FEN CONSULTING

FRESHWATER ECOLOGICAL ASSESSMENT

FOR THE PROPOSED 132KV OVERHEAD POWERLINE AND 33/132KV SUBSTATION ASSOCIATED WITH THE PROPOSED KAREEBOSCH WIND ENERGY FACILITY, BETWEEN SUTHERLAND AND MATJIESFONTEIN IN THE WESTERN AND NORTHERN CAPE PROVINCES

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EXECUTIVE SUMMARY

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) application processes for the proposed 132 kV overhead powerline (6 alternatives proposed) to be routed from the proposed on-site 33/132kV substation (2 alternatives proposed) to the to the existing Bon Espirange substation, after which it will connect to the existing 400kV Komsberg substation. The proposed powerlines will traverse a network of episodic drainage lines and ephemeral tributaries (with riparian vegetation) of the Wilgebos, Tankwa and Meintjiesplaas River systems.

It was determined that the proposed development will have a low risk significance on the watercourses with the implementation of mitigation measures for all six proposed powerline alternatives and the powerline between the Bon Espirange to Komsberg substations. The risk significance can be reduced should the powerline support structures be located at least 32 m from a watercourse and the watercourse road crossings only be constructed during the dry periods when no surface water is present with the watercourses; the impacts 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 and based on the risk assessment. However, it is acknowledged that due to the pollution risk associated with any potential accidental transformer leakage such as substations, substation Option 2 is not preferred as it is located in close proximity to the delineated extent of the watercourses (at least 20 m of a watercourse). Preference is thus given to Substation Option 1 which is located at least 100 m to the nearest watercourse, and thus powerline route Option 1A/1B/1C and the access roads associated thereof, as no direct or indirect impacts from Substation 1 are expected. In addition, the access roads associated with the Option 1 route alternatives avoid the crossing of major rivers such as the Tankwa River. With the 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, from a freshwater conservation perspective the proposed development is considered acceptable.

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) application processes for the proposed Karreebosch 132 kV overhead powerline and 33/132kV substation development between Matjiesfontein and Sutherland in the Northern and Western Cape Provinces. The proposed 132 kV powerline will be routed from the proposed onsite Karreebosch 33/132 kV substation (associated with the approved Karreebsoch WEF (EA Ref: 14/12/16/3/3/2/807/AM3) (2 alternatives proposed for the 33/132 kV substation) to the existing Bon Espirange substation, after which it will connect to the existing 400 kV Komsberg substation. Only one (1) overhead powerline route is technically feasible for the section of the proposed powerline directly preceding the existing Bon Esiprange Substation (Option 3) and for the section connecting the Bon Espirange substation to the Komsberg substation (Bon Espirange to Komsberg route), which is approximately 9.2 km in length. No alternatives can therefore be provided for these two sections of the powerline (Option 3 and Bon Espirange to Komsberg route). Six (6) powerline route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the proposed Karreebosch WEF onsite 33/132kV substation and Option 3 preceding the existing Bon Espirange Substation. Access/maintenance roads will be developed to construct the proposed development, which will predominantly make use of existing informal roads and grading of new informal roads (typical jeep track style roads).

The purpose of this report is to provide a description and assessment of the ecology of the watercourses associated with the proposed development 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 development 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 25th to the 28th of May 2021. The proposed development is located on the western (Option 1A, 1B, 1C and 2A) and eastern (Option 2B and 2C) slopes of a mountainous area known as Rooiberg. The proposed overhead powerline between the Bon Espirange and Komsberg Substations will be routed along the existing 132 kV Bonespirange/Komsberg1 Powerline. The watercourses to be traversed by the powerline development and those identified within the investigation area can best be described as headwater episodic[1] drainage lines (EDLs) without riparian vegetation which flow into larger ephemeral tributaries with riparian vegetation, which ultimately flow into the larger riverine systems located outside the investigation area. Although these EDLs cannot be classified as riparian resources in the traditional sense, due to the lack of saturated soil and riparian vegetation, they do still function as waterways, through episodic conveyance of water. However, based on the definition of a watercourse water flows regularly or intermittently within these EDLs, conveying water from the upgradient catchment area into the downgradient tributaries and eventually into the larger river systems. As such, they can be considered as watercourses due to their importance for hydrological functioning as they do function as waterways and therefore enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998).

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)
Episodic drainage lines associated with the Wilgebos, Tankwa and Meintjiesplaas River systems	B (Largely natural with few modifications)	Intermediate (1,4)	High	REC: Category B (Largely natural with few modifications)
Ephemeral tributaries with riparian vegetation associated with the Wilgebos, Tankwa and Meintjiesplaas River systems	B (Largely natural with few modifications)	Intermediate (1,5)	High	REC: Category B (Largely natural with few modifications)

The proposed powerline alternatives will cross several of the assessed watercourses, and the proposed substation Option 2 is located at least 20 m from the delineated extent of a watercourse. 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) (NEMA), as far as feasible, but will still be located within the Government Notice (GN) 509 of 2016 ZoR as it relates to the National Water Act, 1998 (Act No. 36 of 1998) (NWA). The GN509 ZoR was considered as the combined extent of the delineated edge of a watercourse and the modelled 1:100 year floodline of the watercourses, where applicable. For the smaller episodic drainage lines without riparian vegetation and for which the 1:100 year floodline has not been modelled, a 100 m ZoR in accordance with GN509 of the NWA was applied. The proposed access roads (new and existing) will traverse several watercourses. The risk significance

[1] "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).

of the proposed substation Option 1 was not considered as it is located outside the GN509 ZoR (i.e., located at least 100 m from the nearest watercourse).

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 assumes 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 development (with the implementation of mitigation measures).

	Impact and Aspect	Risk	Borderline LOW MODERATE Rating
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 soil, and access to the site, including grading of existing informal farm roads.	Low	NA
	• Installation of the support structures (further than 32 m but within the GN509 ZoR) and spanning of the proposed powerline; and • Construction of substation (Option 2 located at least 20 m from delineated extent of a watercourse): • 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	NA
Construction Phase	Construction of access roads and creation of new watercourse crossings, including site preparation within a watercourse. • Increased sedimentation of the watercourses, leading to smothering of vegetation associated in the watercourse; • Transportation of construction materials can result in disturbances to soil, and increased risk of sedimentation/erosion; and • Proliferation of alien and/or invasive vegetation as a result of disturbances • Possible spills / leaks from construction vehicles.	Moderate	55 (-7) L
	Upgrading of existing roads within watercourses, and those within close proximity (within 32 m): • Increased sedimentation of the watercourses, leading to smothering of vegetation associated in the watercourses; • Transportation of construction materials can result in disturbances to soil, and increased risk of sedimentation/erosion; and • Proliferation of alien and/or invasive vegetation as a result of disturbances. • Possible spills / leaks from construction vehicles.	Moderate	55 (-1) L
Operational Phase	Operation and maintenance of the proposed development: • 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	NA

No fatal flaws in terms of freshwater ecological aspects were identified. Should all the powerline support structures be located at least 32 m from (or as far as possible where feasible) the delineated extent of a watercourse and the recommended mitigation measures be implemented, it is the opinion of the freshwater specialist, the risk significance of the proposed development can be considered Low. Direct negative impacts associated with the creation of new access roads (albeit informal jeep track style roads) to service the powerline development are expected to occur to the watercourse drivers and receptors during the construction phase. Should the recommended mitigation measures be implemented with specific mention of installing appropriate culverts or subsurface drainage within new and existing road watercourse crossings, it is considered a positive long-term benefit for the maintenance and potential improvement of the hydrological functionality of the watercourses and associated downstream systems. Therefore, also assuming that the construction and grading of the proposed access roads will be

undertaken during the dry periods when no surface water is present within the watercourse and the recommended mitigation measures are applied, the risk significance can be reduced to Low (with manual adjustment).

Although transformers such as substations have a spill tray/bund factored into the design to catch any potential spills (of hazardous material), the risk of pollution due to any potential accidental leakage is higher for substation Option 2 considering its distance from the delineated watercourses (located at least 20 m of a watercourse), and is therefore, not preferred. If for any reason Substation Option 2 must be developed, it must be moved to be located outside the GN509 m ZoR (and at least 100 m from the delineated extent of a watercourse). Preference is thus given to Substation Option 1 considering its location at least 100 m from the nearest watercourse, and thus powerline route Option 1A/1B/1C and the access roads associated thereof. The access roads associated with these route options avoid the crossing of major rivers such as the Tankwa River. Water Use Authorisation by means of General Authorisation (GA) in terms of Section 21(c) and (i) water uses may 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 freshwater ecologist that the proposed powerline and substation development 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 practice are adhered to, the proposed 132kV powerline and a 33/132kV substation development associated with the Karreebosch WEF (preferably substation Option 1) are 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 development 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: 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, peat soil, etc).	Section 7
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
3.7	Additional environmental impacts expected from the proposed development.	Section 7
3.8	Any direct, indirect and cumulative impacts of the proposed development on site.	Section 7
3.9	The degree to which impacts, and risks can be mitigated.	Section 7
3.10	The degree to which impacts, and risks can be reversed.	Section 7, Appendix F – Table F1
3.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	Section 7
3.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.	Section 6
3.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).	Section 7
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 development and if the proposed development should receive approval or not.	Section 8
3.16	Any conditions to which this statement is subjected.	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 on soil, 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
Hydromorphic soil:	A soil 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 anaerobic soil).
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.
REL (Red Data listed) species:	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (END), 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 (Wette) 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
DFFE	Department of Forestry, Fisheries and the Environment
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) application processes for the proposed 132 kV overhead powerline and 33/132kV substation development between Matjiesfontein and Sutherland in the Northern and Western Cape provinces (Figures 1 and 2). The proposed 132 kV powerline will be routed from the proposed onsite Karreebosch 33/132 kV substation (associated with the approved Karreebsoch Wind Energy Facility (WEF) (EA Ref: 14/12/16/3/3/2/807/AM3) to the existing Bon Espirange substation, after which it will connect to the existing 400 kV Komsberg substation. Six (6) powerline route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the proposed Karreebosch WEF onsite 33/132kV substation and the powerline route to the existing Bon Espirange Substation (Figures 1 and 2). Two location alternative options have been provided for the 33/132kV onsite substation (substation alternatives: Option 1 and Option 2 (Figures 1 and 2). The proposed activity and associated alternatives are collectively referred to as the 'proposed development'. Please refer to Section 2 for the project description.

In order to identify all watercourses that may potentially be impacted by the proposed development, a 500 m "zone of investigation" was implemented around the proposed development, in accordance with Government Notice (GN) 509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) as amened (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 development – 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 development 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 was applied to determine the significance of the impacts associated with the proposed development and mitigatory measures were identified which aim to minimise the potential impacts.

This study further aims to provide detailed information to guide the proposed development 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 powerline from a watercourse management perspective.

1.2 *Structure of this report*

This report investigates the impact significance of the proposed development, 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 development as well as a brief summary of the proposed activities associated with the proposed development.

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 Western Cape Biodiversity Spatial Plan (2017), Critical Biodiversity Areas of the Northern Cape (2016) 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 development t according to "Department of Water Affairs and Forestry (DWAF)[2] (2008)[3]: 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 development in accordance with Government Notice 509 as it relates to activities as stipulated in Section 21(c) and (i) of the NWA;
- 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 development 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: Impact and Risk Assessment
Provides the outcomes from the DWS Risk Assessment Matrix which highlights all potential impacts and that may affect the surrounding watercourses. Management and mitigation measures are provided which should be implemented during the various proposed development activities (planning, construction and operational phases) in order to assist in minimising the impact on the receiving environment.

[2] 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.

[3] 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 risk assessment outcomes and legislative requirements.

1.3 *Assumptions and Limitations*

- The ground-truthing and verification of the delineated extent of the watercourses was confined to a single site visit undertaken from the 25th to the 28th of May 2021 of the proposed development. This is a report update following layout changes and addition of the proposed access roads. All watercourses identified within the investigation area were delineated in fulfilment of Government Notice 509 using various desktop methods with limited field verification including the use of topographic maps, historical and current digital satellite imagery and aerial photographs. The watercourses associated with the proposed roads were delineated using desktop methods only as the road layout was only available after the site assessment;
- 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. However, a 400m wide overhead powerline corridor (200m on either side of the centre line) has been assessed by the specialists for the purposes of the Basic Assessment (BA) and has been walked down by the specialists for approval to allow for micro siting of powerline support structure positions once the detailed design has been completed;
- Due to the landscape in some areas being rugged and very undeveloped, some reaches of the identified watercourses were inaccessible. Therefore, verification points for watercourses were located at points as close to the watercourse to be verified as possible and, where necessary the conditions at the exact point required were inferred or extrapolated;
- Due to the majority of the watercourses being ephemeral or episodic 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 development is located 35 km north of Matjiesfontein and extends across the Northern and Western Cape Provinces (Figures 1 and 2). The proposed 132 kV powerline will be routed from the proposed onsite Karreebosch 33/132kV substation (associated with the approved Karreebsoch WEF (EA Ref: 14/12/16/3/3/2/807/AM3) to the existing Bon Espirange substation, after which it will connect to the existing 400kV Komsberg substation.

Only one (1) powerline route is technically feasible for the section of the proposed powerline directly preceding the existing Bon Espirange Substation (Option 3) and for the section connecting the Bon Espirange substation to the Komsberg substation (Bon Espirange to Komsberg powerline), which is approximately 9.2 km in length. No alternatives can therefore be provided for these two sections of the proposed powerline (Option 3 and Bon Espirange to Komsberg powerline). Six (6) powerline route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the Karreebosch WEF onsite 33/132kV substation and Option 3 preceding the existing Bon Espirange Substation. A 400m wide powerline corridor (200m on either side of the centre line) (see Figure 3) has been assessed by the specialists for the purposes of the BA and has been walked down by the specialists for approval to allow for micro siting of tower positions once the detailed design has been completed.

Two alternative 33/132kV onsite substation locations at the Karreebosch WEF site (Substation Option 1 and Substation Option 2) are proposed and have been assessed as part of the BA, each with a 200m x 150m (3 ha) footprint. A 200m assessment area surrounding the proposed substation alternatives have been included as part of this assessment for micro siting, with a slight funnel leading into the existing Bon Espirange and Komsberg substations to allow for greater flexibility for micro siting for incoming proposed powerline may require an extension of the existing 400kV Komsberg substation, and therefore, the entire Komsberg substation property has been assessed as part of the BA

The proposed 132 kV powerline will be a 132kV twin tern double circuit overhead powerline. The powerline support structures will either be steel lattice or monopole structures (see Figure 4 for example). Support structure positions will only be available once the powerline detail design has been completed by the Eskom Design Review Team (DRT). It is anticipated that the support structures will be located on average 200 m to 250 m apart; however, longer spans may be needed due to terrain and watercourse crossings.

The proposed development will be accessed via roads forming part of the approved Karreebosch WEF. Existing roads will be used as much as possible, where feasible. However, additional access roads may be required to provide access to sections of the powerline route. New sections of access roads will deviate off existing roads, as needed to construct, operate and maintain the powerline. Access roads will be mostly two-track gravel roads (typical jeep track style roads) following beneath the 132 kV powerline. As such, provisional access roads (mostly existing informal roads and grading of new informal roads) have been included in this assessment until a finalised access road layout is available, which is mostly likely to follow the same route as the assessed provisional access roads (Figure 1).

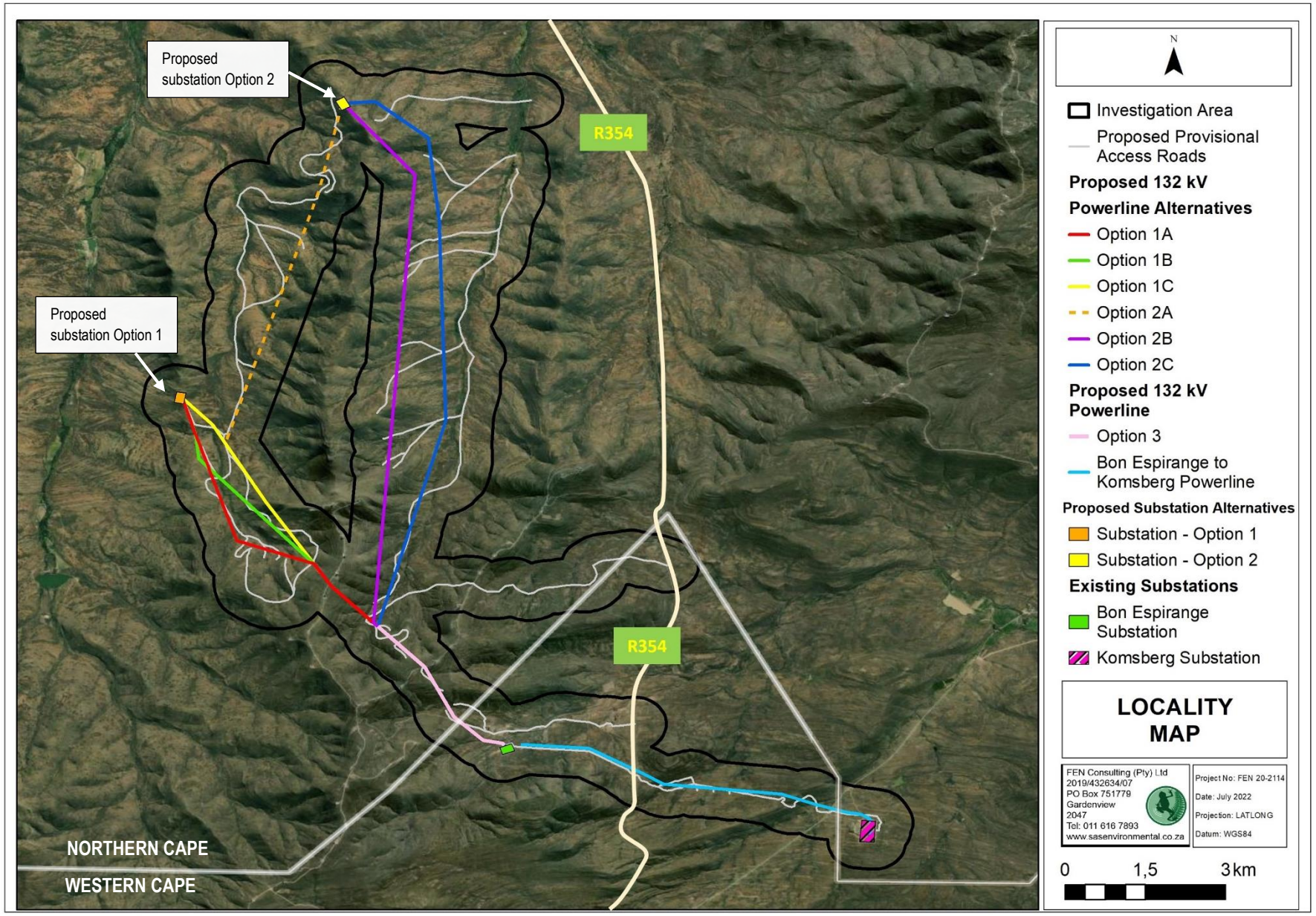

Figure 1: Digital satellite image depicting the proposed development and the investigation area in relation to its surroundings.

