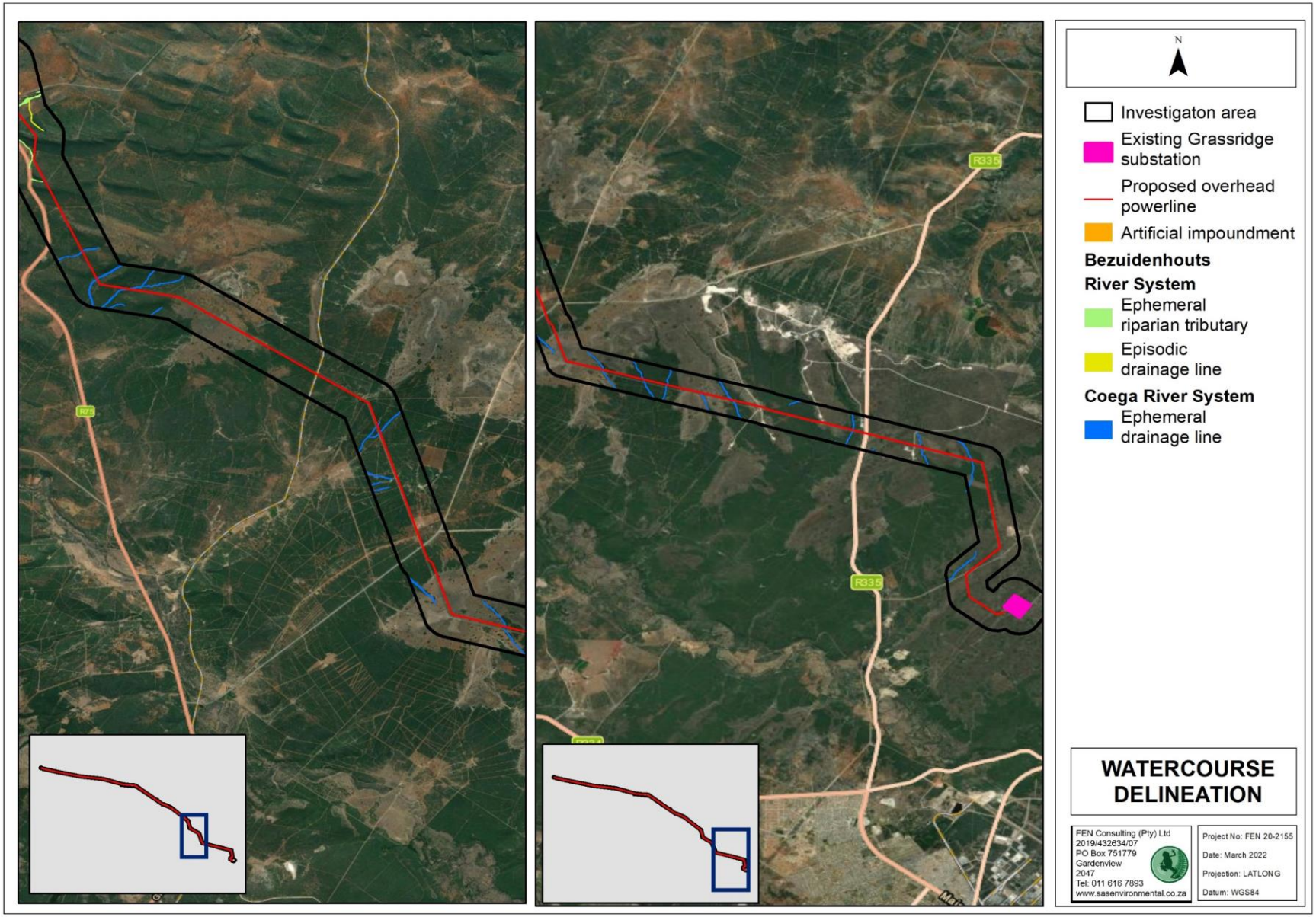


Figure 15: The locality of the delineated watercourses and their associated river systems within the south-eastern portion of the proposed overhead powerline route and associated investigation area.

5.2 *Watercourse delineation*

The outer boundary of the identified watercourses was delineated according to the guidelines advocated by DWAF (2008). The delineations as presented in this report are regarded as a best estimate based on the site conditions present at the time of the assessment. During the field assessment, the following indicators were used in order to determine the boundary of the riparian watercourses identified to be associated with the proposed overhead powerline and associated investigation area:

- **Topography/elevation** was used to determine which parts of the landscape watercourses are most likely to occur. Since watercourses occur where there is a prolonged presence of water in the landscape, the most common place one could expect to find watercourses is in the valley bottom position (DWAF, 2008). The main tributaries and major river systems are located in the valley bottom position (Figure 16). The drainage lines are also located in valleys between undulating hills (for example the ephemeral drainage lines) or in the upslope position that slopes towards the larger downstream systems where concentration of flow leads to drainage towards the larger tributaries and rivers.

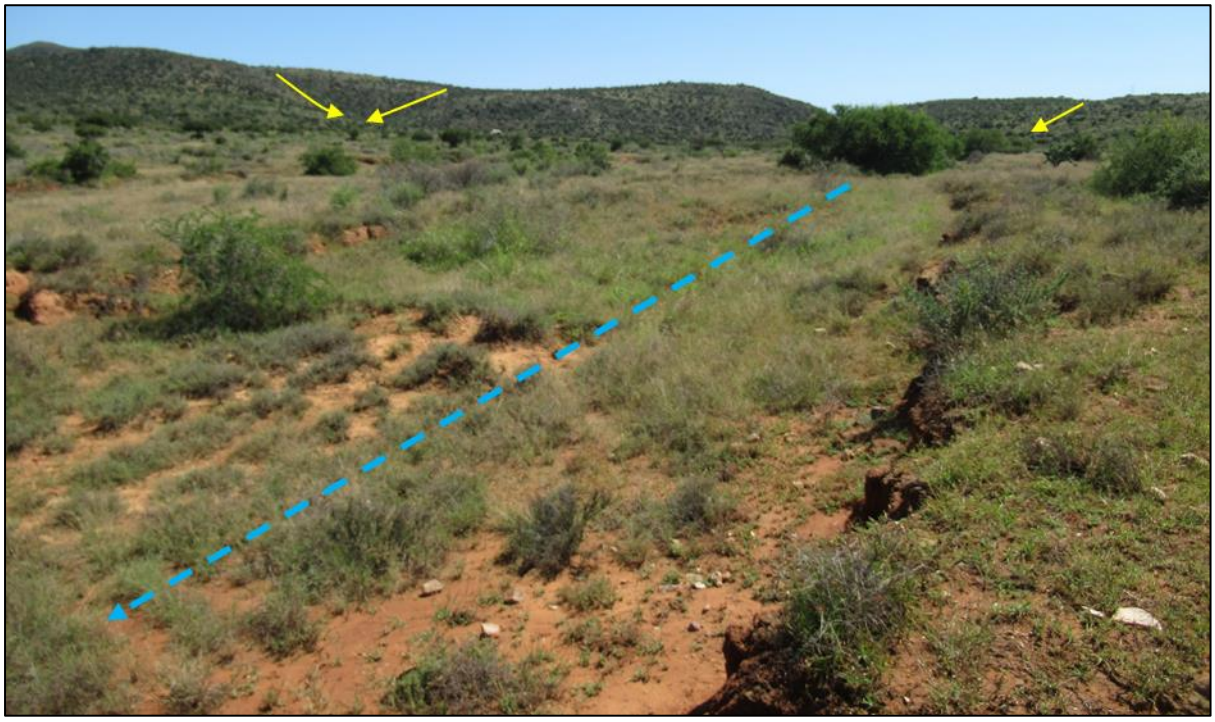


Figure 16: A photograph depicting the topographical setting of the smaller episodic drainage lines in the higher slope position (yellow line) relative to the larger ephemeral tributaries or major river systems in the valley bottom position (blue dashed arrow).

- **Vegetation associated with riparian areas:** the identification of riparian areas relies heavily on vegetative indicators. Using vegetation, the outer boundary of a riparian area can be defined as the point where a distinctive change occurs:
  - in species composition relative to the adjacent terrestrial area; and
  - in the physical structure, such as vigour or robustness of growth forms of species similar to that of adjacent terrestrial areas. Growth form refers to the health, density, crowding, size, structure and/or numbers of individual plants.

  Only within the larger ephemeral riparian tributaries and rivers was a change in riparian vegetation identified from that of the surrounding terrestrial vegetation (Figure 17), where a mix of low tree and shrub species such as *Vahellia karroo* and *Azima tetracantha* and graminoid species such as *Setaria verticillate*, *Eragrostis cilianensis* and *Chloris virgata* were observed. The shrub species such as *Azima tetracantha* were also observed within the ephemeral drainage lines.

Figure 17: Photographs depicting the vegetation component of the watercourses associated with the proposed development. (Left) the rivers and tributaries host tree species in their marginal zones. (Right) some of the lower reaches of the ephemeral riparian tributaries host graminoid species (indicated by the black arrows), which can be easily distinguished from the surrounding terrestrial vegetation.

- ***The presence of alluvial soil:*** The presence of alluvial soil was used as an indicator of riparian zones, as defined by the National Water Act, 1998 (Act No. 36 of 1998). The occurrence of alluvial deposited material adjacent to the active channel is a good indicator of the riparian zone of a riparian watercourse (such as that of the identified river, tributaries and ephemeral drainage lines). Alluvial soil is soil derived from materials deposited by flowing water, especially in the valley bottom position. Riparian areas often, but not always, have alluvial soil (Figure 18). While the presence of alluvial soil cannot always be used as a primary indicator to delineate riparian watercourses accurately, it can be used in conjunction with the topographical and vegetative indicators. Unlike wetland areas, riparian zones are usually not saturated for a long enough period of time for redoximorphic features to develop. This is because riparian watercourses are mainly driven by surface flow, originating from its local catchment which flows through the watercourse and does not persist for significant periods of time in the riparian watercourse as with wetlands. This is specifically true for ephemeral and episodic systems that experience flash flooding in response to rainfall events.

Figure 18: A shallow layer of alluvial soil is present in the active channel of the Holbak River.

5.3 *Watercourse classification and assessment*

The natural watercourses as described above were classified according to the Classification System outlined in **Appendix C** of this report as Inland Systems, located within the Southern Folded Mountains and South Eastern Coastal Belt Ecoregions. Table 5 below presents the classification from level 3 to 4 of the Wetland Classification System (Ollis *et al.* 2013).

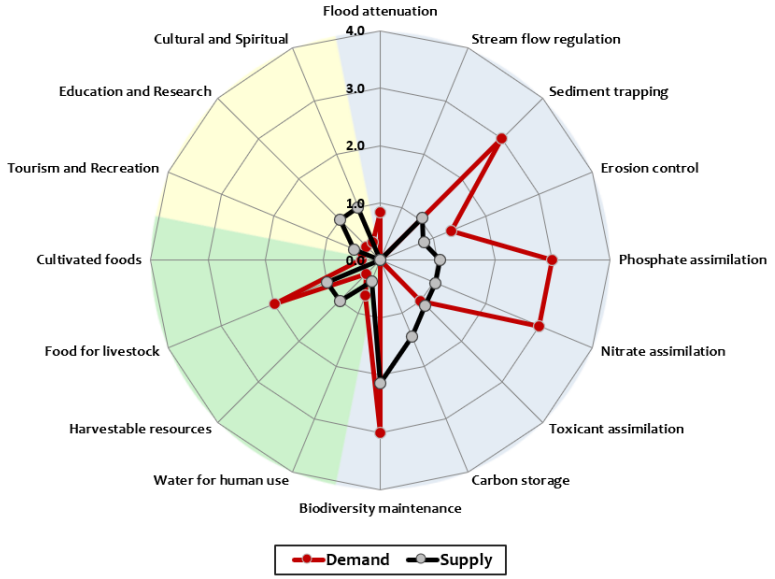
Table 5: Classification of the watercourses associated with the proposed overhead powerline.

Watercourse	Level 3: Landscape Unit	Level 4: Hydrogeomorphic (HGM) Type
Rivers and ephemeral riparian tributaries	Valley Floor: the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	A linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
Episodic and Ephemeral drainage lines	Slope—an inclined stretch of ground typically located on the side of a mountain, hill or valley, not forming part of a valley floor. Includes scarp slopes, mid-slopes and foot-slopes.	

Tables 6 to 10 below provide a summary of the ecological assessment of the watercourses in terms of relevant aspects (hydrology, geomorphology and vegetation components) associated with the watercourses. Consideration was given into the similar in characteristics of some of the watercourses, having been subjected to the same anthropogenic impacts, thus in such cases the ecoservice provision, hydrological regime, geomorphological characteristics, water quality and habitat of these watercourses were assessed in a combined fashion. For example, the Kariega and Holbak Rivers are assessed together, while the ephemeral riparian tributaries are assessed collectively, as well as the ephemeral drainage lines. Table 10 provides a qualitative summary of the visual assessment of the identified EDLs to be traversed by the proposed overhead powerline. The details pertaining to the methodology used to assess the natural watercourses is contained in **Appendix C**.

Table 6: Summary of results of the assessment of the Kariega and Holbak Rivers to be traversed by the proposed overhead powerline.

Ecological & socio-cultural service provision graph:



Aquatic IHI discussion

IHI Riparian PES Category: D (Largely modified)

The catchment of the Kariega and Holbak Rivers remains largely undeveloped but has been transformed by wide scale agricultural activities including livestock farming (sheep) and cultivation (of mostly citrus crop) and various linear infrastructure developments including roads, railway lines and existing powerline crossings. Widespread overgrazing, trampling and tillage of the soil during cultivation (though not extensive) and movement of vehicles have resulted in increased sediment inputs and erosion within the river systems. Specific impacts to the identified rivers include various road crossings and artificial instream impoundments, which has resulted in some bank erosion, loss of tree diversity within the riparian zone and associated disturbances such as an increase in the presence of alien vegetation species.

Figure 19: Representative photographs of the Kariega and Holbak Rivers. (Top Left) Riparian vegetation of the Kariega River hosting tree species; (Top Right) An informal road crossing and disposal of rubble within the active channel of the Kariega River; (Bottom Left) Riparian vegetation of the Holbak River hosting tree species (primarily *Vachellia karoo*) in relation to the existing overhead powerline, the proposed overhead powerline will be located east thereof; (Bottom Right) Steep, eroded embankments of the Holbak River.

Ecoservice provision

Ecoservice Provisioning: Very Low to Moderate

The Kariega and Holbak Rivers are considered of moderate importance for the supply of biodiversity maintenance due to providing habitat for various faunal and avifauna species and acting as migratory corridors within a highly terrestrial landscape, especially given their ecological connectivity with other aquatic habitats in the region. The demand for sediment trapping and assimilation of phosphate and nitrate is considered of high importance due to the agricultural activities in the catchment, however, the rivers are only considered of low importance for the supply of these services due to the largely modified ecological condition of the rivers, compromising their capacity to supply certain ecosystem services. Although the Kariega and Holbak Rivers play an important role in water supply given the presence of instream impoundments for agricultural purposes within these systems, the reduction in capacity to provide socio-cultural benefits (determined to be of very low importance) is attributed to land use changes in the surrounding landscape as these rivers are not considered important for harvestable resources, recreational value or cultural value.

