KC PHYTO ENTERPRISES CC
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Western Cape Office
P.O Box 1
Brackenfell
Cape Town
7561
Mobile: 076 095 5129

Eastern Cape Office
Valley View
11 Waterfall Drive
Hogsback
5721

Email: lymnologist@gmail.com or kcphyto@gmail.com

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Title: Aquatic Biodiversity Impact Assessment Report for the Boskloof-Laingsburg 132kV line Basic Assessment, Western Cape Province.

Report Prepared by:

Mr Earl L Herdien *Pr.Sci.Nat.* – Earll.Herdien@gmail.com – KC Phyto Enterprises (NED)

Report Prepared for:

UFEFE Development Consultants (Pty) Ltd
Mr Caiphus Mukwevho - caiphusm@ufefe.co.za
Dr Sivile Mgese - sivilem@ufefe.co.za

UFEFE Development Consultants Service Excellence

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This report made use of freely available sector-based images and Geographic Information System (GIS) platforms. Site photographs were taken in person during ground-truth assessment phase.

Declarations:

Specialist Consultant	Consultant Declaration of Independence
Name: Earl L Herdien Role: Production Scientist (Aquatic Specialist) Vocation: Environmentalist, Pedologist, Biodiversity & Professional Aquatic Scientist SACNASP Registration Number: 400211/11 Email: **Earll.Herdien@gmail.com** / or alternatively **Lymnologist@gmail.com**	I, *Earl L Herdien*, declare that I am independent of the client and their consultants, and stand to gain no financial benefit from the proposed activity apart from remuneration for the work performed. All views expressed in this report are my own and the use of all material from other sources has been acknowledged.  …….. Date: 04 August 2025

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Acronyms and Abbreviations

AHP	Analytic Hierarchy Process
AIP	Alien Invasive Plants
CBA	Critical Biodiversity Area
CESA / ESA	Critical Ecological Support Area / Ecological Support Area
CMA	Catchment Management Agency
CMS	Catchment Management Strategy (i.e. wetland management - utilisation class configuration; catchment management objectives - RQO's)
DEA / DFFE	Department of Environmental Affairs (Forestry and Fisheries)
DWAF (now DWS)	Department of Water Affairs and Forestry
DWS (prev. DWAF)	Department of Water and Sanitation
EG&S	Ecological Goods and Services
EIAMS	Environmental Impact Assessment and Management Strategy
EI&S	Ecological Importance and Sensitivity
ELU	Existing Lawful Use
EMPr	Environmental Management Programme
ENPAT	Environmental Potential Atlas
GA	General Authorisation (i.e. NWA S21 water use)
GG	Government Gazette
GIS	Geographic Information System
GN	Government Notice
Ha	Hectares
HGM	Hydro-geomorphic (Unit)
IEM	Integrated Environmental Management
IAP	Invasive Alien Plant (Species)
IUA	Integrated Unit of Analysis

IWRM	Integrated Water Resources Management
MCDM	Multi-Criteria-Discission-Analysis
MMP	Maintenance Management Plan
NEMA	National Environmental Management Act
NEM:BA	National Environmental Management Biodiversity Act
NEM:PAA	National Environmental Management Protected Areas Act
NFEPA	National Freshwater Ecosystem Priority Area Atlas
NWA	National Water Act
NWM5	National Wetland Map 5 (SANBI Wetlands type Classification)
NWRS (1, 2 & 3)	National Water Resource Strategy 1, 2 & 3
PES	Present Ecological State
PPP	Public Participation Process
RDM	Resource Directed Measures
REC	Recommended Ecological Condition (CMA/CMS - Configuration)
RQO	Resource Quality Objectives
SANBI BGIS	South African National Biodiversity Institute – Biodiversity Geographic Information System
SDC	Source Directed Controls (i.e. anti-pollution management mechanism)
SQM	Square Meters
TPC	Threshold of Probable Concern (Eco Specification – EcoSpecs)
WMA	Water Management Area
WRC	Water Resource Commission

Glossary

Adaptive Management	Eliminate, reduce or rectify unforeseen or adverse impacts through corrective action and subsequent monitoring of efficacy for management pro-active and responsive management action, which achieves best practice through continual improvement.
Analytic Hierarchy Process	A decision-making process implemented by arranging the important components of a problem into a hierarchical structure similar to a family tree (i.e. principle components). The AHP method is a decision-making tool useful because it is a good fit with the hierarchy of Principles, Criteria, Indicators and Verifiers. It is also easier to undertake than principle component analysis which may be used as a reliable supplementary tool to improve resolution or confidence (i.e. correlation).
Baseline Information or Reference	The existing elements and trends in the environment; the characteristics of a given project (locality setting, plans/permits/agreements). Reference information also refers to prior development state or perceived natural setting.
Biodiversity / Biota	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.
Catchment Management Agency	Empowered directly by the National Department of Water and Sanitation (DWS) and Minister of Water Resources, Catchment Management Agency (Breede-Gouritz WMA CMA) undertake water resource management at a regional or catchment level and involve local communities (ie catchment management forums – CMF, water user associations / institutions), within the framework of the national water resource strategy, its Catchment Management Strategy (CMS). Regulation of CMAs is the responsibility of the Minister of Water and Sanitation DWS.
Ecological Pattern and Process	Ecosystem patterns includes its genetic variability (i.e. alpha, beta, gamma), and the number and distribution in space and time of populations and species, communities, ecosystems and landscapes (i.e. fauna may be either residential, alien or just visiting). The interactions of living organisms, populations, species and community linkages, which allows the biodiversity pattern to persist. Both process and pattern may relate to significant or rudimentary ecosystem functioning such as in the case with pollinators, pollination, competition, the breakdown and recycling of nutrients, predator-prey interactions, evolution of new sub-species or species, carbon fixing, and primary production. Although both pattern and process is important, the conserving processes requires a significantly larger proportion of the landscape than is needed in comparison to conserving representative biodiversity patterns.
Ecosystem	A dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Macro-scale conditions and interactions are relatively homogenous.
EcoClassification	The determination and categorisation of the Present Ecological State (PES; health or integrity) of various biophysical attributes of wetlands and watercourses with reference to its natural reference condition and the degree of change therein. The purpose of EcoClassification also seek to gain insights into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition.
Ecosystem Services	Goods and services inherent to the wetland, its habitat, biota & surrounding value (i.e. pollutant trapping, stormwater retardation and retention).

Environment	"Environment" means the surroundings within which humans exist and that are made up of: the land, water and atmosphere of the earth; Micro-organisms, plants and animal life; any part or combination of (i) of (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing (NEMA).
Environmental Impact	A change to the environment, whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.
Environmental Screening	Is a process that undertakes to determine if any key environmental issues and opportunities are associated to the proponent land use activity. Generally utilised as an early process tool in the Integrated Environmental Management Sector (i.e. activity feasibility or planning phase or NEMA National Screening Tool).
Indicator Species	Species which reveal the qualitative health or condition of its local environment, such as obligatory (salt-halophytes) or alien species (wattle or weed).
Integrated Water Resource Management (IWRM)	Integrated water resource management (IWRM) is a sector approach that seeks to reach an appropriate balance between the need to protect and sustain water resources on the one hand, and the need to develop and use.
Mitigation	The implementation of practical measures to reduce the adverse effects or enhance the beneficial effects of an action (i.e. Environmental Impact Management).
Multi-Criteria-Analysis	A decision making tool developed for complex multi-criteria problems which includes both qualitative and quantitative aspects of problems in the decision making process.
Natural Resources	Generally specific to the distinction to the natural local ecosystem setting and inclusive of the understanding of climate, geology, soil, biota (including invasive alien species, fungi, algae and bacteria) but excluding artificial anthropogenic resources such as concrete (i.e. man-made structures).
Present Ecological State (PES) / Recommended (REC)	Determined ecological system components (i.e. habitat, biota, flow hydraulics) used in *terms of the eco-classification process* is an indices derived approach measuring representative changes from a perceived natural reference state.
Pollution	Direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (inter alia)- less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful to the welfare or human beings, to any aquatic or non-aquatic organisms, or to the resource quality. In reference to water resource management, the NWA S19 and S20 apply.
Present Ecological State (PES) / Recommend (REC)	Determined ecological system components (i.e. habitat, biota, flow hydraulics) used in terms of the eco-classification process is an indices derived approach measuring representative changes from a perceived natural reference state.
Protected Area	A protected area is an area that has been contemplated in Section 9 (Kinds of Protected Areas) of the National Environmental Management: Protected Areas Act such as nature reserves, mountain catchment area.
Ramsar Convention	Wetlands of International Importance especially Waterfoul Habitat (1971).
Resource Quality	Resource quality comprises the Quality of all the aspects of a water resource - *(a)* the quantity, pattern, timing, water level and assurance of instream flow; *(b)* the water quality, including the physical, chemical and biological characteristics of the water; *(c)* the character and condition of the instream and riparian habitat; and *(d)* the characteristics, condition and distribution of the aquatic biota.

Risk Analysis	Technique used to determine the likelihood or chance of hazardous events occurring and the likely consequences. Originally developed for nuclear and chemical industry, where low probability events potentially have extremely serious results. Probabilistic risk analysis can be used to characterise environmental impacts, whose occurrence and nature are difficult to predict with any degree of accuracy.
Sensitive Ecosystem	An ecologically sensitive ecosystem is one where even relatively minor disturbances may result in substantial and significant changes to the equilibrium of healthy ecosystem, habitats or species structural integrity.
Soil Classification, Soil Type, Soil Form or Soil Profile	Soils groups are classed on an order level and identified as either Luvisols, Ferralsols, Arenosols, Acrisols, Nitosols, Cambisols and Lithsols. Soils belonging to the Namib, Fernwood, Hutton and Clovely forms as well as sandy soils with Neocarbonate B horizons are characteristic to South Africa (about 12 groups). Soil forms consist of soil bodies classified in a family type class by diagnosis of the layering of the distinctly associated soil horizons (i.e. Orthic "A" top horizon over a subsoil comprised of an "E" and "G"-horizon implies a Kroonstad soil form). The common understanding is South Africa comprise 73 soil forms which may be placed in 14 groups represented by either organic, humic, vertic, melanic, silicic, calcic, duplex, podzolic, plinthic, oxidic, gleyic, cumulic, lithic and anthropic forms.
Sustainability	Ecological Sustainability which recognizes the balance required in nature to ensure or confer on ecological resource condition, resilience and assurance requirements.
Sustainable Development Goal	SDG6 aims to achieve the sustainable management of water and sanitation.
Threshold	The capacity or level or limit beyond which the state or a variable of state (e.g. ecological integrity) incurs negative changes to its sustainability, its condition, efficiency and qualities. Beyond threshold levels, changes are frequently irreversible or very slowly reversible (i.e. residual effect).
Watercourse / Water Resource	According to the NWA, a watercourse constitutes a river or spring; a natural channel or depression in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) and a reference to a watercourse includes, where relevant, its bed and banks (i.e. excludes aquifer and estuaries).
Water Quality	The term water quality describes the physical, chemical, biological and aesthetic properties of water which determine its fitness for a variety of uses and for protecting the health and integrity of aquatic ecosystems. Many of these properties are controlled or influenced by constituents which are either dissolved or suspended.
Water Use Activity	An activity, as described in the NWA Section 21, Section 39, 40, 41 and 155 or other (Schedule 1, ELU, etc.), which may have relation or likely impact on a water resource and affects the: amount of water in the resource; the quality of water in the resource; or the environment surrounding the resource.
Wetland	Means 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.

1. Background and Scope

.1.1 Introduction

The proposed project activity comprises the repair of existing ESKOM: Distribution 132kV Line between Touwsrivier and Laingsburg, as well as the maintenance upgrade replacement of current Lattice Towers with Monopoles Towers supporting the line (i.e. Boskloof to Laingsburg Sub-Stations) (Figure 1, Figure 2, Figure 3, Table 1 and Table 2). In specific the proposed project activity will include:

- Restore the section of the double circuit 132kV Touwsrivier-Laingsburg power line that fell by constructing 8 new monopole towers on the same servitude and line route to normalize the supply.
- Install 10kA OPGW between towers T270 and T278, connect to the newly installed joint boxes.
- Replace the damaged earth peak on T278 (1LAI-TOU 178).
- Decommission and remove existing temporary wood pole structures from the site.

.1.2 Terms of Reference

1.2.1. Overview

According to the National Environmental Management Act (107 of 1998), the EIA regulations of 2014 (as amended), activities in respect to the proposed project are regarded as a listed activity under the EIA Regulatory Listing Notice 1 which requires a Basic Assessment (BA) process to be undertaken for the entire powerline covering a distance of 143.6km in length between Boskloof and Laingsburg substations (Figure 1, Figure 2, Figure 3, Table 1 and Table 2). Subsequently ESKOM has contracted UFEFE Development Consultants to manage and undertake for the provisioning of the required Basic Assessment Report to the Department of Forestry, Fisheries and Environmental Affairs (DFFE), as well as in seeking to comply with other environmental government agency jurisdiction (i.e. Department of Water and Sanitation – National Water Act 36 of 1998 Section 21 Water Use, Heritage Agency, Biodiversity, etc.).

The Independent KC Phyto Enterprises cc specialist aquatic consultant, Earl Herdien, aquatic qualification services, the subject and scope of this report, were hereby sub-contracted to:

- provide for the information requirements in respect to the project receiving aquatic resource quality status quos, the identification, confirmation of any subject watercourses or water resources potentially affected by the project;
- provide an impact and risk mitigation assessment in respect to project receiving watercourses and water resources;
- provide findings and recommendations to be taken up in the project BAR/MMP and WULA

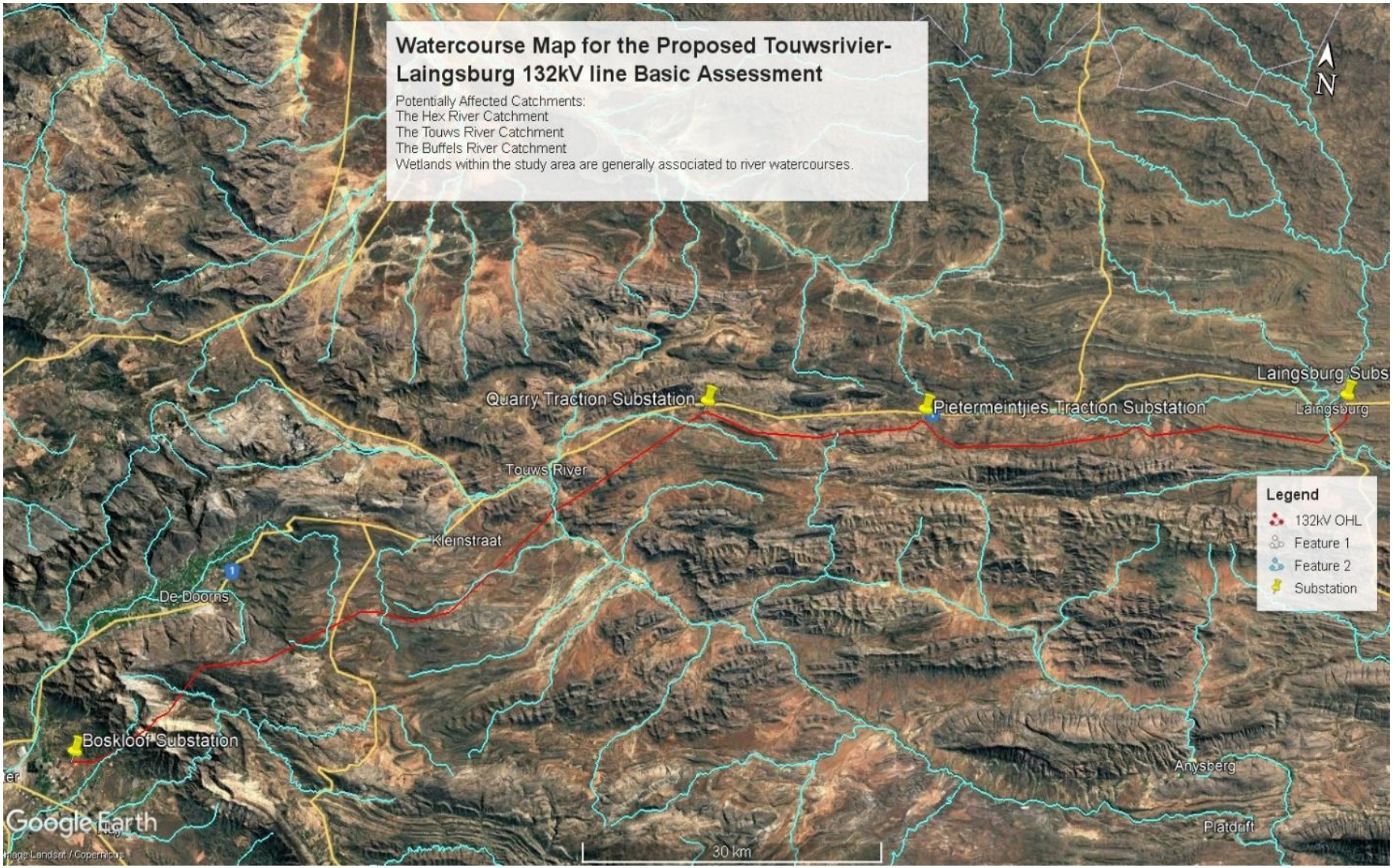


Figure 1: Project study area watercourse intersect project activity (red line) measuring about 143.6km from Boskloof substation and Laingsburg Substation (Google Earth 2025)

Table 1: Details of Project Location (Taken from UFEFE BAR)

Farm Name	Portion No	SG 21 Code
Oude Wagendrift 362	0	C08500000000036200000
	6	C08500000000036200000
Bernheim 899	RE	C08500000000089900000
	2	C08500000000089900002
De nonna 341	1	C08500000000034100001
	4	C08500000000034100004
	6	C08500000000034100006
Patrys Kloof 330	0	C08500000000033000000
Keeroms 1	RE	C05000000000000100000
	1	C05000000000000100001
Witkwaters Kloof 3	0	C05000000000000300000
Witvlakte 175	RE	C08500000000017500000
Farm 761	RE	C0850000000001740000
	2	C0850000000001740002
Stinkfontein 172	RE	C08500000000017200000
Stinkfonteins Berg 140	RE	C08500000000014700000
Helpmekaar 148	9	C08500000000014800009
Ratelbosch 149	1	C08500000000014900001
Skulpiesklip 151	RE	C08500000000015100000
Nouwgat 157	2	C08500000000015700002
Farm 740	0	C08500000000074000000
Vredefort 34	RE	C08500000000003400000
Zeekoe Gat 32	RE	C08500000000003200000
Slang Rivier 21	1	C08500000000002100001
Farm 262	0	C08500030000026200000
Farm 771	0	C08500000000077100000
Quaree Kloof 12	RE	C08500000000001200000
Quarrie Kloof 155	0	C04300000000015500000
Farm 156	0	C04300000000015600000
Farm 157	0	C04300000000015700000
Tweeside 151	RE	C04300000000015100000
Besten Weg 150	RE	C04300000000015000000
	1	C04300000000015000001
Matjesfontein 148	8	C04300000000014800008
Grootwater 270	RE	C04300000000027000000
Farm 282	RE	C04300000000028200000
Paarde fontein 44	3	C04300000000014400003
Baviaans Krants 104	6	C04300000000029000006
Farm 1115	0	C04300010000111500000

Table 2: Project Substation Locations (Taken from UFEFE BAR)

Substation	Central Coordinates	
	Longitude	Latitude
Boskloof Substation	19°33'7.21"E	33°37'49.53"S
Quarry Traction Substation	20°11'19.37"E	33°15'58.67"S
Pietermeinties Traction Substation	20°25'19.24"E	33°15'2.87"S
Laingsburg Substation	20°52'14.78"E	33°11'35.66"S

Figure 2: Photograph of Boskloof Substation taken during this report assessment ground-truth site investigation (i.e. affected Hex-Nonna-Nuy River Catchment Watercourses). Note that the project site is located on a mountain foothill and nested in a mesic natural fynbos ecosystem type.

Figure 3: Photograph of a Substation taken during this report assessment powerline route site ground-truth site investigation (i.e. ”Pietermeinties Traction Substation” along the Baviaans-Buffels River Catchment Watercourses). Note that the project area is located in a plain nested in a mesic natural succulent thicket ecosystem type.

1.2.2. Triggering NEMA Screening Tool Aquatic Biodiversity Theme

The need for undertaking of a specialist aquatic impact assessment study, the scope of this report, was identified by the project EAP, UFEFE Development Consultants (Pty) Ltd., when confirming for the relevant environmental sensitivity themes scope requiring specialist qualification for input into the project environmental impact assessment process (Figure 4, Table 3) (i.e. NEMA national screening tool).

As previously indicated, the "protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity resources" (i.e. aquatic biodiversity impact assessment protocol), as published by the Department of Environmental Affairs (No. 320) in Government Gazette No 43110, on 20 March 2020, consequently guides the implementation scope of this report. These regulations represent the procedures for the assessment and minimum criteria for reporting on identified environmental themes (i.e. Aquatic) in terms of Section 24(5)(a) and (h) and 44 of the NEMA when applying for environmental authorisation.

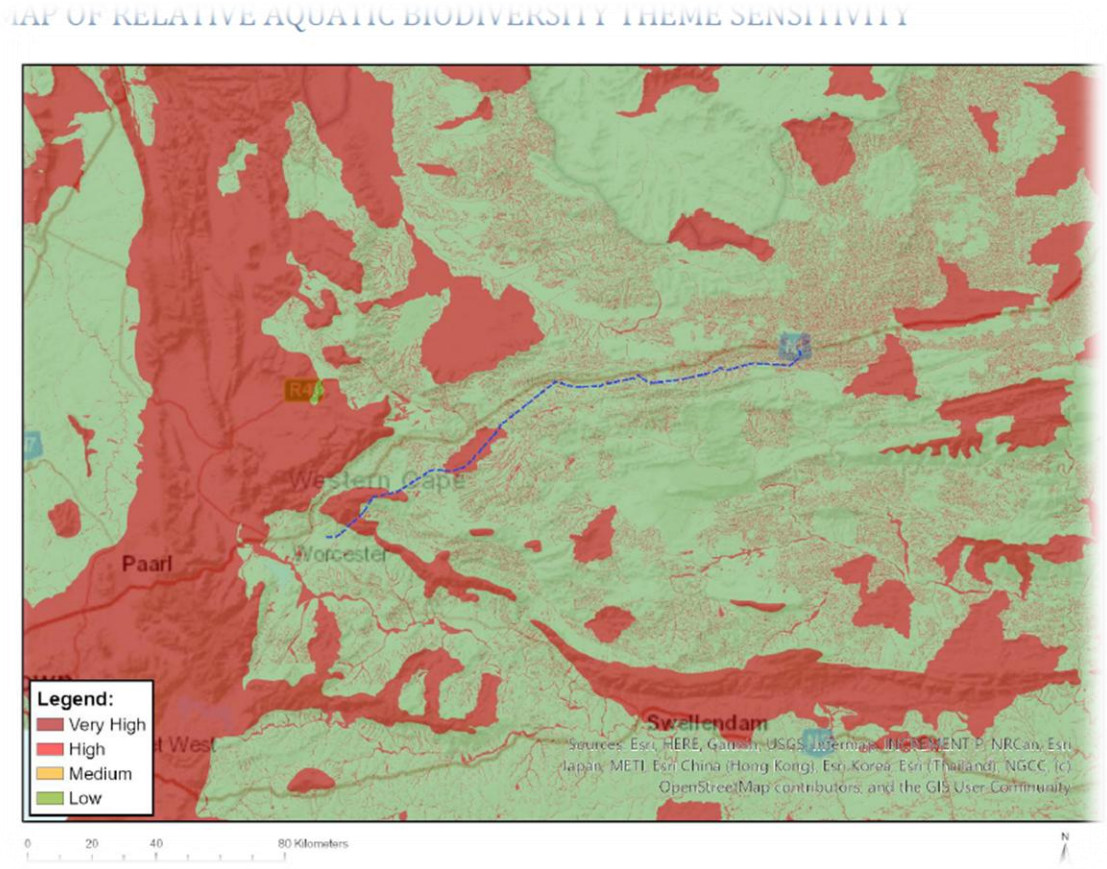


Figure 4: Excerpt from the UFEFE environmental practitioner report following the synthesis of the NEMA Screening Tool indicating that the project site is regarded to comprise a very high sensitivity in respect to its aquatic biodiversity theme.

