FRESHWATER ECOLOGY SCOPING ASSESSMENT REPORT FOR THE PROPOSED KALGOLD EXPANSION PROJECT

Ratlou Local Municipality, North West

October 2020 (amended February 2021)

CLIENT

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1 Introduction

The Biodiversity Company was commissioned to compile a freshwater ecology scoping report for the Kalgold Expansion project. The existing Harmony Kalgold operation wishes to expand its current production from the current production rate of 130 000 tons per month to 300 000 tons per month. A pre-feasibility study has been undertaken. The findings of the pre-feasibility study have concluded that the following new activities and expansions must be provided for:

1 The pit footprint will increase.

2 Larger dewatering pipelines.

3 Extension to Spanover waste rock dump.

4 Road from the pit to new ROM pad.

5 New ROM pad.

6 New plant.

7 Recommission old Tailings Storage Facility (TSF) at low deposition rate.

8 Increase tailings deposition rate at D-zone pit.

9 Install pipeline from Central dam to the new processing plant.

10 Install a tailings pipeline from the new processing plant to old TSF and D-zone pit.

11 Install pipeline from old processing plant raw water pond to the new plant (D-zone return water).

12 Install two power lines from Ferndale substation to the new processing plant.

13 Install evaporators at Central dam (to get rid of excess water).

14 Install a water treatment plant at the new plant.

15 Relocate and expand the explosives magazine.

16 Additional new road from the plant to the N18.

Kalgold mine is an open pit mining operation located some 60km South West of Mahikeng in the North West Province. The mine is owned and operated by Harmony Gold, who acquired the mine in 1999. The mine is located in the Kraaipan Greenstone Belt, which is part of the large Amalia-Kraaipan Greenstone terrain. The largest ore body is found in the D-Zone, which was mined out by a single pit operation along a strike length of 1 300m and to a depth of approximately 290m below surface. Mining at Kalgold Mine continued at the A-Zone, Windmill and Watertank Open Pits, which are all relatively new opencast operations.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (No. 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 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". The National Web based Environmental Screening Tool has characterised the terrestrial biodiversity for the project area as "very high sensitivity".

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making with regards to the proposed project.

2 Document Structure

The table below provides the NEMA (2014) Requirements for Ecological Assessments, and also the relevant sections in the reports where these requirements are addressed (Table 2-1).

Table 2-1 Report Structure

Environmental Regulation	Description	Section in Report
NEMA EIA Regulations 2014 (as amended)		
Appendix 6 (1)(a):	Details of – (I) The specialist who prepared the report; and (II) The expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 3
Appendix 6 (1)(b):	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix A
Appendix 6 (1)(c):	An indication of the scope of, and the purpose for which, the report was prepared;	Section 4
Appendix 6 (1)(cA):	An indication of the quality and age of base data used for the specialist report;	Section 8
Appendix 6 (1)(cB):	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10
Appendix 6 (1)(d):	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
Appendix 6 (1)(e):	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 7
Appendix 6(1)(f):	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 9
Appendix 6(1)(g):	An identification of any areas to be avoided, including buffers;	Section 9
Appendix 6(1)(h):	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 9
Appendix 6(1)(i):	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7
Appendix 6(1)(j):	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 11
Appendix 6(1)(k):	Any mitigation measures for inclusion in the empr;	Section 12
Appendix 6(1)(l):	Any conditions for inclusion in the environmental authorisation;	N/A
Appendix 6(1)(m):	Any monitoring requirements for inclusion in the empr or environmental authorisation;	N/A
Appendix 6(1)(n):	A reasoned opinion- (i) whether the proposed activity, activities or portions thereof should be authorised; (ia) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the empr, and where applicable, the closure plan;	N/A
Appendix 6(1)(o):	A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A

Appendix 6(1)(p):	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
Appendix 6(1)(q):	Any other information requested by the competent authority.	N/A

3 Specialist Details

Report Name	**FRESHWATER ECOLOGY SCOPING ASSESSMENT REPORT FOR THE PROPOSED KALGOLD EXPANSION PROJECT COLLIERY**
Submitted to	EIMS
Report Writer	**Michael Ryan (Cand. Sci. Nat. 125128)**  Michael Ryan is an Aquatic Ecologist and Hydrologist (Cand. Sci. Nat. 128125). Michael has with 2 years of experience in baseline river assessments and aquatics, with his SASS5 accreditation. Michael Ryan received his B.Sc Honours degree (Geography) from the University of Witwatersrand. Michael specialises in surface water monitoring and aquatic systems and floodline determination. Michael has experience in projects analysing water quality and hydrology which include pipelines; dams; road upgrades; power stations; mining; etc
Report Writer / Reviewer	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
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 principals of science.

4 Terms of Reference

The Terms of Reference (ToR) included the following:

- Description of the desktop baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines that occur in the project area, and the manner in which these sensitive receptors may be affected by the activity;
- The delineation and assessment of wetlands within 500 m regulation area;
- A risk assessment for the proposed development; and
- The prescription of mitigation measures and recommendations for identified risks.

5 Project Description

Kalgold mine is an open pit mining operation located some 60 km from Mahikeng in the North West Province. The project area is divided by the N18 national highway and falls in the Ratlou Local Municipality within the Ngaka Modiri Molema District Municipality. The area surrounding the project area consists predominantly of mining activities, secondary roads and agricultural fields. The project layout is shown in Figure 5-1, while the location of the project area is shown in Figure 5-2.

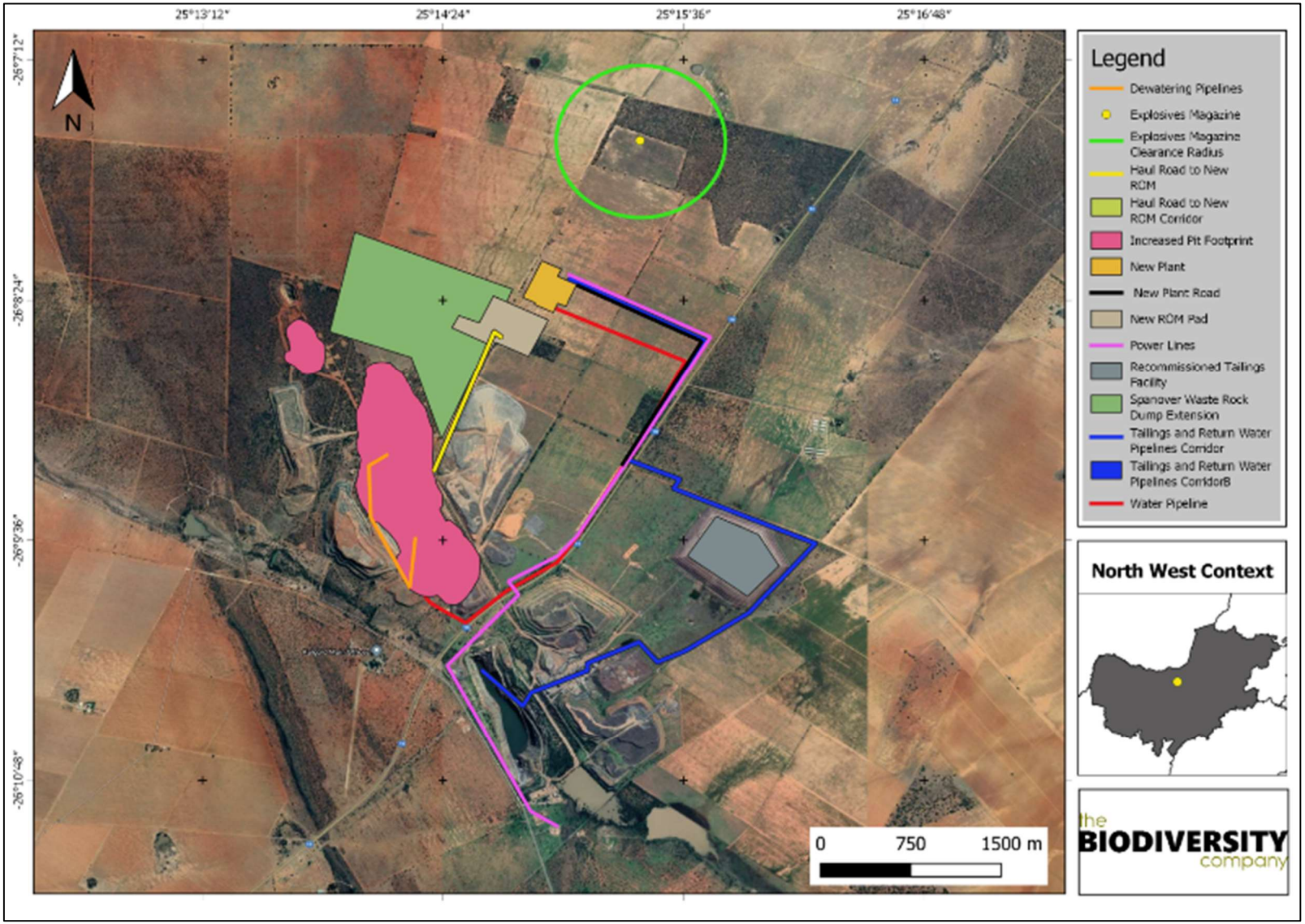

Figure 5-1 Project infrastructure layout

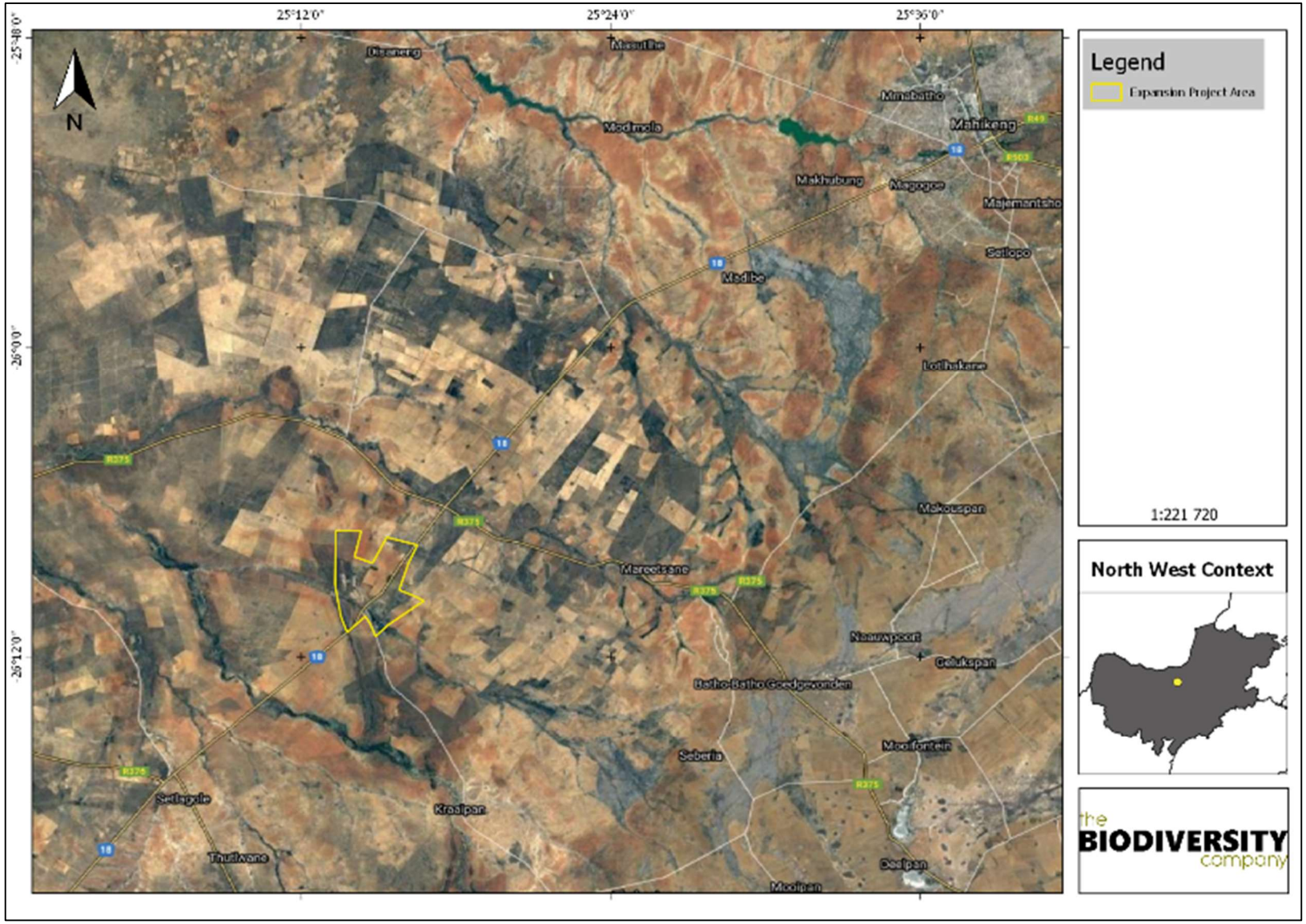

Figure 5-2 Locality of the project area

6 Key Legislative Requirements

6.1 National Water Act (NWA, 1998)

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

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

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; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

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

6.2 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (Act No. 107 of 1998 – NEMA) and the associated Regulations as amended in April 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation application process needs to be followed. This could follow either the Basic Assessment (BA) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact.