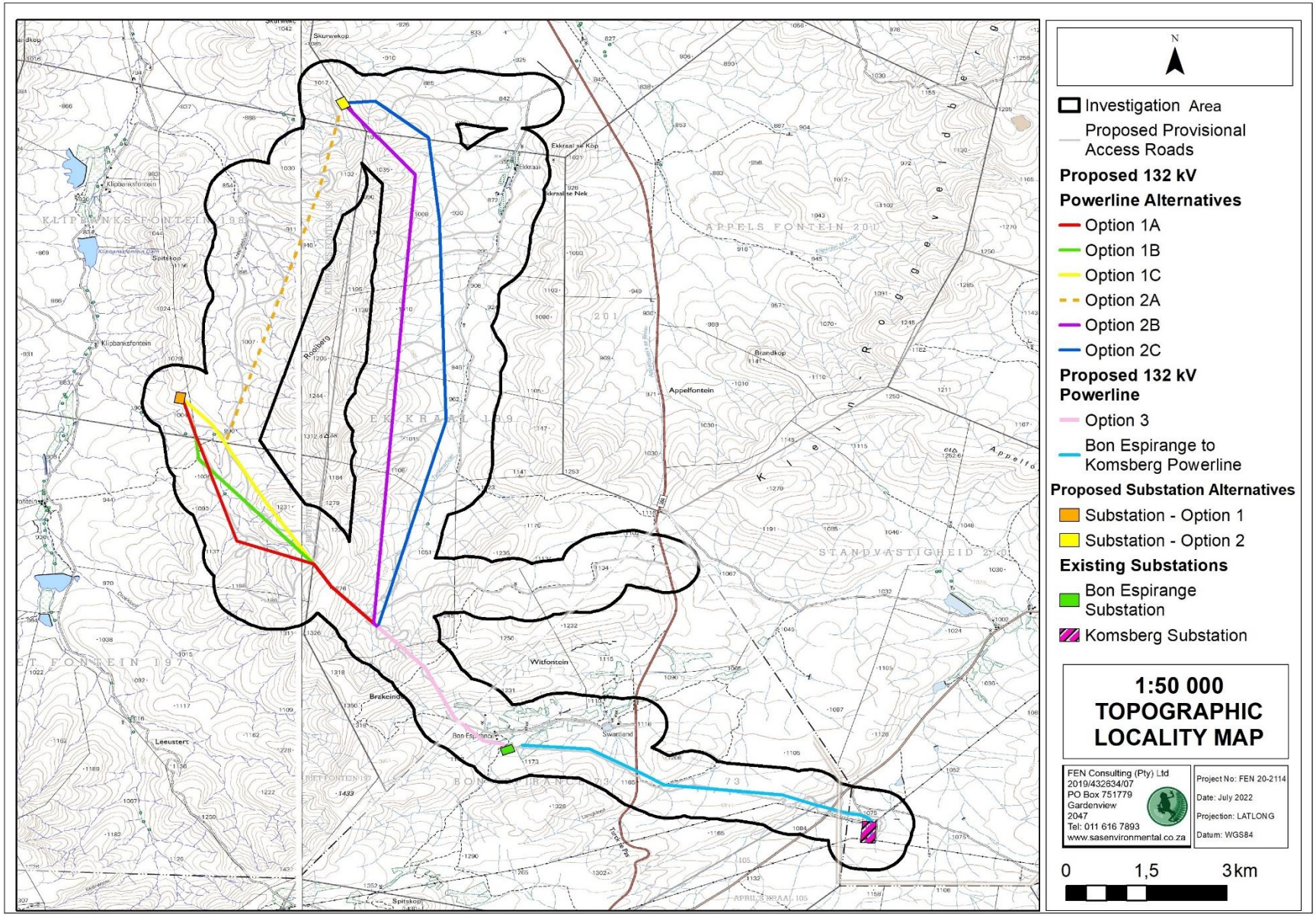

Figure 2: Location of the proposed development and the investigation area depicted on a 1:50 000 topographical map in relation to surrounding areas.

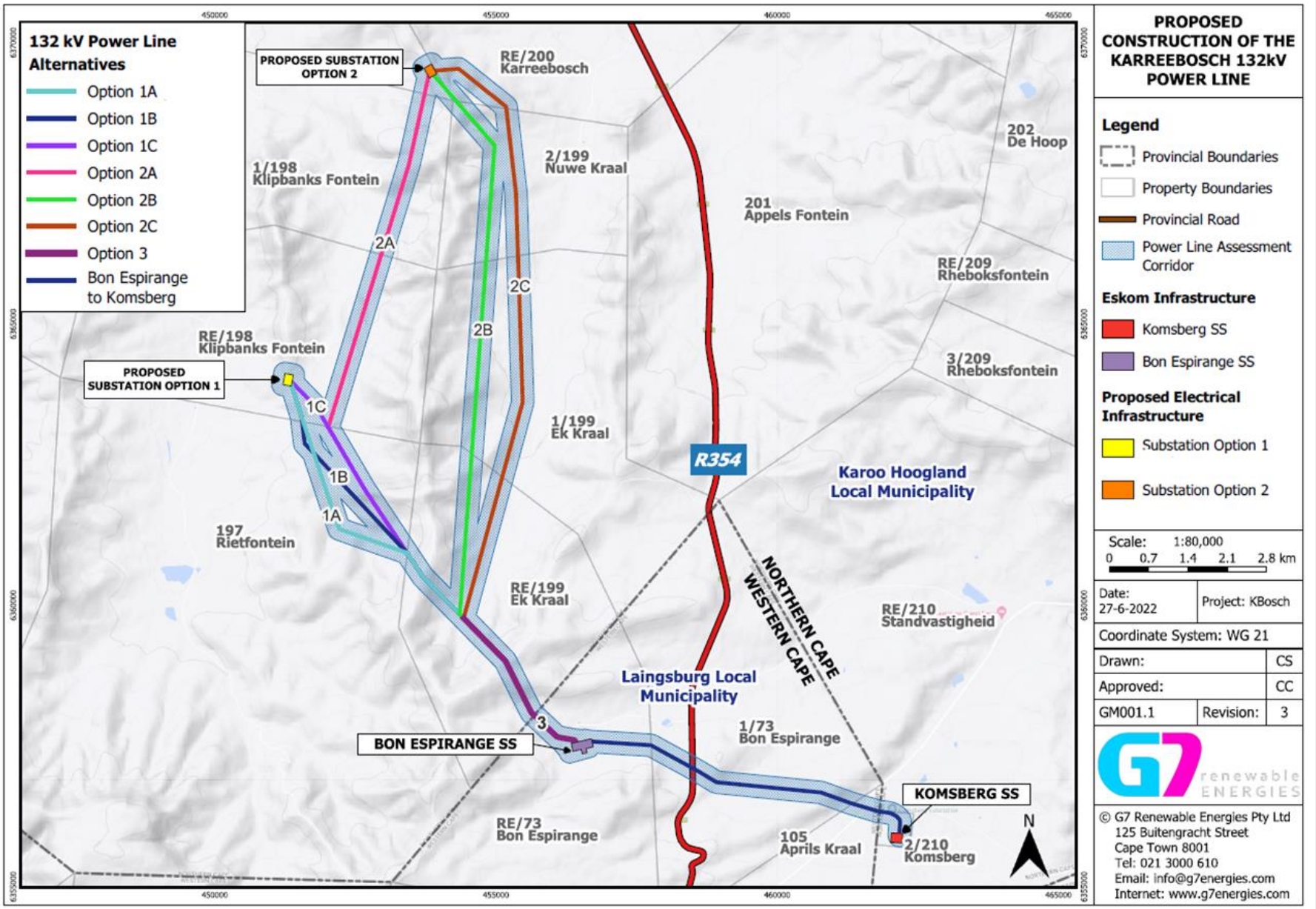

Figure 3: Layout of the proposed development as provided by G7 Renewable Energies (Pty) Ltd (2022).

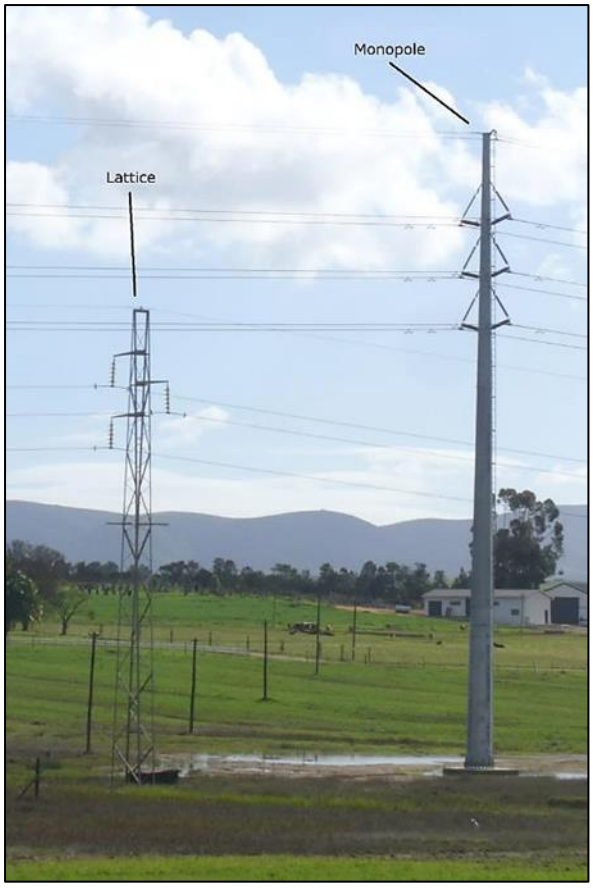

Figure 4: Conventional lattice powerline tower compared with a steel monopole structure

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 25th to 28th of May 2021 (early winter season[4]) 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 1.2 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.

3.2 *Sensitivity Mapping*

All watercourses associated with the proposed development 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 development.

3.3 *Risk and Impact Assessment and Recommendations*

Following the completion of the assessment, a risk assessment (DWS Risk Assessment) was conducted (please refer to **Appendix D** for the method of approach) and recommendations were developed to address and mitigate impacts associated with the proposed development. 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] 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. Thus, the site conditions at the time of the field assessment are considered optimal as rainfall had occurred in the local area prior to the site assessment undertaken end of May 2021.

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 1). 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 development 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 development 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	Great Karoo	FEPACODE	The central to northern portions of the investigation area is located in a sub-quaternary catchment classified as an upstream management catchment which is required to be managed to prevent downstream degradation of Freshwater Ecosystem Priority Areas (FEPAs) and fish support areas (FEPA CODE = UPSTREAM). The southern extent of the investigation area is located in an area not considered of to be a freshwater ecosystem priority protection area.
Catchment	Olifants – Cape and Gourits		
Quaternary Catchment	E23A and J11D		
WMA	Olifants/Doorn and Gouritz		
subWMA	Doring and Groot		
Dominant characteristics of the Great Karoo Ecoregion Level II (21.03) (Kleynhans *et al*., 2007)			
Level II Code	21.03		
Dominant primary terrain morphology	Low Mountains, Parallel Hills and Lowlands, Mountains and Lowlands.	NFEPA Wetlands (Figure 5)	According to the NFEPA database (2011), only two natural wetlands are located in the southern portion of the investigation area. None of these features will be directly traversed by the proposed development. These wetlands are classified as a seep and a channelled valley bottom wetland and considered to be in a moderately modified ((WETCON = C) and natural or good (WETCON = AB) ecological condition respectively.
Dominant primary vegetation types	Great Nama Karoo, Escarpment Mountains Renosterveld, Upland Succulent Karoo, Upper Nama Karoo		
Altitude (m a.m.s.l)	500 – 1700	Wetland Vegetation Type (Figure 6)	The southern portion of the investigation area is located in the Karoo Shale Renosterveld Wetland Vegetation type (least threatened) and the northern portion in the Rainshadow Valley Karoo (Skv) Wetland Vegetation type (critically endangered). The threat status of each wetland vegetation type is provided by Mbona *et al.* (2015), which may differ to the threat status provided by the National Vegetation Map (2018) for non-wetland vegetation types.
MAP (mm)	100 – 300		
The coefficient of Variation (% of MAP)	30 – 40		
Rainfall concentration index	30 – 55		
Rainfall seasonality	Very late summer, Winter	NFEPA Rivers (Figure 5)	As per the NFEPA database (2011), the headwaters of the Tankwa River and an unnamed tributary of the Meintjiesplaas River system are located in the investigation area. The Tankwa River is considered to be in a moderately modified ecological condition (RIVCON = C) according to the NFEPA database (2011) and the PES 1999 dataset, while unnamed tributary of the Meintjiesplaas River system is considered to be largely natural with only a few modifications (RIVCON = AB) but considered to be in a moderately modified (Class C) ecological condition by the PES 1999 dataset.
Mean annual temp. (°C)	14 – 18		
Winter temperature (July)	0 – 18		
Summer temperature (Feb)	10 – 30		
Median annual simulated runoff (mm)	<5 - 20		
Importance of the investigation area according to the Western Cape Biodiversity Spatial Plan (2017) (Figure 7)			
According to the Western Cape Biodiversity Spatial Plan (2017), the southern portion of the investigation is routed through an area classified as Critical Biodiversity Areas (CBA) 1, of terrestrial ecological importance. CBAs are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure, in this case specifically for riverine environments. CBA 1 are areas likely to be in a natural condition. The southern portion of the proposed development will traverse small areas considered to be Ecological Support Areas (ESAs) 2 (of aquatic importance). ESAs are important in supporting the functioning of CBAs and are often vital for delivering ecosystem services. ESA 1 are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.			
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 development footprint to avoid sensitive areas.		The majority of the investigation area is located within areas considered of low aquatic biodiversity sensitivity. However, the Tankwa River associated with the southern portion of the investigation area is considered to be of very high aquatic biodiversity importance. Similarly, it is considered of biodiversity importance as per the WCBSP (2017) and NCCBA (2016) datasets.	

Importance of the investigation area according to the Critical Biodiversity Areas of the Northern Cape (CNANC) (2016) (Figure 7)
According to the Critical Biodiversity Areas of the Northern Cape (2016), the investigation area is located within several areas classified as Critical Biodiversity Areas (CBAs) 1 and 2, Ecological Support Areas (ESAs) and Other Natural Areas (ONAs). CBAs are areas that must remain in good ecological condition in order to meet biodiversity targets for ecosystem types, species of special concern or ecological processes. CBA 1 areas that are considered to be irreplaceable or near irreplaceable for meeting biodiversity targets. CBA 2 areas are areas that have been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency, connectivity and/or avoidance of conflict with other land or resources uses. Powerline Option 1A and 1B will be routed through areas classified as ESAs. ESAs are areas that are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning in CBAs. Powerline Option 1A and 1B will be routed through areas classified as ONAs. ONAs are areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem. It is acknowledged that the terrestrial ecologist for the proposed project (Malcolme Logie of Trusted Partners) concluded that the proposed development will not significantly undermine the ecological functioning of the designated CBA and ESA areas. The Namakwa Bioregional Plan for the Northern Cape (2010) (Namakwa District Critical Biodiversity Areas (CBA) Map) does not show the investigation area as important in terms of aquatic CBAs but of only terrestrial CBA importance and was thus not included in the results of this desktop assessment.
National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (National Wetland Map 5 is included in the NBA) (Figure 8)
According to the NBA 2018: SAIIAE the headwaters of the Tankwa River and an unnamed tributary of the Meintjiesplaas River system are located within the investigation area; this corresponds with the rivers identified by the NFEPA Database. These rivers are considered to be in a moderately modified ecological condition (Class C). The Ecosystem Threat Status (ETS) of the rivers are least threatened, and the ecosystem protection level (EPL) thereof is poorly protected. A natural seep and channelled valley wetland are located in the southern portion of the investigation area (corresponding to the two natural wetland identified by the NFEPA database). Both these wetlands are considered to be in a heavily to severely/critically modified ecological condition (WETCON = D/E/F). The ETS of the seep wetland is of least concern but is considered to be critical for the channelled valley bottom wetland. The EPL of both these wetlands are not protected.

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.

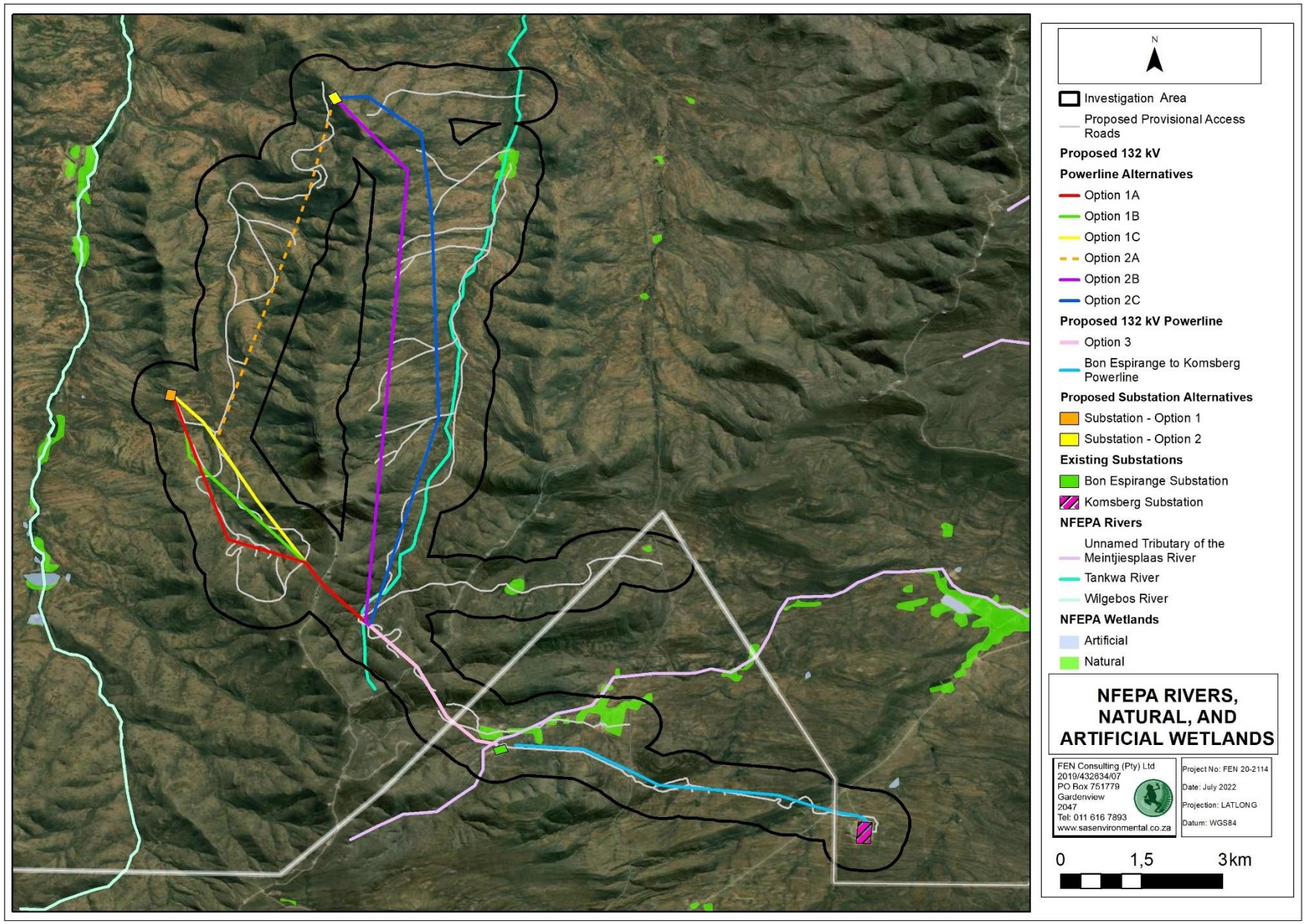

Figure 5: Natural and artificial wetlands associated with the proposed development and investigation area, according to the NFEPA database (2011).

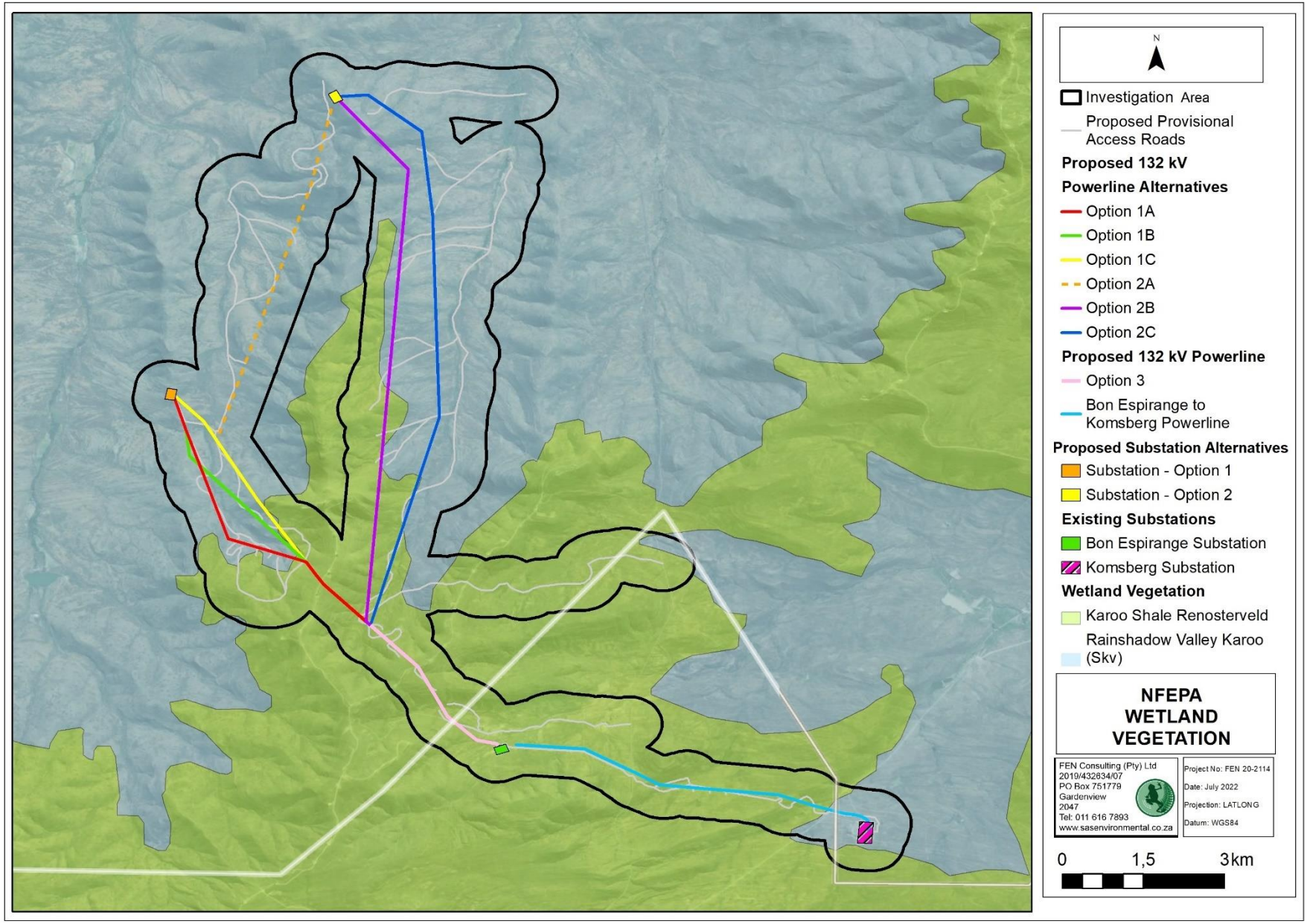

Figure 6: Wetland vegetation types associated with the proposed development and investigation area, according to the NFEPA database (2011).