Table 3:Project area aquatic biodiversity sensitivity feature attributes triggered by the NEMA Screening Tool whereby the project site falls within a very high aquatic biodiversity sensitivity zone

Sensitivity Feature	Sensitivity Rating
Freshwater Ecological Priority Areas	Project site falls within a very high sensitivity rating in respect to falling within a FEPA Freshwater Ecological Priority Area Sub-catchment
Wetlands_(River), Wetlands_Southern Fynbos Bioregion (Seep), Wetlands_Western Fynbos-Renosterveld Bioregion (Valley-bottom)	Project site falls within a very high sensitivity rating in respect to falling within areas with wetlands associated to rivers, as well as that project site receiving wetlands fall within Fynbos and Renosterveld bioregions. Of note is that Renosterveld is generally regarded as a critically endangered vegetation type.
Critical Biodiversity Area 1: Aquatic	Project site falls within a very high sensitivity rating in respect to falling within a category 1 Aquatic CBA
Ecological Support Area 1: Aquatic	Project site falls within a very high sensitivity rating in respect to falling within a category 1 Aquatic ESA
Rivers_AB, Rivers_C, Rivers_Z	Project site falls within a very high sensitivity rating in respect to associated catchment rivers within the AB (natural to good), C (moderately fair) and Z (undetermined) class in respect to its ecological condition
Strategic Water Source Area (SW)_Groot Winterhoek	Project site falls within a very high sensitivity rating in respect to being located within a SWSA

1.2.3. Aquatic Biodiversity Specialist Protocol

The aquatic biodiversity specialist protocol use refers to:

- An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of "very high" or "high" sensitivity for aquatic biodiversity resources must submit an Aquatic Biodiversity Specialist Assessment Report.
- If any part of the proposed development footprint falls within an area of "very high" sensitivity, the assessment and reporting requirements prescribed for the "very high" sensitivity apply to the entire footprint, excluding a linear activity for which impacts on aquatic biodiversity are temporary and the land in the opinion of the aquatic biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.

The instruction received from the EAP was that the specialist assessment must conform to the requirements for specialist assessments as set out in the relevant Guidelines for Specialist Assessments.

The terms of reference sourced from the aquatic biodiversity impact assessment protocol therefore refer:

- The Aquatic Biodiversity Specialist Assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP).
- The Aquatic Biodiversity Specialist Assessment Report must contain as a minimum, the following information:
    - a description of the aquatic biodiversity and ecosystems on the site, including; (a) aquatic ecosystem types; and (b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns;
    - the threat status of the ecosystem and species as identified by the screening tool;
    - an indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free-flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area);

- a description of the ecological importance and sensitivity of the aquatic ecosystem including: (a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and (b) the historic ecological condition (reference) as well as present ecological state of rivers (in-stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).

- Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions:
  - is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?
  - is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present
  - how will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include: (a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); (b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub-catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns); (c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.);
  - how will the proposed development impact on the functioning of the aquatic feature? This must include: (a) base flows (e.g. too little or too much water in terms of characteristics and requirements of the system); (b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over-abstraction or instream or off-stream impoundment of a wetland or river); (c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley-bottom wetland to a channelled valley-bottom wetland); (d) quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); (e) fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and (f) the loss or degradation of all or part

of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);

- how will the proposed development impact on key ecosystems regulating and supporting services especially: (a) flood attenuation; (b) streamflow regulation; (c) sediment trapping; (d) phosphate assimilation; (e) nitrate assimilation; (f) toxicant assimilation; (g) erosion control; and (h) carbon storage?
- how will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?

- The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:
  - contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;
  - a signed statement of independence by the specialist;
  - a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
  - the methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;
  - a description of the assumptions made, any uncertainties or gaps in knowledge or data; the location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;
  - additional environmental impacts expected from the proposed development;
  - any direct, indirect and cumulative impacts of the proposed development on site;
  - the degree to which impacts and risks can be mitigated;
  - the degree to which the impacts and risks can be reversed;
  - the degree to which the impacts and risks can cause loss of irreplaceable resources;
  - a suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;
  - proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr) / Maintenance Management Plan (MMP);
  - a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and any conditions to which this statement is subjected.

.2 Approach to Aquatic Biodiversity Impact Assessment Study

.2.1 Approach to implementing the TOR as described

Initially a conventional 3 phase approach was adopted as framework for the undertaking of an aquatic biodiversity study.

The first phase of this aquatic biodiversity impact assessment study report may be regarded as a desktop-based review study to provide a baseline reference for project site abiotic and biotic characteristics such as in respect to its regional setting (i.e. climate, topography, geology and water resource delineations). Due to the project site spanning a significant linear distance, the understanding of the resulting diversity of the receiving water environment is therefore also regarded as essential (i.e. project site comprises a number of different water catchment areas including 2 historic water management areas – Breede and Gouritz, currently amalgamated). As a result the study was synthesized according to 3 significant catchment areas namely:

- the receiving Hex, Nonna and Nuy (Breede) River catchment area which are associated to the project western extent (i.e. Boskloof Substation)
- the receiving Touws River catchment area which are associated to the project central extents (i.e. the project area that was damaged)
- the receiving Buffels River catchment area which are associated to the project western extent (i.e. Laingsburg Substation)

The second phase of the study will utilise the desktop assessment to then inform on a ground-truth validation or verification (confirmation) assessment phase, which seeks by way of site ground-truth investigation to better confirm and inform on the relevant project affected receiving catchment aquatic biodiversity aspects and resource quality characteristics where required. This includes the refinement of reference water resource classification or its delineation where required any potential project catchment affected wetland or watercourses potentially intersected by the project (i.e. substation - powerline route). Further where deviating from the reference catchment understanding the updating (data collecting) and provision of water resource present ecological ecological state (PES), its ecological importance and sensitivity, to allow for inferences on project receiving water resource quality aspects and characteristics (i.e. SANBI wetland classification, hydropedological investigation, DWS wetland delineation guideline, site habitat survey, DWS PES 1999, DWS River Helath, WRC WET-Health). The project water use scope may therefore also be confirmed during this ground-truth assessment phase.

The third and final phase of the aquatic biodiversity impact assessment report may be regarded as the impact or risk reporting phase, comprising the study collation, its synthesis and findings transcription phase. According to DEAT (2002) it is regarded as essential and important to ensure that relevant information is utilised in order to suitably identify, address and predict impacts and risks to aquatic biodiversity (i.e. status quo vs degree of change). The management of these impacts and risks therefore in turn allow for the provision of suitable mitigation measures (i.e. maintenance management programme). The standard environmental sector impact rating methodology applies (i.e. probability and significance) in addressing the project activity apply. The provision of the DWS Risk Matrix and further refinement of PES/EIS and EGS models may also apply where required.

.2.2 Key Approach Methods

Study aquatic resource quality confirmation, evaluation, are broadly supported and aligned to the following key policies and guidelines:

- Department of Water Affairs and Forestry. (1999). *Resource Directed Measures for Protection of Water Resources. Volume 3: River Ecosystems Version 1.0*. Resource Directed Measures for Protection of Water Resources, Pretoria, South Africa.
- Department of Water Affairs and Forestry. (1999). *Resource Directed Measures for Protection of Water Resources. Volume 4: Wetland Ecosystems Version 1.0*. Resource Directed Measures for Protection of Water Resources, Pretoria, South Africa.
- Department of Water Affairs and Forestry. (2008). *Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas,* Pretoria.
- Department of Water Affairs. (2013). *Guideline to regulate activities/developments affecting wetlands.* First Edition. Pretoria.
- Department of Water and Sanitation. (2017). *Regulations Regarding the Procedural Requirements for Licence Applications and Appeals in terms of Section 26(1) (k) of the National Water Act, 1998 (Act No. 36 of 1998).*
- Department of Water and Sanitation, South Africa. (2017). *Determination of Water Resources Classes and Associated Resource Quality Objectives in the Berg Catchment*.
- Department of Water and Sanitation, South Africa. (2020). *Determination of Classes of Water Resources and Resource Quality Objectives for the Breede-Gourtiz Water Management Area.*
- Department of Environmental Affairs. (2020). *Biodiversity: Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity*, in Government Gazette No 43110.

- Fynbos Forum (2016) *Ecosystem Guidelines for Environmental Assessment, Edition 2,* Cape Town, South Africa.

As in Job *et al.* (2018) and Sieben *et al.* (2017), this aquatic study rely or is supported and aligned to several standardized sector based standards to inform and confirm on watercourse resource quality, its classification, delineation, the present condition and functional value, as well as in respect to its catchment management context (see following Figures 5 to 12).

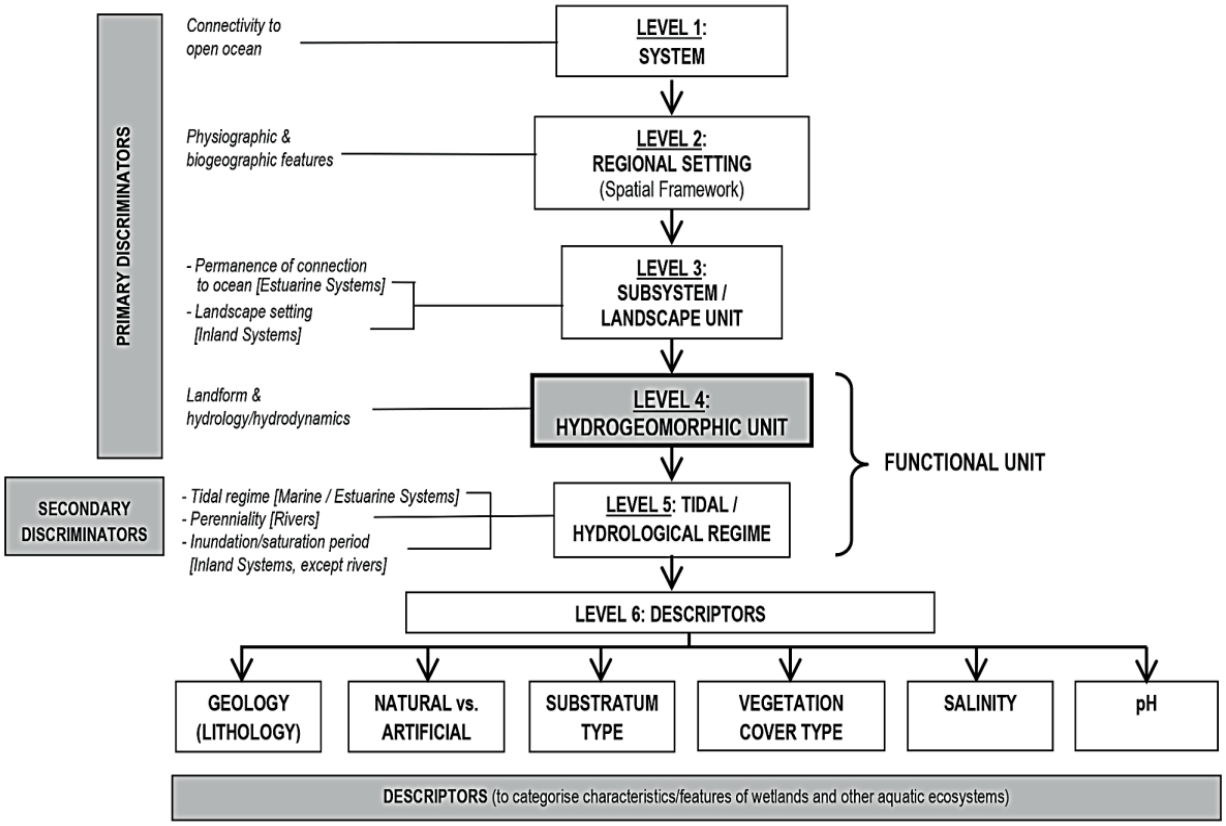


Figure 5: Conceptual illustration of the relationship between the implementation of a “top-down” primary determinant and integrating it with a “bottom-up” secondary discriminator (descriptor) within the context of wetland classification practise (Ollis *et al.* (2015))

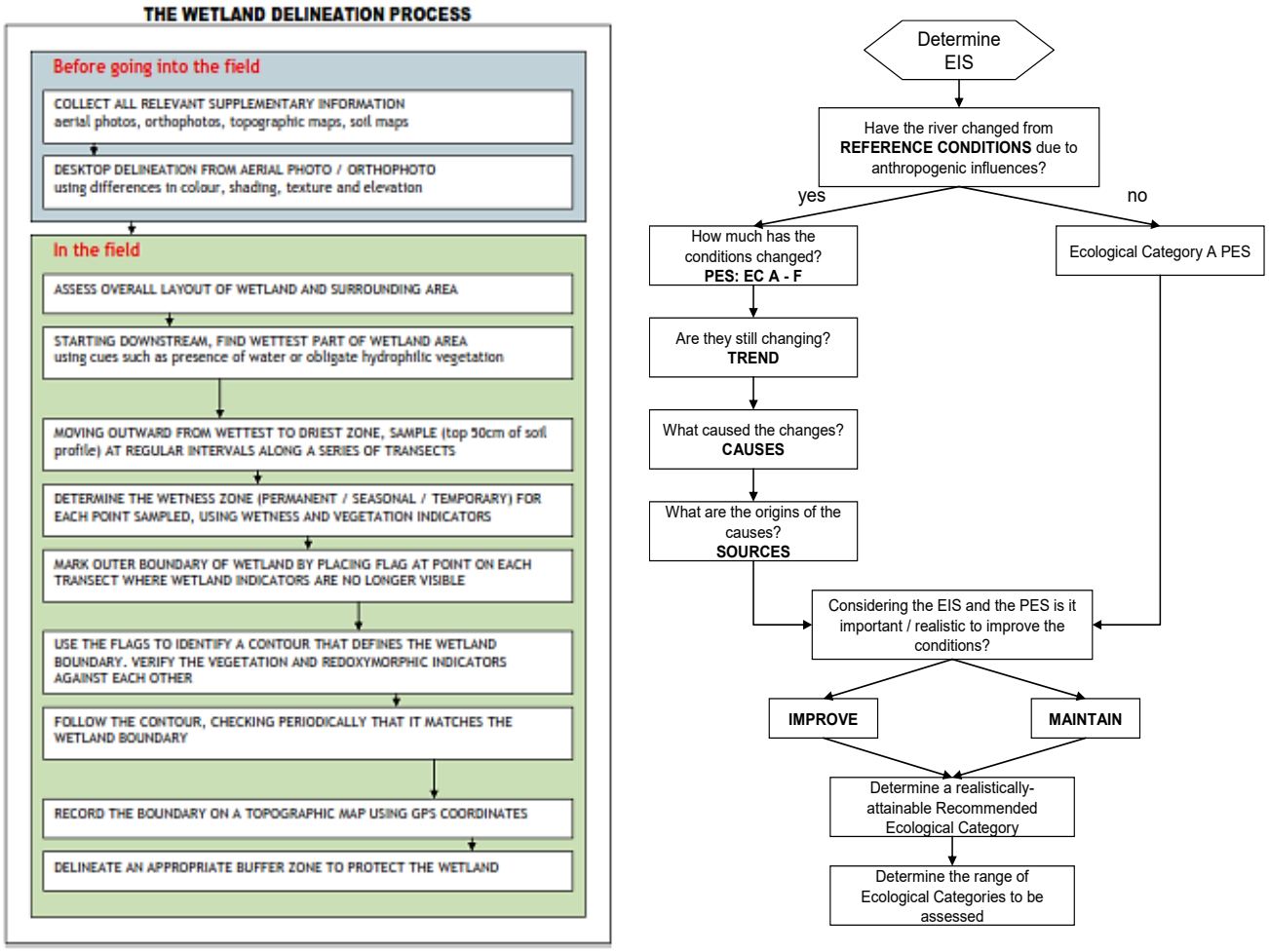


Figure 6: Wetlands Delineation Guideline Process (DWAF 2005 and 2008) (left); DWS RDM Present Ecological State (PES) Determination Methodology (DWAF 1999) (right).

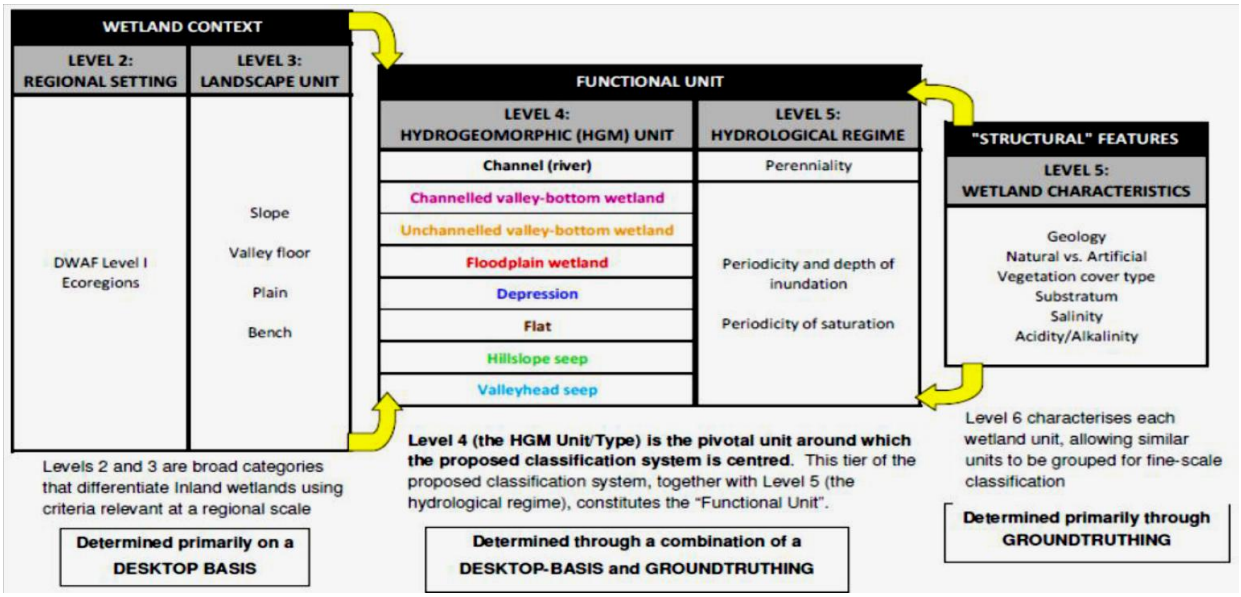


Figure 7: Conceptual diagram illustrating the relationship between wetlands classification and reporting levels (From: SANBI National Wetlands Classification System, SANBI 2009)

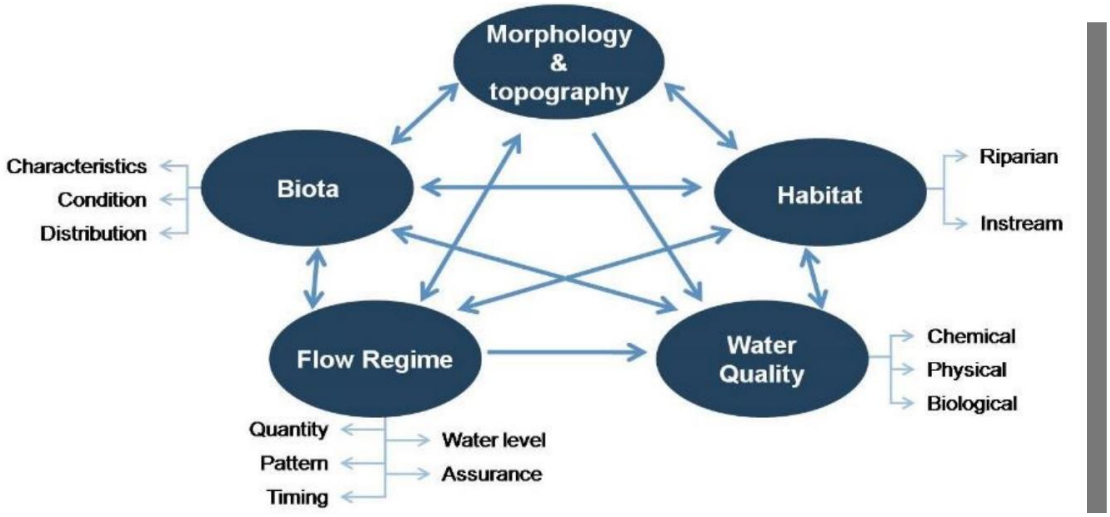


Figure 8:Watercourse characteristics (ecosystem or network) in terms of resource quality from DWS Impact and Risk Assessment Matrix Training Presentation which have been updated to incorporate for (HGM) hydrogeomorphic aspects (Dr Wietsche Roets 2015)

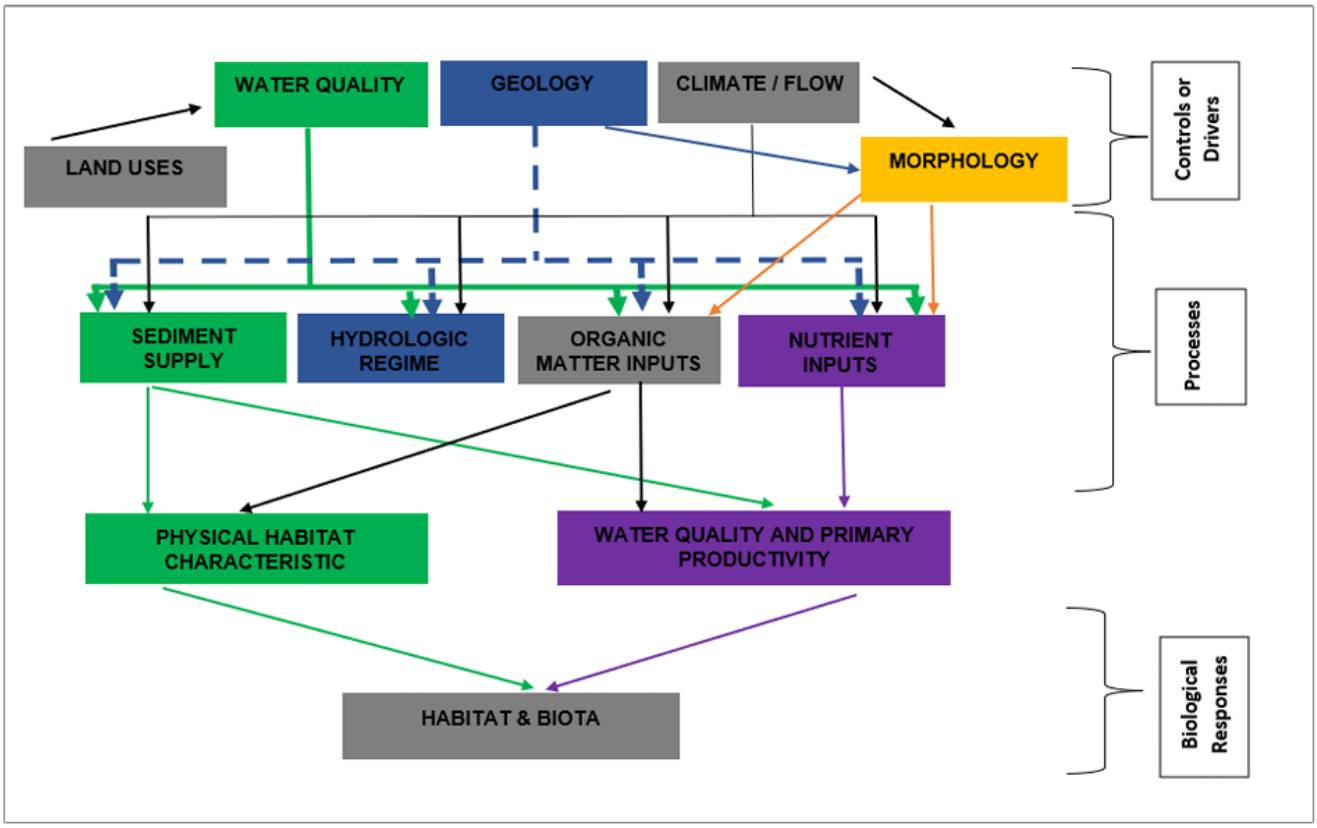


Figure 6: The Ecological Water Requirements of the Reserve including drivers and responses (adapted from Beechie and Bolton, 1999).

