Aquatic Biodiversity Impact Assessment

AQUATIC SPECIALIST STUDY:

Gamma Gridline Corridor near Beaufort West in the Western and Northern Cape Provinces

Report prepared for:

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August 2022

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SPECIALIST DECLARATION

I, **Antonia Belcher**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: 

Name of Specialist: Antonia Belcher

Date: 22 August 2022

LIST OF ABBREVIATIONS

BA	Basic Assessment
BGCMA	Breede Gouritz Catchment Management Agency
CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DWA(F)	Department of Water Affairs (and Forestry)
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EI&ES	Ecological Importance and Ecological Sensitivity
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
GA	General Authorisation
GIS	Global Information System
GN	Government Notice
ha	hectare
HI	Habitat Integrity
IUCN	International Union for Conservation of Nature
kW	kilowatt
MMP	Maintenance Management Plan
MW	megawatt
ONA	Other Natural Areas
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Area
NWA	National Water Act
PA	Protected Area
PES	Present Ecological Status
REC	Recommended Ecological Condition
REDZ	Renewable Energy Development Zone
SANBI	South African National Biodiversity Institute
SEA	Strategic Environmental Assessment
WCBSP	Western Cape Biodiversity Spatial Plan
WMA	Water Management Area
WUL	Water Use License
WULA	Water Use License Application

GLOSSARY

DEFINITIONS	
Catchment	The area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points
Critical Biodiversity Areas	Areas that are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure.
Ecological Importance and Sensitivity	The rating of any given wetland or river reach that provides an indication of the ecological importance of the aquatic system using criteria such as conservation needy habitat or species, protected ecosystems or unique habitat observed. The sensitivity is then derived by assessing the resilience the habitat exhibits under stress as a result of changes in flow or water quality.
Ecological Support Areas	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of Protected Areas or Critical Biodiversity Areas and are often vital for delivering ecosystem services.
Other Natural Areas	Areas that have not been identified as a priority in the biodiversity spatial plans but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for meeting biodiversity targets, they are still an important part of the natural ecosystem.
Present Ecological State	The current ecological condition of a watercourse as measured against the deviation from the natural or pre-impacted condition of the system
Protected Areas	Areas that are formally protected by law and recognised in terms of the National Environmental Management: Protected Areas Act. This includes gazetted private Nature Reserves and Protected Environments concluded via a stewardship programme.
Riparian habitat	The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, 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
River FEPA	Rivers currently in a good condition (A or B ecological category) that have been identified to achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species. They should remain in a good condition to contribute to the biodiversity goals of the country.
Upstream Management Areas	Sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream River FEPAs
Valley-bottom wetlands	Wetlands located on the valley floors that are mostly fed by overland inflow, hillslope interflow and groundwater. They may be channelled or un-channelled.
Watercourse	(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 of DWS may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks;
Water management area	An area established as a management unit in the national water resource strategy within which a catchment management agency will conduct the protection, use, development, conservation, management and control of water resources
Wetland	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.
Wetland FEPA	Wetlands currently in a good condition (A or B ecological category) that have been identified to achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species. They should remain in a good condition in order to contribute to the biodiversity goals of the country.

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1. INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

Red Cap Energy (Pty) Ltd ('Red Cap') has received Environmental Authorisation for three wind farms and for a 400 kV grid corridor, collectively known as Nuweveld Wind Farm Development, located close to Beaufort West in the Western Cape Province. The approved grid corridor links the Nuweveld projects to the Droërivier Substation ~65 km to the south of the wind farms (refer to Figure 1).

Red Cap is also proposing to develop four additional wind farms and associated grid connections, known as the Hoogland Projects. The Hoogland Wind Farms are located north and south of the Nuweveld complex, and the Hoogland grid connections will terminate at the Nuweveld Collector Substation (refer to Figure 1) and are the subject of separate applications.

To expand the capacity of Eskom grid and improve the functionality of the grid in the area, an additional 400 kV grid connection is required from the Nuweveld Collector Substation to the Gamma Substation, ~90 km to the east (the Gamma Gridline, Gamma Grid Connection or project). This additional line will improve functionality by creating a 400 kV ring-line between the Droërivier Substation, Gamma Substation and Nuweveld projects, and create opportunities for other wind farm developments (such as the proposed Hoogland projects) to tie-into the grid either at the Nuweveld Collector Substation or along the new 400 kV line. As such, the proposed new line will allow Eskom to release further renewable energy potential in an area that is becoming a renewable energy development node in South Africa, thereby helping to alleviate South Africa's power crisis.

A 300 m x 300 m expansion to the Gamma Substation (including transformers and other standard substation infrastructure) and access tracks for construction and maintenance of the line will also be required and form components of the project.

This Aquatic Specialist Assessment of the Gamma Gridline Corridor (or the study area or site - see Figure 1) is intended to inform an application for Environmental Authorisation for the proposed Gamma Grid Connection The Gridline Corridor falls within a strategic transmission corridor.

1.2 Terms of Reference

The terms of reference for the Aquatic Impact Assessment are as follows:

a) Undertake and manage the aquatic impact assessment (including the required site verification report) for the Gamma Grid Corridor.

b) Compile the DWS risk assessment matrix for the Gamma Grid Connection.

The compilation of this Specialist Impact Assessment Report is in compliance with the NEMA EIA Regulations 2014, including specific requirements for a Site Sensitivity Verification Report and the Protocol for an Aquatic Biodiversity Specialist Assessment.

1.3 Approach and Methodology

This report was informed by a combination of desktop assessments of existing freshwater ecosystem information for the study area and surrounding catchments, as well as by a more detailed field assessment of the freshwater features on the various farm portions that comprise the study area.

The site was visited for two days in March 2022. No additional site visits were deemed necessary. During the field visits, the characterisation and integrity assessments of the freshwater features were undertaken. Mapping of the freshwater features was undertaken using a GPS Tracker and mapped in PlanetGIS and Google Earth Professional.

The following techniques and methodologies were utilised to undertake this study:

1 The guideline document, "A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas" document, as published by DWAF (2005), was followed for the delineation of the wetland areas. According to the delineation procedure, the wetlands were delineated by considering the following wetland indicators: terrain unit indicator; soil form indicator; soil wetness indicator; and vegetation indicator;
2 The wetlands were subsequently classified according to their hydro-geomorphic determinants based on a classification system devised by Kotze *et al* (2004) and SANBI (2009). Notes were made on the levels of degradation in the wetlands based on field experience and a general understanding of the types of systems present;
3 A Present Ecological State (PES) assessment was conducted for each hydro-geomorphic wetland unit identified and delineated within the study area;
4 The functional wetland assessment technique, WET-EcoServices, developed by Kotze *et al* (2009), was used to indicate the ecological benefits and services provided by delineated wetland habitats. This technique consists of assessing a combination of desktop and infield criteria to identify the importance and level of functioning of the wetland units within the landscape;
5 The present ecological condition of the watercourses was determined using national River Health Programme methodologies as described in this report;
6 The ecological importance and ecological sensitivity (EI&ES) assessment of the wetlands and watercourses were conducted according to the guidelines as developed by DWAF (1999); and
7 Recommendations are made with respect to the adoption of buffer zones within the development site based on the river and wetlands' functioning and site characteristics.

1.4 Assumptions and Limitations

Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. The methodologies and techniques used in this assessment have been developed nationally and are typically of a rapid nature, as is required for this freshwater impact assessment.

Given the topography at the site, it was not possible to cover the site in a high level of detail. Extrapolation of the areas ground-truthed to those not covered was thus done using the latest available aerial imagery for the site. No baseline long-term monitoring was undertaken as part of this assessment. In addition, there is very little existing information available for the aquatic features within the study area. Data was utilised for adjacent aquatic ecosystems, and where available, more detailed assessments were used for the aquatic features within the area.

The nature of the proposed activities, however, also allows them to be placed some distance from any mapped aquatic features such that the significance of likely impacts would be very low. It is usually the associated infrastructure that has the potential to have a greater impact on the aquatic features. The impacts of access tracks and powerlines on the aquatic features are, however, well understood and can be effectively mitigated to ensure the impacts remain low. The preferred mitigation measure is to limit the disturbance to aquatic features as far as possible by avoiding and minimising the number of crossings and providing adequate buffer areas. This will also ensure that the cumulative impacts will remain low.

The level of aquatic assessment undertaken was considered to be adequate for this study. The assessment was undertaken in March however there has been recent rainfall in the area and suffient water was present in the rivers to allow for the required level of assessment for this study. No further fieldwork will thus be required if the proposed project activities remain outside of the delineated aquatic features and the recommended buffers.

1.5 Source of Information

Information used in this freshwater impact assessment includes:

- The satellite image used as a background to all maps was obtained from PlanetGIS and Google Earth Professional;
- The SANBI Biodiversity GIS, CapeFarmMapper and Freshwater Biodiversity Information System websites were consulted to identify any constraints in terms of geology, soils, natural vegetation cover, fine-scale biodiversity conservation mapping as well as possible freshwater features mapped in the Freshwater Ecosystem Priority Areas maps;
- Available PES and EI&ES data from the watercourses in the area was obtained from the national Desktop PES EI ES Assessment undertaken by DWA in 2012;
- Water Resources 2012 and climate data from the South African Atlas of Climatology and Agrohydrology (2009, RE Schulze) were utilised to determine the runoff; and
- Project information was sourced from the client.

2. DESCRIPTION OF PROJECT

The Gridline Corridor crosses the upper catchment of the Brak and Sout Rivers, which are tributaries of the Buffels / Kariega Rivers in the Groot / Gamtoos River System. The rivers within the area lie within the Fish to Tsitsikamma Water Management Area, within Quaternary Catchment L21A. Figure 1 shows the main rivers and the tertiary catchments within the wider study area.

The Gamma substation is located 90 km east of the Nuweveld collector substation, close to Victoria West in the Northern Cape Province. The Gamma Gridline Corridor is proposed to consist of the development of one ±110 km 400 kV gridline connecting the approved Nuweveld collector substation to the existing Gamma substation. An upgrade and expansion to the Gamma substation also forms a component of the project.

Lattice-type pylons will be required for the 400 kV overhead line. Different lattice-type pylons will be required along the gridline depending on the topography and span characteristics. The majority of the pylons will be cross-rope suspension towers, with self-supporting towers only being used at turn points, at steep slopes or where a very large distance needs to be spanned.

Existing access roads and tracks (upgraded to ±2-4 m wide where needed) will be used for construction and maintenance as far as possible and new access tracks would also be ±2-4m wide. These tracks would avoid steep areas and drainage lines and rather use existing roads/tracks to cross these features as far as possible, however, crossing at certain points will be unavoidable.

Access tracks would be upgraded or established during the construction phase to enable access for the construction of the pylons and stringing of the lines. In certain areas, such as when the line spans over a sensitive watercourse, goes up very steep slopes, or spans an ecologically sensitive area, the service track will not run parallel to the line but will be routed to access the specific pylons (where possible). These tracks would not be rehabilitated as they would continue to provide access for maintenance and management purposes and will be maintained throughout the life of the project.

It is conservatively assumed that the total area required for the access tracks is up to 46 ha (i.e. assuming the new tracks are required for the entire route of the powerline).

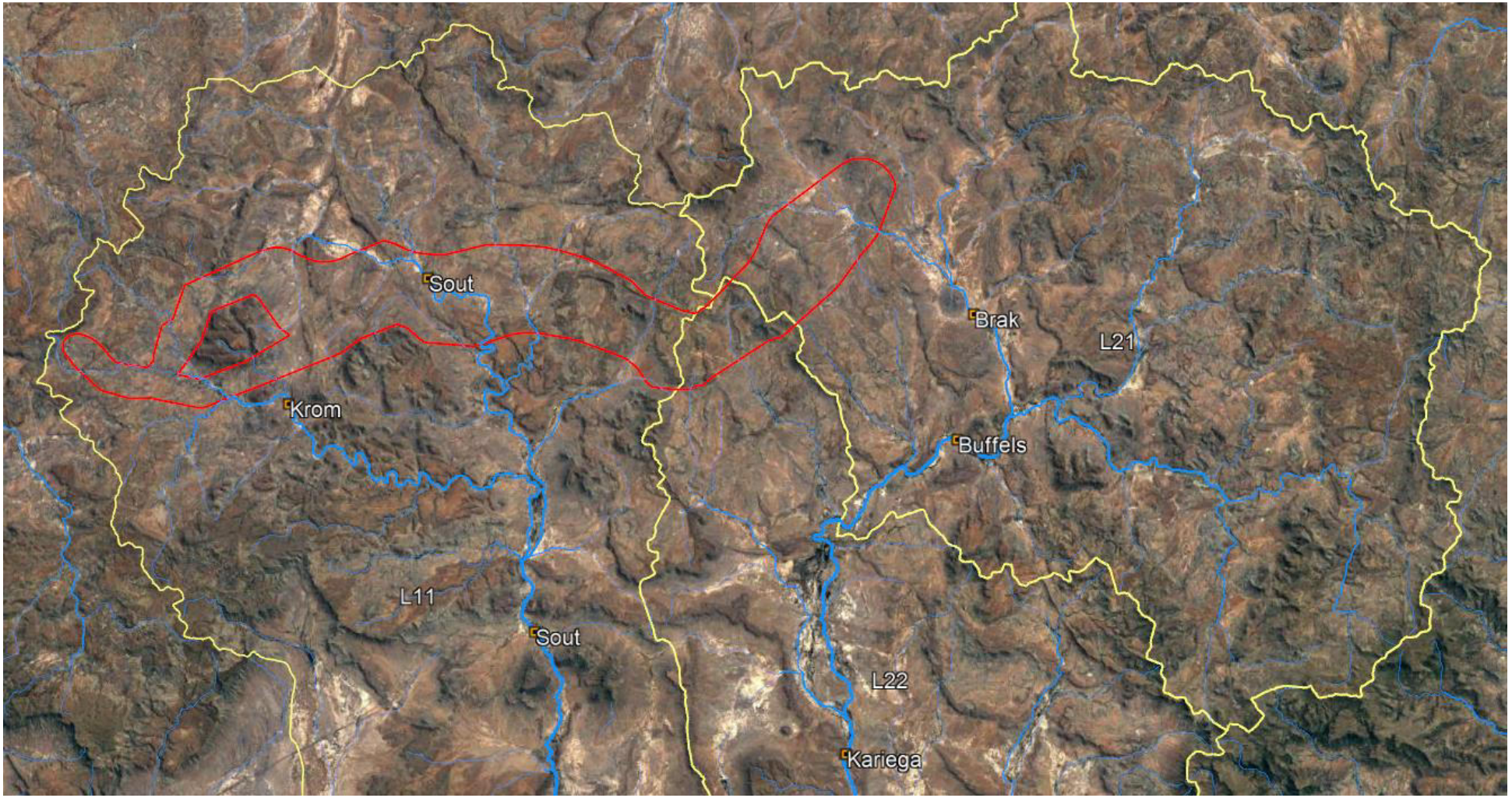


Figure 1. Google Earth image showing the proposed Gamma Gridline Corridor in relation to the main rivers and the tertiary catchments in the area.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Topography

The proposed grid connection is located north of Beaufort West along the border between the Western and Northern Cape. The proposed powerline would cross the upper reaches of several tributaries of the Brak and Sout Rivers in the Groot / Gamtoos River System (Figure 2). The rivers drain towards the south, with the Brak River draining the eastern portion of the study site and the Sout River draining the western portion. The Brak River drains into the Buffels River, which joins the Sout River to form the Kariega River, which feeds into the Groot / Gamtoos River. On the western extent of the site, the Kareespruit and the Tierhoekspruit drain southwards to the Sout and Buffels Tributaries of the Groot River, respectively.