In addition to the above, the assessment will also take cognisance of the following relevant national legislation, conventions and regulations applicable to wetlands and riparian zones:

- Convention on Wetlands of International Importance - the Ramsar Convention and the South African Wetlands Conservation Programme (SAWCP);
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004);
- National Environment Management Protected Areas Act, 2003 (Act 57 of 2003);
- Conservation of Agriculture Resources Act, 1983 (Act 43 of 1983);

- South African Water Quality Guidelines under the NWA;
- Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002); and
- GN R267 (Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals)

7 Limitations

The following limitations should be noted for the study:

- This assessment represents the Scoping Phase of the project only. Further field surveys a final baseline and impact assessment report will be submitted once the field studies have been concluded;
- A GN 509 risk assessment will be completed once the field assessment has been completed to adequately assess all potential risks associated with the expansion;
- The sensitivity map included in this report is based on desktop information alone; and
- A field survey still needs to be conducted to further advise on the viability of the project aspects.

8 Study Approach

The following approach (or methods) will be implemented for the baseline and impact assessment phase of the project.

8.1 Wetland Ecology

8.1.1 Wetland Assessment

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this assessment. 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 includes structural features at the lower levels of classification (Ollis *et al.*, 2013).

8.1.1.1 Wetland Delineation

The wetland areas will be delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 8-1. The outer edges of the wetland areas will be 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 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.

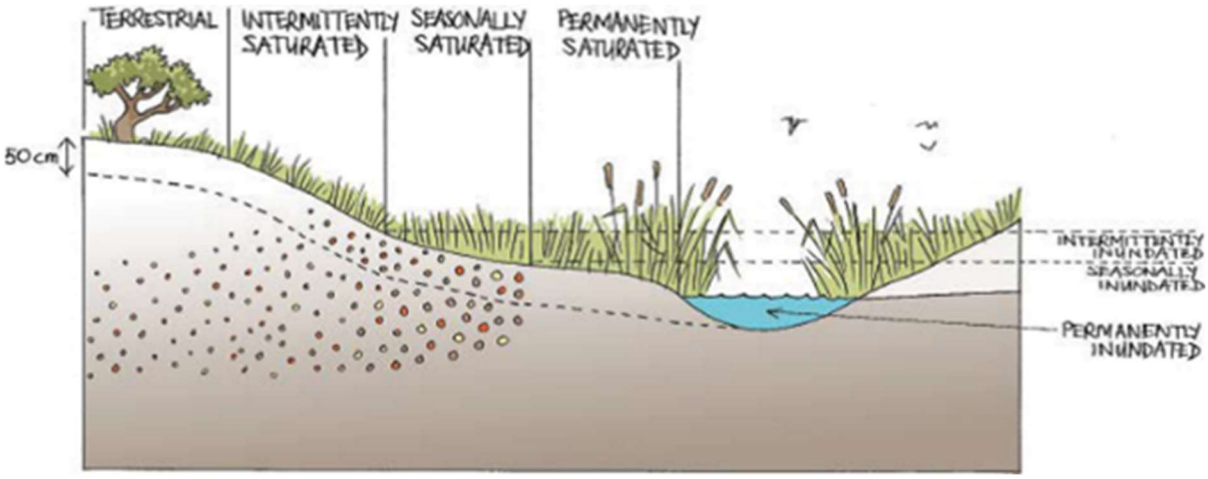

Figure 8-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis, et al., 2013)

8.1.1.2 Wetland 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 for humans. Ecosystem services serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands will be conducted per the guidelines as described in WET-EcoServices (Kotze, *et al*. 2009). An assessment will be undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 8-1).

Table 8-1 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

8.1.1.3 Determining the Present Ecological Status

The overall approach 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 PES categories are provided in Table 8-2.

Table 8-2 The Present Ecological Status categories (Macfarlane, et al., 2009)

Impact Category	Description	Impact Score Range	PES
None	Unmodified, natural	0 to 0.9	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	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	C
Large	**Largely Modified.** A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	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	E
Critical	**Critical Modification.** 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	F

8.1.1.4 Determining the Ecological Importance and Sensitivity

The method used for the Ecological Importance and Sensitivity (EIS) determination is adapted from the method as provided by DWS (1999) for floodplains. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed. A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The mean of the determinants is used to assign the EIS category as listed in Table 8-3, (Rountree, M. & Kotze, D. 2013).

Table 8-3 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

8.1.1.5 Recommended Ecological Category

The Recommended Ecological Category (REC) is determined by the PES of the water resource and the importance and/or sensitivity of the water resource.

Water resources which have Present Ecological State categories in an E or F ecological category are deemed unsustainable by the DWA. In such cases the REC must automatically be increased to a D (Rountree *et.al.* 2013).

Where the PES is in the A, B, C or D ecological category, then the EIS components must be checked to determine if any of the aspects of importance and sensitivity (Ecological Importance; Hydrological Functions and Direct Human Benefits) are high or very high. If this is the case, the feasibility of increasing the PES (particularly if the PES is in a low C or D category) should be evaluated. This is recommended to enable important and/or sensitive wetland water resources to maintain their functionality and continue to provide the goods and services for the environment and society.

The REC is determined as follows with Table 8-4 showing the summarised selection criteria.

- If PES is in an E or F category, then the EIS is not important and the REC is set to at least a D (since E and F ecological categories are considered unsustainable);
- If PES is in an A, B, C or D category, ***AND*** the EIS is Moderate to Low ***OR*** the EIS criteria is High or even Very High, ***AND*** It is ***not feasible*** or practicable for the PES to be improved ***THEN*** the REC is set to the current PES; and
- If PES is in a B, C or D category, ***AND*** the EIS is High or Very High. ***AND*** It is ***feasible*** or practicable for the PES to be improved ***THEN*** the REC is set to at least one category higher than the current PES.

Table 8-4 Summary of selection criteria

PES	EIS	Condition	REC
E or F	N/A	N/A	At least a D
A, B, C, or D	Moderate to Low OR the EIS criteria is High or even Very High	It is not feasible or practicable for the PES to be improved	Set to current PES
B, C, or D	High or Very High	It is feasible or practicable for the PES to be improved	Set at least one category higher than the current PES

8.2 Aquatic Ecology

Standard methods used in the River Ecosystem Monitoring Programme will be used to determine the PES of the considered watercourse. This will be conducted in a single wet season survey. The various sections provided below elaborate on the various methods/indexes which were applied for this study.

8.2.1 Water Quality

Water quality will be measured *in situ* using a handheld calibrated Extech ExStik II meter. The constituents considered that will be measured included: pH, conductivity (µS/cm), temperature (°C) and Dissolved Oxygen (DO) in mg/l.

8.2.2 Aquatic Habitat Integrity and Riparian Zone Delineation

The Intermediate Habitat Assessment Index (IHIA) as described in the Procedure for Rapid Determination of Resource Directed Measures for River Ecosystems (Section D, 1999) will be used to define the ecological status of the river reach.

The IHIA model will be used to assess the integrity of the habitats from a riparian and instream perspective. 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 that are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996). The criteria and ratings utilised in the assessment of habitat integrity in the current study are presented in Table 8-5 and Table 8-6.

Table 8-5 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.
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 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. Indirect indications of sedimentation are stream bank and catchment erosion. Purposeful alteration of the stream bed, e.g. the removal of rapids for navigation 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.
Water quality modification	Originates from point and diffuse point sources. Measured directly or alternatively 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.
Exotic macrophytes	Alteration of habitat by obstruction of flow and may influence water quality. Dependent upon the species involved and scale of infestation.
Exotic 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.
Solid waste disposal	A direct anthropogenic impact which may alter habitat structurally. Also, a general indication of the misuse and mismanagement of the river.
Indigenous vegetation removal	Impairment of the buffer the vegetation forms to the movement of sediment and other catchment runoff products into the river. Refers to physical removal for farming, firewood and overgrazing.
Exotic vegetation encroachment	Excludes natural vegetation due to vigorous growth, causing bank instability and decreasing the buffering function of the riparian zone. Allochtonous 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 river bank 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 8-6 Descriptions used for the ratings of the various habitat criteria (Kleynhans, 1996)

Impact Category	Description	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 riparian delineation will be completed according to the then Department of Water Affairs and Forestry (DWAF, 2005) procedure for identification and delineation of wetlands and riparian areas. Typical riparian cross sections and structures are provided in Figure 8-2. Indicators such as topography and vegetation will be the primary indicators used to define the riparian zone.

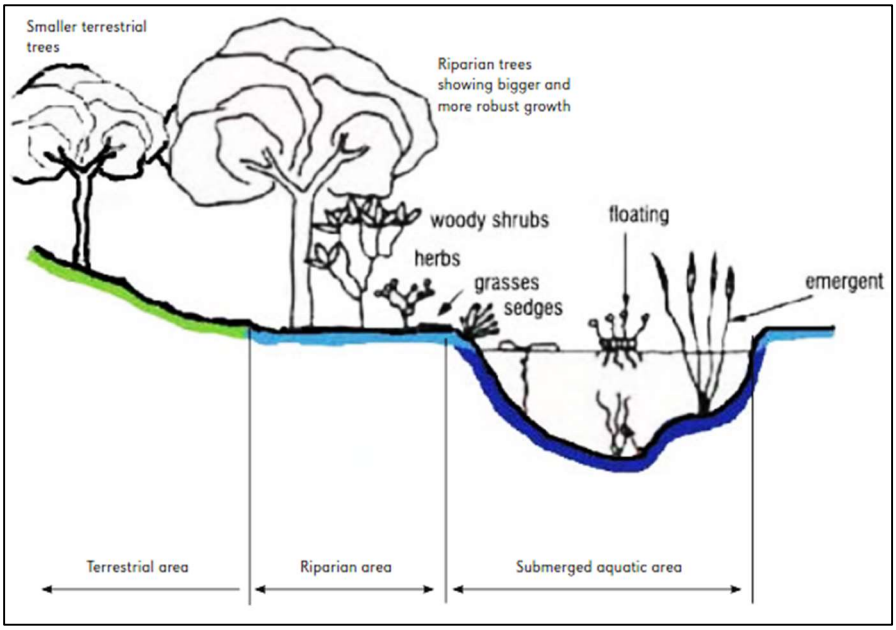

Figure 8-2 Riparian Habitat Delineations (DWAF, 2005)

8.2.3 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 forms an integral part of the monitoring of the health of an aquatic ecosystem.

8.2.3.1 Invertebrate Habitat

The invertebrate habitat at the site was assessed using the South African Scoring System version 5 (SASS5) biotope rating assessment as applied in Tate and Husted (2015). A rating system of 0 to 5 was applied, 0 being not available. The weightings for lowland rivers (slope class F) were used to categorize biotope ratings (Rowntree et al. 2000; Rowntree and Ziervogel, 1999).

8.2.3.2 South African Scoring System

The South African Scoring System version 5 (SASS5) is the current index being used to assess the status of riverine macroinvertebrates in South Africa. According to Dickens and Graham (2002), the index is based on the presence of aquatic invertebrate families and the perceived sensitivity to water quality changes of these families. Different families exhibit different sensitivities to pollution, these sensitivities range from highly tolerant families (e.g. Chironomidae) to highly sensitive families (e.g. Perlidae). SASS results are expressed both as an index score (SASS score) and the Average Score Per Recorded Taxon (ASPT value).

Sampled invertebrates will be identified using the “Aquatic Invertebrates of South African Rivers” Illustrations book, by Gerber and Gabriel (2002). Identification of organisms will be

made to family level (Thirion *et al.,* 1995; Dickens and Graham, 2002; Gerber and Gabriel, 2002).

All SASS5 and ASPT scores are compared with the SASS5 Data Interpretation Guidelines (Dallas, 2007) for the Southern Kalahari ecoregion (Figure 8-3). This method seeks to develop biological bands depicting the various ecological states and is derived from data contained within the Rivers Database and supplemented with other data not yet in the database.