Figure 9: Excerpt illustrating water resource process characteristics from a systems drivers and response perspective (DWS 2022)

Although this study provides a measure of risk to resource quality by modelling the DWS NWA Risk Matrix, impacts are also synthesised after a fashion for ease of reference into the EIA/NEMA framework.

Table 4: Department of Water and Sanitation Impact and DWS Risk Matrix Model Aspects

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

As previously indicated, in order to determine or make estimation in the determination of the severity and extent of potential project activity risks and impacts on the receiving aquatic environment, including considering the potential for any long-term or irreversible damage which may derive from the project requires a sound understanding of the watercourse reference setting (i.e. ecological condition in current state vs degree of disturbance vs sensitivity to change). This includes consideration of the perceived potential and cumulative risks and potential even existential land use impact effects (i.e. climate change threat, ecological importance). Similarly impacts are measured by its potential known effect as well as in considering the potential mitigation efficiency (i.e. sustainability). The measuring of impacts infers from a yard-stick approach relying on the experience of the scientist or assessor to informed from both ground and ecosystem level by way of status quo confirmation investigation and consider broad and specific criteria which may affect on the subject resource quality integrity or its facets (i.e. resource quantity, quality, habitat, biota):

- Topography, Slope, Geology, Soil, Catchment Aspects and Niche Aspects (i.e. mountain foothill vs valley plains)
- Vegetation Composition and Community Structure, Species of Special Concern, Habitat Importance, Habitat Sensitivity, Habitat Fragmentation, Biodiversity and Conservation Value
- Erosion/Accretion Potential, Rehabilitation/Restoration potential, Anthropogenic Disturbance Pressure, Vectors and Threats, Alien Disturbances and Threats, Ecological Goods and Services, Catchment Management Setting (i.e. Desired State, REC)

In general as far as possible sector guidelines and policy are utilised to inform on the strategies and measures recommended to avoid, minimize, or offset negative impacts on the project receiving aquatic environment, ensuring for project sustainability.

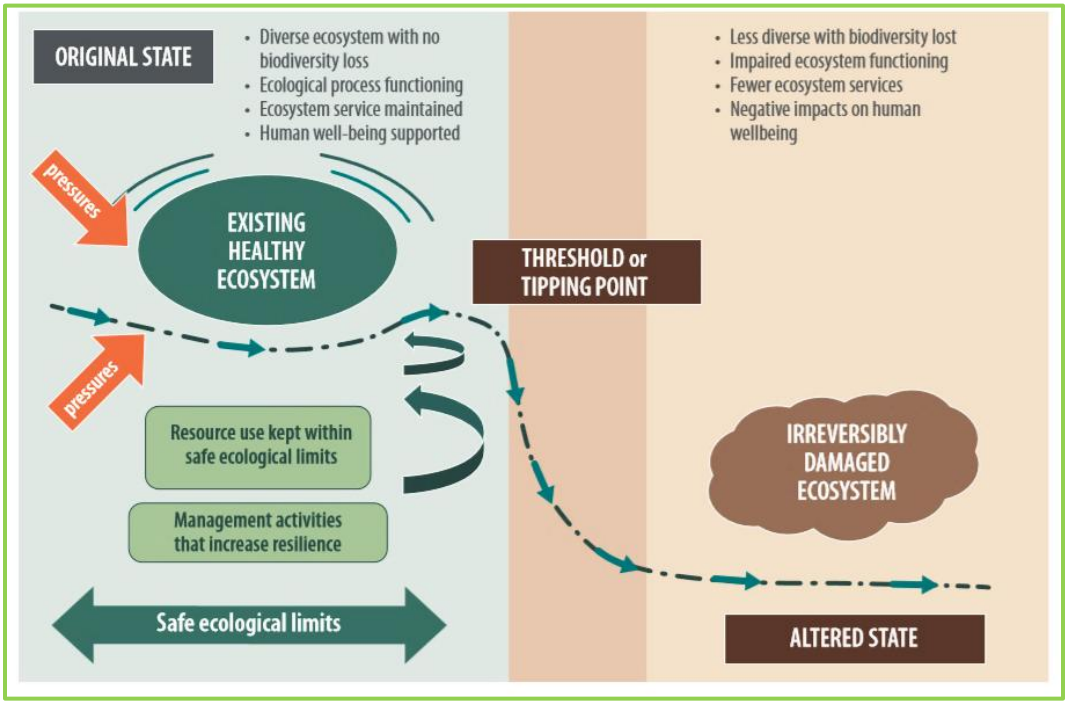


Figure 10: Ecosystem Resilience and Threshhold of change illustration (Fynbos Forum 2016)

Broad Sensitivity Context Framework		
Risk confidence	Resource quality	Compliance and Maintenance requirements
Impact significance	Resource sensitivity	Development costs
Impact mitigation efficiency	Resource importance	Development benefits

Figure 11:Framework concept for water resource development planning consideration.

.2.3 Limitations

Limitations and uncertainties often exist with the application of various techniques adopted to screen aquatic biodiversity ecosystem status quo and its aspects or characteristics. The following techniques and methodology was utilised to undertake this study:

- Project site affected catchment characterisation data was sourced from reference work and DWS River Health Programme State of Rivers Reports;
- Water resources were also screened using popular sector platforms such as Google Earth Pro and Cape Farm Mapper and SANBI BGIS;
- Verification of the freshwater ecosystems was undertaken according to nationally developed methodologies as defined by DWS and/or DEA as cited;

- Limitations with respect to the systems understudy having seasonal flow regimes and associated hydrological response may imply some limit on system reference understanding confidence (continuum concept with natural regime characterisation confidence);
  - represents various degrees of characterisation constraints for abiotic or biotic processes control and ecological community structure
  - constraints with describing connectivity of surface aquatic habitat
  - constraints with degree of flow predictability
  - constraints with degree of flow variability, and
  - constraints with degree of natural disturbance.
- Impacts and Risks were modelled according to broad sector practise and oversight of the EAP.

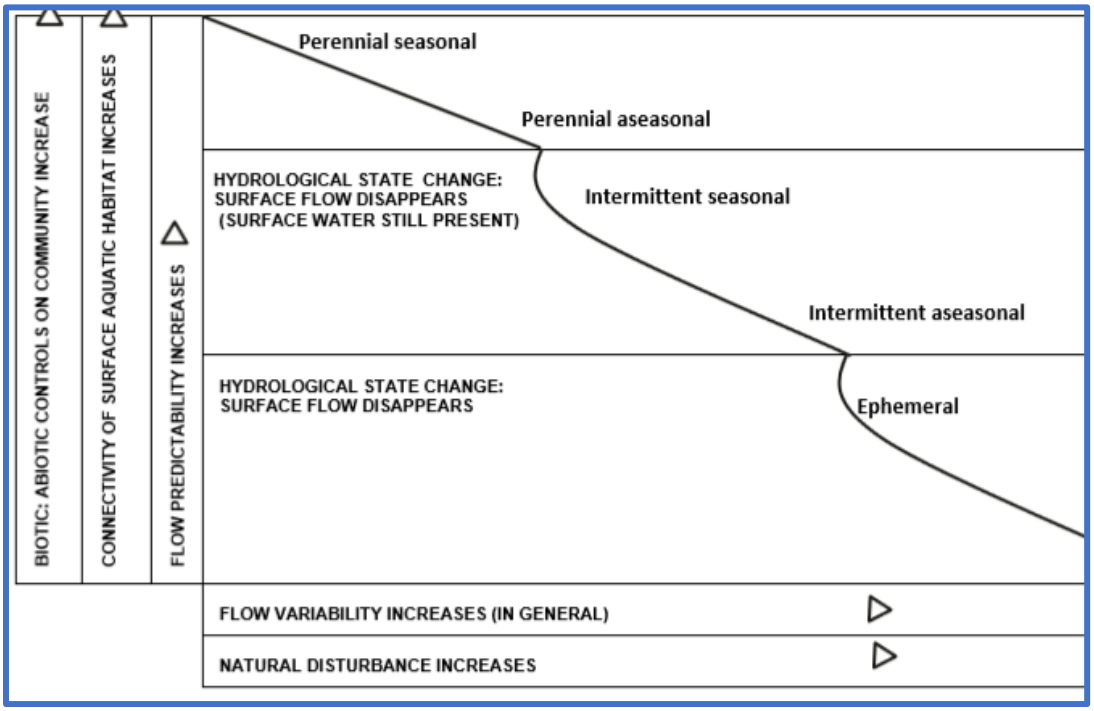


Figure 12: Continuum concept response metric relations (Seaman *et al.* 2010)

Importantly undertaking for an aquatic impact assessment implies a good level of literature review relevant to the study site, preferably having an assessor (i.e. specialist) with local first-hand knowledge and to evaluate the potential effects of a project on the receiving watercourse and catchment resource quality (i.e. this report author has undertaken seasonal river health biomonitoring of the project catchment areas over a period of at least 5 to 10 years).

The following selected studies serve as relevant reference work undertaken by the compiler of this aquatic qualification report:

- River Health Programme. (2007). State of Rivers Report: Rivers of the Gouritz Water Management Area. Department of Water Affairs and Forestry. Cape Town. (DWS)
- River Health Programme. (2008). State of Rivers Report: Rivers of the Breede Water Management Area. Department of Water Affairs and Forestry. Cape Town. (DWS)
- Herdien, E. and Belcher, A. (2010). Freshwater Assessment for Proposed Double Sided Breede Valley Vehicle Service Development, Portion 16(of 17) De Mond van Hartebeest Rivier Farm No 379, Worcester (BlueScience)
- Herdien, E. (2018). Aquatic Status Quo Report for the Proposed Housing Development on Erven 1817 to 1834, Touwsrivier. (DJ Environmental)
- Herdien, E. (2018). Aquatic Status Quo and DWS Risk Matrix Report for the Skoonvlei Industrial Hub, Roads and Stormwater Upgrades Project, Ceres (RHDHV)
- Herdien, E. (2025). Aquatic Biodiversity Impact Assessment for the Proposed Calvin Wind Energy Facility (WEF), alongside the Proposed Calvin Solar Energy Facility (SEF), Laingsburg, *in prep.* (Braaf Environmental)

Ultimately the effectiveness of Integrated Environmental Management is directly dependent on the quality and ethical values of professionals working in the environmental assessment field (DEA 2011a; DEA 2011b). Recommendations are based on experience, professional opinion, industry standards and best practise within South Africa.

.3 Study Desktop Assessment

.3.1 Relevant Policy Framework Overview

.3.1.1 Principle Regulatory Context

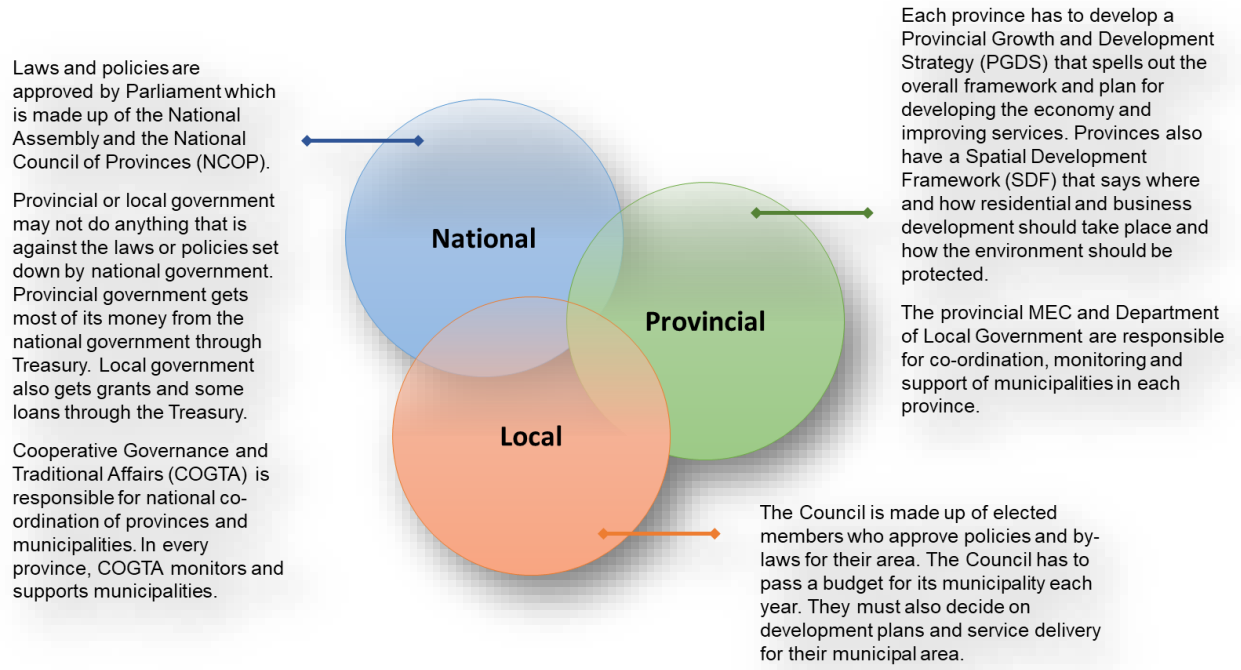


Figure 13: Illustration representing South African spheres of government (Steenkamp & Herdien 2021)

The Constitution of the Republic of South Africa (No 108 of 1996) is the fundamental "cornerstone" legislation leading reform for a fair and just South Africa. The Constitution is regarded as the Supreme Law of South Africa. The Constitution famously contains the cornerstone "Bill of Rights" in Chapter 2 which provides for the provision of basic human needs and empowering citizen rights in enshrining human dignity, equality and freedom as the democratic principles it affirms for our country. The bill of rights therefore embody our constitutional democracy aspiration from a socio-economic and environmental management perspective, amongst other.

Section 24 empowers everyone in South Africa with the right to an environment that is not harmful to their health, wellbeing, and that the environment is protected for the benefit of present and future generations. These rights are upholded by managing against pollution or ecological degradation and in facing the threat of climate change, while promoting conservation and securing ecologically sustainable development by implementing a mindful approach to environmental resource use and the management

of natural resources while promoting justifiable economic and social development (i.e. principles of sustainable development, SDGs, environmental and water reforms, EIAMS).

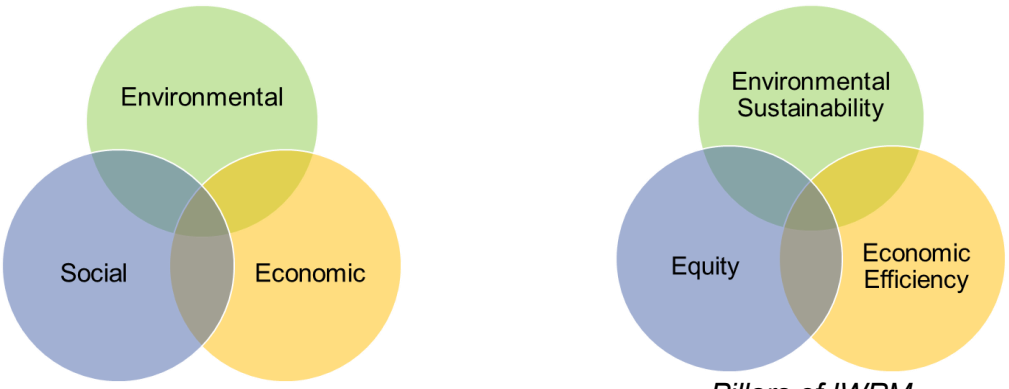
Section 25(4)(a) indicates that in respect to property which is not limited to land, that the public interest includes the nations commitment to land reform, to bring about equitable access to all South Africa's natural resources. Furthermore, Section 27(b) indicates that everyone has the right to have access to sufficient food and water.

Section 152 empowers local government to promote social and economic development, as well as ensure the provision of services in a sustainable and inclusive manner. Schedule 4 of the Constitution provides provincial government to direct trade and industry development, and housing and the further empowerment of local government.

Principle of Integrated Environmental Management

As with water use, the principles of Integrated Water Resource Management (IWRM) and the National Water Act (36 of 1998) (NWA), the adoption in ethic and practice of Integrated Environmental Management (IEM), the principles translated and embedded into the National Environmental Management Act (NEMA) in 1998, with Integrated Environmental Management (IEM) forming the title of Chapter 5 (NEMA) having the purpose of promoting the application of appropriate environmental management tools to ensure the integrated environmental management of land use activities. The original principles and procedures of IEM seek to provide a potential alternative to ensuring a balance between environmental protection and economic growth (EIAMS framework - DEA 2014).

The main aim of the Integrated Environmental Management according to Section 23 of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) is to; "Identify, predict and evaluate the actual and potential impact on the environment, socioeconomic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimize negative impacts, maximizing benefits, and promoting compliance with the principles of environmental management set out in section 2". However in further comparison to IWRM it must however be noted that the DWS NWA approach to impact and risk management and that concerning the outcomes of activity suitably permitted will consider policy positions related to its sphere of governance such as the case with water use management and Section 27 of the NWA which places weight on a number of policy reforms in considering the subject of the redress of past injustices, the public and local CMS, among other factors in its management and decision making processes (i.e. Water User Association, Catchment Management Forum).



Pillars of sustainability *Pillars of IWRM*

Figure 14: Comparative illustration between principle environmental and principle water philosophy (Steenkamp *et al.* 2021).

Principle of Integrated Water Resource Management

The philosophy of Integrated Water Resource Management (IWRM) is regarded as one of the major concepts underpinning the advance in south africa water law (NWA). In this respect, and even though not fully realised in practise, IWRM is continually refined from an implementation scope in the national water resource strategy of south Africa (NWRS1, 2&3) in seeking to realise its goals (i.e. social equity, economic efficiency, environmental sustainability) (Figure 13 & 14). According to the United Nations (UNEP), IWRM is a process that promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (i.e. national outcomes programme).

International Obligations may affect principle regulations to the degree where consideration to the application of existing and future international agreements and conventions may require South Africa to participate as signatory to thereby duly undertake in fulfilling its international obligations such as to the Convention on Biological Diversity (since 1993), the Ramsar Convention (since 1975) or Paris Agreement of 2016 which may limit or disrupt conventional development in seeking to promote resource protection in transitioning to sustainability based economy which are adapted to the climate change threat (COP21). The Comprehensive African Agricultural Development Programme (CAADP) and 4th industrial revolution may refer among other (i.e. United Nations, BRICS, SADC, DBSA, NDP 2030, Agenda 2063). Although South Africa have developed its own policy for wetland management, it should be noted that there is alignment with international convention:

- Ramsar Convention. (2010). *Wetland Risk Assessment Framework.*
- World Wildlife Fund (WWF). (2012). *Wetland Risk Assessment Methodology.*
- International Union for Conservation of Nature (IUCN). (2013). *Wetland Risk Assessment Guidelines.*

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) regarded as an umbrella act, the NEMA is mandated to provide for co-operate, environmental governance by establishing principles and policy for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state.

Beyond ensuring the protection and sustainability of our environment as indicated in Section 24 of the Constitution of the Republic, NEMA also prescribes listed activities and listed areas (i.e. EIA listing Notices). Section 24F of NEMA makes it a criminal offence to conduct a listed activity without an environmental authorization. Further Section 28(1) of the NEMA provides 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. In this regard a collective approach is required known as the duty of care principle which incorporates company, organisation as well as to the individual private and even the lay person to be mindful about our shared environment.

NEMA as an umbrella act has an integrated mandate implemented via a suit of supportive and subsidiary policy and acts (SEMA's), such as with respect to the National Environmental Management: Protected Areas Act (Act 57 of 2003), National Environmental Management: Biodiversity Act (Act 10 of 2004), National Environmental Management: Air Quality Act (Act 39 of 2004), National Environmental Management: Waste Act (Act 59 of 2008) (NEMWA), etc.

The National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA, hereafter referred to as Biodiversity Act) was promulgated to ensure for the protection of species and ecosystems that warrant protection. It also seeks to promote the realization of a biodiversity economy with sustainable use of indigenous biological resources. Section 52 (1) (a) & (b) and 52(2) of the Act makes provision for the conservation of threatened ecosystems which includes wetlands in need of protection (i.e. the adoption of SANBI Biodiversity Maps).

The National Environmental Management: Protected Areas Act 57 of 2003 (NEM:PAA, hereafter referred to as Protected Areas Act) was promulgated to bring effect to a national system of representative protected areas to preserve the country's biodiversity, natural landscapes, and seascapes, including wetlands and wetland dependent species, and manage such areas in a sustainable manner.

The Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) broadly regarded as the principle implementing policy with respect to Agricultural Resources. In principle CARA aims to provide for control over the utilisation of natural agricultural resources in order to promote conservation of the soil, the water sources, as well as the vegetation and in the combating of weeds and invader plants.
The objectives of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) are to provide for the conservation of the natural agricultural resources of South Africa by the:

- maintenance of the production potential of land;
- combating and prevention of erosion and weakening or destruction of the water sources; and
- protection of the vegetation and the combating of weeds and invasive plants.

According to the amended regulations (GN R280 of March 2001), declared weeds and invader plants are divided into three categories:

- Category 1 may not be grown and must be eradicated and controlled,
- Category 2 may only be grown in an area demarcated for commercial cultivation purposes and for which a permit has been issued, and must be controlled, and
- Category 3 plants may no longer be planted and existing plants may remain as long as their spread is prevented.

It is regarded the legal duty of the land user or land owner to control invasive alien plants occurring on the land under their control. This implies that should any alien plant species occur within the study area; which will require to be managed for in line with an approved Environmental Management Programme or Maintenance Management Programme (EMPr/MMP).

The National Water Act (no 36 of 1998) (NWA) is the principal water policy framework for South Africa's water resources with the Minister of Water and Sanitation (DWS) serving as custodian of our nations water resources. The National Department is mandated to promote effective and efficient water resources management, its protection and use, and in ensuring its sustainability with balancing economic and social development.

The NWA provides for the balance between preservation and exploitation of water resources (i.e. sustainability, water reserve, fitness for use, conservation and demand management). The act is mandated to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled. As such all water resources in the country falls within the custodianship of the state and the Minister of Water and Sanitation whereby its use is registered, permitted for basic human

needs, authorised under General Authorisation (GA) or in the context of a specific conditional water use license (WULA) application. Water use is defined in Section 21 of the Act, which may be subject to regulations in respect to procedure securing the use aspects and ambits such as referred to in Section 39, 40, 41, and other sections of the Act (i.e. Section 27 motivation) or relevant Schedules of the Act (i.e. Schedule 1 use, WULA or GA as indicated).

.3.1.2 Administration Context

The Department of Forestry, Fisheries and the Environment (DFFE) The previous Department of Agriculture, Forestry and Fisheries, rightfully solicits its powers and functions from the Constitution of the Republic. The Department of Forestry, Fisheries and the Environment (DFFE) was renamed on 1 April 2021, from the previous Department of Environment, Forestry and Fisheries (DEFF). In June 2019 the DFFE had been established by incorporating the forestry and fisheries functions from the previous Department of Agriculture, Forestry and Fisheries and now into the Department of Environmental Affairs. The DFFE mandated to give effect to the right of citizens to an environment that is not harmful to their health or well-being, and to have the environment protected for the benefit of present and future generations. To this end, the Department provides leadership in environmental management, conservation and protection towards sustainability for the benefit of South Africans and the global community (Sourced from DFFE website). Land use is subject to the compliance provisions of the NEMA (i.e. EIA listing notice), its subsidiary policies and those in respect to the Department of Agriculture.

It should be noted that South Africa has both a main and strategic perspective in that organs of state will also collaborate in strategic programmes to expedite specific needs requiring priority such as with the case of the Department of Agriculture, Land Reform and Rural Development (DALRRD) which focus on integrating rural development by way of land reform (i.e. the Land Reform Act 1997) and generally utilising the Cooperative Governance and Department of Traditional Affairs (CoGTa), Municipal Infrastructure Agency (MIA) and where possible further strengthening the services base relationship with the South African Local Government Association (SALGA). The DALRRD is thus mandated to initiate, facilitate, coordinate, catalyse and implement an integrated rural development programme. Its vision is to transform and invigorate the agricultural sector into one that is equitably vibrant in terms of food security, financial viability and sustainable rural development.

The NEMA oversight agent provides (2021 as amended) Ecosystem Environmental Assessment Guideline: Guidelines for the implementation of the Terrestrial and Aquatic Ecosystem Protocols for environmental impact assessments in South Africa, by the South African National Biodiversity Institute (SANBI) and the Council for Scientific and Industrial Research (CSIR) forms the key process requirement in respect to complying with environmental policy requirements in respect to this study.

Although NEMA and the DFFE guides the key process requirements, additional subsidiary and supportive institutional process requirements may be triggered as a result of the undertaking of environmental management processes such as for suitable land use planning or management (i.e. DWS confirmation on water use registration applicability, GA or WULA ambits).

Accordingly where required Regulation 16(1)(v) of the Environmental Impact Assessment (EIA) Regulations, 2014 (recently amended in April 2017 and again in June 2021, or most recent) requires an applicant or project principal EAP to submit an environmental sensitivity screening report which further guides specialist input in environmental management practise (Procedures to be Followed for the Assessment and Minimum Criteria for Reporting of Identified Environmental Themes in terms of Section 24(5)(a) and (h) of the National Environmental Management Act, 1998, when applying for Environmental Authorisation. Department of Environmental Affairs, South Africa). The National Web based Environmental Screening Tool is a geographic information system (GIS) based web-enabled application which allows a proponent intending to submit an application for Environmental Authorisation (EA) in terms of the EIA Regulations (2014) (as amended) to screen their proposed site for the sensitivity of various environmental themes. The National Environmental Screening Tool thus advise on project-specific or triggered specialist study requirements such as in respect to the aquatic biodiversity theme.

Specific Wetlands Water Use Regulatory Compliance and Management Context

Eleven (11) water uses are outlined in the National Water Act (36 of 1998) Section 21 (a-k). Water use activities related to stormwater management structures, such as culverts and canals or other, or where associated with wetland or watercourse characteristics (i.e. alteration of flow or characteristics), may require water use registration, authorisation or licensing with the National Department of Water and Sanitation (DWS) or DWS Catchment Management Agency (CMA), in respect to NWA Section 39 or Section 40, or other, and in reference to undertaking a water use activity described in the NWA Section 21 (c) and/or (i) as the specific water uses commonly in question as associated.

In the case of artificial or semi-natural water resources, wetlands or watercourses, the DWS and its CMA reserves the right to make determination, or confirm on whether a water use activity is indeed “triggered” or undertaken within the activity scope and which will therefore require clarity engagement with the National DWS and/or DWS CMA (i.e. Breede-Gouritz Catchment Management Agency).

The DWS Risk Matrix (Risk Assessment Protocol Guideline) is a popular RDM based tool used to determine whether a water use activity where confirmed may require authorisation by way of risk based threshold ambit calculation as to whether a water use license or a general authorisation may be applicable for a project water use activity in respect to NWA Section 21 (c) and (i).

Table 5:Potential Applicable Project Water Use Activity (i.e. watercourses transected by project line)

NWA Section 21 (c)	Impeding or diverting the flow of water in a watercourse
NWA Section 21 (i)	***Altering the bed, banks, course or characteristics of a watercourse***

*Registration of project watercourse in respect to NWA S21(i) water use may justifiably refer in the context of the project activity.

Regional Catchment Management (CMA)

Table 6: DWS Catchment Water Resources Management Classes Definitions according to the NWA National Water Resource Classification System. Site falls within a Class 3 water resource management class setting (DWS 2017)

Water Resource Management Class	Description
Class I: Minimally used	The configuration of water resources within a catchment results in an overall water resource condition that is minimally altered from its pre-development condition.
Class II: Moderately used	The configuration of water resources within a catchment results in an overall water resource condition that is moderately altered from its pre-development condition.
Class III: Heavily used	The configuration of water resources within a catchment results in an overall water resource condition that is significantly altered from its pre-development condition.

It must be noted that the Department of Water and Sanitation or its Catchment Management Agency (CMA) (Breede-Olifants CMA) (previous Breede-Gouritz) will be required to make determination on the confirmation of any potential water use in respect to project activity or project site receiving watercourses (i.e. water use authorisation).

Potential Pollution Activity Concerns

Pollution prevention of water resource and pollution management requires a duty to care principle to be adhered to. Section 19 of the National Water Act (36 of 1998) as well as Section 20 provides a framework understanding to this concern, amongst other possible contraventions. Pollution prevention in the case of water resources requires adherence to Section 19 of the National Water Act (36 of 1998) in order to mitigate against any contraventions. Offenses with respect to the NWA are commonly processed via Section 151 and the Provision of Administrative Justice Act (Act 3 of 2000) (PAJA).

.3.2 Bioregional, Climate, Land-use and Ecosystem Setting

With the project activity powerline study site covering about 143.6km in extent, its bioregional setting perspective incorporates a significant variance in climate, topographical and ecosystem diversity (Figures 15 & 16). According to the DWS Internal Strategy Perspectives, the subject project activity receiving affected aquatic catchment areas falls within two historic water management areas: namely the Breede Water Management Area in respect to the project western extent (Boskloof substation); which extends and resides predominantly within the Gouritz Water Management Area (Figure 17).

According to DWAF (2004a) and DWAF (2004b) the project area weather is characterised by the cold winter frontal rainfall Mediterranean climate region to the west which ranges between 1000-2000mm (MAP), which contrasts significantly with the predominating summer Karoo climate of the project central and western extents averaging with a nominal 160mm-250mm annual rainfall typically occurring by way of a few summer thunderstorm events. The mean annual temperature ranges between 16ºC along the south-east coast to 17ºC in the interior, with an average close to 17ºC for the catchment as a whole. Maximum temperatures of up to 41ºC are experienced during February, predominantly in the inland catchments where minimum temperatures as low as 0ºC usually occur in July.

From a landuse perspective project area receiving surface water resources are considered to be 95% exploited for irrigation uses. However the catchment areas comprise largely natural veld and rangeland, with limited cultivation and crop suitability being a factor (i.e. salinity and high evaporation rate factor). The natural geology (shales) and agricultural practices contribute to the salinity problem in catchment river systems, which impacts on water quality for irrigation. In this respect it must be noted that elevated salinity occurs naturally within the inland catchments of the Great and Little Karoo as a result of natural geology and high evaporation (Table 7).

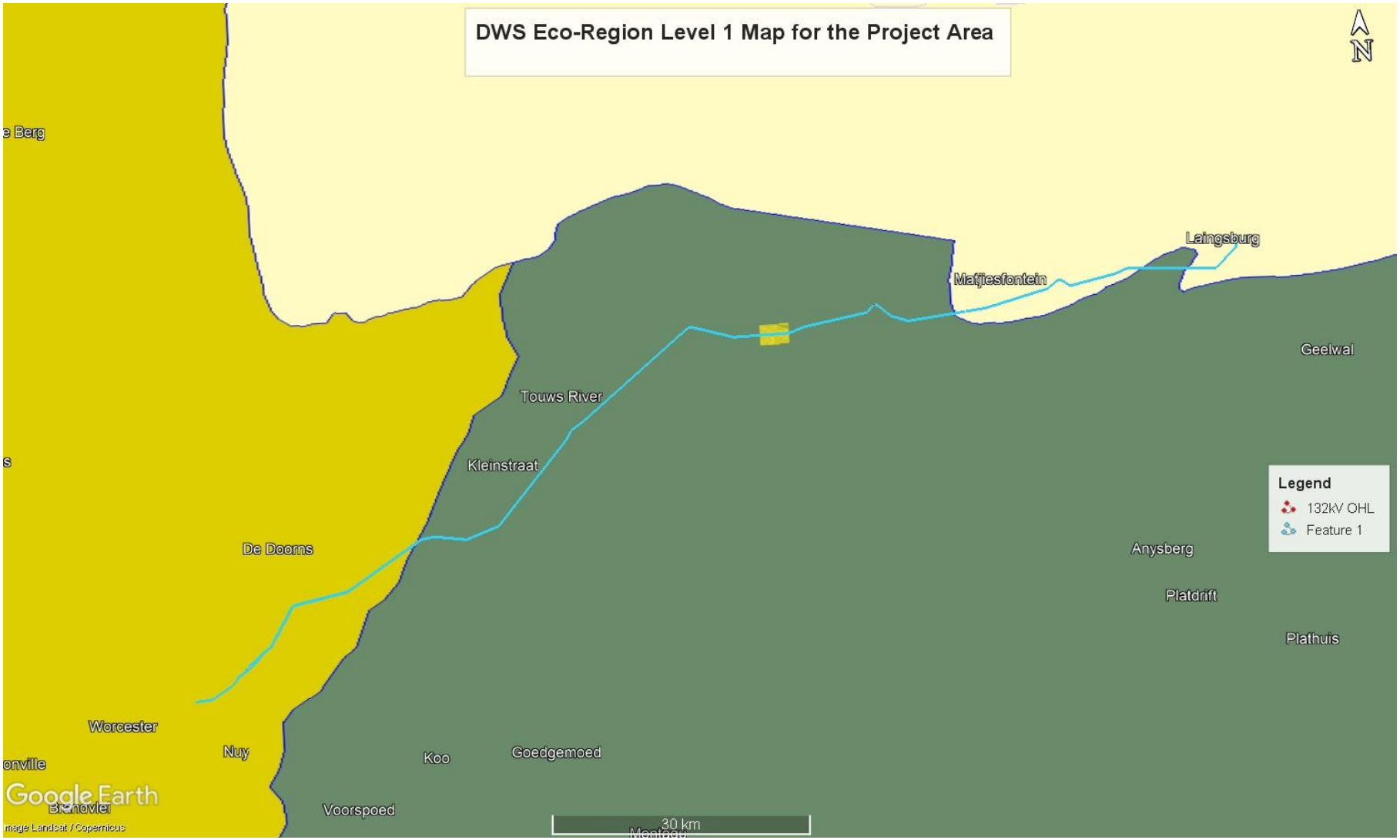


Figure 15: DWS Ecoregion Level 1 map for the project study area (Google Earth 2025)

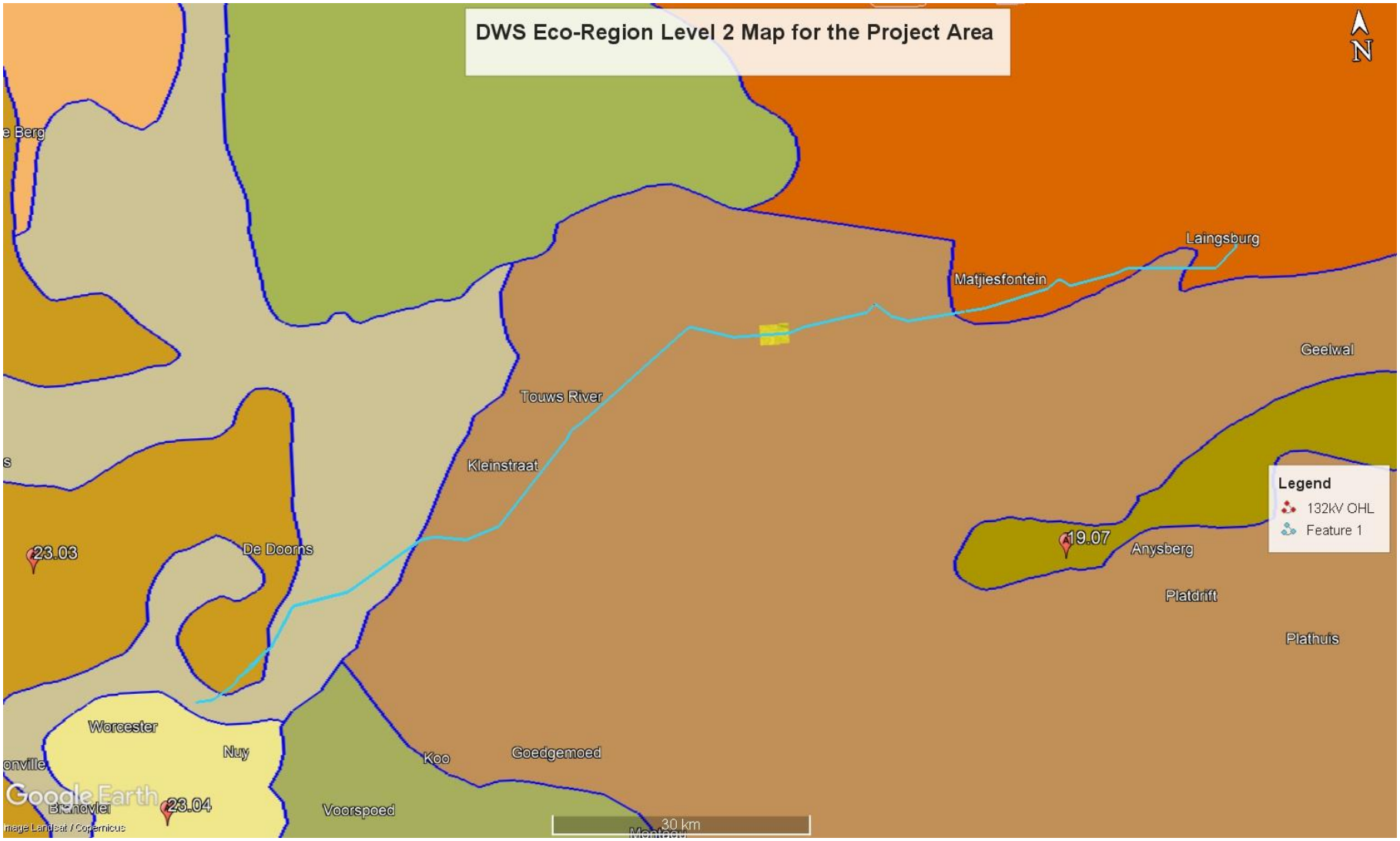


Figure 16: DWS Ecoregion Level 2 map for the project study area (Google Earth 2025)

.3.3 Project Associated Watercourse Characterisation

For ease of reference the project affected watercourses were grouped on a catchment level comprising the following characterization:

Table 7: Site catchment area watercourse characterization assessment (RHP 2007 &2008)

Reference Breede Water Management Area	Reference Gouritz Water Management Area	
Hex, Nonna and Nuy Catchment	**Touws River Catchment**	**Buffels River Catchment**
Geology: From the Hex Catchment - Quartzitic and feldspathic sandstone of the Skurweberg and Rietvlei Formations, Table Mountain Group. From the Nonna Catchment - Phyllite, greywacke, quartzite and conglomerate of the Norree and Brandwacht Formations, Malmesbury Group and quartzitic sandstone of the Peninsula Formation occur on midslopes. Conglomerate of the Enon Formation, Uitenhage Group, covered by alluvium, oc	Geology: Mainly shale of the Witteberg Group covered by alluvium, stony colluvium and aeolian deposits. Shale and sandstone can also comprise of the Bokkeveld Group.	Geology: Mudstone, or shale with thin siltstone and sandstone beds of the Fort Brown Formation, Ecca Group.
Soil Types: From the Hex Catchment - rocky areas with miscellaneous soils , From the Nonna Catchment - Red-yellow apedal, freely drained soils; red, high base status, > 300 mm deep (no dunes)	Soil Types: Red-yellow apedal, freely drained soils; red and yellow, high base status, usually < 15% clay	Soil Types: Glenrosa and/or Mispah forms (other soils may occur), lime generally present in the entire landscape or without undifferentiated deep deposits
Catchment PES = Natural AB ecological category in upper mountain catchment and C/D in valley plains due to high agriculture use and urban return flows.	Catchment PES = Natural C/D moderately modified ecological condition	Catchment PES = Natural C/D moderately modified ecological condition
Catchment EIS = High in mountain catchment areas and moderate in valley plains	Catchment EIS = High in mountain catchment areas and moderate in valley plains	Catchment EIS = High in mountain catchment areas and moderate in valley plains

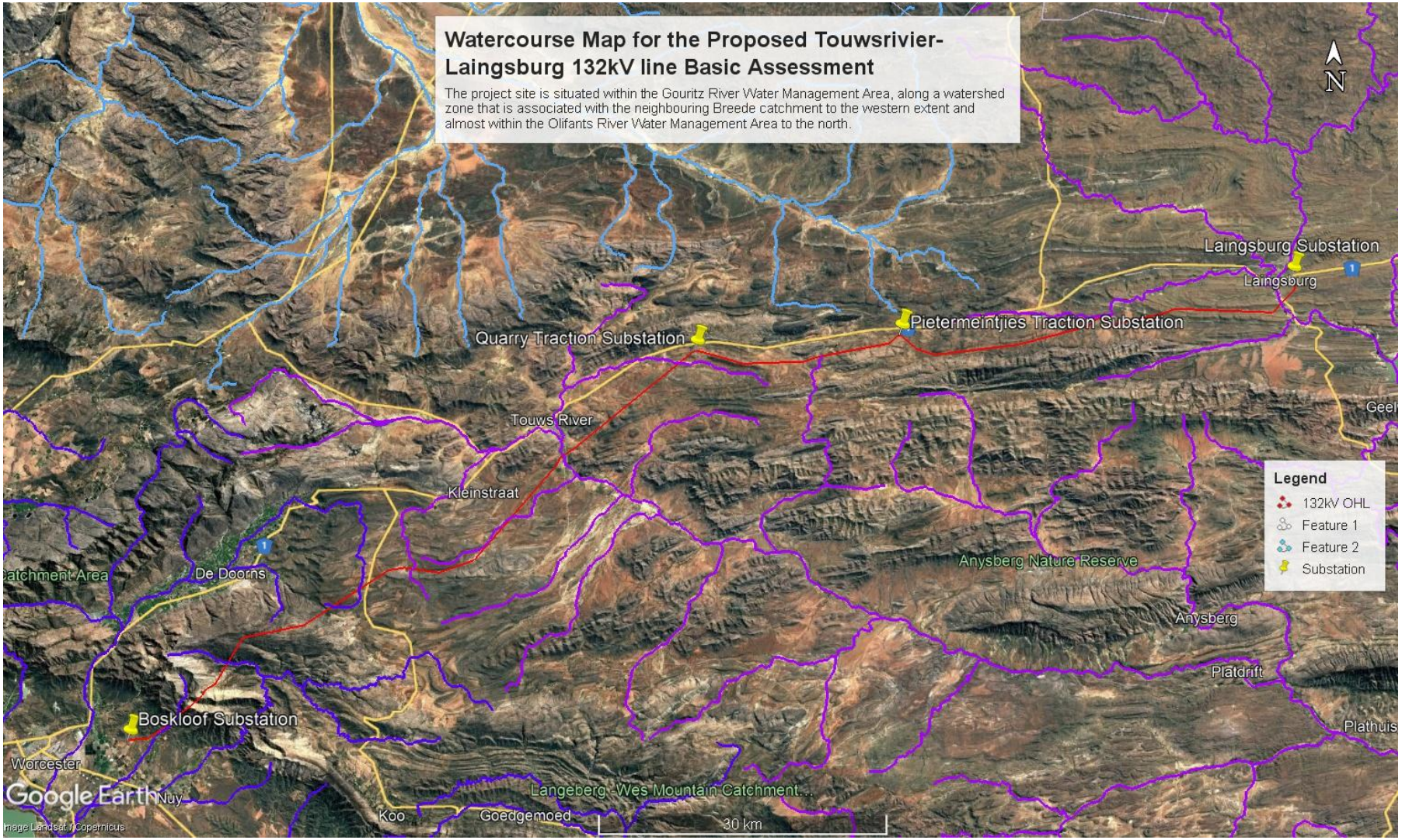


Figure 17: Project affected watercourses grouped according to 3 major reference water management areas (2 affected) (Google Earth 2025) (Shapefiles available)

