FRESHWATER ECOLOGY IMPACT ASSESSMENT REPORT FOR THE PROPOSED BLACK MOUNTAIN MINING SANDGAT PROSPECTING RIGHT AND ENVIRONMENTAL AUTHORISATION APPLICATION

Khâi-Ma and Kai !Garib Local Municipalities, Z F Mgcawu and Namakwa District Municipalities, Northern Cape Province, South Africa

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Report Name	**FRESHWATER ECOLOGY IMPACT ASSESSMENT REPORT FOR THE PROPOSED BLACK MOUNTAIN MINING SANDGAT PROSPECTING RIGHT AND ENVIRONMENTAL AUTHORISATION APPLICATION**	
Specialist Theme	Aquatic Biodiversity Theme	
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Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principles of science.	

Abbreviations

Abbreviation	Definition
BAR	Basic Assessment Report
BMM	Black Mountain Mining
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DO	Dissolved Oxygen
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
DWAF	Department of Water Affairs and Forestry
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECO	Environmental Control Officer
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
ESA	Ecological Support Area
ES	Ecological Sensitivity
ETS	Ecosystem Threat Status
GA	General Authorisation
GIS	Geographic Information Systems
GN	Government Notice
IHI	Index of Habitat Integrity
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act
NWBEST	National Web-Based Environmental Screening Tool
PAOI	Project Area Of Influence
PES	Present Ecological State
RAM	Risk Assessment Matrix
REC	Recommended Ecological Condition
RQO(s)	Resource Quality Objectives
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SANBI	South African National Biodiversity Institute
SQR	Sub Quaternary Reach
WMA	Water Management Area

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1 Introduction

1.1 Background

The Biodiversity Company was appointed by EIMS to conduct a Freshwater Ecology Impact Assessment for the proposed Black Mountain Mining Sandgat Prospecting Right located in the Khâi-Ma and Kai !Garib Local Municipalities, Z F Mgcawu and Namakwa District Municipalities, Northern Cape Province, South Africa. (Figure 1-1).

To achieve this, a single aquatics survey was conducted from the 14th to the 17th of April 2026 during the late wet season (high flow). A 500 m area has been demarcated around the project area to facilitate the identification of any sensitive freshwater features. This area is referred to as the project area of influence (PAOI) (Figure 1-2).

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations (2014) (amended by GNR 326, 7 April 2017 and GNR. 517, 11 June 2021) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020) in terms of NEMA, dated 20 March and 30 October 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation” (Reporting Criteria).

This assessment has been completed in accordance with the requirements of the published General Notice (GN) 4167 by the Department of Water and Sanitation (DWS) (previously GN 509 of 2016 and GN 3139 of 2023). The said notice was published in the Government Gazette (no. 49833) under Section 39 of the National Water Act (Act no. 36 of 1998) in December 2023, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 4167 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA). A water use (or potential) qualifies for a GA under GN 4167 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM), provided the identified risks are all considered low risk, and the applicant is listed under Appendix D1 or Appendix D2 of the same notice. This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation to be dealt with in the conclusion.

The purpose of the specialist assessment and ecological walkdown was to provide relevant input into the EA process and provide a report for the activities associated with the project. This report, after taking into consideration the findings and recommendations provided by the specialist herein, including the identified watercourses, their buffers, sensitive sites, and no-go areas, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision-making with regard to the ecological viability of the proposed development and related activities.

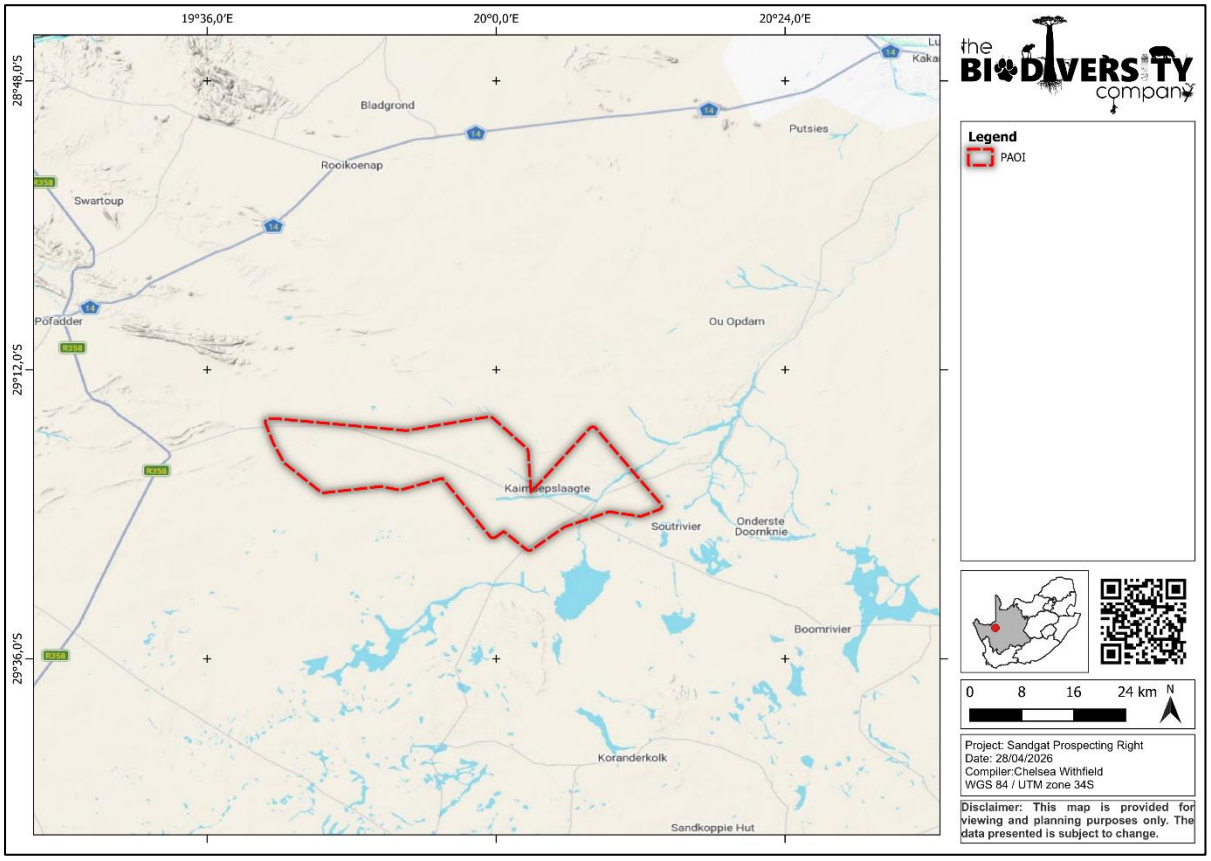


Figure 1-1 Location of the project area

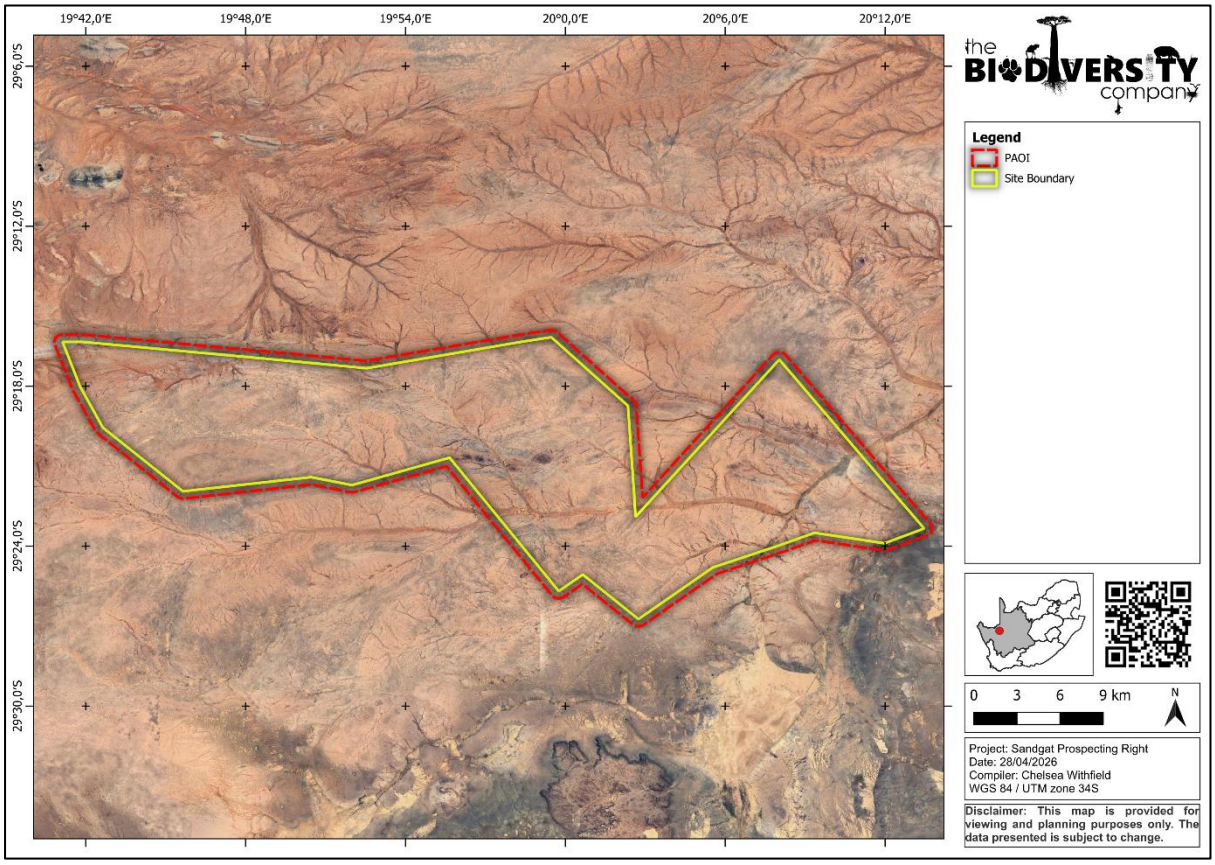


Figure 1-2 Location of the site boundary and 500 m PAOI

1.2 Project Description

1.2.1 Description of the scope of the proposed overall activity

Both non-invasive and invasive prospecting activities will be undertaken as part of the proposed Prospecting Work Programme (PWP). The application will follow a phased approach, where the prospecting work program is divided into several sequential phases.

Figure 1-3 below depicts the proposed prospecting area, the proposed areas of interest within the application area will be defined within the course of prospecting activities. This application employs a phased approach, where the work program is divided into several sequential sections. At the end of each section there will be a period of compiling, evaluating and reporting results. These results will not only determine whether the project proceeds, but also the manner in which it will go forward. Essentially, BMM will only action the next phase once satisfied with the results obtained. It is not possible to give details of the drilling program before the surveys and surface work phase 1 is completed. In the event that more information becomes available or that an ore body is located at an earlier stage, then an amended program will be put forward for the DMPR's approval.

It is anticipated that the invasive program will consist of a number of boreholes / drill sites with a footprint of approximately 300 m2 each. Vegetation will be cleared at the borehole locations within the application area. Minor access tracks will be created to access the proposed borehole sites where there are no existing roads. The total length of the access routes is anticipated to be 5 000 m and the approximate width is 3m. The targeting of all drilling activities will be dependent on the results obtained during the preceding phases of prospecting, namely the geological mapping and geophysical surveying and as such it is currently not possible to include a finalised surface plan showing the intended location, extent and depth of boreholes to be completed.

No bulk sampling work is to be carried out during this prospecting program. Initial prospecting will be carried out by BMM itself, utilising its own in-house geologists to conduct and oversee the work. Drilling will be outsourced to a local drilling company. The methods detailed below will be used to investigate the prospecting area.

It is hereby noted that the different phases and timeframes of the prospecting herein envisaged are, by their nature, dependent on the results obtained during the preceding phases of such prospecting. The proposals set out in this Prospecting Work Programme are therefore made on the basis that results obtained during the preceding phases may necessitate reasonable changes and adaptations to such proposals, which will be reported as prescribed.

1.2.2 Description of planned non-invasive activities

These activities do not disturb the land where prospecting will take place e.g., aerial photography, desktop studies, aeromagnetic surveys, etc.

1.2.2.1 Phase 1: Desktop study

To include:

- Compilation of historical exploration data with the aim of developing a working plan of the prospecting area on a suitable scale (1:5,000 or 1:10,000).
- Analysis of existing data and maps to further understand prospecting area structure & geology
- Initial targeting and ranking of prospective areas

1.2.2.2 Phase 2: Geological field mapping

The field mapping will be focused on potentially prospective areas (Bushmanland Group rocks) to improve understanding of the structure & geology in order to define targets for ground-based geophysics as well as to be able to interpret geophysical results. Geological mapping will be on a scale suitable for the observed geological variability and will be conducted by an in-house well-trained and highly experienced geologist.

During the geological field mapping activity soil and litho-sampling along with analysis (XRF & or assaying) may be conducted to determine prospective horizons.

1.2.2.3 Phase 3: Semi-Regional Geophysical Survey (ground based)

The primary ground-based geophysical technique that will be employed will be time-domain electromagnetics (TDEM) utilizing a new state-of-the-art SQUID electromagnetic sensor. Existing airborne EM and aeromagnetic coverage will guide the ground follow-up strategy. Additional techniques, such as controlled source audio magnetotellurics (CSAMT) and direct current resistivity / induced polarization, might be employed over prospective targets.

1.2.3 Description of planned invasive activities

These activities result in land disturbances e.g. sampling, drilling, bulk sampling, etc.

1.2.3.1 Drilling

The targeting of all drilling activities will be dependent on the results obtained during the preceding phases of prospecting, namely the geological mapping and geophysical surveying and as such it is currently not possible to include a finalized surface plan showing the intended location, extent and depth of boreholes to be completed.

Diamond drilling will be of the standard HQ or NQ size. Down hole surveys will be done every 50m in each hole. Core will be marked, logged, photographed and sampled according to the standard of the applicant's logging and sampling procedures.

Down the hole geophysical surveying will take place upon completion of the exploratory boreholes along with Ground EM surveys to determine positions of conductors.

Rehabilitation of drill sites will be done according to an approved Environmental Management Plan.

Percussion Rotary Air Blast (RAB) or Reverse Circulation (RC) drilling may be carried out for pre-collaring of diamond drill boreholes or for obtaining samples if significant depth of cover is encountered over particular targets.

1.2.3.2 Assaying

Rock chip / soil samples will be sent to a laboratory of the applicant's choice to be crushed, split, pulverized and assayed. Samples from core will be split using a core cutter before being sent to the laboratory for analysis.

1.2.3.3 Metallurgical Test Work

Metallurgical test work would start during phase 7 of the prospecting work programme. These tests will be done by and in consultation with a preferred and accredited Laboratory of the applicant's choice.

1.2.4 Phase 4: Boreholes

The initial planned invasive exploration activities will consist of diamond drill boreholes drilled to appropriate depths to target any anomalies identified during Phases 2 and 3 of the non-invasive portion of the prospecting work plan. The work will consist of:

- Access and drill site preparation
- Diamond core drilling
- Sampling and assaying
- Quality assurance and quality control programs
- Down hole geophysics
- Rehabilitation of drill sites
- Recording and Integration of data

1.2.5 Phase 7: Boreholes

This phase of boreholes would determine the continuity of mineralization and potential deposit size. The work will consist of:

- Access and drill site preparation
- Widely spaced diamond drilling and analyses to confirm grade / tonnage potential
- Sampling and assaying
- Quality assurance and quality control programs
- Metallurgical test work
- Rehabilitation of drill sites
- Recording and Integration of data

1.2.6 Phase 8: Boreholes

This phase of boreholes would provide enough information to be able to calculate an inferred resource. The work would consist of:

- Access and drill site preparation
- Close spaced infill diamond drilling and analyses to determine actual grade / tonnage
- Sampling and assaying
- Quality assurance and quality control programs
- Metallurgical test work
- Geotechnical drilling program
- Rehabilitation of drill sites
- Recording & Integration of data

Only the mineral deposit of the area was provided as shown below;

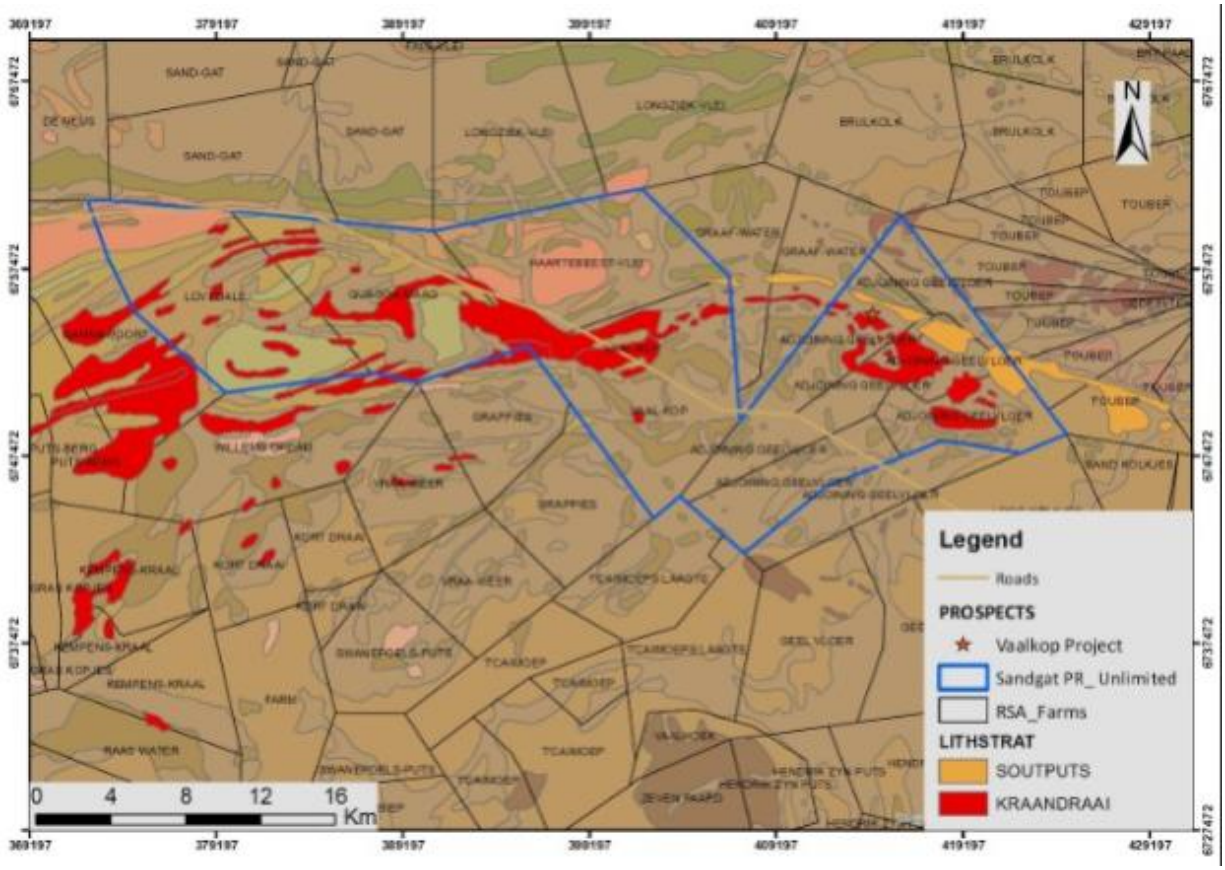


Figure 1-3 Proposed Project deposits and prospects

1.3 Assumptions and Limitations

The following aspects were considered as limitations:

- It is assumed that the extent of the project area provided to the specialist is accurate;
- Due to the scope of the study, this report only assessed the impacts of prospecting activities;
- The specialist was not provided with an architectural plan or any engineering drawings with regard to the planned development activities and, as such, the potential impacts arising from these activities may only be assumed based on previous experience;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- The assessment area was based on the footprint areas as provided by the client, and any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- A single-season survey was conducted for the respective study, which would constitute a wet season/high flow survey. Thus, temporal trends were not investigated. Despite this, it is the specialist's opinion that the findings are conclusive, and no further fieldwork would be required; and
- Due to the ephemeral nature of the assessed watercourses, standard freshwater methodologies could not be undertaken. Only the temporary depressions and In-stream dams, with water, were sampled for vernal biota.