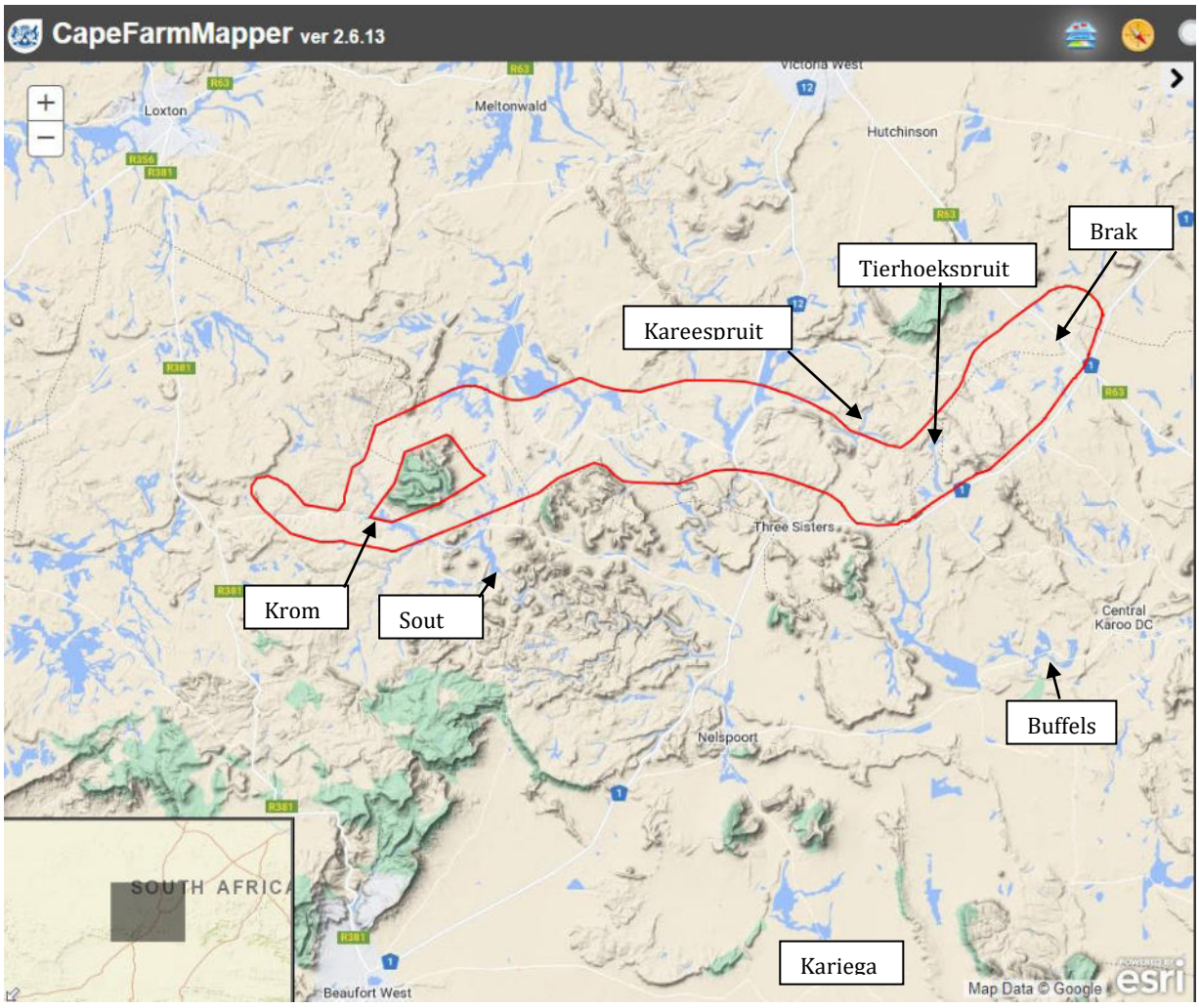


Figure 2. Relief map for the area, showing the topography and main watercourses and the location of the grid corridor (CapeFarmMapper, 2021)

Table 1 provides an overview and summary of the water resource information for the study area.

Table 1: Key water resources information for the proposed project Gamma Gridline Corridor

Descriptor	Name / details	Notes
Water Management Area	Fish Tsitsikamma WMA	
Catchment Area	Krom and Kookfonteinspruit, tributaries of the Sout River Brak, Skietkuilspruit, Waaifonteinspruit and Tierhoekspruit, tributaries of Kariega River	Upper portion of the Groot/ Gamtoos Catchment
Tertiary Catchment	Sout River (L11) Kariega (L21 and L22)	
Present Ecological State	Brak, Krom, Kookfonteinspruit and Waaifonteinspruit: C (moderately modified) Sout, Skietkuilspruit, Brak and Tierhoekspruit: B (largely natural)	DWS (2012)
Ecological Importance and Ecological Sensitivity	Brak, Teirhoekspruit and Waaifonteinspruit- High EI and Moderate ES All other rivers Moderate EI and ES	
Type of water resources	Rivers, ephemeral streams and valley floor / floodplain wetlands	

3.2 Climate and Hydrology

The study area experiences a low rainfall of 241mm per annum. Rainfall falls mostly in late summer/autumn, with June being the highest rainfall month on average. Winters (June – August) are typically colder than summers which experience average daily highs of 20°C (December – February) (Figure 3). Flow in the smaller tributaries in the upper catchment tends to be episodic (Figure 4), with very little to no flow in the rivers for much of the year. Flow typically only occurs for a short period following localised rainfall. These rainfall events tend to mostly occur in the higher rainfall months in late summer and into autumn. When flow occurs in the watercourses, it occurs as a high-flow event. This flow pattern is unlikely to change significantly due to longer-term climatic changes. The flow nature does, however make erosion control measures in the watercourses, particularly on the slopes, essential mitigation.

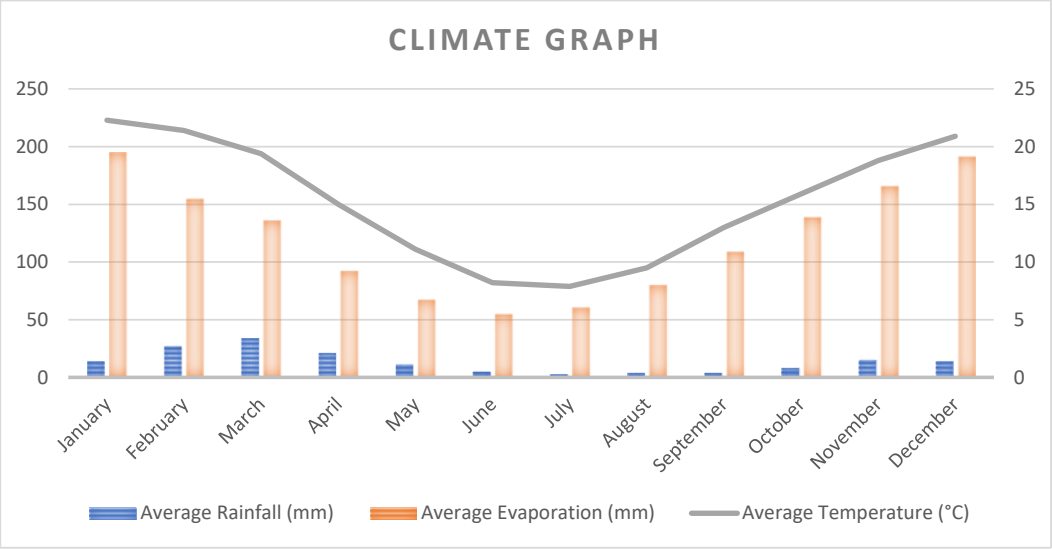


Figure 3. Average monthly rainfall, evaporation and temperatures for the study area, collected between 1950 and 2000 (Schulze, 2009)

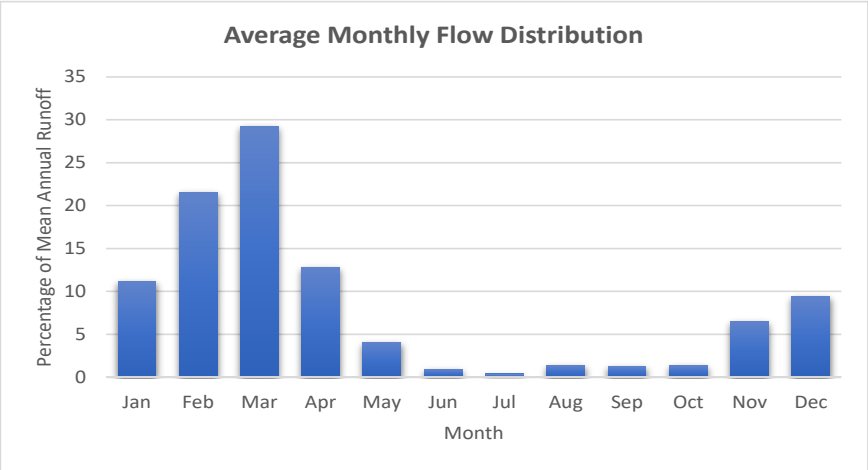


Figure 4. Monthly flow distribution within the rivers in the study area, with the month flow shown as a percentage of the natural mean annual runoff (nMAR) for the catchment

3.3 Geology and Soils

The underlying geology in the area comprises mudstone and shale of the Beaufort Group and the Karoo System, overlain by alluvial deposits and with dolerite intrusions in places that occur within the area. The soils are usually shallow on a hard or weathering rock in higher-lying areas. Within the valley floor of the larger rivers, soils have a marked clay accumulation and moderate to high erodibility.

3.4 Vegetation

Under unmodified conditions, four vegetation types occur across the wider study area. These are primarily Eastern Upper Karoo (Least Threatened) with bands of Upper Karoo Hardeveld (Least Threatened) (Figure 6). Southern Karoo Riviere vegetation occurs along the larger rivers in the centre of the study area. Gamka Karoo occurs largely to the south of the corridor. The natural vegetation reflects the varied topography and associated geology of the area. Upper Karoo Hardeveld occurs on all the koppies, tabletops and higher-lying areas**,** while Eastern Upper Karoo occurs in the valleys and lower slopes, and Southern Karoo Riviere within the main river valleys**.**

The Southern Karoo Riviere vegetation comprises largely of *Vachellia karroo* or *Tamarix usneoides* thickets fringed by tall *Salsola aphylla*-dominated shrubland and comprising of *Stipagrostis namaquensis* grass within the sandy drainage lines. Most of the vegetation associated with the aquatic features within the valley floors in the study area is still largely natural and comprises a mix of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Euclea undulata*, *Melianthus comosus, Lycium* spp. and *Asparagus striatus* within the riparian zones. Patches of common *Phragmites australis* reeds, grasses such as *Stipagrostis namaquensis* with *Juncus* rushes within the instream habitat. There is a low density of invasive alien plants such as *Eucalyptus* and pepper trees (*Schinus molle*) occurring in the more disturbed aquatic habitats.

3.5 Biodiversity Conservation Value

The Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool map for the Aquatic Biodiversity Combined Sensitivity at the site indicates most of the wider area to be of low sensitivity, with only the wide valley floor wetlands associated with the main channel of the larger rivers mapped as being of very high sensitivity (Figure 5).