<table>
<tr><th colspan="4">EIS discussion</th></tr>
<tr><td colspan="4">EIS Category: Moderate
The Kariega and Holbak Rivers are considered of ecological importance on a landscape scale, primarily due to both rivers being classified as CBA 2 of aquatic importance as per the ECBCP (2018) and the catchment thereof classified as a river FEPAs (according to NFEPA, 2011). The rivers are also considered of moderate hydro-functional importance through the provision of regulating and supporting benefits such as streamflow regulation and erosion control, especially given the high degree of hydrological connectivity within the surrounding landscape.</td></tr>
<tr><th colspan="4">REC Category and RMO</th></tr>
<tr><td colspan="4">REC: Category D (Largely modified)
BAS: Category D
RMO: D (Maintain)
Since the Kariega and Holbak Rivers are considered to be in a largely modified ecological condition and of moderate ecological importance and sensitivity, the RMO is to maintain the ecological condition of these rivers. Thus, it is recommended that no further degradation to the rivers be permitted as a result of the proposed overhead powerline. As such, it is also recommended that the construction and operation of the proposed overhead powerline follow strict mitigation measures as outlined in this report (refer to Section 7). Small scale rehabilitation of areas which may potentially be impacted by the proposed overhead powerline development (such as road crossings) must be undertaken. Additionally, it must be ensured that no edge effects from any surface infrastructure proposed as part of the proposed development (such as support structures or service roads) that may be located within close proximity to the rivers, enter these systems.</td></tr>
<tr><th colspan="4">Watercourse characteristics:</th></tr>
<tr><td colspan="2">a) Hydraulic regime
The Kariega and Holbak Rivers are non-perennial rivers originating from the slopes of the mountainous areas located approximately 26 km south-west of the investigation area. The rivers flow along the surrounding farmland, past the proposed overhead powerline and eventually into the Sundays River system located approximately 10 km north-east of the proposed overhead powerline. Low volume surface water was observed within the active channel of these rivers at the time of the site assessment, which may be attributed to the prolonged period of low rainfall experienced in the local catchment. Despite the interruption to the hydrological connectivity between the upstream and downstream reaches of these rivers as a result of the existing formal and informal road crossings and instream artificial impoundments associated with agricultural activities in the catchment, overall changes to the hydrological functioning of the Kariega and Holbak Rivers are not considered severe, allowing for continued hydrological functioning of the downstream reaches and systems.</td><td colspan="2">b) Geomorphology and sediment balance
Agricultural activities in the surrounding catchment of the Kariega and Holbak Rivers have resulted in increased sediment loads into the rivers through an increase in bare surface from livestock trampling and grazing. These activities have also increased the risk of erosion of these rivers, which is also exacerbated by the highly erodible soil characteristic of the surrounding landscape. As such, severe bank erosion was observed in some sections of these rivers, though noted to be stable. Despite the erosion noted within these rivers, no significant deposition of sediment was observed.</td></tr>
<tr><td colspan="2">c) Water quality
Due to land use changes in the catchment, it is expected that the surface water quality of these systems is somewhat impaired as a result of stormwater runoff from the agricultural activities and generally soil disturbance and stormwater input from the various road crossings.</td><td colspan="2">d) Habitat and biota
The riparian vegetation of the Kariega and Holbak Rivers is characterised by low growing shrub and tree species, predominantly Vachelia Karoo. The surrounding agricultural activities have resulted in reduced tree diversity within the riparian zone. Nevertheless, these rivers act as migratory corridors and provide habitat for a variety of faunal species due to their high ecological connectivity with other aquatic systems in the landscape.</td></tr>
<tr><td>Extent of modification anticipated</td><td colspan="3">Minimal
Some modification is anticipated to the extent of the Kariega and Holbak Rivers. This is attributed to the grading/upgrading of existing road crossings through the watercourses. During the construction and operational phase of the upgrading of the existing road crossings, changes to flow pattern and timing of the rivers will need to be monitored to ensure that the hydrological connectivity of these rivers is not adversely impacted. Should road grading/upgrading through the watercourses only occur within the dry period (that does not require diversion of flow) and the recommended mitigation measures be applied, the impact significance can be reduced to a low negative impact.</td></tr>
<tr><td>Impact Significance:</td><td>Low (with the implementation of mitigation measures)</td><td colspan="2">No powerline support structures may be constructed within the delineated extent of the Kariega and Holbak Rivers, however, existing roads traversing these rivers may be upgraded. Such activities were identified to pose a negative medium impact to the rivers without the implementation of mitigation measures. Should road upgrading/grading activities be undertaken only within the dry period (that will not require any kind of diversion of flow) and the recommended mitigation measures applied as recommended in Section 7, the impact significance can be reduced to a low negative impact.</td></tr>
</table>

Table 7: Summary of results of the assessment of the Bezuidenhouts River to be traversed by the proposed overhead powerline.

Ecological & socio-cultural service provision graph:

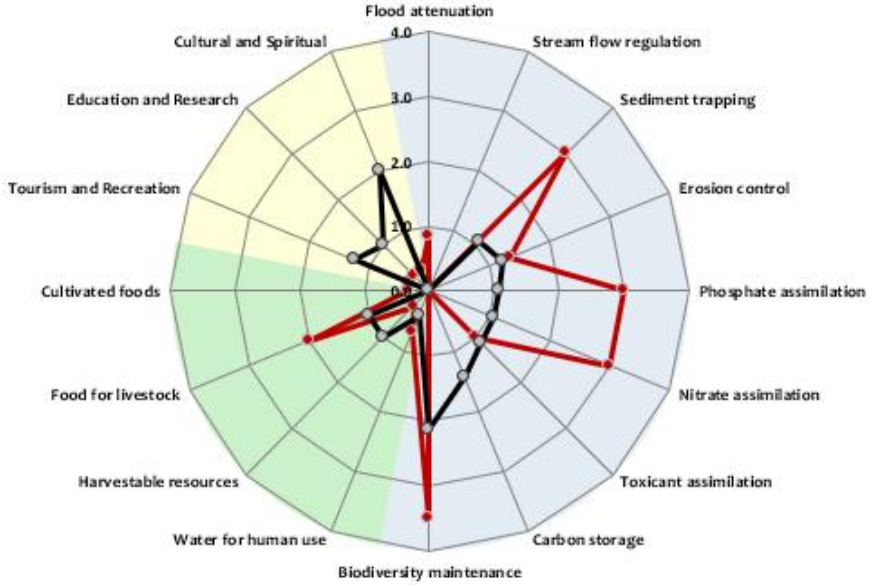


Figure 20: Representative photographs of the Bezuidenhouts River. (Left) an overview of the Bezuidenhouts River with intact vegetation cover; (Right) a weir observed within the reach of the Bezuidenhouts River upgradient of the R75.

Aquatic IHI discussion

IHI Riparian PES Category: C (Moderately modified)

The catchment of the Bezuidenhouts River is characterised by mountainous areas and small-scale agricultural activities including crop and livestock farming and various linear infrastructure developments, many of which (existing roads and powerlines) traverse this system. Based on the assessment of the habitat integrity, the hydrological and geomorphological processes of this river, though modified, remain functional. No significant erosion or obstruction to flow was noted along the reach of the Bezuidenhouts River assessed. The riparian habitat of the Bezuidenhouts River is characterised by a high vegetation cover relative to similar systems in the regional catchment.

Ecoservice provision

Ecoservice Provisioning: Very Low to Moderately High

Though the overall ecoservice provision of the Bezuidenhouts River is considered moderately low, this river is considered of moderately high importance for biodiversity maintenance, largely as a result of the high surface roughness provided by the vegetation within the marginal and non-marginal zones, offering habitat for various floral and faunal species. The Bezuidenhouts River is considered of low importance for other regulating and supporting services such as erosion control and phosphate and nitrate assimilation though there is a high demand for these services in the catchment. The high vegetation cover within the riparian habitat of the Bezuidenhouts River also contributes to the scenic beauty of this river, hence it is considered of moderate importance for cultural and spiritual services. The presence of surface water within the Bezuidenhouts River, observed at relatively higher volumes compared to river systems in the regional catchment, offers opportunities for bird watching, further contributing to the importance of cultural services offered by this river.

EIS discussion

EIS Category: High

The Bezuidenhouts River is considered of high ecological importance due to its hydro-functional importance with specific mention of sediment and to a degree, erosion control. This river is also considered to be a CBA 2 of aquatic importance per the ECBCP (2018), which are areas that must remain in good ecological condition for meeting biodiversity targets for ecosystem types, species of special concern or ecological processes. Due To the connectedness of this river to both large river systems and smaller drainage areas within a vast terrestrial landscape, it is considered important for biodiversity maintenance on a landscape scale.

<table>
<tr><th colspan="4">REC Category and RMO</th></tr>
<tr><td colspan="4">REC: Category C (Moderately modified)
BAS: Category C
RMO: C (Maintain)
The Recommended Management Objective (RMO) is, at minimum, to maintain the river in its current ecological state, but it is recommended that small scale rehabilitation of areas which may potentially be impacted by the proposed development (such as road crossings) be undertaken. Additionally, it must be ensured that no edge effects from any surface infrastructure proposed as part of the proposed overhead powerline (such as the support structures and service roads) that may be located within close proximity to the river, enter this system.</td></tr>
<tr><th colspan="4">Watercourse characteristics:</th></tr>
<tr><td colspan="2">a) Hydraulic regime
The Bezuidenhouts River is a non-perennial river system originating from the slopes of the mountainous area located approximately 20 km south west of the proposed overhead powerline, which flows through various farm land, before discharging into the Sundays River located approximately 15 km north east of the proposed overhead powerline. A weir was noted within the reach of the Bezuidenhouts River upgradient of the R75 road crossing. Despite the minor interruption to the hydrological connectivity between the upstream and downstream reaches as a result of the existing road crossings, overall changes to the hydrological functioning of the Bezuidenhouts River are not pronounced, allowing for uninterrupted hydrological functionality of the downstream systems.</td><td colspan="2">b) Water quality
Due to land use changes in the catchment, it is expected that the surface water quality of this river system is somewhat impaired as a result of agricultural activities and stormwater input from the various road crossings.</td></tr>
<tr><td colspan="2">c) Geomorphology and sediment balance
Agricultural activities in the surrounding catchment have resulted in increased sediment sources to the river through an increase in bare surface from livestock trampling and grazing. Nevertheless, no significant erosion was noted within the assessed reach of the Bezuidenhouts River. This may be attributed to the high surface roughness offered by the vegetation cover associated with this river. In addition, no significant deposition of sediment was observed.</td><td colspan="2">d) Habitat and biota
The riparian vegetation of the Bezuidenhouts River is characterised by a dense cover of low growing shrub and tree species, predominantly Vachelia Karoo. Limited agricultural activities surrounding this river have contributed to the relatively less disturbed condition of the riparian habitat of the river. This river acts as migratory corridors and is important for providing habitat for a variety of faunal species due to its ecological connectivity with other aquatic habitats in the landscape.</td></tr>
<tr><td>Extent of modification anticipated</td><td colspan="3">Minimal
Some modification is anticipated to the extent of the Bezuidenhouts River. This is attributed to the grading/upgrading of existing road crossings through the river. During the construction and operational phase of the upgrading of the existing road crossings, changes to flow pattern and timing of the river will need to be monitored to ensure that the hydrological connectivity of this river is not adversely impacted. Should road grading/upgrading through the river only occur within the dry period (that does not require diversion of flow) and the recommended mitigation measures applied, the impact significance can be reduced to a low negative impact.</td></tr>
<tr><td>Impact Significance:</td><td>Low (with the implementation of mitigation measures)</td><td colspan="2">No powerline support structures may be constructed within the delineated extent of the Bezuidenhouts River, however, existing roads traversing the river may be upgraded. Such activities were identified to pose a negative medium impact to the river without the implementation of mitigation measures. Should road upgrading/grading activities be undertaken only within the dry period (that will not require any kind of diversion of flow) and the recommended mitigation measures applied as recommended in Section 7, the impact significance can be reduced to a low negative impact.</td></tr>
</table>

Table 8: Summary of results of the assessment of the ephemeral riparian tributaries to be traversed by the proposed overhead powerline.

Ecological & socio-cultural service provision graph:

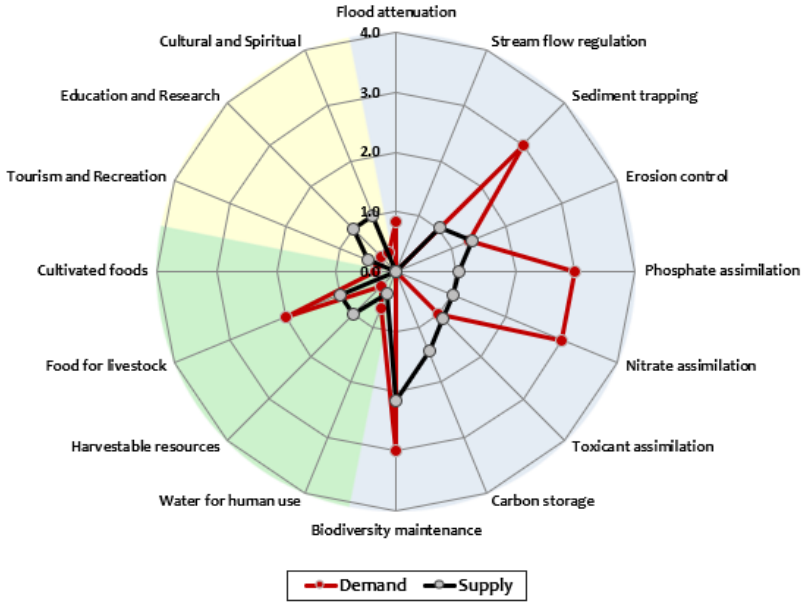


Figure 21: Representative photographs of the ephemeral riparian tributaries. (Top Left) Ephemeral riparian tributary of the Wolwefonteinspoortspruit River system with an incised channel (steep embankments); (Top Right) A road and existing overhead powerline crossing over the ephemeral riparian tributary of the Bezuidenhouts River system; (Bottom): Some of the lower reaches of the ephemeral riparian tributaries of the Kariega River system located on low lying areas where flow from the surrounding slopes (indicated with black arrows) diffuses over a broader area. Graminoid species including *Setaria verticillate, Eragrostis cilianensis* and *Chloris virgata* were noted to be dominant. Blue dashed lines indicate direction of flow.

Aquatic IHI discussion

IHI Riparian PES Category: D (Largely modified)

The ephemeral tributaries with riparian vegetation have been impacted by anthropogenic impacts in the surrounding catchment, largely associated with agricultural activities such as livestock farming, and linear infrastructure developments including road and powerline crossings. These systems flow through various farmland where they are impounded for water supply, grazed and heavily trampled by livestock and movement of vehicles. Excavation and infilling activities associated with historical farming practices were also noted within these systems. This has resulted in altered flow patterns and disturbance to the soil and vegetation of a majority of these ephemeral riparian tributaries, such that an increase in the prevalence of alien vegetation species and significant erosion was noted within these tributaries. Nevertheless, the ephemeral riparian tributaries still serve an important hydrological function in the landscape due to their high connectivity with other watercourses.

Ecoservice provision

Ecoservice Provisioning: Very Low to Moderate

The ephemeral riparian tributaries are considered of moderate importance for the supply of biodiversity maintenance due to providing habitat for various faunal and avifauna species and acting as migratory corridors within a highly terrestrial landscape, especially given their ecological connectivity with major rivers downstream. The reduction in capacity to provide certain regulating and supporting services, provisioning services, and cultural services (determined to be of very low to low importance) is due to the largely modified ecological condition of the tributaries, compromising their capacity to supply certain ecosystem services.

EIS discussion

EIS Category: Moderate

The assessed ephemeral riparian tributaries are considered of moderate hydro-functional importance through the provision of regulating and supporting benefits such as streamflow regulation and, to a degree, assimilation of nutrients, These tributaries are also considered of ecological importance due to being classified as CBA 1 and 2 of aquatic importance as per the ECBCP (2018) and the catchment thereof classified as river FEPA and an upstream catchment management area (according to NFEPA, 2011).

REC Category and RMO

REC: Category D (Largely modified)
BAS: Category D
RMO: D (Maintain)

The RMO is, at minimum, to maintain the ephemeral riparian tributaries in their current ecological state. Given that the proposed activities will be limited in extent and most likely associated with existing disturbances (since the proposed overhead powerline alignment largely follows the route of an existing access road), to maintain the PES is considered acceptable. Small scale rehabilitation of areas which may potentially be impacted by the proposed overhead powerline must be undertaken including erosion management and removal of alien vegetation species.

Watercourse characteristics:

a) Hydraulic regime

The identified ephemeral riparian tributaries are typically located in the valley bottom position where runoff from the surrounding slopes collects and flows to the downstream river systems to which these tributaries are connected to. Artificial instream impoundments associated with agricultural activities have been developed within these tributaries, which has resulted in disturbance to flow. Given the semi-arid climate of the local area and many of the ephemeral riparian tributaries being located in areas of low relief, these watercourses were noted to be weakly channelled and sometimes unchanneled. For example, two ephemeral riparian tributaries within the western portion of the proposed overhead powerline (Figure 21) are characterised as unchanneled and some reaches thereof noted to be relatively more extensive. Catchment runoff typically flows from the undulating slopes of the surrounding mountainous areas in a narrow drainage channel before reaching the downstream areas of low relief, where the channel diffuses and spreads over a broader area becoming unchanneled as it flows downstream. This was typical of many of the unchanneled lower reaches of some of the identified ephemeral riparian tributaries. However, due to the high infiltration of the soil, drainage within these watercourses is sub-surface, deeper than 50 cm and thus does not elicit a wetland response.

b) Habitat and biota

The riparian vegetation of the ephemeral riparian tributaries has been modified by the surrounding agricultural activities, where ruderal vegetation occurs in abundance and alien species such as *Opuntia ficus-indica* and *Agave americana* were noted along the reaches of these tributaries. Nevertheless, the tributaries still present riparian vegetation including *Vahellia karroo* and *Azima tetracantha*. The reaches of the unchanneled and broader ephemeral riparian tributaries (Figure 21) were noted to be typically dominated by graminoid species such as *Setaria verticillate, Eragrostis cilianensis* and *Chloris virgata*, species that tend to occur where additional rain water collects and in disturbed, overgrazed and trampled areas. The ephemeral riparian tributaries are considered as important migratory corridors, providing habitat for a variety of faunal species due to their high ecological connectivity with other aquatic systems in the landscape.

c) Geomorphology and sediment balance

Agricultural activities in the surrounding catchment have resulted in increased sediment sources to the receiving freshwater environment including these ephemeral riparian tributaries. Severe erosion was noted along the reaches of these tributaries, typically associated with livestock trampling and grazing, and road crossimgs. Despite the erosion noted within these rivers, no significant deposition of sediment was observed.