- The Global Positioning System (GPS) used for watercourse delineations is accurate to five metres. Therefore, the delineation plotted digitally may be offset by a maximum of five metres to either side.

1.4 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 apply to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements

Region	Legislation / Guideline	Comment
National	NEMA	Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017 amended March 2022), Appendix 6 requirements
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA), Threatened or Protected Species Regulations	The protection of species and ecosystems that warrant protection
	Assessment Protocol (March 2020)	The minimum criteria for reporting.
	Assessment Protocol (October 2020)	Protocol for the specialist assessment and minimum report content requirements.
	NEMWA;	The regulation of waste management to protect the environment.
	NWA	The regulation of water use.
	GN 1003 of GG 43726 of 18 Sept 2020	The regulation and management of alien invasive species.
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)	To provide for control over the utilisation of the natural agricultural resources, including the vegetation and the combating of weeds and invader plants.
Provincial	Northern Cape Planning and Development Act no. 7 of 1998	To provide for the management and conservation of the province's biophysical environment and protected areas.
	Northern Cape Nature Conservation act no. 9 of 2009	To inform land use planning, environmental assessments, land and water use authorisations, as well as natural resource management

1.5 National Water Act (NWA, 1998)

The DWS is the custodian of South Africa's watercourses and therefore assumes public trusteeship of watercourses, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of watercourses, which includes:

- The maintenance of the quality of the watercourse to the extent that the watercourses may be used in an ecologically sustainable way.
- The prevention of the degradation of the watercourse.
- The rehabilitation of the watercourse.

A watercourse means:

- A river or spring.
- A natural channel in which water flows regularly or intermittently.
- A wetland, lake or dam into which, or from which, water flows.
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, and any given watercourse constitutes the resource and as such needs to be conserved. No activity may therefore take place within

a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

1.6 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended, state that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact.

1.7 Legislative Framework

In line with the protocol for the specialist assessment and minimum report content requirements for environmental impacts on freshwater biodiversity, as per Government Notice 320 published in terms of NEMA, dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation" – the following has been assumed:

- 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 sensitivity" for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment.

An Aquatic / Freshwater Biodiversity Specialist Assessment Report must contain the information as presented in Table 1-2 below.

Table 1-2 Aquatic Biodiversity Specialist Assessment information requirements as per the relevant protocol, including the location of the information within this report

Information to be Included (as per GN 320, 20 March 2020)	Report Section
The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of aquatic sciences	7.5
Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae	7.5
A signed statement of independence by the specialist(s)	7.4
The assessment must be undertaken on the preferred site and within the proposed development footprint	2.2.1
A baseline description of the aquatic biodiversity and ecosystems on the site, including: aquatic ecosystem types; presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns.	2.1
The threat status of the ecosystem and species as identified by the screening tool	2.4.1
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)	2.1
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 the 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)	2.1.8 and 2.2.7
The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate	3.3

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.); and (d) to what extent will the risks associated with water use and related activities change.	3
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 offstream impoundment of a wetland or river); (c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g., change from an unchanneled valley-bottom wetland to a channelled valley-bottom wetland); (d) quality of water (e.g., due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); (e) fragmentation (e.g., road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and (f) 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.)	3
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?	3
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?	-
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment	1.1
The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant	7.1
A description of the assumptions made, any uncertainties or gaps in knowledge or data	1.2.1
The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant	2.4
Additional environmental impacts expected from the proposed development	-
Any direct, indirect and cumulative impacts of the proposed development on-site	3
The degree to which impacts and risks can be mitigated	3
The degree to which the impacts and risks can be reversed	3
The degree to which the impacts and risks can cause loss of irreplaceable resources	3
A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies	2.3

Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr)	3.103.9
A motivation must be provided if there were development footprints identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate	-
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	5.2
Any conditions to which this statement is subjected	5.2

A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

2 Results & Discussion

2.1 Desktop Dataset Assessment - Ecologically Important Landscape Features

The following spatial features describe the general area and associated freshwater watercourses (ecologically important landscape features). This assessment is based on spatial data that are provided by various sources such as the provincial environmental authority and the South African National Biodiversity Institute (SANBI). The desktop analysis and their relevance to this project are summarised in Table 2-1.

Table 2-1 Summary of the relevance of the proposed project to ecologically important landscape features

Desktop Information Considered	Relevance	Reasoning	Section
Strategic Water Source Areas	No	The PAOI is not located within any SWSAs for groundwater or surface water.	2.1.1
Conservation Plan	**Yes**	**The PAOI overlaps with Critical Biodiversity Areas 1 and 2**	**2.1.2**
National Biodiversity Assessment (NBA)	**Yes**	**The PAOI overlaps with the NBA rivers, as well as depression wetlands.**	**2.1.3**
Aquatic Ecosystem Threat Status	**Yes**	**The PAOI intersect with 'Endangered' and Critically Endangered watercourses.**	**2.1.4**
Aquatic Ecosystem Protection Level	No	The PAOI does not intersect with any protected rivers and wetlands.	2.1.5
National Freshwater Ecosystem Priority Areas (NFEPA)	**Yes**	**The PAOI intersect five NFEPA rivers (Kaboep River, Steenkampsvlei se Holte River and tributary, Soutputs se Laagte River and Tributary) which are classified as NFEPA rivers. Additionally, the PAOI overlaps with the FEPA area.**	**2.1.6**
Protected Areas	No	The PAOI does not overlap with any Protected Areas.	2.1.7

2.1.1 Strategic Water Source Areas

Strategic Water Source Areas (SWSAs) are areas that supply a disproportionate amount of mean annual runoff to a geographical region of interest. The areas supplying ≥ 50% of South Africa's water supply (which were represented by areas with a mean annual runoff of ≥ 135 mm/year) represent national Strategic Water Source Areas (SANBI, 2013). According to Le Maitre (2018), ''SWSAs are defined as areas of land that either: (a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important, or (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b). They include transboundary Water Source Areas that extend into Lesotho and Swaziland. According to Lötter and Le Maitre (2021), the 2018 SWSAs data set for surface water was identified based on a generalised 1.7 x 1.7 km resolution Mean Annual Runoff dataset, while the 2021 data set was delineated at a finer resolution of 90 x 90 m. The purpose of the update was to refine the spatial resolution such that SWSAs can be reliably integrated into a range of catchment - and local-level planning, management, and regulatory processes.

According to the SWSAs of South Africa, Lesotho and Swaziland, the PAOI is not located within any SWSAs for surface water or groundwater.

2.1.2 Conservation Plan

The Northern Cape Biodiversity Spatial Plan (NCBSP) (2024), developed by the Northern Cape Department of Environment and Nature Conservation (DENC) in collaboration with SANBI, provides the latest spatial framework for biodiversity conservation in the province. This plan updates and replaces the 2016 Northern Cape CBA Map, aiming to guide sustainable land use and inform environmental decision-making in line with national biodiversity legislation.

The BSP defines the following categories: Protected Areas, Critical Biodiversity Areas (CBA), subdivided into CBA 1 and CBA 2, and Ecological Support Areas (ESA).

The PAOI overlaps with Critical Biodiversity Areas 1 and 2 (Figure 2-1).

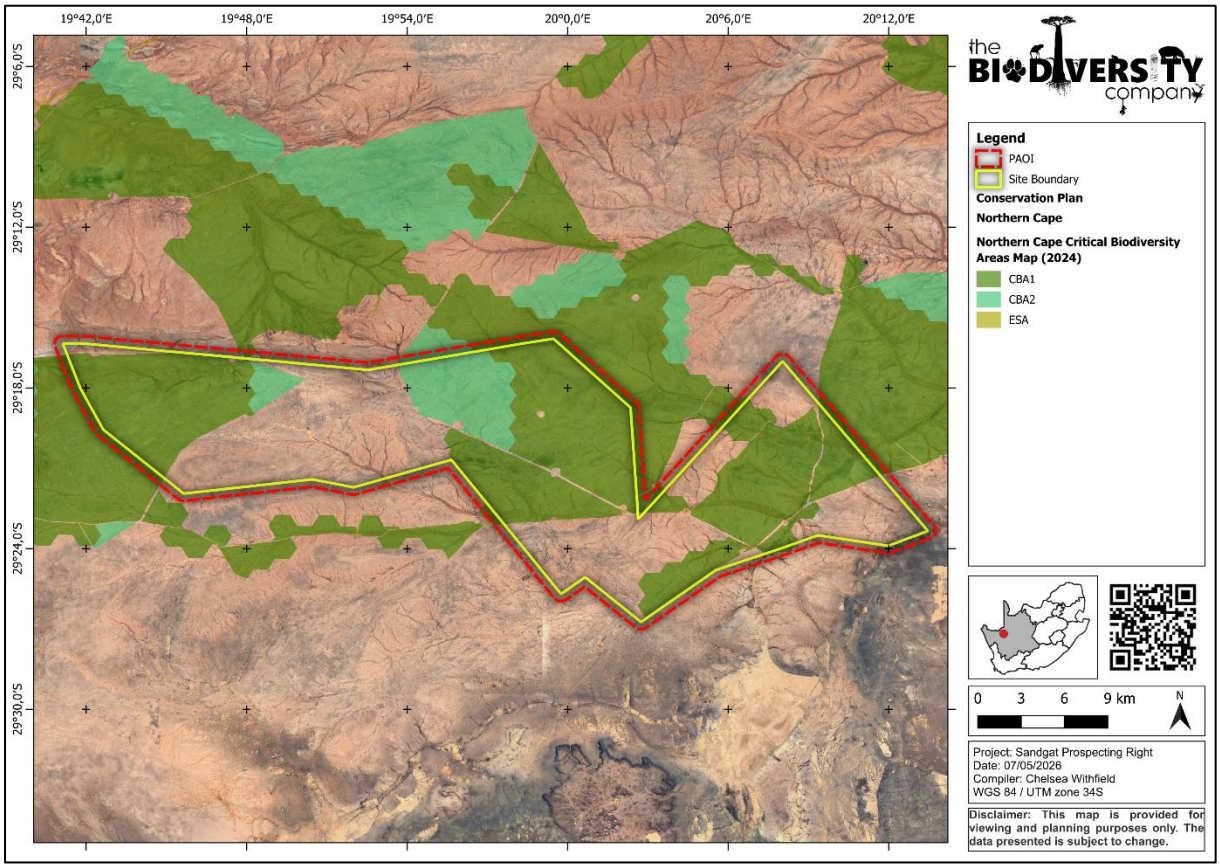


Figure 2-1 The PAOI superimposed on the Provincial Conservation Plan

2.1.3 The National Biodiversity Assessment

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the DEA and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Van Deventer *et al*., 2019). The purpose of the NBA is to assess the state of South Africa's biodiversity to understand trends over time and inform policy and decision-making across a range of sectors (Van Deventer *et al*., 2019).

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the NBA (2018). National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (2018).

According to the NBA, the PAOI overlaps with the Kaboep River, the Steenkampsvlei se Holte River and Tributary, the Soutputs se Laagte River and Tributary, as well as depression wetlands (Figure 2-2).

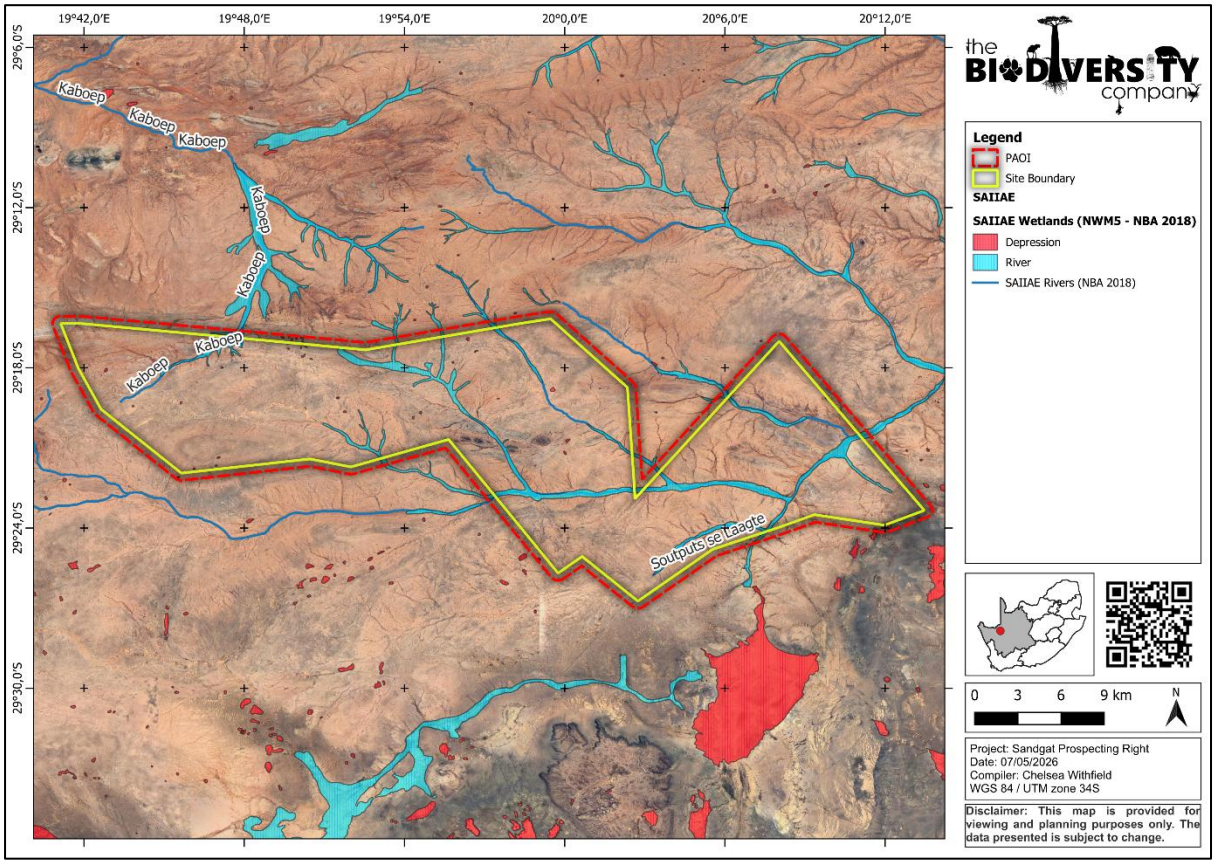


Figure 2-2 Illustration of NBA wetlands and/or rivers within the PAOI (NBA, 2018)

2.1.4 Aquatic Ecosystem Threat Status

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA in 2018. The Ecosystem threat status of river and wetland ecosystem outlines the degree to which the ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Van Deventer *et al*., 2019). Ecosystem types are categorised as Critically Endangered, Endangered, Vulnerable or Least Threatened, based on the proportion of each ecosystem type that remains in a good ecological condition (Van Deventer *et al*., 2019). The Ecosystem Threat Status (ETS) of each river assessed was based on the extent to which the system had been modified from its natural condition (SANBI, 2017).

According to the SAIIAE dataset, the rivers within the PAOI are classified as 'Endangered' and the wetlands as 'Critically Endangered' (Figure 2-3).

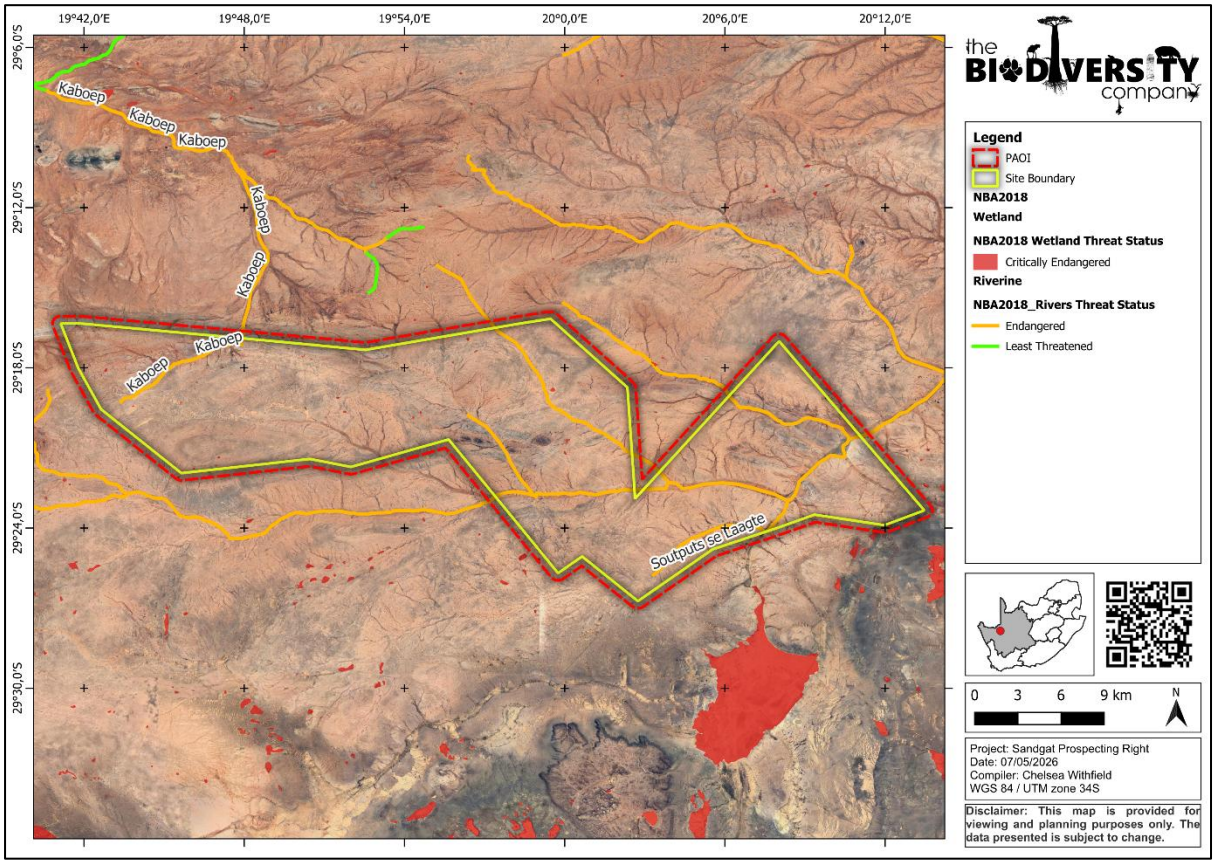


Figure 2-3 The project area showing the regional ecosystem threat status of the associated aquatic ecosystems (NBA, 2018)

2.1.5 Aquatic Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Van Deventer *et al*., 2019). The Ecosystem Protection Level (EPL) of each river assessed was based on the extent (expressed as a percentage) to which the system has their biodiversity target located within protected areas and are in a natural or near-natural ecological condition. Rivers in protected areas need to be in good condition (A or B ecological category) to be considered as protected. Well protected rivers have 100% of their extent located within protected areas, while moderately protected and poorly protected river ecosystem types have at least 50% and 5% of their biodiversity target in protected areas, respectively. Not protected rivers are characterised by less than 5% (SANBI, 2022).