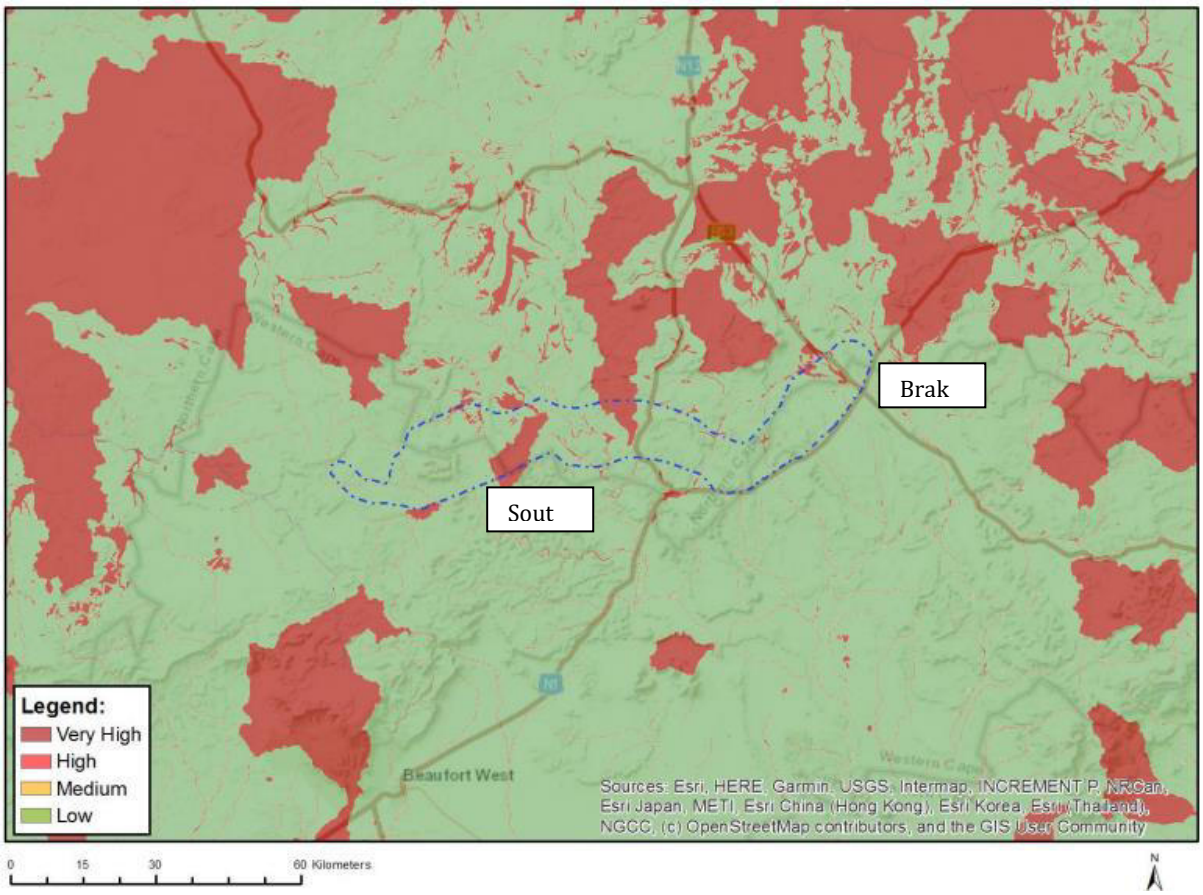


Figure 5. DFFE Screening Tool mapping of the area for Aquatic Biodiversity Combined Sensitivity

There are three freshwater biodiversity conservation mapping initiatives of relevance to the study area because the site is split over two provinces: the national Freshwater Ecosystem Priority Areas (FEPAs), the 2017 Western Cape Biodiversity Spatial Plan (WCBSP) and the 2016 Northern Cape Critical Biodiversity Area.

FEPAs are intended to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for serving ecosystems and associated biodiversity of rivers, wetlands and estuaries. The only FEPA River Subcatchments in the study area (green areas in Figure 7) are the Wagenaarskraal Tributary of the Sout River and the Sout River itself, as well as the Upper Brak River. The downstream Brak River and its tributaries are mapped as an Upstream Catchment. The goal for River FEPAs is that they should not be allowed to degrade but should be retained in a near natural condition or rehabilitated. There are

several instream wetland areas within the channel of the larger watercourses, particularly in the Sout River System, that have been mapped as FEPA Wetlands (Upper Nama Karoo Channelled and Unchanneled valley-bottom wetlands).

The 2017 WCBSP used available land cover data to identify areas of potential biodiversity importance. The use of land cover data means that data collected by a site visit is still required to confirm the ecological condition of the area. The WCBSP mapping comprises the following categories:

- CBA1- Critical Biodiversity Areas likely to be in a natural condition (terrestrial, forest, river, estuary and wetland);
- CBA2 – Potentially degraded Critical Biodiversity Areas or those that contain secondary vegetation (terrestrial and aquatic);
- ESA1 – Natural or near natural Ecological Support Areas (terrestrial and aquatic);
- ESA2 – Ecological Support Areas degraded and require restoration where feasible; and
- ONA – Other Natural Areas have not been identified as a priority to meet biodiversity targets.

Within the WCBSP the watercourses are all mapped as aquatic ESAs (ESA1). Very limited aquatic ESAs (ESA2) occur only where there is localised disturbance within the watercourses, such as at the track/road crossings. Within the terrestrial CBAs, the watercourses have also been mapped as aquatic CBAs. This relates to the Skietkuilspruit, Tierhoekspruit and Krom Rivers. Within the Northern Cape CBA mapping of 2016, the larger Sout River Catchment is mapped as a terrestrial CBA and the rivers outside of this area as aquatic ESAs. The rivers provide important ecological corridors within the landscape.

3.6 Aquatic Habitat and Species of Concern

The watercourses in the study area are non-perennial, however, some rock pools and dams are likely to contain water for most of the year. As a result, no indigenous fishes occur for most of the river systems, with some indigenous fish, such as smallscale redfin *Psuedobarbus asper* (vulnerable), moggel *Labeobarbus umbratus* (least concern) and chubbyhead barb *Barbus anoplus* (least concern), occurring in the larger rivers where there are deep pools that contain water through the dry season.

The amphibian diversity within the study area is also likely to be relatively low. No species of conservation concern are thus known to occur in the study area from an aquatic perspective. The amphibian species likely to be present are quite widespread and of low conservation concern. These include the Karoo Dainty Frog *Cacosternum karooicum* (Data Deficient), Poynton's River Frog *Amietia poyntoni*, the Cape Sand Frog, *Tomopterna delalandii,* Pygmy Toad *Poyntonophrynus vertebralis* and the Karoo Toad, *Vandijkophrynus gariepensis*. The latter two amphibian species are listed as "Not Threatened".

A faunal species potentially in the area and associated with the watercourses in the landscape is the Riverine Rabbit which is listed as Critically Endangered. The habitat preference of Riverine Rabbits is alluvial seasonal watercourses, browsing on *Pteronia erythrochaetha, Kochia pubescens, Salsola glabrescens* and Mesembryanthemaceae. They are unable to survive on heavily overgrazed or agriculturally transformed habitats. A dedicated Riverine Rabbit species assessment has been undertaken for the project by the terrestrial ecologist.

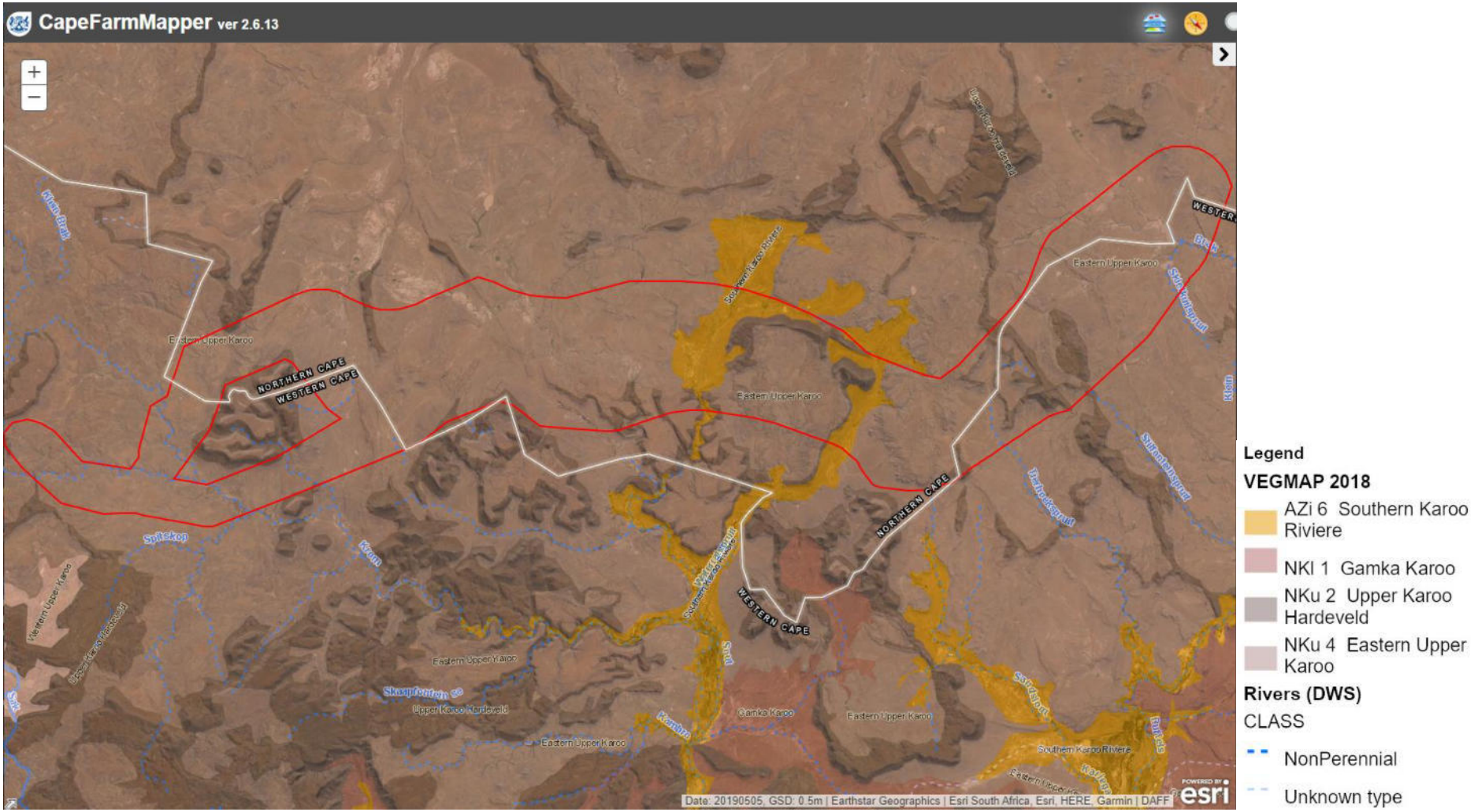


Figure 6. National Vegetation Map (2018 VegMap) for the study area (red outlined area) (CapeFarmMapper, 2022)

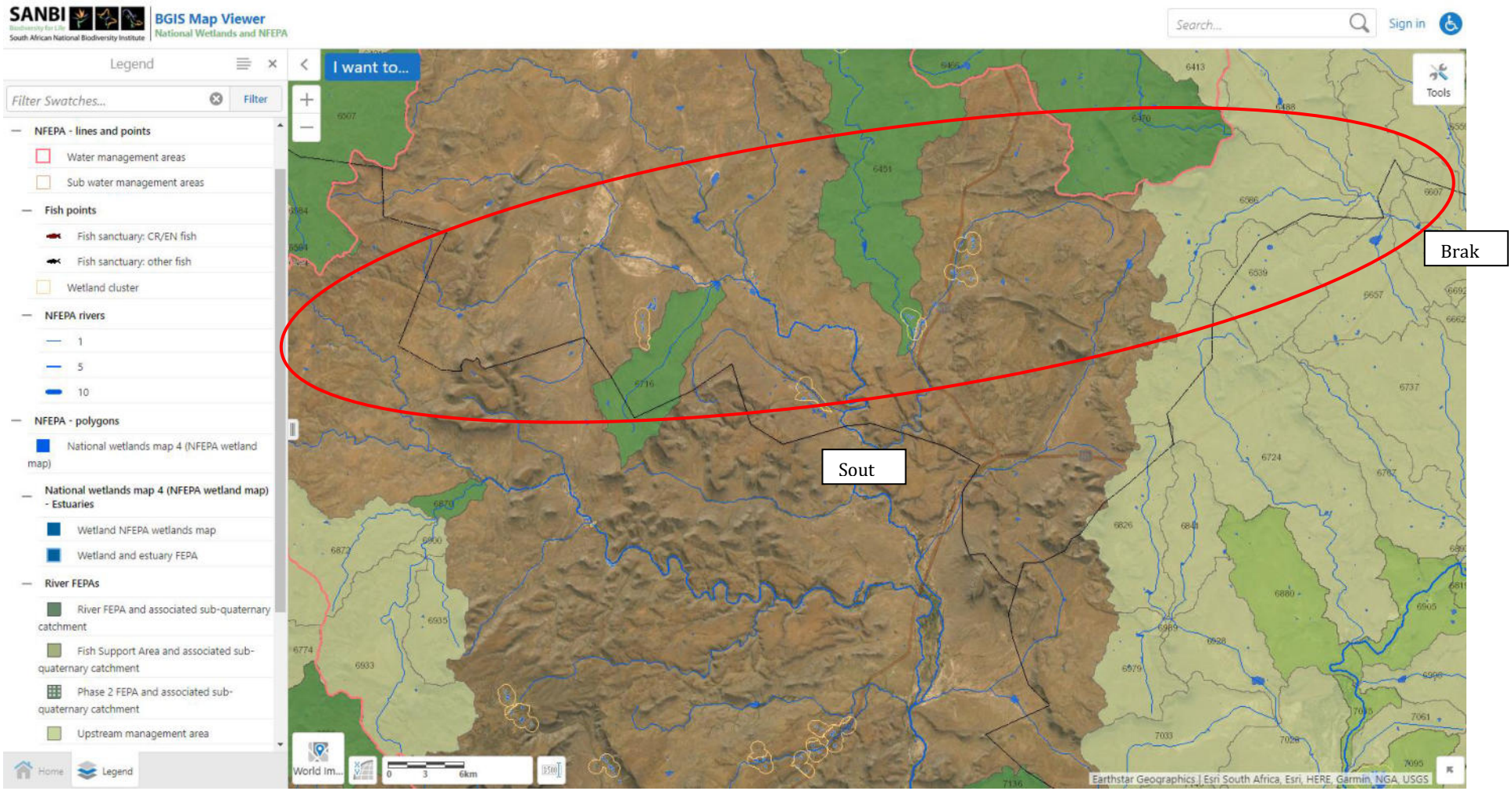


Figure 7. National Freshwater Ecosystem Priority Areas for the study area (red oval) (SANBI Biodiversity GIS, 2022)

Figure 8. The 2017 Western Cape Biodiversity Spatial Plan and National Wetland Map version 5 for the study area (CapeFarmMapper, 2022)