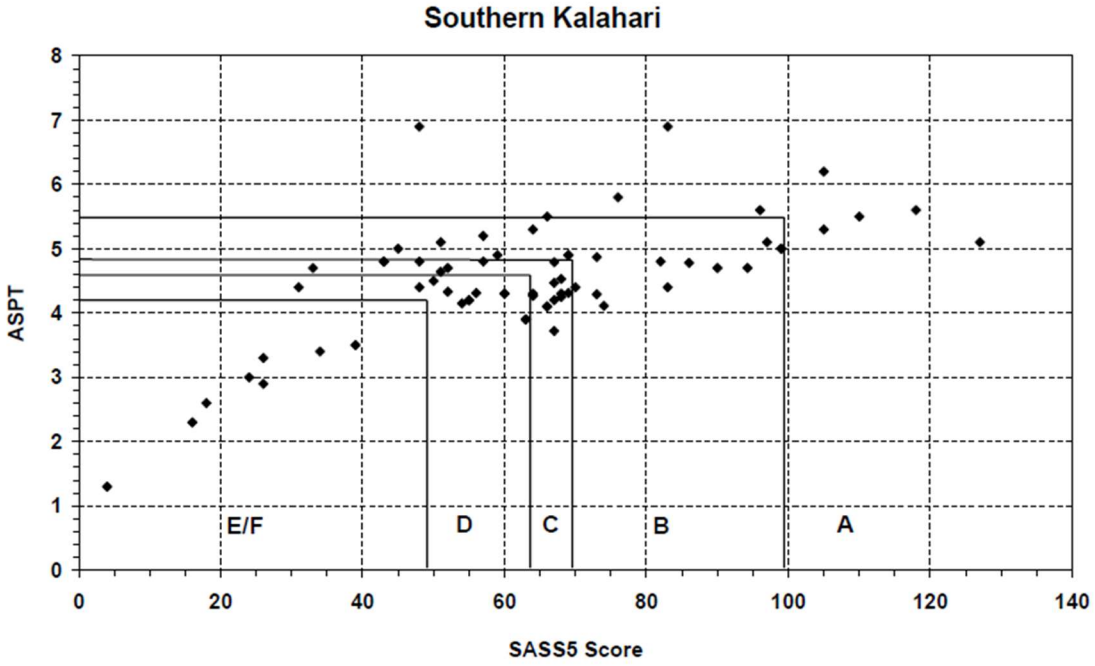

Figure 8-3 Biological Bands for the Southern Kalahari Ecoregion (Dallas, 2007)

8.2.3.3 Macroinvertebrate Response Assessment Index

The Macroinvertebrate Response Assessment Index (MIRAI) will be used to provide a habitat-based cause-and-effect foundation to interpret the deviation of the aquatic invertebrate community from the calculated reference conditions for the SQR. This does not preclude the calculation of SASS5 scores if required (Thirion, 2007). The four major components of a stream system that determine productivity for aquatic macroinvertebrates are as follows:

- Flow regime;
- Physical habitat structure;
- Water quality; and
- Energy inputs from the watershed.

The results of the MIRAI will provide an indication of the current ecological category and therefore assist in the determination of the PES.

8.2.4 Fish Community Assessment

A standard qualitative fish assessment will be completed for this study. Electrofishing techniques, fyke and cast netting methods will be applied to determine the reach based fish

community during the survey for comparative purposes and interpretation. The Fish Response Assessment Index will be applied for this study.

8.2.5 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). For the purpose of this study ecological classifications will be determined for biophysical attributes for the associated watercourse. This was completed using the river ecoclassification manual by Kleynhans and Louw (2007).

8.3 Buffer Determination

The “Buffer zone guidelines for wetlands, rivers, and estuaries” (Macfarlane, *et al.,* 2014) will be determined the appropriate buffer zone for the proposed activity.

8.4 Risk Assessment

The risk assessment will be completed in accordance with the requirements of the DWS General Authorisation (GA) in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 2016). The significance of the impact is calculated according to Table 8-7.

Table 8-7 Significance ratings matrix

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

9 Receiving Environment

9.1 Climate

The project area is characterised by summer rainfall with very dry winters. The mean annual precipitation (MAP) is about 400–480 mm. There is frost frequent in winter, Mucina & Rutherford (2006), see Figure 9-1.

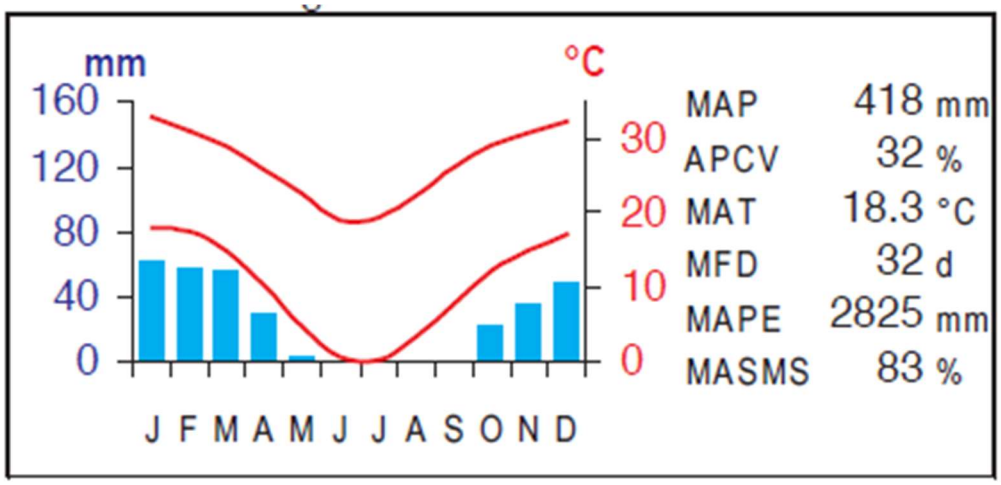

Figure 9-1 Climate diagram for the region, Mucina & Rutherford (2006).

9.2 Soils and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Ae29, Ah17 and Ai3 land types (*Figure 9-2*). A description of these land types is as follows:

Land type Ai3 is dominated by the foot-slopes terrain unit and has a slope of 0 to 1 %. The dominant soil forms expected in this land type is the Clovelly (Cv) and the Fernwood (Fw). Both these soils are expected to be sandy with a clay percentage of around 5 % or less and have depths exceeding 1.2 m.

Land type Ah17 has a good mix of terrain units but predominantly the slope is between 0 and 5 %. The dominant soil forms expected in this land type is the Clovelly (Cv) and the Hutton (Hu). Both these soils are expected to be sandy with a clay percentage of around 5 % or less and have depths exceeding 1.2 m and should have a good land capability associated with them.

Land type Ae29 is dominated by the mid-slopes terrain unit and has a slope of 0 to 10 %. The dominant soil form expected in this land type is the Hutton (Hu). The expected clay content for these soils are between 5 % and 15 % and the depths range from 750 mm to deeper than 1200 mm.

The geology of this area is characterised by the Andesitic lavas of the Allanridge Formation of the Ventersdorp Supergroup, sometimes covered with silcrete or calcrete of the Kalahari Group, on flat to hilly plains.

The soils for the area are characterised by Aeolian Kalahari sand of Tertiary to Recent age on flat sandy plains, soils deep (>1.2 m). The dominant soil forms include the Clovelly and Hutton forms (Mucina & Rutherford, 2006).

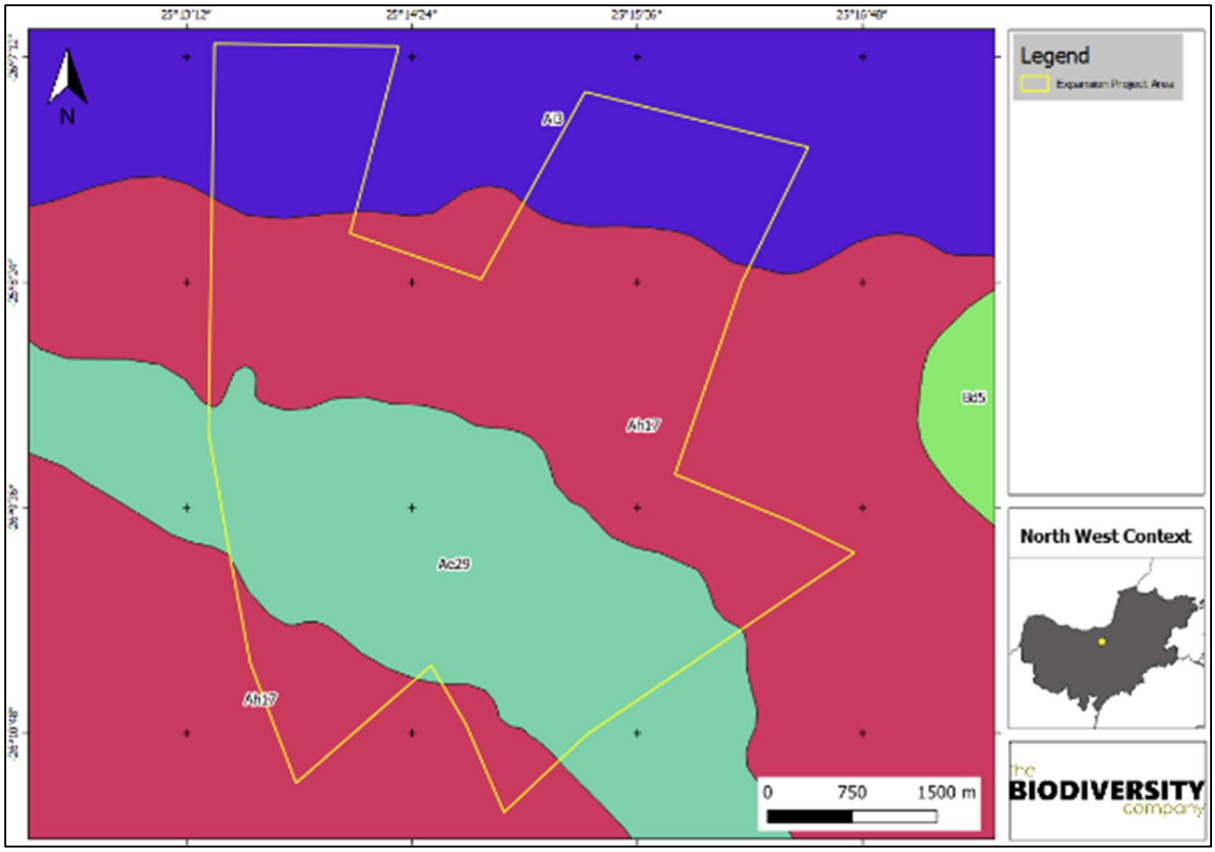

Figure 9-2 The land types associated with the project area

9.3 Vegetation Types

The site is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). The savanna biome comprises many different vegetation types. The project area is situated within one vegetation type, namely the Mafikeng Bushveld according to Mucina & Rutherford (2006) (Figure 9-3).

Mafikeng Bushveld is found in the North West province, in Aeolian Kalahari sand of Tertiary to Recent age on flat sandy plains. This vegetation type has well developed tree and shrub layers, dense stands of *Terminalia sericea*, *Acacia luederitzii* and *A. erioloba* in certain areas. The grass layer is also well developed in this vegetation type (Mucina & Rutherford 2006).

The vegetation type is listed as Vulnerable (Mucina & Rutherford, 2006). The conservation target is at 16%. No section of this vegetation type is conserved in statutory conservation areas, but very small area conserved in the Mmabatho Recreation Area. About 25% already transformed, mainly for cultivation and urban development.

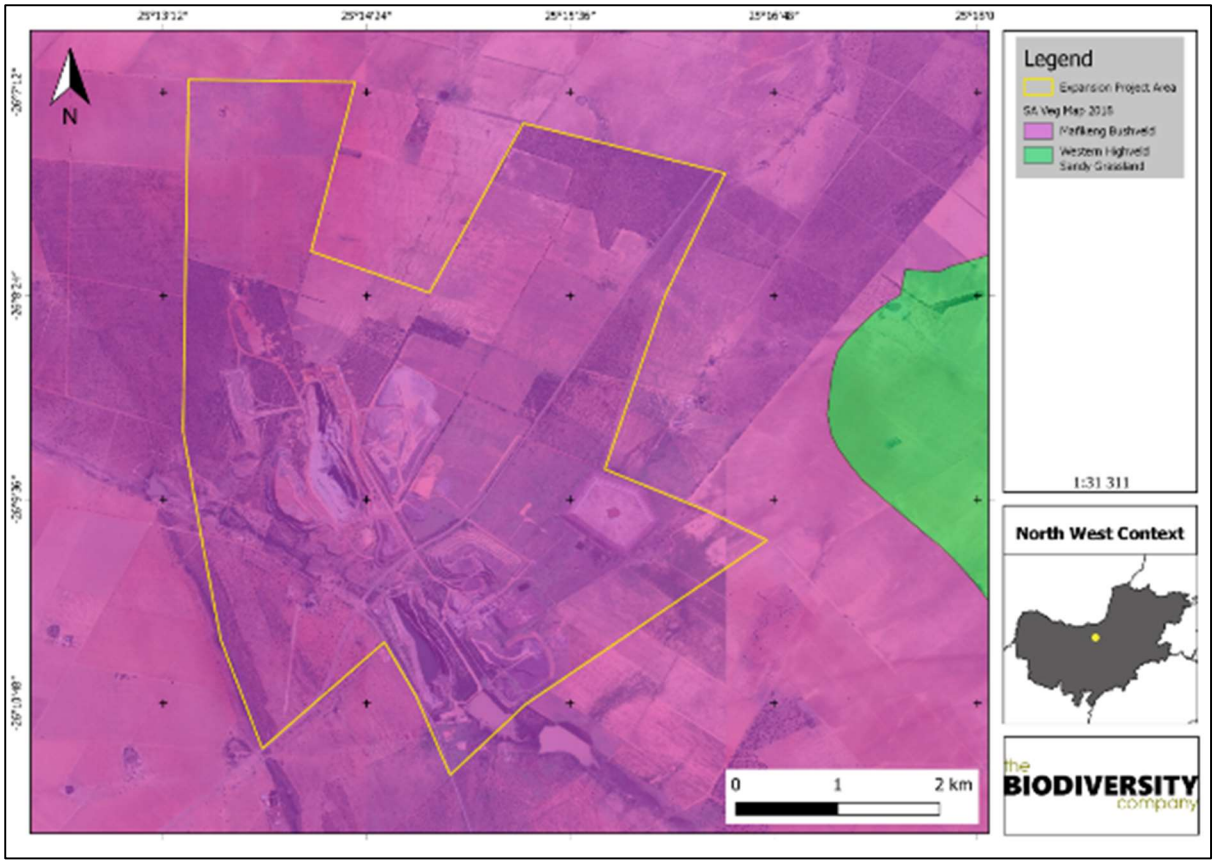

Figure 9-3 The Kalgold Expansion Project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2017)

9.4 NFEPA Wetlands

The National Freshwater Ecosystem Priority Areas (Nel *et al.*, 2011) where used to determine the presence of NFEPA wetlands. One wetland NFEPAs has been identified within the project area, namely a seep (see Figure 9-4).