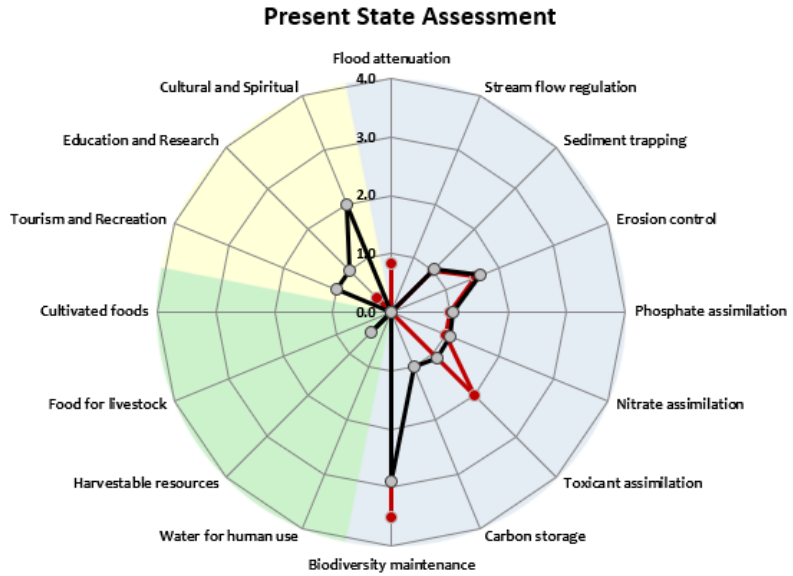
d) Water quality

Due to land use changes in the catchment, it is expected that the surface water quality of these systems is somewhat impaired as a result of agricultural activities and stormwater input from the various road crossings.

Extent of modification anticipated	**Minimal**	Some modification is anticipated to the extent of the ephemeral riparian tributaries. This is attributed to the grading/upgrading of existing road crossings through the watercourses. During the construction and operational phase of the upgrading of the existing road crossings, changes to flow pattern and timing of the ephemeral riparian tributaries will need to be monitored to ensure that the hydrological connectivity of these ephemeral riparian tributaries is not adversely impacted. Should road grading/upgrading through the watercourses only occur within the dry period (that does not require diversion of flow) and the recommended mitigation measures applied, the impact significance can be reduced to a low negative impact.
Impact Significance:	**Low** (with the implementation of mitigation measures)	No powerline support structures may be constructed within the delineated extent of the ephemeral riparian tributaries, however, existing roads traversing these ephemeral riparian tributaries may be upgraded. Such activities were identified to pose a negative medium impact to the ephemeral riparian tributaries without the implementation of mitigation measures. Should road upgrading/grading activities be undertaken only within the dry period (that will not require any kind of diversion of flow) and the recommended mitigation measures applied, the impact significance can be reduced to a low negative impact.

Table 9: Summary of results of the assessment of the ephemeral drainage lines with riparian vegetation to be traversed by the proposed overhead powerline.

Ecological & socio-cultural service provision graph:



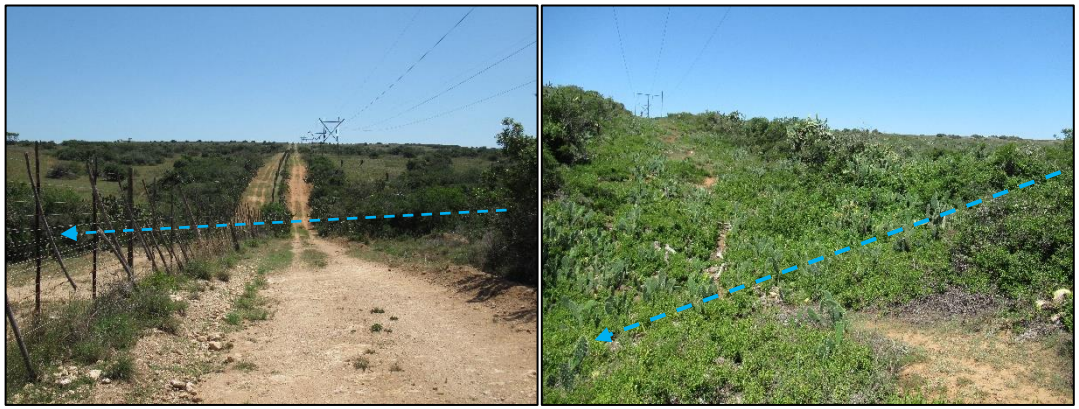


Figure 22: Representative photographs of the ephemeral drainage lines. (Left) The location of an ephemeral drainage line in a valley bottom position with an existing access road and overhead powerline crossing; (Right) Vegetation associated with the ephemeral drainage lines not different from the surrounding vegetatin, hosting tree and shrub species but also alien invasive vegetation species such as *Opuntia ficus-indica*, noted in abundance. Blue dashed lines indicate direction of flow

Aquatic IHI discussion

IHI Riparian PES Category: C (Moderately modified)

The ephemeral drainage lines are located within the Portland Pozzolana Cement (PPC Ltd.) property which is subject to (cement) mining activities and the development of a Wind Energy Facility (WEF) (the existing Dassiesridge WEF). As such, activities in the catchment have directly and indirectly impacted on these drainage lines. Several access roads and the existing overhead powerline traverse these systems, resulting in minor disturbances to flow and fragmentation of habitat, albeit not extensive. Disturbances in soil and vegetation associated with activities in the catchment have resulted in the proliferation of alien vegetation species within the ephemeral drainage lines, where *Opuntia ficus-indica* was noted to be dominant.

Ecoservice provision

Ecoservice Provisioning: Very Low to High

The ephemeral drainage lines are considered of high importance for biodiversity maintanance. This is due to the presence of unique and potentially species of conservation concern (SCC) identified in the vicinity of these ephemeral drainage lines, of which the ephemeral drainage lines generally form part of the habitat suitable for the occurrence of SCC. In addition, due to the high degree of connectivity with other natural areas, these ephemeral drainage lines provide mitigatory corridors and habitat for a variety of biota. The ephemeral drainage lines are important for erosion control and assimilation of nutriences and toxicants (though determied to be of low importance) given their location on a steep gradient and connectivity with other systems downstream. The demand for toxicant assimilation is considered moderate given the mining activities in the catchment.

EIS discussion

EIS Category: High

The ephemeral drainage lines are considered of ecological importance due to forming a part of the habitat considered suitable for SCC such as *Encephalartos horridus* and *Boophone disticha* identified to occur in very close proximity to the ephemeral drainage lines. The drainage lines are also located in areas classified as CBA 1 and 2 of aquatic importance (ECBCP, 2018). Even though modifications to these ephemeral drainage lines have occurred, they still provide habitat to a variety of biota, given the high degree of connectivity of these features with the surrounding landscape.

<table>
<tr><th colspan="4">REC Category and RMO</th></tr>
<tr><td colspan="4">REC: Category B/C (Largely natural to moderately modified)
BAS: Category B/C
RMO: B/C (Improve)

Since these ephemeral drainage lines are classified are classified as CBA 1 and 2 of aquatic importance, they are considered of high Ecological Importance and Sensitivity, the Recommended Management Objective (RMO) is to, at minimum, maintain these ephemeral drainage lines in their current ecological state, as any potential impacts my also impact cumulatively on the downstream tributaries and rivers. Whilst some modifications to the overall drainage system have occurred as a result of mining and WEF development activities in the catchment and road crossings through the ephemeral drainage lines, further degradation of these drainage lines should not be permitted. It is recommended that small scale rehabilitation of areas which may potentially be impacted by the proposed overhead powerline (such as road crossings or powerline support structures within close proximity to the ephemeral drainage lines) be undertaken. Additionally, it must be ensured that no edge effects (such as sediment laden stormwater runoff) from surface infrastructure (such as the powerline support structures or service roads) that may be located within close proximity to the ephemeral drainage lines, enters these systems.</td></tr>
<tr><th colspan="4">Watercourse characteristics:</th></tr>
<tr><td colspan="2">a) Hydraulic regime

These ephemeral drainage lines are located high in the catchment and are considered part of the headwaters of the larger downstream systems, mainly the Coega River system. Road crossings within the ephemeral drainage lines have resulted in small changes to existing flow patterns. However, overall, changes to the hydrological functioning of the drainage lines are not pronounced and allow for uninterrupted hydrological functionality of the downstream systems.</td><td colspan="2">b) Water quality

No surface water was present in the ephemeral drainage lines during the site assessment; thus, no water quality parameters could be measured. Nevertheless, due to land use changes in the catchment, it is expected that the surface water quality of these systems (when present) is somewhat impaired as a result of stormwater runoff from the mining activities in the catchment.</td></tr>
<tr><td colspan="2">c) Geomorphology and sediment balance
The geomorphology of the ephemeral drainage lines is largely intact. No significant erosion or sediment deposition was observed, this can be attributed to the high surface roughness offered by the vegetation within these ephemeral drainage lines. Nevertheless, road crossings remain a potential threat of erosion if not maintained.</td><td colspan="2">d) Habitat and biota
The ephemeral drainage lines were noted to support riparian vegetation species such as dense stands of Azima tetracantha, a spiny scrambling shrub typical of hot, dry riverine systems and found in alluvial soil. Other woody/shrub vegetation species were noted to occur in abundance within these drainage lines, including the perennial Plumbago auriculata, signifying the importance of these drainage lines for habitat and biodiversity support despite their ephemeral nature, albeit also dominated by the invasive Opuntia ficus-indica. In addition, these ephemeral drainage lines form part of the habitat considered suitable for SCC such Encephalartos horridus and Boophone disticha, noted to occur in the vicinity. Although not necessarily large enough to support significant populations of fauna, these ephemeral drainage lines offer habitat and thus likely to provide important refuge and migratory corridors for smaller mammals and avifauna, but lack in adequate provision for aquatic biota.</td></tr>
<tr><td>Extent of modification anticipated</td><td colspan="3">Minimal
Some modification is anticipated to the extent of the ephemeral drainage lines. This is attributed to the grading/upgrading of existing road crossings through the watercourses. During the construction and operational phase of the upgrading of the existing road crossings, changes to flow pattern and timing of the ephemeral drainage lines will need to be monitored to ensure that the hydrological connectivity of these drainage lines is not adversely impacted. Should road grading/upgrading through the watercourses only occur within the dry period (that does not require diversion of flow) and the recommended mitigation measures applied, the impact significance can be reduced to a low negative impact.</td></tr>
<tr><td>Impact Significance:</td><td>Low (with the implementation of mitigation measures)</td><td colspan="2">No powerline support structures may be constructed within the delineated extent of the ephemeral drainage lines, however, existing roads traversing the ephemeral drainage lines may be upgraded. Such activities were identified to pose a negative medium impact to the ephemeral drainage lines without the implementation of mitigation measures. Should road upgrading/grading activities be undertaken only within the dry period (that will not require any kind of diversion of flow) and the recommended mitigation measures applied, the impact significance can be reduced to a low negative impact.</td></tr>
</table>

All comprehensive results calculated are available in **Appendix D.**

Table 10: Summary of the visual assessment of the episodic drainage lines without riparian vegetation associated with the proposed overhead powerline.

Figure 23: Representative photographs of the EDLs. (Left) shallow vegetated channel of an EDL; (middle) some unvegetated with exposed bedrock; and (Right) eroded channel of EDL. Blue dashed lines indicate direction of flow.

Ecological discussion	Agricultural activities in the catchment including livestock grazing and trampling, artificial instream impoundments and road crossings have significantly impacted on the EDLs. Such that the hydrological functioning and continuity of some of the EDLs has been disturbed by the presence of instream artificial impoundments and road crossings. The vegetation and geomorphology of the EDLs has also been altered through soil disturbance activities including livestock grazing, trampling and movement of vehicles within these EDLs. At present, the EDLs are characterised by a low vegetation cover, prominence of ruderal and alien invasive vegetation and severe erosion, particularly downgradient of the artificial impoundments and road crossings. Due to soil and vegetation disturbance and increased sediment sources in the catchment from surface runoff off bare surfaces (grazed and cultivated fields) in the investigation area, the EDLs are not considered hydrologically sensitive but do still play an important role in maintaining hydrological connectivity in the landscape. Due to the episodic nature of these EDLs, their capacity to provide certain ecological services is considered reduced. In consideration of the impacts to the EDLs and function in the landscape, the identified EDLs (based on a qualitative assessment) can be considered to be in a **largely modified ecological condition** and likely have a **low ecological importance and sensitivity**.		
Watercourse drivers and receptors discussion (hydrology, geomorphology and topography, water quality and habitat and biota)			
The EDLs of the different river systems arise from the slopes of the surrounding mountainous areas. The identified EDLs are considered part of the headwaters of the larger river systems, where the lower reaches thereof are predominantly associated with the proposed overhead powerline. These EDLs are typically narrow, shallow flow paths located along a slope. Instream artificial impoundments and road crossings through some of the EDLs have resulted in interruption to the flow pattern. The EDLs do not host any riparian or wetland vegetation but are dominated by ruderal and alien invasive vegetation. Trees and shrubs are less prominent within the along the EDLs. The geomorphological integrity of the EDLs has been compromised by the level of erosion observed within these drainage features. The EDLs were noted to be characterised by an eroded channel with a sparse vegetation cover. Despite this, no significant deposition of sediment was observed. Due to land use changes in the catchment and and an increase in sediment sources and stormwater runoff from roads, the surface water (when present) quality of the EDLs is expected to be impaired.			
Impact Significance and Business Case:	**Low** (with the implementation of mitigation measures) No powerline support structures may be constructed within the delineated extent of the EDLs and no indiscriminate traversing of these features during the construction phase may take place. Such activities are identified to pose a low, direct negative impact to the EDLs. Should road upgrading/grading activities within the EDLs only be undertaken during the dry period (which will not require any kind of diversion of flow) and the recommended mitigation measures be applied, the impact significance can be reduced to a low risk significance.	**Extent of modification anticipated**	**None** No modification is anticipated to the extent of the EDLs that may fragment or degrade these features as all powerline support structures must be located outside the delineated extent of the EDLs. No impacts are likely during the spanning of the cables, and minimal impacts are expected due to road development, as existing road crossings is recommended to be used.

6 LEGISLATIVE REQUIREMENTS & SENSITIVITY MAPPING

The following legislative requirements were considered during the assessment. A detailed description of these legislative requirements is presented in **Appendix B** of this report:

- The Constitution of the Republic of South Africa, 1996[5];
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Water Act, 1998 (Act No. 36 of 1998) (NWA); and
- Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998).

It is important to note that in terms of the definition of a watercourse as per the NWA (See **Appendix B**), all of the natural watercourses associated with the proposed overhead powerline (including the ephemeral rivers and tributaries with riparian vegetation and the episodic drainage lines with no riparian vegetation) will be regulated by Section 21(c) and (i) of the NWA. All the natural watercourses will thus require authorisation from the Department of Water and Sanitation (DWS). This report aids in providing relevant information for these authorisation processes.

According to Macfarlane *et al.* (2015) the definition of a buffer zone is variable, depending on the purpose of the buffer zone, however in summary, it is considered to be "a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another". Buffer zones are considered important to provide protection of basic ecosystem processes (in this case, the protection of aquatic and wetland ecological services), reduce impacts on watercourses arising from upstream activities (e.g. by removing or filtering sediment and pollutants), provision of habitat for aquatic and wetland species as well as for certain terrestrial species, and a range of ancillary societal benefits (Macfarlane *et. al,* 2015). It should be noted, however that buffer zones are not considered to be effective mitigation against impacts such as hydrological changes arising from stream flow reduction, impoundments or abstraction, nor are they considered to be effective in the management of point-source discharges or contamination of groundwater, both of which require site-specific mitigation measures (Macfarlane *et. al,* 2015).