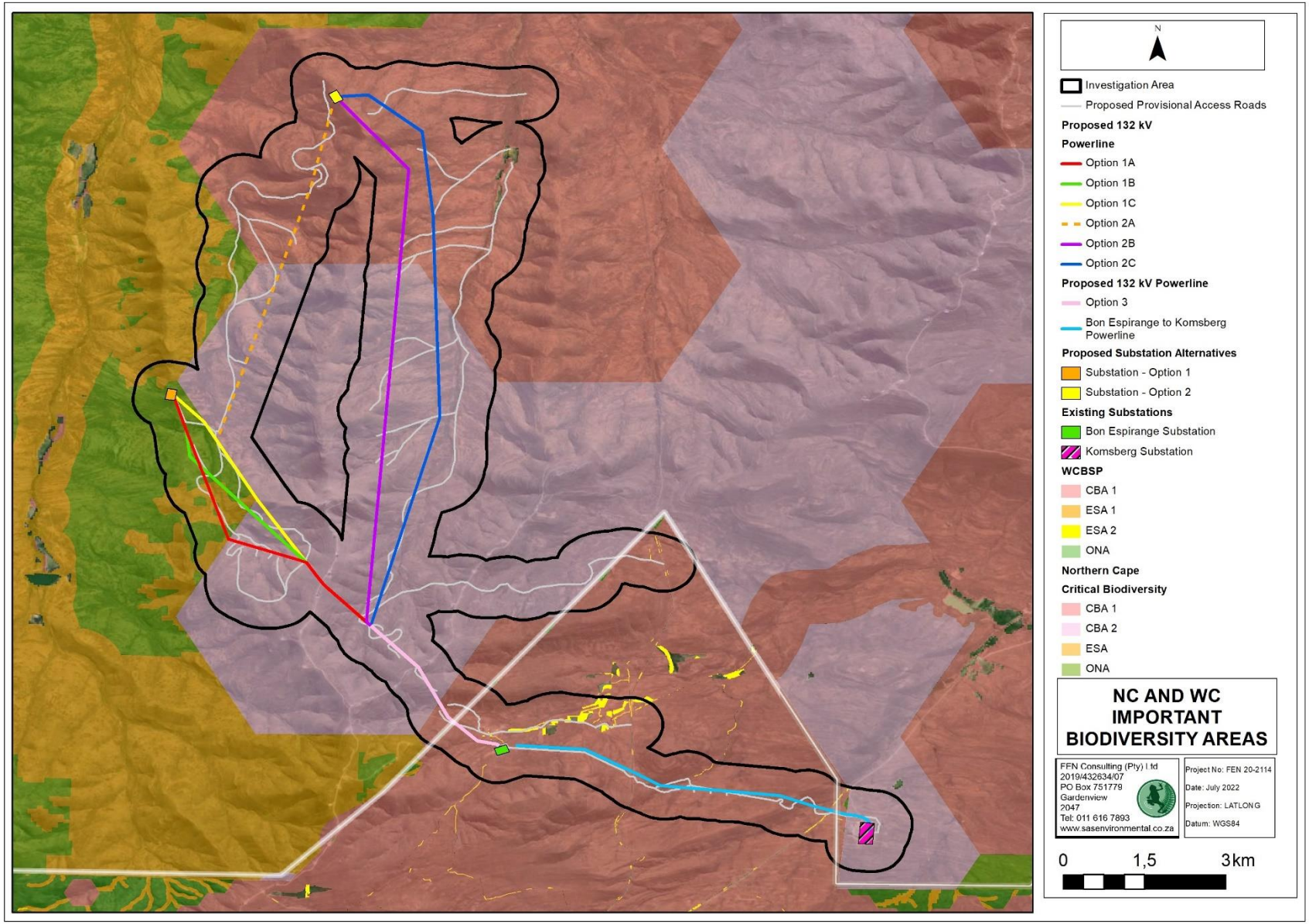

Figure 7: The areas of biodiversity importance associated with the proposed development and investigation area, according to the Western Cape Biodiversity Spatial Plan (2017) and the Critical Biodiversity Areas of the Northern Cape (2016) (CBANC) database.

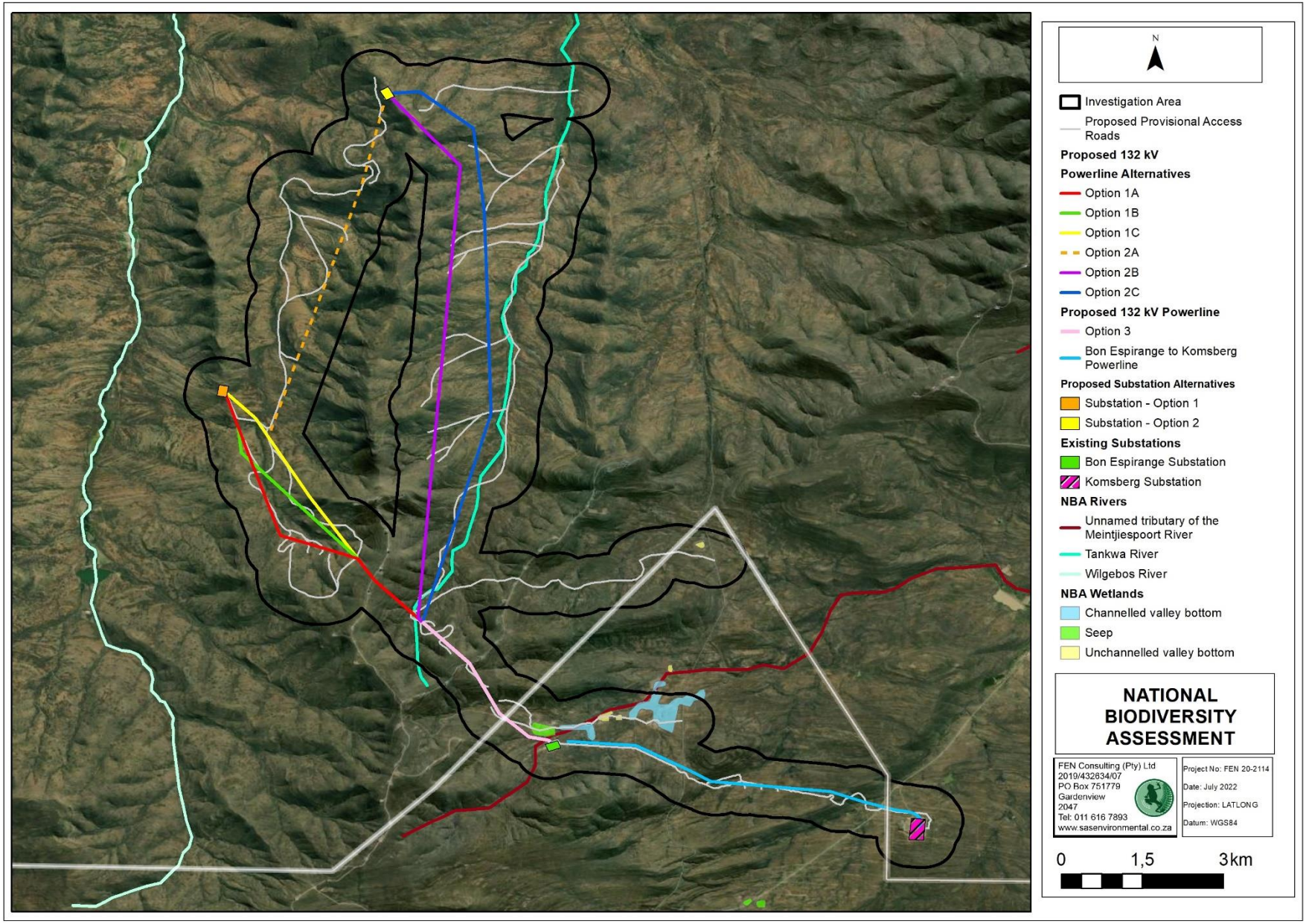

Figure 8: NBA identified wetlands and rivers associated with the proposed development and investigation area, according to the NBA database (2018).

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 E23A-07860 (Tankwa River) and E23A-07875 (Wilgebos River) as contained in this database and pertaining to the PES and EIS are tabulated in Tables 2 and 3 and visually represented in Figure 9 that follows.

Table 2: Invertebrates previously collected from or expected at the SQR monitoring points.

Macro-Invertebrates	E23A-07860 (Tankwa River)	E23A-07875 (Wilgebos River)
Aeshnidae	X	X
Ancylidae	X	X
Baetidae 1 Sp	X	X
Belostomatidae	X	X
Ceratopogonidae	X	X
Caenidae	X	X
Chironomidae	X	X
Coenagrionidae	X	X
Corduliidae	X	X
Corixidae	X	X
Culicidae	X	X
Dytiscidae	X	X
Gerridae	X	X
Gyrinidae	X	X
Hydracarina	X	X
Lestidae	X	X
Libellulidae	X	X
Lymnaeidae	X	X
Muscidae	X	X
Notonectidae	X	X
Oligochaeta	X	X
Physidae		X
Pleidae	X	X
Simuliidae	X	X
Veliidae/Mesoveliidae	X	X

Table 3: Summary of the ecological status of the sub-quaternary catchment (SQ) reaches associated with the proposed development based on the DWS RQS PES/EIS database.

	E23A-07860 (Tankwa River)	E23A-07875 (Wilgebos River)
Synopsis		
PES Category Median	Natural/Close to natural	Natural/Close to natural
Mean EI class	High	High
Mean ES class	High	High
Length	32,4	31,84
Stream order	1	1
Default EC[4]	B (High)	B (High)
PES Details		
Instream habitat continuity MOD	None	None
RIP/wetland zone continuity MOD	Small	Small
Potential instream habitat MOD activities	None	None
Riparian/wetland zone MOD	None	None
Potential flow MOD activities	Small	Small
Potential physico-chemical MOD activities	None	None
EI Details		
Fish spp/SQ	-	-
Fish average confidence	-	-
Fish representivity per secondary class	-	-
Fish rarity per secondary class	-	-
Invertebrate taxa/SQ	25	25
Invertebrate average confidence	3	3
Invertebrate representivity per secondary class	Moderate	Moderate
Invertebrate rarity per secondary class	High	High
EI importance: riparian-wetland-instream vertebrates (excluding fish) rating	Very Low	Very Low
Habitat diversity class	Low	Low
Habitat size (length) class	Moderate	Moderate
Instream migration link class	Very High	Very High
Riparian-wetland zone migration link	Very High	Very High
Riparian-wetland zone habitat integrity class	Very High	Very High
Instream habitat integrity class	Very High	Very High
Riparian-wetland natural vegetation rating based on percentage natural vegetation in 500m	Very High	Very High
Riparian-wetland natural vegetation rating based on expert rating	Very High	Very High
ES Details		
Fish physical-chemical sensitivity description	-	-
Fish no-flow sensitivity	-	-
Invertebrates physical-chemical sensitivity description	Moderate	Moderate
Invertebrates velocity sensitivity	High	High
Riparian-wetland-instream vertebrates (excluding fish) intolerance water level/flow changes description	High	Very High
Stream size sensitivity to modified flow/water level changes description	High	High
Riparian-wetland vegetation intolerance to water level changes description	Very High	Very High

[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.

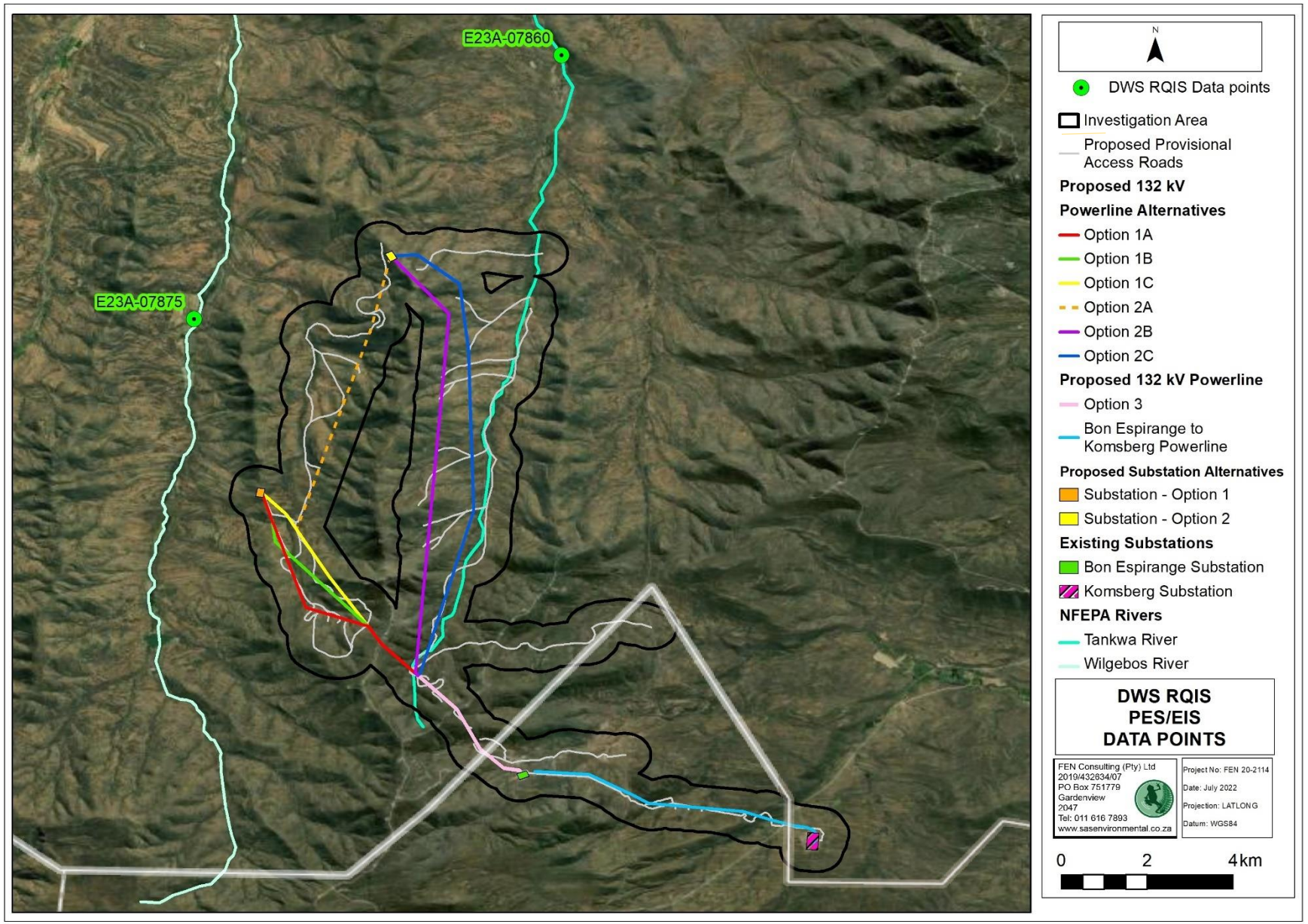

Figure 9: DWS RQIS PES/EIS sub-quaternary catchment reaches (SQRs) indicated relative to the proposed development and investigation area.

5 RESULTS OF SCREENING TOOL ASSESSMENT

On 20 March 2020, the Minister gazetted a set of protocols for the assessment and minimum report content requirements of environmental impacts for various environmental themes. The assessment requirements of these protocols are associated with a level of environmental sensitivity determined by the screening tool5. The relevant faunal and floral biodiversity data is stated in the screening tool and has been provided by the South African National Biodiversity Institute (SANBI).

The main purpose of the screening tool is to ensure that the sensitivity of the site is sufficiently considered and determine the baseline conditions of the proposed OHPL route. The information provided in this report aims to enable the Competent Authority to come to a sound conclusion on the potential impacts of the proposed development to the aquatic resources of the region. To meet this objective, site sensitivity verification must be conducted of which the results must meet the following objectives:

- It must confirm or dispute the current land use and the environmental sensitivity as was indicated by the National Environmental Screening Tool;
- It must contain proof (e.g., photographs) of the sensitivity pertaining to the OHPL route;
- All data and conclusions are submitted together with the main report to report on the site sensitivity and potential impacts;

As part of the process of initiating the EIA process, the screening tool was applied to the proposed Karreebosch OHPL. A site verification visit (25 to the 28 May 2021) was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tools. According to the output report of the screening tool, the majority of the proposed OHPL, and in particular the northern portion of the OHPL Route is located within a low sensitivity area for the aquatic theme. The southern portions of the OHPL route options are located in an area of high Aquatic ecosystem sensitivity.

The reason for the high sensitivity is the presence of a quinary catchment of high aquatic ecological importance and Sensitivity. the Meintjiesplaas River system is considered largely natural with only a few modifications (RIVCON = AB). The watercourses in the vicinity of the proposed OHPL routes are all considered river systems with the larger more developed systems having riparian characteristics. No wetlands were identified to be traversed by the proposed overhead powerline, nor were any identified within the investigation area. Only Ephemeral Drainage Lines (EDLs) and non perennial tributaries of the Meintjiesplaas River are crossed and as such the risk to the quinary catchment from this low risk activity is limited. Also notable is that there is no aquatic sensitivity associated with the substation.

[5] The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the environmental authorisation process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas. The different sensitivity ratings pertaining to the plant [and animal] protocols are described below:

- Very high: habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km^2 are considered critical habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under critically endangered (CR), endangered (EN), or vulnerable (VU) criteria of the IUCN or species listed as critically/ extremely rare under South Africa's national red list criteria. For each species reliant on a critical habitat, all remaining suitable habitat has been manually mapped at a fine scale;
- High: recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level;
- Medium: model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level; and
- Low: areas where no SCC are known or expected to occur.

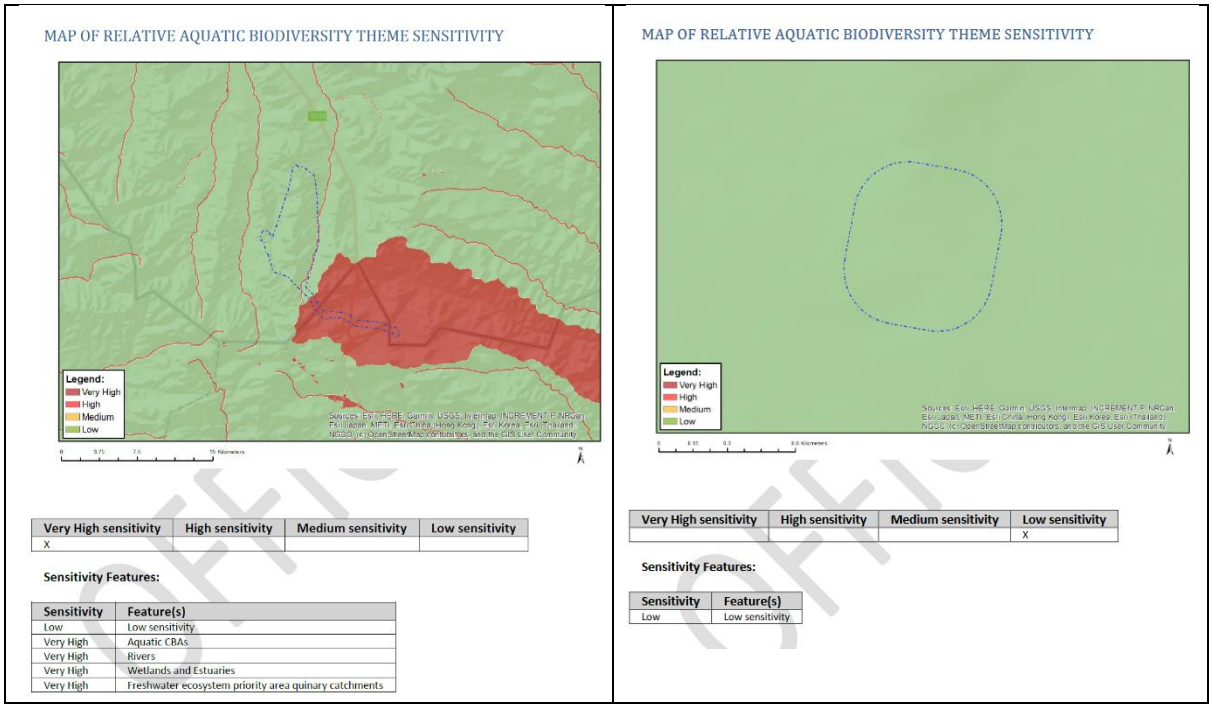

Figure 10 Aquatic theme sensitivity according to the DFFE screening tool.