The project area was superimposed on the aquatic ecosystem protection level map to assess the protection status of aquatic ecosystems associated with the development. According to the SAIIAE dataset, The PAOI does not intersect with any protected rivers and wetlands (Figure 2-4).

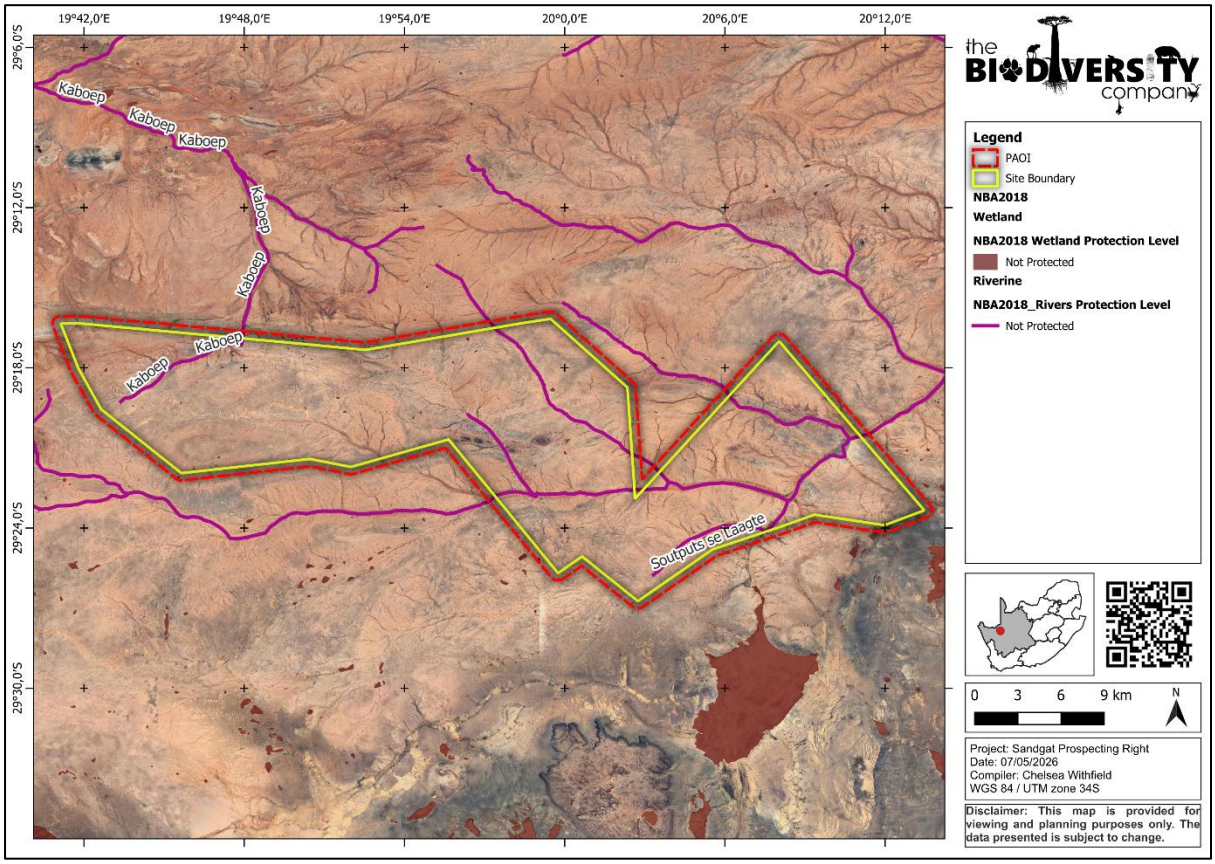


Figure 2-4 The project area showing the regional level of protection of aquatic ecosystems (NBA, 2018)

2.1.6 National Freshwater Ecosystem Priority Area Status

The National Freshwater Ecosystem Priority Areas (NFEPA) database forms part of a comprehensive approach to the sustainable and equitable development of South Africa's scarce water resources. This database provides guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act 36 of 1998). This directly applies to the National Water Act, which feeds into Catchment Management Strategies, water resource classification, reserve determination, and the setting and monitoring of resource quality objectives (Nel *et al*., 2011). The NFEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's biodiversity goals (NEM: BA) (Act 10 of 2004), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel *et al*., 2011).

According to the NFEPA dataset, the PAOI intersect five rivers (Kaboep River, Steenkampsvlei se Holte River and Tributary, and Soutputs se Laagte River and Tributary) which are classified as NFEPA rivers. Additionally, the PAOI overlaps with the FEPA area (Figure 2-5). Conserving the water quality, riverine and wetland habitat and associated ecological functioning within the project area and associated catchments, will aid in the protection of aquatic species occurring within the entire catchment and water quality for the aquatic and terrestrial biota downstream of the project area. The catchments in which human activities occur need to be managed to maintain water quality and prevent further degradation of local and downstream watercourses in order to contribute to national biodiversity goals and support the sustainable use of watercourses.

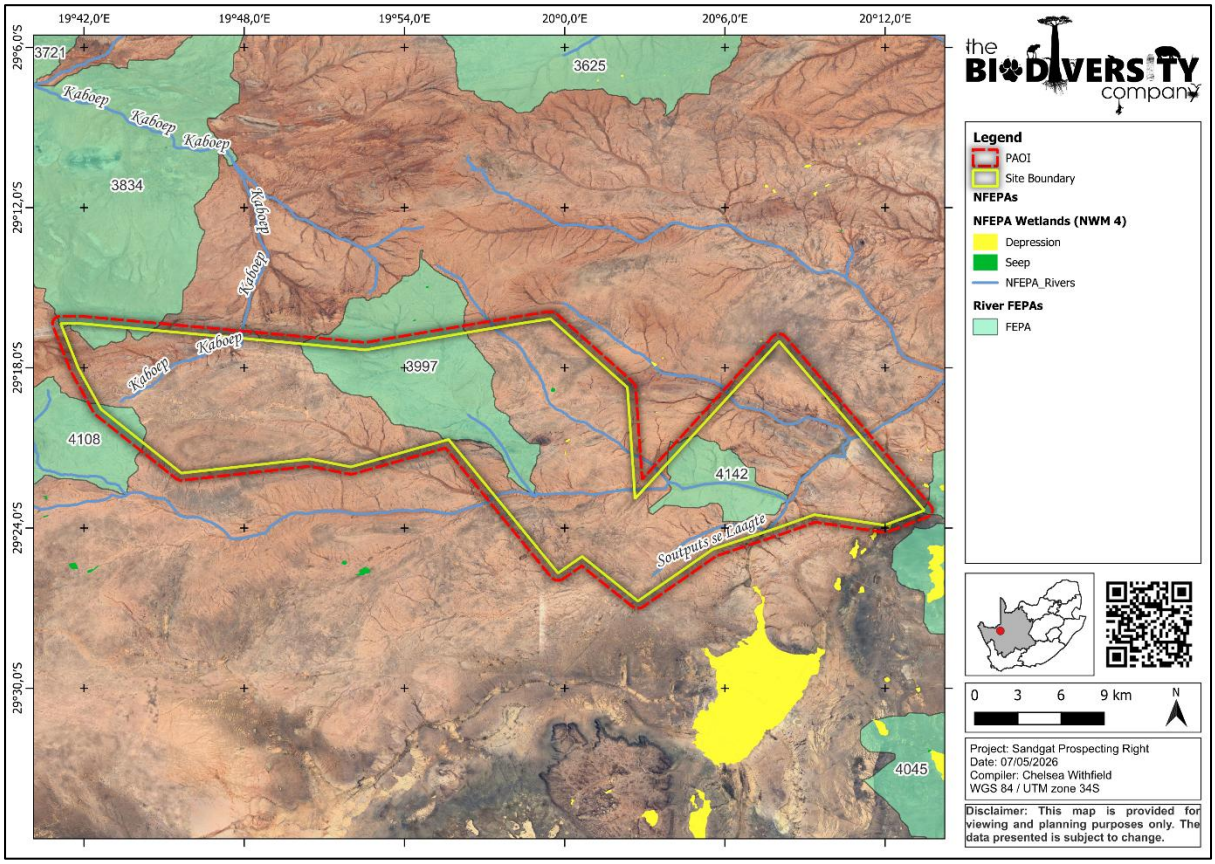


Figure 2-5 NFEPA map for the PAOI (Nel et al., 2011)

2.1.7 Protected Areas

The Department of Environmental Affairs maintains a spatial database of Protected Areas and Conservation Areas. The Protected Areas and Conservation Areas (PACA) Database scheme is used for classifying protected areas (South Africa Protected Areas Database-SAPAD) and conservation areas (South Africa Conservation Areas Database-SACAD) into types and sub-types in South Africa. The definition of protected areas used in these documents follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas: Special nature reserves, National parks, Nature reserves, Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003), World heritage sites declared in terms of the World Heritage Convention Act, Marine protected areas declared in terms of the Marine Living Resources Act, Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998), and Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970). The types of conservation areas that are currently included in the database include: Biosphere reserves, Ramsar sites, Stewardship agreements (other than nature reserves and protected environments), Botanical gardens, Transfrontier conservation areas, Transfrontier parks, Military conservation areas, and Conservancies.

According to the protected area spatial datasets from SAPAD (2025) and SACAD (2025), the PAOI does not overlap with any Protected or Conservation Areas. According to the protected area spatial datasets from SAPAD (2025, Q3) and SACAD (2025, Q3), at the nearest point, the PAOI is situated approximately 50 km east of the Gamsberg Nature Reserve (Figure 2-6).

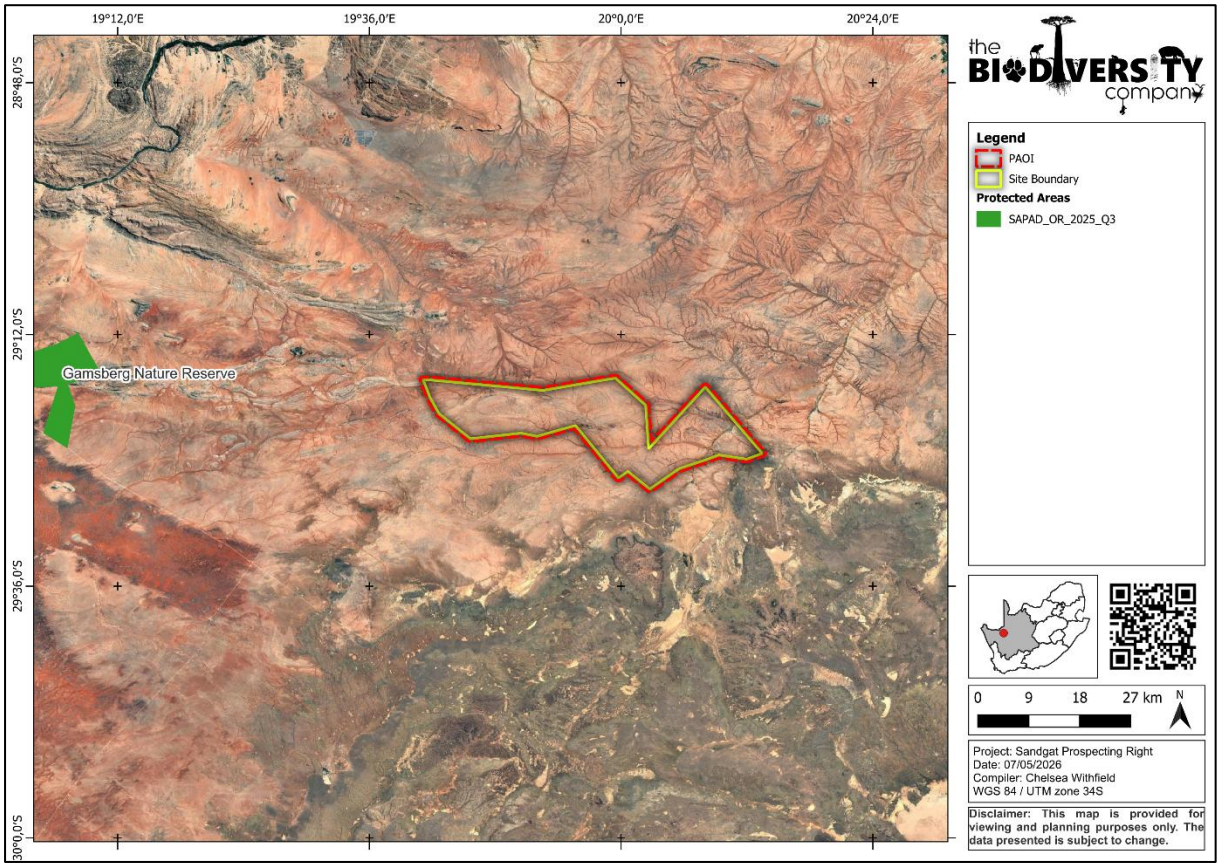


Figure 2-6 Map illustrating the location of the Protected Areas proximal to the PAOI

2.1.8 Freshwater Ecology

The project area falls within the Vaal-Orange Water Management Area (WMA) (previously the Orange WMA) (DWS, 2023), the Nama-Karoo Ecoregion (Figure 2-7). The PAOI overlaps three quaternary catchments: D81G, D81F and D53G (Figure 2-7). Desktop information for the Sub-Quaternary Reaches (SQRs) associated with the PAOI was obtained from the DWS (2014). The PAOI falls within the Kaboep River, Steenkampsvlei se Holte River and Soutputs River SQRs as well as the Steenkampsvlei se Holte River Tributary and Soutputs se Laagte River Tributary SQR which will from henceforth be referred to as SVH Tributary and SL Tributary respectively. No SQR information or catchment impacts is available for all the rivers. The Present Ecological State (PES), Ecological Importance (EI), and Ecological Sensitivity (ES) for the available SQRs are summarised in Table 2-2.

Table 2-2 PES of systems and the SQR associated with the project (DWS, 2014)

Component/SQR	D81F-03929 (Kaboep River)	D53G-03991,04142 (Steenkampsvlei se Holte River)	D53G-03997, 04085, 04180 (SVH Tributary)	D53G-04058, 04132, (Soutputs se Laagte River)	D53G-03992 (SL Tributary)
Length (km)	22.11	29.08	42.83	25.12	21.77
Default Ecological Category	N/A	N/A	N/A	N/A	N/A
Ecological Importance (EI)	Low	Low	Low	Low	Low
Ecological Sensitivity (ES)	N/A	N/A	N/A	N/A	N/A
Recommended Ecological Category (REC)	N/A	N/A	N/A	N/A	N/A

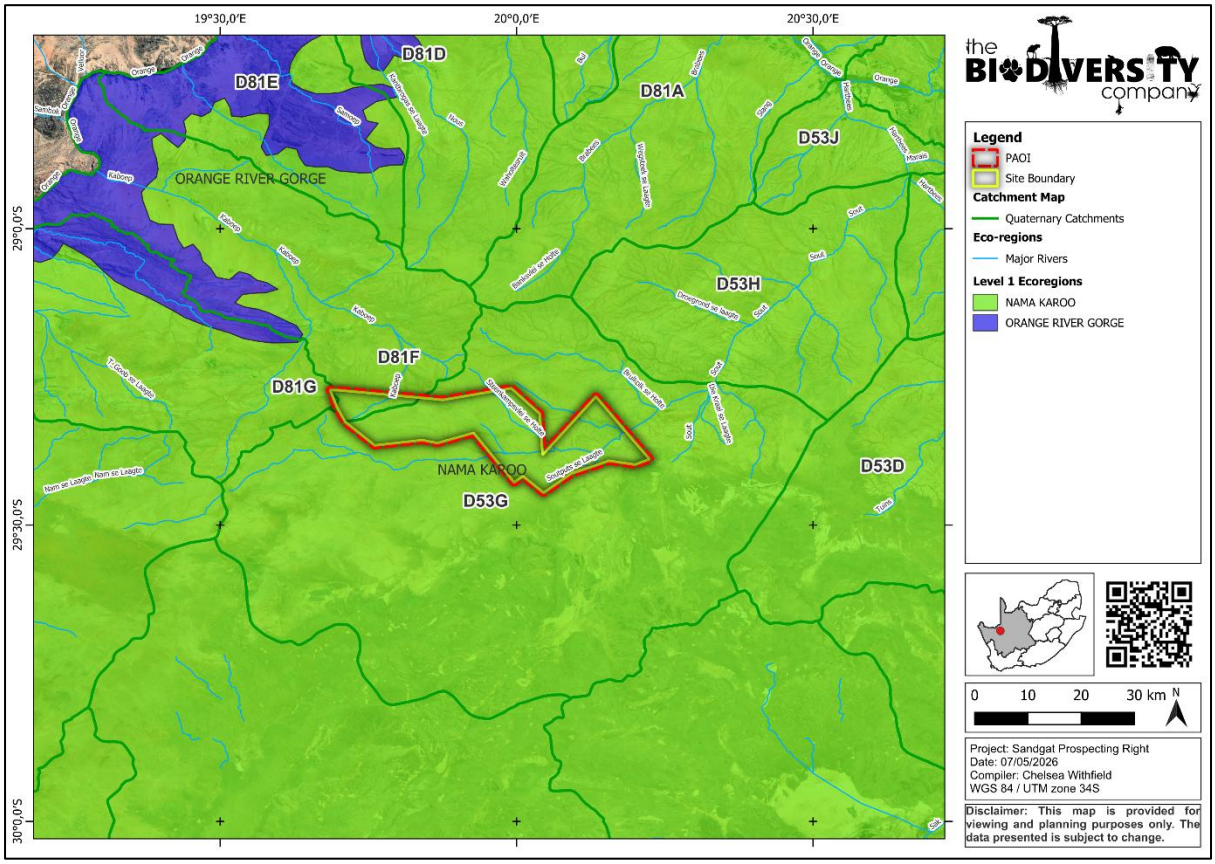


Figure 2-7 Hydrological aspects associated with the project area

2.1.9 Resource Quality Objectives

The NWA sets out to ensure that water resources are used, managed and controlled in such a way that they benefit all users. To achieve this, the Act has prescribed a series of measures such as Resource Quality Objectives (RQOs) to ensure comprehensive protection of water resources so that they can be used sustainably (DWA, 2011b). Results from the riverine assessment are ideally compared to the Resource Quality Objectives (RQOs) for the WMA and at a finer level for specific catchments (where available). RQOs provide numerical and/or descriptive statements about the biological, chemical, and physical attributes that characterise a resource for the level of protection defined by its class. “Resource Quality Objectives might describe, among other things, the quantity, pattern and timing of instream flow; water quality; the character and condition of riparian habitat, and the characteristics and condition of the aquatic biota”. The PAOI falls within the Vaal-Orange WMA (previously the Orange WMA). No RQO information is available for the PAOI as the rivers in the region are considered ephemeral watercourses and have not been assessed.