The definition and motivation for a regulated zone of activity for the protection of the assessed watercourses can be summarised in Table 11 that follows.

Table 11: Articles of Legislation and the relevant zones of regulation applicable to each article.

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). **Department of Water and Sanitation (DWS)**	**Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)** In accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21c and 21i is defined as: • the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • in the **absence of a determined 1 in 100-year flood line or riparian area the area within 100 m from the edge of a watercourse** where the edge of the watercourse is the first identifiable annual bank fill flood bench; or

[5] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 19996". It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.

Regulatory authorisation required	Zone of applicability
	• a 500m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.
Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended. **Department of Forestry, Fisheries and the Environment (DFFE)**	Activities of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) **Activity 12**: *The development of:* *(xii) Infrastructure or structures with a physical footprint of 100 square meters or more;* *Where such development occurs—* *a) Within a watercourse;* *b) In front of a development setback; or* *c) If no development setback has been adopted, within **32 meters of a watercourse**, measured from the edge of a watercourse.* **Activity 19:** *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving ofsoil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from –* *(a) a watercourse* Activities of Listing Notice 3 (GN 324) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) applicable to the Eastern Cape, outside of urban areas. **Activity 14**: *The development of –* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more within (ff) critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority;* *Where such development occurs-* *a) Within a watercourse;* *b) In front of a development setback; or* *c) If no development setback has been adopted, within **32 meters of a watercourse**, measured from the edge of a watercourse*

A 32 m Zone of Regulation (ZoR) in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998), and a 100 m Zone of Regulation in accordance with Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) (in the absence of a defined 1 in 100 year floodline), were applied to all identified watercourses (Kariega, Holbak, Bezuidenhouts and Coega Rivers, ephemeral riparian tributaries and ephemeral riparian drainage lines, including the EDLs without riparian vegetation, Figures 24 and 25).

The proposed overhead powerline will encroach into the 100 m GN509 regulated area, thus Water Use Authorisation (WUA) from the DWS is required prior to commencement of any construction. Based on the outcome of the DWS Risk Assessment as per Section 7, WUA by means of General Authorisation in terms of Gn 509 of 2016 as it relates to Section 21(c) and (i) water uses are required to be obtained in consultation with the DWS.

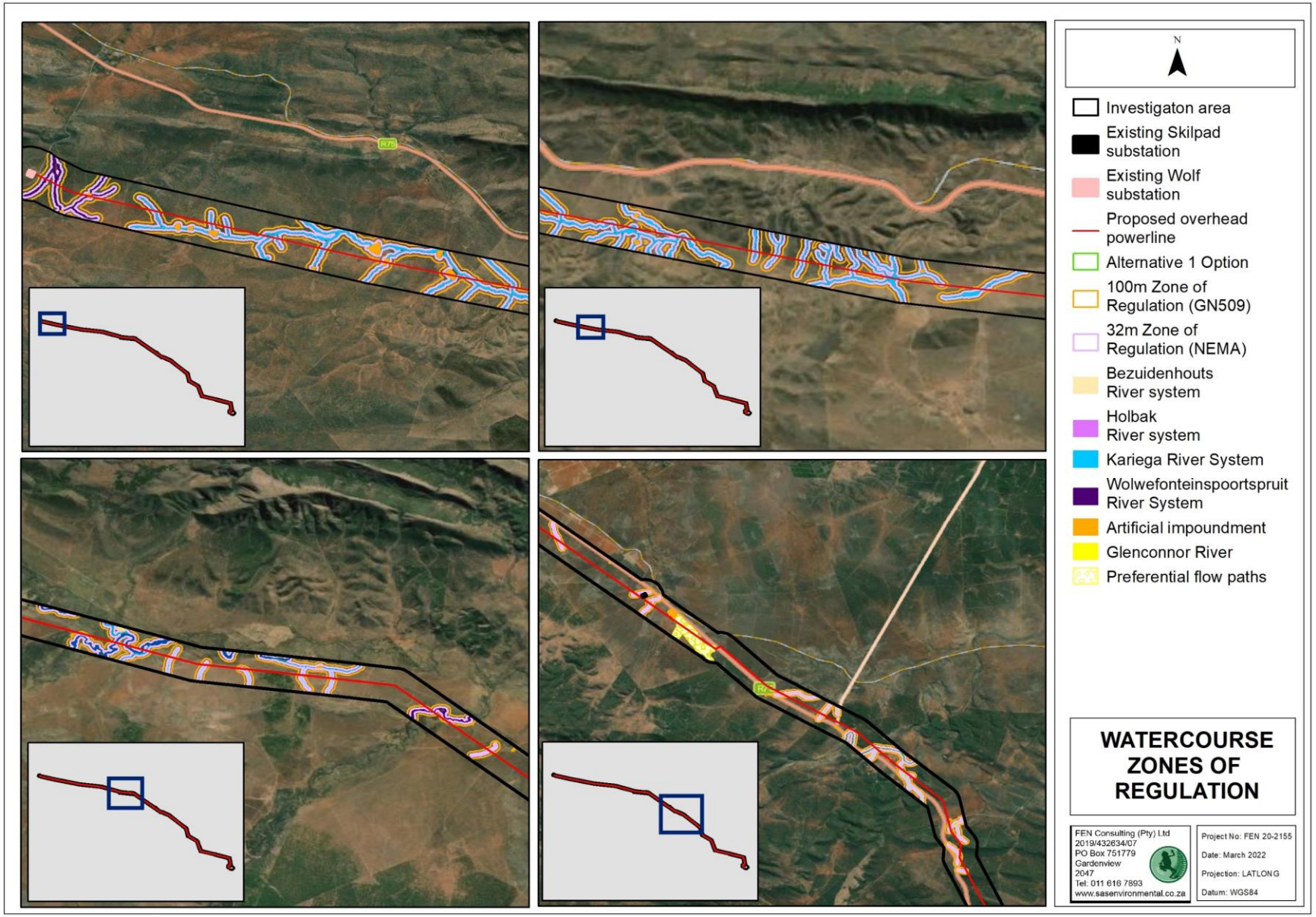


Figure 24: The conceptual presentation of the zones of regulation in terms of NEMA and GN509 as it relates to the NWA for the watercourses associated with the central to western portion of the proposed overhead powerline.

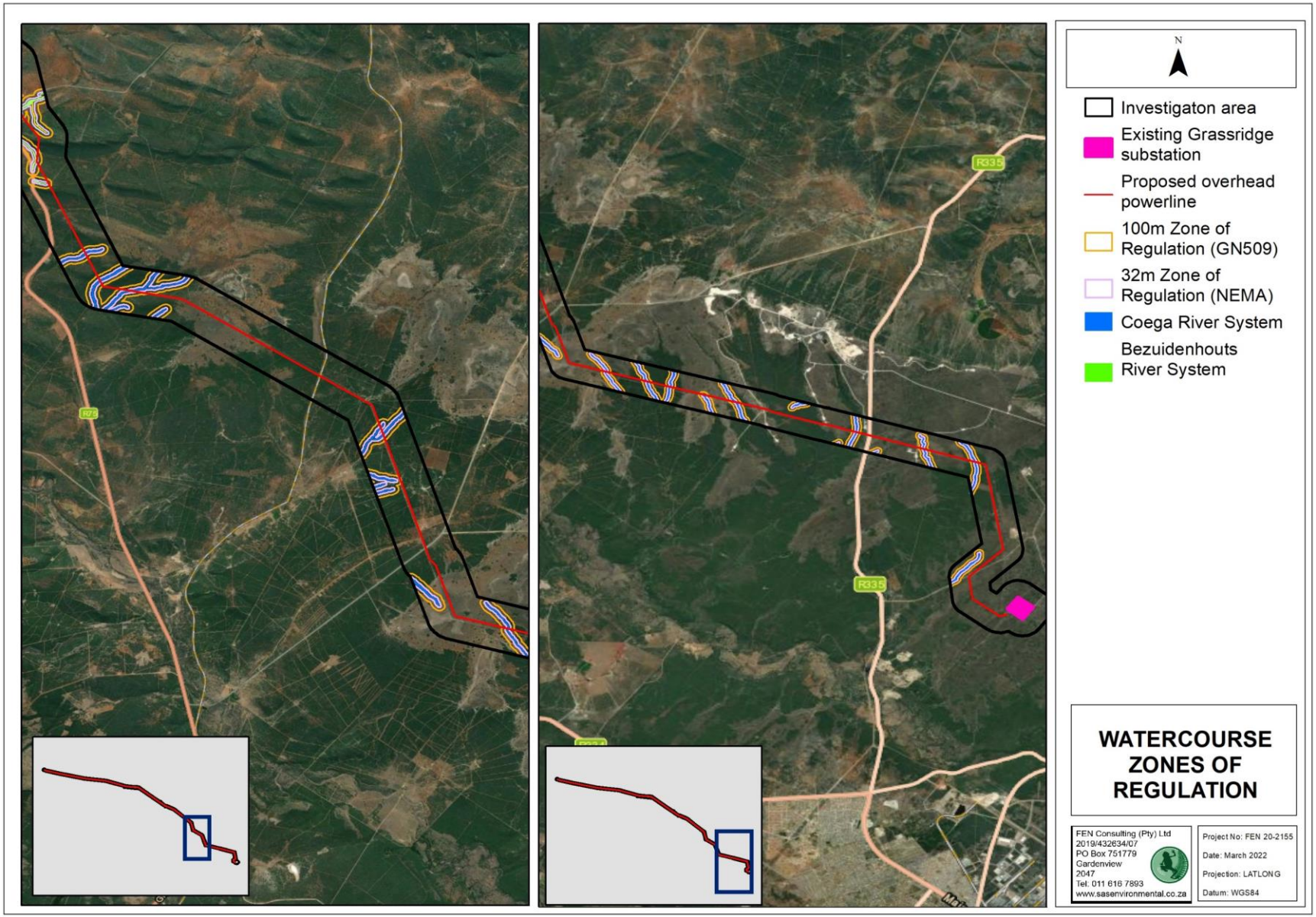


Figure 25: The conceptual presentation of the zones of regulation in terms of NEMA and GN509 as it relates to the NWA for the watercourses associated with the southern portion of the proposed overhead powerline.

7 RISK AND IMPACT ASSESSMENT

This section provides the impact assessment outcomes and highlights all potential impacts that may affect the identified watercourses. The risk assessment is undertaken according to the DWS specified Risk Assessment Matrix (as promulgated in GN509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)), and results translated into the impact assessment methodology provided by the EAP (refer to Section 7.2). Management and mitigation measures are provided which should be implemented during the various development phases to assist in minimising the impact on the receiving environment.

7.1 *DWS Risk Assessment*

Following the assessment of the watercourses associated with the proposed overhead powerline, the risk assessment was applied to ascertain the significance of perceived impacts on the key drivers and receptors (hydrology, water quality, geomorphology, habitat and biota) of the identified watercourses. The risk assessment was undertaken for the proposed layout as provided by the proponent and as described in Section 2 of this report and presented in Figures 1 and 2. The points below summarise the considerations made when applying the impact assessment:

- The risk assessment was applied considering the risk significance of the proposed surface infrastructure components (proposed overhead powerline and support structures), as described in Section 2 and depicted in Figures 1 and 2;
- At the time of this assessment the layout for any access roads associated with the proposed overhead powerline and potential upgrading of the existing substations was not available. As such, it is assumed that the existing informal farm roads and access road associated with the existing overhead powerline to be decommissioned, will be used as access roads. It is assumed that these roads will be used as is or will be graded (but the width of the roads will remain the same) to accommodate construction vehicles. No formal construction of roads, widening of roads, use of tar or concrete, was considered as part of this risk assessment;
- Although the PFPs are not considered true watercourses, the potential risk significance of the proposed overhead powerline was nevertheless included in the DWS Risk Assessment as these features are linked to natural watercourses;
- The risk assessment was applied assuming that a high level of mitigation is implemented, thus the results of the risk assessment provided in this report present the perceived impact significance post-mitigation;
- In applying the risk assessment, it was assumed that the mitigation hierarchy as advocated by the Department of Environmental Affairs (DEA) *et a*l (2013)[6] would be followed, i.e., the impacts would first be avoided, minimised if avoidance is not feasible, rehabilitated as necessary and offset if required. In this regard, the risk assessment was undertaken assuming that the location of the proposed overhead powerline support structures will be located, as far as possible, at least 32 m (outside the 32 m regulated zone in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998)) from the delineated extent of a watercourse;
- Since it is expected that the 100 m GN509 ZoR cannot be avoided for the placement of support structures (spanning width is usually at most 80 m), the legal issues for the construction of support structures were scored a maximum value of “5”;

[6] The Department of Forestry, Fisheries and the Environment (DFFE) was formerly known as the Department of Environmental Affairs (DEA). For the purposes of referencing in this report, the name under which the Department was known during the time of publication of reference material, will be used.

- The activities relating to the proposed overhead powerline are all highly site specific, not of a significant extent relative to the area of the watercourses assessed, and therefore have a limited spatial extent;
- While the operation of the proposed overhead powerline will be a permanent activity, the installation thereof is envisioned to take no more than a few months. However, the frequency of the construction impacts in a given area may be daily during this time;
- Most impacts are considered to be easily detectable; and
- The considered mitigation measures are easily practicable.

Table 12 below provides a summary of the outcome of the DWS Risk Assessment for the above-listed activities, based on the method presented in **Appendix D**. All general good housekeeping mitigation measures and the full risk assessment scoring is provided in **Appendix F.**

Table 12: Summary of the results of the DWS risk assessment applied to the proposed overhead powerline activities.

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Reversibility of Impact
1	Construction Phase	Site preparation prior to construction activities.	Vehicular movement (transportation of construction materials).	• Loss of watercourse vegetation, associated habitat and ecosystem services; • Transportation of construction materials can result in disturbances topsoil, and increased risk of sedimentation/erosion; and • Soil and stormwater contamination from potentially spilled oils and hydrocarbons originating from construction vehicles.	1,25	3,25	3	42,25	L	It is assumed that the proposed overhead powerline support structures will be located outside of the watercourses and at least 32 m from the delineated edge of a watercourses – this in itself is considered a mitigation measure, which entails no direct negative impacts from occurring on the watercourses. The following mitigation measure must be implemented: • It is imperative that all construction works (with specific mention of creating new watercourse crossings) be undertaken during the driest period of the year when the flow is very low in the watercourses and use of informal road crossings will have a limited impact; • Due to the accessibility of the sites, no unnecessary crossing of the watercourses by machinery or construction vehicles may be permitted. Use must be made of existing watercourse crossing to access the project sites. This will limit edge effects, erosion and sedimentation of the watercourses during the construction phase; • The reaches of the watercourses where no activities are planned (i.e. no support structures and no spanning of the overhead powerline over the watercourse) must be considered no-go areas; • Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the watercourses and their associated 32 m NEMA Zone of Regulation (ZoR); • Removed vegetation must be stockpiled outside of the delineated boundary of the watercourse, if possible. Should it not be possible, the removed vegetation may be stockpiled in the watercourse, for the duration of the construction period. The footprint areas and height of these stockpiles should be kept to a minimum. Should the vegetation not be suitable for reinstatement after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.	Fully reversible
2			Removal of vegetation and associated disturbances topsoil, and access to the site, including grading of existing informal farm roads.	• Earthworks could be potential sources of sediment, which may be transported as runoff into the downstream watercourse areas; • Exposure of soil, leading to increased runoff, and erosion, and thus increased sedimentation of the watercourses; • Increased sedimentation of the watercourses, leading to smothering of vegetation associated in the watercourses; and • Proliferation of alien and/or invasive vegetation as a result of disturbances.	1,25	3,25	14	45,5	L		