Therefore it is confirmed that the quinary catchment of the Meintjiesplaas river is of relatively high ecological importance and sensitivity for the region but due to the low risk nature of the development which occurs in tributaries of the EDLs and non perennial tributaries of this system, the risk posed to the receiving environment is limited. There is very little risk to the mainstem of this quinary catchment. The support towers of the OHPL can be developed outside of the floodline and 32m buffer of all watercourses. Despite the low risk, due to the nature of the development and to ensure sufficient information is available to inform the Basic Assessment Report (BAR) and the Water Use Authorisation, a detailed report was nevertheless developed following the application of the screening tool. The results of this assessment follow in the sections below.

6 RESULTS: WATERCOURSE ASSESSMENT

6.1 *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 development 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: with 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 25th to 28th of May 2021. The proposed development is located on the western (Options 1A, 1B, 1C and 2A) and eastern (Options 2B and 2C) slopes of a mountainous area known as Rooiberg. The remainder of the proposed powerline (Option 3 and Bon Espirange to Komsberg powerline) will be routed to the south east of the Rooiberg mountainous area. As such, watercourses associated with the Tankwa River system, Wilgebos River system and Meintjiesplaas River system are traversed by the proposed development. These watercourses are all considered riparian systems. No wetlands were identified to be traversed by the proposed overhead powerline, nor were any identified within the investigation area.

The watercourses to be traversed by the powerline development and those identified within the investigation area can best be described as headwater episodic[6] drainage lines (EDLs) without riparian vegetation. These systems flow into larger ephemeral tributaries with riparian vegetation, which ultimately flow into the larger riverine systems located outside of the investigation area. Although these EDLs cannot be classified as riparian resources in the traditional sense, due to the lack of saturated soil and riparian vegetation, they do still function as waterways, 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 tributaries and eventually into the larger river systems. As such, they can be considered as watercourses due to their importance for hydrological functioning as they do function as waterways and therefore enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998).

The delineated extent of the identified watercourses associated with the proposed development is presented in Figures 10 to 13.

[6] "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).

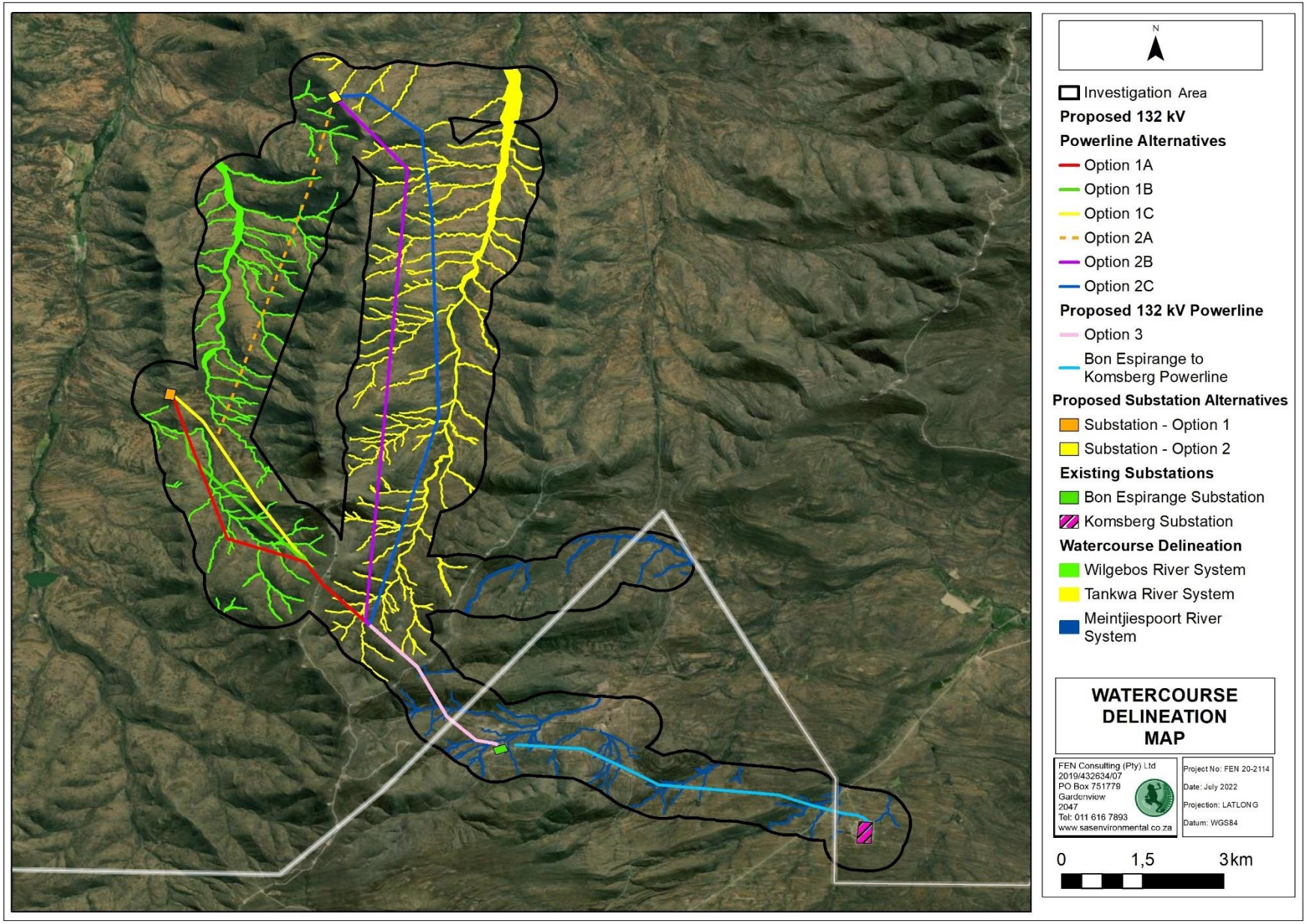

Figure 11: The locality of the delineated watercourses associated with the proposed development.

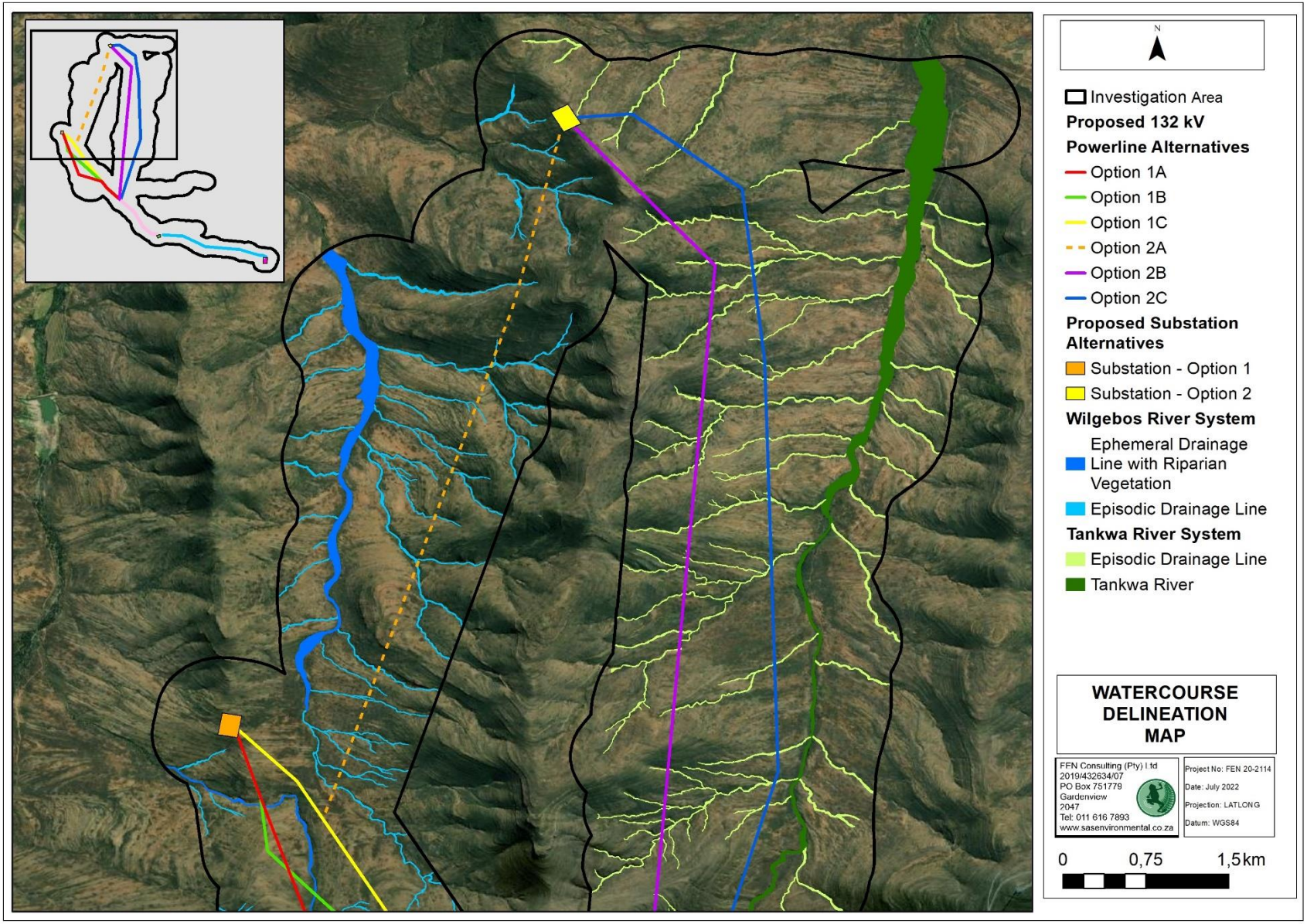

Figure 12: The locality of the delineated watercourses of the Wilgebos and Tankwa River system associated with the northern portion of the investigation area. (Take note due to the scale of the map: Substation Option 2 is located approximately 20m from the delineated extent of an episodic drainage line).

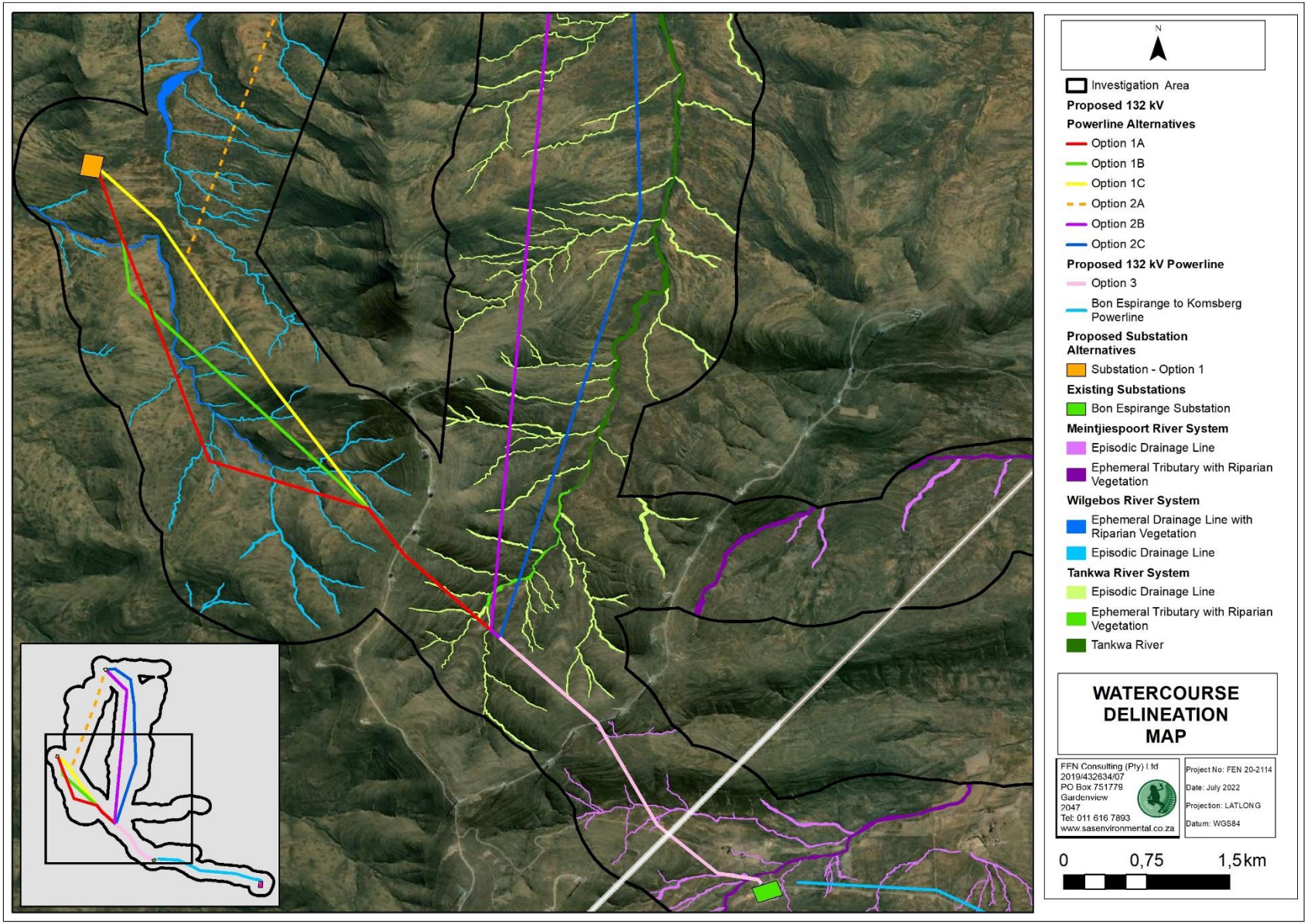

Figure 13: The locality of the delineated watercourses of the Wilgebos, Tankwa and Meintjiesplaas River system associated with the central portion of the investigation area.

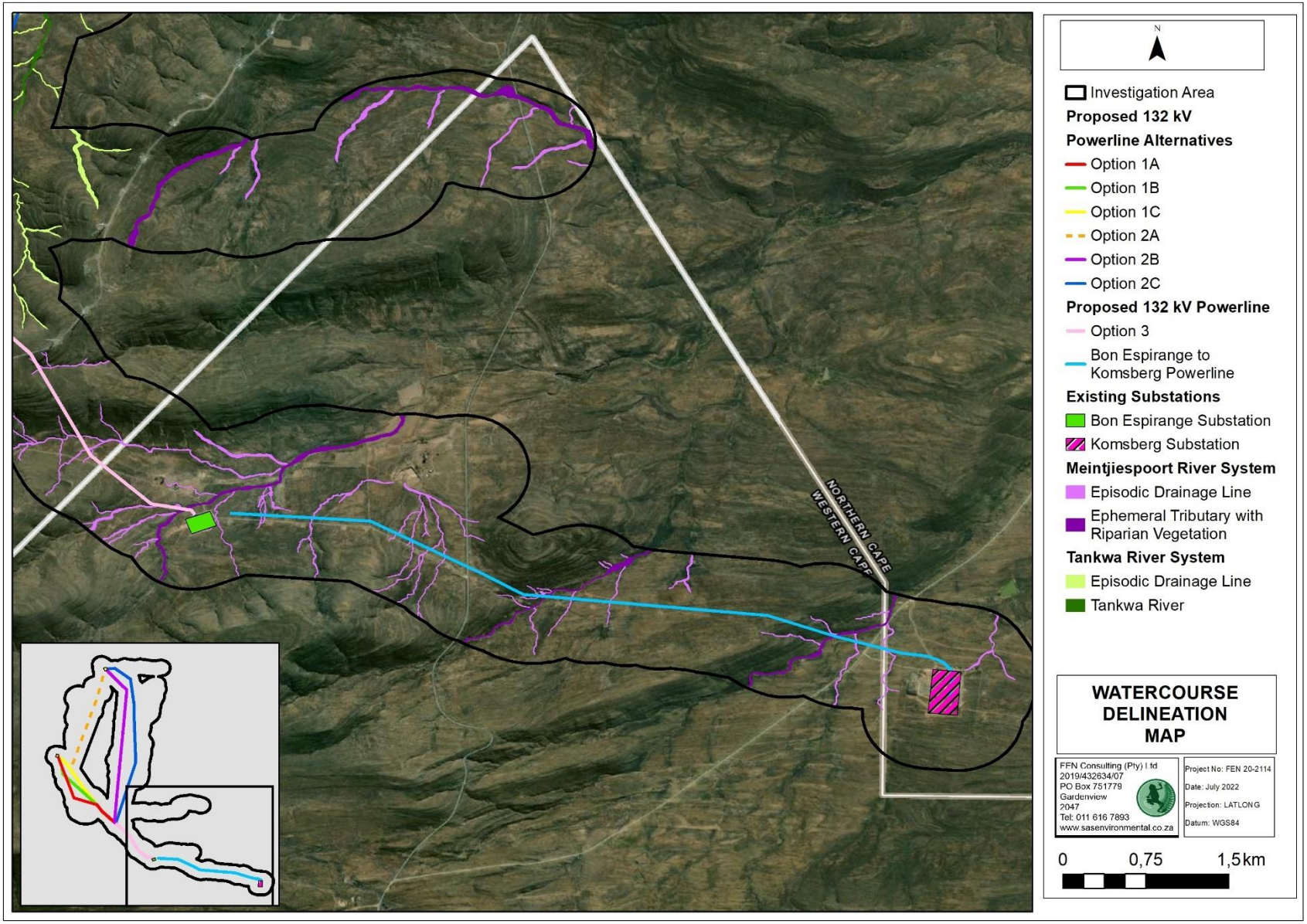

Figure 14: The locality of the delineated watercourses of the Tankwa and Meintjiesplaas River system associated with the southern portion of the investigation area.

6.2 *Watercourse delineation*

The outer boundary of the identified watercourses was delineated according to the guidelines advocated by DWAF (2008) taking into consideration soil characteristics as defined by Job (2009). 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 development 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 rivers of the identified drainage systems are all located in the valley bottom position (Figure 14). Most other watercourses (like the smaller episodic drainage lines) are also located in valleys between undulating hills within the upslope that slopes towards the larger downstream system where concentration of flow leads to drainage towards the larger tributaries.