2.2 Fieldwork Findings

2.2.1 Investigation Sites

A single high flow survey was conducted from the 14th to the 17th of April 2026. Sampling points were selected for the study to assess the current state of the associated watercourses and identify potential risks that may result from the project. Only watercourses at an appreciable level of risk in relation to the proposed project and related activities were considered for assessment.

The following watercourses were identified within the PAOI during the field survey:

- NFEPA Rivers:
  - Kaboep River, Soutputs se Laagte River, Steenkampsvlei se Holte River, SVH Tributary, SL Tributary
- Wetlands:
  - Temporary depression wetlands
- Non-perennial/ephemeral watercourses:
  - Drainage areas
  - NFEPA River tributaries
- In-stream dams

The on-site assessment of the watercourses presented dry conditions in all assessed sites except for the Depressions Wetlands and in-stream dams. Cumulatively these systems displayed ephemeral characteristics which is typical for watercourses in a semi-arid region such as where the project area is located. Portions of the watercourses intersect terrestrial habitat, highlighting their interdependence. Despite their ephemeral nature, the watercourses are sensitive to modification as these systems do provide drinking opportunities (following rainfall) and habitat for foraging, nesting and refugia for terrestrial biota and avifauna. Therefore, the watercourses in the project area are regarded as sensitive environments in relation to changes in habitat integrity, flow and water quality (ecological drivers) requiring avoidance from the project related disturbance activities and as well as maintenance of baseline conditions. Given the extensive number of sites assessed, photographs and Global Positioning System (GPS) coordinates of representative habitat types are presented in Table 2-3, together with corresponding photographs. The examples illustrate the range of habitats encountered during the survey.

Due to the ephemeral, dry nature of the watercourses within the PAOI, standard aquatic methods could not be conducted. The Index of Habitat Integrity (IHI) model as described in Kleynhans (1996) v2 was therefore used to determine the Present Ecological State (PES) of these watercourses.

Table 2-3 Photos and coordinates of representative sites assessed (April 2026)

Site	Upstream View	Downstream View
Kaboep River		
Kaboep 3A		

GPS	**29°18'57.83"S 19°44'4.67"E**	
Steenkampsvlei se Holte River		
SH 2		
GPS	**29°19'13.43"S 19°59'23.24"E**	
SH 3		
GPS	**29°22'28.83"S 20° 4'43.91"E**	
Soutputs se Laagte River		
SPL 3A		
GPS	**29°21'23.75"S 20° 9'45.23"E**	
SPL 4		
GPS	**29°24'8.14"S 20° 7'29.76"E**	
Unnamed NFEPA rivers		
	DL 3 (SVH Tributary)	**SPL2 (SL Tributary)**

		
GPS	29°20'6.84"S 19°55'48.15"E	29°17'2.99"S 19°55'29.53"E
Temporary Depression Wetlands		
	D1	D2
		
GPS	29°17'42.04"S 19°50'29.63"E	29°16'56.02"S 19°56'23.18"E
	TP3	TP5
		
GPS	29°20'5.30"S 19°44'15.16"E	29°18'50.14"S 19°54'20.57"E
In-stream dams		
	D4	Kaboep 2
		
GPS	29°22'34.98"S 20° 4'24.94"E	29°16'57.50"S 19°47'34.11"E

2.2.2 Water Quality

The *in-situ* results are important to assist in the interpretation of biological results due to the direct influence water quality has on aquatic life forms. The *in-situ* results recorded during the April 2026 study are presented in Table 2-4. Results have been compared to the Resource Directed Management of Water Quality (DWA, 2011), Target Water Quality Range (TWQR) for aquatic ecosystems (DWAF, 1996), DWAF (2011a) and Chapman and Kimstach (1996). Due to the arid to semi-arid nature of the project area, water presence was limited to the in-stream dams and depression wetlands.

Table 2-4 In-situ water quality results for the project area (April 2026)

Parameters	pH	Conductivity (µS/cm)	DO (mg/L)	Temperature (°C)
Limits	**6.5-8.4[A]**	**500[A]**	**>5.0****	**5-30***
Kaboep River				
Kaboep 2	8.82	36.6	5	18.6
Steenkampsvlei se Holte River				
D4	7.71	48	5.9	18.5
Depression Wetlands				
D1	7.96	45.3	6.6	21.7
D2	7.19	28.0	6.1	24.4
SH4	8.37	39.1	**4.3**	19.3
TP4	7.75	23.4	6.1	25.1
TP5	7.64	57.4	7.5	25.8
TP6	6.73	121.9	**3.0**	18.6

Levels exceeding recommended guideline levels are indicated in red.
* TWQR – Target Water Quality Range (DWAF, 1996)
** Chapman and Kimstach (1996)
[A] – Planning level water quality RSA (DWA, 2011a)

The riverine sites within the PAOI were dry at the time of the survey. Therefore, in-stream dams and depression wetlands within the PAOI were referred to for baseline water quality. The *in-situ* water quality results indicated no water quality perturbations within the Kaboep and Steenkampsvlei se Holte rivers (as indicated by the dams sampled) and depression wetlands except for the Dissolved Oxygen (DO), which was below the guideline limit. This was expected due to the stagnant nature of the systems. The pH levels, temperature and electrical conductivity (EC) were within the acceptable limits, therefore indicative of no pollution within the catchment.

These results were expected due to the various sites being in-stream dams or depression wetlands in an arid to semi-arid location. Water quality may therefore limit the diversity and abundance of sensitive aquatic biota within the system and may only be optimal for tolerant aquatic organisms (i.e. biota adapted to these conditions). The water quality observed may be considered baseline/reference water quality for these ephemeral reaches within the PAOI. It should be noted that *in-situ* water quality provides a simplistic overview of physical water quality parameters and aids in the interpretation of biological results.

2.2.3 Index of Habitat Integrity

The condition of the watercourse and associated aquatic biodiversity are largely dependent on the condition and degree of modification of the surrounding catchment. The more intact and natural the catchment is, the greater the watercourse condition and ecosystem functioning, and the more services there will be with an associated high aquatic and terrestrial biodiversity presence. An altered catchment compromises the watercourse condition, ecosystem functioning, and services offered, with deleterious

effects depending on the degree and type of catchment modification. The more modified catchment will ultimately have a low ecological value watercourse offering limited services with an absence of key services such as phytoremediation (cleaning of water by vegetation) with the cumulative loss of its original biodiversity with only the most tolerant biota remaining in the most negatively modified catchments. The IHI was conducted to determine the PES of the watercourses.

The IHI assessment was conducted for each of the five NFEPA rivers within the project area. In addition, an overall IHI assessment was completed for the drainage areas within the project area. The results for the instream and riparian IHI assessment for the associated watercourses are presented in Table 2-5.

According to the IHI results, the instream and riparian habitat of the NFEPA rivers, NFEPA River tributaries were rated as Largely Natural (class B), slightly modified, largely natural habitats. Limited anthropogenic activities within the local area include agricultural activities (livestock and farm dams), erosion, and dirt road and fence crossings (Figure 2-8). These activities have led to limited flow, bed and channel modifications within the assessed habitats.

Table 2-5 Results for the Instream Habitat Integrity assessment for the associated reaches (April 2026)

Instream Criteria	Kaboep River	Steenkampsvlei se Holte River	Soutputs se Laagte River	SVH Tributary	SL Tributary
Water abstraction	4	4	3	3	3
Flow modification	5	5	4	4	4
Bed modification	4	4	4	4	5
Channel modification	4	4	5	4	4
Phys-chem modification	4	4	4	4	4
Inundation	6	6	4	5	4
Alien macrophytes	0	0	0	0	0
Introduced aquatic fauna	0	0	0	0	0
Rubbish dumping	0	0	0	0	0
Instream Habitat Integrity Score	86	86	88	88	88
Instream Habitat Integrity Category	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)
Riparian Criteria	**Kaboep River**	**Steenkampsvlei se Holte River**	**Soutputs se Laagte River**	**SVH Tributary**	**SL Tributary**
Vegetation removal	0	0	0	0	0
Exotic vegetation	0	0	0	0	0
Bank erosion	5	5	5	5	5
Channel modification	4	4	4	4	4
Water abstraction	5	5	3	3	5
Inundation	4	4	5	3	3
Flow modification	5	5	5	5	5
Phys-chem	3	3	3	4	3
Riparian Zone Integrity Score	87	87	88	88	87
Riparian Zone Integrity Category	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)

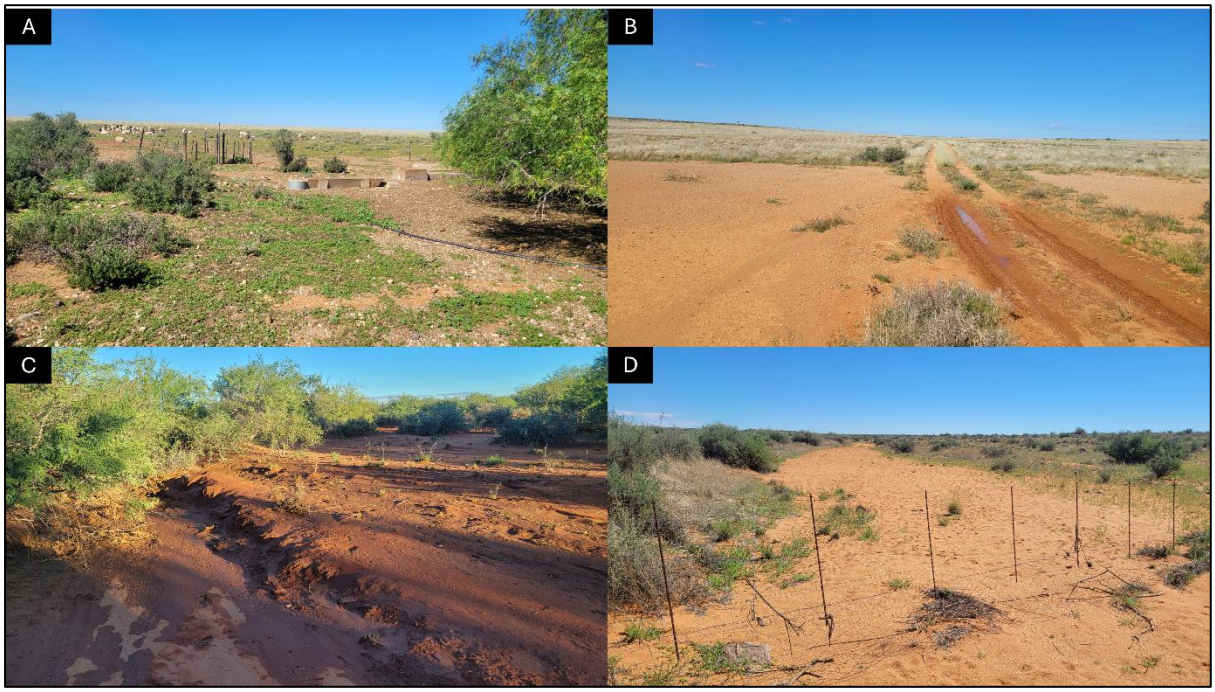


Figure 2-8 Impacts observed within the PAOI surrounding the NFEPA rivers and tributaries (April 2026): A) Livestock; B) Dirt road crossing through River; C) Bank erosion; and E)Fence crossing through River

2.2.4 Aquatic Macroinvertebrates

2.2.5 Vernal Aquatic Biota

2.2.5.1 Branchiopods

Invertebrates are keystone species in ephemeral pans globally, playing a crucial role in the food web as prey. They produce drought-resistant egg cysts, or resting eggs, which form an egg bank in the sediments and hatch following desiccation and inundation. Branchiopods, a class of extinct freshwater crustaceans, have evolved to survive in the transient conditions of ephemeral pans and marshes, including orders like Anostraca (fairy shrimp), Notostraca (tadpole shrimp), and Spinicaudata (clam shrimp). Their life cycles are adapted to intermittent water availability, involving rapid development and reproduction during rainy periods, followed by the formation of drought-resistant cysts that can survive for decades in dry sediments until favourable conditions return (Day *et al.,* 1999; Dube, T., *et al*., 2020; Meyer-Milne, E., *et al*. 2022).

Branchiopods are essential to the ecology of transient wetland environments. They support higher trophic levels, such as birds and amphibians, by participating in energy flow and nutrient cycling as filter feeders and grazers. Furthermore, they can colonize new habitats and promote genetic exchange between populations because to the passive dispersal made possible by their latent eggs. Branches are important bioindicators for evaluating the health and integrity of transitory wetland habitats because of their ecological significance and sensitivity (Meyer-Milne, E., *et al*. 2022). The biodiversity and biological processes that these ecosystems support depend on conservation efforts to keep them intact.

It is expected that more of the temporary wetlands present within the project area will support vernal biota. Southern Africa has one of the richest Anostracan faunas in the world, of which 80% are endemic (Day *et al*., 1999). The other Branchiopods are similarly endemic with some species only occurring from a single location in the country and nowhere else.

Due to the lack of research and baseline data on these temporary wetlands, the Present Ecological Status (PES) and importance and sensitivity were unable to be determined. Due to the limited

information on how these systems function within the environment, it was not possible to quantify (assign numerical values to) the ecosystem services, ecological importance, and sensitivity for the project, specifically in relation to the collected branchiopods. Despite this, ephemeral pans are essential components of the Karoo ecosystem, sustaining biodiversity, aiding nutrient cycling, and some providing temporary water sources during dry seasons. Their importance is heightened by their vulnerability to environmental changes such as land-use shifts and climate variability. The list of Branchiopods collected within the project area is presented in Table 2-6.

Table 2-6 Branchiopods collected within the project area (April 2026)

Common Name	Order	Family	Genus	IUCN Status (2026)	Assessed Sites							
					D1	D2	D4	Kaboep2	SH4	TP4	TP5	TP6
Fairy Shrimp	Anostraca	Branchinectidae	*Branchipodopsis*	LC	✓	✓	✓	✓	✓	✓	✓	✓
Tadpole Shrimp	Notostraca	Triopsidae	*Triops*	LC	✓	✓	✓	✓	✓	✓	✓	✓
Clam Shrimp	Laevicaudata / Spinicaudata	Limnadiidae / Cyzicidae	*Limnadia / Eulimnadia*	VU	✓	-	-	✓	✓	✓	-	✓

LC=Least concerned
VU= Vulnerable

Table 2-7 Photographs of branchiopods collected within the project area during the survey (April 2026).

Common Name	Photograph
Fairy Shrimp	
Tadpole Shrimp	
Clam Shrimp	

2.2.6 Fish Community Structure

Due to the ephemeral, dry nature of the rivers within the PAOI, fish community assessments could not be conducted, and no information is available regarding potential fish species that may occur within the region.

2.2.7 Present Ecological Status

The PES assessment for the sampled watercourses is based on the data collected during the April 2026 survey and the results are provided in Table 2-8. The PES assessment indicated that the assessed riverine features (All NFEPA rivers) are in a class B (Largely Natural) state, indicating slightly modified, largely natural habitats. It should be noted that the PES results represent a single survey conducted during April 2026 and is based only on the IHI results and the opinion of the specialist. These results should be interpreted accordingly.

The temporary depression wetlands located in the PAOI was classified and the PES determined following the methods provided in Section 7.1.7. The temporary depression wetlands are currently classified as Category B systems (Largely Natural), a small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged. The primary impacts affecting the wetland include grazing by sheep, which can lead to trampling, soil compaction, and selective removal of vegetation, as well as the presence of dirt roads within its catchment. These disturbances have contributed to changes in vegetation structure and hydrological patterns, but the wetland continues to provide important ecosystem services such as water retention and habitat provision. Ongoing management of grazing intensity and careful planning of road placement are recommended to prevent further degradation and to maintain the wetland's ecological integrity in line with South African wetland assessment guidelines.

Table 2-8 Present Ecological Status of the aquatic ecosystems in the project area

Aspect Assessed	Baboep River	Steenkampsvlei se Holte River	Soutputs se Laagte River	SVH Tributary	SL Tributary	Temporary depression wetlands
Present Ecological State	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)	B (Largely Natural)
Recommended Ecological Condition	Not available	Not available	Not available	Not available	Not available	Not applicable
	Maintain	Maintain	Maintain	Maintain	Maintain	Not applicable

2.3 Watercourse Delineations, Buffer Requirements and Regulated Areas

2.3.1 Watercourses and Buffer Areas

The watercourses were delineated according to DWAF (2005), 5 m contour data, the SAIIAE dataset (NBA National Wetland Map, 2018), and the latest Google Earth aerial imagery (2024) as well as a site visit and are presented in Figure 2-9 along with the required buffer areas. According to the buffer guidelines, the maximum required buffer should be applied to a system (Macfarlane, *et al*., 2014). Riparian areas have high conservation value and can be considered the most important part of a watershed for a wide range of values and resources. They provide important habitat for a large volume of wildlife and often forage for domestic animals. The vegetation they contain is an important part of the water balance for the hydrological cycle through evapotranspiration. They are crucial for riverbank stability and in preventing erosion within the channel (Elmore and Beschta, 1987). The implementation of a buffer zone ensures the ecological requirements needed to maintain both the ecosystem functioning and services offered by the watercourses are maintained. Additionally, the watercourses potentially influenced by the project have sensitivity to further disturbance, requiring protection from the

project activities. Therefore, they are considered as high priority areas and should be avoided at all costs.