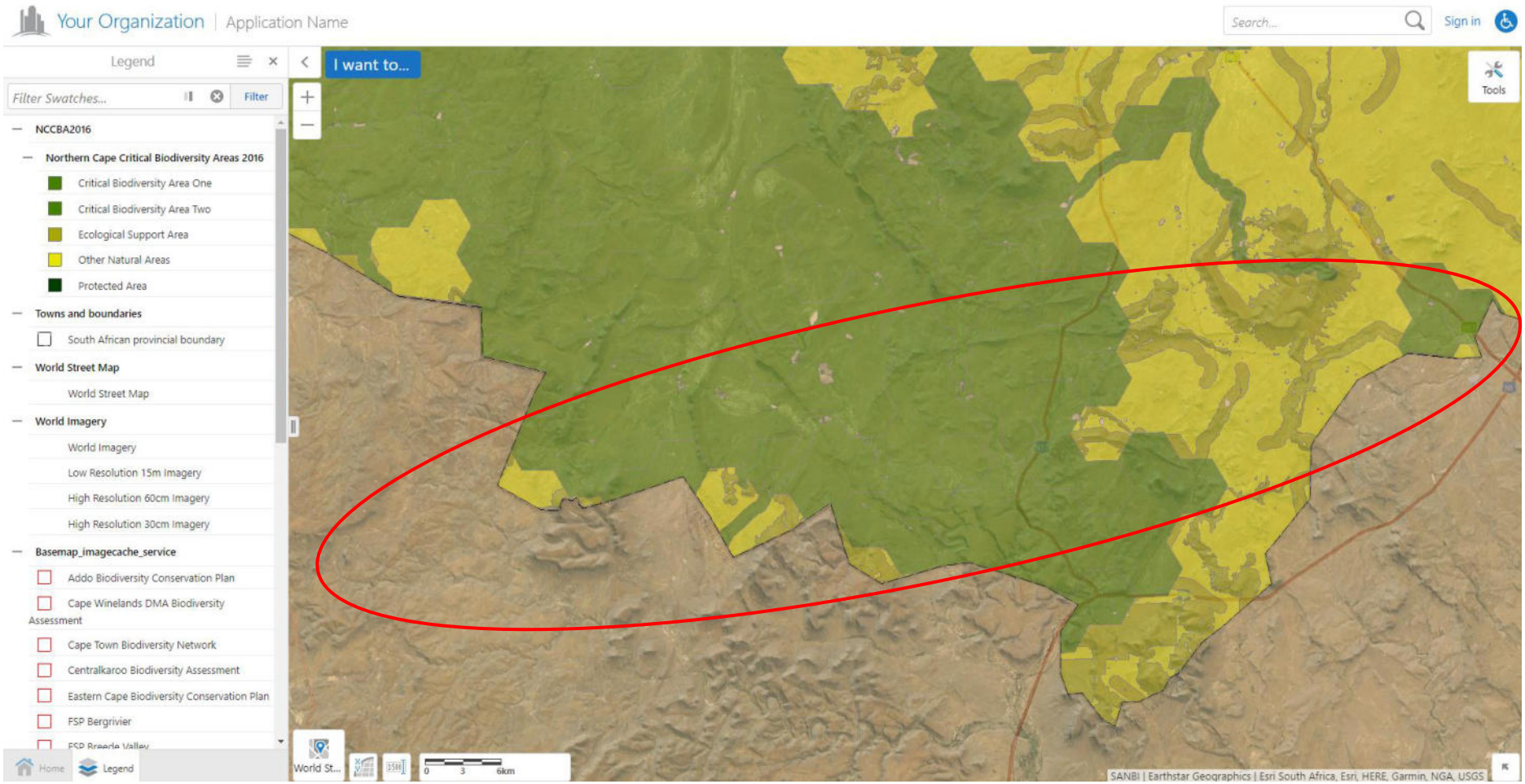


Figure 9. The 2016 Northern Cape Critical Biodiversity Areas for the study area (red outlined area) (SANBI Biodiversity GIS, 2022)

4. APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The proposed activity needs to take cognizance of the legislative requirements, policies, strategies, guidelines and principles of the relevant regulatory documents such as the National Water Act (NWA) and the National Environmental Management Act (NEMA).

4.1 The National Environmental Management Act (Act No. 107 of 1998)

NEMA is the overarching piece of legislation for environmental management in South Africa and includes provisions that must be considered to give effect to the general objectives of integrated environmental management.

Chapter Seven of the NEMA states that:

"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment".

The Act also clearly states that the landowner, or the person using or controlling the land, is responsible for taking measures to control and rectify any degradation. These may include measures to:

"(a) investigate, assess and evaluate the impact on the environment;

(b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment:

(c) cease, modify or control any act, activity or process causing the pollution or degradation:

(d) contain or prevent the movement of pollutants or degradation: or

(e) eliminate any source of pollution or degradation: or

(f) remedy the effects of the pollution or degradation."

4.2 NEMA Environmental Impact Assessment Regulations, 2014, as amended

NEMA provides for the identification of activities that will impact the environment in terms of Section 24. These activities were promulgated in terms of Government Notice No. R. 324, 325 and 327, dated 4 December 2014, as amended, and requires environmental authorisation. The impacts of the listed activities must be investigated, assessed and reported to the competent authority before authorisation to commence with such listed activities can be granted.

4.3 National Water Act, 1998 (Act No. 36 of 1998)

The purpose of the National Water Act, 1998 (NWA) is to provide a framework for the equitable allocation and sustainable management of water resources. Both surface and groundwater sources are defined by the Act as national resources which cannot be owned by any individual and rights which are not automatically coupled to land rights but for which prospective users must apply for authorisation and register as users. The NWA also provides for measures to prevent, control and remedy the pollution of surface and groundwater sources.

The Act aims to regulate the use of water and activities (as defined in Part 4, Section 21 of the NWA), which may impact water resources through the categorisation of 'listed water uses' encompassing water abstraction and flow attenuation within catchments as well as the potential contamination of water resources, where the DWS is the administering body in this regard. Defined water use activities require the approval of DWS in the form of a General Authorisation (GA) or WUL. There are restrictions on the extent and scale of listed activities for which General Authorisations apply.

Section 22(3) of the NWA allows for a responsible authority (DWS) to dispense with the requirement for a WUL if it is satisfied that the purpose of the Act will be met by the grant of a licence, permit or authorisation under any other law.

4.3.1 Regulations requiring that a water user be registered, GN R.1352 (1999)

Regulations requiring the registration of water users were promulgated by the Minister of Water Affairs in terms of provision made in Section 26(1)(c), read together with Section 69 of the National Water Act, 1998. Section 26(1)(c) of the Act allows for registration of all water uses, including existing lawful water use in terms of Section 34(2). Section 29(1)(b)(vi) also states that in the case of a GA, the responsible authority may attach a condition requiring the registration of such water use. The Regulations (Art. 3) oblige any water user as defined under Section 21 of the Act to register such use with the responsible authority and effectively to apply for a Registration Certificate as contemplated under Art. 7(1) of the Regulations.

4.3.2 General Authorisations in terms of Section. 39 of the NWA

According to the preamble to Part 6 of the NWA, 1998, "*This Part established a procedure to enable a responsible authority, after public consultation, to permit the use of water by publishing general authorisations in the Gazette*…" and further states that "*The use of water under a general authorisation does not require a licence until the general authorisation is revoked, in which case licensing will be necessary*…"

The GAs for Section 21 (c) and (i) water uses (impeding or diverting flow or changing the bed, banks or characteristics of a watercourse) as defined under the NWA were revised in 2016 (Government Notice R509 of 2016). The proposed works associated with the Gamma Gridline within, or adjacent to, the wetland areas and river channels are likely to change the characteristics of the associated freshwater ecosystems and may therefore require authorization. Determining if a water use licence is

required for these water uses is now associated with the risk of degrading the ecological status of a watercourse. A low risk of impact could be authorised in terms of a GA. A risk assessment has been undertaken for the new proposed grid connection and is included in this report (see Section 7.7).

5. ECOLOGICAL ASSESSMENT OF THE AQUATIC FEATURES WITHIN THE STUDY AREA

This section comprises a description of the aquatic ecosystems within the study area as well as an assessment of their present ecological condition and their ecological importance and ecological sensitivity. The aquatic features within the study area consist of the upper reaches of:

- Buffels River tributaries: the Brak River, Gabrielspruit, Waaihoekspruit, Tierhoekspruit and Skietspruit,
- Sout River and its tributaries, the Krom and Kareespruit Rivers and their lesser, unnamed tributaries, as well as
- Valley bottom/floodplain wetlands associated with larger watercourses and some small dams.

The Present Ecological Status (PES) of the rivers and tributaries was determined using Habitat Integrity (HI) Assessments and the Site Characterisation information. The ecological importance and sensitivity of the rivers were also assessed. The patches of valley bottom/floor wetland areas are closely associated with the rivers and thus have been included in the rivers' assessments.

5.1. Description of Aquatic Features

Buffels River Tributaries

The Brak River is the main tributary of the Buffels River that crosses the eastern extent of the study area. It has a wide floodplain but appears to have a highly seasonal to episodic flow. The river flows southwards to drain into the Buffels/Kariega Rivers in the Groot/Gamtoos River System. Several minor tributaries of the river drain the hilltops into large valley floor and floodplain wetlands associated with the main river immediately to the west of the Gamma Substation. The mainstem of the river is in a moderately modified ecological condition with some flow modification and disturbance of habitat within its upper catchment. The tributaries on the hillslopes are all mostly still in a largely natural ecological condition.

The river and its tributaries within the site are all mapped as aquatic ESAs. The river lies within an Upstream FEPA River Sub-Catchment. The Tierhoekspruit and Waaihoekspruit tributaries of the Buffels River in the Groot / Gamtoos River System lie in the central portion of the study area. These rivers originate as smaller streams on the hillslopes where they are still in a natural ecological condition with little to no disturbance except for farm roads and Eskom powerlines. The watercourses associated are all mapped as aquatic ESAs fall within the Upstream FEPA River Sub-Catchment. The upper Brak River, largely upstream of the corridor, is mapped as a FEPA River Sub Catchment.

Sout and Krom Rivers

The Sout and Krom rivers in the Groot / Gamtoos River System lie in the western portion of the study area. The rivers flow in a southeasterly direction to drain confluence with the Kariega River in the Groot/Gamtoos River System. The Sout is a larger watercourse with wide floodplains and a larger catchment that tends to result in water occurring for longer periods in the rivers. The rivers arise in higher lying areas to the north and west of the grid corridor. The rivers are still in a natural ecological condition with little to no disturbance except for farm roads along the river. The river corridors are mapped as terrestrial and aquatic CBAs with a tributary of the Sout River mapped as a FEPA River Sub-catchment.

Figure 10. Google Earth showing the location of the main aquatic features within the area

Figure 11. View of some of the aquatic features within the eastern half of the study area (Brak River)

Figure 12. View of some of the aquatic features within the eastern half of the study area (Sout River)

5.2 Classification of aquatic features

Classification of the watercourses within the study area

To assess the condition and ecological importance and sensitivity of the watercourses, it is necessary to understand how they might have appeared under unimpacted conditions. This is achieved by classifying the rivers according to their ecological characteristics, so that they can be compared to ecologically similar rivers.

River typing or classification involves the hierarchical grouping of rivers into ecologically similar units so that inter- and intra-river variation in factors that influence water chemistry, channel type, substratum composition and hydrology are best accounted for. Any comparative assessment of river conditions should only be done between rivers that share similar physical and biological characteristics under natural conditions. Thus, the classification of rivers provides the basis for assessing river conditions to allow comparison between similar river types. The primary classification of rivers is a division into Ecoregions. Rivers within an ecoregion are further divided into sub-regions.

Ecoregions: groups of rivers within South Africa which share similar physiography, climate, geology, soils and potential natural vegetation. For this study, the ecoregional classification presented in DWAF (1999), which divides the country's rivers into ecoregions, was used. The study area falls within the Great Karoo Ecoregion (Table 2).

Table 2. Characteristics of the Great Karoo Ecoregion

Main Attributes	Characteristics
Terrain Morphology:	Plains: Moderate to Low Relief Lowlands; Hills and Mountains: Moderate and High Relief Open Hills, Lowlands; Mountains: Moderate to High Relief Closed Hills; Mountains: Moderate and High Relief; Table-Lands: Moderate and High Relief
Vegetation types	Valley Thicket; Spekboom Succulent Thicket (limited); Central Nama Karoo; Eastern Mixed Nama Karoo; Great Nama Karoo; Upper Nama Karoo; Bushmanland Nama Karoo (limited), Lowland Succulent Karoo; Upland Succulent Karoo; and Escarpment Mountain Renosterveld
Altitude	300-1700m; 1700-1900m (limited occurrence)
MAP	0 to 500m
Rainfall seasonality	Very late summer to winter
Mean annual temp.	10 to 20 °C
Median annual simulated runoff	<5 to 60 mm for quaternary catchment

Sub-regions: sub-regions (or geomorphological zones) are groups of rivers, or segments of rivers, within an ecoregion, which share similar geomorphological features, of which gradient is the most important. The use of geomorphological features is based on the assumption that this is a major factor in the determination of the distribution of the biota. Table 3 provides the geomorphological and physical features of the rivers within the study area. From the Site Characterisation assessment, the geomorphological and physical characteristics of the channels can be classified as follows:

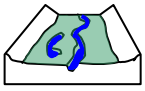
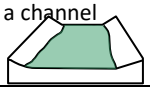
Table 3. Geomorphological and physical features of the watercourses on site

River	Larger Brak, Sout and tributaries	Minor unnamed tributaries & drainage features
Geomorph Zone	Lower Foothill Zone	Mountain streams and upper foothills zone
Lateral mobility	Semi-Confined by topography	
Channel form	Single to multiple channels	Simple single channel
Channel pattern	Braided channel with moderate sinuosity	Single channel, moderate to low sinuosity
Channel type	Bedrock and alluvium	Bedrock, alluvial and gravel
Channel modification	Channel is fairly natural with some flow and habitat modification	Natural with very small disturbances
Hydrological type	Seasonal to episodic	Episodic
Ecoregion	Great Karoo	
DWA catchment	L11B, L11D, L21A, L22A	
Vegetation type	Eastern Upper Karoo and Southern Karoo Riviere	
Rainfall region	Very late summer to autumn	

Classification of the watercourses within the study area

Wetlands can be broadly classified according to their flow and geomorphic characteristics. The wetlands associated with the larger rivers of the study area are classified as valley bottom and floodplain wetlands. Flow into and out of the wetland areas is associated with the watercourses within the study area as opposed to sub-surface flow. According to Table 4, the wetland features within the study area can be classified as described in Table 5.