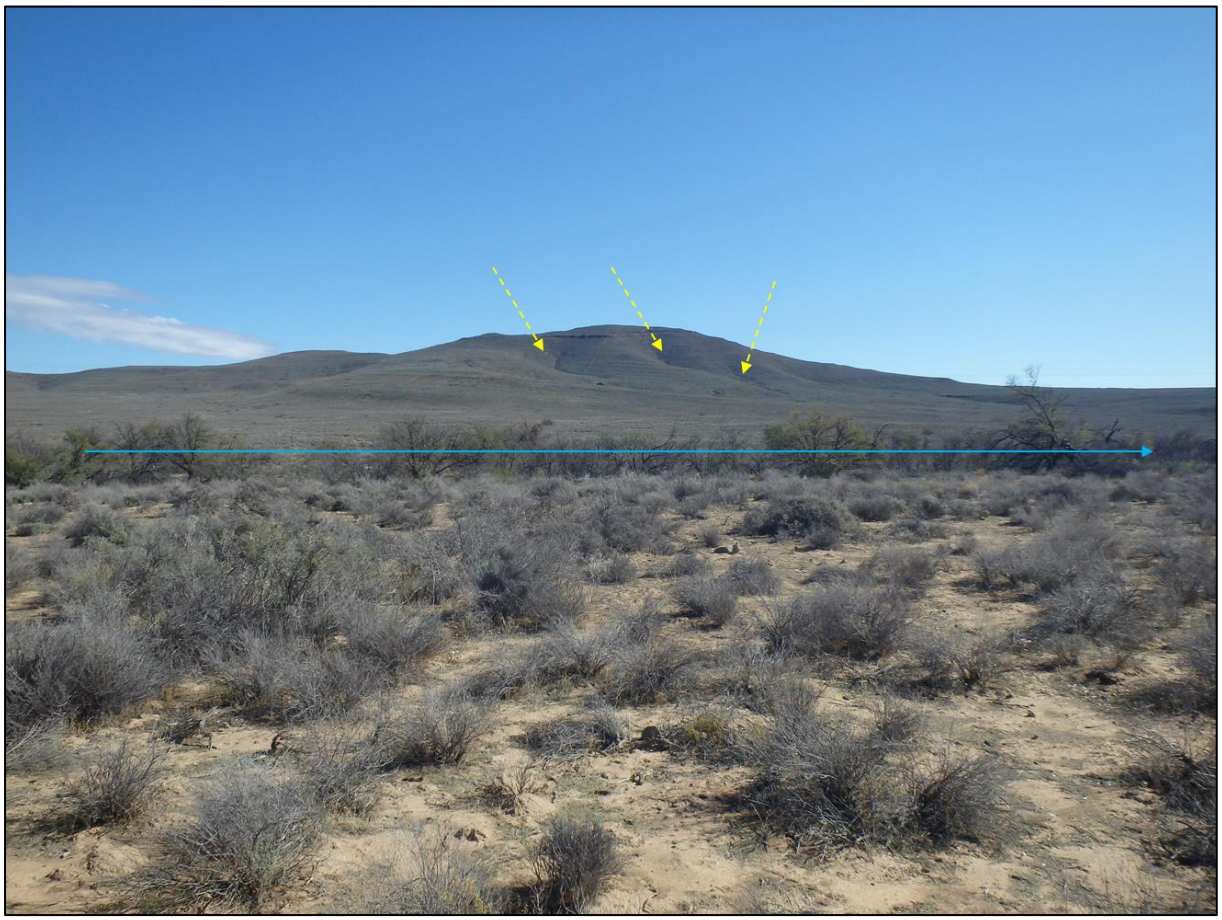

Figure 15: A photograph depicting the topographical setting of the smaller episodic drainage lines in the higher slope position (yellow dashed arrows) relative to the larger ephemeral tributaries or river in the valley bottom position (blue line).

- **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 downstream ephemeral rivers and tributaries was a change in riparian vegetation identified from that of the surrounding terrestrial vegetation (Figure 15), where a mix of low tree and shrub species such as *Vahellia karroo* and *Searsia lancea* were observed. Trees and shrubs are less prominent along the rocky episodic drainage lines located in the upper reaches of the drainage systems (Figure 15). Patches of *Phragmites australis* reeds, grasses such as *Stipagrostis namaquensis* with *Juncus spp* rushes were also identified in isolated patches within the ephemeral tributaries located in the valley bottom position, specifically where anthropogenic impacts have occurred, such as the construction of instream artificial impoundments.

Figure 16: Photographs depicting the vegetation component of the watercourses associated with the proposed development. (Left) the lower reaches of the ephemeral tributaries host tree species in its marginal zones, which can be easily distinguished from the surrounding terrestrial vegetation. (Right) the vegetation of the smaller episodic drainage line type watercourses is similar to that of the surrounding terrestrial areas.

- ***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 16). 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 17: (Left) a shallow layer of alluvial soil is present in the active channel of this ephemeral tributary. (Right) the upper reaches of the tributaries and smaller episodic drainage lines have exposed bedrock, and only present with small, isolated areas where alluvial soil is deposited.

6.3 *Watercourse classification and assessment*

The watercourses listed in Table 4 above were classified according to the Classification System outlined in **Appendix C** of this report as Inland Systems, located within the Great Karoo Ecoregion. Table 4 below presents the classification from level 3 to 4 of the Wetland Classification System (Ollis *et al.* 2013).

Table 4: Classification of the watercourses associated with the proposed development.

Watercourse	Level 3: Landscape Unit	Level 4: Hydrogeomorphic (HGM) Type
Ephemeral tributaries with riparian vegetation	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 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.	

Table 5 and 6 provides a summary of the ecological assessment of the watercourses in terms of relevant aspects (hydrology, geomorphology and vegetation components) associated with the watercourses. Due to the similar watercourse characteristics of the watercourses and each of these watercourse types having been subjected to the same anthropogenic impacts, the ecoservice provision, hydrological regime, geomorphological characteristics, water quality and habitat of these watercourses were assessed in a combined fashion. The details pertaining to the methodology used to assess the watercourses is contained in **Appendix C**.

Table 5: Summary of results of the assessment of the episodic drainage lines (EDLs) associated with the Wilgebos, Tankwa and Meintjieplaas River systems proposed to be traversed by the proposed development.

Watercourse characteristics overview:
EDLs arise from the Rooiberg mountainous area located between the Wilgebos and Tankwa River systems, with the EDLs of the Meintjiesplaas River system rising from the southern extent of this mountainous area. The identified EDLs are considered part of the headwaters of these larger river systems, as they are located in the landscape where runoff flows as surface water over impermeable bedrock at the point of outcropping. Road crossings and small instream impoundments within the EDLs have resulted in small changes to existing flow patterns. However, overall, changes to the hydrological functioning of the EDLs are not pronounced and allow for uninterrupted hydrological functionality of the downstream systems. The vegetation associated with the EDLs are predominantly short growing shrubs, but no facultative wetland vegetation species were identified within these EDLs. The vegetation cover within the immediate vicinity of the EDLs (along its active channel) remains fairly intact and indicative of the natural species composition expected of the vegetation type, however some invasive species were present in areas where disturbance has occurred (i.e., road crossings). Some erosion of the downstream reaches of the EDLs just below the instream impoundments and at road crossings were noted, however, it is not considered significant. Despite erosion noted within isolated areas of the EDLs, no significant deposition of sediment was observed.
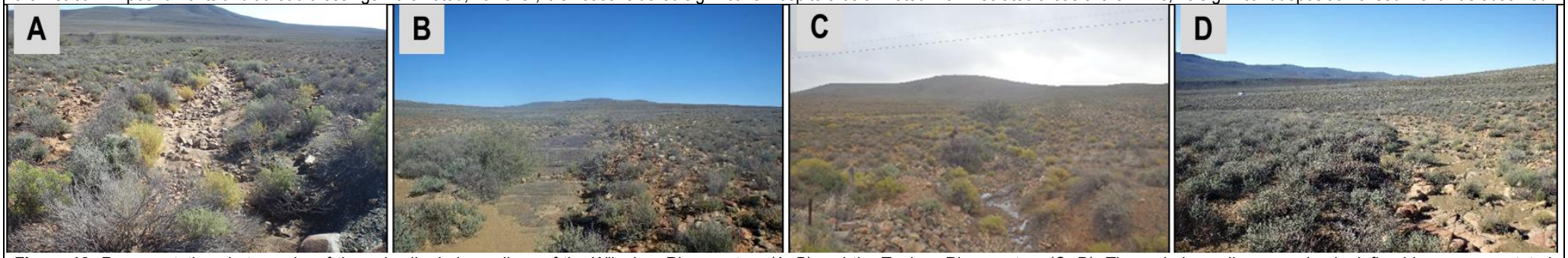
Figure 18: Representative photographs of the episodic drainage lines of the Wilgebos River system (A, B) and the Tankwa River system (C, D). These drainage lines are clearly defined by an unvegetated channel of exposed bedrock. No significant change between the vegetation associated with the edge of the drainage line channel to that of the surrounding terrestrial area is evident.

Assessment of the EDLs of the Wilgebos River System	**IHI Outcome**	**IHI Riparian PES Category: B (Largely natural with few modifications)** Due to the position of the EDLs in the landscape, they are considered largely intact, with limited change to the cover, abundance and species composition of the EDLs. Informal road crossings were determined to be an anthropogenic impacting factor.	**EIS Discussion**	**High** The EDLs are considered of ecological importance on a landscape scale, primarily due to the wetland vegetation type associated with the investigation area (according to NFEPA, 2011) which is considered to be critically endangered according to Mbona *et al.* (2015) and almost the entire extent of the investigation area is located within a CBA 1/2 as per the CBANC (2016) database[7]. Even though modifications to these EDLs have occurred, they still provide habitat to a variety of biota, given the high degree of connectivity of these features with the surrounding landscape.
	Ecoservice provision	**Ecoservice Provisioning: 1,4 (Intermediate)** Important for providing habitat (functions as migratory corridors) and erosion control, with intermediate nutrient and toxicant assimilation.	**REC Category, BAS and RMO**	**REC: Category B (Largely natural with few modifications)** **BAS: Category B RMO: A/B (Improve)** The RMO is to, at minimum, maintain these EDLs in their current ecological state, as any potential impacts my also impact cumulatively on the downstream larger Wilgebos River system. Small scale rehabilitation of areas which may potentially be impacted by the proposed development must be considered where feasible.

[7] It is acknowledged that the terrestrial ecologist for the proposed project (Malcolme Logie of Trusted Partners) concluded that the proposed development will not significantly undermine the ecological functioning of the designated CBA and ESA areas.

Assessment of the EDLs of the Tankwa River System	**IHI Outcome**	**IHI Riparian PES Category: B (Largely natural with few modifications)** Due to the position of the EDLs in the landscape, they are considered largely intact, with limited anthropogenic impacts which have resulted in minor modification to the EDLs.	**EIS Discussion**	**High** The EDLs are considered of ecological importance on a landscape scale, primarily due to the wetland vegetation type associated with the investigation area (according to NFEPA, 2011) which is considered to be critically endangered according to Mbona *et al*. (2015) and almost the entire extent of the investigation area is located within a CBA 1/2 as per the CBANC (2016) database[6]. Even though modifications to these EDLs have occurred, it still provides habitat to a variety of biota, given the high degree of connectivity of these features with the surrounding landscape.
	Ecoservice provision	**Ecoservice Provisioning: 1,4 (Intermediate)** Important for providing habitat (functions as migratory corridors) and erosion control, with intermediate nutrient and toxicant assimilation.	**REC Category, BAS and RMO**	**REC: Category B (Largely natural with few modifications)** **BAS: Category B RMO: A/B (Improve)** The RMO is to, at minimum, maintain these EDLs in its current ecological state, as any potential impacts my also impact cumulatively on the downstream larger Tankwa River system. Small scale rehabilitation of areas which may potentially be impacted by the proposed development must be undertaken.
Assessment of the EDLs of the Meintjiesplaas River System	**IHI Outcome**	**IHI Riparian PES Category: C (Moderately modified)** Due to surrounding agricultural activities and informal road crossings, these EDLs have been modified, primarily the vegetation component with evidence of erosion in isolated areas.	**EIS Discussion**	**High** The EDLs are considered of ecological importance on a landscape scale, primarily due to the wetland vegetation type associated with the investigation area (according to NFEPA, 2011) which is considered to be critically endangered and almost the entire extent of the investigation area being located within a CBA 1/2 as per the CBANC (2016) database and CBA 1 as per WCBSP (2017)[6]. Even though modifications to these EDLs have occurred, they still provide habitat to a variety of biota, given the high degree of connectivity of these features with the surrounding landscape.
	Ecoservice provision	**Ecoservice Provisioning: 1,4 (Intermediate)** Important for providing habitat (functions as migratory corridors) and erosion control, with intermediate nutrient and toxicant assimilation.	**REC Category, BAS and RMO**	**REC: Category B (Largely natural with few modifications)** **BAS: Category B RMO: A/B (Improve)** The RMO is to, at minimum, maintain these EDLs in its current ecological state, as any potential impacts my also impact cumulatively on the downstream larger Meintjiesplaas River system. Small scale rehabilitation of areas which may potentially be impacted by the proposed development must be undertaken.
Extent of modification from proposed activities anticipated	**Minimal** Some modification is anticipated to the extent of the EDLs. This is attributed to the grading of existing road crossings through the watercourses, upgrading of the existing road crossings, changes to the flow, pattern and timing in the EDLs, which will need to be monitored to ensure that the hydrological connectivity of the EDLs are not adversely affected. Should road grading/upgrading only occur within the dry period (that does not require diversion of flow) that would traverse the EDLs and the recommended mitigation measures be 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 EDLs. The spanning of the overhead powerline over the watercourses was determined to pose a Low risk significance to the watercourses. The upgrading of existing roads traversing some EDLs and the creation of new road crossings within the EDLs were identified to pose Moderate risk significance to the EDLs. However, a manual adjustment to a Low risk significance was applied with the proviso that the construction of the proposed access roads through the EDL be undertaken during the dry periods when no surface water is present with the watercourse. It is the opinion of the freshwater ecologist that installation of appropriate through flow structures is considered advantageous to prevent further negative impacts and improve the functionality of these EDLs. The construction footprints within the watercourse must be suitably rehabilitated and monitored for the establishment of alien and invasive plant species during the operational phase and to ensure that any structures installed are hydraulically and geotechnically stable. 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.		

Table 6: Summary of results of the assessment of the ephemeral tributaries associated with the Wilgebos, Tankwa and Meintjieplaas River systems proposed to be traversed by the proposed development.

Watercourse characteristics overview:
The ephemeral tributaries identified within the investigation area have remained largely intact, however these watercourses have seen more frequent impacts due to their lower position in the landscape, confluencing with the larger river systems outside the study area (of specific mention in the unnamed tributary of the Meintjiesplaas River which have seen more frequent impact de to the construction of a near by substation). These disturbances have resulted in some bank erosion, an increase in the presence of alien vegetation species and some loss of tree diversity within the riparian zone (albeit not considered extensive). These tributaries function as migratory corridors due to its connectiveness with the smaller EDLs and larger river systems (thus high hydrological connectivity in the landscape). They also provide habitat for a variety of faunal species, even more so due to the presence of small trees species within the marginal zone.

Figure 19: Representative photographs of the ephemeral tributaries. (Left: ephemeral tributary of the Meintjiesplaas River system; Centre: tributary of the Wilgebos River system; Right: tributary of the Tankwa River system). The active channel of these tributaries consists of a shallow layer of alluvial soil. These tributaries can be distinguished in the landscape from the surrounding terrestrial area based on the presence of tree species.

Assessment of the tributary of the Wilgebos River System	**IHI Outcome**	**IHI Riparian PES Category: B (Largely natural with few modifications)** These tributaries are fairly intact, with road crossings noted as the only anthropogenic activity to impact on the tributaries. The vegetation composition is representative of the vegetation of the biome and consists of indigenous species.	**EIS Discussion**	**High** The tributaries are considered of ecological importance on a landscape scale, primarily due to the wetland vegetation type associated with the investigation area (according to NFEPA, 2011) which is considered to be critically endangered and almost the entire extent of the investigation area is located within a CBA 1/2 as per the CBANC (2016) database[6]. Even though modifications to these tributaries have occurred, it still provides habitat to a variety of biota, given the high degree of connectivity of these features with the surrounding landscape to the larger rivers outside the investigation area.
	Ecoservice provision	**Ecoservice Provisioning: 1,5 (Intermediate)** Important for providing habitat (functions as migratory corridors) and erosion control, with intermediate nutrient and toxicant assimilation.	**REC Category, BAS and RMO**	**REC: Category B (Largely natural with few modifications)** **BAS: Category B RMO: A/B (Improve)** The RMO is to, at minimum, maintain these tributaries in its current ecological state, as any potential impacts my also impact cumulatively on the downstream larger Wilgebos River system. Small scale rehabilitation of areas which may potentially be impacted by the proposed development must be undertaken.
Assessment of the tributary of the Tankwa River System	**IHI Outcome**	**IHI Riparian PES Category: B (Largely natural with few modifications)** These tributaries are fairly intact, with road crossings noted as the only anthropogenic activity to impact on the tributaries, which may have resulted in some alien species establishing. Overall, the vegetation composition consists of largely indigenous species.	**EIS Discussion**	**High** The tributaries are considered of ecological importance on a landscape scale, primarily due to the wetland vegetation type associated with the investigation area (according to NFEPA, 2011) which is considered to be critically endangered and the almost the entire extent of the investigation areas is located within a CBA 1/2 as per the CBANC (2016) database[6]. Even though modifications to these EDLs have occurred, it still provides habitat to a variety of biota, given the high degree of connectivity of these features with the surrounding landscape.
	Ecoservice provision	**Ecoservice Provisioning: 1,5 (Intermediate)** Important for providing habitat (functions as migratory corridors) and erosion control, with intermediate nutrient and toxicant assimilation.	**REC Category, BAS and RMO**	**REC: Category B (Largely natural with few modifications)** **BAS: Category B RMO: A/B (Improve)** The RMO is to, at minimum, maintain these EDLs in its current ecological state, as any potential impacts my also impact cumulatively on the downstream larger Tankwa River system located outside the northern boundary of the investigation area. Small scale rehabilitation of areas which may potentially be impacted by the proposed development must be undertaken.
Assessment of the tributary of the Meintjiesplaas River System	**IHI Outcome**	**IHI Riparian PES Category: B (Largely natural with few modifications)** Limited change to the cover, abundance and species composition of the tributaries are noted despite informal road crossings noted.	**EIS Discussion**	**High** The tributaries are considered of ecological importance on a landscape scale, primarily due to the wetland vegetation type associated with the investigation area (according to NFEPA, 2011) which is considered to be critically endangered and almost the entire extent of the investigation area is located within a CBA 1/2 as per the CBANC (2016) database and CBA 1 as per WCBSP (2017)[6]. Even though modifications to these tributaries have occurred, it still provides habitat to a variety of biota, given the high degree of connectivity of these features with the surrounding landscape.
	Ecoservice provision	**Ecoservice Provisioning: 1,5 (Intermediate)** Important for providing habitat (functions as migratory corridors) and erosion control, with intermediate nutrient and toxicant assimilation.	**REC Category, BAS and RMO**	**REC: Category B (Largely natural with few modifications)** **BAS: Category B RMO: A/B (Improve)** The RMO is to, at minimum, maintain these tributaries in their current ecological state, as any potential impacts my also impact cumulatively on the downstream larger Meintjiesplaas River system. Small scale rehabilitation of areas which may potentially be impacted by the proposed development must be undertaken.

Extent of modification from proposed activities anticipated	**Minimal** Some modification is anticipated to the extent of the tributaries. This is attributed to the construction of the grading of existing road crossings through the watercourses, changes to the flow, pattern and timing in the tributaries, which will need to be monitored to ensure that the hydrological connectivity of the tributaries are not adversely affected. It is assumed that no powerline support tower will be constructed within the delineated extent of the tributaries. Nevertheless, the recommend mitigation measures must still be implemented to mitigate any potential indirect impacts.	
Impact Significance:	**Low** (with the implementation of mitigation measures)	No powerline support structures may be constructed within the delineated extent of the ephemeral tributaries. The spanning of the overhead powerline over the watercourses was determined to pose a Low risk significance to the watercourses. The upgrading of existing roads traversing some of these watercourses and the creation of new road crossings within the ephemeral tributaries were identified to pose Moderate risk significance to the ephemeral tributaries. However, a manual adjustment to a Low risk significance was applied with the proviso that the construction of the proposed access roads through the ephemeral tributaries be undertaken during the dry periods when no surface water is present with the watercourse. It is the opinion of the freshwater ecologist that installation of appropriate through flow structures is considered advantageous to prevent further negative impacts and improve functionality of these watercourses. The construction footprints within the watercourse must be suitably rehabilitated and monitored for the establishment of alien and invasive plant species during the operational phase and to ensure that any structures installed are hydraulically and geotechnically stable. Should road grading/upgrading only occur within 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.

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

7 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[8];
- 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 development (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 7 that follows.

Table 7: Articles of Legislation and the relevant zones of regulation applicable to each article.

Regulatory authorisation required	Zone of applicability
Water Use Authorisation Application in terms of the National Water Act, 1998 (Act No. 36 of 1998) as amended. **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

[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.

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—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres;or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—;* *a) within a watercourse;* *b) in front of a development setback; or* *c) if no development setback exists, within **32 metres 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 of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from –* *(a) a watercourse* **Activity 48:** *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs—* *a) within a watercourse;* *b) in front of a development setback; or* *c) if no development setback exists, within **32 metres of a watercourse**, measured from the edge of 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 Northern and Western Cape, outside of urban areas. ***Activity 10:*** *The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.* *Western Cape:* *ii. All areas outside urban areas;* *Northern Cape:* *ii. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland;* *iii. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* ***Activity 14**:* *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) infrastructure or structures with a physical footprint of 10 square metres 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 metres of a watercourse**,*

Regulatory authorisation required	Zone of applicability
	Northern Cape: *ii. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *Western Cape:* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* ***Activity 18:*** *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *Northern Cape:* *i) Outside urban areas:* *(ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; or* **Activity 23:** *The expansion 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*

The following Zones of Regulation (ZoR) are applicable to the watercourses (Figures 19 to 24):

- A 32 m Zone of Regulation (ZoR) in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) was assigned to all identified watercourses;
- A 1:100 year floodline has been modelled for some of the watercourses within the investigation area (i.e., Tankwa River and ephemeral drainage lines with riparian vegetation). As such, the GN509 ZoR was assigned as the combined extent of the delineated edge of a watercourse and the modelled 1:100 year floodline, in accordance with the National Water Act, 1998 (Act No. 36 of 1998) (NWA), for the watercourses where the 1:100 year floodline was modelled;
- In the absence of a defined 1:100 year floodline (such as for some of the smaller episodic drainage lines without riparian vegetation), a 100 m ZoR in accordance with GN509 as published in the Government Gazette 40229 of 2016 as it relates to the NWA, was assigned;
- The 100 m GN509 ZoR and the GN509 ZoR assigned using the 1:100 year floodline were combined to form an overall GN509 ZoR for the watercourses associated with the proposed development.