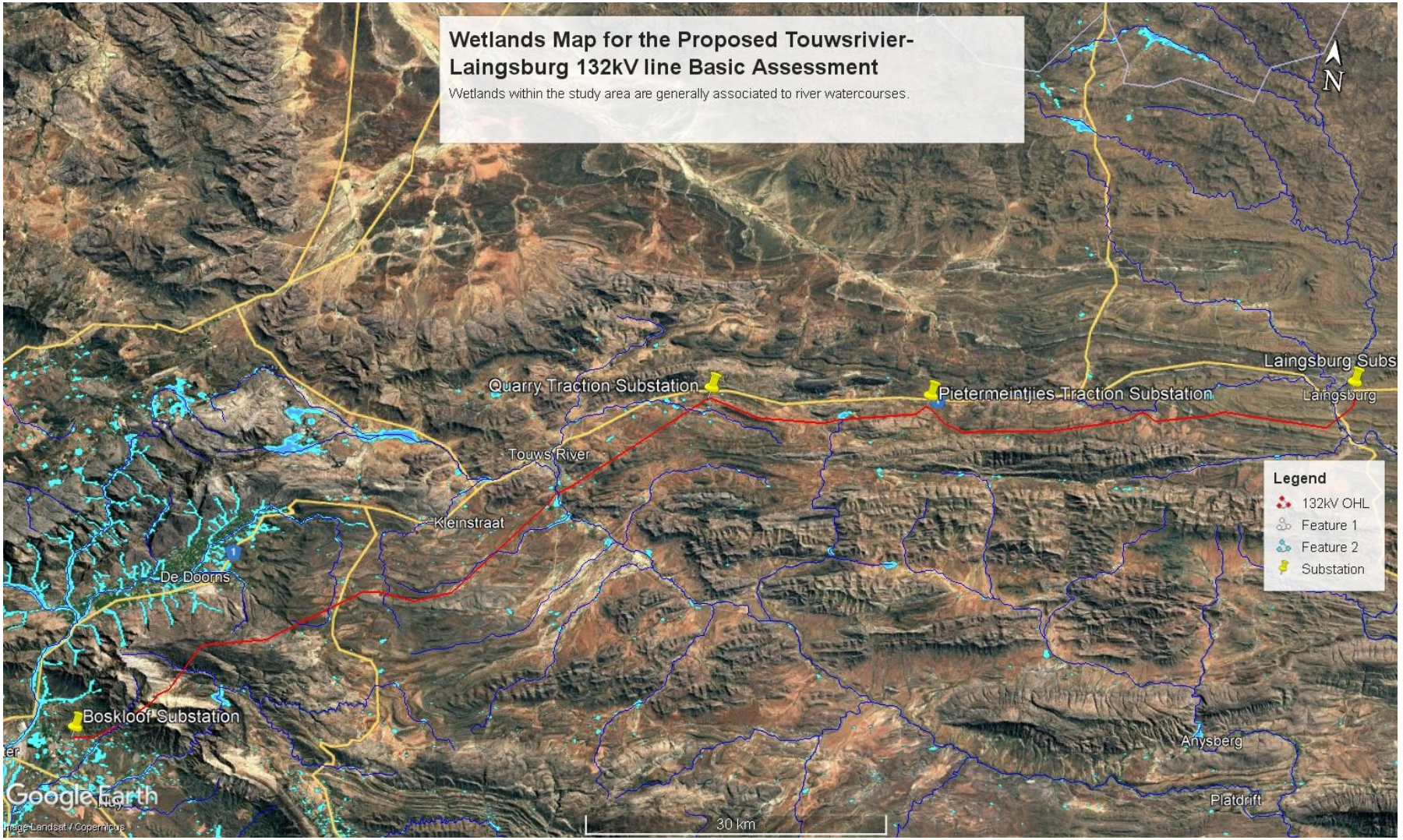


Figure 18: Project affected watercourse map overlayed with a wetlands layer (i.e. wetlands associated with Touwsriver Catchment) (Google Earth 2025) (Shapefiles available)

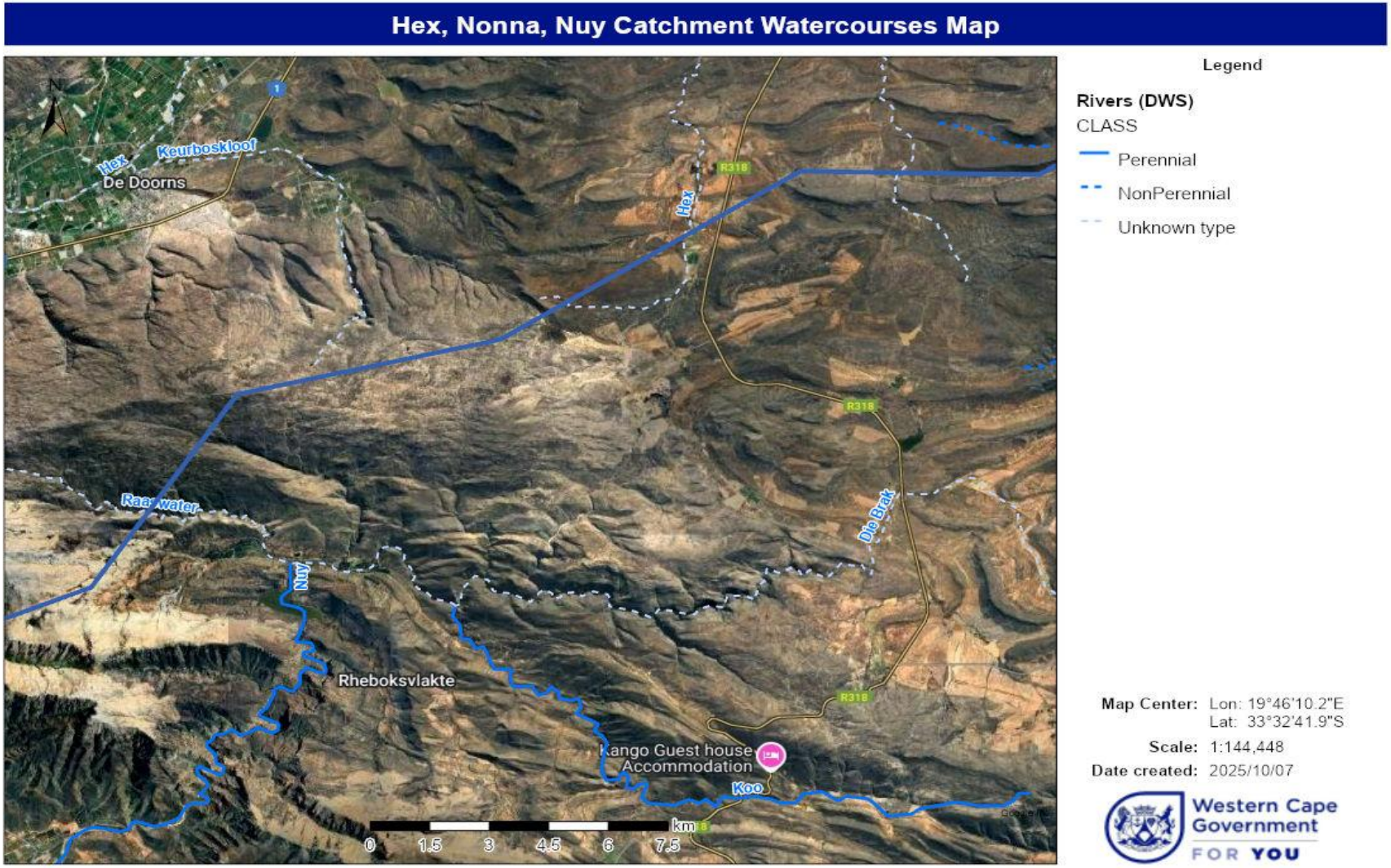


Figure 19: Affected project area western extent watercourses “transected” – Hex, Nonna, Nuy catchment area (CapeFarm Mapper 2025)

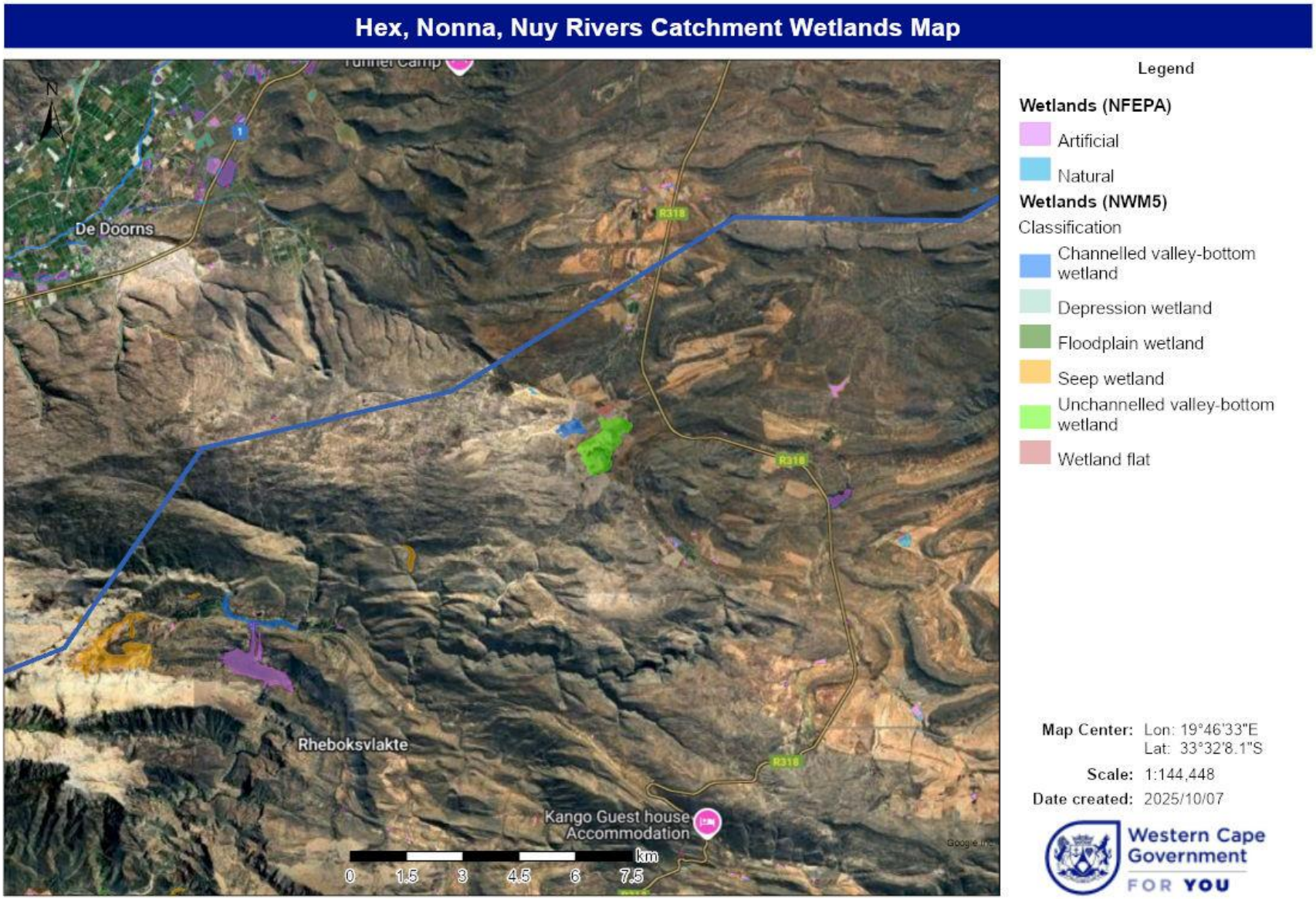


Figure 20: Affected project area western extent wetlands map (CapeFarm Mapper 2025)

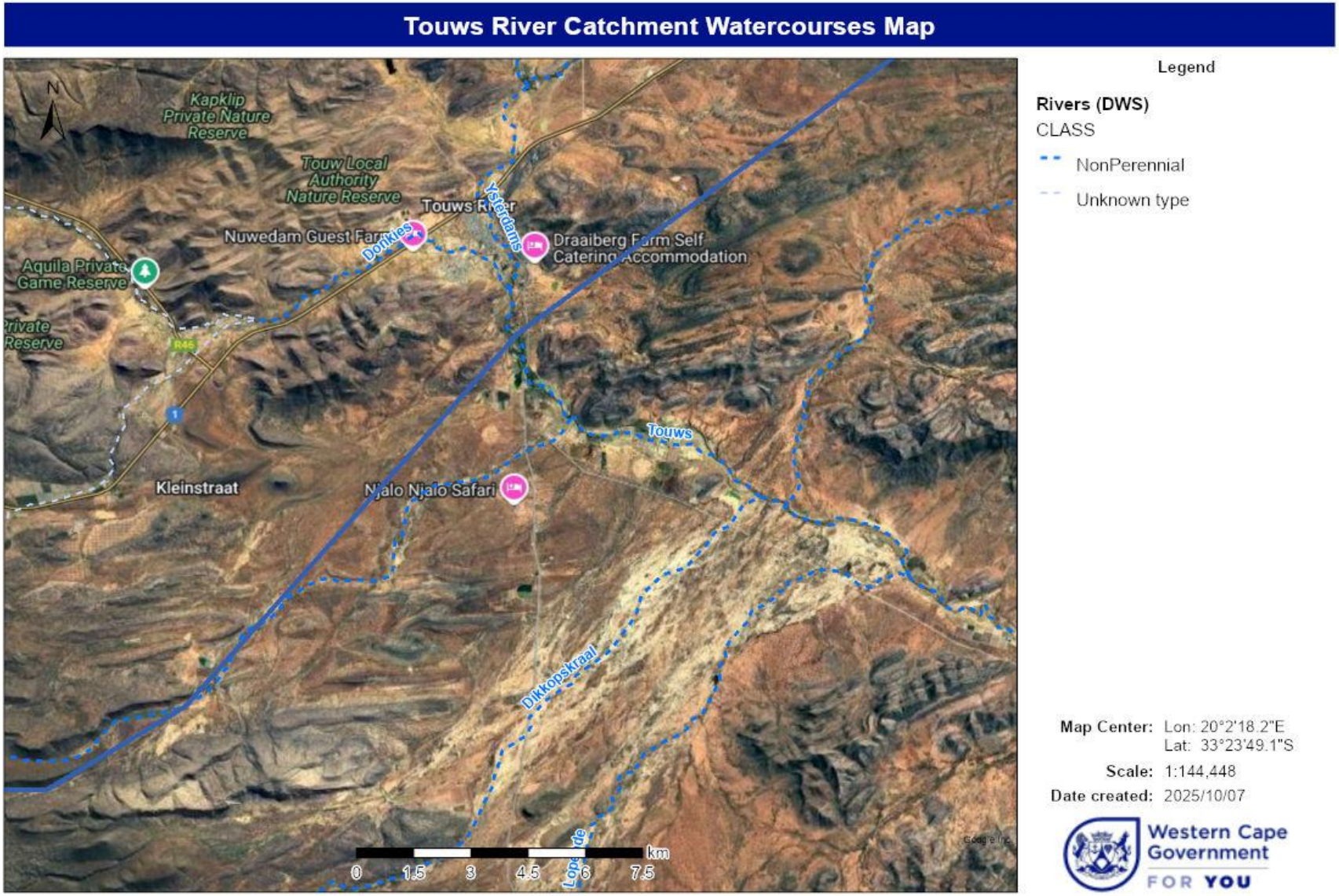


Figure 21: Affected project area central extent watercourses “transected” – Touws River catchment area (CapeFarm Mapper 2025)

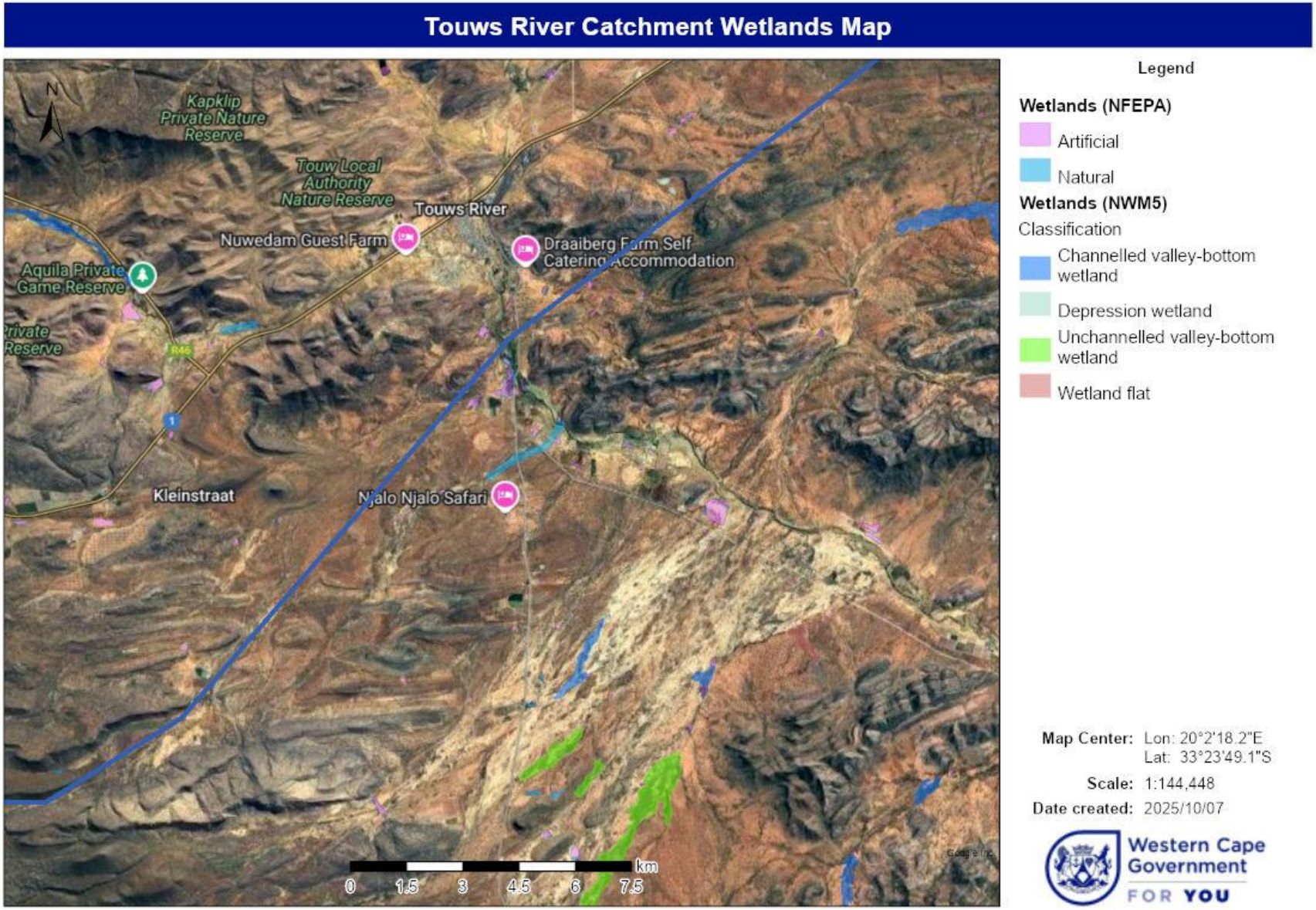


Figure 22: Affected project area central extent wetlands map (CapeFarm Mapper 2025)

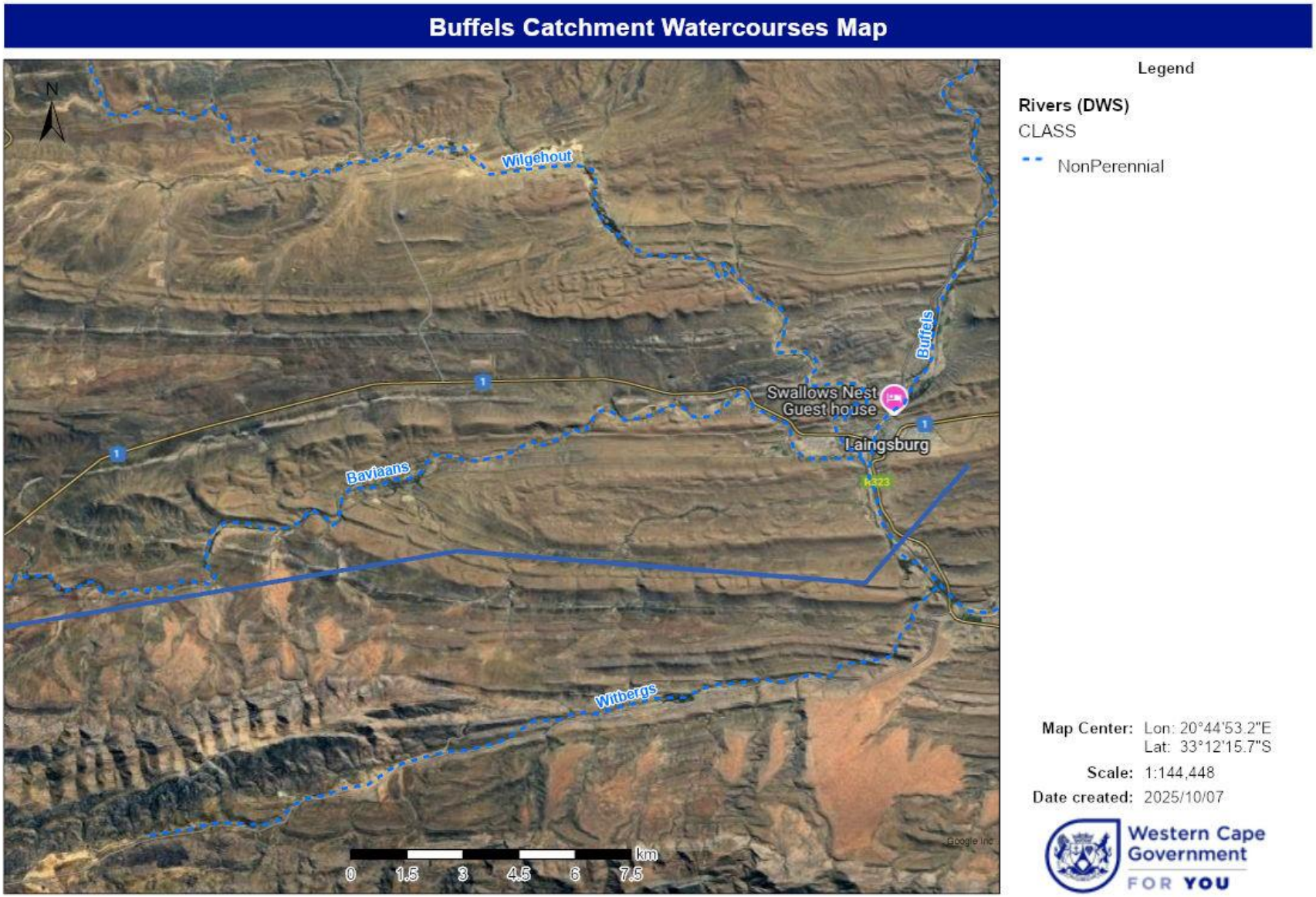


Figure 23: Affected project area eastern extent watercourses “transected” – Buffels River catchment area (CapeFarm Mapper 2025)