Table 4. Description of wetland hydro-geomorphic types occurring in the study area

Hydro-geomorphic types	Description	Source of water[1]	
		Surface	Sub-surface
Floodplain 	Valley bottom areas with a well-defined stream channel, gently sloped and characterised by floodplain features and alluvial transport and deposition of sediment, leads to a net accumulation of sediment. Water inputs from main channel and from adjacent slopes.	***	*
Valley bottom with a channel 	Valley bottom areas with well-defined stream channel, lacking characteristic floodplain features. May be gently sloped, characterised by net alluvial deposit accumulation or have steeper slopes, characterised by net loss of sediment. Water inputs from main channel and from adjacent slopes.	***	*/ ***
Valley bottom without a channel 	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterised by alluvial sediment deposition, generally leading to net accumulation of sediment. Water inputs mainly from channel entering wetland and from adjacent slopes.	***	*/ ***

1 Precipitation is an important water source and evapotranspiration an important output

Water source: * Contribution usually small

*** Contribution usually large

*/ *** Contribution may be small or important depending on local circumstances

 Wetland

Table 5: Classification of wetland areas within study area

Name	Valley bottom and floodplain wetlands
System	Inland
Ecoregion	Great Karoo
Landscape setting	Channeled and unchanneled valley floor, extending into the wider floodplains
Longitudinal zonation	Lower foothill
Drainage	With channel in- and outflow
Seasonality	Seasonally inundated
Modification	Largely natural to Moderately modified
Geology	Shale and siltstone of the Ecca Group; Karoo Sequence
Vegetation	Eastern Upper Karoo and Southern Karoo Riviere
Substrate	Rock with alluvium
Salinity	Fresh to brackish

5.3 Present Ecological Condition

Habitat Integrity of the Watercourses

The evaluation of Habitat Integrity provides a measure of the degree to which a river has been modified from its natural state. The methodology (DWAF, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system. These disturbances include both abiotic and biotic factors, which are regarded as the primary causes of the degradation of a river. The severity of each impact is ranked using a six-point scale from 0 (no impact) to 25 (critical impact). The Habitat Integrity Assessment is based on an assessment of the impacts of two components of the river, the riparian zone and the instream habitat. The total scores for the instream and riparian zone components are then used to place the habitat integrity of both in a specific habitat category (Table 7).

Table 6. Instream Habitat Integrity assessment for the watercourses within the study area

Instream Criteria	Unnamed tributaries & drainage features	Larger Rivers	Riparian Category	Unnamed tributaries & drainage features	Larger Rivers
Water Abstraction	2	8	Vegetation Removal	2	6
Flow Modification	3	9	Exotic Vegetation	2	6
Bed Modification	3	8	Bank Erosion	3	5
Channel Modification	3	4	Channel Modification	2	5
Water Quality	2	5	Water Abstraction	2	6
Inundation	3	6	Inundation	3	5
Exotic Macrophytes	0	0	Flow Modification	3	7
Exotic Fauna	0	0	Water Quality	2	5
Rubbish Dumping	0	2			
Instream Integrity Class	**A**	**B/C**	**Riparian Integrity Category**	**A/B**	**B/C**

The habitat integrity assessment was divided into the upper reaches of the watercourses that have few modifications and the lower, more modified reaches of the larger watercourses within the study area. The ecological habitat integrity of the rivers within the study area is still in a natural condition in their upper reaches with few modifications. Downstream, the rivers become largely natural to moderately modified.

Table 7. Habitat Integrity categories (From DWAF, 1999)

Category	Description	Score (%)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. Large loss of natural habitat, biota and ecosystem function has occurred.	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In worst instances, basic ecosystem functions have been destroyed and changes are irreversible.	0

Wetland Habitat Integrity

The Wetland PES Method (DWAF 2005) was used to establish the integrity of the wetlands in the study area and was based on the modified HI approach developed by Kleynhans (DWAF, 1999; Dickens et al, 2003). Table 8 displays the criteria and results from the assessment of the habitat integrity of the wetlands within the study area. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland.

Table 8. Habitat integrity assessment and criteria for palustrine wetlands (assessment (score of 0=critically modified to 5=unmodified))

Criteria	Relevance	Wetlands
Hydrologic		
Flow Modification	Abstraction, impoundments or increased runoff from developed areas. Change in flow regime, volume, velocity & inundation of habitats resulting in floristic changes or incorrect cues to biota.	3.4
Permanent Inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.	3.7
Water Quality		
Water Quality Modification	From point or diffuse sources such as upstream agriculture, human settlements and industry. Aggravated by volumetric decrease in flow delivered to the wetland.	3.8
Sediment Load Modification	Reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rate of erosion, accretion, infilling of wetlands &habitat change.	3.2
Hydraulic/Geomorphic		
Canalisation	Desiccation or change to inundation of wetland and change in habitat	3.8
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat	3.6
Biota		
Terrestrial Encroachment	Desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat	3.9
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.	3.8
Invasive Plants	Affects habitat characteristics through changes in community structure and water quality changes	4.5
Alien Fauna	Presence of alien fauna affecting faunal community structure.	3.5
Biota Over use	Overgrazing, over fishing, etc.	4.5
Category		**B**

The valley bottom/floodplain wetlands have been modified but are still in a largely natural ecological condition and would fall under Category B (Table 9).

Table 9. Relation between scores given and ecological categories

Scoring Guidelines	Interpretation of Scores: Rating of Present Ecological Status Category (PESC)
Natural, unmodified – score=5.	CATEGORY A >4; Unmodified, or approximates natural condition.
Largely natural – score=4.	CATEGORY B >3 and ≤4; Largely natural with few modifications, with some loss of natural habitat.
Moderately modified-score=3.	CATEGORY C >2 and ≤3; moderately modified, but with some loss of natural habitats.
Largely modified – score=2.	CATEGORY D ≤2; largely modified. Large loss of natural habitat & basic ecosystem function
	OUTSIDE GENERALLY ACCEPTABLE RANGE
Seriously modified – rating=1.	CATEGORY E >0 and <2; seriously modified. Extensive loss of natural habitat & basic ecosystem function.
Critically modified – rating=0.	CLASS F 0; critically modified. Modification reached critical levels with system completely modified.

The WET-Health method was then used to determine the overall PES for the wetlands. PES scores were determined for geomorphology, hydrology, water quality and vegetation to generate the overall score and ecological category (Table 10).

Table 10: WET-Health assessment of valley bottom/floodplain wetland areas in the study area

Components	Method used for assessment	PES% Score	Ecological Category
Hydrology PES	WET-Health Hydro Module	85 %	B
Geomorphology PES	WET-Health Geomorph Module	88 %	A/B
Water quality PES	Landuse-WQ Model	91 %	A/B
Vegetation PES	WET-Health Veg Module	83 %	B
Overall Wetland PES	WET-Health default weightings	86 %	B

The valley bottom and floodplain wetlands are largely natural, with modification to the indigenous vegetation being the most impacted component of the wetlands as a result of direct disturbances of adjacent land use activities (i.e. agriculture / grazing) and infrastructure (road) development.

5.4 Ecological Importance and Sensitivity

The Ecological Importance and Ecological Sensitivity (EI&ES) assessment for both watercourses and wetlands considers a number of biotic and habitat determinants surmised to indicate either importance or sensitivity. The determinants are rated according to a four-point scale (Table 11).

Table 11. Scale used to indicate either ecological importance or sensitivity

Scale	Definition
1	One species/taxon judged as rare or endangered at a local scale.
2	More than one species/taxon judged to be rare or endangered on a local scale.
3	One or more species/taxon judged to be rare or endangered on a Provincial/regional scale.
4	One or more species/taxon judged as rare or endangered on a National scale

The median of the resultant score is calculated to derive the EI&ES category (Table 12). The results of the EIS assessment are shown in Table 13. The EI&ES have been determined for the larger watercourses and the smaller unnamed tributaries separately.

Table 12. Ecological importance and sensitivity categories (DWAF, 1999)

EISC	General description	Median
Very high	Quaternaries/delineations unique on a national and international level based on unique biodiversity. These rivers are usually very sensitive and have no or only a small capacity for use.	>3-4
High	Quaternaries/delineations unique on a national scale based on biodiversity. These rivers may be sensitive to flow modifications and may have substantial capacity for use.	>2-≤3
Moderate	Quaternaries/delineations unique on a provincial/ local scale due to biodiversity. These rivers are not very sensitive to flow modification and have substantial capacity for use.	>1-≤2
Low/ marginal	Quaternaries/delineations not unique on any scale. These rivers are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

Table 13. Results of the EI&ES assessment of the watercourses in the study area

Biotic and Aquatic Habitat Determinants	Rivers	Smaller watercourses
Rare and endangered biota	1.5	2
Unique biota	2	1
Intolerant biota	2	2
Species/taxon richness	1.5	1.5
Diversity of aquatic habitat types or features	2.5	2
Refuge value of habitat type	2.5	2
Sensitivity of habitat to flow changes	2.5	3
Sensitivity of flow related water quality changes	2	2.5
Migration route/corridor for instream & riparian biota	2.5	1
National parks, wilderness areas, Nature Reserves & areas, PNEs	1.5	1.5
EIS CATEGORY	High	Moderate

The larger watercourses in the study area have a high ecological importance and sensitivity. This is due to the importance of these larger aquatic ecosystems in providing a diversity of habitats and being important refugia for biota as well as corridors for the movement within the landscape. The smaller tributaries/drainage features are of a moderate ecological importance and sensitivity and tend to be more sensitive to flow and water quality changes. The larger watercourses thus tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. Indigenous fish and amphibian diversity in the rivers are likely to be relatively low. Potential fish and amphibian populations that may occur in the wetter Sout and Krom Rivers are listed in Section 3.6 of this report.

The results from the wetland EIS assessment are provided in Table 14. The assessment of the ecosystem services supplied by the wetland areas (divided into Hydrological Functional Importance and Direct Human Benefits) is included in the table and was conducted according to the guidelines as described by Kotze *et al* (2005).

Table 14: Results of the EIS assessment for the wetland areas

Ecological Importance	Valley bottom and floodplain wetlands
Biodiversity support	2.17
Presence of Red Data species	1
Populations of unique species	2
Migration/breeding/feeding sites	3.5
Landscape scale	1.40
Protection status of the wetland	1
Protection status of the vegetation type	1
Regional context of the ecological integrity	2
Size and rarity of the wetland type/s present	1

Diversity of habitat types	2
Sensitivity of the wetland	1.93
Sensitivity to changes in floods	2.8
Sensitivity to changes in low flows/dry season	2
Sensitivity to changes in water quality	1
ECOLOGICAL IMPORTANCE & SENSITIVITY	2.17
Flood attenuation	3
Streamflow regulation	1
Sediment trapping	2.5
Phosphate assimilation	1
Nitrate assimilation	1.5
Toxicant assimilation	1
Erosion control	2
Carbon storage	1
HYDROLOGICAL/FUNCTIONAL IMPORTANCE	1.63
Water for human use	1.5
Harvestable resources	1.5
Cultivated foods	0
Cultural heritage	0
Tourism and recreation	2
Education and research	1
IMPORTANCE OF DIRECT HUMAN BENEFITS	1.00
OVERALL IMPORTANCE (highest score of ecological, hydrological and direct human benefits)	2.17

The wetland features within the study area are considered of moderate ecological importance and sensitivity. The valley bottom and floodplain wetlands are closely associated with the rivers in the area and the importance of the habitat in providing ecological corridors for the movement of biota.

5.5 Recommended Ecological Condition of Aquatic Ecosystems

Considering the moderately modified to largely natural ecological condition of the aquatic ecosystems within the study area and their moderate to high ecological importance and ecological sensitivities, the recommended ecological condition (REC) of these features would be that they remain their current condition or be improved where possible. These rivers should not be allowed to degrade further. The proposed grid connection is, however, unlikely to result in any degradation of aquatic ecosystem integrity if the recommended mitigation measures are implemented (primarily areas of high sensitivity should be avoided).

6. AQUATIC ECOSYSTEM CONSTRAINTS MAPPING

This section provides an assessment of the proposed project components in relation to the mapped and assessed aquatic ecosystems. Based on the PES, and EI&ES, REC and the sensitivity categories presented, aquatic sensitivity and recommended buffers have been mapped to protect these ecosystems. The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is 35m from the centre of these streams or along the delineated edge of the wide associated floodplain area. The buffer areas

are an area of protection recommended as a development setback that is intended to reduce the edge effect and direct impacts on the integrity and functionality of the aquatic ecosystems.

Table 15. Summary of condition, ecological importance and sensitivity of aquatic features together with recommended buffers

Aquatic feature	PES	EIS	REC	Sensitivity	Recommended buffer
Large rivers	B/C	High	B/C	High	35m and surrounding valley bottom and floodplain wetland and buffer
Small tributaries and drainage lines	A/B	Moderate	A/B	Medium	35
Valley bottom wetlands	B	Moderate	B	Medium	35

The placing of the access tracks within the recommended buffers and through the *medium* sensitivity watercourses, and the mitigation thereof, is discussed separately in the following table that further assesses the potential freshwater constraints.