The proposed development will encroach into the GN509 ZoR, thus Water Use Authorisation (WUA) for water uses as stipulated in Section 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998), must be obtained from the DWS prior to commencement of any construction. The outcome of the DWS Risk Assessment (Section 7) will prescribe the application of either a GA should the proposed development activities pose a low risk significance to the watercourses, or a Water Use Licence Application (WULA) should the proposed development activities pose a moderate to high risk significance to the watercourses. Additionally, environmental authorisation (EA) in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) must be obtained as the proposed access roads are within watercourses.

It is recommended that a Watercourse Rehabilitation, Maintenance and Management Plan (WRMMP) be undertaken as part of the WUA approval process to inform input into the site specific Environmental Management Programme (EMPr).

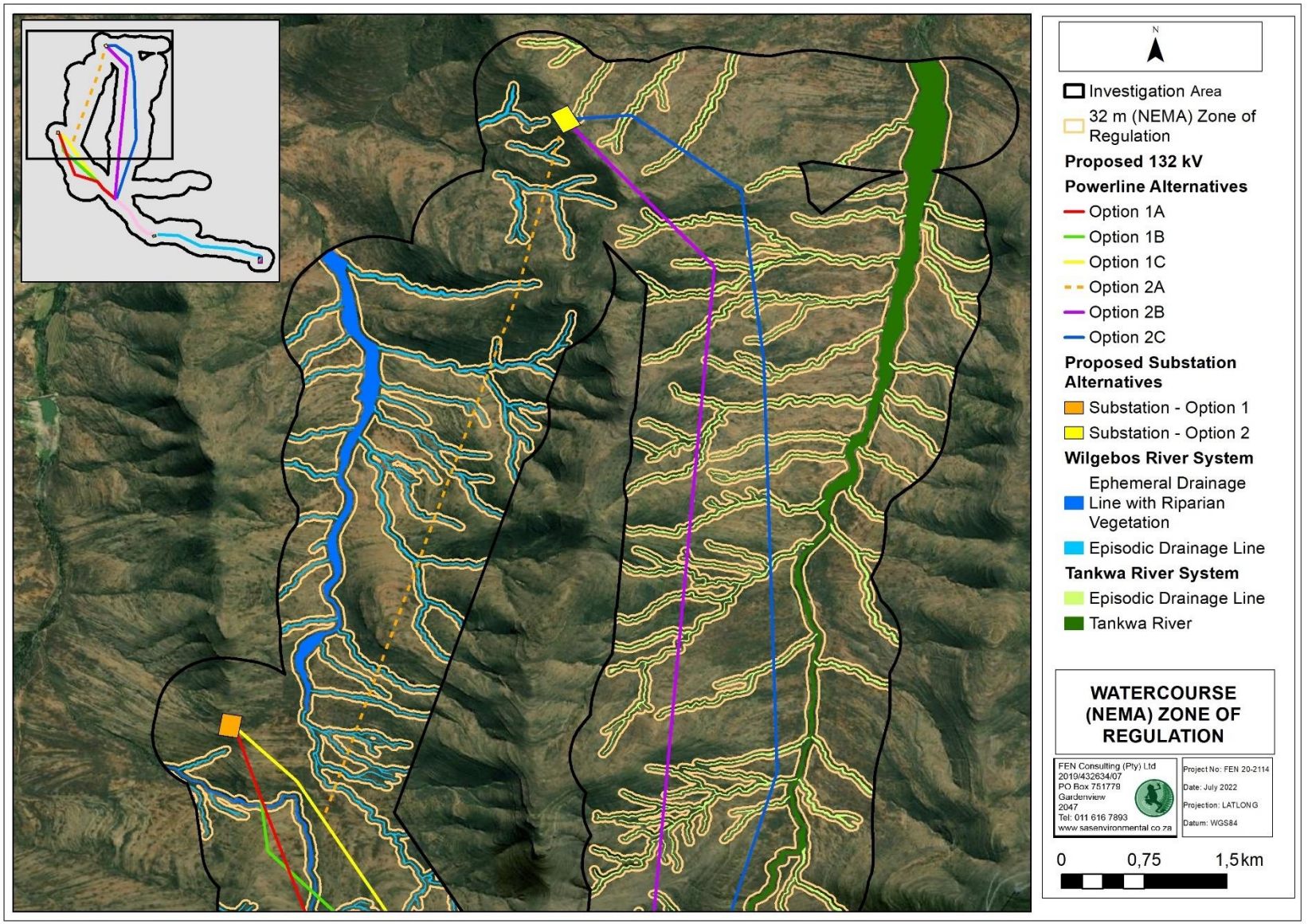

Figure 20: The conceptual presentation of the 32m NEMA zone of regulation relation to the delineated watercourses that form part of the Tankwa and Wilgebos River system within the northern portion of the investigation area. (Take note due to the scale of the map: Substation Option 2 is located approximately 20m from the delineated extent of an episodic drainage line)

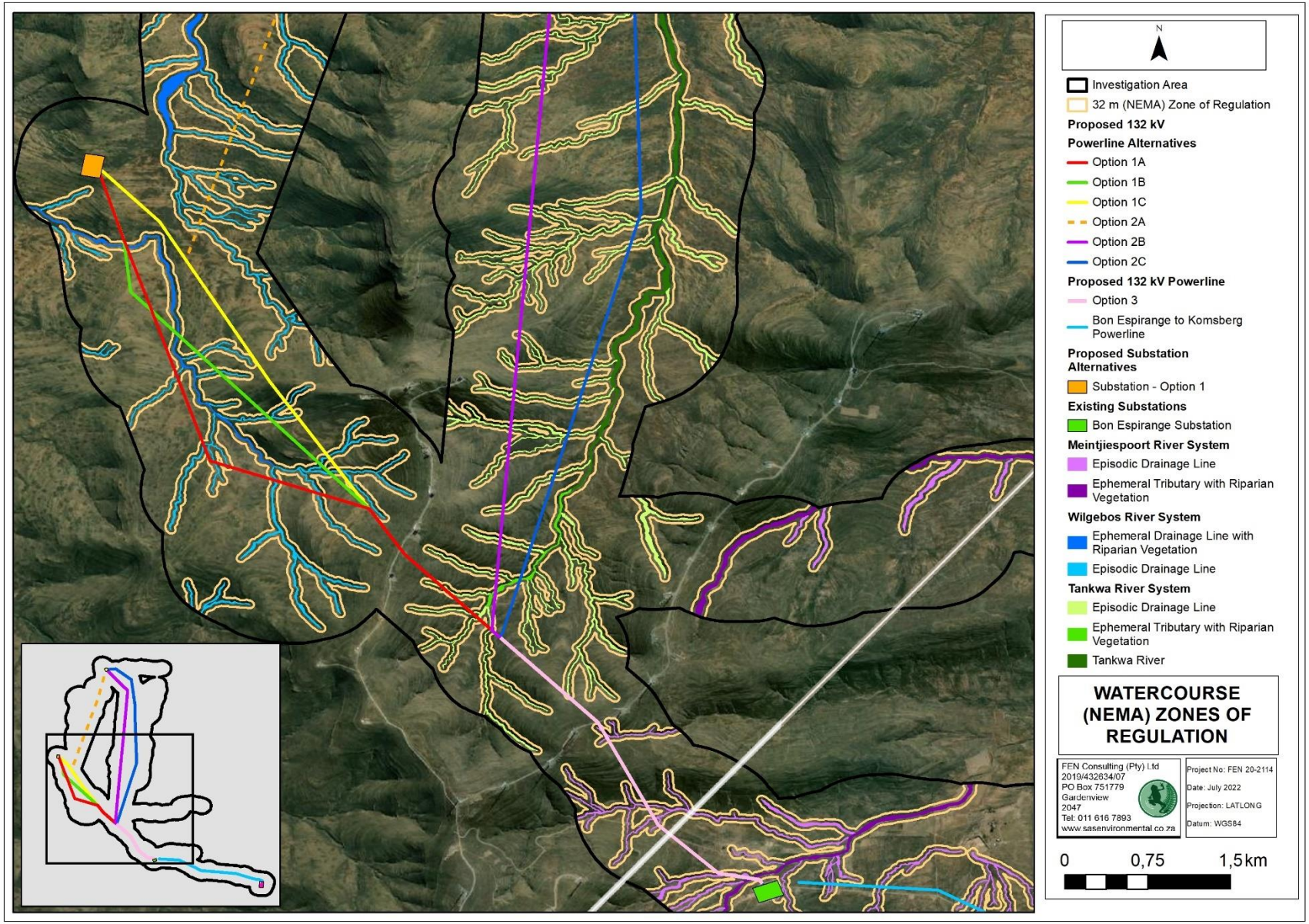

Figure 21: The conceptual presentation of the 32m NEMA zone of regulation in relation to the delineated watercourses that form part of the Tankwa, Wilgebos and Meintjiesplaas River system within the central portion of the investigation area.

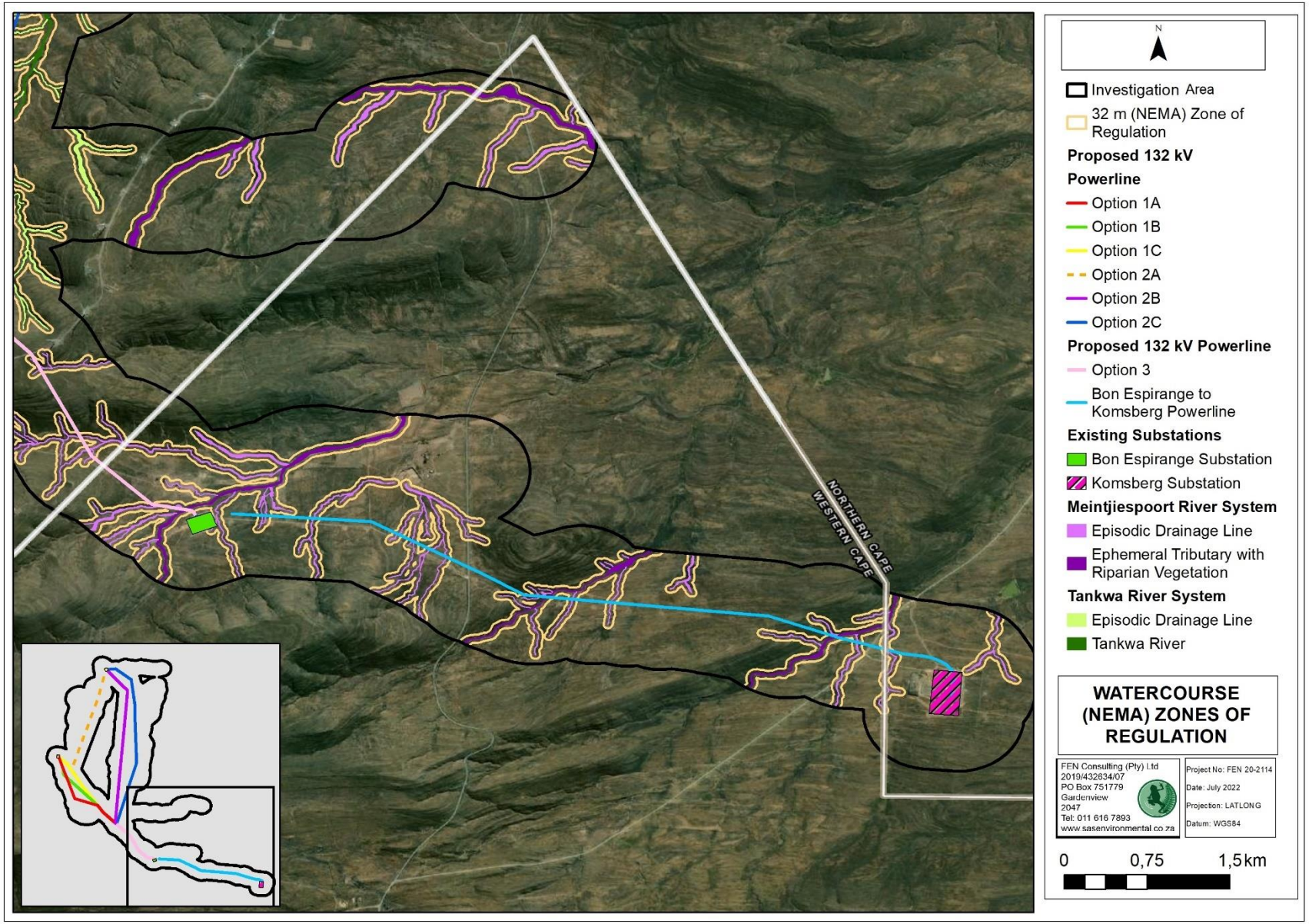

Figure 22: The conceptual presentation of the 32m NEMA zone of regulation in relation to the delineated watercourses that form part of the Tankwa and Meintjiesplaas River system within the southern portion of the investigation area.

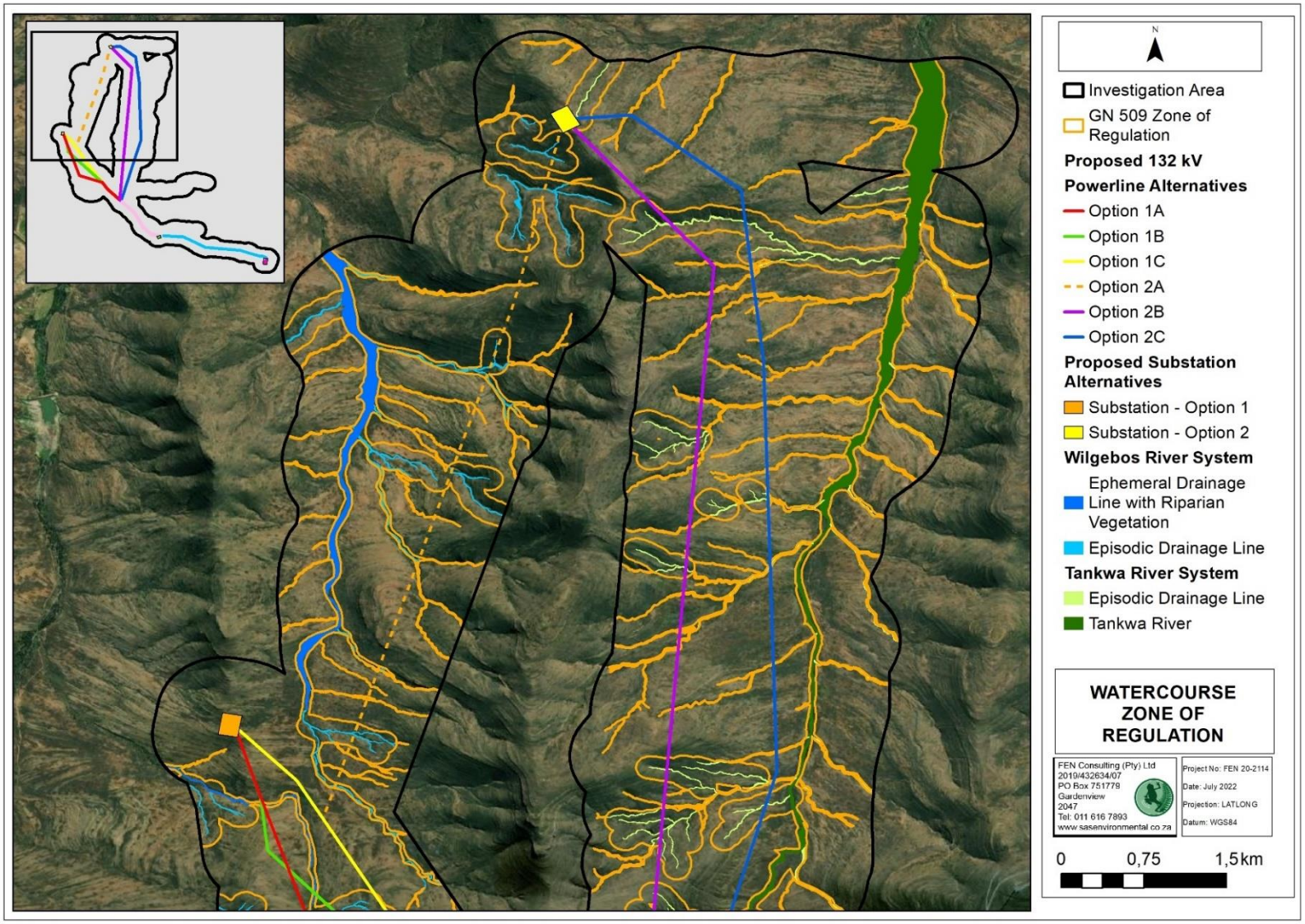

Figure 23: The conceptual presentation of the GN509 zone of regulation as it related to the NWA (determined as the combined extent of the delineated edge of a watercourse and the modelled 1:100 year floodline, where applicable) relation to the delineated watercourses that form part of the Tankwa and Wilgebos River system within the northern portion of the investigation area. (Take note due to the scale of the map: Substation Option 2 is located approximately 20m from the delineated extent of an episodic drainage line)

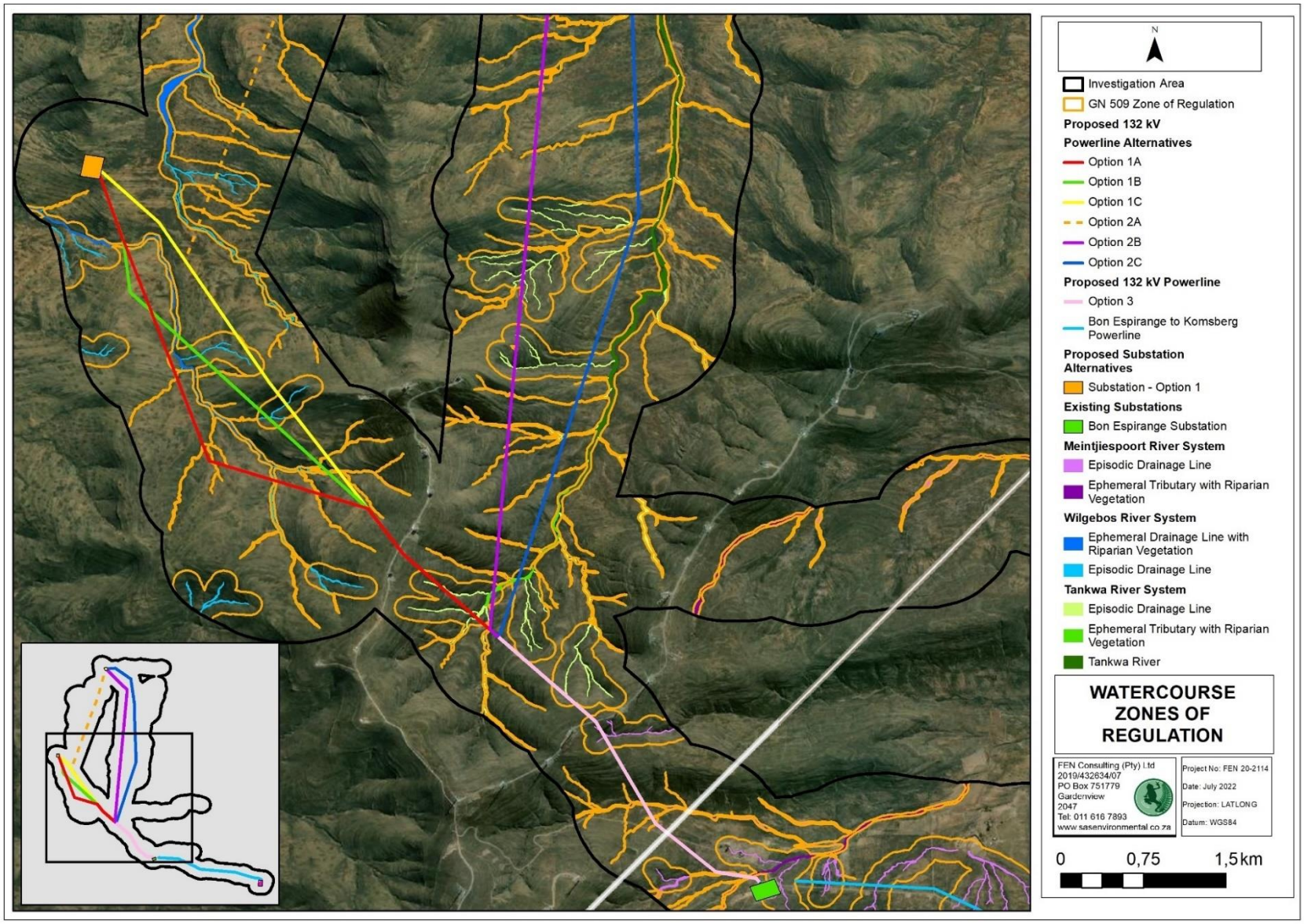

Figure 24: The conceptual presentation of the GN509 zone of regulation as it related to the NWA (determined as the combined extent of the delineated edge of a watercourse and the modelled 1:100 year floodline, where applicable) in relation to the delineated watercourses that form part of the Tankwa, Wilgebos and Meintjiesplaas River system within the central portion of the investigation area.