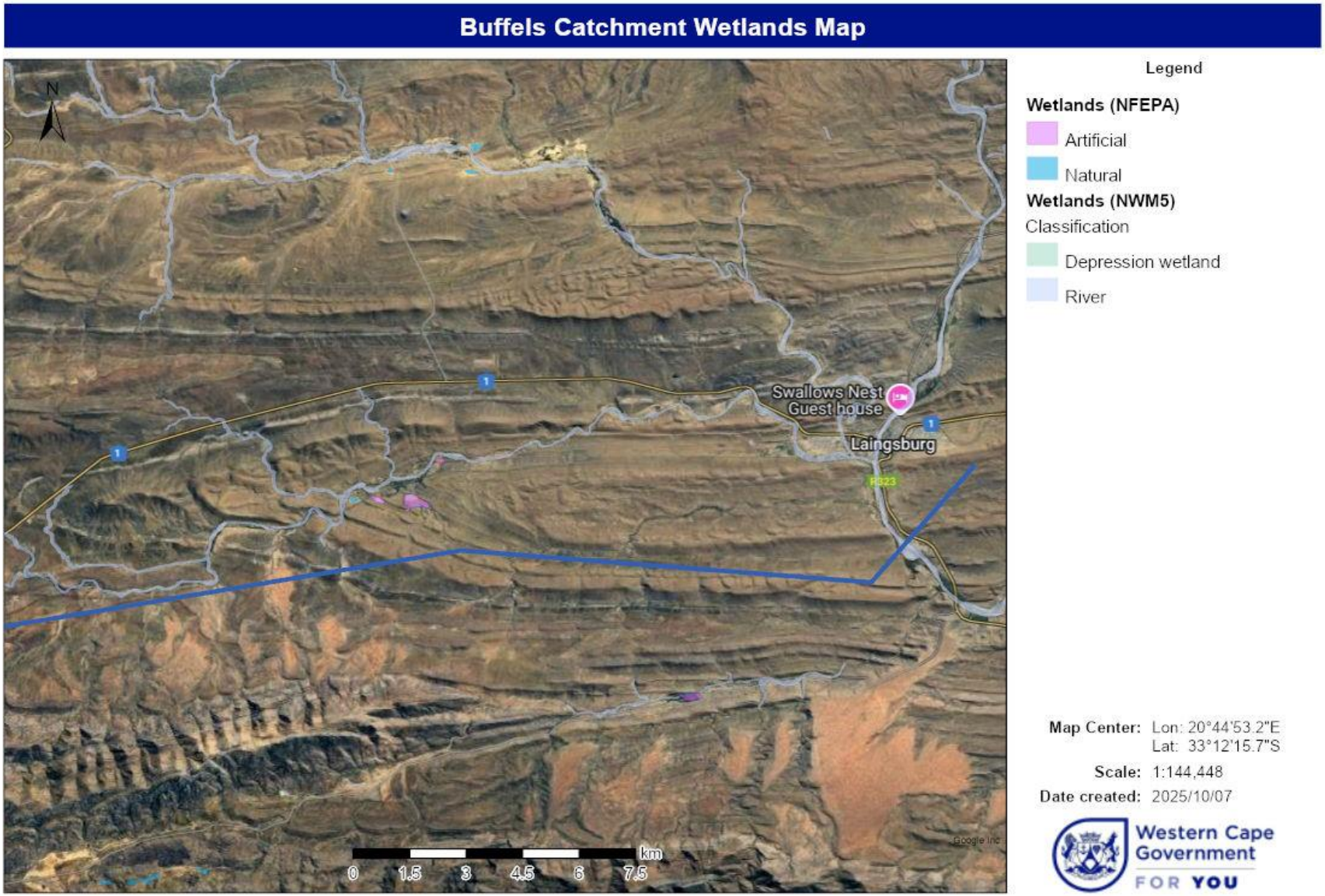


Figure 24: Affected project area eastern extent wetlands map (CapeFarm Mapper 2025)

4. Ground-truth Assessment

4.1. Project site affected Hex, Nonna and Nuy River Catchment

Ground-truth assessments of the project site reference desktop delineation took place on the 26th and 27th of June 2025. Overall the ground-truth assessment does confirm that the information presented during the desktop phase assessment were consistent with the present day ecological status quos of the receiving catchment affected water resources. This may be due to the catchments in question having already been historically developed for use in agriculture or where land use development may have been considered unsuitable. As such over the past decades the subject watercourse setting has not changed since the undertaking of the reference assessments cited and used to inform this report.

In respect to the project affected Breede water management area, the Hex catchment area was in flood during this ground-truth assessment undertaking, whereas the Nonna and Nuy Rivers exhibited low flows. This may imply that the Nuy and Nonna River catchment areas are over allocated and that agriculture use within these catchment areas are significant. Affected Nonna and Nuy River catchment areas were particularly transformed in the lower lying reaches whereas the upper tributaries remain in a close to natural ecological condition.

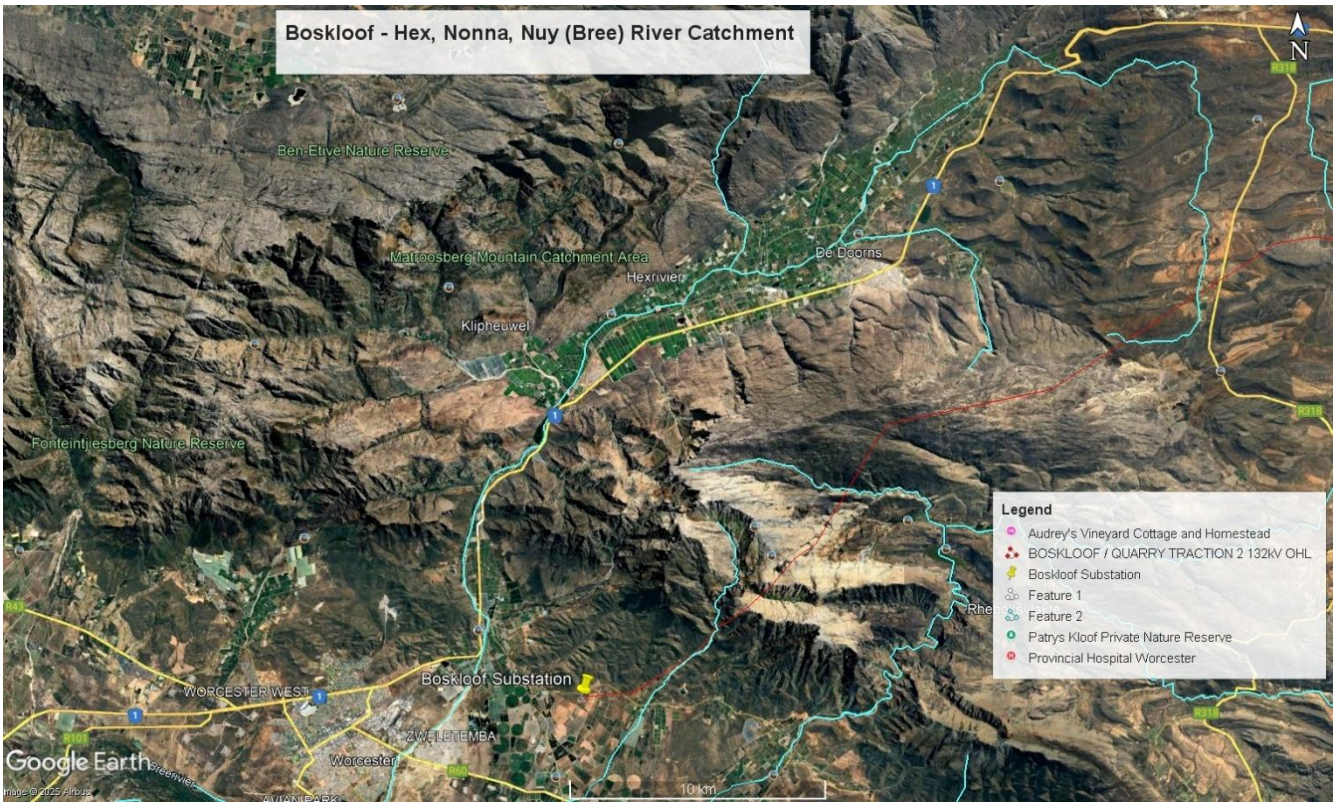


Figure 25: Project affected western catchment areas (Google Earth 2025)

Figure 26: Photograph of the Hex River

Figure 27: Photograph of the Boskloof Sub-station

Figure 28: Photograph of the Nonna River

Figure 29: Photograph of the Nuy River dominated by cosmopolitan reed species *Phragmites australis*

4.2. Project site affected Touws River Catchment

In contrast to the diversity of habitat and ecosystem presented in the Breede catchment area, the central and eastern portion of the project area comprises or forms part of the dryer Gouritz catchment area. No watercourses investigated during this assessment period comprised any significant flow, with any evidence of river flow being limited to baseflow and water trapped in the floodplain as inchannel wetland. This is surprising since the assessment period followed significant rainfall events.

As previously indicated watercourses investigated during the site ground-truth assessment remained consistent with existing reference information and to this effect the Touws River watercourses were only regarded as moderately fair in respect to its current ecological condition.

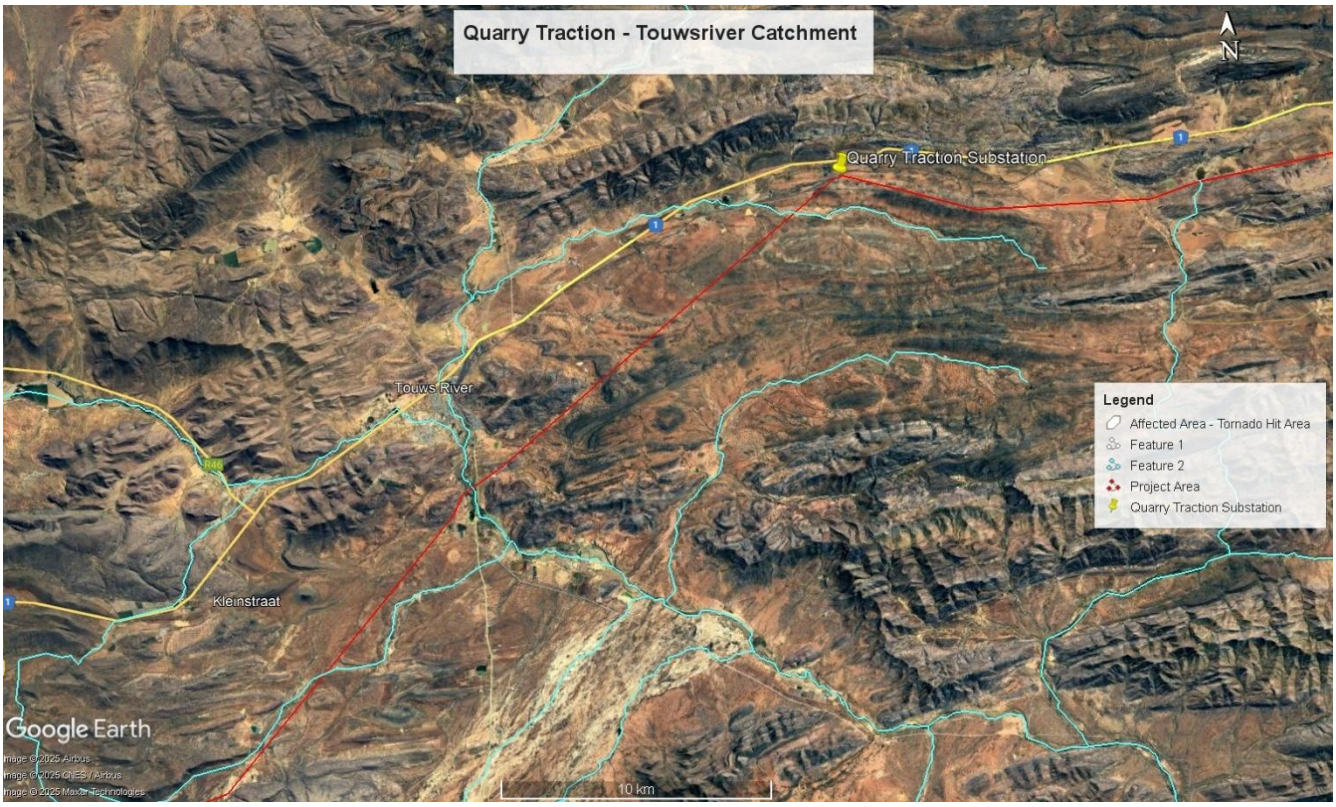


Figure 30: Project affected central catchment areas (Google Earth 2025)

Figure 31: Touws River within the Town of Touwsrivier (note that baseflow is pooling as a wetland)

Figure 32: Touws River tributary upstream of the Town of Touwsrivier (note that baseflow is pooling superficially as an instream valley bottom wetland)

Figure 33: Project line crossing the Touws River catchment area

Figure 34: Quarry Traction sub-station watercourse

Figure 35: Watershed seep wetland drainage on project damage area site “De Hoop Farm vicinity”

Figure 36: Photograph of private solar installation within proximity to the affected project damage site.

4.3. Project site affected Buffels River Catchment

The ground-truth investigation was completed at the project eastern extent, namely the Laingsburg sub-station. Characteristic to the karoo, none of the catchment watercourses transected by the project line comprised any flow. Similarly to reference condition, the catchment present ecological state remains in a transformed or moderately modified condition in respect to its ecological health, sensitivity and importance.

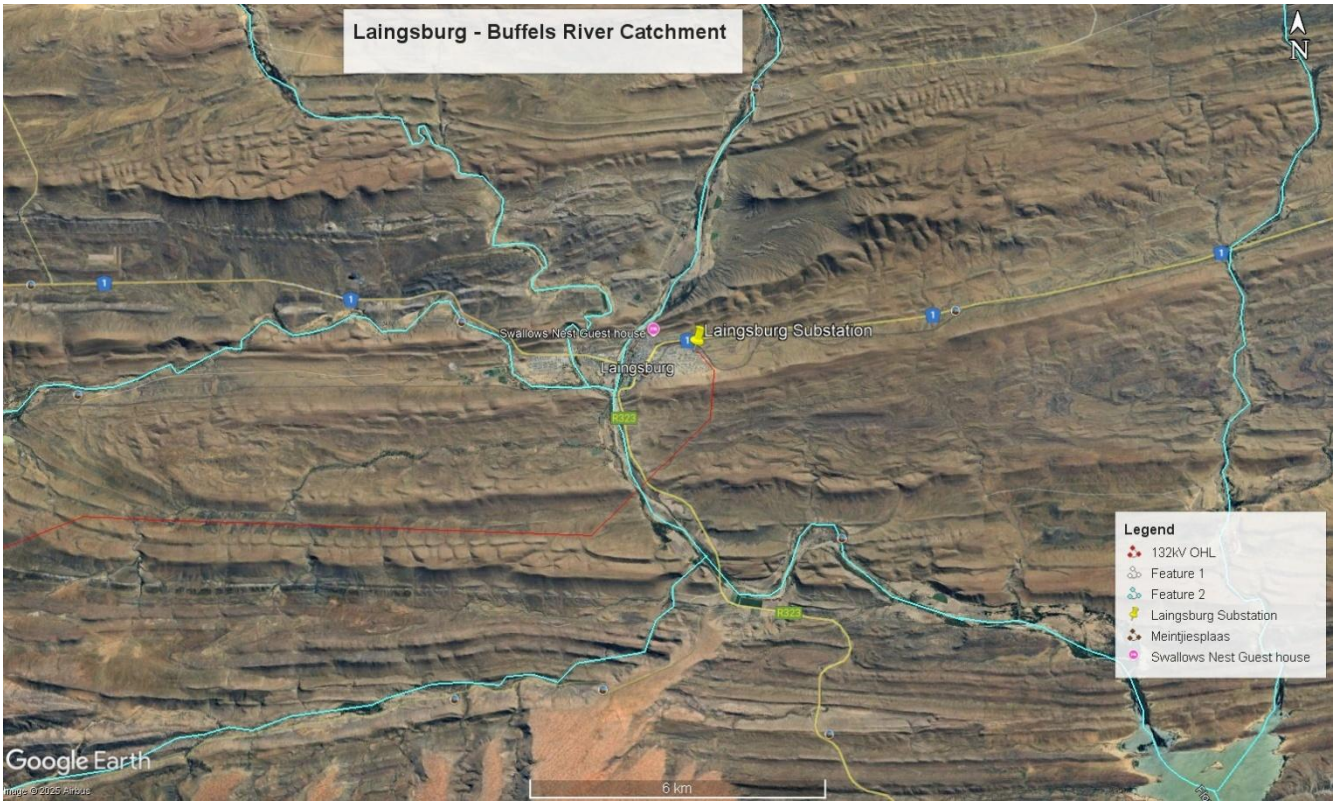


Figure 37: Project affected eastern catchment areas (Google Earth 2025)

Figure 38: Baviaans River tributary culvert along the N1

Figure 39: Buffels River downstream of Laingsburg

Figure 40: Project line crossing the Buffels River catchment area

.5. Development Risk Synthesis

.5.1. Summarised Status Quo of Project Receiving Watercourses and Aquatic Resource Quality Risk Assessment Context

The project study area extent, being 143.6km, unsurprisingly transects with a number of watercourses (Figure 42). In fact the following 10 listed watercourses (Table 8) have been identified as intersecting with the project activity, and consequently delineated as potentially affected by the proposed activity development (construction), operations (maintenance), and/or decommissioning. The project activity and the receiving watercourses intersected therefore form the central thesis of this development risk synthesis. In addition, it should also be noted that the impact and risk assessment provides an added focus on project damage repair works required on the De Hoop farm within the Kragga River watercourse vicinity (Figure 44).

Table 8: Watercourse location and aquatic ecological characteristics

Activity Affected Watercourse	NWA S21(c)&(i) Water Use Activity Location	Quaternary Catchment	Present Ecological State (PES) / Ecological Importance & Sensitivity (EI&S)
Tributary of the Hex River	19°48'40.00"E 33°29'25.34"S	H20A	PES = A/B EIS = High
Nonna River	19°36'30.81"E 33°36'19.70"S	H40C	PES = C EIS = High
Tributary of the Nuy River	19°39'48.84"E 33°33'30.38"S	H40B	PES = C EIS = Moderate
Donkies River (tributary of Touws River)	19°52'15.84"E 33°28'21.77"S	J12B	PES = C EIS = High
Unnamed Tributary of the Touws River –	19°58'52.65"E 33°25'28.18"S	J12D	PES = C EIS = Moderate
Touws River	20° 2'27.27"E 33°21'57.22"S	J12D	PES = C EIS = Moderate
Jan De Boer River (tributary of Touws River)	20°10'19.51"E 33°16'41.02"S	J12C	PES = C EIS = Moderate
Kragga River (tributary of Touws River)	20°19'59.16"E 33°16'15.62"S	J12E	PES = C EIS = Moderate
Baviaans River (tributary of Buffels River)	20°39'5.25"E 33°14'2.23"S	J11E	PES = C EIS = Moderate
Buffels River	20°51'32.69"E 33°13'7.93"S	J11F	PES = C EIS = Moderate

As previously indicated in the desktop screening assessment, in summary project affected watercourses fall within 2 dominant and contrasting ecosystems and distinct hydrological regimes: with the western portion of the study area falling within the fynbos rich reference winter rainfall Breede Water Management Area (i.e. project affected watercourses – Hex, Nonna and Nuy Rivers); and whereas the central and eastern project extent residing within the timeless succulent karoo semi-arid scrubby desert setting of Touws and Buffels River Catchments, the tributaries of the regional Gourtiz River. The natural land uses towards the east therefore becoming more rangeland in nature (i.e. rainfall becomes less frequent towards the karoo). Watercourses identified were therefore generally found to be seasonal and in a moderately modified ecological condition, except for where the project activity passes across watercourses that are in the upper foothill to high rising mountain reach extent (i.e. Hex River, 1st and 2nd order).

Please note that the following maps were synthesized to illustrate the complete 143.6km extent to address the project impact and risk scope, in respect to the receiving aquatic ecological resources, namely watercourses potentially affected by the project and therefore requiring due consideration (figure 42 & figure 43). The project impact and risk assessment scope also includes the damage repair and upgrade of 2.7km of powerline-pylons on the affected De Hoop farm (figure 44). In this respect three landscape seeps are identified to intersect along the identified damaged area and will require due care so as to not unduly impact the receiving hydrological regime (i.e. no pylons within seep or watercourse flow paths). These seeps all form part of the Kragga River watercourse which is represented as intersected by the project area (Figure 30) and further delineated for purposes of this report (Figure 44).

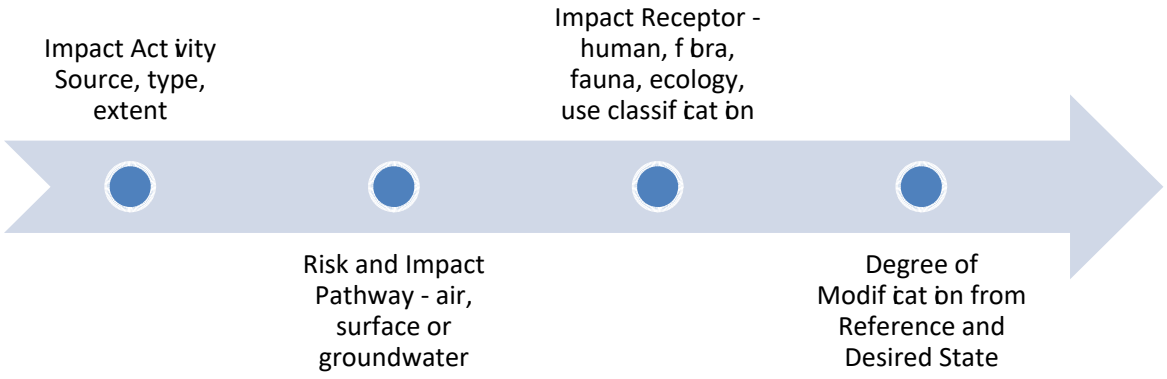


Figure 41:Conceptualised water resource risk assessment impact prediction and significance model

The determination of potential impacts and risks from project development to potentially cause or disturb or alter project receiving watercourse resource quality is regarded as an important principle focus to aquatic biodiversity specialist reporting amongst other (i.e. impact inferred by perceived degree of change from reference state, Bayesian logic, analytic hierarchy process). From a practitioner perspective, the impact pathway and the potential change away from the perceived reference state as well as the desired reference state are factors which are therefore in mind (Figure 41). In addition the degree and scale of impact and its intensity, duration or likelihood are also regarded as commonplace factors to consider in addressing or contemplating potential activity impacts. The subject of resilience may also specify to a degree (i.e. yard stick approach). In general impacts and risks to watercourses or receiving project water resources, its resource quality and characteristics are addressed by inferring consideration to perceived disturbance effects to watercourses in terms of its water quality, water quantity, habitat and biota. The interdependencies of these factors are also kept in mind, for instance with respect to relevant theme of hydro-geomorphic relations, and broader dependencies (i.e. knock-on-effect or cumulative effects). Consideration may also include the risk posed by climate change or climatic extremes (i.e. storm events).