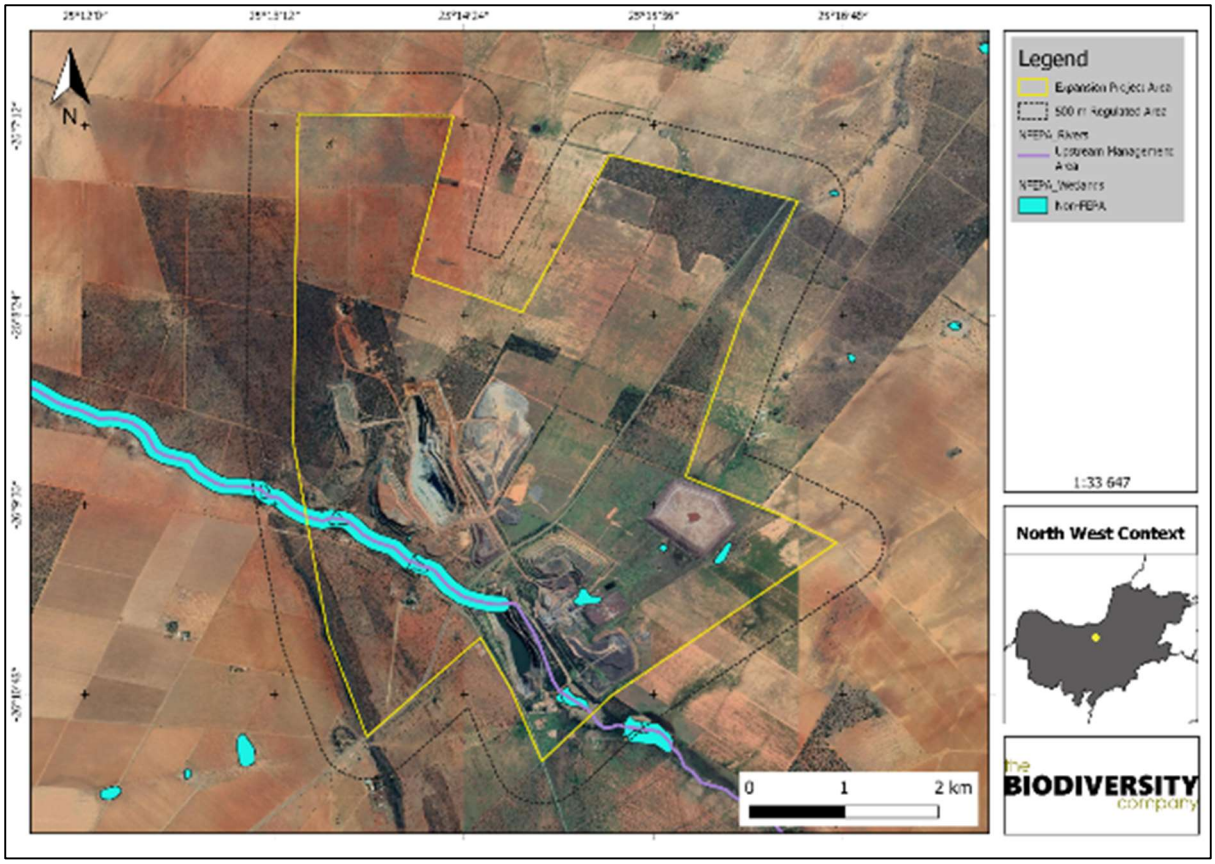

Figure 9-4 Illustration of the NFEPA wetlands identified within range of the proposed development

9.5 National Wetland Map 5

The National Wetland Map 5 spatial data was published in October 2019 (Deventer *et al*. 2019) in collaboration with SANBI with the specific aim of spatially representing the location, type and extent of wetlands in South Africa. The data represents a synthesis of a wide number of official watercourse data including rivers, inland wetlands and estuaries. This database does recognise the presence of four natural wetland types within the 500 m regulated with only a floodplain and seep being traversed by a proposed road and power line respectively (Figure 9-5). The threat status of these systems ranges from Least Concern to Critically Endangered. The projection level ranges from Not Protected to Poorly Protected.

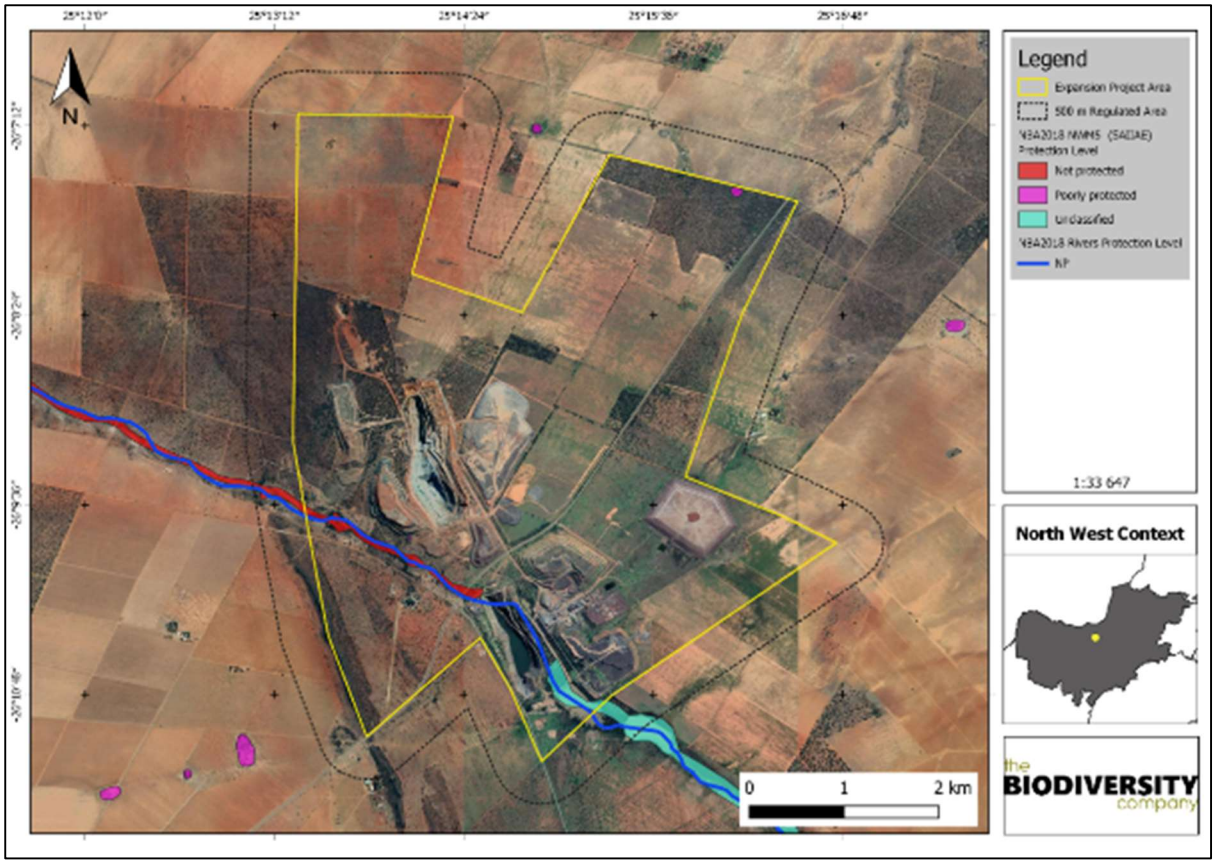

Figure 9-5 National Wetland Map 5

9.6 Strategic Water Source Areas

The Strategic Water Source Areas (SWSA) dataset outlines the surface water of south Africa as defined by the Water Research Commission (WRC) project (K5/2431) (WRC, 2017). Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size. Figure 9-6 shows that the project area is 2.2 km from a SWSA.

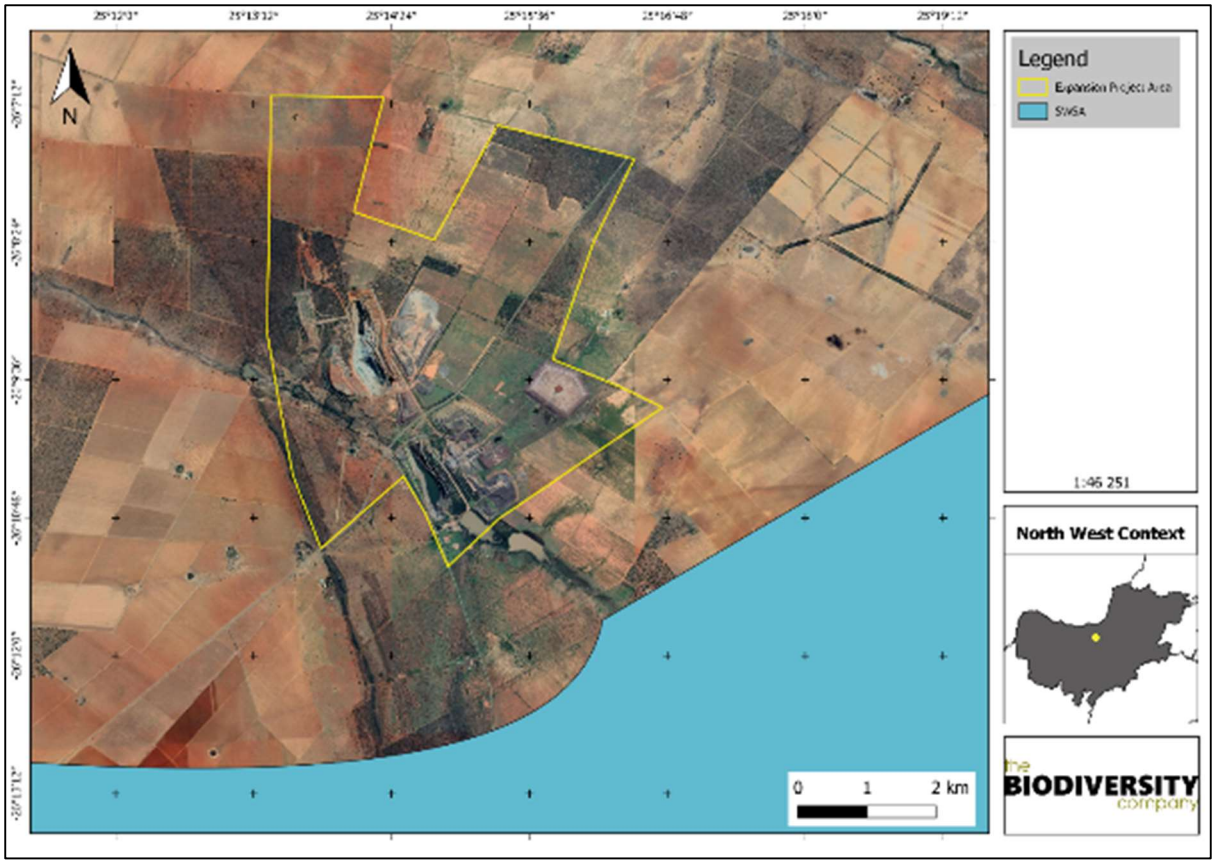

Figure 9-6 The project area in relation to a strategic water source area (WRC, 2017).