A conservative buffer zone of **30 m** for all the NFEPA rivers, in-stream dams and temporary depression wetlands, and a **22 m** conservative buffer for the drainage areas were assigned according to the buffer guidelines, the maximum required buffer should be applied to a system (Macfarlane, *et al.*, 2014). These **post-mitigation** buffers considered the projects description (to avoid all sensitive areas), localised and minimal impacts of prospecting, ephemeral nature these systems (Figure 2-9). These buffer areas serve as **No-go** zones for any unauthorised activities. The site development plan should therefore be created accordingly. Ensuring buffers are intact increases the resilience of a watercourse to future disturbances. **It should be noted that these conservation buffers only apply to the prospecting activities, not Mining activities.**

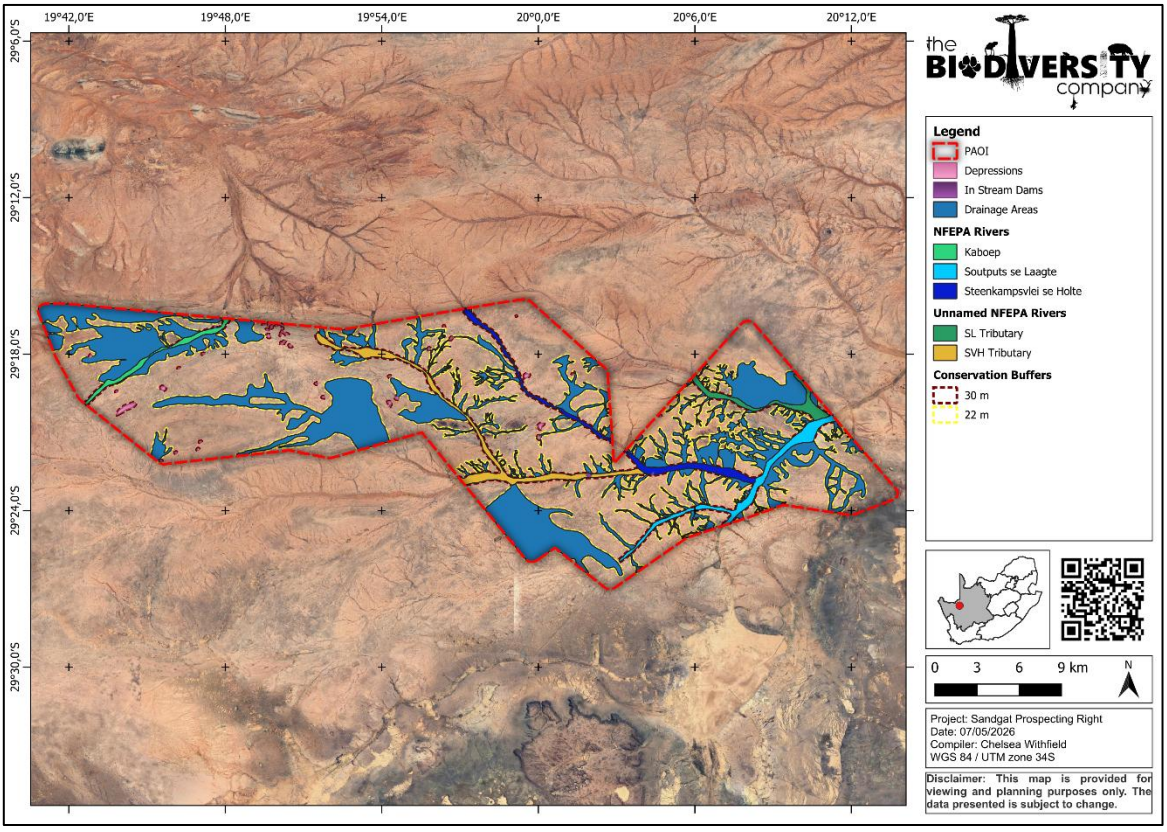


Figure 2-9 Delineations and buffer areas within the PAOI

2.3.2 Regulation Zones

Table 2-9 presents the legislated zones of regulation that would be applicable to the PAOI. In accordance with General Notice (GN) 4167 of 2023 as it relates to the NWA (1998), a regulated area of a watercourse for Section 21 (c) and 21 (i) of the NWA, 1998 means the outer edge of the 1 in 100 year flood or where no flood line has been determined it means **100 m** from the edge of a watercourse or a **500 m** radius from the delineated boundary (extent) of any wetland or pan. Listed activities in terms of the NEMA (1998), (Act 107 of 1998) EIA Regulations as amended in April 2017 must be taken into consideration if any infrastructure is to be placed within the applicable zone of regulation, which in this case is a **32 m** zone of regulation (ZoR). The PAOI includes five NFEPA rivers, In-stream dams, drainage areas and several temporary depression wetlands and therefore the project falls within the NEMA Act 107 and DWS GN 4167 regulated zones. The regulated areas have been applied to the delineations within the PAOI and are presented in Figure 2-10.

Table 2-9 The legislated zones of regulation

Regulatory authorisation	Zone of applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). **Department of Water and Sanitation (DWS)**	Government Notice 4167 as published in the Government Gazette 49833 of 08 December 2023 as it relates to the National Water Act, 1998 (Act No.36 of 1998) as amended. In accordance with GN4167, a regulated area of a watercourse in terms of water uses as listed in Section 21(c) and 21(i) is defined as: • the outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake, or dam; • in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m distance from the edge of a watercourse where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench; or • In respect of a wetland, a 500 m radius around the delineated boundary (extent) of any wetland, including pans.
Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended. **Department of Environmental Affairs and Development Planning (DEA&DP)**	**Activities of Listing Notice 1 (GN 983) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended):** **Activity 12:** The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres;or (j) infrastructure or structures with a physical footprint of 100 square metres or more. where such development occurs: a) within a watercourse; b) in front of a development setback; or c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse. Excluding – …(dd) where such development occurs within an urban area… **Activity 19:** The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or estuary, whichever distance is the greater— but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies. **<u>Activities of Listing Notice 3 (GN 985) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended)</u>** **Activity 14** *The development of—* *(xii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse,*

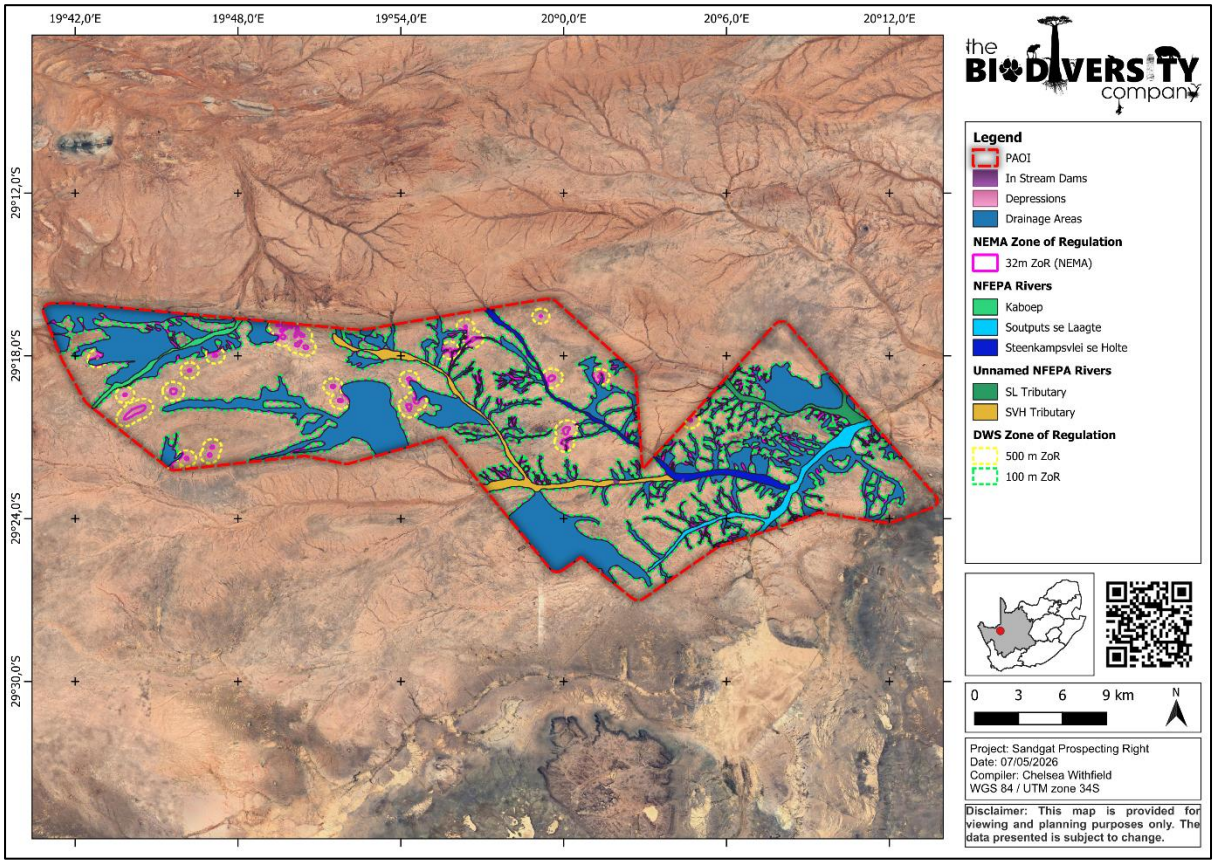


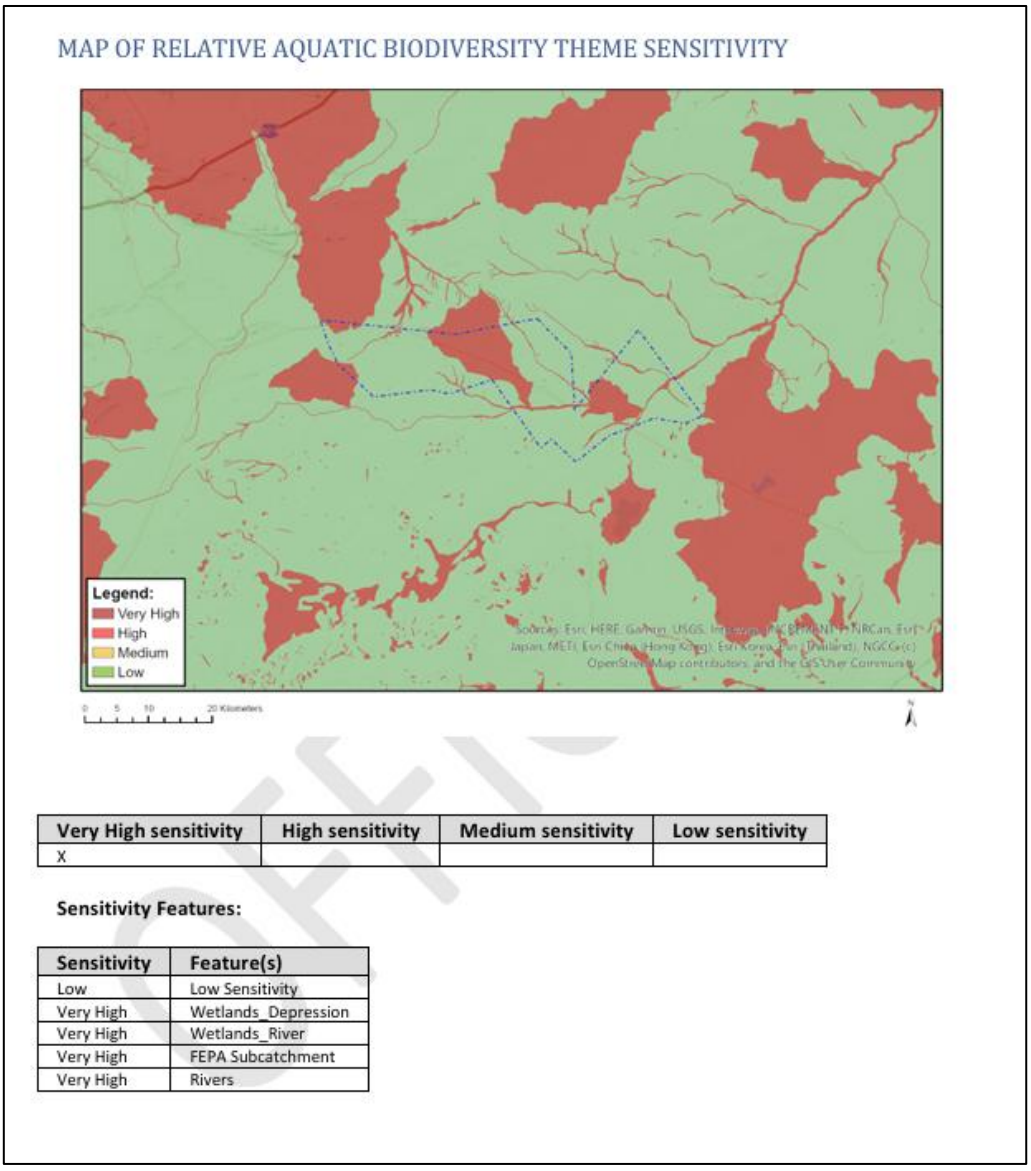
Figure 2-10 Riparian areas and Zones of Regulation (ZoR) within the PAOI

2.4 Site Sensitivity Verification

2.4.1 Ecological Sensitivity

The following is deduced from the National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended) and the current assessment:

- The National Web-Based Environmental Screening Tool has characterised the aquatic theme sensitivity of the project area and the PAOI as “Very High” (Figure 2-11).



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Wetlands_Depression
Very High	Wetlands_River
Very High	FEPA Subcatchment
Very High	Rivers

Figure 2-11 Aquatic Biodiversity Theme Sensitivity for the Project Area

2.4.2 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas in Table 2-10 below. A summative explanation for each result is provided as relevant. The specialist-assigned sensitivity ratings are informed by desktop screening and field verification, including observed freshwater indicators and habitat characteristics, and consideration is given to any observed or likely presence of sensitive fauna and flora. The sensitivities are displayed in Figure 2-12.

The freshwater ecology of the immediate project area and further downstream areas are considered sensitive to disturbance from a hydrological and biological perspective, however due to the ephemeral nature of the watercourses, this sensitivity applies more to the watercourses' physical characteristics that influence the hydrological and biological aspects in times of surface water presence/ inundation. This will include all watercourses within the project area which are considered sensitive due to their relatively small spatial scale when compared to adjacent terrestrial habitat with a large demand for the ecosystem services which they provide. Construction and operation activities must take cognisance of this and avoid any unnecessary disturbance of the watercourses and adjacent habitat.

Table 2-10 Summary of the screening tool vs specialist assigned sensitivities

Screening Tool Sensitivity	Features	Tool Validated or Disputed by Specialist	Specialist Sensitivity	Specialist Verification
Very High	Wetlands_Depression	Validated	Very High	The PAOI overlaps with several Depression wetlands listed as Critically Endangered according to the NWM5 dataset, some of which were confirmed during the survey. Field verification confirmed that these depressions support vernal biota, as evidenced by sampling of Clam, Tadpole and Fairy Shrimps.
Very High	Rivers (Kaboep River, Steenkampsvlei se Holte River, Soutputs se Laagte River, All Unnamed NFEPA Rivers)	Validated	Very High	Despite its ephemeral nature, the NFEPA River systems warrants Very High sensitivity classification and protection due to its critical ecological functions within a water-scarce region. Although the system does not support freshwater biota, its wide channel and Endangered classification reflect its importance as a key hydrological feature that sustains downstream ecosystems and water availability. Therefore, the Very High sensitivity designation remains justified.
Very High	Rivers (drainage areas)	Disputed	Medium	The Drainage areas warrant a medium rather than Very High sensitivity classification due to their narrower channel widths compared to the main river system. While these drainage areas contribute to the overall hydrological network within the water-scarce region, their reduced spatial extent and flow capacity limit their individual ecological impact on downstream ecosystems. Additionally, their ephemeral nature combined with their constrained morphology means they support fewer critical ecological functions than the main river channel. Therefore, although the drainage areas remain important components of the broader river system and warrant protection, their medium sensitivity classification appropriately reflects their secondary role relative to the main stem, which retains its Very High sensitivity designation due to its greater width, hydrological significance, and ecosystem support capacity.
Low	Low Sensitivity (Remaining Area)	Validated	Low	Low sensitivity areas are present throughout large portions of the PAOI, comprising minor drainage lines that serve only basic ecosystem functions such as surface flow control. These minor drainage lines do not support aquatic biota, as they are the first to dry and do not retain water for extended periods, limiting their ecological value and justifying their Low sensitivity designation.

*Screening tool uses metadata from 2018 NBA

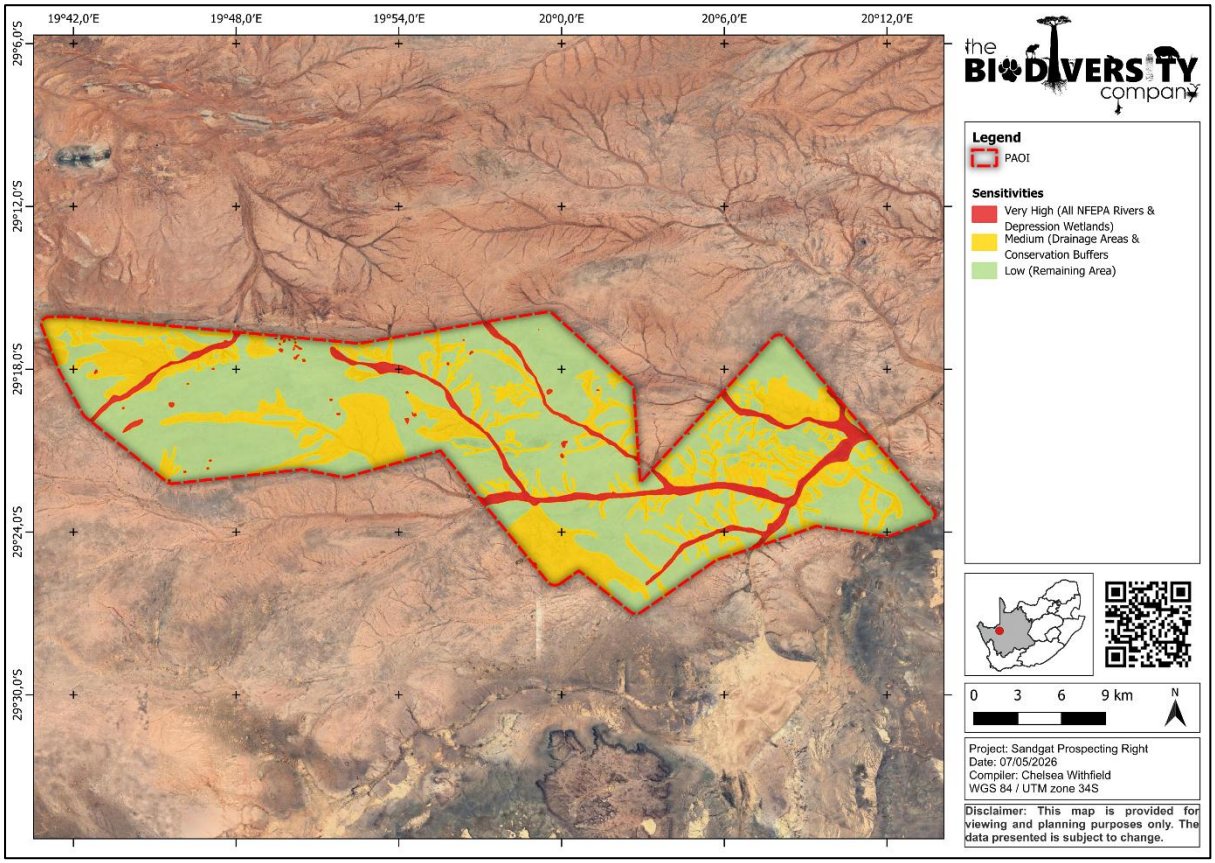


Figure 2-12 Aquatic delineated sensitivity for the PAOI

3 Risk and Impact Assessment

3.1 Risk Screening

Table 3-1 provides the results of risk screening for the delineated watercourses identified to be at risk and provides motivation for each of the determined categories.