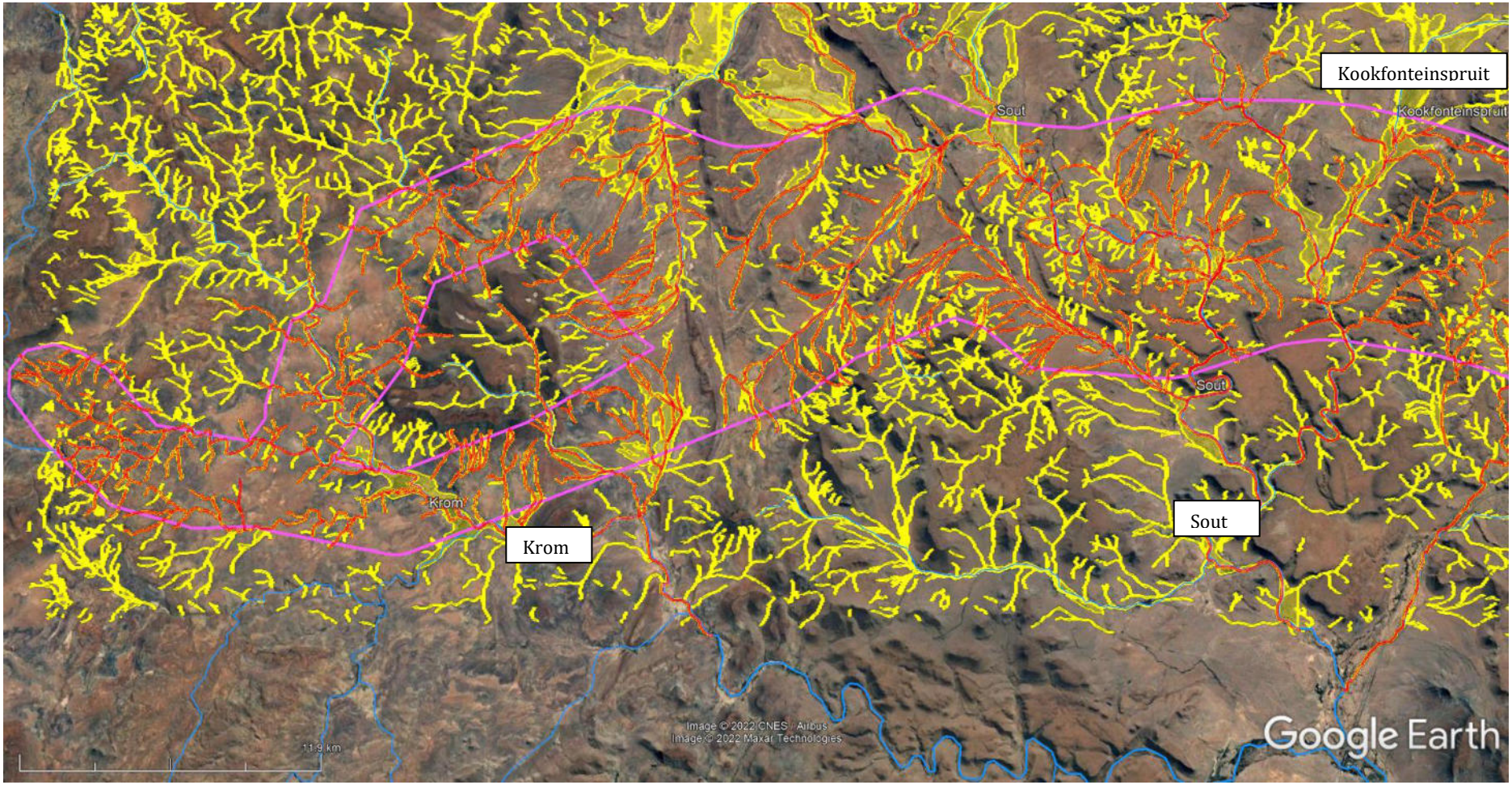


Figure 13. Google Earth image showing the recommended aquatic buffer/setback areas and associated aquatic ecosystem sensitivity mapping for the western extent of the proposed project. The red areas are areas of high aquatic sensitivity that should be treated as no-go areas and the yellow areas are of medium sensitivity that should be avoided or the impacts adequately mitigated as stipulated in this report. The development restrictions apply to pylons and access tracks. The overhead line may cross these features.

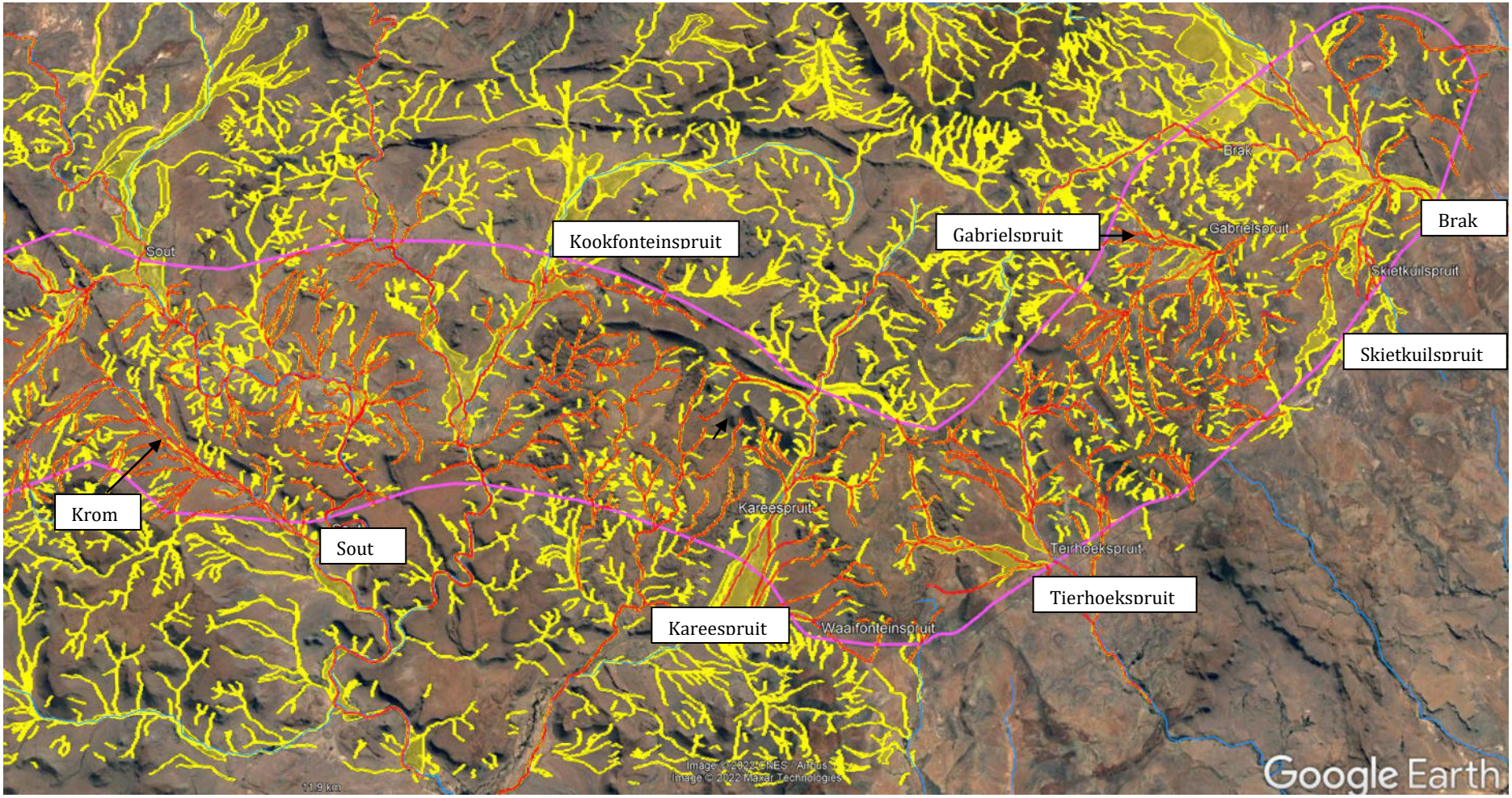


Figure 14. Google Earth image showing the recommended aquatic buffer/setback areas and associated aquatic ecosystem sensitivity mapping for the eastern extent of the proposed project. The red areas are areas of high aquatic sensitivity that should be treated as no-go areas and the yellow areas are of medium sensitivity that should be avoided or the impacts adequately mitigated. The development restrictions apply to pylons and access tracks. The overhead line may cross these features.

7. IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

7.1. Description of Potential Aquatic Ecosystem Impacts

The proposed gridline connection and access tracks have the potential to impact the freshwater features if located within or immediately adjacent to the aquatic features. As there is some flexibility relating to the exact location of the pylons, it is usually easy to mitigate the potential impact by locating them far from the freshwater features. Thus, it is usually the associated access track that potentially impacts more on the freshwater features where they need to cross freshwater features. Such crossings and disturbances of the aquatic features need to be minimised and mitigated as far as possible.

The potential aquatic ecosystem impacts can be summarised as follows:

Construction Phase: **Direct Impacts**: Disturbance or modification of aquatic habitat; increased water use and water quality impacts **Indirect Impacts**: Degradation of aquatic ecosystem integrity
Operational Phase**:** **Direct Impacts:** Aquatic habitat disturbance **Indirect Impacts:** Degradation of the ecological condition of aquatic ecosystems; erosion and alien vegetation invasion
Decommissioning Phase**:** **Direct Impacts:** Disturbance of aquatic habitats and water quality impacts
Cumulative impacts**:** **Indirect Impacts:** Degradation of the ecological condition of aquatic ecosystems

Most of the potential aquatic ecosystem impacts of the proposed grid connection are likely to take place during the construction phase. These potential impacts and the associated issues identified include:

1. Disturbance of aquatic habitats within the watercourses with the associated impacts to sensitive aquatic biota. Construction activities within watercourses could result in the disturbance or destruction of sensitive habitats and any listed and or protected plant or animal species. The construction activities would, however, be unlikely to modify aquatic habitat and biota to such an extent that the present or future desired state of the watercourses would be compromised.
2. Water availability is limited in the area. Any proposal to utilise water will need to be assessed to ensure a sustainable water use practice takes place. The water use will need to be authorised and registered with the Department of Water and Sanitation.
3. Increased sedimentation and risks of contamination of surface water runoff during construction. During construction, the earthworks near watercourses will expose and mobilise soil as well as construction materials and chemicals that may end up in the water resources. Any spills during transport or while works are conducted in proximity to a watercourse also have the potential to affect the surrounding biota. Given the low rainfall in the area, if works are undertaken during the drier periods of the year, this impact would be unlikely.
4. The removal of indigenous riparian and instream vegetation will reduce the ecological integrity and functionality of the watercourses. Construction works, in particular, could result in the loss of riparian vegetation that provides ecosystem services within the site. This would occur for the required access track as the pylons could easily avoid delineated aquatic habitats and the recommended buffers. The impact would only be very localised at crossings through watercourses and would not impact the wider river reaches of the watercourses. With rehabilitation, this impact could be reduced to a negligible level.

During the operational phase of the proposed grid connection, potential impacts would include:

1. Ongoing disturbance of aquatic features and associated vegetation along the access track. The disturbance of aquatic habitat is likely to be very localised to the crossings and would not impact the larger aquatic ecosystem.
2. Erosion as a result of removal of cover vegetation and a change to surface water runoff along the access track. Increased intensity of runoff along the access track for the powerline may take place where gradients are steep and may result in erosion along the access track. This can easily be mitigated by the shaping of the track (placement of humps) that will disperse or impede the runoff. Ongoing monitoring and maintenance of the access track would prevent this potential impact from taking place.
3. Alien vegetation infestation within the aquatic features due to disturbance. The current presence of alien vegetation on the site is limited. Sources of alien seed should be prevented from being brought onto the site with imported materials. Monitoring post-construction for the growth of alien vegetation can mitigate this potential impact.

During the decommissioning phase, the potential impacts would largely be associated with an increased disturbance of aquatic habitat due to the increased activity on the site. Increased sedimentation and risks of contamination of surface water runoff may also occur.

7.2. Summary of Issues identified during the Public Consultation Phase

No aquatic ecosystem issues have as yet been raised as the public participation process for the project has not yet been undertaken.

7.3. Summary of Impact Tables for Construction, Operation and Decommissioning Phases

The summary tables for the various impacts identified during the construction, operation and decommissioning phases of the proposed project are provided on the following pages.

7.4. Cumulative Impacts

Land use in the area currently consists mostly of low-density livestock farming due to the limited water supply and poor carrying capacity of the cover vegetation. Current land and water use impacts on the watercourses and surrounding area are therefore low to very low. The cumulative impact of the project activities, together with the existing activities in the area, could have the potential to reduce the integrity of the watercourses if not properly mitigated and managed. The nature of the proposed powerline allows it to have minimal impact on the surface water features since the pylons can be placed far enough away from the freshwater features (35m buffers) to not impact them. The largest potential impact of these projects is a result of the associated access track, which can be mitigated such that its impact on the aquatic ecosystems will be of low significance. ***One could thus expect that the cumulative impact of the proposed project would be low, provided mitigation measures are implemented.*** Availability of water is a limiting factor in the further development of this area; however, the water requirements of the project are during the construction phase and are low.

Impact Summary Tables: Construction Phase

Direct Impacts: Disturbance or modification of aquatic habitat; increased water use and water quality impacts;

Indirect Impacts: Degradation of aquatic ecosystem integrity

Table 16. Impact table for the potential aquatic biodiversity impacts of the project during the construction phase

Impact	Impact Criteria		Significance (Pre-Mitigation)	Potential mitigation measures	Significance (Post-Mitigation)	Confidence Level
AQUATIC BIODIVERSITY						
CONSTRUCTION PHASE						
Disturbance of aquatic habitats within the watercourses with the associated impact to sensitive aquatic biota	Status	Negative	Very low (5)	Locate all infrastructure outside of high sensitivity areas. Limit the placement of infrastructure in areas of medium aquatic sensitivity as far as possible. Rationalise infrastructure as far as possible by sharing of the infrastructure or using existing disturbed areas (e.g., roads and access tracks). Existing roads through features mapped as medium sensitivity must be utilised as far as possible. In terms of new service tracks, these must be kept to a minimum and should ideally not result in any new / permanent water course crossings, but if these are required, then a specific walkdown should be conducted with the specialist to identify the most suited crossing position. Where these crossings do occur, it needs to be monitored for erosion Ensure road crossings structures are properly designed to not result in blockage in the watercourses or erosion. Minimise any works within aquatic ecosystems and buffers Apply the generic EMPr for power line development[1].	Very low (5)	High
	Spatial Extent	Site-specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				

[1] Applicable measures include:

Increased sedimentation and risks of contamination of surface water runoff during construction	Status	Negative	Very low (5)	Construction sites and laydown areas should be placed at least 35m away from the delineated aquatic features; Apply the generic EMPr for power line development[2]	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Likely to Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low				
Demand for water for construction could place stress on the existing available water resources	Status	Negative	Very low (5)	Source water from legal supply sources only (e.g. new or existing water allocation to a property and/or municipal supply).	Very low (5)	High
	Spatial Extent	Local				
	Duration	Long term				
	Consequence	Moderate				
	Probability	Extremely Unlikely				
	Reversibility	Moderate reversibility				
	Irreplaceability	Moderate irreplaceability				

- "Appropriate rehabilitation and re-vegetation measures for the watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows.";
- "Existing (watercourse) crossing points must be favoured over the creation of new (watercourse) crossings (including temporary access)";
- "Indigenous species must be used for with species and/grasses to where it compliments or approximates the original condition";
- "Where required, re-vegetation including hydro-seeding can be enhanced using a vegetation seed mixture as described below. A mixture of seed can be used provided the mixture is carefully selected to ensure the following: c) Species chosen must be indigenous to the area with".