9.7 Catchments

The proposed project area is situated in the D41B quaternary catchment within the Vaal Water Management Area (WMA 5) (NWA, 2016) and the Southern Kalahari (29.01) ecoregion (Dallas, 2007). On a smaller scale the project area is located in the 1291 catchment, with the southern tip of the project area in the 1312 catchment and the northern section in the 1182 catchment (Figure 9-8). These catchments are considered upper management area for the catchments downstream (1190 and 1122) which are river NFEPAs. As a result, modification should be avoided/mitigated as these management areas feed downstream NFEPAs, with resultant modification causing impacts downstream. The watercourse which flows through the project area is the upper reaches of the Morokwa River within the D41B-1291 Sub Quaternary Reach (SQR). The proposed project is directly associated with the D41B-1291 SQR and will therefore directly affect this reach.

The project area considered in this assessment is located within the Southern Kalahari Freshwater Ecoregion (Abel *et al.*, 2008). In comparison to river systems located north of this watercourse, the aquatic fauna of the considered ecoregion is “lacking in diversity” (Abel *et al.*, 2008). This ecoregion is known to contain approximately 1-19 freshwater fish species of which 1-11 are known to be endemic (Figure 9-7). The rivers in this ecoregion are typically alkaline and turbid and flow briefly after rainfall. The majority of the aquatic habitats in this ecoregion are composed of endorheic pans.

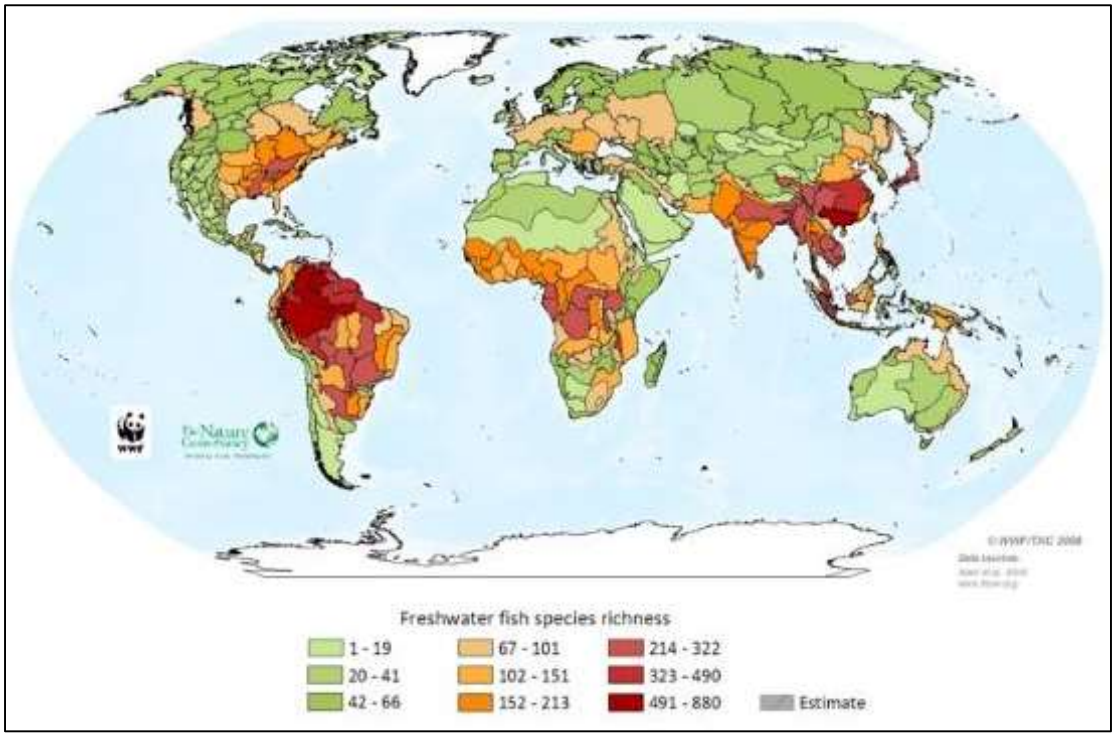

Figure 9-7 Freshwater Fish Species Richness of the Freshwater Ecoregions of the World (Abel et al., 2008)

Notable aquatic ecology in the overall River basin are the several endemic Cyprinid species such as *Labeo capensis* (Least Concern- LC), *L. umbratus* (LC), *Labeobarbus kimberleyensis* (Near Threatened -NT), *Labeobarbus aeneus* (LC) and the Rock Catlet, *Austroglanis sclateri* (LC). The species which are expected to occur in the reach flowing through the project area are represented in Table 9-1. This list includes five species of which one is identified as a Near Threatened (NT) species (*Enteromius brevipinnis*). The expected species are generated on a reach basis, and the occurrence of all species in the system is unlikely as different species are specialists of different habitats which are present along a reach. The presence and absence of the expected species will be verified in the field surveys to follow.

Table 9-1 Expected fish species

Species	Common Name	IUCN Status (2020)
Clarias gariepinus	Sharptooth Catfish / Barbel	LC
Enteromius brevipinnis	Shortfin Barb	NT
Enteromius paludinosus	Straightfin Barb	LC
Pseudocrenilabrus philander	Southern Mouthbrooder	LC
Tilapia sparrmanii	Banded Tilapia	LC

LC - Least Concern, NT – Near Threatened, VU - Vulnerable

The desktop ecological status of the D41B-1291 SQR is presented in Table 9-2. The desktop data for the SQR considered in this assessment indicates that the PES of the watercourse is Largely Modified (class D). The central factors negatively effecting the PES include diffuse water quality deterioration, in the form of contaminated surface runoff from agricultural activities, and several instream habitat perturbations in the form of impoundments and mining activities. Further sources of modification including influence from mining with serious habitat

loss from mining in the watercourse and flow and channel modification from instream dams and road crossings.

Table 9-2 Desktop Ecological Status of the Morokwa River within the D41B-1291 Sub Quaternary Reach (DWS, 2018)

Present Ecological Status	Largely Modified (class D)
Default Ecological Category (EC)	class C
Ecological Importance	Moderate
Ecological Sensitivity	Moderate

The ecological importance of the watercourse at a desktop level was determined to be moderate. The moderate rated level of importance can be attributed to the wide distribution of aquatic fauna throughout the Orange-Vaal River Basins. The ecological sensitivity was derived to be moderate. The moderate sensitivity was largely attributed to the likely absence of flow reliant taxa.

Considering the identified information at a desktop level the reach of concern flowing through the proposed project area is moderately sensitive to modification with respect to instream biota. Modification has occurred to the system, however fish and macroinvertebrate communities are expected to inhabit the reach which are susceptible to higher levels of modification.

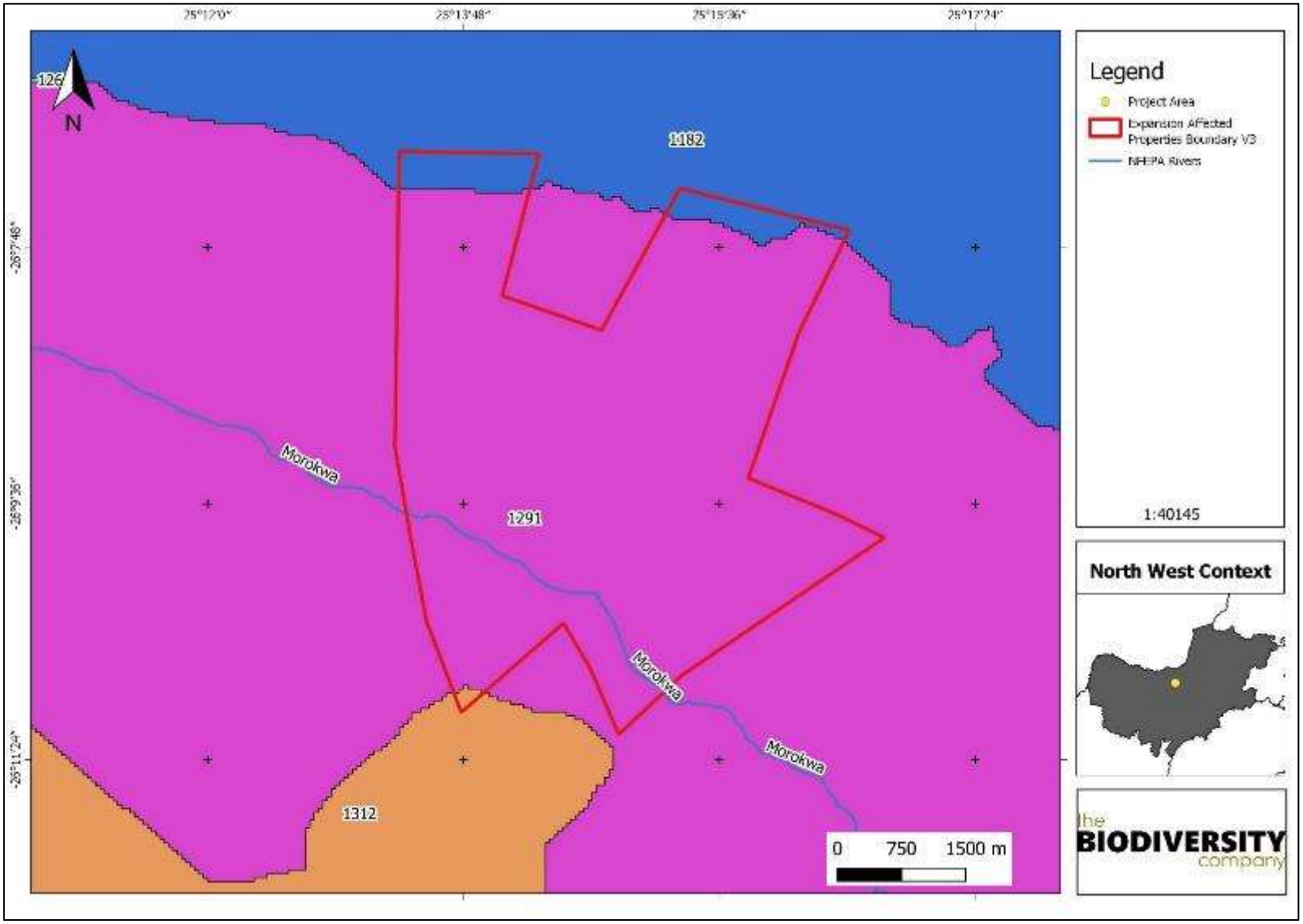

Figure 9-8 Map illustrating fish and river FEPAs for the project area

10 Aquatic Biodiversity Theme Sensitivity

10.1 Approach

As part of the EIMS environmental mapping methodology, specialists are required to identify all features in terms of the specific field of expertise within the study area. This methodology includes the compilation of detailed shapefiles with specific attributes. Three main components form part of this methodology, namely;

- Feature layer;
- Overall sensitivity layer; and
- Legislative constraint layer.

All identified features will be rated according to the sensitivity of the feature as well as threats posed by proposed activities. These sensitivity rankings are described and illustrated in Table 10-1.

Table 10-1 Sensitivities relevant to the EIMS methodology

	Sensitivities				
	Least Concern	Low	Medium	High	No-Go
Broad Class Description	The inherent feature status and sensitivity is already degraded. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for the project or infrastructure placement.	The proposed development will have not had a significant effect on the inherent feature status and sensitivity.	The proposed development will negatively influence the current status of the feature.	The proposed development will negatively significantly influence the current status of the feature.	The proposed development cannot legally or practically take place.
Scoring	0	1	2	3	+99

10.2 Wetland Sensitivity

The aquatic biodiversity theme sensitivity as indicated in the screening report was derived to be Low and Very High (Figure 10-1). The Very High classification is attributed to the presence of wetlands and also aquatic Critical Biodiversity Areas (CBA). The local water resources (including rivers) have been assigned a High sensitivity classification (Figure 10-2). A Medium sensitivity was assigned to the remaining extent (excluding actual water resources) of the 500 m regulation area.