Table 3-1 Risk status of the delineated watercourses

Activity	Aquatic Feature	Risk Status	Rational
Sandgat Prospecting Right	Drainage Areas	At Risk	The proposed project overlaps the numerous non-perennial drainage areas. Therefore, direct impacts are anticipated.
	NFEPA Rivers	At Risk	The proposed project overlaps the NFEPA rivers and buffer areas. Therefore, both direct and indirect impacts are anticipated.
	In-stream dams	At Risk	The proposed project overlaps. Therefore, direct impacts are anticipated
	Temporary depression wetlands and In-stream dams	At Risk	The proposed project overlaps the wetland buffer and regulated areas. Therefore, indirect impacts are anticipated.

3.2 Current Impacts on Freshwater Biodiversity

The assessed watercourses exhibit limited impacts on both the catchment and local scale. These impacts result from present and historical land use relating to infrastructure development and agricultural practices in proximity to watercourses. The list below refers to the present-day local impacts associated with the assessed freshwater areas:

- Agricultural activities (livestock and farm dams)
- Erosion resulting from hardened surfaces
- Dirt road and fence crossings

3.3 Alternatives Considered

Alternatives were not presented at the time of report compilation.

3.4 Loss of Irreplaceable Resources

The freshwater ecology of the project area is considered moderately to highly sensitive to disturbance from a hydrological, biological and conservational perspective. This includes the five NFEPA rivers (Kaboep, Steenkampsvlei se Holte and tributary, Soutputs se Laagte and tributary), In-stream dams, various drainage areas and temporary depression wetlands. The proposed prospecting activities must take cognisance of this and avoid sensitive areas and any unnecessary disturbance of these areas. Development within these sensitive areas will lead to modifications to the present ecological state and therefore ecosystem degradation.

3.5 Quantitative Risk and Impact Assessment (DWS GN4167 Risk Assessment)

The Risk/Impact Assessment considered the direct and indirect impacts of the activity on the freshwater systems associated with the project area. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 3-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in the project location, setting, scale, layout, technology, and phasing to avoid impacts. For this assessment, the specialist was provided with the location of the proposed activity and the study focussed on the watercourses within and close to the project area. Mitigation measures should be implemented to negate potential impacts on the watercourses associated with the project area.

A single risk assessment was compiled for the project, which relates to the Black Mountain Mining Sandgat Prospecting project and associated activities post-mitigation. The DWS Risk Assessment

Matrix (GN 4167) was applied to identify and evaluate both the potential risks and impacts associated with the proposed activities including all the activities located within the proposed project area. In the specialist's opinion, the outcomes of this assessment are adequate to inform an application for the required Environmental Authorisation (EA). In terms of GN 4167, Low post-mitigation risk scores would indicate that the identified Section 21(c) and (i) water uses are likely to fall within the scope of the General Authorisation, subject to DWS confirmation.

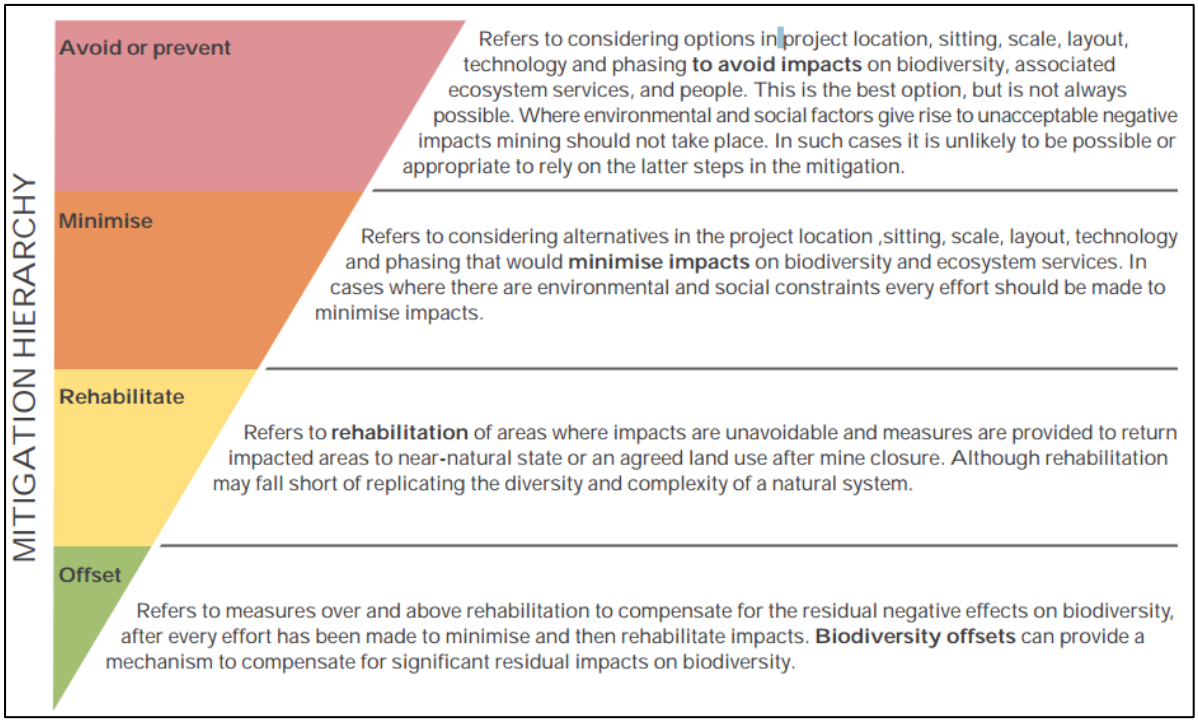


Figure 3-1 The mitigation hierarchy as described by the DEA (2013)

3.5.1 Potential Anticipated Impacts

Table 3-3 illustrates the DWS risk ratings associated with the project. The potential direct and indirect impacts are expected to threaten the integrity of sensitive receptors during the project activities if unmitigated. The post-mitigation significance ratings have been calculated considering various parameters for watercourses within the DWS zone of regulation only. The summative results are presented in the subsequent table. Kindly refer to the corresponding DWS Risk Assessment Matrix in excel format for the full assessment.

Table 3-2 Anticipated impacts to watercourses

Activity	Project activities that can cause loss/impacts to watercourse	Impacts to freshwater ecology
Construction and Operation Phase	• Clearing of vegetation • Stripping and stockpiling of topsoil • Establish working area • Core drilling and sampling • Digging of sump (lining), if applicable • Vehicle access (gravel roads and crossings) • Leaks and spillages from machinery, equipment & vehicles • Solid waste disposal • Human sanitation & ablutions • Re-fuelling of machinery and vehicles	• Impeding hydro-dynamics; • Siltation of watercourse; • Erosion of watercourse; • Loss of indigenous vegetation; • Altering hydromorphic soils; • Drainage pattern change; • Direct loss of riparian areas; • Decrease in functionality; • Additional water quality impairment; • Degradation of ecological integrity and ecosystem services.

Activity	Project activities that can cause loss/impacts to watercourse	Impacts to freshwater ecology
	• Laying of core samples • Backfill of material	
Decommissioning Phase	• Removal of structures, machinery, and equipment • Backfilling of holes • Final landscaping and concurrent rehabilitation.	• Impeding hydro-dynamics; • Siltation of watercourses; • Additional water quality impairment.
Compiled by Prasheen Singh (Pr. Sci. Nat. 116822)		

Table 3-3 Summative results of the DWS Risk Assessment Matrix compiled by Prasheen Singh (Pr. Sci. Nat. 116822)

Phase	Activity	Impact	Potentially affected watercourses Name/s		Significance (max = 100)	Risk Rating (with mitigation and avoidance)	Confidence level
CONSTRUCTION / OPERATIONAL	Clearing of vegetation; Establish working area; Core drilling and sampling; Digging of sump (lining), if applicable; Vehicle access (gravel roads and crossings); Leaks and spillages from machinery, equipment & vehicles; Solid waste disposal; Human sanitation & ablutions; Re-fuelling of machinery and vehicles; Laying of core samples; and Backfill of material	Loss, disturbance and degradation of riparian areas	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		12	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		12	L	High
			In-stream Dams		9,6	L	High
			Drainage Areas		9,6	L	High
			Temporary Depression Wetlands		12	L	High
		Altered hydrological regimes (Drainage pattern change)	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		12	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		12	L	High
			In-stream dams		9,6	L	High
			Drainage Areas		12	L	High
			Temporary Depression Wetlands		10,8	L	High
		Increase in erosion and sedimentation of receiving freshwater systems	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		12	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		12	L	High
			In-stream dams		10,8	L	High
			Drainage Areas		10,8	L	High
			Temporary Depression Wetlands		12	L	High
		Introduction and spread of alien and invasive vegetation	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		18	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		18	L	High

			In-stream dams		18	L	High
			Drainage Areas		18	L	High
			Temporary Depression Wetlands		18	L	High
		Increased bare surfaces, flood peaks and potential erosion	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		16,2	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		16,2	L	High
			In-stream dams		16,2	L	High
			Drainage Areas		18	L	High
			Temporary Depression Wetlands		16,2	L	High
		Impaired water quality (Contamination of freshwater systems)	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		9,6	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		9,6	L	High
			In-stream dams		9,6	L	High
			Drainage Areas		9,6	L	High
			Temporary Depression Wetlands		16,2	L	High
DECOMMISSIONING	Removal of structures; machinery, and equipment Backfilling of holes; and Final landscaping and concurrent rehabilitation.	Impeding hydro-dynamics	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		8.4	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		8,4	L	High
			In-stream dams		7,2	L	High
			Drainage Areas		7,2	L	High
			Temporary Depression Wetlands		8,4	L	High
		Siltation of watercourses	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		8,4	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		8,4	L	High
			In-stream dams		8,4	L	High
			Drainage Areas		8,4	L	High
			Temporary Depression Wetlands		8,4	L	High
		Additional water quality impairment	Unnamed NFEPA Rivers (SVH Tributary, SL Tributary)		7,2	L	High
			NFEPA Rivers (Kaboep, Steenkampsvlei se Holte, Soutputs se Laagte)		7,2	L	High
			In-stream dams		7,2	L	High
			Drainage Areas		7,2	L	High

			Temporary Depression Wetlands		12,6	L	High

(L) Low Risk

Anthropogenic activities drive habitat destruction, causing displacement of aquatic and terrestrial fauna and flora. Land clearing for development/agriculture (all inclusive) destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites, and wildlife movement corridors as well as impacting rivers, streams and drainage lines and their associated riparian area, or other locally important features.

The planning phase activities are considered a low risk as they typically involve desktop assessments and initial site inspections. This would include compiling of stormwater, landscape and waste management plans, obtaining of necessary permits, environmental and social impact assessments, characterisation of baseline site conditions, design of project area layouts and facilities and consultation with various contractors involved with a diversity of proposed project related activities going forward.

The construction related activities which will pose risks (directly and indirectly) to the freshwater watercourses. It is anticipated that the construction and operation phases of the project poses “Moderate” pre-mitigation risks to the freshwater ecosystems, which can change to “Low” post-mitigation risks for all impacts/activities. The presence and operation of the prospecting activity has a low spatial impact if avoidance is implemented. The project will entail the clearing of and levelling areas, establishment of roads which may traverse/encroach on aquatic systems, operation of heavy machinery both within and adjacent to the freshwater watercourses, soil and building material stockpiling, establishment of additional prospecting related infrastructure and hazardous material handling and storage. The constructional impacts are short in duration and following the implementation of mitigation and rehabilitation in these disturbed areas, the areas will recover. Following the implementation of appropriate mitigation, the construction phase impacts are predominantly lowered to a low-risk significance rating and have a high reversibility rating.

Due to the Low risk post-mitigation, a General Authorisation is permissible for the drilling programme/prospecting activities. All recommendations and mitigation measures are to be implemented for the project to maintain this Low-risk rating. No operation of unauthorized heavy vehicles within delineated watercourses and buffer areas, and most importantly, avoidance of watercourse and buffer areas.

3.6 Impact Assessment (EIMS)

The impacts associated with the proposed activities, was assessed in the impact matrix provided by EIMS and the results are provided in Table 3-4.

The impact assessment shows that the risks from the proposed project are generally of "Medium to High" significance prior to mitigation. With the application of mitigation measures, all impacts are reduced to "Low" significance, indicating effective management. The results confirm that, with proper controls, the long-term impacts on aquatic ecosystem health and function are minimal.

Table 3-4 Summative results of the EIMS Impact Assessment conducted for the proposed project (compiled by Prasheen Singh Pr. Sci. Nat. 116822)

Impact	Phase	Pre-Mitigation Significance	Post-Mitigation Significance	Final Significance
Loss, disturbance and degradation of watercourses	**Construction / Operation**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• A method statement is required from the Contractor(s) that includes the layout of the drilling site, amenities and wastewater / water management during drilling. • Site establishment must be undertaken in an orderly manner and all amenities must be installed before the onset of drilling. • Adherence to the buffer areas. These should be visibly demarcated on site to avoid encroachment into these areas.				

Impact	Phase	Pre-Mitigation Significance	Post-Mitigation Significance	Final Significance
• Restrict all drilling related activities to within the designated footprint area. • Clearly demarcate drill site footprint areas and limit all activities to within this area. • Avoid the creation of new access roads; use existing roads where possible. • No vehicle or machinery is allowed to be washed within a watercourse or its buffer area. • Laydown yards, camps and storage areas must be beyond the watercourse areas. • Prevent uncontrolled access of vehicles through the watercourse. • Heavy vehicles must be parked outside of the riparian buffer zone except where needed for construction / operation.				
Altered hydrological regimes (Drainage pattern change)	**Construction/ Operation**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• Retain as much vegetation cover as possible for all selected routes and working areas to limit future erosion potential. • Minimise unnecessary clearing of vegetation. • Landscape and re-vegetate all denuded areas as soon as possible. • Erosion and sedimentation into drainage lines must be minimised through stabilisation and revegetation. • All alterations or hardened surfaces must not induce sedimentation, erosion, or flooding, or cause detrimental changes in flow.				
Increase in erosion of receiving freshwater systems	**Construction/ Operation**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• Landscape and revegetate all cleared areas as soon as possible. • Install sedimentation/erosion protection measures (sandbags, silt traps, fences). • Signs of erosion must be addressed immediately. • Temporary and permanent erosion control methods (silt fences, curtains, basins, ponds, ditches, seeding, riprap, mats, mulching). • Practice good soil management across the construction footprint, notably around the topsoil berms and road reserves. • All removed soil and drilled material must not be stockpiled within the system; stockpiles must be protected from erosion. • Erosion prevention and sediment control measures must be implemented.				
Introduction and spread of alien and invasive vegetation	**Construction/ Operation**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• An alien invasive plant management plan must be implemented at disturbed sites to prevent the spread of AIPs. • Alien vegetation must not be allowed to encroach onto the sites and must be continually removed during construction / operation.				
Increased bare surfaces, flood peaks and potential erosion	**Construction/ Operation**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• Avoid the creation of concentrated flow paths wherever possible, especially along the road reserves. • Devise and implement a suitable stormwater management plan for the construction and operation phases. • In addition to this, basic stormwater structures such as berms must be designed and implemented prior to and throughout the duration of the construction activities • Landscape and revegetate all cleared areas as soon as possible. • Areas exposed to erosion must be protected through sandbags, berms, and efficient drilling processes. • Limit the extent and duration that areas are exposed.				
Impaired water quality (Contamination of freshwater systems)	**Construction/ Operation**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• All contractors and labour must undergo environmental awareness training and be encouraged to maintain a “clean” working area, and report any (potential) risks to the environment as a result of the drilling programme. • Ablution facilities with chemical toilets must be provided for all labour. The labour must be encouraged to make use of the ablution and under no circumstances shall indiscriminate excretion and urinating be permitted other than in supplied facilities. • The locations of domestic waste areas, contractors camp and placement of ablution facilities must be demarcated on an approved site plan. The temporary storage of domestic waste shall be in covered bins, but these must be emptied on a weekly basis. • The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected must be disposed of at a licensed disposal facility. • The Contractor must be in possession of emergency spill kits that must be complete and available at all times on site.				

Impact	Phase	Pre-Mitigation Significance	Post-Mitigation Significance	Final Significance
• Any possible contamination of topsoil by hydrocarbons, concrete or concrete water must be avoided. Any contaminated soil must be treated in situ or be placed in containers and removed from the site for disposal in a licensed facility. • Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. • No storage of vehicles or equipment will be allowed outside of the designated drilling site or contractor's camp area. Make use of existing tracks and routes as much as possible before new routes are constructed. • No servicing of equipment on site unless absolutely necessary. Leaking equipment must be repaired immediately or be removed from site to facilitate repair. • All vehicles and equipment must be well maintained to ensure that there are no oil or fuel leakages.				
Impeding hydro-dynamics	**Decommissioning**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• Landscape and re-vegetate all denuded areas as soon as possible. • Erosion and sedimentation into drainage lines must be minimised through stabilisation and revegetation. • All alterations or hardened surfaces must not induce sedimentation, erosion, or flooding, or cause detrimental changes in flow.				
Additional water quality impairment	**Decommissioning**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• All contractors and labour must undergo environmental awareness training and be encouraged to maintain a "clean" working area, and report any (potential) risks to the environment as a result of the drilling programme. • In the event the freshwater watercourses are contaminated by means of an unforeseen spill/ leak, relevant specialists should be consulted for suitable mitigation or rehabilitation measures. • No dumping of material on-site. • All waste generated on-site must be adequately managed, support separation and recycling. • All chemicals and toxicants must be stored in bunded areas.				
Siltation of watercourses	**Decommissioning**	**Medium to High**	**Low**	**Medium to Low**
Mitigation Measures				
• All disturbed and compacted footprint areas must be rehabilitated and landscaped after drilling is complete. These areas must either be rehabilitated to the original land use or an agreed upon land use. • Landscape and revegetate all cleared areas as soon as possible. • Install sedimentation/erosion protection measures (sandbags, silt traps, fences). • Signs of erosion must be addressed immediately. • Temporary and permanent erosion control methods. • Practice good soil management across the construction footprint, notably around the topsoil berms and road reserves.				

3.7 Unplanned Events

The planned activities will have known impacts as discussed above; however, unplanned events may occur on any project and may have potential impacts which will need mitigation and management. Table 3-5 is a summary of the findings from a watercourse ecology perspective. Please note not all potential unplanned events may be captured herein and this must therefore be managed throughout all phases of the project.

Table 3-5 Unplanned Events, Risks and their Management Measures

Unplanned Event	Potential Impact	Mitigation
Spills into the surrounding environment and watercourses	Contamination of habitat as well as watercourses associated with a spillage (at hazardous chemical and hydrocarbons storage areas and across Project Area).	A spill response kit must be available at all times. The incident must be reported on and if necessary, an experienced ecologist must investigate the extent of the impact and provide rehabilitation recommendations.
Uncontrolled erosion	Erosion on the side of the access roads. Sedimentation of downslope watercourses	Storm water management plan must be compiled by a suitably qualified engineer and implemented throughout the life of the activity. Erosion control measures must be put in place. Measures must include monthly inspections across

		the project footprint and should be adaptive based on site-conditions.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural areas which includes the watercourses.	Appropriate/Adequate fire management plan needs to be implemented to protect the watercourse areas from potential loss.