Therefore the following risks and potential impacts were subsequently identified following investigation as associated with the project to the receiving site watercourse resource quality context refer.

- Water quality impairment
    - Activity based dust and runoff, increased turbidity and risk of sedimentation
    - Accidental spillage from vehicle access (i.e. diesel / fuel)
- Water quantity modification
    - Limited impedance and/or diversion of site hydrology (stormwater flow modification) associated with landscape earth works (stormwater is regarded to be largely overland)
    - Alteration of site stormwater situation setting with transformation of receiving site (i.e. development of stormwater wetland)
    - Increase risk in landscape weathering and erosion where erosion management is not controlled within the context of the installation (i.e. pylon)
- Habitat modification
    - Limited topographic, soil and geological aspects like alteration of site habitat by site activity
    - Limited niche aspects, loss of ecological goods and services processes
- Impact to Biota
    - Limited loss of biodiversity, biota community structure, habitat fragmentation

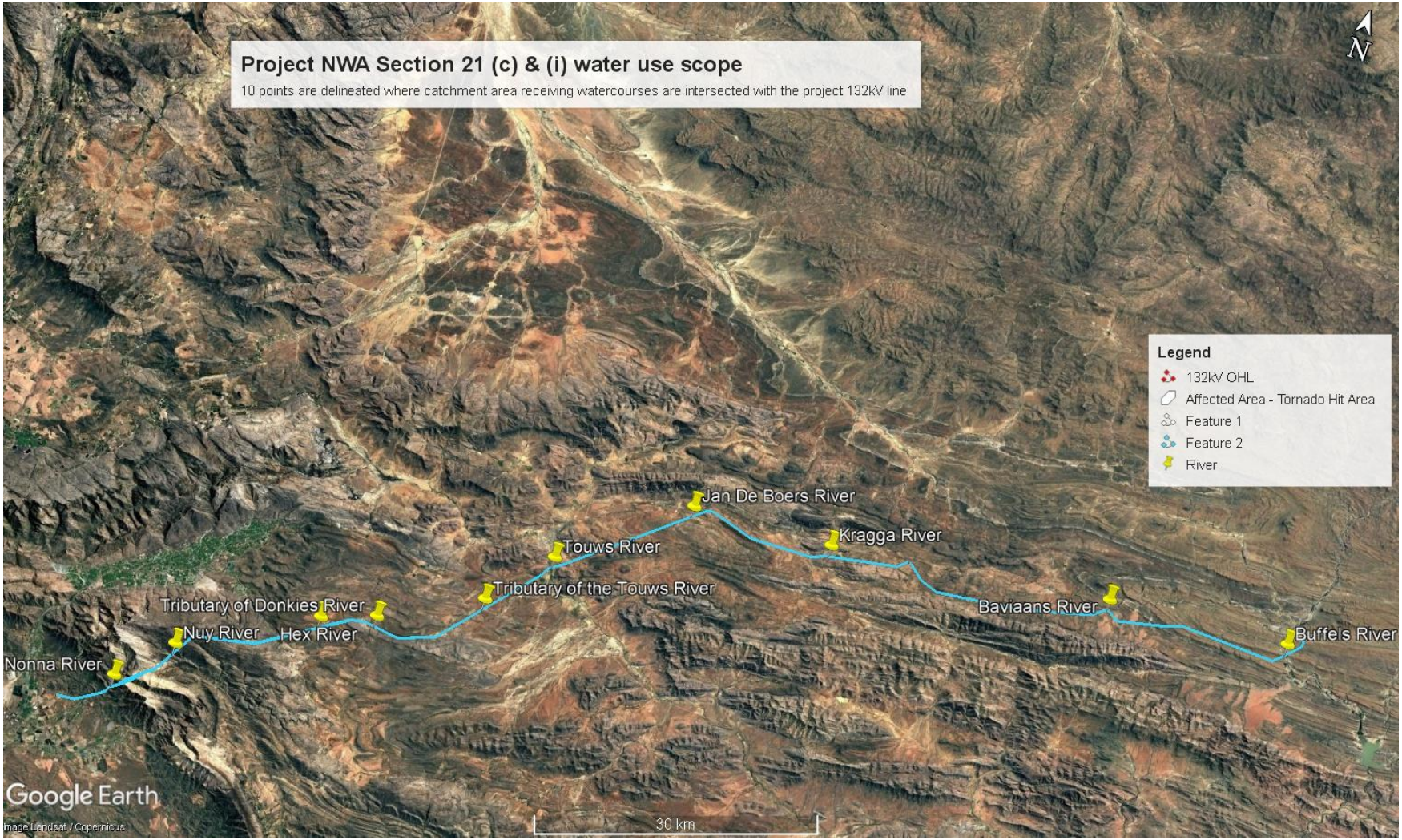


Figure 42: NWA S21(c)&(i) Water Use Activity Locations Transecting the Project 143.6km Suspension Lattice Powerline (Shapefiles available) (Google Earth 2025)

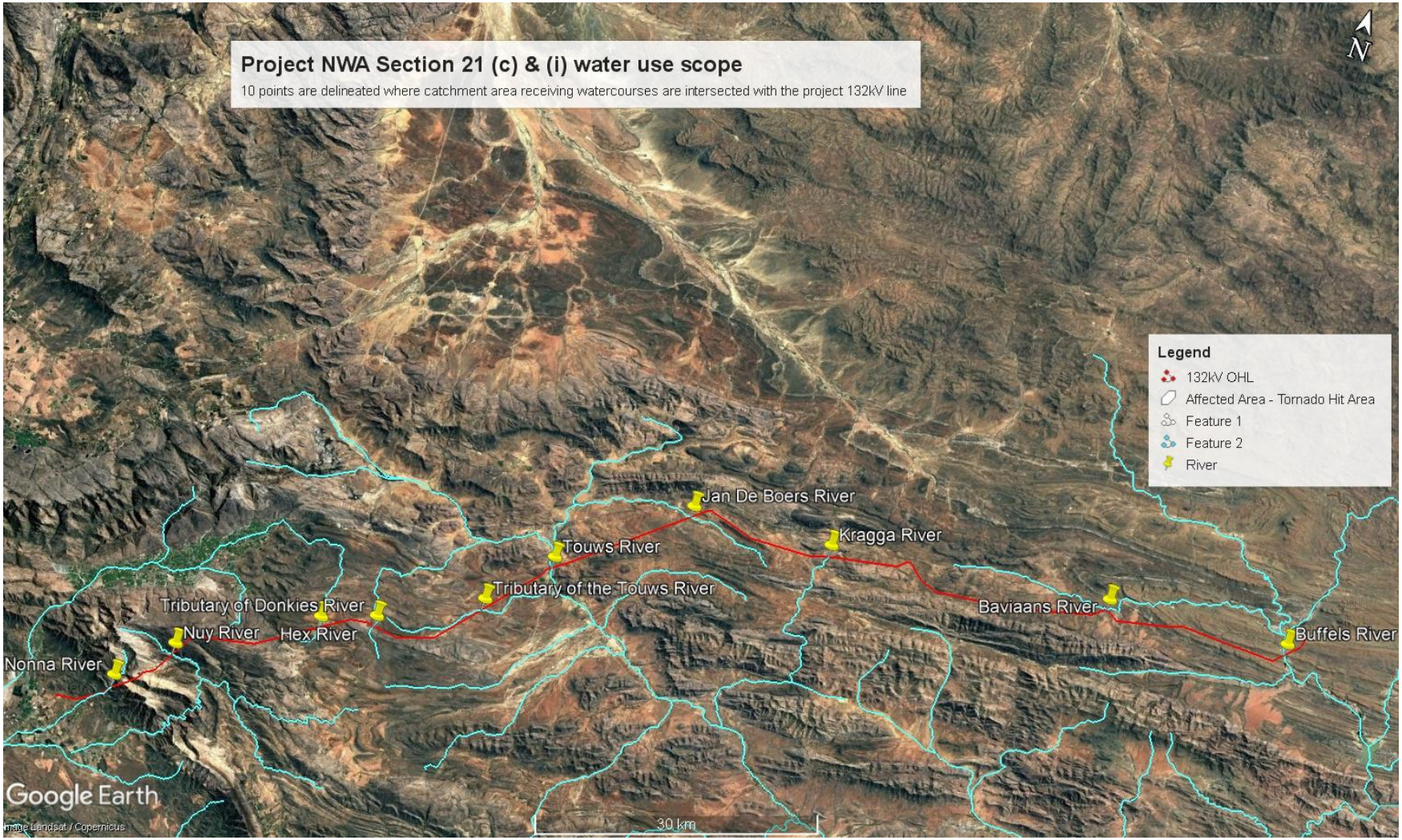


Figure 43: NWA S21(c)&(i) Water Use Activity Locations Transecting the Project 143.6km Suspension Lattice Powerline (Shapefiles available) (Google Earth 2025)

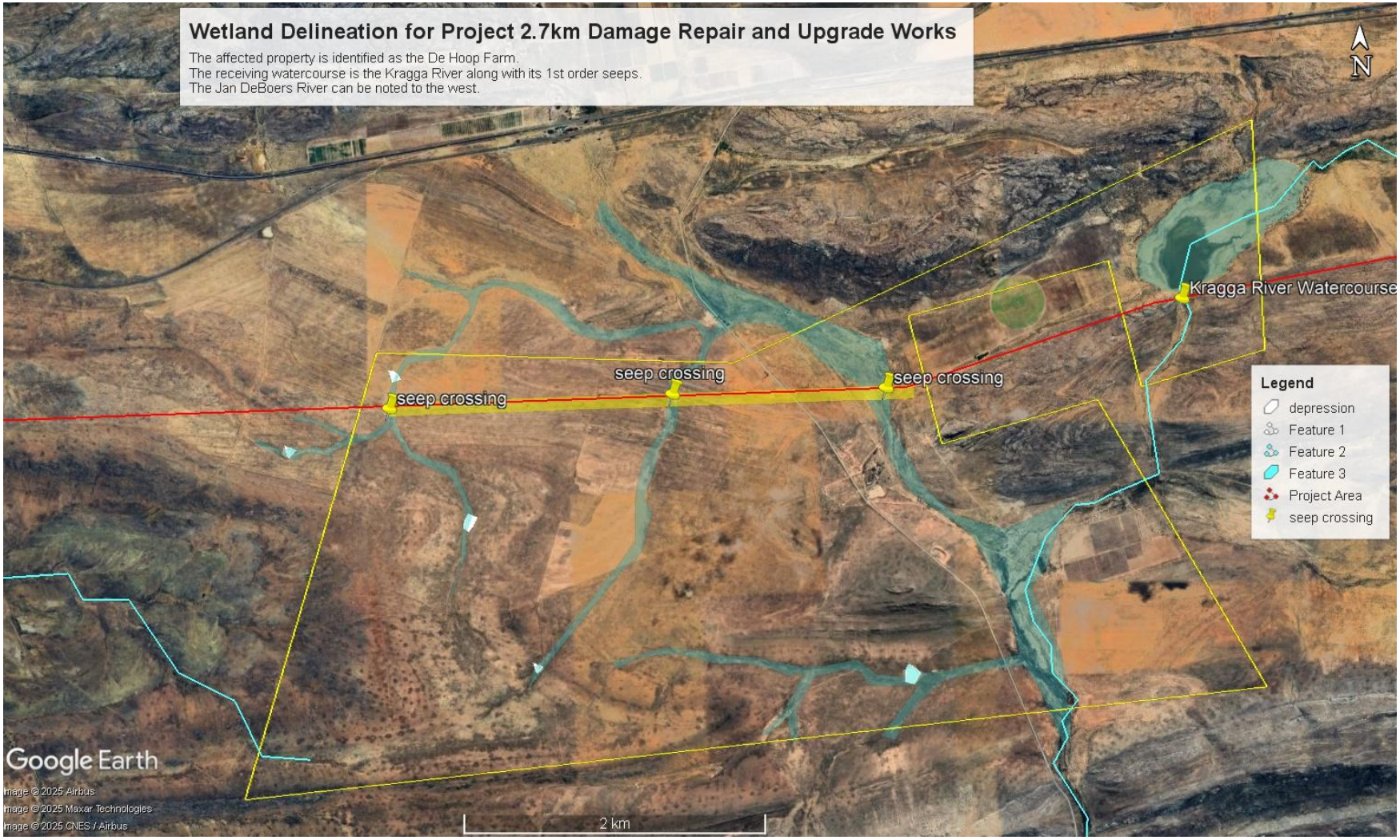


Figure 44: Project 2.7km section damage repair zone for pylon upgrade (yellow polygon and red line) falling within the Kragga River watercourse - NWA S21(c)&(i) Water Use Activity zone (Shapefiles available) (Google Earth 2025)

5.2. DWS Risk Matrix Protocol

The provisioning of the DWS NWA Section 21 (c) and (i) water use Risk Assessment Protocol (DWS Risk Matrix) was undertaken and the Excel Spreadsheet was populated with the 10 project affected watercourses (i.e. spreadsheet e-copy attached). As a result, this report provides a summary of the provisioning of the DWS risk matrix finding. It should be noted that the outcomes of the DWS risk matrix scored the project as having a significance rating at 25.6 in respect to its highest risk significance as determined by this assessment, which is thus regarded to fall within a low risk water use activity threshold (i.e. Figure 45 rating the potential aquatic biodiversity vegetation loss risk as 25.6) (Table 9).

A Low risk water use activity are regarded as acceptable with proposed mitigation measures and impacts to potentially affected receiving watercourse and resource quality being regarded as easily mitigated. The project is therefore regarded as below the threshold for water use licensing activity and within range of considering registering for water use within the compliance ambit of the available General Authorisation for NWA S21 (c) and (i) water uses if confirmed for as suitable by the DWS or relevant CMA. The general authorisation in question was published in the Government Gazette dated 10 March, by the Department of Water and Sanitation Notice Number 3139, entitled: "*Revision of General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No 36 of 1998) for Water Uses as Defined in Section 21 (c) and Section 21 (i)*".

Table 9: Department of Water and Sanitation Risk Matrix Rating Interpretation Guideline

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 29	(L) Low Risk OR (+) Positive (+ +) Highly positive	Acceptable as is or or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61 – 100	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.
A low risk class must be obtained for all activities to be considered for a GA		

PROJECT: Aquatic Biodiversity Impact Assessment for Touwsrivier-Laingsburg 132kV line BAR/MMP

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1

Name of Assessor: <Earl Lesley Herdien> **Signature:**

SACNASP Registration Number: <400211/11>

Date of assessment: <July 2025>

Risk to be scored for all relevant phases of the project (**factoring in specified control measures**). MUST BE COMPLETED BY SACNASP PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE.

Phase	Activity	Impact	Potentially affected watercourses			Intensity of Impact on Resource Quality				
						Abiotic Habitat (Drivers)			Biota (Responses)	
			Name/s	PES	Overall Watercourse Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna
CONSTRUCTION	<1> Site Establishment, site preparation, vegetation clearing, foundation and earthworks for installation of pylon	<1a> Vegetation Clearence / Loss of vegetation and faunal habitat (i.e. conserve topsoil for rehabilitation)	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	0	-1	0	-2	-1
		<1b> Dust and Soil erosion (i.e. undertake dust supression measures,implement erosion controls)	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	0	-1	0	-1	-1
		<1c> Stormwater impairement (i.e. implement pollution and stormwater control measures)	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	0	-1	0	0	-1
	<2> installation (replacement) of pylon on existing powerline (i.e. 143.6km)	<2a> Construction based dust and erosion (i.e. implement pollution and stormwater control measures - anti erosion)	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	0	-1	-1	-1	-1
		<2b>								
		<2c>								
	<3> Existing repair of 2.7km damaged powerline (Decommissioning and safe removal of damaged suspension lattice structures, and Replacement of damaged suspension lattice towers and recommisioning of existing powerline	<3a> Construction based dust and erosion (i.e. implement pollution and stormwater control measures - anti erosion)	Kragga River	C	High	-1	-1	-1	-1	-1
		<3b> Dust and Soil erosion (i.e. undertake dust supression measures,implement erosion controls)	Kragga River	C	High	-1	-1	-2	-2	-1
		<3c>Vegetation Clearence / Loss of vegetation and faunal habitat (i.e. conserve topsoil for rehabilitation)	Kragga River	C	High	-1	-1	-1	-2	-1
L	<1> Maintenance of 143.6km pylon and electric line	<1a> maintenance based disturbances, reinforce anti erosion measures where required	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	-1	-2	-1	-1	-1
		<1b> intersected watercourse alien vegetation management	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	-1	-2	-1	2	-1
		<1c> Replacement of damaged suspension support structures and powerline	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	-1	-2	-1	-2	-1
	<2>	<2a>								
DECOMMISSIONING	<1> Safe removal of pylon and electric line	<1a> Activity based dust and erosion (i.e. implement pollution and stormwater control measures)	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	-1	-1	-2	-2	-1
		<1b>								
		<1c>								
	<2> Rehabilitation and Reinstatement of landscape to ensure against undue erosion	<2a>Activity based dust and erosion (i.e. implement pollution and stormwater control measures)	Hex, Nuy, Nonna, Touws and Buffels River Catchments	C	High	1	1	1	1	1
		<2b>								
		<2c>								

Figure 45:Cropped illustration of the DWS Risk Matrix Excel model provisioning undertaken for the project activity (continued on next page)

Overall Intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating	Confidence level
0	1	3	4	4	16	80%	12,8	L	High
0	1	1	2	4	8	40%	3,2	L	High
0	1	1	2	4	8	40%	3,2	L	High
0	1	1	2	4	8	40%	3,2	L	High
0			0	none	#VALUE!		#VALUE!	#VALUE!	
0			0	none	#VALUE!		#VALUE!	#VALUE!	
-2	1	1	-4	4	-16	40%	-6,4	+	High
-4	1	1	-6	4	-24	40%	-9,6	+	High
-4	1	3	-8	4	-32	80%	-25,6	+	
-4	1	2	-7	4	-28	60%	-16,8	+	High
4	1	2	7	4	28	60%	16,8	L	High
-4	1	2	-7	4	-28	60%	-16,8	+	High
-4	1	2	-7	4	-28	60%	-16,8	+	High
0			0	none	#VALUE!		#VALUE!	#VALUE!	
0			0	none	#VALUE!		#VALUE!	#VALUE!	
2	1	3	6	4	24	80%	19,2	L	High

Figure 45: Cropped illustration of the DWS Risk Matrix Excel model provisioning undertaken for the project activity (Continued from previous)

5.3. Impact Assessment Transcribed for NEMA Protocols

5.3.1. Rating Methodology Adopted for EIA alignment

A number of standards and guidelines were adopted to inform and formulate the framework and contents for the undertaking of this environmental impact assessment study (DEAT 2002; DEAT 2005; DEAT 2009; DEAT 2009; US EPA 1992). In addition, the method in application gleamed to support the standardisation of this study was supplemented from local literature and aquatic biodiversity assessments managed via established environmental consulting agents from firms such as RHDHV (Atana), Digby Wells and Braaf Environmental Practitioners (Memo (sahra.org.za). Similarly is the case with the template and style adapted for synthesising for the required aquatic biodiversity information aspects scope of this report in being informed by researching the manner of which leading local aquatic sector specialist practitioners undertake to inform on technical aspects such as in the case of watercourse sensitivity, importance and ecological condition (i.e. BlueScience, Wetland Consulting Services). Engagement with the project EAP and gleaming from the provisioning of the draft BAR/MMP also ensured for suitable alignment.

In seeking to remain within the standardised framework of aquatic impact assessment protocols by practitioners, and in conforming to the sector requirements for making prediction and identification of project environmental impacts (i.e. subject) its effects on the receiving project site (i.e. object – receptor); use was thus made of the significance probability matrix, the sensitivity matrix, in respect to the subject risk and impacts to aquatic resource quality, as well as in informing on the suitable mitigation scope, in being aligned with identified sector policy guideline frameworks, as far as possible.

The following methods and component metrics are utilised in the application framework of risk assessment (subject) and in order to inform for suitable risk management (object).

Subject project activity impacts, risks or threats hypothesised were broadly identified to include its life-cycle and were modelled according to industry best practise in furnishing for activity consequence and significance rating formulae (models) utilised to make assessment of identified subject stress, hazard and/or disturbance pathways, effects on an object resource quality (i.e. aquatic biodiversity) and are generally represented with the following necessary components:

1. **Consequence** = Type of Impact x (Intensity + Extent + Duration)

Where

2. **Significance** = Consequence x Probability x Nature

And

3. **Probability** = Likelihood of the Effect Occurring

Consideration to the Nature of the type of impact (i.e. degrading or improving) are assigned the value rating of +1 (Positive Impact) or -1 (Negative Impact) respectfully.

The determination of probability or likelihood of a potential impact rating is guided by the following matrix (Table 10).

Table 10: Probability Consequence Matrix for Impacts Guide

Probability \ Significance	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Consequence																																						

The following table provide a score guide for significance as determined which may be categorised into falling within the ambit range of the 8 classes (i.e. major positive to major negative) as provided (Table 11). Lastly a guideline table is provided along with description to serve as an implementation template for impact rating and modelling as undertaken (Table 12).