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Reversibility of Impact
3		Installation of the support structures (recommended to be further than 32m but within 100 m of the delineated watercourses) and spanning of the proposed overhead powerline.	• Excavation of pits for the support structures leading to stockpiling of soil; and • Potential movement of construction equipment and personnel in the areas surrounding watercourses.	• Disturbances of soil leading to potential impacts to the watercourse vegetation, increased alien vegetation proliferation in the footprint areas, and in turn to altered watercourse habitat; • Altered runoff patterns, leading to increased erosion and sedimentation of the watercourses.	1,25	3,25	14	45,5	L	• Excavation of pits for the support structure foundation may result in loose sediments within the landscape, specifically if works are taken during a period of rainfall (if applicable). As such, sediment traps should also be installed downstream/downgradient of the construction area. Sediment traps can be created by pegging an appropriate geotextile across the entire width of the work area at the specified support structure, held down by cobbles/boulders or by geotextile wrapped hay bales spanning the width of the work area and staked into position; • During excavation of the pits, soil must be stockpiled upgradient of the excavated pit. Mixture of the lower and upper layers of the excavated soil should be kept to a minimum. The soil must be used to close off the pits, immediately after installation of the support structure; • Material used as bedding material (at the bottom of the excavated pit) should be stockpiled outside of the 32m NEMA ZoR and as close as possible to the support structure footprint area. Once the pit has been excavated, the bedding material should directly be placed within the pit, rather than stockpiling it alongside the pit; • When the overhead powerline is strung between the support structures, no vehicles my indiscriminately drive through the watercourses, use must be made of the dedicated access roads. <u>Control measures for concrete mixing on site:</u> • No mixed concrete may be deposited outside of the designated construction footprint; • As far as possible, concrete mixing should be restricted to the contractor laydown area. Additionally, batter / dagga board mixing trays and impermeable sumps should be provided, onto which any mixed concrete can be deposited while it awaits placing; and • Concrete spilled outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site. <u>With regards to backfilling of the concrete encasing;</u> • Soil removed for excavating the pit should be used as backfill material; All excavated pits must be compacted to natural soil compaction levels to prevent the formation of preferential surface flow paths and subsequent erosion. Conversely, areas compacted as a result of construction activities (within the 5 m buffer zone) must be loosened to natural soil compaction levels; • Any remaining soil following the completion of backfilling of the pits are to be spread out thinly surrounding the installed support structure (outside watercourses) to aid in the natural reclamation process; and	Fully reversible

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Reversibility of Impact
4			Mixing and casting of concrete for foundations.	• Potential contamination of surface water (if present).	1,25	3,25	14	45,5	L	• The construction footprint must be limited to the pit area and an additional 5 m buffer (to allow for the stockpiling and movement of personnel). The area must be rehabilitated after the completion of the construction phase, including revegetation thereof with indigenous vegetation. In addition, alien vegetation eradication of the footprint area must be undertaken. <u>Support structures located within preferential flow paths (PFPs) (it must be noted that PFPs are not considered true watercourses):</u> • Should support structures be located in or near preferential flow paths[7], all mitigation measures as listed in this table is applicable; and • It is recommended that gabions be installed around the support structure footprint, as depicted in Figure 26 below. Figure 26 depicts an existing overhead powerline within an area hosting PFPs. This allows for surface water to freely drain through the landscape but also protects the base of the support structure from potential erosion.  **Figure 26: Photograph depicting a support structure located within an area hosting preferential flow paths. The gabion structures around the base of the support structure prevents erosion.**	Fully reversible

[7] Preferential flow paths also lack riparian and wetland characteristics and may potentially only convey surface water for a short period of time after rainfall events. Thus, these features are not considered of ecological importance but contributes to the hydrological functioning of the drainage systems at large. The PFP cannot be considered as watercourses and may potentially only enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998) should a floodline be applicable to these features.

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Reversibility of Impact
5	**OPERATIONAL PHASE**	Operation and maintenance of the overhead powerline and existing substations (where required)	• Potential indiscriminate movement of maintenance vehicles within the watercourses or within close proximity to the watercourses; • Increased risk of sedimentation and/or hydrocarbons entering the watercourses via stormwater runoff from the access roads.	• Disturbance to soil and ongoing erosion as a result of periodic maintenance activities; • Altered water quality (if surface water is present) as a result of increased availability of pollutants	1	3	12	36	**L**	• Maintenance vehicles must make use of dedicated access roads and no indiscriminate movement in the watercourses may be permitted; • During periodic maintenance activities of the overhead powerline and substations, monitoring for erosion should be undertaken with specific mention investigating the support structures located near areas hosting preferential flow paths; • Should erosion be noted at the base of the support structure that may potentially impact on a watercourse in the surrounding area, the area must be rehabilitated by infilling the erosion gully and revegetation thereof with suitable indigenous vegetation; and • Monitoring for the establishment for alien and invasive vegetation species must be undertaken, specifically for access roads through or along the watercourses used to service the overhead powerline and substations. Should alien and invasive plan species be identified, they must be removed and disposed of as per an alien and invasive species control plan and the area must be revegetated with suitable indigenous vegetation.	Fully reversible

7.2 *Impact Assessment*

The results of the DWS specified Risk Assessment Matrix (as promulgated in GN509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)) are translated into the impact assessment methodology provided by the EAP.

An impact assessment and results of the construction, operational and decommissioning activities are provided in Section 7.2.1 below. All mitigatory measures required to minimise the perceived impacts are presented in Section 7.2.2 below.

Proposed Activity Description**:**
The development of the proposed surface infrastructure components (proposed overhead powerline and support structures) as described in Section 2 and depicted in Figures 1 and 2, spanning across various drainage lines, tributaries and rivers of the Wolwefonteinspoortspruit, Kariega, Holbak, Bezuidenhouts and Coega River systems.

7.2.1 Watercourse impact assessment results

The below table indicates the perceived risks to the identified watercourses associated with all phases of the proposed project. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. Key integrated mitigation measures that are applicable to the proposed project are presented in the below table and are required to suitably manage and mitigate the ecological impacts that are associated with all phases of the proposed activities.

The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Table 13: Construction, operational and decommissioning phase impacts on the watercourses from the proposed overhead powerline activities.

Ref	Project phase	Impact	Without mitigation						With mitigation					
			Nature	Duration	Extent	Intensity	Probability	Significance	Nature	Duration	Extent	Intensity	Probability	Significance
1	Construction	Site preparation prior to construction activities, involving: • Vehicular movement (transportation of construction materials); • Removal of vegetation within the development footprint; and • Associated disturbances to soil, and access to the site. This impact may lead to increased risk of sedimentation/erosion of the watercourses and potential impacts to water quality.	Negative	Medium term	Local	Moderate	Almost certain / Highly probable	Minor - negative	Negative	Brief	Limited	Very low	Probable	Negligible - negative
2	Construction	Installation of the support structures and spanning of the proposed powerline entailing the excavation of pits for the support structures leading to: • Stockpiling of soil, and • Potential movement of construction equipment and personnel within the watercourses. This impact may lead to increased sediment runoff from the construction site to the watercourses, in turn leading to altered watercourse habitat and impacts to water quality.	Medium term	Local	High	Certain / definite	Medium term	Moderate - negative	Negative	Short term	Very limited	Low	Likely	Negligible - negative

3	Operation	Operation and maintenance of the powerline entailing: • Potential indiscriminate movement of maintenance vehicles within close proximity to the watercourses, increasing the risk of erosion of the watercourses; and • Increased risk of sedimentation and/or hydrocarbons entering the watercourses via stormwater runoff from the access roads.	Negative	Medium term	Limited	Moderate	Likely	Minor - negative	Negative	Brief	Very limited	Very low	Probable	Negligible - negative
4	Decommissioning	Removal of the proposed overhead powerline from the project area, involving: • Movement of construction vehicles and personnel; and • Disturbance to the buffer zone surrounding the watercourses. This impact may lead to increased risk of sedimentation/erosion of the watercourses and potential impacts to water quality.	Negative	Medium term	Limited	High	Almost certain / Highly probable	Minor - negative	Negative	Short term	Very limited	Low	Likely	Negligible - negative

7.2.2 Mitigation and management measures applicable for the construction, operation and decommissioning phases of the proposed overhead powerline.

Ref 1 (Table 13)

Construction phase: Site preparation prior to construction activities, involving vehicular movement (transportation of construction materials) and the removal of vegetation within the development footprint and associated disturbances to soil, and access to the site, potentially including grading of existing informal farm roads.

- It is imperative that all construction works be undertaken during periods of low to no rainfall (thus preferably during the dry, winter months) when the flow/level of water is very low in the watercourses;
- Due to the accessibility of the sites, no unnecessary crossing of the watercourses may be permitted and it is strongly recommended that the existing roads be utilised. This will limit edge effects, erosion and sedimentation of the watercourses during the construction phase;
- Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the watercourse areas (including the cryptic wetlands identified within the larger investigation area) and their associated buffer zones; and
- Any material stockpiled should be kept to a minimum. Should the vegetation not be suitable for reinstatement after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.

Ref 2 (Table 13)

Construction phase: Installation of the support structures and spanning of the proposed powerline entailing the excavation of pits for the support structures leading to stockpiling of soil, and potential movement of construction equipment and personnel within the watercourses.

- It is imperative that all construction works be undertaken during periods of low to no rainfall (thus preferably during the dry, winter months), and no diversion of flow would be necessary;
- It is strongly recommended that all support structures associated with the proposed powerline infrastructure be located outside the delineated extent of the identified watercourses and the 32 m NEMA ZoR;
- The construction footprint and period should be kept as small and as short as possible, respectively; and construction activities within the delineated watercourses should be avoided;
- Only a 5 m zone of disturbance should be permitted to be disturbed. This 5 m zone of disturbance will limit construction vehicles/personnel to disturb the surrounding area to watercourses, should the support structures be located in close proximity to a watercourse;
- Protect exposed stockpiles (if necessary) from wind and limit the time in which the stockpiled soil is exposed, by covering with a suitable geotextile such as hessian sheeting;
- During excavation of the foundation pits, soil must be stockpiled upgradient of the excavated foundation pit and away from the watercourses. Mixture of the lower and upper layers of the excavated soil should be kept to a minimum. The soil must be used to close off the pits, immediately after installation of the support structures;
- The bedding layer (such as clean gravel) should be spread evenly and compacted uniformly to the required density using a hand tamper (one man operator) in order to minimise the use of large machinery within the watercourse or within close proximity to a watercourse; When the powerline is spun between the support structures, no vehicles may indiscriminately drive through the watercourses, use must be made of the dedicated access roads.

Control measures for concrete mixing on site (where applicable):

- No mixed concrete may be deposited outside of the designated construction footprint;

- As far as possible, concrete mixing should be restricted to the contractor laydown area. Additionally, batter / dagga board mixing trays and impermeable sumps should be provided, onto which any mixed concrete can be deposited while it awaits placing; and
- Any concrete potentially spilled outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site.

With regards to backfilling of the excavated material and concrete encasing;

- Soil removed for excavating the foundation pit should be used as backfill material;
- All excavated foundation pits must be compacted to natural soil compaction levels to prevent the formation of preferential surface flow paths and subsequent erosion. Conversely, areas compacted as a result of construction activities must be loosened to natural soil compaction levels to allow vegetation establishment;
- Any remaining soil following the completion of backfilling of the foundation pits is to be spread out thinly surrounding the constructed support structures (outside watercourses) to aid in the natural reclamation process; and
- The construction footprint must be limited to the foundation pit area associated with the support structures and recommended 5 m construction buffer (to allow for the stockpiling and movement of personnel). The area must be rehabilitated after the completion of the construction phase, including revegetation thereof with indigenous vegetation. In addition, alien vegetation eradication of the footprint area must be undertaken where applicable.

Ref 3 (Table 13)

Operational phase: Operation and maintenance of the powerline entailing potential indiscriminate movement of maintenance vehicles within close proximity to the watercourses and increased risk of sedimentation and/or hydrocarbons entering the watercourses via stormwater runoff from the access roads.

- Maintenance vehicles must make use of dedicated access roads and no indiscriminate movement in the watercourses may be permitted;
- During periodic maintenance activities of the powerline, monitoring for erosion should be undertaken;
- Should erosion be noted at the base of the support structures, the area must be rehabilitated by infilling the erosion gully and revegetation thereof with suitable indigenous vegetation;
- Monitoring for the establishment of alien and invasive vegetation species must be undertaken, specifically where the support structures are within close proximity (within 32 m) to the watercourses and for access roads through or along the watercourses. Should alien and invasive plant species be identified, they must be removed and disposed of as and the area must be revegetated with suitable indigenous vegetation.

Ref 4 (Table 13)

Decommissioning phase: Removal of the proposed overhead powerline from the project area, involving movement of construction vehicles and personnel, and disturbance to the buffer zone surrounding the watercourses.

- No indiscriminate movement of construction equipment in the watercourses and buffer zones surrounding the watercourses may be permitted. Use must be made of the existing roads during the decommissioning phase;
- All surface infrastructure (including support structures) must be decommissioned. All materials must be removed from the watercourses (where applicable) and may temporarily be stored/ stockpiled outside of the delineated extent of the watercourses, where after it must be removed from site and disposed of at a registered disposal facility;
- Areas where surface infrastructure have been decommissioned and removed must be suitably compacted/ripped and revegetated to ensure that no erosion occurs which may contribute to the sediment load of the watercourses;

- Should erosion gullies be noted, these areas must be rehabilitated by infilling them with suitable soil and ensuring the area is vegetated. The increased surface roughness will discourage concentrated flow paths to develop and ensure diffuse flow patterns;
- Watercourse embankments must be suitably rehabilitated (shaped end revegetated) to prevent any erosion from occurring;
- All bare areas in the investigation area, specifically where vegetation was initially cleared for surface infrastructure components) must be ripped and be revegetated within suitable indigenous vegetation species;
- Follow up revegetation should take place where initial revegetation is not successful; and
- Post-closure monitoring of the watercourses (for a period of 3 years), with specific mention of the invasion of alien vegetation species) is recommended to be undertaken.

7.3 *Risk/Impact Assessment Discussion*

The activities associated with the construction and operational phases of the proposed overhead powerline based on the alignment provided by the proponent include site preparation, excavation of pits for the installation of powerline support structures at least 32 m from the delineated extent of watercourses (where feasible); these activities pose a Low risk significance to the identified watercourses, with the implementation of the recommended mitigation measures (DWS Risk Assessment). The installation of the support structures and spanning of the proposed powerline was found to pose a Moderate egative risk significance without mitigation per the impact assessment, and a Low Negative risk significance with effective mitigation. All mitigation measures as stipulated in Table 12 and Section 7.2.2 above must be implemented to prevent any negative edge effects from occurring on the watercourse.

Assuming that strict enforcement of cogent, well-developed mitigation measures takes place, the significance of impacts arising from the proposed overhead powerline are likely to be reduced during the construction and operational phases assuming that a high level of mitigation takes place. Additional “good practice” mitigation measures applicable to a project of this nature are provided in **Appendix F** of this report.

7.4 *Cumulative Impact Statement*

Cumulative impacts are activities and their associated impacts on the past, present and foreseeable future, both spatially and temporally, considered together with the impacts identified in Section 7.1 above.

Direct and indirect impacts identified within the assessed watercourses can predominantley be attributed to informal road crossings leading to limited alien and invasive species establishment. Considering that the proposed overhead powerline support structures will be located outside the assessed watercourses (thus avoiding direct negative impacts), increased vehicular movement and infrastructure in the surrounding landscape may result in indirect edge effects. Such edge effects may have cumulative impacts to the watercourses, with specific mention of alien and invasive species establishment and increased sediment loads. With management and mitigation measures implemented during the construction phase and monitoring of support structures for any erosion during the operational phase, the direct and indirect negative impacts can be reduced, thus cumulative impact on the larger catchment can, therefore, be considered low/limited.

8 CONCLUSION

FEN Consulting (Pty) Ltd was appointed to conduct a specialist freshwater ecological assessment as part of the EA and WUA processes for the proposed 132 kV overhead powerline associated the existing Wolf, Skilpad and Grassridge substations north of Kariega and West of Kirkwood in the Eastern Cape Province.

During the site visit undertaken several watercourses associated with the Wolwefonteinspoortspruit, Kariega, Holbak, Bezuidenhouts and Coega River systems were identified to be traversed by the proposed overhead powerline. More specifically, the proposed overhead powerline will traverse the Kariega, Holbak and Bezuidenhouts Rivers, several ephemeral tributaries with riparian vegetation and episodic drainage lines (EDLs) without riparian vegetation associated with these major river systems and ephemeral drainage lines (with riparian vegetation) of the Coega River system.

The results of the ecological assessment of the watercourses are discussed in Section 5 of this report as summarised in the table below:

Table 14: Summary of results of the ecological assessment as discussed in Section 5.

Watercourse	PES	Ecoservices	EIS	REC
Kariega and Holbak Rivers	D (Largely modified)	Very Low to Moderate	Moderate	REC: Category D (Largely modified) (Maintain)
Bezuidenhouts River	C (Moderately modified)	Very Low to Moderately High	Moderate	REC: Category C (Moderately modified) (Maintain)
Ephemeral riparian tributaries of the Wolwefonteinspoortspruit, Kariega, Holbak and Bezuidenhouts River systems	D (Largely modified)	Very Low to Moderate	Moderate	REC: Category C (Largely modified) (Maintain)
Ephemeral drainage lines of the Coega River system	C (Moderately modified)	Very Low to High	High	REC: Category B/C (Largely natural to moderately modified)) (Improve)

The activities associated with the construction and operational phases of the proposed overhead powerline development assessed based on the alignment and location provided respectively by the proponent, include site preparation, excavation of pits for installation of the support structures and construction activities. Should the recommended mitigation measures be implemented with specific mention of only installing support structures outside the delineated extent of the watercourses and their associated 32 m NEMA ZoR, a **Low risk significance** is expected to occur. It is recommended that no construction activities take place within the identified EDLs as this may have severe impacts to the larger downstream watercourses to which these features are connected to. Development within the PFP is considered acceptable with the implementation of mitigation measures, with specific mention of erosion and sediment control. As such, Water Use Authorisation by means of a General Authorisation in terms of GN 509 of 2016 as it relates to Section 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) may potentially be obtained in consultation with the DWS. However, the DWS, the custodian of water resources in South Africa, must be consulted with regards to the outcome of this assessment.