3.8 Cumulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the SQR and Quaternary catchment areas; and general habitat loss and transformation resulting from other activities in the area. The impacts of projects are often assessed by comparing the post-project condition to a pre-existing baseline condition. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for freshwater fauna and flora.

Localised cumulative impacts include the cumulative effects from anthropogenic activities that are close enough (such as nearby farming activities within the area) to potentially cause additive effects on the environment or sensitive receivers. These include disruption of ecological corridors or habitat such as watercourses, impacts to groundwater and surface water quality, and transport of soils and instream habitat smothering impacts.

The cumulative impacts include the loss or alteration of watercourse system that maintains water quality for downslope aquatic systems when undisturbed), loss of interflow and the resulting deterioration of the systems to provide necessary ecological services. Following the implementation of appropriate mitigation, the cumulative impacts will remain as a low risk significance rating. Furthermore, should hazardous spillages occur, the associated FEPA areas could be contaminated and spilled materials could be carried from the contaminated soils into downstream freshwater systems during precipitation events.

3.9 Mitigation and Management Measures

In light of the present and expected impacts from the activities, mitigation measures in relation to management outcomes have been proposed to lower the intensity of the potential impacts on the ecological integrity of the watercourses catchments and the temporary depression wetland and are presented in Table 3-6. The watercourses and their associated buffers must be avoided as far as is feasible by the proposed development to prevent riverine and wetland habitat loss, disturbance and significant changes to flow patterns which subsequently increase the risk to erosion and sedimentation.

3.10 Mitigation Measure Objectives

The focus of mitigation measures should be to reduce the significance of potential environmental impacts associated with the prospecting activities and thereby to:

- Prevent the unnecessary destruction of, and fragmentation, of the vegetation community.
- Prevent the loss of the biodiversity associated with the riverine and temporary depression wetland habitat; and
- Drilling outside of regulated areas and limiting the construction area to the defined project areas and only impacting those areas.

Table 3-6 Suggested mitigation measures and management outcomes for the proposed development

No	Mitigation Measure	Phase	Timeframe	Responsible Party for Implementation	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
Aq01	Restrict vehicle movement to designated routes	Construction; Operation	Throughout construction	Site Manager, Contractor	Weekly	No off-route vehicle tracks	Site inspection and monitoring report findings
Aq02	Stabilise exposed soils promptly with vegetation or mulch	Construction; Operation	Immediately after disturbance	Contractor	Weekly	All exposed soils stabilised within 2 weeks of construction completion	Site inspection and audit / monitoring report findings
Aq03	Schedule earthworks during dry periods where possible	Construction; Operation	Planning & construction	Project Manager	N/A	Earthworks scheduled for dry season	Construction schedule and site inspections
Aq04	Regularly inspect and maintain erosion control measures	Construction; Operation	Throughout construction	Environmental Officer	Weekly	All controls functional	Inspection checklists, site inspection and audit report findings
Aq05	Store fuels and chemicals in bunded, secure areas away from watercourses	Construction; Operation	Throughout construction	Contractor, SHE Officer	Weekly	No spills or leaks	Site inspection and audit report findings
Aq06	Refuel and maintain machinery in designated areas with spill containment	Construction; Operation	Throughout activity	Contractor, SHE Officer	Weekly	No spills outside containment	Site inspection and audit report findings
Aq07	Implement a spill response plan and train staff involved in the handling of chemicals, fuels and mixes	Construction; Operation	Prior to and during activity	SHE Officer	Annually & after incidents	100% trained staff	Training records, drills
Aq08	Regularly inspect machinery for leaks and service in a designated bunded area	Construction; Operation	Throughout construction	Contractor	Weekly	No uncontained leaks	Maintenance logs and audit report findings
Aq09	Provide adequate waste bins and collection points	Construction; Operation	Throughout activity	Contractor	Weekly	No litter on site	Site inspection and audit report findings
Aq10	Segregate and properly dispose of domestic and industrial waste	Construction; Operation	Throughout activity	Contractor	Weekly	100% waste disposed at licensed facilities	Waste disposal records and audit report findings
Aq11	Educate workers on proper waste management	Construction; Operation	Induction & quarterly	Contractor, SHE Officer	Quarterly	100% trained staff	Training records
Aq12	Monitor for invasive species and remove promptly in line with an alien invasive management plan	Construction; Operation; Decommissioning	Throughout activity	Environmental Officer	Monthly	No established invasives	Invasive species log and monitoring report findings
Aq13	Use indigenous species for landscaping and rehabilitation	Decommissioning	During rehabilitation	Contractor, Environmental Officer	Once-off, then monitor	100% indigenous species used	Site inspection and rehabilitation monitoring survey findings
Aq14	Maintain and regularly inspect stormwater infrastructure	Construction; Operation	Throughout operation	Facility Manager	Monthly	No blockages or failures	Maintenance logs, site inspection and audit report findings
Aq15	Maintain native vegetative cover on all open spaces and slopes	Construction; Operation	Throughout operation	Facility Manager	Monthly	80% cover maintained	Vegetation survey

Aq16	Monitor for signs of erosion and repair promptly	Operation; Decommissioning	Throughout activity	Facility Manager, Environmental Officer	Monthly	No active erosion	Site inspection and monitoring survey findings
Aq17	Maintain indigenous vegetation buffers around the plant boundary.	Operation; Decommissioning	Throughout operation	Facility Manager, Environmental Officer	Quarterly	Buffer maintained	Site inspection and audit / monitoring report findings

3.10.1 Water Quality Impairment

The following water quality specific mitigation measures are provided:

- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;
- During construction contractors used for the project must have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly;
- Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the freshwater systems;
- Where feasible, as much material must be prefabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site;
- No vehicle or machinery is allowed to be washed within a watercourse or its buffer area, and should preferably take place off site;
- All chemicals and toxicants during construction must be stored in bunded areas;
- All machinery and equipment should be inspected regularly for faults and possible leaks; these should be serviced off-site;
- No dumping of construction material on-site may take place; and
- All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.

3.10.2 Erosion & Sedimentation

- All removed soil and material must not be stockpiled within the system. Stockpiling should take place outside of the freshwater systems. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;
- Install sandbags around soil stockpiles to prevent soils washing into the system;
- Document the soil profile on removal and ensure the soil is backfilled in the same horizon order in which it was removed;
- Ensure that topsoil is appropriately stored and re-applied; and
- Make sure that the soil is backfilled and compacted to appropriate geotechnical specifications for the project area.
- Signs of erosion must be addressed immediately to prevent further erosion of the upgraded infrastructure;
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil; and
- Landscape and revegetate all cleared areas as soon as possible to limit erosion potential.

3.10.3 Alien Vegetation Establishment

The following alien vegetation establishment specific mitigation measures are provided:

- Vegetation rehabilitation survey needs to be conducted of the vegetation within the project footprint three (3) months after rehabilitation; and

- An alien invasive plant management plan must be implemented at disturbed sites to prevent the spread of AIPs.

3.10.4 Operation of Vehicles and Heavy Machinery

- Due to the scope of work, heavy machinery should only be operated in authorised watercourse areas and under supervision of an ECO;
- Implement seasonal restrictions on operations to avoid sensitive periods such as breeding seasons for wildlife or periods of high water levels;
- Schedule operations during the dry season when ground conditions are more stable and less prone to damage;
- No heavy machinery shall be permitted within unauthorised watercourse areas for any purpose, without the prior approval of the internal ECO (except emergency procedures);
- All construction vehicles required for the proposed activities should only be allowed to use existing roads (including dirt roads);
- The route for vehicles (including heavy machinery) must be planned to avoid sensitive habitats, wetland/riparian vegetation, buffer areas and other waterbodies as far as feasibly possible;
- Operators must be trained in operating machinery in wetland/sensitive environments and aware of the sensitivity of the area;
- Sensitive areas must be demarcated so as to guide operators, labourers and contractors;
- Develop spill prevention and response plans to address potential leaks or spills of fuels, oils, or other hazardous substances;
- Have spill containment materials readily available on-site and train personnel in proper spill response procedures; and
- The contractor is responsible for cleaning up any spillages (e.g. concrete, oil, fuel), immediately.

4 Recommendations

It is recommended that an internal ECO oversee and audit the prospecting activities and ensure that the watercourses (including buffer and regulated areas) are avoided. As this report and assessment focuses on prospecting activities only, the buffer areas and mitigation measures for any mining activities must be determined in a separate study and authorised by the competent authority prior to commencement, due to the magnitude of environmental impacts associated with mining.

5 Conclusion

The freshwater assessment of the Black Mountain Mining Sandgat Prospecting Right confirmed, through both desktop analysis and field verification, that the project area is of high aquatic ecological sensitivity. The desktop review, including the National Web-Based Environmental Screening Tool, classified the area as having Very High aquatic biodiversity sensitivity, and identified important freshwater features such as the Kaboep River, Steenkampsvlei se Holte River and tributary, Soutputs se Laagte River and tributary,in-stream dams, drainage areas, and temporary depression wetland. Desktop findings further indicated that wetlands within the area are considered 'Critically Endangered' while all the NFEPA Rivers are considered 'Endangered'. Field observations supported these findings and confirmed that the freshwater systems are 'Largely Natural' in condition. Furthermore, in some of the sampled depression wetlands together with the in-stream dams, vernal biota was observed, lending evidence to the high sensitivity.

5.1 Risk and Impact Statement

The planning phase poses low risk but sets the foundation for higher-impact construction and operational phases. The main risks associated with the proposed prospecting activities include disturbance or loss of aquatic habitat, erosion, sedimentation, pollution from fuels or chemicals, altered drainage patterns, and the spread of alien invasive species. These impacts could affect the ecological integrity of the rivers and wetlands if activities are not carefully controlled. However, the risks can be reduced to a low and manageable level through strict avoidance of all delineated aquatic features and buffer areas, limiting vehicle access, implementing erosion and stormwater controls, ensuring proper storage and handling of hazardous substances, rehabilitating disturbed areas promptly, and maintaining environmental compliance monitoring throughout the project.

5.2 Specialist Opinion

In the specialist's opinion, the proposed prospecting activities may be considered acceptable from a freshwater perspective, provided that all recommended mitigation and avoidance measures are fully implemented. The survey confirmed that the aquatic environment is sensitive, but the anticipated impacts are likely to remain low if the project footprint avoids watercourses and wetlands, field activities are tightly managed, and disturbed areas are rehabilitated without delay. Ongoing oversight and adherence to the recommended management measures will be essential to protect the integrity of the freshwater ecosystems within the project area.

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7 Appendices

7.1 Appendix A: Freshwater Methodology

7.1.1 Desktop Dataset Assessment

The desktop assessment was undertaken using Geographic Information System (GIS) to access, view and overlay the latest available related datasets with the project area. The information represented within the datasets was used to develop the relevant digital maps used to identify potentially environmentally sensitive areas. These datasets and their respective dates of publishing are provided below:

The following information sources were considered for the desktop assessment;

- Aerial imagery (Google Earth Pro);
- The inland water dataset;
- Topographical river line data;
- Present Ecological State (PES), Ecological Importance (EI) and Ecological Sensitivity (ES) per Sub Quaternary Reaches (SQR) for Secondary Catchments in South Africa (DWS, 2014);
- The National Freshwater Ecosystem Priority Areas (NFEPA) (Nel *et al*., 2011);
- Provincial Conservation Plans;
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al*., 2019);
- National Biodiversity Assessment (NBA) (Van Deventer *et al*., 2019);
- The SANBI National Wetland Map 5 (Van Deventer *et al*., 2019); and
- Contour data (5 m).

7.1.1.1 Topographical River Lines and Inland Water Areas

Topographical Inland Water Areas and River Lines for South Africa are based on the topographic maps dated 1994 as per the National Geo-spatial Information. These datasets are used in this report to provide insight into potential wetland areas and serve to highlight the location and extent of rivers, drainage features, dams, wetlands, reservoirs, and other relevant inland waterbodies.

7.1.1.2 Ecologically Important Landscape Features

The datasets listed below were incorporated to establish the relation between the project and ecologically important or sensitive freshwater entities. Emphasis was placed on the following spatial datasets:

- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Van Deventer *et al.,* 2019).
- National Freshwater Priority Areas (Nel *et al.,* 2011).
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021).
- Provincial Conservation Plans.

7.1.1.3 The South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the 2018 NBA, the SAIIAE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and

their associated categorisations, are applied as with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type has been altered from its natural condition.

7.1.1.4 National Freshwater Ecosystem Priority Areas, Rivers and Wetlands

To better conserve aquatic ecosystems, South Africa has categorised its inland aquatic systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs). The FEPAs are intended to be conservation support tools and it is envisioned that they will guide the effective implementation of measures to achieve the National Environment Management: Biodiversity Act's biodiversity conservation goals (Nel *et al.,* 2011).

7.1.2 Water Quality

Water quality was measured *in-situ* using a handheld calibrated multi-parameter water quality meter. The constituents considered that were measured included: pH, electrical conductivity (µS/cm), water temperature (°C) and Dissolved Oxygen (DO) in mg/l.

7.1.3 Habitat Assessments

Habitat availability and diversity are major attributes of the biota found in a specific ecosystem, and thus knowledge of the quality of habitats is important in an overall assessment of ecosystem health. Habitat assessment can be defined as the evaluation of the structure of the surrounding physical habitat that influences the quality of the watercourse and the condition of the resident aquatic community (Barbour *et al*., 1996). Both the quality and quantity of available habitat affect the structure and composition of resident biological communities (USEPA, 1998). Habitat quality and availability play a critical role in the occurrence of aquatic biota. For this reason, habitat evaluation is conducted simultaneously with biological evaluations to facilitate the interpretation of results.

7.1.3.1 Index of Habitat Integrity

The Index of Habitat Integrity (IHI) model was used to assess the integrity of the habitats from a riparian and instream perspective as described in Kleynhans (1996) v2. The habitat integrity of a river refers to the maintenance of a balanced composition of physico-chemical and habitat characteristics on a temporal and spatial scale which are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996).

This model compares current conditions with reference conditions that are expected to have been present. Specification of the reference condition follows an impact-based approach where the intensity and extent of anthropogenic changes are used to interpret the impact on the habitat integrity of the system. To accomplish this, information on abiotic changes that can potentially influence river habitat integrity is obtained from surveys or available data sources. These changes are all related and interpreted in terms of modification of the drivers of the system, namely hydrology, geomorphology and physicochemical conditions and how these changes would impact the natural riverine habitats.

The criteria and ratings utilised in the assessment of habitat integrity in the current study are presented in Table 7-1 and Table 7-2 respectively. The spatial framework for each IHI was 5 km upstream and downstream of the respective sampling points within the watercourse(s).

Table 7-1 Criteria used in the assessment of habitat integrity (Kleynhans, 1996)

Criterion	Relevance
Water abstraction	Direct impact on habitat type, abundance and size. Also implicated in flow, bed, channel and water quality characteristics. Riparian vegetation may be influenced by a decrease in the supply of water.

Criterion	Relevance
Flow modification	Consequence of abstraction or regulation by impoundments. Changes in temporal and spatial characteristics of flow can have an impact on habitat attributes such as an increase in the duration of low flow season, resulting in low availability of certain habitat types or water at the start of the breeding, flowering or growing season.
Bed modification	Regarded as the result of increased input of sediment from the catchment or a decrease in the ability of the river to transport sediment (Gordon *et al*., 1993). Indirect indications of sedimentation are stream bank and catchment erosion. Purposeful alteration of the stream bed, e.g. the removal of rapids for navigation (Hilden & Rapport, 1993) is also included.
Channel modification	may be the result of a change in flow, which may alter channel characteristics causing a change in marginal instream and riparian habitat. Purposeful channel modification to improve drainage is also included.
Phys-chem modification	Originates from point and diffuse point sources. Measured directly or agricultural activities, human settlements and industrial activities may indicate the likelihood of modification. Aggravated by a decrease in the volume of water during low or no flow conditions.
Inundation	Destruction of riffle, rapid and riparian zone habitat. Obstruction to the movement of aquatic fauna and influences water quality and the movement of sediments (Gordon *et al*., 1992).
Alien macrophytes	Alteration of habitat by obstruction of flow and may influence water quality. Dependent upon the species involved and scale of infestation.
Introduced aquatic fauna	The disturbance of the stream bottom during feeding may influence the water quality and increase turbidity. Dependent upon the species involved and their abundance.
Rubbish dumping	A direct anthropogenic impact which may alter habitat structurally. Also a general indication of the misuse and mismanagement of the river.
Vegetation removal	Impairment of the buffer the vegetation forms to the movement of sediment and other catchment runoff products into the river (Gordon *et al*., 1992). Refers to physical removal for farming, firewood and overgrazing.
Exotic vegetation	Excludes natural vegetation due to vigorous growth, causing bank instability and decreasing the buffering function of the riparian zone. Allochthonous organic matter input will also be changed. Riparian zone habitat diversity is also reduced.
Bank erosion	Decrease in bank stability will cause sedimentation and possible collapse of the riverbank resulting in a loss or modification of both instream and riparian habitats. Increased erosion can be the result of natural vegetation removal, overgrazing or exotic vegetation encroachment.

Table 7-2 Descriptions used for the Ratings of the Various Habitat Criteria

Impact Category	Description	Impact Score
None	No discernible impact or the modification is located in such a way that it has no impact on habitat quality, diversity, size and variability.	0
Small	The modification is limited to very few localities and the impact on habitat quality, diversity, size and variability are also very small.	1-5
Moderate	The modifications are present at a small number of localities and the impact on habitat quality, diversity, size and variability are also limited.	6-10
Large	The modification is generally present with a clearly detrimental impact on habitat quality, diversity, size and variability. Large areas are, however, not influenced.	11-15
Serious	The modification is frequently present and the habitat quality, diversity, size and variability in almost the whole of the defined area are affected. Only small areas are not influenced.	16-20
Critical	The modification is present overall with a high intensity. The habitat quality, diversity, size and variability in almost the whole of the defined section are influenced detrimentally.	21-25

The habitat integrity assessment takes into account the riparian zone and the instream channel of the river. Assessments are made separately for both aspects, but data for the riparian zone are primarily interpreted in terms of the potential impact on the instream component (Table 7-3). The relative weighting of criteria remains the same as for the assessment of habitat integrity (DWS, 1999).

Table 7-3 Criteria and weights used for the assessment of habitat integrity and habitat integrity (from Kleynhans, 1996)

Instream Criteria	Weight	Riparian Zone Criteria	Weight
Water abstraction	14	Vegetation removal	13
Flow modification	13	Exotic vegetation	12
Bed modification	13	Bank erosion	14
Channel modification	13	Channel modification	12
Phys-chem modification	14	Water abstraction	13
Inundation	10	Inundation	11
Alien macrophytes	9	Flow modification	12
Introduced aquatic fauna	8	Phys-chem	13
Rubbish dumping	6		
Total	100	Total	100

The negative weights are added for the instream and riparian facets respectively and the total additional negative weight subtracted from the provisionally determined integrity to arrive at a final habitat integrity estimate. The eventual total scores for the instream and riparian zone components are then used to place the habitat integrity in a specific habitat integrity category (DWS, 1999). These categories are indicated in Table 7-4.