Table 11: Significance Threshold Limits Guide

Score	Description	Rating
109 to 147	A very favorable impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	Major (positive)
73 to 108	A favorable impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	Moderate (positive)
36 to 72	A significant positive impact. However, by itself this impact is insufficient to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	Minor (positive)
3 to 35	A small positive impact. This impact will result in medium to short term effects on the social and/or natural environment.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. By itself this impact is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the social and/or natural environment. The impacts are reversible and will not result in the loss of irreplaceable aspects.	Negligible (negative)
-36 to -72	A significant negative impact which requires mitigation. By itself this impact is insufficient avoid the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	Minor (negative)
-73 to -108	A significant negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects. The impacts may result in the irreversible damage to irreplaceable environmental or social aspects should mitigation measures not be implemented.	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts will be irreplaceable and irreversible should adequate mitigation and management measures not be successfully implemented.	Major (negative)

Table 12: Impact Assessment Parameter Ratings Weighting Consideration Guide (i.e. adapted from local heritage and social impact assessment templates – SAHRIS/SAHRA)

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	***Positive Impacts (Type of Impact = +1)***			
7	Very significant impact on the environment. Irreparable and irreplaceable damage to highly valued species, habitat or ecosystem. Persistent severe damage. Irreparable and irreplaceable damage to highly valued items of great cultural significance or complete breakdown of social order.	Noticeable, on-going social and environmental benefits which have improved the livelihoods and living standards of the local community in general and the environmental features.	International - The effect will occur across international borders	Permanent: No Mitigation The impact will remain long after the life of the Project. The impacts are irreversible.	Certain/ Definite. There are sound scientific reasons to expect that the impact will definitely occur.
6	Significant impact on highly valued species, habitat or ecosystem. Significant management and rehabilitation measures required to prevent irreplaceable impacts. Irreparable damage to highly valued items of cultural significance or breakdown of social order.	Great improvement to livelihoods and living standards of a large percentage of population, as well as significant increase in the quality of the receiving environment.	National Will affect the entire country	Beyond Project Life The impact will remain for some time after the life of a Project.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread positive benefits to local communities which improves livelihoods, as well as a positive improvement to the receiving environment.	Province/ Region Will affect the entire province or region.	Project Life The impact will cease after the operational life span of the Project.	Likely The impact may occur
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense social benefits to some people. Average to intense environmental enhancements.	Municipal Area Will affect the whole municipal area.	Long term 6-15 years to reverse impacts.	Probable Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem functions. Rehabilitation requires intervention of external specialists and can be done in less than a month. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some.	Local Extending across the site and to nearby settlements.	Medium term 1-5 years to reverse impacts	Unlikely Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by very few of population.	Limited Limited to the site and its immediate surroundings	Short term Less than 1 year to completely reverse the impact.	Rare/ improbable Conceivable, with the possibility of the impact materialising being very low as a result of design, historic experience or implementation of adequate mitigation measures.
1	Limited damage to minimal area of low significance that will have no impact on the environment. No irreplaceable loss of a significant aspect to the environment. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level social and environmental benefits felt by very few of the population.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month to completely reverse the impact.	Highly unlikely/None Expected never to happen.

5.3.2. Identification of Key Potential Risk and Impacts

According to DEAT (2005), existing agricultural activities have had adverse effects on the environment, and to this end, the Department of Environmental Affairs and Tourism (2009) has identified that the major pressures on South Africa biodiversity are:

- Loss and degradation of natural habitat
- Invasive alien species
- Over-harvesting of species
- Over-abstraction of water, especially for irrigation, and
- Climate change

DEAT (2005) also indicates that the agricultural sector has had the most profound impact on natural habitat across South Africa. The clearing of natural vegetation for agriculture use has impacted on all biomes. For instance it is rumoured that during the 1970s that South Africa government has encouraged the farming of wetland areas whereas in present times the government seeks to conserve all wetlands.

In general the objectives of environmental impact assessment (EIA) are implemented using a mindful or systematic approach, in evaluating the effects imposed by a proposed project or specific proposed land use on a land unit. It may include the determination of existing and reference integrity status quo in respect to either the reference ecosystem or both (the existing condition of the receiving project landscape footprint area under land use activity – rangeland area). Further that the environmental effects or responses will vary in contrast when the change ecosystem and even within the quaternary catchment scale (i.e. resilience).

In respect to aquatic biodiversity, the identification and determination of potential impacts and risks from planned projects to potentially cause or disturb or alter watercourse resource quality, its sensitivity, its condition, may be regarded as an important principle focus to aquatic impact assessment reporting amongst other. As previously indicated, from an impact assessment practitioner perspective, the impact pathway of a proposed activity and the potential change away from a perceived reference state or existing land use integrity setting will therefore require management and control as a focus (i.e. compliance to RDM RQO and SDCs, MMP). Lastly where onsite impact mitigation is not possible that guidelines are available to planners, environmental practitioners and in ensure that the decision-making framework at a last resort may consider trade-offs where impacts are unavoidable (DEAT 2009).

In general the aquatic biodiversity risk and impact scope may be viewed as comprising elements related to disturbing aquatic resource quality, its integrity, habitat or biodiversity. Due to the watercourses understudy being dry during the assessment period aspects related to water quantity are inferred as with water quality (i.e. size, form or dimensions of feature). Proposed development risks in respect to potential pollution or accidents may include the receiving downstream immediate and surrounding water table (i.e. Aquifer), the site receiving environment (construction-based dust) and then lastly any negative effects to the surrounding neighboring environment and unforeseen extreme events (i.e. neighboring farming community, climate change, storms).

Estimated Impact Ratings for EIA configuration

The major aquatic related impact groupings applying to the project were assessed as part of the EIA requirements and consistent with the DWS Risk Matrix as provided.

- Aquatic biodiversity impairment – site formal establishment
- Aquatic habitat impairment – soil and sediment removal and infilling activities (as above and includes water quality related impacts – turbidity, erosion – reinstatement management)
- Alteration and loss of ecological processes – associate with flow alteration (migratory pathways)
- Cumulative impairment impact – full estimated development impact

The following comprises a list of potential project activity risks and impact description criteria:

- Construction Phase: Alteration and degradation of soil (i.e. geomorphology)
- Construction Phase: Increase in weathering and soil erosion potential (i.e. geomorphology)
- Construction Phase: loss of natural vegetation
- Construction Phase: Impacts or risks to neighbouring localised surrounding catchment area
- Construction and Operations Phase: Stormwater modification and impairment
- Construction and Operations Phase: vehicle, machinery, tools or equipment pollution risk
- Operations Phase Impacts on the neighbouring localised surrounding catchment area (nuisance)
- Operations Phase Impacts maintenance activity impact related to construction, access and re-habilitation
- Decommissioning impact of project activity on site and localised surrounding catchment area

All risks and potential impacts identified are regarded as potentially significant if not managed against. The proposed development EIA/MMP and related compliance management (ECO) must ensure that potential impacts are managed against with suitable oversight and risk mitigation measures (i.e. land use permit general and specific conditions).

The proposed land use (proposed project) impact assessment are transcribed and provided as standardised as possible for decision-making convenience in identifying and addressing risks and potential impacts to the existing natural environment and more specifically the aquatic biodiversity and watercourse status quo. In following convention the nature, scale, and duration of effects on the receiving project environment and whether such effects are positive (beneficial) or negative (detrimental) are provided. Risks and impacts are duly assessed from a project life-cycle view comprising construction (including planning), operations; and lastly decommissioning scope. The significance comprises a synthesis of impact characteristics like intensity, scale or magnitude and importantly the probability. Consequently, these aspects support prescription of suitable mitigation measures (i.e. economy of scale). Herewithin follows the impact and mitigation rating context rating for the EIA:

5.3.3. Construction Phase Impact Significance Prediction Model

As presented in this report Section 5.3.2. “Identification of Key Potential Risk and Impacts” the following is considered:

- Alteration and degradation of soil (i.e. geomorphology)
- Increase in weathering and soil erosion potential (i.e. geomorphology)
- Impacts on the neighbouring localised surrounding catchment area (nuisance)
- Stormwater modification and impairment (i.e. flow regime, water quality)
- Vehicle, machinery, tools or equipment use pollution risk (i.e. NWA S19)

Table 13: Construction Phase Impact Assessment Parameter Scoring

Impact Nature / Risk Metric	**Type** (-7 to +7)		**Intensity** (0 to 7)	**Extent - Spatial Scale** (0 to 7)	**Duration - Reversibility** (0 to 7)	**Consequence** (-147+147)	**Probability - likelihood** (0 to 7)	**Significance** (-21+21)
	Negative Impacts (Type of Impact = -1)	*Positive Impacts (Type of Impact = +1)*						
Alteration and degradation of soil	-2 minor	0 negligible	3 Average	3 local	5 project lifetime	22 negligible	5 Likely	7 to 8
Increase in weathering and soil erosion potential	-2 minor	0 negligible	3 Average	3 local	5 project lifetime	22 negligible	3 Unlikely	7 to 8
Impacts on the neighbouring localised surrounding catchment area	-2 Minor	0 negligible	3 Average	3 local	5 project lifetime	22 negligible	3 Unlikely	7 to 8
Stormwater modification and impairment	-3 moderate	+1 limited	2 Minor	5 regional	3 Medium	20 negligible	3 Unlikely	8
Vehicle, machinery, tools or equipment use pollution risk	-3 moderate	0 negligible	1 Low	5 regional	3 medium	27 negligible	3 Unlikely	9

5.3.4. Operations Phase Impact Significance Prediction Model

As presented in this report Section 5.3.2. “Identification of Key Potential Risk and Impacts” the following is considered:

- Stormwater modification and impairment (i.e. flow regime, water quality)
- Maintenance upgrade pylon or powerline replacement
- Vehicle, machinery, tools or equipment use pollution risk
- Impacts on the neighbouring localised surrounding catchment area

Operational phase impacts generally relate to the possibility of nuisances such as accidental pollution of the project area and the knock on effect of it or in specific to malpractice such as being in non-compliance with the professional code of conduct, the environmental management plan and/or the conditions of the environmental authorisation, among other (i.e. NEMA duty of care principle). Operations phase impacts also relate to maintenance and replacement of damaged pylon or powerline.

Table 14: Operations Phase Impact Assessment Parameter Scoring

Impact Nature / Risk Metric	**Type** (-7 to +7)		**Intensity** (0 to 7)	**Extent - Spatial Scale** (0 to 7)	**Duration - Reversibility** (0 to 7)	**Consequence** (-147+147)	**Probability -likelihood** (0 to 7)	**Significance** (-21+21)
	Negative Impacts (Type of Impact = -1)	*Positive Impacts (Type of Impact = +1)*						
Stormwater modification and impairment	-2 minor	0 negligible	3 Average	3 local	5 project lifetime	22 negligible	5 Likely	7 to 8
Maintenance upgrade pylon or powerline replacement	-3 minor	0 negligible	3 Average	3 local	5 project lifetime	28-32 Negligible	5 likely	7 to 8
Vehicle, machinery, tools or equipment use pollution risk	-2 minor	0 negligible	1 Low	3 local	5 project lifetime	16 Negligible	3 Unlikely	6
Impacts on the neighbouring localised surrounding catchment area	-1 limited	0 Negligible	1 Low	3 local	5 project lifetime	9 negligible	4 Probable	3

5.3.5. Decommissioning Phase Impact Significance Prediction Model

As presented in this report Section 5.3.2. “Identification of Key Potential Risk and Impacts”, the decommissioning phase impact of project activity on site and localised surrounding catchment area must be considered in order to fully assess the life-cycle impact of the proposed project.

Table 15: Decommissioning Phase Impact Assessment Parameter Scoring

Impact Nature / Risk Metric	**Type** (-7 to +7)		**Intensity** (0 to 7)	**Extent - Spatial Scale** (0 to 7)	**Duration - Reversibility** (0 to 7)	**Consequence** (-147+147)	**Probability -likelihood** (0 to 7)	**Significance** (-21+21)
	Negative Impacts (Type of Impact = -1)	*Positive Impacts (Type of Impact = +1)*						
Decommissioning of project	-1 Negligible	0 negligible	3 Average	3 local	5 project lifetime	11 negligible	5 Likely	3

5.3.6. Cumulative Impact Significance Prediction Model

Drawing from the project activity risks and impacts identified as relevant to construction, operations and decommissioning phases, the cumulative impact of the proposed development may be estimated. These may include an understanding of combined and knock on effects, as well as in respect to mounting threats and pressures such as extreme storm events, climate change and the need to suitably adapt resource management accordingly (i.e. sustainability, improved structure quality, anti-erosion measures). Ultimately a superposition on the subject risks and impacts was consequently assumed to estimate the cumulative impact to the project site receiving aquatic resource quality and characteristics.

Table 16: Cumulative Impact Assessment Parameter Scoring

Impact Nature / Risk Metric	**Type** (-7 to +7)		**Inten-sity** (0 to 7)	**Extent - Spatial Scale** (0 to 7)	**Dura-tion - Revers-ibility** (0 to 7)	**Conse-quence** (-147+147)	**Probability -likelihood** (0 to 7)	**Signifi-cance** (-21+21)
	Negative Impacts (Type of Impact = -1)	*Positive Impacts (Type of Impact = +1)*						
Climate Change Effect	-2 minor	0 negligi-ble	3 Aver-age	3 local	5 project lifetime	22 negligi-ble	5 Likely	7 to 8
Cumulative ef-fect of the pro-ject construc-tion, operations and decommis-sioning phase risks and im-pacts (including Cli-mate change)	-2 minor	0 negligi-ble	3 Aver-age	5 re-gional	5 project lifetime	26-27 negligi-ble	5 Likely	9

5.3.7. Impacts in respect to considering the "no-go" alternative

The project no-go alternative assumes the continuation of the existing situation on the project site and that the project activity will not be implemented.

In the context of project, powerline is existing. The positioning of the powerline also follows an existing major national route which is located along an ideal strategic corridor zone. The implications of considering the no-go alternative does not support the interest of energy services, a national obligation.

.6. Consideration for Maintenance Management Programme (MMPR)

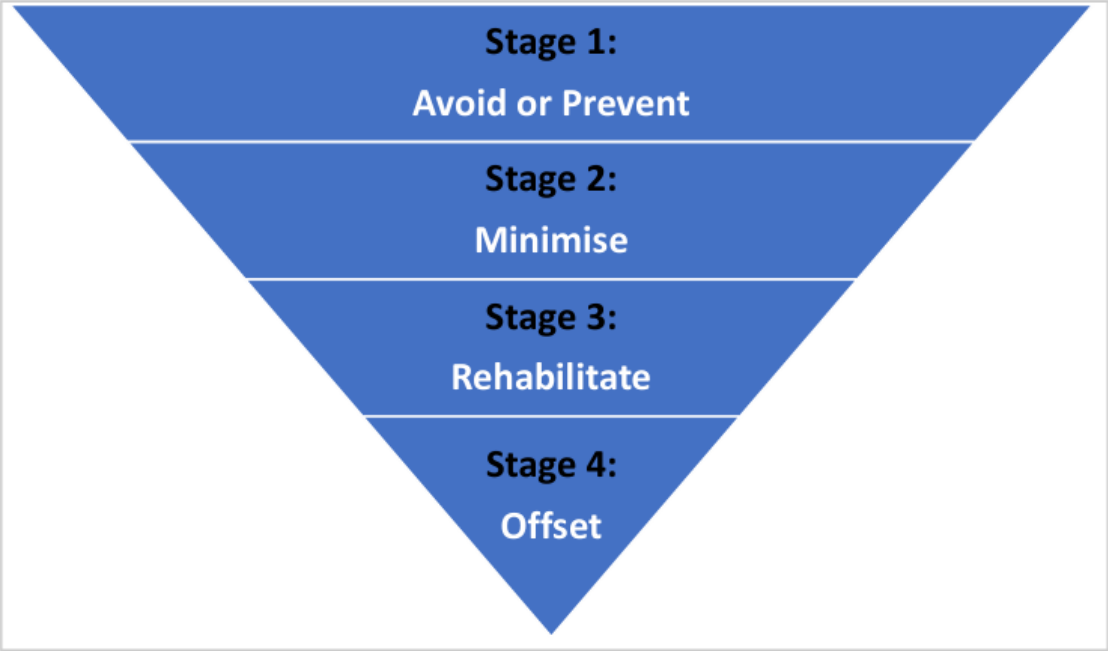


Figure 4: Rehabilitation as part of the mitigation hierarchy for dealing with negative impacts on biodiversity (adapted from DEA et al., 2013)

Figure 46: Excerpt extracted to illustrate the mitigation hierarchy (WRC, 2016)

All risks and potential impacts identified are regarded as potentially significant if not managed against. The proposed development EIA, MMP and related compliance management (ECO) must ensure that potential impacts identified are managed against with suitable oversight and risk mitigation (i.e. compliance with the project MMP and DWS GA conditions). The prescription of risk mitigation measures are generally aligned in support of existing industry policy sector norms, standards and best practise, as far as possible (DEAT 2002, 2005, 2009). However, these may not include specific measures identified in this report which should also be adopted (i.e. MMP) to further ensure for suitable impact management planning and effective use of environmental management implementation measures (i.e. Duty of care, development must not occur within watercourses or wetland areas as far as permitted). In this respect it is essential that compliance audits must take place with the oversight of an independent suitably registered professional scientist (i.e. SACNASP Aquatic Scientist) for project activity works being undertaken within watercourses, so as to ensure that no unauthorized activities have taken place. Further it is also important to consider having a suitably registered professional scientist to provide supervision of all works undertaken within watercourses or within proximity to watercourses (i.e. watercourse source seep zones), so as to ensure that no pylons are installed within any watercourses and to avoid impeding any natural flow paths or seeps.

The adoption of mitigation measures and compliance with environmental management implementation plans (i.e. EIA EA ROD conditions / GA compliance conditions) thus simultaneously ensures against undue project activity threats, risks and impacts. Overall the project activity risks and impacts to the receiving environment and in specific to the aquatic resource status quo of the project development was generally determined to be associated with a low degree of impact. The exceptions are the threat posed by climate change and the potential construction or operations based accidental pollution incidents. Due to the project site being located in a water scares area the emergency awareness for pollution management, erosion management and stormwater control must be adequately addressed in the project management planning (i.e. MMP). Further that stormwater control must ensure against undue erosion is managed as far as possible.

As a result the following measures should be considered to be taken into account, among other:

- Site establishment, Earthworks, heavy machinery and all construction vehicles must be mindful of undue site erosion and pollution to the receiving watercourse zones.
- The use of hazardous materials must be avoided as far as possible and where required to be managed and controlled appropriately in order to avoid any site pollution (i.e. dust, noise).
- Hydrocarbon spills and site pollution must be avoided (i.e. reduce the likelihood of accidents).
- In the event of soil contamination suitable emergency procedures must be followed and reported to the local and national authorities within 24 hours of the incident occurring (i.e. municipality and department of water and sanitation). Please find emergency protocols within the DWS GA. The response should include the suitable use and availability of spill kits, drip trays, plastic and other sheeting to absorb and control and remedy the incident as far as possible and to report on the matter after the correct procedure (i.e. report contaminated land, land contamination registry, remedy contamination).
- Staff must be trained and aware of pollution and fire prevention best practise protocols.
- Construction and operations based waste must be managed appropriately by the use of professional service providers (i.e. waste disposal certificate).
- Dust and site generated debris must be controlled.
- Only impermeable surfaces and suitably bunded areas may be used for storage.

It should be noted that the proponent ESKOM operations are professionally tailored with sound guidelines and standards in place. In adopting a mindful approach the proponent must always ensure that all construction, maintenance and decommissioning works are always undertaken in alignment with sector best practice and adopting the principle of duty of care.

An example of being mindful includes the maintenance of alien vegetation along the project activity corridor. Similarly the case may be made for maintenance of pylon structure integrity so as to not cause undue weathering or erosion to the receiving environment. The following guideline use for implementation of adaptive management measures are also supported in specific to habitat and biota consideration (DWS 2022).

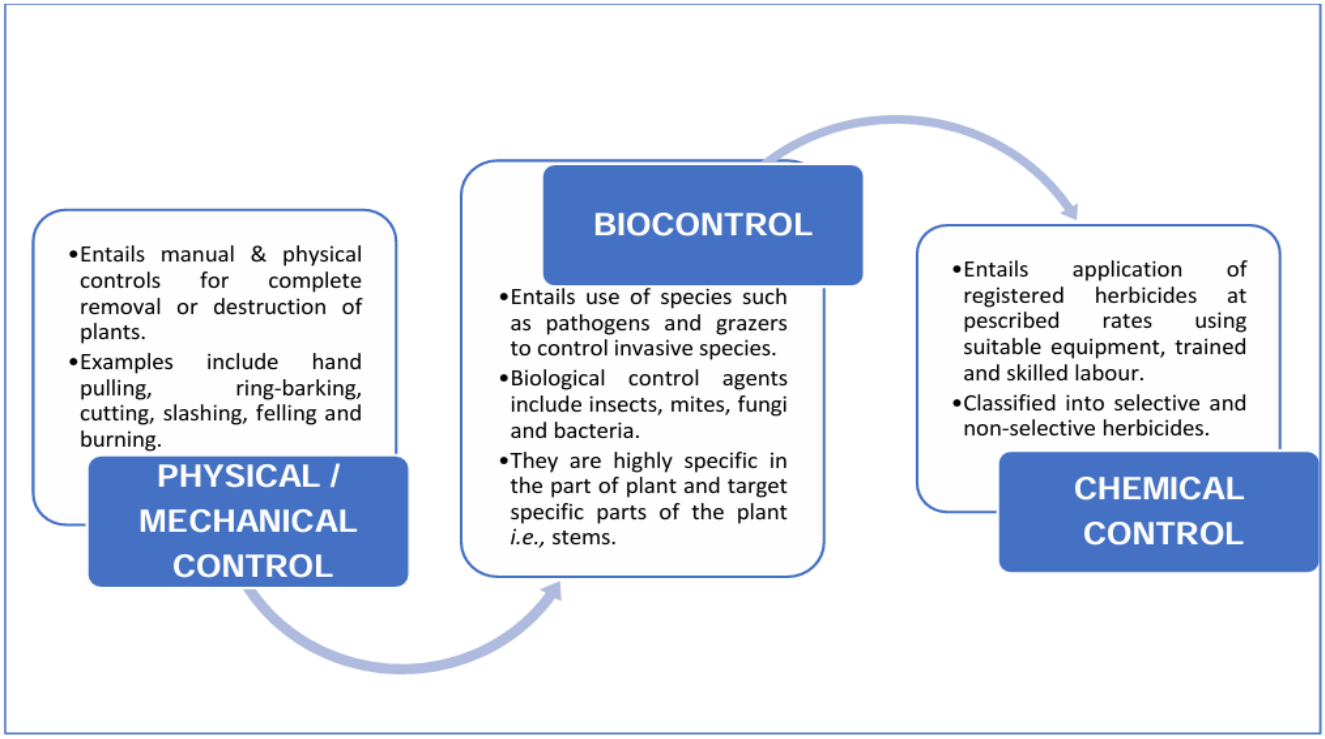


Figure 14: Alien vegetation clearing and control methods.

Figure 47: Alien Clearing Methods illustration Excerpt (DWS 2022)

7. Conclusion

The proposed development activity is not regarded to impact significantly on project area receiving watercourses, wetland resources or aquatic biodiversity. This is due to the proposed project being established primarily outside of areas zoned as wetlands or watercourses, as well as the project footprint on the ground being limited to a few substations, but a number of pylons which may span powerline beyond 200m overhead (i.e. activity impact on the ground is limited to pylons installation and powerline establishment or their replacement).

With sound environmental management and where required mitigation of negligible to minor negative aquatic biodiversity impacts may refer, it is concluded that from an aquatic biodiversity impact point of view, the proposed project activity can be authorised under NEMA by incorporating the findings and recommendations of this report into the project MMPR; as well as in respect to the NWA, with compliance to the conditions of the new GA (DWS Notice 4167 in Government Gazette No 49833 of 8 December 2023) for water uses under Section 21 (c) and (i) (also to be incorporated in the project MMP).

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9. Appendix.

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