With implementation of the mitigation measures as provided in this report and the good housekeeping measures as per Appendix F to prevent any direct/indirect impacts from occurring to the watercourses, the proposed overhead powerline is not considered fatally flawed from a freshwater ecological perspective.

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APPENDIX A: Indemnity and Terms of Use of this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and FEN CC and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field or pertaining to this investigation.

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APPENDIX B: Legislative Requirements

The Constitution of the Republic of South Africa, 1996[8]	The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive normalization of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.
National Environmental Management Act, 1998 (Act No. 107 of 1998)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the associated Regulations as amended in 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact. Provincial regulations must also be considered.
The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The objectives of this act are (within the framework of the National Environmental Management Act) to provide for: ➢ the management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity; ➢ the use of indigenous biological resources in a sustainable manner; ➢ the fair and equitable sharing among stakeholders of benefits arising from bio prospecting involving indigenous biological resources; ➢ to give effect to 'ratified international agreements' relating to biodiversity which are binding to the Republic; ➢ to provide for co-operative governance in biodiversity management and conservation; and ➢ to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act. This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of surrounding areas is not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of benefits arising from indigenous biological resources. Furthermore, a person may not carry out a restricted activity involving either: a) a specimen of a listed threatened or protected species; b) specimen of an alien species; or c) a specimen of a listed invasive species without a permit. Permits for the above may only be issued after an assessment of risks and potential impacts on biodiversity is carried out. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. The Minister may also prohibit the carrying out of any activity, which may negatively impact on the survival of a listed threatened or protected species or prohibit the carrying out of such activity without a permit. Provision is made for appeals against the decision to issue/refuse/cancel a permit or conditions thereof. ***National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (Alien and Invasive Species Regulations, 2014)*** NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of alien and invasive species. This act in terms of alien and invasive species aim to: ➢ Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur, ➢ Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and ➢ Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats. Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) as: (a) a species that is not an indigenous species; or

[8] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 19996". It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.

	(b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention. Categories according to NEMBA (Alien and Invasive Species Regulations, 2014): ➢ **Category 1a**: Invasive species that require compulsory control. ➢ **Category 1b**: Invasive species that require control by means of an invasive species management programme. ➢ **Category 2**: Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread. ➢ **Category 3**: Ornamentally used plants that may no longer be planted.
National Environmental Management: Biodiversity Act, 2004(Act No.10 of 2004) (NEMBA)	**Ecosystems that are threatened or in need of protection** (1) (a) The Minister may, by notice in the Gazette, publish a national list of ecosystems that are threatened and in need of protection. (b) An MEC for environmental affairs in a province may, by notice in the Gazette, publish a provincial list of ecosystems in the province that are threatened and in need of protection. (2) The following categories of ecosystems may be listed in terms of subsection (1): (a) critically endangered ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation; (b) endangered ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems; (c) vulnerable ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and (d) protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed in terms of paragraphs (a), (b) or (c).
National Water Act , 1998 (Act No. 36 of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i). A watercourse is defined as: a) A river or spring; b) A natural channel in which water flows regularly or intermittently; c) A wetland, lake or dam into which, or from which water flows; and d) Any collection of water which the minister may, by notice in the Gazette, declare a watercourse.
Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act , 1998 (Act No. 36 of 1998)	In accordance with Government Notice (GN)509 of 2016, a regulated area of a watercourse for section 21c and 21i of the NWA, 1998 is defined as: ➢ The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; ➢ In the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or ➢ A 500 m radius from the delineated boundary (extent) of any wetland or pan. This notice **replaces GN1199** and may be exercised as follows: i) Exercise the water use activities in terms of Section 21(c) and (i) of the Act as set out in the table below, subject to the conditions of this authorisation; ii) Use water in terms of section 21(c) or (i) of the Act if it has a low risk class as determines through the Risk Matrix; iii) Do maintenance with their existing lawful water use in terms of section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix; iv) Conduct river and storm water management activities as contained in a river management plan; v) Conduct rehabilitation of wetlands or rivers where such rehabilitation activities have a LOW risk class as determined through the Risk Matrix; and vi) Conduct emergency work arising from an emergency situation or incident associated with the persons' existing lawful water use, provided that all work is executed and reported in the manner prescribed in the Emergency protocol. A General Authorisation (GA) issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA. Upon completion of the registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission. On written receipt of a registration certificate from the Department, the person will be regarded as a registered water user and can commence within the water use as contemplated in the GA.

APPENDIX C: Method of Assessment

1. Desktop Study

Prior to the commencement of the field assessment, a background study, including a literature review, was conducted in order to determine the ecoregion and ecostatus of the larger aquatic system within which the watercourses and drainage line features present in close proximity of the proposed overhead powerline are located. Aspects considered as part of the literature review are discussed in the sections that follow.

1.1 National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), DWA, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland feature present in the vicinity of the proposed overhead powerline.

1.2 *Department of Water and Sanitation (DWS) Resource Quality Information Services Present Ecological State / Ecological Importance and Sensitivity (PES/EIS) Database (2014)*

The PES/EIS database as developed by the DWS RQIS department was utilised to obtain background information on the project area. The PES/EIS database has been made available to consultants since mid-August 2014. The information from this database is based on information at a sub-quaternary catchment reach (subquat reach) level with the descriptions of the aquatic ecology based on the information collated by the DWS RQIS department from all reliable sources of reliable information such as SA RHP sites, EWR sites and Hydro WMS sites. The results obtained serve to summarise this information as a background to the conditions of the watercourse traversed by the proposed linear development.

2. Classification System for Wetlands and other Aquatic Ecosystems in South Africa (2013)

All watercourses encountered within the study area was assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems, hereafter referred to as the "Classification System" (Ollis et. al., 2013). A summary on Levels 1 to 4 of the classification system are presented in the tables below.

Table C1: Classification System for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	**LEVEL 2: REGIONAL SETTING**	**LEVEL 3:LANDSCAPE UNIT**
Inland Systems	DWA Level 1 Ecoregions OR NFEPA WetVeg Groups OR Other special framework	Valley Floor
		Slope
		Plain
		Bench (Hilltop / Saddle / Shelf)

Table C2: Hydrogeomorphic (HGM) Units for the Inland System, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4:HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
River	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional	Active channel
		Riparian zone
	Upper foothills	Active channel
		Riparian zone
	Lower foothills	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone
	Rejuvenated foothills	Active channel
		Riparian zone
	Upland floodplain	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
Floodplain wetland	Floodplain depression	(not applicable)
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

Level 1: Inland systems
From the classification system, Inland Systems are defined as **aquatic ecosystems that have no existing connection to the ocean[9]** (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but **which are inundated or saturated with water, either permanently or periodically.** It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

Level 2: Ecoregions & NFEPA Wetland Vegetation Groups
For Inland Systems, the regional spatial framework that has been included in Level 2 of the classification system is that of the DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et. al.,* 2005). There is a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland. DWA Ecoregions have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford, 2006) groups' vegetation types across the country, according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups. It is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

Level 3: Landscape Setting
At Level 3 of the classification system for Inland Systems, a distinction is made between four Landscape Units (Table C1) on the basis of the landscape setting (i.e. topographical position) within which an HGM Unit is situated, as follows (Ollis *et. al.,* 2013):

- **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley;
- **Valley floor:** The base of a valley, situated between two distinct valley side-slopes;
- **Plain:** an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land; and
- **Bench (hilltop/saddle/shelf):** an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

Level 4: Hydrogeomorphic Units
Seven primary HGM Types are recognised for Inland Systems at Level 4A of the classification system (Table C2), on the basis of hydrology and geomorphology (Ollis *et. al*., 2013), namely:

- **River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
- **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it;
- **Unchannelled valley-bottom wetland:** a valley-bottom wetland without a river channel running through it;
- **Floodplain wetland:** the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank;
- **Depression:** a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates;
- **Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat; and

[9] Most rivers are indirectly connected to the ocean via an estuary at the downstream end, but where marine exchange (i.e. the presence of seawater) or tidal fluctuations are detectable in a river channel that is permanently or periodically connected to the ocean, it is defined as part of the estuary.

- **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the classification system to try and ensure consistency with the wetland classification terms currently in common usage in South Africa. Similar terminology (but excluding categories for "channel", "flat" and "valleyhead seep") is used, for example, in the recently developed tools produced as part of the Wetland Management Series including WET-Health (Macfarlane *et. al*., 2008), WET-IHI (DWAF, 2007) and WET-EcoServices (Kotze *et. al*., 2009).

3. Wet-Ecoservices (2009)

"The importance of a water resource, in ecological, social or economic terms, acts as a modifying or motivating determinant in the selection of the management class" (DWA, 1999). The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by 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 service is provided:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate trapping;
- Nitrate removal;
- Toxicant removal;
- Erosion control;
- Carbon storage;
- Maintenance of biodiversity;
- Water supply for human use;
- Natural resources;
- Cultivated foods;
- Cultural significance;
- Tourism and recreation; and
- Education and research.

The characteristics were used to quantitatively determine the value, and by extension sensitivity, of the wetlands. Each characteristic was scored to give the likelihood that the service is being provided. The scores for each service were then averaged to give an overall score to the wetland.

Table C3: Classes for determining the likely extent to which a benefit is being supplied.

Score	Rating of the likely extent to which the benefit is being supplied
<0.5	Low
0.6-1.2	Moderately low
1.3-2	Intermediate
2.1-3	Moderately high
>3	High

4. Index of Habitat Integrity

The general habitat integrity of each site was discussed based on the application of the Index of Habitat Integrity (Kleynhans *et al.* 2008). It is important to assess the habitat at each site in order to aid in the interpretation of the results of the community integrity assessments, by taking habitat conditions and impacts into consideration. This method describes the Present Ecological State (PES) of both the in-stream and riparian habitat at each site. The method classifies habitat integrity into one of six classes, ranging from unmodified/natural (Class A) to critically modified (Class F), as indicated in the table below.

Table C4: Classification of Present State Classes in terms of Habitat Integrity [Kleynhans et al. 2008]

Class	Description	Score (% of total)
A	Unmodified, natural.	90 - 100
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 - 89
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 - 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0 - 19

5. Ecological Importance and Sensitivity (EIS) (Rountree & Kotze, 2013)

The purpose of assessing importance and sensitivity of water resources is to be able to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. Water resources with higher ecological importance may require managing such water resources in a better condition than the present to ensure the continued provision of ecosystem benefits in the long term (Rountree & Kotze, 2013).

In order to align the outputs of the Ecoservices assessment (i.e. ecological and socio-cultural service provision) with methods used by the DWA (now the DWS) used to assess the EIS of other watercourse types, a tool was developed using criteria from both WET-Ecoservices (Kotze, *et, al,* 2009) and earlier DWA EIA assessment tools. Thus, three proposed suites of important criteria for assessing the Importance and Sensitivity for wetlands were proposed, namely:

- Ecological Importance and Sensitivity, incorporating the traditionally examined criteria used in EIS assessments of other water resources by DWA and thus enabling consistent assessment approaches across water resource types;
- Hydro-functional importance, taking into consideration water quality, flood attenuation and sediment trapping ecosystem services that the wetland may provide; and
- Importance in terms of socio-cultural benefits, including the subsistence and cultural benefits provided by the wetland system.

The highest of these three suites of scores is then used to determine the overall Importance and Sensitivity category (see table below) of the wetland system being assessed.

Table C5: Ecological Importance and Sensitivity Categories and the interpretation of median scores for biota and habitat determinants (adapted from Kleynhans, 1999).

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

6. Recommended Management Objective (RMO) and Recommended Ecological Category (REC) Determination

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability but carries a higher risk of ecosystem failure" (DWA, 1999).

The RMO (table below) was determined based on the results obtained from the PES, reference conditions and EIS of the watercourse (sections above), with the objective of either maintaining, or improving the ecological integrity of the watercourse in order to ensure continued ecological functionality.

Table C6: Recommended management objectives (RMO) for watercourses based on PES & EIS scores.

PES			Ecological and Importance Sensitivity (EIS)			
			Very High	High	Moderate	Low
	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good	A Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D* Improve	E/F* Improve	E/F* Maintain	E/F* Maintain

***PES Categories E and F are considered ecologically unacceptable (Malan and Day, 2012) and therefore, should a watercourse fall into one of these PES categories, a REC class D is allocated by default, as the minimum acceptable PES category.**

A watercourse may receive the same class for the REC as the PES if the watercourse is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the watercourse.

Table C7: Description of Recommended Ecological Category (REC) classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

7. Watercourse Delineation

For the purposes of this investigation, a wetland is defined in the National Water Act, 1998 (Act No. 36 of 1998) as “land which is transitional between terrestrial and aquatic systems where the water table is at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturatedsoil”.
The wetland zone delineation took place according to the method presented in the DWAF (2005) document “A practical field procedure for identification and delineation of wetlands and riparian areas.

An updated draft version of this report is also available and was therefore also considered during the wetland delineation (DWAF, 2008). The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The position in the landscape, which will help identify those parts of the landscape where wetlands are more likely to occur;
- The type ofsoil form (i.e. the type ofsoil according to a standardsoil classification system), since wetlands are associated with certainsoil types;
- The presence of wetland vegetation species; and
- The presence of redoximorphicsoil feature, which are morphological signatures that appear insoil with prolonged periods of saturation.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWAF, 2005 and 2008).
Riparian and wetland zones can be divided into three zones (DWAF, 2005). The permanent zone of wetness is nearly always saturated. The seasonal zone is saturated for a significant period of wetness (at least three months of saturation per annum) and the temporary zone surrounds the seasonal zone and is only saturated for a short period of saturation (typically less than three months of saturation per annum), but is saturated for a sufficient period, under normal circumstances, to allow for the formation of hydromorphicsoil and the growth of wetland vegetation. The object of this study was to identify the outer boundary of the temporary zone and then to identify a suitable buffer zone around the wetland area.

APPENDIX D: Risk and Impact Assessment Methodology

Risk Assessment Methodology

In order for the EAP to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of the risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation;
- An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'[10]. The interaction of an aspect with the environment may result in an impact;
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is;
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems;
- **Resources** include components of the biophysical environment;
- **Frequency of activity** refers to how often the proposed activity will take place;
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor;
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards;
- **Spatial extent** refers to the geographical scale of the impact; and
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity, impact, legal issues and the detection of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 20. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary[11].

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act, 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances,

[10] The definition has been aligned with that used in the ISO 14001 Standard.
[11] Some risks/impacts that have low significance will however still require mitigation

where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

"RISK ASSESSMENT KEY" (Based on DWS 2015 publication: Section 21 c and i water use Risk Assessment Protocol)

Table D1: Severity (How severe does the aspects impact on the resource quality (flow regime, water quality, geomorphology, biota, habitat)

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland. The score of 5 is only compulsory for the significance rating.	

Table D2: Spatial Scale (How big is the area that the aspect is impacting on)

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5

Table D3: Duration (How long does the aspect impact on the resource quality)

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, an E or F	5
PES and EIS (sensitivity) must be considered.	

Table D4: Frequency of the activity (How often do you do the specific activity)

Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

Table D5: The frequency of the incident or impact (How often does the activity impact on the resource quality)

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

Table D6: Legal issues (How is the activity governed by legislation)

No legislation	1
Fully covered by legislation (wetlands are legally governed)	5
Located within the regulated areas	

Table D7: Detection (How quickly or easily can the impacts/risks of the activity be observed on the resource quality, people and resource)

Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

Table D8: Rating Classes

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.
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. Licence required.
170 – 300	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

A low risk class must be obtained for all activities to be considered for a GA (after the application of mitigation measures)

Table D9: Calculations

Consequence = Severity + Spatial Scale + Duration
Likelihood = Frequency of Activity + Frequency of Incident + Legal Issues + Detection
Significance\Risk = Consequence X Likelihood

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the client and its contractors develop or controls;
  - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/Impacts were assessed for construction phase and operational phase; and
- Individuals or groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status were assessed.