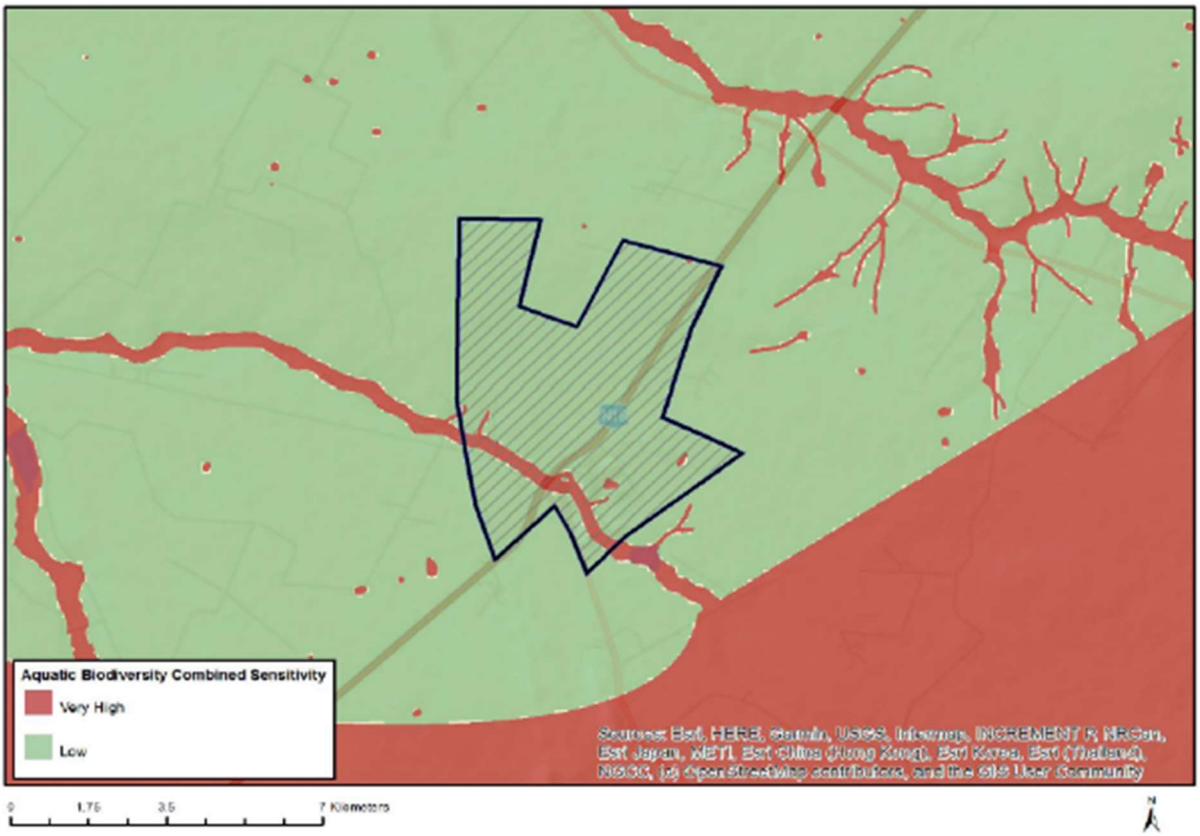

Figure 10-1 Aquatic Biodiversity Theme Sensitivity, TBC Screening Report

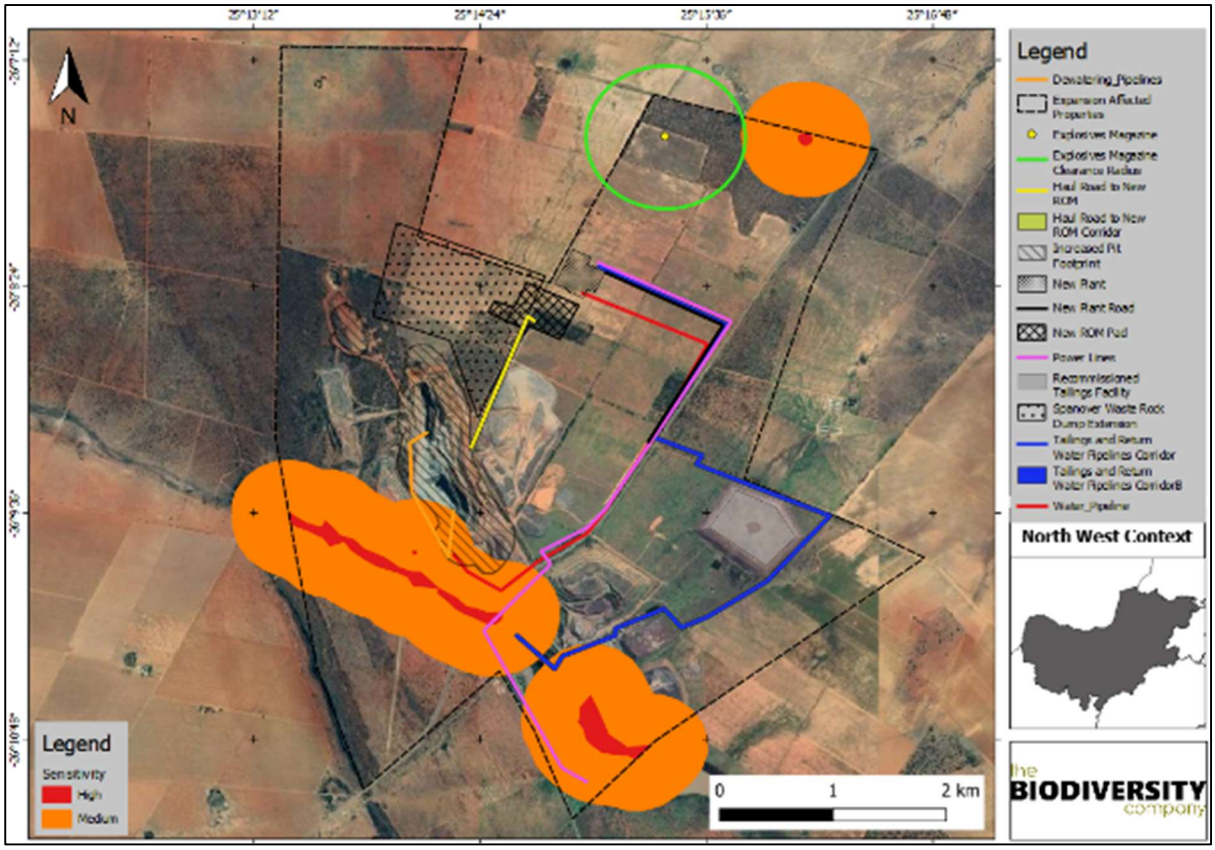

Figure 10-2 Wetland sensitivity

10.3 Aquatic Ecology Sensitivity

The watercourse is classified as sensitive as the channel is classified as a CBA1 and the riparian area as a CBA2 (NWBSP, 2015). This indicates that the system is highly vulnerable from a habitat perspective with the watercourse considered as endangered habitat (NBA, 2018). The habitat sensitivity is represented in Figure 10-3. The available habitat within the reach is considered highly vulnerable at a desktop level, and therefore high susceptible to modification.

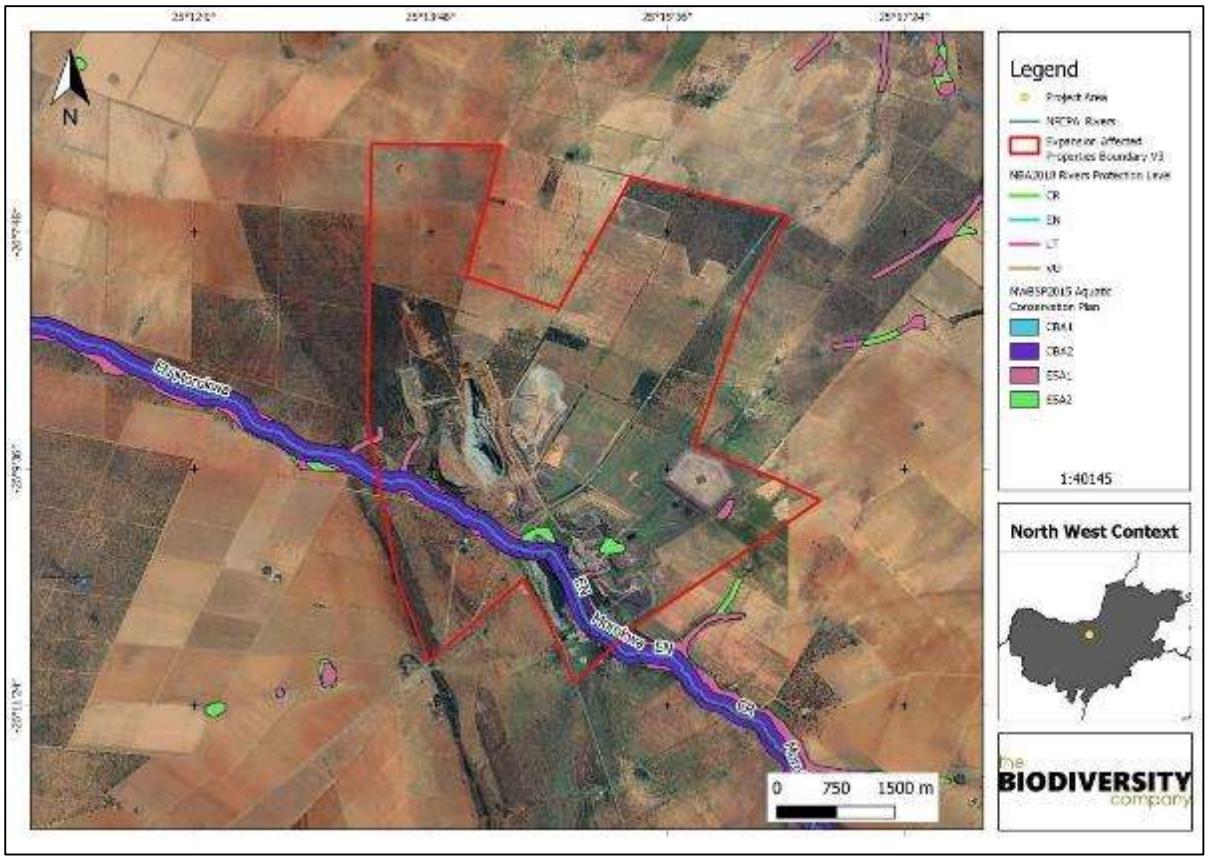

Figure 10-3 Aquatic habitat sensitivity

11 Impact Assessment

This report forms the scoping phase of the project and therefore the anticipated risks identified are based off of a desktop analysis of the region, project area and all potential project aspects in order to assess the potential impacts they could impose on the surrounding watercourses. It is imperative to state that the pre-existing mine does not permit for uncontrolled expansion regardless of its influence on the surrounding environment. Hence the following assessments are conducted to identify and mitigate all potential further degradation to the surrounding watercourses.

The project area is relatively flat in relief with a flow direction towards the lower lying water resources (Figure 11-1). Infrastructure within the 500 m regulation area assigned to wetlands includes pit extension, water pipeline and power lines.

Impacts were assessed in terms of the construction/operational, decommissioning/ rehabilitation and closure phases. Mitigation measures were only applied to impacts deemed relevant.

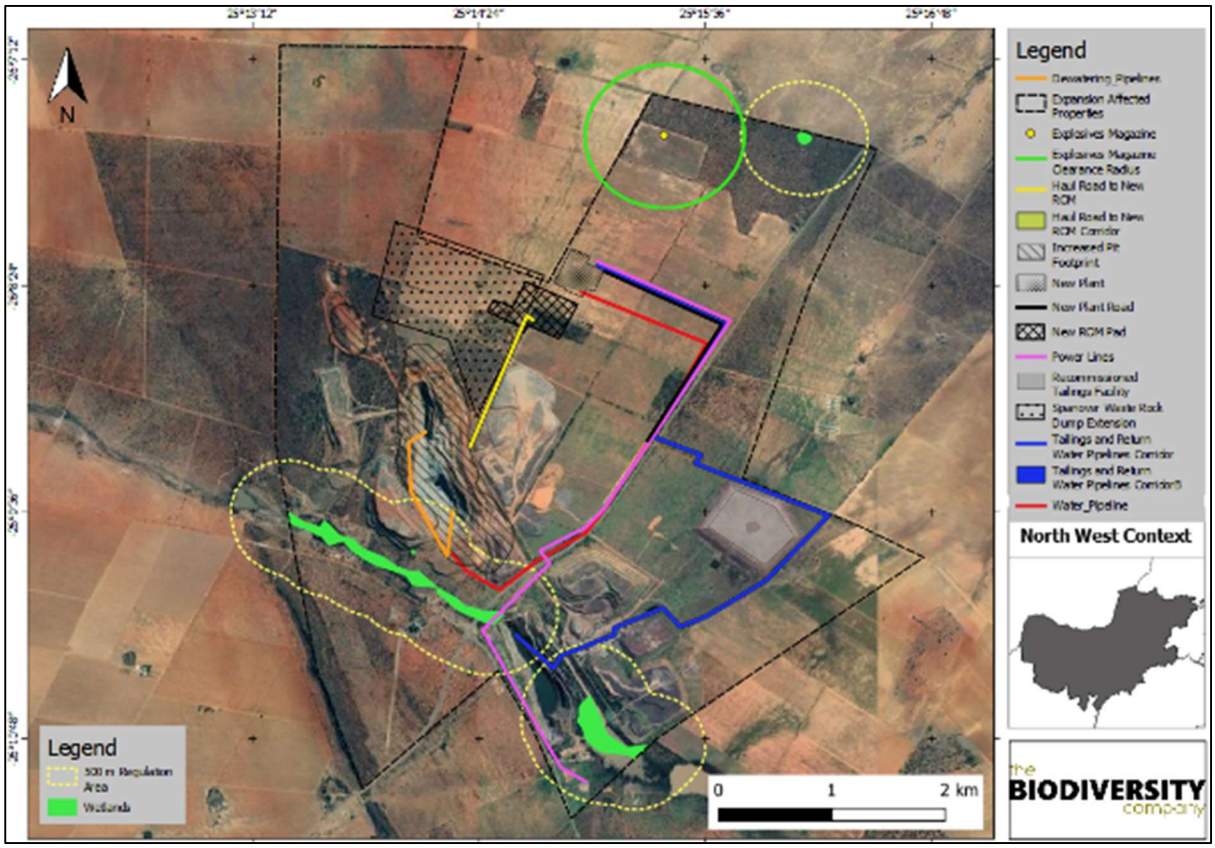

Figure 11-1 Infrastructure within a 500 m regulation area and surface flow direction

11.1 Impact Assessment Methodology

An impact assessment methodology was provided by EIMS to determine the environmental risk associated with various aspects related to the proposed expansion alternatives. This impact assessment takes the following components into consideration.