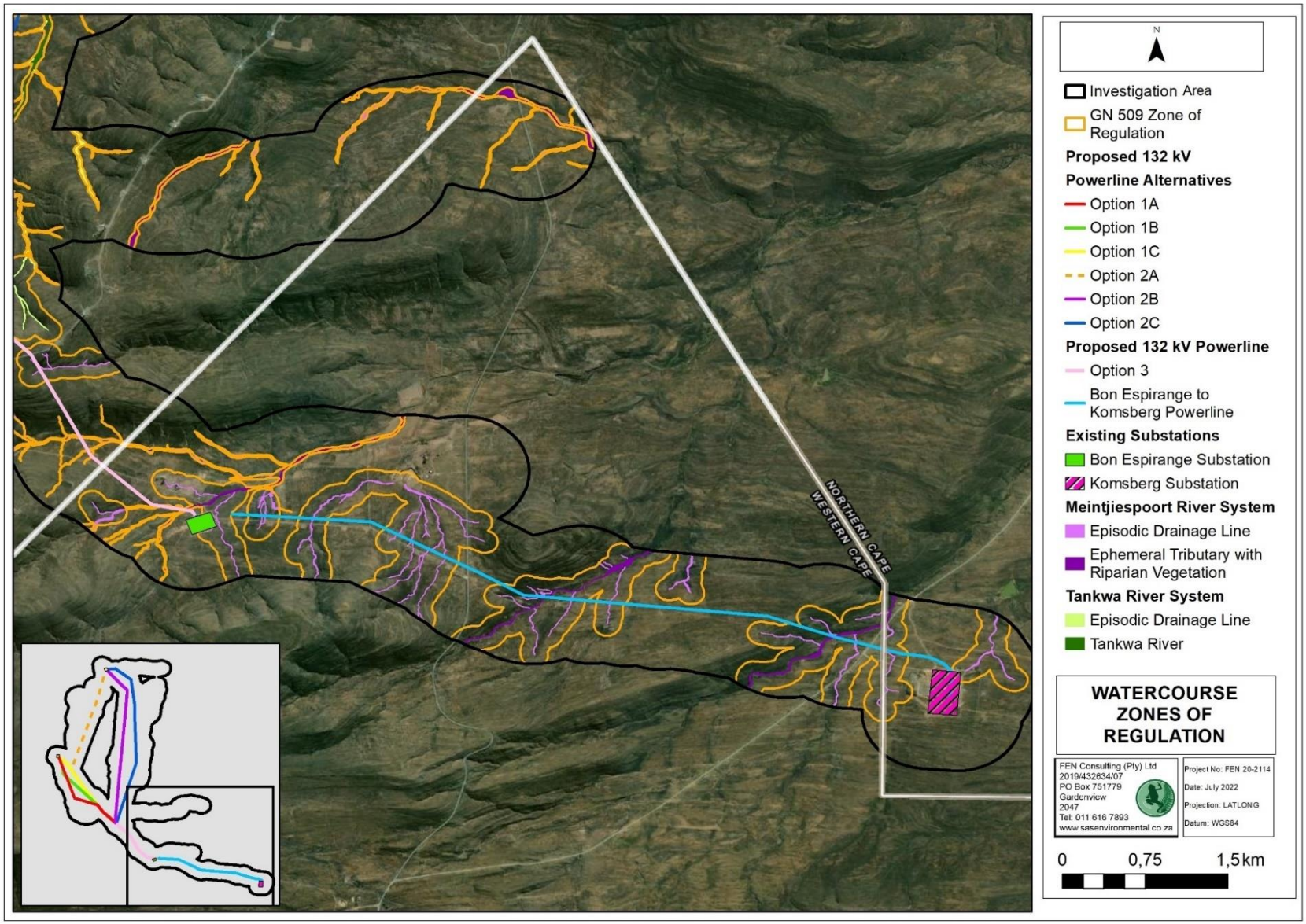

Figure 25: The conceptual presentation of the GN509 zone of regulation as it relates to the NWA (determined as the combined extent of the delineated edge of a watercourse and the modelled 1:100 year floodline, where applicable) in relation to the delineated watercourses that form part of the Tankwa and Meintjiesplaas River system within the southern portion of the investigation area.

8 DWS RISK ASSESSMENT

This section presents the significance of potential impacts on the ecology of the identified watercourses associated with the proposed development. In addition, it also indicates the recommended mitigatory measures needed to minimise the perceived impacts of the proposed development and presents an assessment of the significance of the impacts taking into consideration the available mitigatory measures.

8.1 *Risk Assessment considerations and outcome*

Following the assessment of the watercourses associated with the proposed development, the impact 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 impact assessment was undertaken for the proposed layout as provided by the proponent and as described in Section 2 of this report and presented in Figure 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, substation and access/maintenance road which will be an informal jeep track type road), as described in Section 2 and depicted in Figures 1 and 2;
- The proposed powerline alternative routes and powerline Option 3 and the proposed Bon Espirange and Komsberg powerline will span over several watercourses. The proposed substation Option 2 is located at least 20 m from the delineated extent of a watercourse (an episodic drainage line of the Takwa River system), while the proposed substation Option 1 is located at least 100 m from the delineated extent of a watercourse (an episodic drainage line of the Wilgebos River system), thus outside the GN509 ZoR. The proposed provisional access roads (new and existing) traverse several watercourses;
- The risk significance of the substation Option 1 was not considered as it is considered to not pose a quantum of risk to the identified watercourses due to its distance from the watercourses (at least 100 m from the nearest watercourse) and location outside the GN509 ZoR;
- The access roads to the west of the slope of the mountainous area Rooiberg (associated with the proposed powerline Options 1A, 1B, 1C and 2A), traverse ephemeral tributaries and episodic drainage lines associated with the Wilgebos River System, while the access roads to the east (associated with the proposed powerline Options 2B and 2C), traverse the Tankwa River at existing and new crossings and several ephemeral tributaries and episodic drainage lines associated with this river. The creation of new road crossings within watercourses was assessed separately for the minor ephemeral systems (ephemeral tributaries and episodic drainage lines) and the major river systems, particularly the Tankwa River, to account for the difference in the severity of impacts associated with the watercourses (i.e., direct impacts to the Tankwa River are expected to be of higher severity than the minor ephemeral systems). Similarly, the upgrading of existing crossings within watercourses was assessed separately from the creation of new watercourse crossings;
- 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 Forestry, Fisheries and the Environment (DFFE) *et a*l (2013) 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 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. It is

acknowledged that the substation Option 2 is located 20 m from the delineated watercourse. This will conform to the mitigation hierarchy of the DFFE *et a*l (2013), to avoid significant impacts to the watercourses. However, it is acknowledged that this does not apply to the proposed access (and maintenance) roads which traverse some watercourses;

- Since it is expected that the GN509 ZoR cannot always be avoided for the placement of support structures, the legal issues for the construction of support structures were scored a maximum value of "5";
- The activities relating to the proposed development 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 development 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 8 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.**

According to the DWS Risk Assessment Matrix guidelines, for sensitivity ratings within the Moderate Risk range (56-80) a manual adjustment can be made to allow for a low risk. This is to be done subject to the listing of additional mitigation measures which are highlighted in red below (Table 8). This manual adjustment (presented as the "'Borderline LOW MODERATE Rating" in Table 8, column 12) was applied in order to reduce the proposed development to a low risk. It is important to note, however, that should all mitigation measures not be adhered to, the risk significance will likely be a moderate. Suitable planning must thus be undertaken to ensure all works are undertaken during the dry periods when no surface water is present and thus no diversion of flow required.

Table 8: Summary of the results of the DWS risk assessment applied to the proposed development activities.

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating	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 to soil, 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 powerline support structures will be located outside of the watercourses and at least 32 m (as far as possible/feasible) 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.** • Due to the accessibility of the sites, limit the crossings of watercourse where possible. Use must be made of existing watercourse crossings to access the project sites where possible. 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, no spanning of the powerline over the watercourse and no access roads) 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) and outside of the GN509 ZoR (due to the potential risk of pollution associated with dangerous goods - i.e., refuelling, storage of fuel, oil, etc); • 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.	NA	Fully reversible
2			Removal of vegetation and associated disturbances to soil, and access to the site, including grading of existing informal farm roads (access roads will be maintained as informal gravel roads, or a typical jeep track type road).	• 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		NA	Fully reversible

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating	Reversibility of Impact
3		• Installation of the support structures (further than 32 m but within the GN509 ZoR as defined in Section 6 for the delineated watercourses) and spanning of the proposed powerline. • Construction of substation Option 2 (20 m from the delineated extent of a watercourse) within the GN 509 ZoR.	• Excavation of foundation pits for the support structures and for the substation construction area leading to stockpiling of soil; • 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; and • Altered runoff patterns, leading to increased erosion and sedimentation of the watercourses.	1,25	3,25	14	45,5	L	• **Due to the pollution risk associated with any potential transformer leakage such as substations, substation Option 2 is not preferred as it is located in close proximity to the delineated extent of the watercourses (at least 20 m of a watercourse). Therefore, if substation Option 2 were to be constructed, it must be relocated as far away from the watercourse as possible in order to lower this potential pollution risk;** • Excavation of foundation pits for the support structures foundation and the foundation of the substation 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 (where practically feasible). Sediment traps can be created by pegging an appropriate geotextile across the entire width of the work area at the specified support tower, held down by cobbles/boulders or by geotextile wrapped hay bales spanning the width of the work area and staked into position; • During excavation activities, soil must be stockpiled upgradient of the excavated area. Mixture of the lower and upper layers of the excavated soil should be kept to a minimum. This soil must be used to backfill the foundation pits (support structures), immediately after installation of the support structures and/or other infrastructure; • No stockpiling of topsoil is to take place within close proximity to a watercourse, and suitable dust suppression actions (as needed) must be implemented for the duration of the construction works, especially considering the action of wind within these semi-arid landscapes; • Material used as bedding material (at the bottom of the excavated foundation pit) should be stockpiled outside of the 32m NEMA ZoR and as close as possible to the support structures footprint area. Once the foundation pit has been excavated, the bedding material should be directly placed within the foundation pit (where possible), rather than stockpiling it alongside the foundation pit; • When the powerline is strung between the support structures and during final construction of the substation, no vehicles my indiscriminately drive through the watercourses, use must be made of the dedicated access roads.	NA	Fully reversible

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating	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	<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 batching plant. 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 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 (within the 5 m buffer zone) must be loosened to natural soil compaction levels; • Any remaining soil following the completion of backfilling of the foundation pits are to be spread out thinly surrounding the installed support structures (outside of the delineated watercourses) to aid in the natural reclamation process; and • The construction footprint must be limited to the foundation 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.	NA	Fully reversible

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating	Reversibility of Impact
5		Creation of new road crossings within watercourses, involving: • Site preparation prior to construction activities including movement of construction machinery/vehicles within the watercourses and removal of vegetation; • Ground-breaking and excavations within/adjacent to the watercourses; and; • Placement of culvert structures atop concrete base.	Creation of new road crossings within the Tankwa River associated with the proposed development	• Earthworks and exposure of soil could result in sedimentation of the watercourses, which may be transported as runoff into the downstream watercourse areas and may smother vegetation associated with the watercourses; • Altered water quality (if surface water is present) as a result of vehicle movement and construction activities; and • Proliferation of alien and/or invasive vegetation as a result of disturbances.	3,5	5,5	14	77	M	• It is imperative that all construction works be undertaken during the dry periods when there is no flow within the watercourses, and thus no diversion of flow would be necessary; • The throughflow structures must be designed to ensure that the structures are geotechnically sound and that they are hydraulically stable, even if a 1:100 year flood event was to occur. The designs should include culverts installed intermittently to ensure a free draining landscape. It is recommended that a suitably qualified hydrologist be consulted to provide guidance on the relevant sizes and width requirements to ensure that hydraulic functioning of the system is maintained; • In addition, the crossings must be designed such that should they be overtopped, they remain stable and do not lead to excessive downstream erosion and incision. It must be ensured that the final design accounts for appropriate wetting frequencies and patterns are maintained in the pre-development condition (with input from the freshwater ecologist, where necessary); • The reaches of the EDLs where no activities are planned to occur must be considered no-go areas. These no-go areas can be marked at a maximum distance of 5 m upstream and downstream of the proposed road upgrade crossing. This 5 m buffer area would allow for construction personal, vehicles (if applicable) to enter the watercourse crossing where the road is proposed to be constructed; • The removed vegetation must be stockpiled outside of the delineated boundary of the watercourse. The footprint areas of these stockpiles should be kept to a minimum, and may not exceed a height of 2 m. 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. • Preference is given to the proposed access roads associated with the powerline options 1A/1B/1C as they won't impact on the Tankwa River; • See Activity 7 below with regards to excavation and soil compaction activities within the watercourses. • See Activity 4 above for control measures specific to concrete works.	55 (-21) L	Fully reversible
6			Creation of new road crossings within the ephemeral tributaries with riparian vegetation and episodic drainage lines with no riparian vegetation associated with the proposed development		3,25	5,25	12	63	M		55 (-7) L	Fully reversible

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating	Reversibility of Impact
7		Upgrading of existing access roads within watercourses associated with the Tankwa River system, Wilgebos River system and Meintjiesplaas River system: • Excavation within the watercourse for the removal of existing infrastructure and casting of a base (where applicable); • Placement of culvert structures atop concrete base; and • Upgrading of existing roads within close proximity (within 32 m) to a watercourse.	• Site preparation prior to construction activities; • Removal of vegetation and associated disturbances to soil; • Disturbances to soil of the watercourses; • Movement of construction machinery/ vehicles within the watercourses; and • Possible spills / leaks from construction vehicles.	• Earthworks and exposure of soil could result in sedimentation of the watercourses, which may be transported as runoff into the downstream watercourse areas and may smother vegetation associated with the watercourses; and • Proliferation of alien and/or invasive vegetation as a result of disturbances.	2,25	4,75	12	57	**M**	• The construction footprint must be limited to a construction Right of Way that comprises a 5 m construction buffer (upstream and downstream of the watercourse crossing) only. • Upgrading of the informal roads must take cognisance of the delineated extent of the watercourse traversed by this existing informal access road and that located within close proximity to the road. Should the road be increased in width, the road must be expanded on the side opposite of the watercourse, to ensure that the remaining natural buffer between the access road and the watercourse remains intact; • Material to be used (gravel – if applicable) as part of the upgrading of the existing roads must be stockpiled outside the delineated extent of the watercourses (preferably at least 32 m from the watercourse) to prevent sedimentation thereof and to avoid any other vegetation being impacted by the construction activities. These stockpiles may not exceed a height of 2 m and should be protected from wind using tarpaulins; • The disturbed area surrounding the road must be revegetated with suitable indigenous vegetation to prevent the establishment of alien vegetation species and to prevent erosion from occurring; • The alien vegetation management plan as compiled by the terrestrial/botanical ecologist is highly recommended and supported by the freshwater specialist and must be implemented concurrently with the commencement of construction; and • All existing alien and invasive vegetation should be removed. All material must be disposed of at a registered garden refuse site and may not be burned or mulched on site. <u>With regards to excavation and soil compaction activities within the watercourses</u> Although the proposed watercourse crossings upgrades are associated with generally existing farm roads, and as such the most significant impacts have already occurred, the existing gravel roads are relatively small with no formal through flow structures in most cases. The following are applicable with regards to excavation works and any concrete related activities:	**55 (-1) L**	

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating	Reversibility of Impact
										• During the excavation activities, any soil/sediment or silt removed from the watercourse may be temporarily stockpiled in the road reserve but outside the delineated extent of the watercourse. These stockpiles may not exceed 2 m in height, and their footprint should be kept to a minimum. Stockpiling of removed materials may only be temporary (may only be stockpiled during the period of construction at a particular site) and should be disposed of at a registered waste disposal facility; • Excavated materials should not be contaminated, and it should be ensured that the minimum surface area is taken up. Mixture of the lower and upper layers of the excavated soil should be kept to a minimum, for later usage as backfill material or as part of rehabilitation activities; • Care must be taken to ensure that no scouring or erosion occurs as a result of the proposed culvert crossing. Installation of riprap or gabion mattresses and/or concrete aprons associated with any culverts; • All construction material (with specific mention of prefabricated culvert structures) must be stockpiled in the laydown area and must only be imported to the construction site when required; • Machinery/vehicles used to install culvert structures must be parked on the existing road surface and may not enter the watercourses; and • Reno-mattresses or riprap must be installed at the outlet side of the culvert/bridge structures to ensure energy dissipation and prevent concentrated runoff into the downstream watercourse. The reno mattress/riprap must be installed flush with the culvert outlet. • See Activity 4 above for control measures specific to concrete works.		

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating	Reversibility of Impact
8	OPERATIONAL PHASE	Operation and maintenance of the powerline and substation	• Potential indiscriminate movement of maintenance vehicles within the watercourses or within close proximity to the watercourses; and • 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; and • 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 powerline, substation and access roads, monitoring for erosion should be undertaken; • 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; • Hot spots for the build-up of debris and excess sediment must be identified and when necessary, debris/excess sediment must be removed by hand to prevent future flooding and potential damage to infrastructure; • Routine maintenance of the roads must be undertaken to ensure that no concentration of flow and subsequent erosion occurs due to the road crossings/instream infrastructure. Such maintenance activities must specifically be undertaken after high rainfall events; • Stormwater runoff from the road crossings should be monitored (by the Operation and Maintenance (O&M) Manager), to ensure it does not result in erosion of the watercourses. Stormwater should be allowed to diffusely spread across the landscape, by ensuring adequate surface roughness in the watercourse (through vegetation and rocky areas); 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 powerline and substation. 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.	NA	Fully reversible
9		Operation and maintenance of the proposed main access road and other existing roads traversing watercourses (where applicable).	• Concentrated runoff entering the watercourses; and • Disturbance to the vegetation within and surrounding the watercourses.	• Concentrated runoff from the road crossings leading to erosion and subsequent sedimentation of the watercourses (increase in the sediment load) and turbulent flows when surface water is present; • Higher flood peaks into the watercourses due to reduced surface roughness in the watercourses.	2,5	4,5	12	54	L		NA	Fully reversible

The activities associated with the construction and operational phases of the proposed development based on the alignment provided by the proponent including site preparation, excavation of foundation pits for installation of the support structures at least 32 m from the delineated extent of watercourses, pose a Low risk significance to the watercourses, with the implementation of the recommended mitigation measures. If substation Option 2 (located at least 20m from the delineated extent of a watercourse) is constructed, the risk associated with pollution from potential transformer leakage is possible; as such all mitigation measures as stipulated in Table 8 above must be implemented to prevent any negative edge effects from occurring on the watercourse. Due to the proposed access roads (typical jeep track type roads) traversing watercourses at new and existing crossings, the direct impacts during the construction phase pose a Moderate risk significance to the watercourses. Nevertheless, it is the opinion of the freshwater ecologist that formalising watercourse crossings with appropriate through flow structures is considered advantageous over the long-term as existing informal watercourse crossings have resulted in erosion of the watercourses which have caused interruption of hydrological connectivity between the upstream and downstream reaches. In consideration of the ephemeral nature of the majority of the assessed watercourses (only flooding or flowing in response to extreme rainfall events) and remaining dry for most of the year, a manual amendment of the risk significance scoring was implemented to classify activities associated with the construction of the new access road and potential upgrading of existing roads within watercourses as Low risk. The following rationale supports this amendment:

- If the proposed activities are undertaken during the dry periods when no surface water is present within the watercourse, impacts to the hydrological and geomorphological regime, and surface water quality of the watercourses can be considered 'Low';
- All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential; and
- Installation of appropriate through flow structures within new and existing road watercourse crossings is highly recommended as this is considered a positive long-term benefit for the maintenance and potential improvement of the hydrological functionality of the watercourses and associated downstream systems. In addition, improvement of the hydrological connectivity associated with this would constitute improvement of the PES and RMO for these watercourses.