Control Measure Development

The following points presents the key concepts considered in the development of mitigation measures for the proposed construction:

- Mitigation and performance improvement measures and actions that address the risks and impacts[12] are identified and described in as much detail as possible. Mitigating measures are investigated according to the impact minimisation hierarchy as follows:
  - Avoidance or prevention of impact;
  - Minimisation of impact;
  - Rehabilitation; and
  - Offsetting.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation; and
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, wherever possible.

Recommendations

Recommendations were developed to address and mitigate potential impacts on the freshwater ecology of the resources in traversed by or in close proximity of the proposed infrastructure.

[12] Mitigation measures should address both positive and negative impacts

Ecological Impact Assessment Method of assessment (as provided by the EAP)

This section outlines the proposed method for assessing the significance of the potential environmental impacts. For each predicted impact, criteria are ascribed, and these include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criterion based on a seven-point scale (refer to Table 1); and the significance is auto-generated using a spreadsheet through application of the calculations in Figure 1 in Part A. Specialists can comment where they disagree with the auto-calculated impact significance ratings.

The calculations for each predicted impact, certain criteria are applied to establish the likely significance of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale). These numerical ratings are used in an equation whereby the consequence of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (intensity + duration + extent)

To calculate the significance of an impact, the probability (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

Table D10: Assessment criteria for the evaluation of impacts

CRITERIA	CATEGORY	DESCRIPTION	
Project phase	**Construction**		
	Operation		
	Decommissioning		
Mitigatability	**Low**	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts	
	Medium	Mitigation exists and will notably reduce significance of impacts	
	High	Mitigation exists and will considerably reduce the significance of impacts	
Nature	**Positive**		1
	Negative		-1
Duration	**Immediate**	Impact will self-remedy immediately	1
	Brief	Impact will not last longer than 1 year	2
	Short term	impact will last between 1 and 5 years	3
	Medium term	Impact will last between 5 and 10 years	4
	Long term	Impact will last between 10 and 15 years	5
	On-going	Impact will last between 15 and 20 years	6
	Permanent	Impact may be permanent, or in excess of 20 years	7
Extent	**Very limited**	Limited to specific isolated parts of the site	1
	Limited	Limited to the site and its immediate surroundings	2
	Local	Extending across the site and to nearby settlements	3
	Municipal area	Impacts felt at a municipal level	4
	Regional	Impacts felt at a regional / provincial level	5

	National	Impacts felt at a national level	6
	International	Impacts felt at an international level	7
Intensity	**Negligible**	Natural and/ or social functions and/ or processes are negligibly altered	1
	Very low	Natural and/ or social functions and/ or processes are slightly altered	2
	Low	Natural and/ or social functions and/ or processes are somewhat altered	3
	Moderate	Natural and/ or social functions and/ or processes are moderately altered	4
	High	Natural and/ or social functions and/ or processes are notably altered	5
	Very high	Natural and/ or social functions and/ or processes are majorly altered	6
	Extremely high	Natural and/ or social functions and/ or processes are severely altered	7
Probability	**Highly unlikely / none**	Expected never to happen	1
	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere	2
	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	3
	Probable	The impact has occurred here or elsewhere and could therefore occur	4
	Likely	The impact may occur	5
	Almost certain / Highly probable	It is most likely that the impact will occur	6
	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	7
Confidence	**Low**	Judgement is based on intuition	
	Medium	Determination is based on common sense and general knowledge	
	High	Substantive supportive data exists to verify the assessment	
Reversibility	**Low**	The affected environment will not be able to recover from the impact - permanently modified	
	Medium	The affected environment will only recover from the impact with significant intervention	
	High	The affected environmental will be able to recover from the impact	
Resource irreplaceability	**Low**	The resource is not damaged irreparably or is not scarce	
	Medium	The resource is damaged irreparably but is represented elsewhere	
	High	The resource is irreparably damaged and is not represented elsewhere	
Significance	**Negligible**		
	Minor		
	Moderate		
	Major		

Significance:	negative	positive
Negligible	Negligible - negative	Negligible - positive
Minor	Minor - negative	Minor - positive
Moderate	Moderate - negative	Moderate - positive
Major	Major - negative	Major - positive

APPENDIX E: Results of Field Investigation

PRESENT ECOLOGICAL STATE (PES), ECOSERVICES AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) RESULTS

Table E1: Presentation of the results of the IHI assessment applied to Kariega and Holbak Rivers.

	MRU
INSTREAM IHI	
Base Flows	-4.0
Zero Flows	0.0
Floods	1.0
HYDROLOGY RATING	**4.0**
pH	1.0
Salts	1.0
Nutrients	1.5
Water Temperature	2.0
Water clarity	1.0
Oxygen	1.0
Toxics	
PC RATING	**1.5**
Sediment	2.0
Benthic Growth	2.0
BED RATING	**2.0**
Marginal	2.0
Non-marginal	2.0
BANK RATING	**2.0**
Longitudinal Connectivity	2.0
Lateral Connectivity	2.0
CONNECTIVITY RATING	**2.0**
INSTREAM IHI %	**51.6**
INSTREAM IHI EC	**D**
INSTREAM CONFIDENCE	**3.0**

	MRU
RIPARIAN IHI	
Base Flows	-3.0
Zero Flows	0.0
Moderate Floods	1.0
Large Floods	1.0
HYDROLOGY RATING	**1.4**
Substrate Exposure (marginal)	2.5
Substrate Exposure (non-marginal)	2.5
Invasive Alien Vegetation (marginal)	4.0
Invasive Alien Vegetation (non-marginal)	4.0
Erosion (marginal)	2.0
Erosion (non-marginal)	2.0
Physico-Chemical (marginal)	1.5
Physico-Chemical (non-marginal)	1.5
Marginal	4.0
Non-marginal	4.0
BANK STRUCTURE RATING	**4.0**
Longitudinal Connectivity	2.5
Lateral Connectivity	2.5
CONNECTIVITY RATING	**2.5**
RIPARIAN IHI %	**43.7**
RIPARIAN IHI EC	**D**
RIPARIAN CONFIDENCE	**3.0**

Table E2: Presentation of the results of the IHI assessment applied to the Bezuidenhouts River.

	MRU
INSTREAM IHI	
Base Flows	-2.0
Zero Flows	0.0
Floods	1.0
HYDROLOGY RATING	**1.1**
pH	1.0
Salts	0.5
Nutrients	1.0
Water Temperature	1.0
Water clarity	1.0
Oxygen	1.0
Toxics	
PC RATING	**1.5**
Sediment	1.0
Benthic Growth	0.0
BED RATING	**0.6**
Marginal	1.0
Non-marginal	1.0
BANK RATING	**1.0**
Longitudinal Connectivity	1.0
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.0**
INSTREAM IHI %	**78.6**
INSTREAM IHI EC	**B/C**
INSTREAM CONFIDENCE	**3.0**

	MRU
RIPARIAN IHI	
Base Flows	-2.0
Zero Flows	0.0
Moderate Floods	1.0
Large Floods	1.0
HYDROLOGY RATING	**1.1**
Substrate Exposure (marginal)	2.0
Substrate Exposure (non-marginal)	2.0
Invasive Alien Vegetation (marginal)	3.0
Invasive Alien Vegetation (non-marginal)	3.0
Erosion (marginal)	2.0
Erosion (non-marginal)	2.0
Physico-Chemical (marginal)	1.0
Physico-Chemical (non-marginal)	1.5
Marginal	3.0
Non-marginal	3.0
BANK STRUCTURE RATING	**3.0**
Longitudinal Connectivity	1.0
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.0**
RIPARIAN IHI %	**61.4**
RIPARIAN IHI EC	**C/D**
RIPARIAN CONFIDENCE	**3.0**

Table E3: Presentation of the results of the IHI assessment applied to the ephemeral riparian tributeries.

	MRU
INSTREAM IHI	
Base Flows	-4.0
Zero Flows	0.0
Floods	1.0
HYDROLOGY RATING	**4.0**
pH	1.0
Salts	1.0
Nutrients	1.5
Water Temperature	2.0
Water clarity	1.0
Oxygen	1.0
Toxics	
PC RATING	**1.5**
Sediment	2.0
Benthic Growth	2.0
BED RATING	**2.0**
Marginal	2.0
Non-marginal	2.0
BANK RATING	**2.0**
Longitudinal Connectivity	2.0
Lateral Connectivity	2.0
CONNECTIVITY RATING	**2.0**
INSTREAM IHI %	**51.6**
INSTREAM IHI EC	**D**
INSTREAM CONFIDENCE	**3.0**

	MRU
RIPARIAN IHI	
Base Flows	-3.0
Zero Flows	0.0
Moderate Floods	1.0
Large Floods	1.0
HYDROLOGY RATING	**1.4**
Substrate Exposure (marginal)	2.5
Substrate Exposure (non-marginal)	2.5
Invasive Alien Vegetation (marginal)	4.0
Invasive Alien Vegetation (non-marginal)	4.0
Erosion (marginal)	2.0
Erosion (non-marginal)	2.0
Physico-Chemical (marginal)	1.5
Physico-Chemical (non-marginal)	1.5
Marginal	4.0
Non-marginal	4.0
BANK STRUCTURE RATING	**4.0**
Longitudinal Connectivity	2.5
Lateral Connectivity	2.5
CONNECTIVITY RATING	**2.5**
RIPARIAN IHI %	**43.7**
RIPARIAN IHI EC	**D**
RIPARIAN CONFIDENCE	**3.0**

Table E4: Presentation of the results of the IHI assessment applied to the ephemeral drainage lines.

	MRU
INSTREAM IHI	
Base Flows	-2.0
Zero Flows	0.0
Floods	1.0
HYDROLOGY RATING	**1.1**
pH	1.0
Salts	0.5
Nutrients	1.0
Water Temperature	1.0
Water clarity	1.0
Oxygen	1.0
Toxics	
PC RATING	**1.5**
Sediment	1.0
Benthic Growth	0.0
BED RATING	**0.6**
Marginal	1.0
Non-marginal	1.0
BANK RATING	**1.0**
Longitudinal Connectivity	1.0
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.0**
INSTREAM IHI %	**78.6**
INSTREAM IHI EC	**B/C**
INSTREAM CONFIDENCE	**3.0**

	MRU
RIPARIAN IHI	
Base Flows	-2.0
Zero Flows	0.0
Moderate Floods	1.0
Large Floods	1.0
HYDROLOGY RATING	**1.1**
Substrate Exposure (marginal)	2.0
Substrate Exposure (non-marginal)	2.0
Invasive Alien Vegetation (marginal)	3.0
Invasive Alien Vegetation (non-marginal)	3.0
Erosion (marginal)	2.0
Erosion (non-marginal)	2.0
Physico-Chemical (marginal)	1.0
Physico-Chemical (non-marginal)	1.5
Marginal	3.0
Non-marginal	3.0
BANK STRUCTURE RATING	**3.0**
Longitudinal Connectivity	1.0
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.0**
RIPARIAN IHI %	**61.4**
RIPARIAN IHI EC	**C/D**
RIPARIAN CONFIDENCE	**3.0**

Table E5: Presentation of the results of the Socio-cultural and Ecoservice provision provided by the Kariega and Holbak Rivers (rows without values indicate calculations that are only taken for wetlands and not riparian systems).

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.0	0.8	0.0	Very Low
	Stream flow regulation	-	-	#VALUE!	#VALUE!
	Sediment trapping	1.0	3.0	1.0	Low
	Erosion control	0.8	1.3	0.0	Very Low
	Phosphate assimilation	1.0	3.0	1.0	Low
	Nitrate assimilation	1.0	3.0	1.0	Low
	Toxicant assimilation	1.1	1.0	0.1	Very Low
	Carbon storage	1.4	No scores	No scores	No scores
	Biodiversity maintenance	2.2	3.0	2.2	Moderate
PROVISIONING SERVICES	Water for human use	0.4	0.7	0.0	Very Low
	Harvestable resources	1.0	0.3	0.0	Very Low
	Food for livestock	1.0	2.0	0.5	Very Low
	Cultivated foods	#VALUE!	0.3	#VALUE!	#VALUE!
CULTURAL SERVICES	Tourism and Recreation	0.5	0.3	0.0	Very Low
	Education and Research	1.0	0.3	0.0	Very Low
	Cultural and Spiritual	1.0	0.3	0.0	Very Low

Table E6: Presentation of the results of the Socio-cultural and Ecoservice provision provided by the Bezuidenhouts River (rows without values indicate calculations that are only taken for wetlands and not riparian systems).

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.0	0.8	0.0	Very Low
	Stream flow regulation	-	-	#VALUE!	#VALUE!
	Sediment trapping	1.1	3.0	1.1	Low
	Erosion control	1.2	1.3	0.4	Very Low
	Phosphate assimilation	1.1	3.0	1.1	Low
	Nitrate assimilation	1.1	3.0	1.1	Low
	Toxicant assimilation	1.1	1.0	0.1	Very Low
	Carbon storage	1.4	No scores	No scores	No scores
	Biodiversity maintenance	2.2	3.5	2.4	Moderately High
PROVISIONING SERVICES	Water for human use	0.4	0.7	0.0	Very Low
	Harvestable resources	1.0	0.3	0.0	Very Low
	Food for livestock	1.0	2.0	0.5	Very Low
	Cultivated foods	#VALUE!	0.3	#VALUE!	#VALUE!
CULTURAL SERVICES	Tourism and Recreation	1.3	0.3	0.0	Very Low
	Education and Research	1.0	0.3	0.0	Very Low
	Cultural and Spiritual	2.0	0.3	0.7	Very Low

Table E7: Presentation of the results of the Socio-cultural and Ecoservice provision provided by the ephemeral riparian tributaries (rows without values indicate calculations that are only taken for wetlands and not riparian systems).

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.0	0.8	0.0	Very Low
	Stream flow regulation	-	-	#VALUE!	#VALUE!
	Sediment trapping	1.0	3.0	1.0	Low
	Erosion control	1.4	1.3	0.5	Very Low
	Phosphate assimilation	1.0	3.0	1.0	Low
	Nitrate assimilation	1.0	3.0	1.0	Low
	Toxicant assimilation	1.1	1.0	0.1	Very Low
	Carbon storage	1.4	No scores	No scores	No scores
	Biodiversity maintenance	2.2	3.0	2.2	Moderate
PROVISIONING SERVICES	Water for human use	0.4	0.7	0.0	Very Low
	Harvestable resources	1.0	0.3	0.0	Very Low
	Food for livestock	1.0	2.0	0.5	Very Low
	Cultivated foods	#VALUE!	0.3	#VALUE!	#VALUE!
CULTURAL SERVICES	Tourism and Recreation	0.5	0.3	0.0	Very Low
	Education and Research	1.0	0.3	0.0	Very Low
	Cultural and Spiritual	1.0	0.3	0.0	Very Low

Table E8: Presentation of the results of the Socio-cultural and Ecoservice provision provided by the ephemeral drainage lines (rows without values indicate calculations that are only taken for wetlands and not riparian systems).

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.0	0.8	0.0	Very Low
	Stream flow regulation	-	-	#VALUE!	#VALUE!
	Sediment trapping	1.0	1.0	0.0	Very Low
	Erosion control	1.6	1.6	0.9	Low
	Phosphate assimilation	1.1	1.0	0.1	Very Low
	Nitrate assimilation	1.1	1.0	0.1	Very Low
	Toxicant assimilation	1.1	2.0	0.6	Very Low
	Carbon storage	1.0	No scores	No scores	No scores
	Biodiversity maintenance	2.9	3.5	3.2	High
PROVISIONING SERVICES	Water for human use	0.0	0.0	0.0	Very Low
	Harvestable resources	0.5	0.0	0.0	Very Low
	Food for livestock	0.0	0.0	0.0	Very Low
	Cultivated foods	#VALUE!	0.0	#VALUE!	#VALUE!
CULTURAL SERVICES	Tourism and Recreation	1.0	0.0	0.0	Very Low
	Education and Research	1.0	0.3	0.0	Very Low
	Cultural and Spiritual	2.0	0.0	0.5	Very Low

Table E4: Presentation of the EIS assessment applied to the assessed watercourses.