Table 7-4 Index of habitat integrity categories (From Kleynhans, 1996)

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

7.1.4 Aquatic Macroinvertebrate Assessment

Macroinvertebrate assemblages are good indicators of localised conditions because many benthic macroinvertebrates have limited migration patterns or a sessile mode of life. They are particularly well-suited for assessing site-specific impacts (upstream and downstream studies) (Barbour *et al.,* 1999). Benthic macroinvertebrate assemblages are made up of species that constitute a broad range of trophic levels and pollution tolerances, thus providing strong information for interpreting cumulative effects (Barbour *et al.,* 1999). The assessment and monitoring of benthic macroinvertebrate communities form an integral part of the monitoring of the health of an aquatic ecosystem.

7.1.5 Present Ecological Status

Ecological classification refers to the determination and categorisation of the integrity of the various selected biophysical attributes of ecosystems compared to the natural or close to natural reference conditions (Kleynhans and Louw, 2007) (Table 7-5) . For this study ecological classifications have been

determined for biophysical attributes for the associated water course. This was completed using the river Ecoclassification manual by Kleynhans and Louw (2007). The areas considered in the PES assessment are outlined in the description of the project area section. The combined categories were assessed to determine the reach-based PES.

Table 7-5 Present Ecological State (PES) Categories.

Category	Descriptions (Modifications)	Descriptions (Taxa)
A	**Natural**	
	Unmodified, natural.	Unimpaired. High diversity of taxa with numerous sensitive taxa.
B	**Largely Natural**	
	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	Slightly impaired. High diversity of taxa, but with fewer sensitive taxa.
C	**Moderately Modified**	
	A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	Moderately impaired. Moderate diversity of taxa.
D	**Largely Modified**	
	A large loss of natural habitat, biota and basic ecosystem functions has occurred.	Considerably impaired. Mostly tolerant taxa present.
E	**Seriously Modified**	
	The loss of natural habitat, biota and basic ecosystem functions is extensive.	Severely impaired. Only tolerant taxa present.
F	**Critically Modified**	
	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	Severely impaired. Only tolerant taxa present.

7.1.6 Riparian Delineation

The riparian delineation was completed according to DWAF (2005). Typical riparian cross-sections and structures are provided in Figure 7-1. Indicators such as topography and vegetation were the primary indicators used to define the riparian zone. Elevation data obtained from topography spatial data was also utilised to support the infield assessment.

Macfarlane *et al.* (2009), and Macfarlane and Bredin (2017) were consulted to determine the appropriate watercourse buffer zones associated with the watercourse and the proposed activities. According to the buffer guidelines the maximum required buffer should be applied to a system (Macfarlane, et al., 2014).

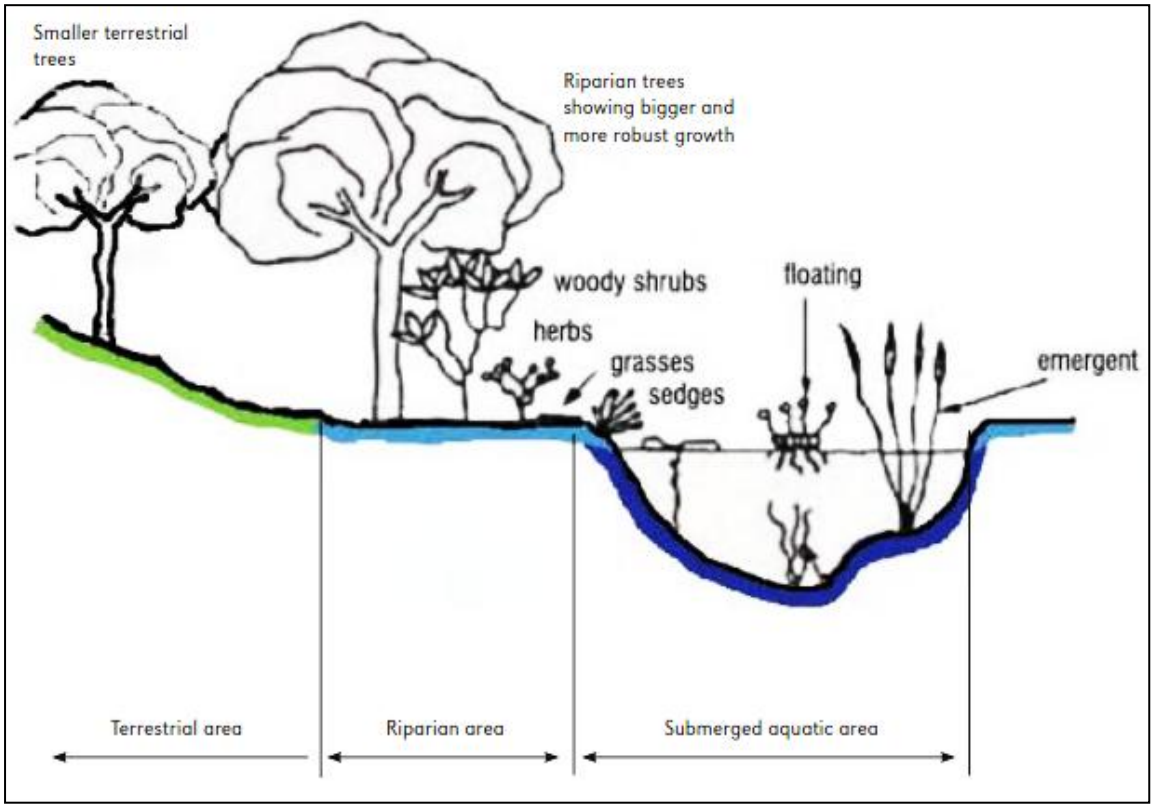

Figure 7-1 Riparian Habitat Delineations (DWAF, 2005)

7.1.7 Wetland Field Survey

7.1.7.1 Identification and Mapping

The wetland area was delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 7-2. The outer edges of the wetland area ws identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

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

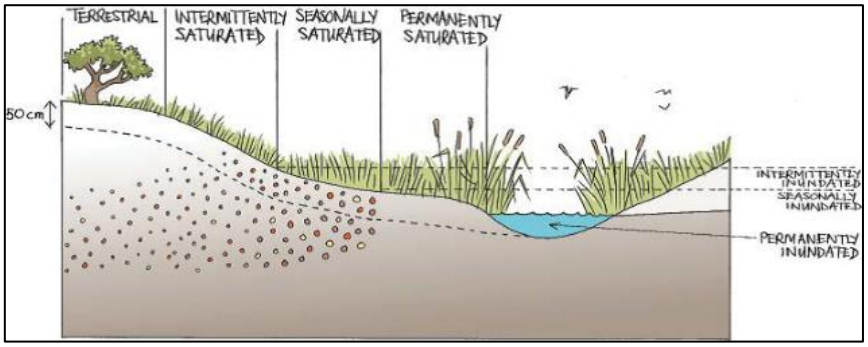

Figure 7-2 Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)

7.1.7.2 Delineation

The wetland indicators described above are used to determine the boundaries of the wetlands within the project area. These delineations are then illustrated by means of maps accompanied by descriptions.

7.1.7.3 Classification and Description

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

7.1.7.4 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as humans. Ecosystem services serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al.,* 2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 7-6).

Table 7-6 Classes for determining the likely extent to which a benefit is being supplied

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

7.1.7.5 Present Ecological Status

The overall approach as described by Macfarlane *et al.,* 2009, is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 7-7.

Table 7-7 The Present Ecological Status categories (Macfarlane et al., 2009)

Impact Category	Description	Impact Score Range	PES Score (%)	PES
None	Unmodified, natural	0 to 0.9	90-00	A
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	80-89	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	60-79	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	40-59	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	20-39	E
Critical	Critically Modified. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	0-19	F

7.1.7.6 Ecological Importance and Sensitivity

The importance and sensitivity of watercourses is determined in order establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants as described by Rountree *et al.,* 2013, is used to assign the Ecological Importance and Sensitivity (EIS) category as listed in Table 7-8.

Table 7-8 Description of Ecological Importance and Sensitivity categories

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

7.1.7.7 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) (Table 7-9) was determined based on the results obtained from the PES and EIS of the assessed wetlands, with the objective of recommending how a watercourse should be managed. This is achieved by either maintaining or improving the ecological integrity of the wetland in order to ensure continued ecological functionality (DWA, 1999).

Table 7-9 Recommended Ecological Category and Recommended Management Objectives for watercourses based on Present Ecological State and Ecological Importance and Sensitivity scores

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

7.1.8 Buffer Requirements

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

7.1.9 Site Sensitivity Verification

The baseline aquatic / freshwater sensitivity of the project area was obtained using the National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended). The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas based on the specialist-assigned Ecological Importance and Sensitivity of the different systems (where applicable), with consideration being given to the presence of observed or likely sensitive fauna and flora.

7.2 Appendix B: Risk and Impact Assessment

The Department of Water and Sanitation (DWS) risk matrix assesses impacts in terms of consequence and likelihood. The significance of the impact is rated according to the classes presented in Table 7-10.

Table 7-10 Significance ratings matrix

Rating	Class	Management Description
1 – 29	(L) Low Risk OR (+) Positive (+ +) Highly positive	Acceptable as is 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. License 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. License required.

7.2.1 Cumulative Impact Assessment

The following aspects as presented in Table 7-11 were considered in the cumulative impact assessment which refers to quantifying the significance of impacts in relation to the proposed development.

Table 7-11 Aspects and ratings considered in the cumulative impact assessment

Extent of impact	Description	Rating
Site specific	Very low (1)	1
Footprint & surrounding areas	Low (2)	2
Local area	Moderate (3)	3
Regional	High (4)	4
Entire habitat unit / Entire system	Very high (5)	5
Duration of impact	**Description**	**Rating**
The lifetime of the impact will be of a very short duration (0–1 years)	Very short term (1)	1
The lifetime of the impact will be of a short duration (2-5 years)	Short term (2)	2
Medium term (5–15 years)	Moderate term (3)	3
Long term (> 15 years)	Long term (4)	4
Permanent	Permanent (5)	5
Consequence/Magnitude of impact	**Description**	**Rating**
Small and will have no effect on the environment	None (0)	0
Minor and will not result in an impact on processes	Minor (2)	2
Low and will cause a slight impact on processes	Low (4)	4
Moderate and will result in processes continuing but in a modified way	Moderate (6)	6

High (processes are altered to the extent that they temporarily cease	High (8)	8
Very high and results in complete destruction of patterns and permanent cessation of processes	Very high (10)	10
Probability of impact	**Description**	**Rating**
Very improbable (probably will not happen)	Very improbable (1)	1
Improbable (some possibility, but low likelihood)	Improbable (2)	2
Probable (distinct possibility)	Probable (3)	3
Highly probable (most likely)	Highly probable (4)	4
Definite (impact will occur regardless of any prevention measures)	Definite (5)	5
Status	**Description**	**Rating**
Positive	Positive	Positive
Negative	Negative	Negative
Neutral	Neutral	Neutral
Reversability	**Description**	**Rating**
None	None	None
Low	Low	Low
Moderate	Moderate	Moderate
High	High	High
Irreplaceable loss of resources?	**Description**	**Rating**
Yes	Yes	Yes
No	No	No
Can impacts be mitigated?	**Description**	**Rating**
Yes	Yes	Yes
No	No	No
Significance	**Description**	**Rating**
< 30 points	Low	Low
30-60 points	Medium	Medium
> 60 points	High	High

7.3 Appendix C – EIMS Impact Assessment for proposed activities

Impact	Phase	Pre-Nature	Pre-Extent	Pre-Duration	Pre-Magnitude	Pre-Reversibility	Consequence	Pre-Probability	Pre-Mitigation Significance Score	Pre-Mitigation Significance	Post-Nature	Post-Extent	Post-Duration	Post-Magnitude	Post-Reversibility	Consequence	Post-Probability	Post-mitigation Significance Score	Post-Mitigation Significance	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score	Final Significance
Loss, disturbance and degradation of watercourses	Operation	-1	2	3	3	3	-2.75	4	-11	Medium to high -	-1	1	2	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -
Altered hydrological regimes (Drainage pattern change)		-1	3	3	3	3	-3	4	-12	Medium to high -	-1	2	2	2	2	-2	2	-4	Low -	High	2	2	1.25	-5.00	Medium to low -
Increase in erosion of receiving freshwater systems		-1	3	3	3	3	-3	4	-12	Medium to high -	-1	2	2	2	2	-2	2	-4	Low -	High	2	2	1.25	-5.00	Medium to low -
Introduction and spread of alien and invasive vegetation		-1	2	3	3	3	-2.75	4	-11	Medium to high -	-1	1	2	2	2	-1.75	3	-5.25	Medium to low -	High	2	2	1.25	-6.56	Medium to low -
Increased bare surfaces, flood peaks and potential erosion		-1	2	3	3	3	-2.75	4	-11	Medium to high -	-1	1	2	2	2	-1.75	3	-5.25	Medium to low -	High	2	2	1.25	-6.56	Medium to low -

Impaired water quality (Contamination of freshwater systems)		-1	3	3	3	3	-3	4	-12	Medium to high -	-1	2	2	2	2	-2	2	-4	Low -	High	2	2	1.25	-5.00	Medium to low -
Impeding hydro-dynamics	**Decommissioning**	-1	2	3	3	3	-2.75	4	-11	Medium to high -	-1	1	2	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -
Additional water quality impairment		-1	3	3	3	3	-3	4	-12	Medium to high -	-1	2	2	2	2	-2	2	-4	Low -	Hi gh	1	2	1.13	-4.50	Medium to low -
Siltation of watercourses		-1	3	3	3	3	-3	4	-12	Medium to high -	-1	2	2	2	2	-2	2	-4	Low -	Hi gh	3	2	1.38	-5.50	Medium to low -

7.4 Appendix D – Specialist Declaration of Independence

DECLARATION

I, Chelsea Withfield, declare that:

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. “the Protocols”) and in Government Notice No. 1150 of 30 October 2020.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
- any decision to be taken with respect to the application by the competent authority; and;
- the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence and is punishable in terms of the NEMA Act.

Chelsea Withfield

Aquatic Ecologist

The Biodiversity Company

05/06/2026

DECLARATION

I, Prasheen Singh, declare that:

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. “the Protocols”) and in Government Notice No. 1150 of 30 October 2020.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
- any decision to be taken with respect to the application by the competent authority; and;
- the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence and is punishable in terms of the NEMA Act.

_____

Prasheen Singh

Aquatic Ecologist

The Biodiversity Company

05/06/2026

7.5 Appendix E – Specialist CV

Chelsea Withfield

Can Sci Nat (In Progress) +27 66 287 9993 Chelsea@thebiodiversitycompany.com

PROFILE SUMMARY

Environmental and ecological intern with almost ~1 year of consulting experience within South Africa. Specialist expertise as a freshwater ecologist in watercourse delineation, aquatic ecological assessments, aquatic biomonitoring, and rehabilitation, as well as water quality and sediment assessments, across sectors including mining, agriculture, and renewable energy. Experienced in delivering high-quality field surveys, and technical reports. SACNASP registry is in progress for Can Sci Nat.

PERSONAL INFO

Nationality: South African

Date of birth: 14 June 2000

EXPERIENCE

Aquatic Ecological/Baseline Assessments

Aquatic Biomonitoring

Environmental Impact Assessments (EIA)

SKILLS

- ✓ Freshwater Ecology Assessments
- ✓ Habitat Assessments and Delineation
- ✓ GIS
- ✓ Water and Sediment Quality

LANGUAGES

English – Proficient

Afrikaans– Proficient

Signed: Chelsea Withfield

ACADEMIC QUALIFICATIONS

North-West University (2024): MASTER IN ENVIRONMENTAL SCIENCES –
Title: Taxonomic and Ecotoxicological Perspectives of the freshwater bivalve *Corbicula* in South Africa

North-West University (2022): BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCE
Major: Biodiversity and Conservation Ecology
With distinction

North-West University (2021): BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCES
Majors: Zoology and Tourism
With distinction

PROFESSIONAL EXPERIENCE

April 2025 – Present — **The Biodiversity Company**
Aquatic Ecologist Intern

INTERNATIONAL EXPERIENCE

Lesotho, South Africa

Prasheen SINGH

Pr. Sci. Nat. 116822 +27 69 206 9440 prasheen@thebiodiversitycompany.com

PROFILE SUMMARY

Prasheen Singh is a SACNASP registered Pr. Sci. Nat in the field of Aquatic Science. He is an Aquatic Ecologist and Water Quality Specialist whose 14 years' experience comprises numerous Aquatic Scientific Studies, Peer Reviews, Research, and served as a SANAS accredited Technical Signatory at an Ecotoxicology Laboratory. He is also a Steering Committee Member for the Water Research Commission. Prasheen attained his MSc in Aquatic Health at the University of Johannesburg, and completed training courses for wetlands, river eco-status monitoring, hydropedology, and ecosystem restoration. He has working experience in South Africa, Angola, Zambia and Lesotho, specialising in water quality studies, aquatic biomonitoring, compliance audits, rehabilitation and monitoring plans and risk assessments.

PERSONAL INFO

Nationality: South African

Date of birth: 25 April 1989

EXPERIENCE

- Environmental Consulting and Specialist Studies
- Freshwater Aquatic Ecological and Functional Assessments (NEMA, DWS, IFC)
- Aquatic Biomonitoring Assessments
- River EcoStatus (IHI, MIRAI, VEGRAI, FRAI)
- Water and Sediment Quality

SKILLS

- ✓ Freshwater Ecology Assessments
- ✓ Critical Habitat Assessments
- ✓ Rehabilitation, Monitoring & Management Plans
- ✓ GIS and Remote Sensing
- ✓ Compliance and Auditing

LANGUAGES

English – Proficient

Afrikaans – Basic

ACADEMIC QUALIFICATIONS

University of Johannesburg (2014): MAGISTER SCIENTIAE (MSc) - Aquatic Health:
Title: *The assessment of sediment contamination in an acid mine drainage impacted river in Gauteng (South Africa) using three sediment bioassays.*

University of Johannesburg (2011): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Biodiversity and Conservation.

University of Johannesburg (2010): BACCALAUREUS SCIENTIAE – Botany and Zoology.

PROFESSIONAL EXPERIENCE

Nov 2022 – Present	**The Biodiversity Company** Aquatic Ecologist / Unit Manager
Feb 2016 – Oct 2022	**Prism EMS** Aquatic Ecologist
May 2012 – Jan 2016	**WSP Golder** Laboratory Scientist

INTERNATIONAL EXPERIENCE

Angola, Lesotho, Zambia, South Africa

PUBLICATIONS

Singh, P., Nel, A. and Durand, J.F. 2017. The use of bioassays to assess the toxicity of sediment in an acid mine drainage impacted river in Gauteng (South Africa). Water SA 43:4.

Singh, P. and Nel, A. 2017. A comparison between *Daphnia pulex* and *Hydra vulgaris* as possible test organisms for agricultural run-off and acid mine drainage toxicity assessments. Water SA 43:2.

Singh, P. 2015. The assessment of sediment contamination in an acid mine drainage impacted river in Gauteng (South Africa) using three sediment bioassays. University of Johannesburg (Thesis).

Signed: Prasheen Singh

CURRICULUM VITAE: Prasheen Singh

- End of Report -