- The nature of the associated impact (positive or negative);
- The extent of the proposed activities;
- The duration of the proposed activities;
- The magnitude of the effects caused by the proposed activities;
- The reversibility of associated impacts; and
- The probability of relevant aspects affecting sensitive receptors.

Each one of the above-mentioned components are given a rating, which cumulatively provides the specialist with a pre-mitigation environmental risk rating. These components are then scored again taking into consideration mitigating factors. The cumulative impact and irreplaceable loss to sensitive receptors are then scored to ultimately indicate a “Priority Factor” score.

11.2 Freshwater Ecology Impact Assessment

The anticipated impacts are derived from the main activities associated with the expansion which include:

1 The pit footprint will increase.

2 Larger dewatering pipelines.

3 Extension to Spanover waste rock dump.

4 Road from the pit to new ROM pad.

5 New ROM pad.

6 New plant.

7 Recommission old Tailings Storage Facility (TSF) at low deposition rate.

8 Increase tailings deposition rate at D-zone pit.

9 Install pipeline from Central dam to the new processing plant.

10 Install a tailings pipeline from the new processing plant to old TSF and D-zone pit.

11 Install pipeline from old processing plant raw water pond to the new plant (D-zone return water).

12 Install two power lines from Ferndale substation to the new processing plant.

13 Install evaporators at Central dam (to get rid of excess water).

14 Install a water treatment plant at the new plant.

15 Relocate and expand the explosives magazine.

16 Additional new road from the plant to the N18.

The proposed project activities were determined to have two primary potential impacts to the associated freshwater ecology. The first was determined to be related to the conditions within the physical make-up of the considered water resources. This includes the substrates, banks, wetland and riparian vegetation and also the water column. These physical components of a watercourse determine the quality of the habitats. Therefore, modification of these physical components would result in a habitat quality impact. The second impact was determined to be related to the chemical properties of water. Considering aquatic biota and vegetation have requirements for habitat, as well as sensitivity to changes in water chemistry, a change to water quality is anticipated to have negative impacts.

The central anticipated impacts associated with the proposed project are related to the seepage and runoff of contaminants such as various dissolved and suspended elements. Contaminants typically stemming from gold mining activities include various processing chemicals, including flocculants and cyanide. In addition, seepage and runoff from ore tailings typically contain high concentrations of various salts such as sulphate and possess the capacity to alter physical parameters such as water pH.

Further, the proposed various infrastructure developments will strip vegetation and alter the drainage of catchments resulting in increased runoff velocities and subsequent erosion, sedimentation and increased suspended solids. This may have an impact on water resources, affecting the integrity and functioning of these systems.

The infrastructure provided for the proposed project will not have a direct impact on local water resources. Rather, as stipulated above, diffuse seepage and an altered catchment will likely indirectly impact on the local systems. Although the various infrastructure aspects represent different areas, each with a different distance from the considered water resources, the anticipated impacts remain largely similar given the that the activities will take place in the same catchment and on similar scales. Once fieldwork has been completed, and the freshwater conditions in the project area will be determined, the effective assessment of the various project options will be assessed. For the purposes of this scoping study, the following groupings have been considered for the risk assessment, namely all linear infrastructure, all infrastructure extensions (or expansions) and all new infrastructure.

11.2.1 Unplanned Events

The planned activities will have anticipated impacts as discussed; however, unplanned events may occur on any project and may have potential impacts which will need management.

Table 11-1 is a summary of the findings of an unplanned event assessment from a terrestrial ecology perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 11-1 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment	Contamination of habitat as well as water resources associated with spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary an biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.

Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural grassland and wetlands	Appropriate/Adequate fire management plan need to be implemented.
Acid Mine Drainage	Severe water quality and in turn habitat degradation	Water treatment, post closure water monitoring and water level management.
TSF Failing or TSP Pipeline burst	Contamination of habitat as well as water resources.	Monitoring of TSF structure and follow legislative guidelines. Regular monitoring for leaks, cracks and faults in the pipeline

11.2.2 Planning Phase Impacts

The planning phase activities are considered a low risk as they typically involve desktop assessments and initial site inspections. This would include preparations and desktop work in support of waste management plans, environmental and social screening assessments, finalising drill sites and facilities and consultation with various contractors involved with a diversity of proposed project related activities going forward. It is assumed all existing servitudes will be used for access and existing plans are implemented, so based on this no impacts have been considered for the planning phase.

11.2.3 Construction Phase Impacts

In the construction phase topsoil will be stripped and vegetation will be cleared for all the aspects. This activity will alter the catchment drainage and subsequently result in erosion and sedimentation. The altered hydrology is likely to affect the structure of the water resources, resulting in erosion of the systems. Sedimentation of the resources will also contribute to impaired water and habitat quality.

11.2.3.1 Habitat Modification

In an effort to make terrain available for the proposed infrastructure associated with the mining expansion, there will be clearing of land which will strip topsoil and also remove vegetation, subsequently leaving bare ground. There is likely to be an increase in run-off volumes and velocity reporting to the water resources, which will be susceptible to erosion. The erosion of these system will alter the structure and geomorphology to some extent. Further to this, sedimentation of the systems will also contribute to altered habitat integrity, and possibly the loss of freshwater habitats.

11.2.3.1.1 Mitigation Measures

Please see section 12.

11.2.3.1.2 Cumulative Impacts

The loss of habitat will result in further fragmentation of the system. This will result in changes to the hydrodynamics of the system, but also have an impact on the local biota. Once habitat is lost the aquatic life such as fish and macroinvertebrates which occupy the reach will be forced to move downstream as they no longer have the safety, feeding and breeding grounds they require. The cumulative impact is therefore regarded as medium with potential incremental, interactive and sequential cumulative impacts on a spatial and temporal scale.

11.2.3.1.3 Irreplaceable loss of Resources

The system is considered to be in the upper reaches near the source. Therefore, once habitat has been lost there is not much of a feeder zone upstream for aquatic life to move or migrate

across the system. This will result in the irreplaceable loss of some species of aquatic life. The degree of potential irreplaceable loss of resources is high due to the loss of high value resources (services and/or functions).

11.2.3.1.4 Impact on Alternatives Considered

No alternatives were provided.

11.2.3.2 Water Quality Modification

During the construction phase of the extension there will be a multitude of materials such as concretes and hydrocarbons which if not appropriately contained, cleaned or managed will potentially be washed/spilled into the watercourse and may have serious potential to impact on the water quality and chemistry of the system.

11.2.3.2.1 Mitigation Measures

Please see section 12.

11.2.3.2.2 Cumulative Impacts

Water quality modification may result in the deaths of freshwater dependent species. Water chemistry is complex especially when metals are involved with some metals are toxic at specific pH levels. Due to the rate at which water runs off within a watercourse it has a large spatial influence which can influence catchments downstream dependent on the dilution potential. The cumulative impact is therefore regarded as medium with potential incremental, interactive and sequential cumulative impacts on a spatial and temporal scale.

11.2.3.2.3 Irreplaceable loss of Resources

The system is considered to be in the upper reaches near the source. Therefore, once water quality has been altered, and taking into account the fragmentation of the system there remains limited options for freshwater dependent biota to evade the impact. Species also have varying tolerances to impaired water quality and it is likely that more intolerant species will be destroyed. This will result in the irreplaceable loss of some species. The degree of potential irreplaceable loss of resources is high due to the loss of high value resources (services and/or functions).

11.2.3.2.4 Impact on Alternatives Considered

No alternatives were provided.

11.2.4 Operational Phase Impacts

The operation phase for the proposed activities will result in the modification of the catchment drainage, which will alter riverine habitats through altered drainage. The presence of the processing and waste facilities will produce contaminated volumes of water that may present diffuse seepage/runoff into local riverine resources without mitigation.

11.2.4.1 Habitat Modification

The alteration of land-use from natural grassland will result in alterations to drainage and runoff within the catchment. This will influence the volume of runoff within the watercourse which will in turn change the habitat integrity and availability within the watercourse.

11.2.4.1.1 Mitigation measures

Please see section 12.

11.2.4.1.2 Cumulative Impacts

This would be a continuation from the construction phase. The loss of habitat will result in further fragmentation of the system. The cumulative impact is therefore regarded as medium with potential incremental, interactive and sequential cumulative impacts on a spatial and temporal scale.

11.2.4.1.3 Irreplaceable loss of Resources

The degree of potential irreplaceable loss of resources is high due to the loss of high value resources (services and/or functions).

11.2.4.1.4 Impact on Alternatives Considered

No alternatives were provided.

11.2.4.2 Water Quality Modification

The new infrastructure possesses the potential for spillages and seepages of dirty water into the watercourse. While this may not be intentional, they pose a serious risk to the watercourse as they can significantly alter the water quality and chemistry of the watercourse.

11.2.4.2.1 Mitigation measures

Please see section 12.

11.2.4.2.2 Cumulative Impacts

This would be a continuation from the construction phase. The cumulative impact is therefore regarded as medium with potential incremental, interactive and sequential cumulative impacts on a spatial and temporal scale.

11.2.4.2.3 Irreplaceable loss of Resources

The degree of potential irreplaceable loss of resources is high due to the loss of high value resources (services and/or functions).

11.2.4.2.4 Impact on Alternatives Considered

No alternatives were provided.

11.2.5 Decommissioning and Rehab/Closure Phase Impacts

The decommissioning/closure phase for the proposed activities will result in similar impacts to the construction phase, in that infrastructure will be removed and the catchment area disturbed. It is however anticipated that the expanded TSF will remain *in situ* and that seepage and runoff from the expanded TSF is therefore likely to contribute to the overall salt loads in the catchment in the long term. The rehabilitation phase is expected to reduce the overall negative impact significance for selected aspects such as the removal and rehabilitation of roads, pipeline routes and powerline routes.

11.2.5.1 Habitat Modification

During the closure phase all infrastructure will be removed from an area which has reached a new equilibrium. The removal will leave a bare disturbed area which is vulnerable to erosion and alien invasive intrusion. While alien invasive flora appears to provide habitat in the watercourse, the endemic aquatic life has not specialised to this habitat and for the most part will avoid it. Secondly there is eroded material as well as many potential materials from construction such as rubble which may reach the watercourse through runoff events. This bed modification will cause habitat loss for aquatic life which inhabit the system.

11.2.5.1.1 Mitigation Measures

Please see section 12.

11.2.5.1.2 Cumulative Impacts

This would be a continuation from the construction phase, but the systems could recover to some extent during this phase. The cumulative impact is therefore regarded as low as considered potential incremental, interactive and sequential cumulative impacts unlikely to cause spatial and temporal scale cumulative change.

11.2.5.1.3 Irreplaceable loss of Resources

The degree of potential irreplaceable loss of resources is low and unlikely to result in loss of resources.

11.2.5.1.4 Impact on Alternatives considered

No alternatives were provided.

11.2.5.2 Water Quality Modification

Unlike the construction phase, the decommissioning phase has a lower risk to water quality as many materials used in construction are not available in their original form (i.e. concrete powder) and therefore the resultant risk is lower. There will however remain the potential for hydrocarbon spillages from vehicles, machinery and equipment used to dismantle the infrastructure as well as the potential from future modification from any materials not removed which are eventually washed into the watercourse.

11.2.5.2.1 Mitigation Measures

Please see section 12.

11.2.5.2.2 Cumulative Impacts

This would be a continuation from the construction phase, but the systems could recover to some extent during this phase. The cumulative impact is therefore regarded as low as considered potential incremental, interactive and sequential cumulative impacts unlikely to cause spatial and temporal scale cumulative change.

11.2.5.2.3 Irreplaceable loss of Resources

The degree of potential irreplaceable loss of resources is low and unlikely to result in loss of resources.

11.2.5.2.4 Impact on Alternatives Considered

No alternatives were provided.

11.3 Assessment of Significance

Table 12-1 and Table 12-2 shows the significance of potential impacts associated with the proposed expansion project before and after the implementation of mitigation measures as well as cumulative and irreplaceable loss.