[2] Applicable measures include:

- "The primary role of the ECO is to act as an independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct periodic site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise. The ECO is also required to conduct compliance audits";
- All housekeeping impact management actions as listed in (but not limited to) "Sanitation", Emergency Procedures", "Hazardous Substance" sections of the Impact Management Chapter of the generic EMPr.

Impact Summary Tables: Operational Phase

Direct Impacts: Aquatic habitat disturbance

Indirect Impacts: Degradation of ecological condition of aquatic ecosystems; erosion; alien riparian vegetation invasion

Table 17. Impact table for the potential aquatic biodiversity impacts of the project during the operation phase

Impact	Impact Criteria		Significance (Pre-Mitigation)	Potential mitigation measures	Significance (Post-Mitigation)	Confidence Level
OPERATIONAL PHASE						
Ongoing disturbance and degradation of aquatic features and associated vegetation along access tracks or adjacent to the infrastructure that needs to be maintained	Status	Negative	Very low (5)	Access project infrastructure using existing roads and access tracks established during maintenance activities. Ensure road crossings structures are properly designed to not result in blockage in the watercourses or erosion. Locate all infrastructure outside of high sensitivity areas. Limit the placement of infrastructure in areas of medium aquatic sensitivity as far as possible. Rationalise infrastructure as far as possible by sharing of the infrastructure or using existing disturbed areas (e.g. roads and access tracks)	Very low	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Likely to Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
Disturbance of cover vegetation and soil and modified runoff characteristics that have the potential to result in erosion of hillslopes and watercourses and invasion of disturbed areas with alien vegetation	Status	Negative	Very low (5)	Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants. The project infrastructure and access tracks must be designed to mitigate the stormwater runoff impacts leaving the developed areas. Where necessary, stormwater management systems at access tracks must be designed to dissipate stormwater over a broad area covered by natural vegetation or to direct stormwater to berms or channels and swales adjacent to hardened surfaces.	Very low	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	Moderate reversibility				
	Irreplaceability	High irreplaceability				

Impact Summary Tables: Decommissioning Phase

Direct Impact: Disturbance of aquatic habitats and water quality impacts.

Table 18. Impact table for the potential aquatic biodiversity impacts of the project during the decommissioning phase

Impact	Impact Criteria		Significance (Pre-Mitigation)	Potential mitigation measures	Significance (Post-Mitigation)	Confidence Level
DECOMMISSIONING PHASE						
Increased disturbance of aquatic habitat due to the increased activity on the site	Status	Negative	Very low (5)	Minimise works within aquatic ecosystems as far as possible. Rehabilitate disturbed areas.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
Increased sedimentation and risks of contamination of surface water runoff	Status	Negative	Very low (5)	Laydown areas should be placed at least 30m away from the delineated aquatic features; Apply the generic EMPr for power line development to decommissioning activities.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				

Impact Summary Tables: Cumulative Impacts

Indirect Impacts: Degradation of the ecological condition of aquatic ecosystems.

Table 19. Impact table for the potential cumulative aquatic biodiversity impacts of the project during the construction, operation and decommissioning phases

Impact	Impact Criteria		Significance (Pre-Mitigation)	Potential mitigation measures	Significance (Post-Mitigation)	Confidence Level
CONSTRUCTION PHASE						
Increased disturbance of aquatic habitat due to the increased activity in the wider area	Status	Negative	Very low (5)	Minimise works within aquatic ecosystems as far as possible. Construct in the dry season. This is only relevant to works adjacent to the larger watercourses that have instream wetland habitat and are mapped as having a high sensitivity in the aquatic ecological sensitivity mapping. Rationalise infrastructure as far as possible by sharing of the infrastructure or using existing disturbed areas (e.g. roads and access tracks). Apply the generic EMPr for power line development.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
OPERATION PHASE						
Degradation of ecological condition of aquatic ecosystems	Status	Negative	Very low (5)	Apply the generic EMPr for power line development. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants. Minimise works within aquatic ecosystems as far as possible. Infrastructure and access tracks designed to mitigate the stormwater runoff impacts leaving the developed areas. Ensure road crossings structures are properly designed to not result in blockage in the watercourses or erosion.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
DECOMMISSIONING PHASE						
Increased disturbance of aquatic habitat due to the increased activity in the wider area	Status	Negative	Very low (5)	Decommission works near aquatic features should preferably be undertaken in the dry season. This is only relevant to works adjacent to the larger watercourses that have instream wetland habitat and are mapped as having a high sensitivity in the aquatic ecological sensitivity mapping. Minimise works within aquatic ecosystems as far as possible. Apply the EMPr for power line development to decommissioning activities.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				

7.5. Impact Assessment Summary

This section provides the overall impact significance findings following the implementation of the proposed mitigation measures. These are shown in the table below:

Table 20: Overall Impact Significance (Post Mitigation)

Phase	Overall Impact Significance	Cumulative Impact
Construction	Very low	Very low
Operational	Very low	Very low
Decommissioning	Very low	Very low
Nature of Impact	Negative	Negative

7.6. Consideration of Alternatives

A comprehensive iterative design process has been undertaken to inform the location of the refined grid connection corridor, including aquatic ecology No-Go areas within the corridor.

By integrating the screening and assessment of environmental and social constraints alongside the technical components of the project, early in a project lifecycle, allowed for the reduction in risks to the project and supports the application of the mitigation hierarchy by demonstrating the avoidance and minimisation of impacts.

However, the project will be assessed against the '**No-Go' alternative**. The 'No-Go' alternative is the option of not constructing the project where the status quo would prevail. In this instance, potential very low significance impacts on aquatic ecology would be avoided should the No-Go alternative be selected.

The impacts assessed in this report would be applicable to any powerline route alternative that avoided high sensitivity areas identified in this report and limited the placement of infrastructure in areas of medium aquatic sensitivity as far as reasonably possible provided that the mitigation specified in the report and in the generic EMPr for power line development are strictly applied.

7.7. Risk Assessment

A risk assessment was carried out for the proposed grid connection. The assessment indicates the level of risk certain activities pose to aquatic ecosystems where the outcomes are used to guide decisions regarding water use authorisation of the proposed activity. A summary of the potential risks and the risk rating classes can be seen below.

Table 21. Summary risk assessment for the proposed project

Phases	Activity	Impact	Significance	Risk
Construction	Construction work for grid connection	Loss of biodiversity & habitat, impeding flow & water quality impact	51	L
Operation	Operation / maintenance of grid connection	Disturbance to aquatic habitat - Facilitation of erosion and invasion by alien plants	36	L
Decommission	Removal of gridline infrastructure	Habitat disturbance and some flow and water quality impacts	36	L

Table 22. Risk rating classes for the Risk Assessment

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

The risk assessment determined that the proposed grid connection poses a low risk of impacting aquatic habitat, water flow and water quality. With these findings of the risk assessment, the water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

8. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

Very limited impact mitigation, monitoring or management actions and outcomes will be necessary for inclusion in Environmental Management Programme (EMPr) if the proposed works take into consideration the aquatic ecosystem constraints and avoid the delineated high sensitivity aquatic ecosystems as well as the recommended buffer of 35 m between the significant aquatic features and the proposed project activities as well as limiting the placement of infrastructure in areas of medium aquatic sensitivity as far as possible.

The recommended mitigation measures are as follows:

- Minimise any works within aquatic ecosystems and buffers.
- Disturbed areas may need to be rehabilitated and revegetated in line with the requirements of the Generic EMPr for power line development.
- Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.
- Existing roads through features mapped as medium sensitivity must be utilised as far as possible. In terms of new service tracks, these must be kept to a minimum and should ideally not result in any new / permanent water course crossings, but if these are required, then a specific walkdown should be conducted with the specialist to identify the most suited crossing position. Where these crossings do occur, it needs to be monitored for erosion
- Erosion and alien vegetation monitoring and control measures should take place at least biannually for the first 3 years of the project,
- Stormwater runoff infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.
- Standard housekeeping measures listed in the Generic EMPr for power line development, including those to manage solid waste, water supply and ablutions, prevent pollution and control the release of contaminated stormwater / effluent from the construction camp and site areas must be strictly applied.

Recommendations for inclusion into the EMPr are provided in the tables on the following pages.

Monitoring Requirements

Daily compliance monitoring of the implementation of the measures as laid out in the EMPr and associated method statements should be undertaken by the Site Manager in conjunction with the Environmental Control Officer. A record of the monitoring undertaken during the maintenance management activities should be kept.

Visual inspections and photographs should be taken weekly upstream and downstream of sites where construction activities will need to take place within aquatic features. Once the construction activities have ceased, the frequency of the monitoring can be reduced to monthly until DWS is satisfied that the site is adequately rehabilitated.

Ongoing monitoring of invasive alien plant growth and erosion within the aquatic features and the recommended buffers biannually (every six months) for the construction phase and the first three operational years of the project. That monitoring should preferably take place before the rainfall period and following high rainfall events.

Table 23. Environmental Management Program Recommandations

Impact	Mitigation/ Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
DESIGN PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed powerlines and associated infrastructure.	Limit the disturbance of aquatic habitat. Minimise potential for erosion	Locate all infrastructure outside of high sensitivity areas. Limit the placement of infrastructure in areas of medium aquatic sensitivity as far as possible. Utilise existing disturbed areas (e.g. roads and access tracks) where possible. Existing roads through features mapped as medium sensitivity must be utilised as far as possible. In terms of new service tracks, these must be kept to a minimum and should ideally not result in any new / permanent water course crossings, but if these are required, then a specific walkdown should be conducted with the specialist to identify the most suited crossing position. Where these crossings do occur, it needs to be monitored for erosion. The design of an access track and other infrastructure should aim to reduce the intensity of runoff, particularly on the steeper slopes and reduce the intensity of the discharge into the adjacent drainage lines. For any new infrastructure placed within the watercourses: - The structure should not impede or concentrate the flow in the watercourse. - It is recommended that low water crossings should be utilised. Where necessary, stormwater management systems at access tracks must be designed to dissipate stormwater over a broad area covered by natural vegetation or to direct stormwater to berms or channels and swales adjacent to hardened surfaces. Water consumption requirements for the site for the construction and operation of the site if not obtained from an authorised water user within the area, must be authorised by the DWS.	Ensure that this is taken into consideration during the planning and design phase.	During design cycle and before construction commences.	Holder of the EA
CONSTRUCTION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed powerlines and associated infrastructure.	Limit the disturbance of aquatic habitat. Limit the potential for contamination/pollution of aquatic ecosystems	For all project-related components within the site, the aquatic features of high sensitivity should be treated as no-go areas during the construction phase. Laydown areas should be placed at least 30m away from the delineated aquatic features Minimise any works within aquatic ecosystems and buffers. Any activities that require construction within the delineated aquatic features and the recommended buffers should be described in method statements that are approved by the ECO. Rehabilitation of any the disturbed areas within the aquatic features and the recommended buffer areas should be undertaken immediately following completion of the disturbance activity according to rehabilitation measures as included in a method statement for that specific activity as described above;	Monitoring that no-go areas are adhered to should be undertaken on an ongoing basis for the duration of the construction phase. Ongoing monitoring of the implementation of method statements and rehabilitation measures should be undertaken in the construction phase. Weekly monitoring of basic	Ongoing during construction	Proponent/ contractor and ECO

Impact	Mitigation/ Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		Vehicles should ideally be washed at their storage yard as opposed to on-site. Apply the generic EMPr for power line development[3].	water quality constituents (Dissolved oxygen, electrical conductivity, suspended solids, and pH) should be undertaken upstream and downstream of sites where construction activities will need to take place within aquatic features. This should be accompanied by ongoing visual inspections.		

[3] Applicable measures include:

- "Appropriate rehabilitation and re-vegetation measures for the watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows";
- "Existing (watercourse) crossing points must be favoured over the creation of new (watercourse) crossings (including temporary access)";
- "Indigenous species must be used for with species and/grasses to where it compliments or approximates the original condition"; and
- "Where required, re-vegetation including hydro-seeding can be enhanced using a vegetation seed mixture as described below. A mixture of seed can be used provided the mixture is carefully selected to ensure the following: c) Species chosen must be indigenous to the area with".
- "Where mobile chemical toilets are required, the following must be ensured: a) Toilets are located no closer than 100 m to any watercourse or water body";
- "Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained";
- "An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance must be available at all times"
- "All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS)";
- "Runoff from the cement/ concrete batching areas must be strictly controlled, and contaminated water must be collected, stored and either treated or disposed of off-site, at a location approved by the project manager";
- "Sufficient, covered waste collection bins (scavenger and weatherproof) must be provided";
- "General waste produced onsite must be disposed of at registered waste disposal sites/ recycling company"; and
- "Hazardous waste must be disposed of at a registered waste disposal site".