Due to the similar areas the proposed powerline alternative routes will be routed through (i.e., all powerline alternative routes will be routed through mountainous areas traversing headwater episodic drainage lines and traversing tributaries within the lower lying area), all the proposed powerline alternative routes are considered to pose a Low risk significance to the identified watercourses. However, preference is given to substation Option 1 and powerline route Option 1A/1B/1C, since the proposed substation is located outside the GN509 ZoR, and no direct or indirect impacts from substation Option 1 is expected, as opposed to Substation Option 2 that is located very close to a watercourse. Additionally, the proposed access roads associated with the substation Option 1 and powerline route Option 1A/1B/1C are the most preferred for the proposed development as they only traverse the minor ephemeral systems, and not major rivers such as the access roads associated with the substation Option 2 and powerline route Option 2B/2C, which will require new crossings within the Tankwa River.

Assuming that strict enforcement of cogent, well-developed mitigation measures takes place, the significance of impacts arising from the proposed development 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.

8.1.1 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. Watercourses within the region are under continued threat due to rapid land use transformation in the surrounding landscape, with specific mention of renewable energy facilities (REF) and associated powerline infrastructure.

Direct and indirect impacts identified within the assessed watercourses can be predominantly attributed to informal road crossings leading to limited alien and invasive species establishment. Considering that the proposed powerline support structures and substation 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. Considering the proposed development of other REFs and associated electrical infrastructure, such edge effects may cause a 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 and substation for any erosion during the operational phase, the direct and indirect negative impacts can be reduced, thus no significant contribution to the above mentioned impacts is considered likely.

8.2 *Recommendations / Conditions / Measures to be included in EMPr / EA*

Based on the outcome of the risk assessment per Section 7.1 above, a list of key mitigation measures is provided below which must be implemented to prevent any direct or indirect negative impacts from occurring to the watercourses as a result of the proposed development. Required monitoring actions are presented in Table 9 that follows.

- It is recommended that the support structures associated with the proposed powerline and substation infrastructure be located outside of the watercourses and at least 32 m from the delineated edge of a watercourses, this will avoid direct negative impact to the watercourses;
- Use must be made, as far as possible, of existing informal roads to access the construction site and for use during the operational phase. Only where it's not possible to circumnavigate watercourses, should new watercourses crossings be made. These watercourses crossings must be kept as small as possible; and
- Due to the pollution risk associated with any potential transformer leakage such as substations, substation Option 2 is not preferred as it is located in close proximity to the delineated extent of the watercourses (at least 20 m of a watercourse). Therefore, should substation Option 2 be developed, it must be relocated as far away from the watercourse as possible (preferably outside the GN509 ZoR) in order to lower this potential pollution risk.
-

<u>Construction phase:</u>

- It is imperative that all construction works (with specific mention of creating new watercourse crossings) be undertaken during the dry periods when the flow is very low in the watercourses and use of informal road crossings will have a limited impact;
- Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the watercourses and their associated 32 m NEMA ZoR and GN509 ZoR (as defined in Section 6);
- Removed vegetation must be stockpiled outside of the delineated boundary of a 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.

- Excavation of foundation pits for the support structure foundations might 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 should it be recommended by the ECO in that period; and
- During excavation of the foundation pits, soil must be stockpiled upgradient of the excavated foundation 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 foundation pits, immediately after installation of the support structure, where possible.

Operational Phase:

- 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 power line and substation, monitoring for erosion should be undertaken with specific mention investigating the powerline support structures located near areas hosting preferential flow paths;
- Should erosion be noted at the base of the powerline support structures 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;
- 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 power line and substation. Should alien and invasive plant 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.

Table 9: Monitoring actions to be implemented for the activities associated with the proposed development.

Aspect	Phase	Monitoring Location	Frequency of sampling	Performance Indicator	Reporting Requirement
Erosion and sedimentation	Construction phase	1. Watercourse road crossings 2. At the base of each powerline support structure	Visual inspections must take place every month during the construction phase and after rainfall events.	To monitor the extent of erosion and sedimentation of the watercourses. Provide a report addressing the following: 1. Brief indication of the method of assessment; 2. Assumptions and Limitations must be listed; 3. Photographs and GPS point locations taken of existing erosion prior to and post rehabilitation activities must be incorporated into the report; 4. Any erosion observed must be discussed in detail; 5. Map indicating where erosion is present; and 6. Recommended mitigation and remediation actions should be presented and dates when remediation actions were undertaken.	Reporting to be included as part of the annual ECO monitoring report and submitted to the competent authority.
	Operational phase		Visual inspections must take place monthly during the winter rainy season for three years after the completion of construction to monitor and remove debris, sediment deposits and erosion along the watercourse crossings.		
Alien Invasive Species Plant Control.	All phases	1. Watercourse road crossings 2. At the base of each powerline support structure 3. Area directly adjacent to the powerline support structures	Monitoring must be undertaken as per an Alien and Invasive plant species plan. This must include: 1. Visual inspection of construction footprint areas once a month during the construction phase; 2. Visual inspections must take place monthly during the winter rainy season for three years after the completion of construction to monitor the establishment of alien or invasive plant species specifically at the watercourses crossings or in the surrounding areas to the powerline support structures.	To monitor the germination of AIPs at watercourse road crossings and powerline support structure base areas: The report needs to address the following: 1. A list of species identified within the focus areas; 2. Discuss the density of species; 4. Fixed point photo (Taking photo at specific point within focus area where AIPs was identified); and 5. Focus areas requiring AIP control and proposed AIP control measures.	Reporting to be included as part of the annual ECO monitoring report and submitted to the competent authority.
Revegetation	All phases	1. Watercourse road crossings (those that will not be retained as maintenance roads) 2. surrounding the base of each powerline support structure	A vegetation assessment to be undertaken one year post rehabilitation (during the growing season) as recommended by the terrestrial ecologist to ensure plant survival and to ensure that no AIPs are outcompeting indigenous species.	To monitor the reinstatement of vegetation. The report needs to address the following: 1. A list of species occurring within the focus areas; 2. Discuss the density of species; 4. Fixed point photo (Taking photo at specific point within focus area to identify the success of revegetation; and 5. Focus areas requiring remedial action and proposed corrective actions.	Reporting to be included as part of the annual ECO monitoring report and submitted to the competent authority.

9 CONCLUSION

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to conduct a specialist freshwater ecological assessment part of the EA and WUA application processes for the proposed 132 kV overhead powerline and 33/132kV substation development associated with the Karreebosch WEF.

During the site visit undertaken from the 25th to 28th of May 2021, several headwater episodic drainage lines (EDLs) without riparian vegetation which flow into larger ephemeral tributaries with riparian vegetation were identified. Although these episodic drainage lines cannot be classified as rivers or streams in the traditional sense, due to the lack of saturated soil and riparian vegetation, they do still function as waterways, through episodic conveyance of water. Based on the definition of a watercourse as per the National Water Act, 1998 (Act No. 36 of 1998), water does flow regularly or intermittently within these drainage lines, conveying water from the upgradient catchment area into the downgradient tributaries and the larger river systems outside the investigation area. As such, they can be considered as watercourses due to their importance for hydrological functioning and therefore enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998).

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

Table 10: Summary of results of the ecological assessment as discussed in Section 5.

Watercourse	PES	Ecoservices	EIS	REC
Episodic drainage lines associated with the Wilgebos, Tankwa and Meintjieplaas River systems	B (Largely natural with few modifications)	Intermediate (1,4)	High	REC: Category B (Largely natural with few modifications)
Ephemeral tributaries with riparian vegetation associated with the Wilgebos, Tankwa and Meintjieplaas River systems	B (Largely natural with few modifications)	Intermediate (1,5)	High	REC: Category B (Largely natural with few modifications)

The activities associated with the construction and operational phases of the proposed powerline and substation development based on the alignment and location provided respectively by the proponent, includes site preparation, excavation of foundation pits for installation of the support structures and construction activities. Direct negative impacts associated with the creation of new access roads (albeit informal jeep track style roads) to service the powerline development are expected to occur to the watercourse drivers and receptors during the construction phase. Should the recommended mitigation measures be implemented with specific mention of installing appropriate culverts or subsurface drainage within new and existing road watercourse crossings, is considered a positive long-term benefit for the maintenance and potential improvement of the hydrological functionality of the watercourses and associated downstream systems. Therefore, also with the condition that the construction and grading of the proposed access roads is undertaken during the dry periods when no surface water is present within the watercourse and the recommended mitigation measures are applied, the risk significance can be reduced to Low (with manual adjustment). Additionally, it is recommended that the support structures associated with the proposed powerline be positioned outside the delineated extent of the watercourses and its associated 32 m NEMA ZoR, and as such a Low risk significance is expected to occur. Water Use Authorisation by means of a GA in terms of Section 21(c) and (i) water uses may, therefore, potentially be obtained in consultation with the DWS. However, the DWS, as the custodian of water resources in South Africa, must be consulted with regards to the outcome of this assessment. Preference is given to substation Option 1 and thus powerline route Option 1A/1B/1C and the access roads associated thereof, since the proposed substation is located outside the GN509 ZoR and no direct or indirect impacts from substation Option 1 are expected, and the access roads associated with these route options avoid the crossing of major rivers such as the Tankwa River. It must be noted that

due to the pollution risk associated with any potential transformer leakage such as substations, substation Option 2 is not preferred as it is located in close proximity to the delineated extent of the watercourses (at least 20 m of a watercourse). Therefore, substation Option 1 should be selected for development. If for any reason Option 2 must be developed, then it must be moved to be outside of the GN509 ZoR.

It is therefore recommended that the mitigation measures as provided in this report and the good housekeeping measures as per Appendix F be implemented to prevent and direct/indirect impacts from occurring on the watercourses. None of the proposed development alternatives are considered fatally flawed.

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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 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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This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

APPENDIX B: Legislative Requirements

The Constitution of the Republic of South Africa, 1996[9]	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

[9] 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 development 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 development.

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[10]** (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

[10] 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 saturated soil".
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 of soil form (i.e. the type of soil according to a standard soil classification system), since wetlands are associated with certain soil types;
- The presence of wetland vegetation species; and
- The presence of redoximorphic soil feature, which are morphological signatures that appear in soil 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 hydromorphic soil 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 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'[11]. 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[12].

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

[11] The definition has been aligned with that used in the ISO 14001 Standard.

[12] Some risks/impacts that have low significance will however still require mitigation

"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[13] 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.

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

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 ephemeral tributaries with riparian vegetation.

RIPARIAN IHI	
Base Flows	0,0
Zero Flows	0,0
Moderate Floods	1,0
Large Floods	1,0
HYDROLOGY RATING	**0,6**
Substrate Exposure (marginal)	1,5
Substrate Exposure (non-marginal)	1,0
Invasive Alien Vegetation (marginal)	1,5
Invasive Alien Vegetation (non-marginal)	1,0
Erosion (marginal)	1,0
Erosion (non-marginal)	1,0
Physico-Chemical (marginal)	1,0
Physico-Chemical (non-marginal)	1,0
Marginal	1,5
Non-marginal	1,0
BANK STRUCTURE RATING	**1,3**
Longitudinal Connectivity	0,0
Lateral Connectivity	0,0
CONNECTIVITY RATING	**0,0**
RIPARIAN IHI %	**84,6**
RIPARIAN IHI EC	**B**
RIPARIAN CONFIDENCE	**2,9**

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

RIPARIAN IHI	
Base Flows	0,0
Zero Flows	0,0
Moderate Floods	1,0
Large Floods	1,0
HYDROLOGY RATING	**0,6**
Substrate Exposure (marginal)	1,5
Substrate Exposure (non-marginal)	1,0
Invasive Alien Vegetation (marginal)	1,5
Invasive Alien Vegetation (non-marginal)	1,0
Erosion (marginal)	1,0
Erosion (non-marginal)	1,0
Physico-Chemical (marginal)	1,0
Physico-Chemical (non-marginal)	1,0
Marginal	1,5
Non-marginal	1,0
BANK STRUCTURE RATING	**1,3**
Longitudinal Connectivity	0,0
Lateral Connectivity	0,0
CONNECTIVITY RATING	**0,0**
RIPARIAN IHI %	**84,6**
RIPARIAN IHI EC	**B**
RIPARIAN CONFIDENCE	**2,9**

Table E3: Presentation of the results of the Socio-cultural and Ecoservice provision provided by the assessed watercourses

Ecosystem service	Ephemeral rivers	Episodic drainage lines	Ephemeral tributaries
Flood attenuation	2,2	1,7	1,8
Streamflow regulation	2,2	1,6	2,2
Sediment trapping	1,6	1,6	1,8
Phosphate assimilation	1,3	1,9	1,9
Nitrate assimilation	1,3	1,7	1,7
Toxicant assimilation	1,3	1,8	1,8
Erosion control	2,0	2,1	1,8
Carbon Storage	1,0	0,8	0,8
Biodiversity maintenance	2,4	2,3	2,4
Water Supply	0,7	0,7	0,7
Harvestable resources	0,6	0,6	0,8
Cultivated foods	0,4	0,4	0,4
Cultural value	0,5	0,5	0,5
Tourism & recreation	2,0	2,0	2,5
Education & research	1,8	0,8	1,8
SUM	**21,2**	**20,3**	**22,6**
Average score	**1,4**	**1,4**	**1,5**

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

FRESHWATER FEATURE:			Episodic drainage lines	Ephemeral tributaries
Ecological Importance and Sensitivity			Score (0-4)	
Biodiversity support			**A (average)**	
			0,67	1,00
Presence of Red Data species			0	0
Populations of unique species			0	1
Migration/breeding/feeding sites			2	2
Landscape scale			**B (average)**	
			2,00	2,20
Protection status of the wetland			2	2
Protection status of the vegetation type			2	2
Regional context of the ecological integrity			2	2
Size and rarity of the wetland type/s present			2	3
Diversity of habitat types			2	2
Sensitivity of the wetland			**C (average)**	
			1,67	2,00
Sensitivity to changes in floods			2	3
Sensitivity to changes in low flows/dry season			1	1
Sensitivity to changes in water quality			2	2
ECOLOGICAL IMPORTANCE & SENSITIVITY (max of A,B or C)			**B**	**B**
Hydro-Functional Importance			**Score (0-4)**	
Regulating & supporting benefits	**Flood attenuation**		1,7	1,8
	Streamflow regulation		1,6	2,2
	Water Quality Enhancement	*Sediment trapping*	1,6	1,8
		Phosphate assimilation	1,9	1,9
		Nitrate assimilation	1,7	1,7
		Toxicant assimilation	1,8	1,8
		Erosion control	2,1	1,8
	Carbon storage		0,8	0,8
HYDRO-FUNCTIONAL IMPORTANCE (average score)			2	2
Direct Human Benefits			**Score (0-4)**	
Subsistence benefits	*Water for human use*		0,7	0,7
	Harvestable resources		0,6	0,8
	Cultivated foods		0,4	0,4
Cultural benefits	*Cultural heritage*		0,5	0,5
	Tourism and recreation		2	2,5
	Education and research		0,8	1,8
DIRECT HUMAN BENEFITS (average score)			0,83	1,12

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 dry periods when no surface water is present within the watercourses;
- As much vegetation growth as possible (of indigenous floral species) should be encouraged to protect soil;

- 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;
- All soil 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 development 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. See Table 8 above for 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 development.

	Phases	Activity	Aspect	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).	2	1	1	1	1,25	1	1	3,25	5	2	5	1	13	42,25	L	**NA**
2			• Removal of vegetation and associated disturbances to soil, and access to the site, including grading of existing informal farm roads.	2	1	1	1	1,25	1	1	3,25	5	3	5	1	14	45,5	L	**NA**
3		• Installation of the support structures (further than 32 m but within the GN509 ZoR as defined in Section 6 for the delineated watercourses) and spanning of the proposed powerline. • Construction of substation Option 2 (20 m from the delineated extent of a watercourse) within the GN 509 ZoR.	• Excavation of foundation pits for the support structures leading to stockpiling of soil; and • Potential movement of construction equipment and personnel in the areas surrounding watercourses.	2	1	1	1	1,25	1	1	3,25	5	3	5	1	14	45,5	L	**NA**
4			• Mixing and casting of concrete for foundations.	1	2	1	1	1,25	1	1	3,25	5	3	5	1	14	45,5	L	**NA**

	Phases	Activity	Aspect	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	Construction Phase	Creation of new road crossings within watercourses, involving: • Site preparation prior to construction activities including movement of construction machinery/vehicles within the watercourses and removal of vegetation; • Ground-breaking and excavations within/adjacent to the watercourses; and; • Placement of culvert structures atop concrete base.	• Creation of new road crossings within the Tankwa River associated with the proposed development	3	3	5	3	**3,5**	1	1	**5,5**	5	3	5	1	**14**	77	M	**55 (-21) L**
6			• Creation of new road crossings within the ephemeral tributaries with riparian vegetation and episodic drainage lines with no riparian vegetation associated with the proposed development	3	2	5	3	3.25	1	1	5.25	4	2	5	1	12	63	M	**55 (-7) L**
7		Upgrading of existing access roads within watercourses associated with the Tankwa River system, Wilgebos River system and Meintjiesplaas River system: • Excavation within the watercourse for the removal of existing infrastructure and casting of a base (where applicable); • Placement of culvert structures atop concrete base; and • Upgrading of existing roads within close proximity (within 32 m) to a watercourse.	• Site preparation prior to construction activities; • Removal of vegetation and associated disturbances to soil; • Disturbances to soil of the watercourses; • Movement of construction machinery/ vehicles within the watercourses; and • Possible spills / leaks from construction vehicles.	3	2	4	2	2.75	1	1	4.75	4	2	5	1	12	57	M	**55 (-1) L**

	Phases	Activity	Aspect	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	
8	OPERATIONAL PHASE	Operation and maintenance of the powerline	• Potential indiscriminate movement of maintenance vehicles within the watercourses or within close proximity to the watercourses; and • Increased risk of sedimentation and/or hydrocarbons entering the watercourses via stormwater runoff from the access roads.	1	1	1	1	1	1	1	3	3	3	5	1	12	36	L	**NA**
9		Operation and maintenance of the proposed main access road and other existing roads traversing watercourses (where applicable).	• Concentrated runoff entering the watercourses; and • Disturbance to the vegetation within and surrounding the watercourses.	3	1	3	3	2,5	1	1	4,5	5	1	5	1	12	54	L	**NA**

APPENDIX G: Details, Expertise and Curriculum Vitae of Specialists

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

Rabia Mathakutha	MSc Plant Sciences (University of Pretoria)
Christel du Preez	MSc Environmental Sciences (North West University)
Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)
P da Cruz	BA (Hons) Geography and Environmental Studies (University of the Witwatersrand)

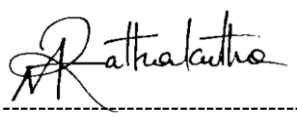
1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

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 Sciences (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



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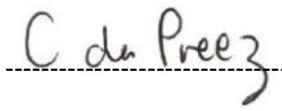
1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, 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

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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, P da Cruz, 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	Freshwater Ecologist
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 (WCF)
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

Tools for Wetland Assessment (Rhodes University)	2021
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, Western Cape, Northern Cape, Eastern Cape
Africa – Lesotho, Mozambique

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 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

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF PAUL DA CRUZ

PERSONAL DETAILS

Position in Company	Senior Ecologist
Joined SAS Environmental Group of Companies	2022

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Certificated Scientist at South African Council for Natural Scientific Professions (SACNASP)
Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA)
Member of the South African Wetland Society (SAWS)

EDUCATION

Qualifications

BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand)	1998
BA (Geography) (University of the Witwatersrand)	1997

Short Courses

Taxonomy of Wetland Plants (Water Research Commission)	2017
Advanced Grass Identification (Frits van Outshoorn)	2010
Grass Identification (Frits van Outshoorn),	2009
Soil Form Classification and Wetland Delineation; (TerraSoil Science)	2008

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana

DEVELOPMENT SECTORS OF EXPERIENCE

1. Renewable energy (Wind and solar)
2. Linear developments (energy transmission, telecommunication, pipelines, roads, border infrastructure)
3. Nature Conservation and Ecotourism Development
4. Commercial development
5. Residential development
6. Environmental and Development Planning and Strategic Assessment
7. Industrial/chemical; Non-renewable power Generation

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- EIA / BA Applications
- Environmental Authorisation Amendments
- EMPr Compilation
- Environmental Compliance Monitoring (Environmental Auditing)
- Environmental Screening Assessments and Listing Notice 3 Trigger Identification / Mapping
- Strategic Environmental Assessments and Environmental Management Frameworks
- EIA / Specialist Study Peer Review

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Assessments in support of Environmental Screening Assessments, Precinct Planning & SEA
- Wetland Construction (Compliance) Monitoring

Biodiversity Assessments

- Avifaunal Assessments
- Strategic Biodiversity Assessment

Visual Impact Assessment

- Visual Impact Assessments

GIS / Spatial Analysis

- GIS Spatial Analysis and Listing Notice 3 mapping