12 Specialist Management Plan

Table 12-2 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators. The mitigation measures within this section have been taken into consideration during the impact assessment in cases where the post-mitigation environmental risk is lower than that of the pre-mitigation environmental risk.

Table 12-1 Assessment of significance of potential impacts on the watercourses associated with the project

Impact	Alternative	Pre-mitigation ER	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Construction Phase								
Habitat modification from Pit Extension, TSF Extension and Associated infrastructure	Alternative 1	-8.25	-1.75	Low	2	2	1.25	-2.1875
Habitat modification from Production Plant and Associated infrastructure	Alternative 1	-8.25	-1.75	Low	2	2	1.25	-2.1875
Habitat modification from New Magazine and Associated infrastructure	Alternative 1	-8.25	-1.75	Low	2	2	1.25	-2.1875
Habitat modification from Spanover WRD Expansion and Associated infrastructure	Alternative 1	-8.25	-1.75	Low	2	2	1.25	-2.1875
Water quality modification from Pit Extension, TSF Extension and Associated infrastructure	Alternative 1	-9	-1.75	Low	2	2	1.25	-2.1875
Water quality modification from Production Plant and Associated infrastructure	Alternative 1	-9	-1.75	Low	2	2	1.25	-2.1875
Water quality modification from New Magazine and Associated infrastructure	Alternative 1	-9	-1.75	Low	2	2	1.25	-2.1875
Water quality modification from Spanover WRD Expansion and Associated infrastructure	Alternative 1	-9	-1.75	Low	2	2	1.25	-2.1875
Operational Phase								
Habitat modification from Pit Extension, TSF Extension and Associated infrastructure	Alternative 1	-9	-2	Medium	2	2	1.25	-2.5
Habitat modification from Production Plant and Associated infrastructure	Alternative 1	-9	-2	Medium	2	2	1.25	-2.5
Habitat modification from New Magazine and Associated infrastructure	Alternative 1	-9	-2.25	Medium	2	3	1.38	-3.09375
Habitat modification from Spanover WRD Expansion and Associated infrastructure	Alternative 1	-9	-2.25	Medium	2	3	1.38	-3.09375
Water quality modification from Pit Extension, TSF Extension and Associated infrastructure	Alternative 1	-16	-6.5	Medium	2	3	1.38	-8.9375
Water quality modification from Production Plant and Associated infrastructure	Alternative 1	-16	-6.5	Medium	2	3	1.38	-8.9375
Water quality modification from New Magazine and Associated infrastructure	Alternative 1	-16	-6.5	Medium	2	3	1.38	-8.9375
Water quality modification from Spanover WRD Expansion and Associated infrastructure	Alternative 1	-16	-6.5	Medium	2	3	1.38	-8.9375
Decommissioning and Rehab/Closure Phase								
Habitat modification from Pit Extension, TSF Extension and Associated infrastructure	Alternative 1	-5.5	-2.75	Medium	1	1	1.00	-2.75

Habitat modification from Production Plant and Associated infrastructure	Alternative 1	-5.5	-2.75	Medium	1	1	1.00	-2.75
Habitat modification from New Magazine and Associated infrastructure	Alternative 1	-5.5	-2.75	Medium	1	1	1.00	-2.75
Habitat modification from Spanover WRD Expansion and Associated infrastructure	Alternative 1	-5.5	-6.5	Medium	1	1	1.00	-6.5
Water quality modification from Pit Extension, TSF Extension and Associated infrastructure	Alternative 1	-7	-6.5	Medium	1	1	1.00	-6.5
Water quality modification from Production Plant and Associated infrastructure	Alternative 1	-7	-6.5	Medium	1	1	1.00	-6.5
Water quality modification from New Magazine and Associated infrastructure	Alternative 1	-7	-6.5	Medium	1	1	1.00	-6.5
Water quality modification from Spanover WRD Expansion and Associated infrastructure	Alternative 1	-7	-6.5	Medium	1	1	1.00	-6.5

Table 12-2 Mitigation measures including requirements for timeframes, roles and responsibilities for the freshwater study.

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Effective stormwater management which includes and controls seepage and runoff control from the expanded operational TSF area	Construction Phase but applied as necessary through Life of Project	Contractor and Environmental Officer	Infrastructure and crossings	Ongoing
Implementation of clean and dirty water separation as effective pollution control using a diversion trench and berm systems which diverts clean stormwater around pollution sources and convey and contain dirty water to central pollution control impoundments effectively controlling runoff. The use of barrier systems, including synthetic, clay and geological liners to minimize contaminated seepage and runoff is encouraged.	Construction Phase but applied as necessary through Life of Project	Contractor and Environmental Officer	Infrastructure and crossings	Ongoing
Erosion and sedimentation controls such as energy dissipation and silt screens. The focus must be placed on locations where stormwater enters the watercourse from disturbed areas.	Construction Phase but applied as necessary through Life of Project	Contractor and Environmental Officer	Infrastructure and crossings	Ongoing
The crossing points should be stabilized to reduce the resulting erosion and downstream sedimentation. Access crossing points must be prioritized and upgraded.	Planning and Construction Phase	Contractor and Environmental Officer	Crossings	During Phase
Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years	Planning and Construction Phase	Contractor and Environmental Officer	Crossings	Ongoing
The indiscriminate use of heavy vehicles and machinery within the water resource areas will result in the compaction of soils and vegetation and must be controlled	Construction and Decommissioning/closure Phase	Contractor and Environmental Officer	Vehicles and machinery	During Phase
Erosion prevention mechanisms such as gabions must be employed to ensure the sustainability of all structures to prevent instream sedimentation	Construction Phase but applied as necessary through Life of Project	Contractor and Environmental Officer	Crossings	Ongoing
The crossing points (culverts) should be unobtrusive (outside riparian and instream habitat) to prevent the obstruction and subsequent habitat modification of downstream portions. These should span the width of the macro-channel	Planning and Construction Phase	Contractor and Environmental Officer	Crossings	During Phase
The planting of indigenous vegetation around pollution control impoundments and structures should be completed as this has been shown to be effective in erosion and nutrient control	Operational and Decommissioning, and Rehabilitation Phase	Environmental Officer	Infrastructure and crossings	Ongoing
The continued removal of alien invasive flora species	Life of Project	Environmental Officer	Project area	Ongoing
The continued implementation of the derived buffer zones and avoidances. Prioritize the use of existing routes and servitudes	Life of Project	Environmental Officer	Project area	Indefinitely
Passive or active water treatment and containment for seepage and runoff emanating from the TSF and decant areas.	Rehabilitation Phase	Contractor and Environmental Officer	Decant & run-off areas	Indefinitely

13 Conclusion

The results of the scoping level assessment indicate the presence of a freshwater ecosystems within the 500 m regulation area, that could be indirectly affected by the proposed project aspects.

Based on the available desktop resources as well as desktop imagery, the watercourse is largely modified (class D) and moderately sensitive however the habitat is considered Endangered and therefore classified as highly sensitive. The proposed project activities have the potential to further degrade and fragment water resources and compound existing water quality impacts. Particular impacts to water quality may stem from the proposed TSF expansion whereby contaminated seepage and runoff may enter into the local watercourses. The extension of the pit could also result in a loss of water reporting to the receiving water resources. Further assessment of the on-site conditions is required to effectively evaluate the various potential impacts and available alternatives.

14 References

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15 Appendices

Appendix A Specialist declarations

DECLARATION

I, Michael Ryan, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Michael Ryan

Riverine Ecologist (Cand. Sci. Nat. 125128)

The Biodiversity Company

October 2020

DECLARATION

I, Andrew Husted, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Andrew Husted

Wetland and Riverine Science (Pr. Sci. Nat. 400213/11)

The Biodiversity Company

October 2020

Michael Ryan

B.Sc Honours (Geography)

Cell: +2716076548

Email: michael@thebiodiversitycompany.com

Identity Number: 9412215103084

Date of birth: 21 December 1994

Profile Summary

Have experience in Environmental Consulting providing Aquatic Ecology expertise to BA and EIA applications for a wide range of projects spanning southern Africa. To the same note have provided monitoring services for mining and industry in accordance with licencing.

I have had the pleasure of conducting assessments on a plethora of projects which range from mining, industry, infrastructure and river health programs.

Areas of Interest

Mining

Renewable Energy.

Conservation Value

Water Resource Management

Aquatic Ecology

Macroinvertebrates

Hydrology

Flood line determination

Key Experience

- Aquatic and wetland fieldwork collection.
- Water resource baseline, monitoring and impact assessments
- Aquatic ecology studies in accordance to local and international standards
- River Health Investigation

Countries worked in

Lesotho

South Africa

Swaziland

Zimbabwe

Nationality

South African

Languages

English – Proficient

Afrikaans – Proficient

Qualifications

- BSc Honours Geography
- BSc Geography, Geology and Advanced Earth Science
- SASS5– Department of Water Affairs and Forestry for the River Health Programme
- Cand. Sci. Nat (125128)

SELECTED PROJECT EXPERIENCE

Project Name: Aquatic biomonitoring of the Limpopo River for the Boikarabelo Coal Mine, in Limpopo

Province.

Client: Ledjadja Coal.

Personal position / role on project: Fieldwork intern

Location: South Africa (Limpopo) – 2017 to present

Main project features: To collect adequate in situ water quality, invertebrate, Fish and riparian data to allow for analysis and report writing.

Project Name: An aquatic specialist baseline and impact assessment for the N2 road upgrade, in

KwaZulu Natal Province.

Client: EnviroPro.

Personal position / role on project: Fieldwork intern.

Location: South Africa (KwaZulu Natal) - 2018

Main project features: To collect adequate in situ water quality, invertebrate, Fish and riparian data to allow for analysis and report writing.

Project Name: Aquatic biomonitoring of the Kloof Mining Operation, Gauteng, South Africa.

Client: Sibanye Stillwater

Personal position / role on project: Fieldwork intern

Location: Gauteng, South Africa– 2018 to present

Main project features: To collect adequate in situ water quality, invertebrate, Fish and riparian data to allow for analysis and report writing.

Project Name: Environmental and Social Impact Assessment and Resettlement Action Plan: Lesotho Lowlands Bulk Water Supply Scheme Zone.

Client: WSP

Personal position / role on project: Fieldwork intern

Location: Lesotho - 2019

Main project features: To collect adequate in situ water quality, invertebrate, Fish and riparian data to allow for analysis and report writing.

Project Name: The Environmental and Social Impact Assessment (ESIA) the proposed Nondvo Dam

Client: WSP

Personal position / role on project: Fieldwork intern

Location: Swaziland 2019

Main project features: To collect adequate in situ water quality, invertebrate, Fish and riparian data to allow for analysis and report writing.

Project Name: Water Resource Assessment for the Mahlokohloko Road Upgrade, Sungulwane, KwaZulu-Natal

Client: Enviropro

Personal position / role on project: Junior Aquatic Ecology Specialist and Wetland fieldwork.

Location: KwaZulu-Natal, South Africa

Main project features: The baseline and impact assessment for the proposed road upgrade as well as wetland assessment and data collection for delineations.

Project Name: Flood line, SWMP and hydrology Report for the Caledon River

Client: EnviroMatrix

Personal position / role on project: Junior Hydrologist.

Location: Caledonspoort Border post between South Africa and Lesotho 2019

Main project features: To model the 1:50 and 1:100 year floods for an abstraction point on the Caledon river as well as calculate water balances and create a stormwater management plan.

Project Name: Ergo Pipeline Aquatic Biomonitoring 2018-2019

Client: Hydroscience

Personal position / role on project: Aquatic Ecology Specialist

Location: Elsburgspruit River reach, Ekurhuleni Metropolitan Municipality, Gauteng 2019

Main project features: To conduct annual biomonitoring of the aquatic ecosystems associated with various pipelines used by Ergo Gold Mining Operations (Ergo) as per the conditions of a Water Use License (WUL).

OVERVIEW

An overview of the specialist technical expertise includes the following:

- Aquatic ecological state and functional assessments of waterbodies.
- Risk assessments to waterbodies by activities
- Monitoring plans for rivers and other wetland systems.
- Flood line determination.
- Hydrology studies.

EMPLOYMENT EXPERIENCE

Name of Organization, City, Country: The Biodiversity Company, Johannesburg, South Africa
Month, Year: July 2019 to Present
Position: Junior Aquatic Ecologist

- Implementation and planning of aquatic related studies
- Technical contributions for the monitoring, mitigation and identification of impacts to water resources associated with industrial and infrastructural developments
- Establishment and identification of baseline ecological and physical structures (surveys)

Name of Organization, City, Country: The Biodiversity Company, Johannesburg, South Africa
Month, Year: November 2017 to June 2019
Position: Fieldwork Intern

- Appropriate onsite data for both aquatic ecology reports as well as wetland delineations.
- This included water sample, soil sample and invertebrate and fish collection.