OPERATION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed powerlines and associated infrastructure.	Limit the disturbance of aquatic habitat; Minimise potential to modify flow/hydraulics related impacts and increase the potential for erosion; Control of invasive alien plants in riparian zones and wetland areas; **Limit the potential for contamination/pollution of aquatic ecosystems**	Access project infrastructure using existing roads and access tracks established during construction. Alien vegetation regrowth monitoring and control measures should take place at least biannually for the first 3 years of the project. Invasive alien plant material that has been cleared should be removed from the riparian zones and not left on the river banks or burnt within the riparian zone and buffer area; Erosion monitoring and control measures should take place at least biannually for the first 3 years of the project, Ongoing monitoring of the structures, in particular before the rainfall period, should be undertaken to ensure that the integrity of the structures is intact and that they are not blocked with sediment or debris. Ongoing monitoring post large rainfall events should also be undertaken to identify and address any erosion occurring within the watercourses. Apply the generic EMPr for power line development[4]	Ongoing monitoring of invasive alien plants within the site should be undertaken according to an approved plan. Once the construction activities have ceased, the frequency of the monitoring can be reduced.	Ongoing during operation	Proponent/contractor

[4] Applicable measures include:

- Alien invasive vegetation must be removed according to a plan (in line with relevant municipal and provincial procedures, guidelines and recommendations) and disposed of at a recognised waste disposal facility

DECOMMISSION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed powerlines and associated infrastructure.	Limit the disturbance of aquatic habitat.	For all project-related components within the site, the aquatic features of high sensitivity should be demarcated by the appointed ECO before the commencement of the decommissioning activities and treated as no-go areas during the decommissioning phase. Any activities that require decommission activities within the delineated aquatic features and the recommended buffers should be described in method statements that are approved by the ECO Control of invasive alien plants within the site should be undertaken according to the approved plan Apply the EMPr for power line development to decommissioning activities.	Monitoring that no-go areas are adhered to should be undertaken on an ongoing basis for the duration of the decommissioning phase. Ongoing monitoring of the implementation of method statements and rehabilitation measures should be undertaken in the decommissioning phase. Ongoing monitoring of invasive alien plants within the site should be undertaken according to an approved plan	Ongoing during decommissioning	Proponent/contractor and ECO

9. RECOMMENDATIONS AND CONCLUSIONS

The aquatic features within the study area consist of the upper reaches of:

- Buffels River tributaries: the Brak River, Gabrielspruit, Waaihoekspruit, Tierhoekspruit and Skietspruit,
- Sout River and its tributaries, the Krom and Kareespruit Rivers and their lesser, unnamed tributaries, as well as
- Valley bottom/floodplain wetlands associated with larger watercourses and some small dams.

The ecological habitat integrity of the rivers within the study area is still in a natural condition in their upper reaches with few modifications. Downstream, the rivers become largely natural to moderately modified. The associated valley bottom and floodplain wetlands are largely natural with modification to the indigenous vegetation being the most impacted component of the wetlands as a result of direct disturbances of adjacent land use activities and infrastructure (track) development.

The larger watercourses in the study area have a high ecological importance and sensitivity (mapped as high sensitivity features), while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity (mapped as medium sensitivity features). The larger watercourses tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The wetland features within the study area are considered of moderate ecological importance and sensitivity (also mapped as medium sensitivity features). The valley bottom wetlands are closely associated with the rivers in the area and the importance of the habitat in providing ecological corridors for the movement of biota.

Due to the fact that most of the watercourses in the study area are non-perennial and are dry for large parts of the year, few indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective. The proposed project is also unlikely to impact the aquatic biota in the rivers and wetlands.

The Screening Tool has indicated most of the wider area to be of low sensitivity, with only the wide valley floor wetlands associated with the main channel of the larger rivers mapped as being of very high sensitivity. The only FEPA River Sub catchments are the Wagenaarskraal Tributary of the Sout River and the Sout River itself, as well as the Upper Brak River. The downstream Brak River and its tributaries are mapped as an Upstream Catchment. The goal for River FEPAs is that they should not be allowed to degrade but should be retained in a near natural condition or rehabilitated. There are several instream wetland areas within the channel of the larger watercourses, particularly in the Sout River System, that have been mapped as FEPA Wetlands (Upper Nama Karoo Channelled and Unchanneled valley-bottom wetlands). The Skietkuilspruit, Tierhoekspruit and Krom tributaries of the Sout River are mapped as aquatic CBAs while the larger Sout River Catchment is mapped as a terrestrial CBA. All the other rivers are mapped as aquatic ESAs.

Based on the site assessment for this study, the larger rivers in the study area were found to be of high sensitivity that is linked to due to the importance of these larger aquatic ecosystems in providing a diversity of habitats and being important refugia for biota as well as corridors for the movement within the landscape.

The potential aquatic ecosystem impacts of the proposed project are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features indicated to be of high aquatic sensitivity, and because the placement of infrastructure in areas of medium sensitivity including recommended buffer areas (35m) will be limited as far as possible, and impacts appropriately mitigated (i.e. through design measures and ongoing monitoring).

Based on the findings of this specialist assessment, there is no reason, from a freshwater perspective, why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized.

The risk assessment determined that the proposed project poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

Recommended mitigation measures are as recommended for inclusion in the EMPr for the project.

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APPENDICES

APPENDIX A: PES, EI AND ES FOR THE MAJOR WATERCOURSES IN THE STUDY AREA (DWS, 2012)

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
L11B-06667	Sout	24.11	3	Y		LARGELY NATURAL	B
MEAN EI CLASS	**MEAN ES CLASS**	**DEFAULT ECOLOGICAL CATEGORY (EC)**	**RECOMMENDED ECOLOGICAL CATEGORY (REC)**				
MODERATE	MODERATE	C	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	MODERATE	FISH SPP/SQ	1.00	INVERT TAXA/SQ	26.00	FISH PHYS-CHEM SENS DESCRIPTION	MODERATE
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	1.92	FISH NO-FLOW SENSITIVITY DESCRIPTION	MODERATE
POTENTIAL INSTREAM HABITAT MOD	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT REPRESENTIVITY PER SECONDARY,	HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	MODERATE
RIPARIAN-WETLAND	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT RARITY PER SECONDARY:	MODERATE	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS	MODERATE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	NONE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	LOW	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	MODERATE	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	VERY HIGH		

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
L11D-06798	Krom	23.75	1	Y		MODERATELY	C
MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (EC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)				
MODERATE	MODERATE	C	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	MODERATE	FISH SPP/SQ		INVERT TAXA/SQ	20.00	FISH PHYS-CHEM SENS DESCRIPTION	
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE	#DIV/0!	INVERT AVERAGE CONFIDENCE	2.50	FISH NO-FLOW SENSITIVITY DESCRIPTION	
POTENTIAL INSTREAM HABITAT MOD	MODERATE	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT REPRESENTIVITY PER SECONDARY,	HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	MODERATE
RIPARIAN-WETLAND	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT RARITY PER SECONDARY:	LOW	INVERTS VELOCITY SENSITIVITY	HIGH
POTENTIAL FLOW MOD ACT.	LARGE	FISH RARITY PER SECONDARY: CLASS		ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	HIGH	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	VERY HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	MODERATE	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	HIGH		

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
L11B-06546	Kookfonteinspr	25.92	1	Y		MODERATELY	C
MEAN EI CLASS	**MEAN ES CLASS**	**DEFAULT ECOLOGICAL CATEGORY (EC)**	**RECOMMENDED ECOLOGICAL CATEGORY (REC)**				
MODERATE	MODERATE	C	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	LARGE	FISH SPP/SQ	1.00	INVERT TAXA/SQ	25.00	FISH PHYS-CHEM SENS DESCRIPTION	MODERATE
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	2.36	FISH NO-FLOW SENSITIVITY DESCRIPTION	MODERATE
POTENTIAL INSTREAM HABITAT MOD	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT REPRESENTIVITY PER SECONDARY,	HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	MODERATE
RIPARIAN-WETLAND	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT RARITY PER SECONDARY:	VERY HIGH	INVERTS VELOCITY SENSITIVITY	HIGH
POTENTIAL FLOW MOD ACT.	MODERATE	FISH RARITY PER SECONDARY: CLASS	MODERATE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	NONE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	LOW	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	MODERATE	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	MODERATE		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	MODERATE		

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
L21A-06539	Brak	3.72	2	Y		LARGELY NATURAL	B
MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (EC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)				
MODERATE	MODERATE	C	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	SMALL	FISH SPP/SQ	1.00	INVERT TAXA/SQ	22.00	FISH PHYS-CHEM SENS DESCRIPTION	MODERATE
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	1.00	FISH NO-FLOW SENSITIVITY DESCRIPTION	MODERATE
POTENTIAL INSTREAM HABITAT MOD ACT.	MODERATE	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT REPRESENTIVITY PER SECONDARY,	HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	MODERATE
RIPARIAN-WETLAND ZONE MOD	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT RARITY PER SECONDARY: CLASS	VERY HIGH	INVERTS VELOCITY SENSITIVITY	HIGH
POTENTIAL FLOW MOD ACT.	LARGE	FISH RARITY PER SECONDARY: CLASS	LOW	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	VERY LOW	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	VERY LOW	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	HIGH		

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
L21A-06586	Brak	22.82	1	Y		MODERATELY MODIFIED	C
MEAN EI CLASS	**MEAN ES CLASS**	**DEFAULT ECOLOGICAL CATEGORY (EC)**	**RECOMMENDED ECOLOGICAL CATEGORY (REC)**				
HIGH	MODERATE	B	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	MODERATE	FISH SPP/SQ		INVERT TAXA/SQ	12.00	FISH PHYS-CHEM SENS DESCRIPTION	
RIP/WETLAND ZONE CONTINUITY	SMALL	FISH: AVERAGE CONFIDENCE	#DIV/0!	INVERT AVERAGE CONFIDENCE	1.00	FISH NO-FLOW SENSITIVITY DESCRIPTION	
POTENTIAL INSTREAM HABITAT MOD ACT.	MODERATE	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT REPRESENTIVITY PER SECONDARY, CLASS	LOW	INVERT PHYS-CHEM SENS DESCRIPTION	MODERATE
RIPARIAN-WETLAND ZONE MOD	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT RARITY PER SECONDARY:	VERY HIGH	INVERTS VELOCITY SENSITIVITY	HIGH
POTENTIAL FLOW MOD ACT.	SERIOUS	FISH RARITY PER SECONDARY: CLASS		ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	MODERATE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	MODERATE	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	VERY HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	MODERATE	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	HIGH		

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
L22A-06724	Tierhoekspruit	39.08	1	Y		LARGELY NATURAL	B
MEAN EI CLASS	**MEAN ES CLASS**	**DEFAULT ECOLOGICAL CATEGORY (EC)**	**RECOMMENDED ECOLOGICAL CATEGORY (REC)**				
HIGH	MODERATE	B	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	MODERATE	FISH SPP/SQ	2.00	INVERT TAXA/SQ	24.00	FISH PHYS-CHEM SENS DESCRIPTION	MODERATE
RIP/WETLAND ZONE CONTINUITY	SMALL	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	1.42	FISH NO-FLOW SENSITIVITY DESCRIPTION	MODERATE
POTENTIAL INSTREAM HABITAT MOD ACT.	MODERATE	FISH REPRESENTIVITY PER SECONDARY: CLASS	HIGH	INVERT REPRESENTIVITY PER SECONDARY, CLASS	HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	MODERATE
RIPARIAN-WETLAND ZONE MOD	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	HIGH	INVERT RARITY PER SECONDARY:	MODERATE	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS	HIGH	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	NONE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	VERY HIGH	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	HIGH	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	HIGH		

APPENDIX B: IMPACT ASSESSMENT CRITERIA AND SCORING SYSTEM

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

APPENDIX C: SITE SENSITIVITY VERIFICATION

Prior to commencing with the Aquatic Biodiversity Specialist Assessment in accordance with the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity (Government Notice 320, dated 20 March 2020), a site sensitivity verification 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 Tool (Screening Tool).

The details of the site sensitivity verification are noted below:

Date of Site Visit	7-8 March 2022
Specialist Name	Toni Belcher
Professional Registration Number	400040/10
Specialist Affiliation / Company	BlueScience (Pty) Ltd

The proposed site for a 400 kV grid connection from the Nuweveld Collector Substation to the Gamma Substation, ~90 km to the east was assessed in terms of its aquatic biodiversity sensitivity by means of a desktop analysis using available aquatic ecosystem mapping, aerial imagery and a site visit, undertaken on 7-8 March 2022. A literature survey was also undertaken to determine any aquatic biodiversity sensitivities that may occur in the surrounding area.

The Gridline Corridor crosses the upper catchment of the Brak and Sout Rivers, which are tributaries of the Buffels / Kariega Rivers in the Groot / Gamtoos River System. The Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool map for the Aquatic Biodiversity Combined Sensitivity at the site indicates most of the wider area to be of low sensitivity, with only the wide valley floor wetlands associated with the main channel of the larger rivers mapped as being of very high sensitivity.

Below is a summary of the aquatic ecological condition, ecological importance and sensitivity and recommended ecological category as well as the sensitivity and associated buffers for the aquatic features, based on the field assessment.

Aquatic feature	PES	EIS	REC	Sensitivity	Recommended buffer
Large rivers	B/C	High	B/C	High	35m and surrounding valley bottom and floodplain wetland and buffer
Small tributaries and drainage lines	A/B	Moderate	A/B	Medium	35
Valley bottom wetlands	B	Moderate	B	Medium	35

The remainder of the study area is deemed to be of Low Aquatic Biodiversity Combined Sensitivity as indicated in the Screening Tool.

The high sensitivity of the larger rivers in the study area is linked to due to the importance of these larger aquatic ecosystems in providing a diversity of habitats and being important refugia for biota as well as corridors for the movement within the landscape.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

GAMMA GRIDLINE CORRIDOR NEAR BEAUFORT WEST

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

2. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Antonia Belcher, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

BlueScience (Pty) Ltd

Name of Company

13 January 2023

Date

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
2023 -01- 13
SOMERSET WEST
AMAPOLISA OMZANTSHI AFRICA

Signature of the Commissioner of Oaths

2023-01-13

Date

SPECIALIST INFORMATION

Specialist Company Name:	BlueScience (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	Level 4 EME	Percentage Procurement recognition	
Specialist name:	Toni Belcher			
Specialist Qualifications:	M.Sc			
Professional affiliation/registration:	400040/10			
Physical address:	Unit 13 | Technostell Building | 9 Quantum Street | Technopark | Stellenbosch | 7600			
Postal address:	PO Box 455, Somerset Mall			
Postal code:	7137	Cell:	082 883 8055	
Telephone:	021 851 0555	Fax:	-	
E-mail:	toni@bluescience.co.za			

1. DECLARATION BY THE SPECIALIST

I, Antonia Belcher, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

BlueScience (Pty) Ltd

Name of Company:

13 January 2023

Date