Watercourse			Kariega and Holbak River	Bezuidenhouts River	Ephemeral riparian tributaries	Ephemeral drainage lines	*Confidence (1-5)*
Ecological Importance and Sensitivity			Score (0-4)	Score (0-4)	Score (0-4)	Score (0-4)	
Biodiversity support			C (average)	C (average)	C (average)	B (average)	B (average)
			1	1	1	2	3,00
Presence of Red Data species			0	0	0	0	3
Populations of unique species			0	0	0	3	3
Migration/breeding/feeding sites			3	3	3	3	3
Landscape scale			C (average)	C (average)	C (average)	C (average)	A (average)
			1,6	1,8	1,4	1,4	4,00
Protection status of the wetland			1	1	1	1	3
Protection status of the vegetation type			1	1	1	1	4
Regional context of the ecological integrity			2	3	2	3	4
Size and rarity of the wetland type/s present			3	3	3	1	4
Diversity of habitat types			1	1	1	1	4
Sensitivity of the wetland			C (average)	C (average)	C (average)	C (average)	B (average)
			1	1	1		2,67
Sensitivity to changes in floods			1	1	1	1	3
Sensitivity to changes in low flows/dry season			1	1	1	1	3
Sensitivity to changes in water quality			1	1	1	1	2
ECOLOGICAL IMPORTANCE & SENSITIVITY			**(max of A,B or C)**	**(max of A,B or C)**	**(max of A,B or C)**	**(max of A,B or C)**	*(average of A, B or C)*
		Fill in highest score:	**B**	**B**	**B**	**B**	**A**
Hydro-Functional Importance			Score (0-4)				*Confidence (1-5)*
Regulating & supporting benefits	**Flood attenuation**		3	3	3	3	4
	Streamflow regulation		2	1	2	1	4
	Water Quality Enhancement	***Sediment trapping***	1	2	2	3	4
		Phosphate assimilation	2	2	1	2	4
		Nitrate assimilation	2	2	1	2	4
		Toxicant assimilation	2	2	1	2	4
		Erosion control	3	3	2	3	4
	Carbon storage		0		0	0	4
HYDRO-FUNCTIONAL IMPORTANCE			**C (average score)**	**C (average score)**	**C (average score)**	**B (Average)**	**A (average confidence)**
			1,9	1,9	1,9	2	4
Direct Human Benefits			Score (0-4)	Score (0-4)			*Confidence (1-5)*
Subsistence benefits	***Water for human use***		2	2	2	2	3
	Harvestable resources		0	0	0	0	4
	Cultivated foods		0	0	0	0	4
Cultural benefits	***Cultural heritage***		0	0	0	0	4
	Tourism and recreation		1	1	1	0	4
	Education and research		0	0	0	0	4
DIRECT HUMAN BENEFITS			D (average score)	D (average score)	D (average score)	D (average score)	A (average confidence)
			0,5	0,5	0,5	0,2	4

APPENDIX F: Risk Analysis and Mitigation Measures

General construction management and good housekeeping practices

Latent and general impacts which may affect the watercourse ecology and biodiversity, will include any activities which take place in close proximity to the proposed activities that may impact on the receiving environment. Mitigation measures for these impacts are highlighted below and are relevant to the watercourse identified in this report:

Development footprint

- All development footprint areas should remain as small as possible and should not encroach into watercourses unless absolutely essential and where project activities are located in the watercourses. It must be ensured that the watercourse habitat is off-limits to construction vehicles and non-essential personnel;
- The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled;
- Planning of temporary roads and access routes (if applicable) should avoid watercourses and be restricted to existing roads where possible;
- Appropriate sanitary facilities must be provided for the life of the construction phase and all waste removed to an appropriate waste facility;
- All hazardous chemicals as well as stockpiles should be stored on bunded surfaces and have facilities constructed to control runoff from these areas;
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage;
- No fires should be permitted in or near the construction area; and
- Ensuring that an adequate number of waste and “spill” bins are provided will also prevent litter and ensure the proper disposal of waste and spills.

Vehicle access

- All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil;
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; and
- All spills should they occur, should be immediately cleaned up and treated accordingly.

Vegetation

- Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) and Section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)) Removal of species should take place throughout the construction, operational, and maintenance phases; and
- Species specific and area specific eradication recommendations:
  - Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used;
  - Footprint areas should be kept as small as possible when removing alien plant species*;* and
  - No vehicles should be allowed to drive through designated sensitive wetland areas during the eradication of alien and weed species.

Soil

- Sheet runoff from access roads should be slowed down by the strategic placement of berms;
- As far as possible, all construction activities should occur in the low flow season, during the drier summer months;
- As much vegetation growth as possible (of indigenous floral species) should be encouraged to protectsoil;

- No stockpiling of topsoil is to take place within the recommended buffer zone around the watercourses (unless specified otherwise), and all stockpiles must be protected with a suitable geotextile to prevent sedimentation of the watercourses;
- Allsoil compacted as a result of construction activities as well as ongoing operational activities falling outside of project footprint areas should be ripped and profiled; and
- A monitoring plan for the development and the immediate zone of influence should be implemented to prevent erosion and incision.

Rehabilitation

- Construction rubble/silt removed from the construction area must be collected and disposed of at a suitable landfill site; and
- All alien vegetation in the footprint area as well as immediate vicinity of the proposed overhead powerline should be removed. Alien vegetation control should take place for a minimum period of two growing seasons after rehabilitation is completed.

Risk significance on the watercourse ecology of the project area

The table below serves to summarise the anticipated impacts that might occur during the construction and operational phases as well as the mitigation measures that must be implemented in order to maintain and enhance the ecological integrity of the resource.

Table F1: DWS Risk Assessment outcomes for the proposed overhead powerline.

	Phases	Activity	Aspect	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph & Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating
1	Construction Phase	Site preparation prior to construction activities.	Vehicular movement (transportation of construction materials)	*Loss of watercourse vegetation, associated habitat and ecosystem services; *Transportation of construction materials can result in disturbances tosoil, and increased risk of sedimentation/erosion; and *Soil and stormwater contamination from potentially spilled oils and hydrocarbons originating from construction vehicles.	2	1	1	1	1,25	1	1	3,25	5	2	5	1	13	42,25	L
2			Removal of vegetation and associated disturbances tosoil, and access to the site, including grading of existing informal farm roads.	*Earthworks could be potential sources of sediment, which may be transported as runoff into the downstream watercourse areas; *Exposure ofsoil, leading to increased runoff, and erosion, and thus increased sedimentation of the watercourses; *Increased sedimentation of the watercourses, leading to smothering of vegetation associated in the watercourses; and *Proliferation of alien and/or invasive vegetation as a result of disturbances.	2	1	1	1	1,25	1	1	3,25	5	3	5	1	14	45,5	L
3		Installation of the support structures and spanning of the proposed overhead powerline.	*Excavation of pits for the support structures leading to stockpiling ofsoil; *Potential movement of construction equipment and personnel within the watercourses.	*Disturbances ofsoil leading to potential impacts to the watercourse vegetation, increased alien vegetation proliferation in the footprint areas, and in turn to altered watercourse habitat; *Altered runoff patterns, leading to increased erosion and sedimentation of the watercourses.	2	1	1	1	1,25	1	1	3,25	5	3	5	1	14	45,5	L
4			Mixing and casting of concrete for foundations.	*Potential contamination of surface water (if present).	1	2	1	1	1,25	1	1	3,25	5	3	5	1	14	45,5	L

	Phases	Activity	Aspect	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph & Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating
5	**OPERATIONAL PHASE**	Operation and maintenance of the proposed overhead powerline	*Potential indiscriminate movement of maintenance vehicles within the watercourses or within close proximity to the watercourses; *Increased risk of sedimentation and/or hydrocarbons entering the watercourses via stormwater runoff from the access roads	*Disturbance tosoil and ongoing erosion as a result of periodic maintenance activities; *Altered water quality (if surface water is present) as a result of increased availability of pollutants	1	1	1	1	1	1	1	3	3	3	5	1	12	36	L

Individual Impact Assessments for the Construction, Maintenance and Decommissioning phases of the proposed overhead powerline as per the impact assessment provided by the EAP.

Ref:	Site preparation activities prior to construction	1

Project phase	**Construction**			
Impact	• Vehicular movement (transportation of construction materials); • Removal of vegetation within the development footprint; and • Associated disturbances to soil, and access to the site.			
Description of impact	• Transportation of construction materials can result in disturbances to soil, and increased risk of sedimentation/erosion • Soil and surface water (if present) contamination from potentially spilled oils and hydrocarbons originating from construction vehicles; • Soil compaction leading to increased runoff and erosion within the vicinity of the watercourses; • Exposure of soils, leading to increased runoff, and erosion, and thus increased sedimentation of the watercourses; • Increased sedimentation of the watercourses, leading to smothering of vegetation associated in the watercourses; and • Proliferation of alien and/or invasive vegetation as a result of disturbances.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• It is imperative that all construction works be undertaken during periods of low to no rainfall (thus preferably during the dry, winter months) when the flow/level of water is very low in the watercourses; • Due to the accessibility of the sites, no unnecessary crossing of the watercourses may be permitted and it is strongly recommended that the exising farm and access roads be utilised			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	If properly mitigated the impact can be limited to a small extent and not to severe.			
Cumulative impacts	Increased vehicular movement and infrastructure in the surrounding landscape may result in indirect edge effects. Such edge effects may have cumulative impacts to the watercourses, with specific mention of alien and invasive species establishment and increased sediment loads. With management and mitigation measures implemented during the construction phase the direct and indirect negative impacts can be reduced, thus cumulative impact on the larger catchment can, therefore, be considered low/limited.			

Ref:	Installation of the support structures and spanning of the proposed powerline	2

Project phase	**Construction**			
Impact	Installation of the support structures and spanning of the proposed powerline entailing the excavation of pits for the support structures leading to stockpiling of soil, and potential movement of construction equipment and personnel within the watercourses.			
Description of impact	• Earthworks could be potential sources of sediment, which may be transported as runoff into the downstream watercourse areas; • Disturbances of soil leading to potential impacts to the watercourses and increased sediment runoff from the construction site to the watercourses, in turn leading to altered watercourse habitat; • Altered runoff patterns, leading to increased erosion and sedimentation of the watercourses where watercourses are within close proximity; and • Dust pollution during construction which may impact on water quality (if surface water is present).			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• It is imperative that all construction works be undertaken during periods of low to no rainfall (thus preferably during the dry, winter months), and no diversion of flow would be necessary; • It is strongly recommended that all support structures associated with the proposed powerline infrastructure be located outside the delineated extent of the identified watercourses and their 32 m NEMA ZoR.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Negligible - negative**	
Comment on significance	It is strongly recommended that all support structures associated with the proposed powerline infrastructure be located outside the delineated extent of the identified watercourses and their 32 m NEMA ZoR			
Cumulative impacts	Increased vehicular movement and infrastructure in the surrounding landscape may result in indirect edge effects. Such edge effects may have cumulative impacts to the watercourses, with specific mention of alien and invasive species establishment and increased sediment loads. With management and mitigation measures implemented during the construction phase the direct and indirect negative impacts can be reduced, thus cumulative impact on the larger catchment can, therefore, be considered low/limited.			

Ref:	Operation and maintenance of the powerline (and access route).	3

Project phase	**Operation**			
Impact	Operation and maintenance of the powerline entailing potential indiscriminate movement of maintenance vehicles within close proximity to the watercourses and increased risk of sedimentation and/or hydrocarbons entering the watercourses via stormwater runoff from the access roads			
Description of impact	• Disturbance to soils and ongoing erosion as a result of periodic maintenance activities; and • Altered water quality (if surface water is present) as a result of increased availability of pollutants.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• Maintenance vehicles must make use of dedicated access roads and no indiscriminate movement in the watercourses may be permitted; • During periodic maintenance activities of the powerline, monitoring for erosion should be undertaken and remediated effectively.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	If properly mitigated, with specific mention of monitoring of erosion and establishment of alien and invasive vegetation, the impact can be limited to a small extent and not to severe.			
Cumulative impacts	Increased vehicular movement and infrastructure in the surrounding landscape may result in indirect edge effects. Such edge effects may have cumulative impacts to the watercourses, with specific mention of alien and invasive species establishment and increased sediment loads. With management and mitigation measures implemented during the construction phase and monitoring of support structures for any erosion during the operational phase, the direct and indirect negative impacts can be reduced, thus cumulative impact on the larger catchment can, therefore, be considered low/limited.			

Ref:	Decommissioning of of the powerline and associated infrastructure	4

Project phase	Decommissioning			
Impact	• Removal of the proposed overhead powerline from the project area, involving movement of construction vehicles and personnel; and • Disturbance to the buffer zone surrounding the watercourses.			
Description of impact	• Disturbance of soil and vegetation that established within the operational area.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• No indiscriminate movement of construction equipment in the watercourses and buffer zones surrounding the watercourses may be permitted. Use must be made of the existing roads during the decommissioning phase; • All surface infrastructure (including throughflow structures) must be decommissioned. All materials must be removed from the watercourses (where applicable) and may temporarily be stored/ stockpiled outside of the delineated extent of the watercourses, where after it must be removed from site and disposed of at a registered disposal facility.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	If properly mitigated the impact can be limited to a small extent and not to severe.			
Cumulative impacts	Increased vehicular movement and infrastructure in the surrounding landscape may result in indirect edge effects. Such edge effects may have cumulative impacts to the watercourses, with specific mention of alien and invasive species establishment and increased sediment loads. With management and mitigation measures implemented during the decomissioning phase the direct and indirect negative impacts can be reduced, thus cumulative impact on the larger catchment can, therefore, be considered low/limited.			

APPENDIX G: Details, Expertise and Curriculum Vitae of Specialists

1. (a) (i) Details of the specialist who prepared the report

Rabia Mathakutha	MSc Plant Science (University of Pretoria)
Christel du Preez	MSc Environmental Sciences (North West University)
Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)

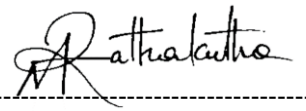
1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	SAS Environmental Gorup of Companies		
Name / Contact person:	Rabia Mathakutha		
Postal address:	221 Riverside Lofts, Tygerfalls Boulevard, Bellville,		
Postal code:	7539	Cell:	083 739 2284
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	rabia@sasenvgroup.co.za		
Qualifications	MSc Plant Science (University of Pretoria)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)		

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Rabia Mathakutha, declare that -

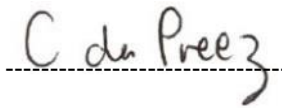
- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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



Signature of the Specialist

I, Christel du Preez, 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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



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1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Kim Marais, 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF RABIA MATHAKUTHA

PERSONAL DETAILS

Position in Company	Field Ecologist Wetland ecology
Joined SAS Environmental Group of Companies	2020

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Candidate member of the South African Council for Natural Scientific Professions (SACNASP – Reg. No. 120040)
Member of the Western Cape Wetland Forum (WCWF)
South African Association of Botany (SAAB)

EDUCATION

Qualifications

MSc Plant Science (University of Pretoria)	2018
BSc (Hons) Environmental Science (Biogeography) (University of KwaZulu-Natal)	2015
BSc Environmental Science (Life Science stream) (University of KwaZulu-Natal)	2014

Short Courses

Official DWS Section 21 (c) and (i) Water Use Authorisation Course	2018
Basic and Applied Statistics in R	2016

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga
Africa – Lesotho, Mozambique

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species Plan

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTEL DU PREEZ

PERSONAL DETAILS

Position in Company	Senior Scientist (Watercourse ecology)
Joined SAS Environmental Group of Companies	2016

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP)
(SACNASP – Reg No. 120240/19)
Member of the Western Cape Wetland Forum (WCF)
Member of the Gauteng Wetland Forum (GWF)

EDUCATION

Qualifications

MSc Environmental Sciences (North West University)	2017
BSc Hons Environmental Sciences (North West University)	2012
BSc Environmental and Biological Sciences (North West University)	2011

Short Courses

Wetland and Aquatic plant Identification presented by Carin van Ginkel (Crispis Environmental)	2019
Wetland Management: Introduction and Delineation presented by the Centre of Environmental Management University of the Free State	2018
Tools for Wetland Assessment presented by Prof. F. Ellery and Rhodes University	2017
Basic Principles of ecological rehabilitation and mine closure presented by the Centre for Environmental Management North West University	2015

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Limpopo, Western Cape, Northern Cape, Eastern Cape

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant species and Landscape Plan
- Freshwater Offset Plan

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF KIM MARAIS

PERSONAL DETAILS

Position in Company	Senior Scientist (Water Resource Manager)
Joined SAS Environmental Group of Companies	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)
Member of the Western Cape Wetland Forum (WCWF)

EDUCATION

Qualifications

BSc (Hons) Zoology (University of the Witwatersrand)	2012
BSc (Zoology and Conservation) (University of the Witwatersrand)	2011

Short Courses

Aquatic and Wetland Plant Identification (Cripsis Environment)	2019
Tools for Wetland Assessment (Rhodes University)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Freshwater Offset Plan

Aquatic Ecological Assessment and Water Quality Studies

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions
- Public Participation processes