SURFACE WATER & HYDROLOGICAL ASSESSMENTREPORT

FOR

The proposed mining development for Diamond kimberlite (DK) and Diamond General (DG) on Farm Viljoenhof 1655 in Boshof, Free State, South Africa.

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DECLARATION OF CONSULTANT'S INDEPENDENCE

I Mboyi D, as the appointed specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- will not have any vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision ofthe competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in termsof regulation 13 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements mayconstitute and result in disqualification;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 48 of GN No. R. 982.

Mboyi D, Pr.Sci.Nat :118763

1. INTRODUCTION

1.1. Applicant

Invest In Property 126 (pty) Ltd

1.2 Project

The mining right application is for a proposed mining development for Diamond kimberlite (DK) and Diamond General (DG) on Farm Viljoenhof 1655 in Boshof, Free State, South Africa.

1.3 Proposed infrastructure

The surface infrastructure planned on the mine includes: Access and security control

- Access and internal haul roads;
- Mine Area
- Soil berms
- Processing plant
- Stockpiles
- Open pits
- Ablution facilities (portable toilets)
- Clean and dirty water trenches, water management sumps and silt traps
- Tailings
- Slime dam

Infrastructure area

- Vehicle Park area
- Workshop and store
- Fuel storage
- Site camps and offices
- Ablution facilities (chemical toilets)
- JoJo tanks
- Waste disposal site
- Slump dam
- Tailings
- Water recycling facility
- Stockpile Yard
- Wash bay
- Generators
- Lighting

1.4 Location

The proposed development site (here after referred as “the site”) is situated 13 km east of Boshof town, within the Boshof district municipality, Free State Province. With relation to major cities, the site is located 27.9 km northeast of Kimberly and 120km west of Bloemfontein. The site covers an area approximately 3.389 ha. The R64 road can be used to access the site. Figure 1 shows the locality map. The central co-ordinates that can be used to locate the site are: 28° 35' 40" S, 25° 03' 43" E

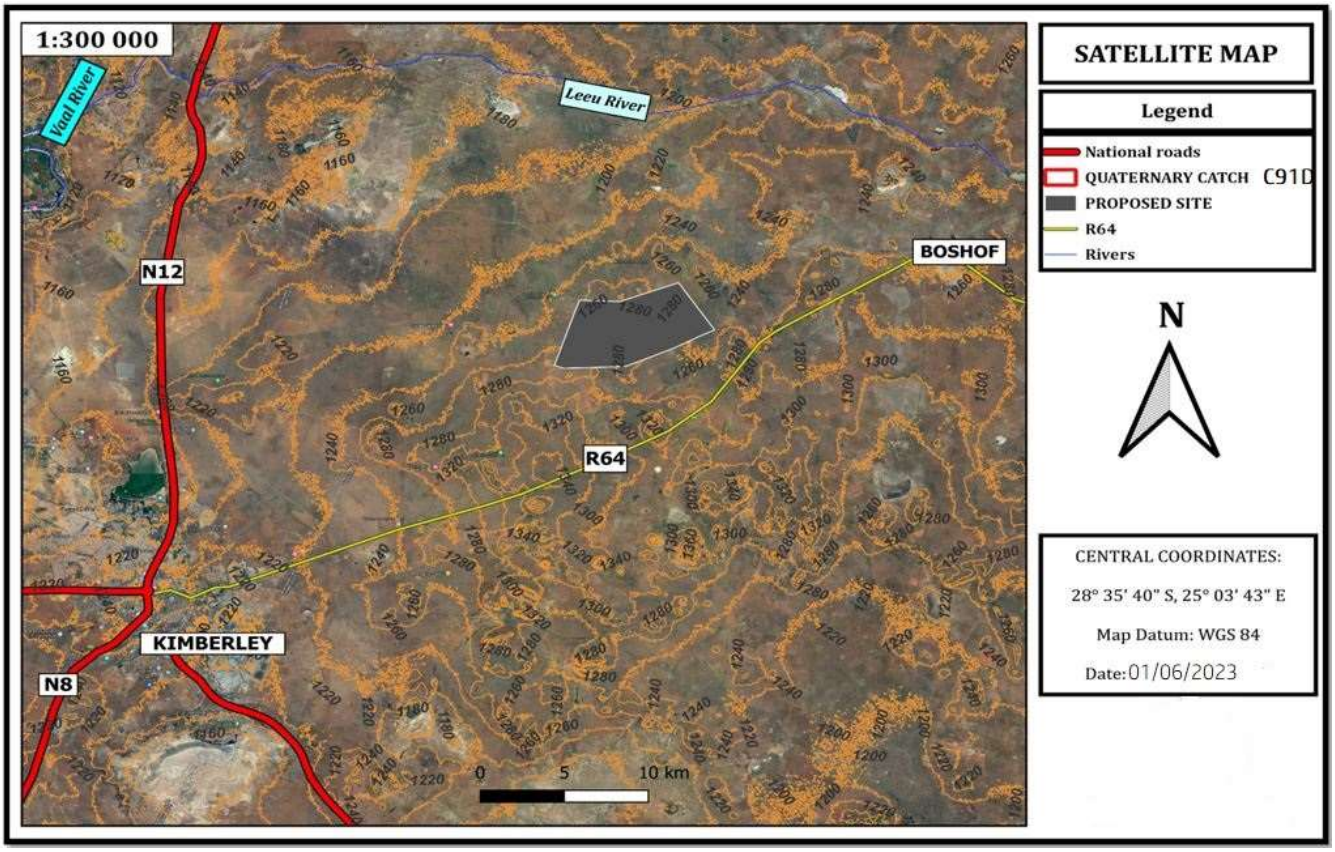


Figure 1: Locality map

1.5 Terms of reference

To conduct a Surface Water & Hydrological impact assessment of the development area.

The following terms of references are associated with this Surface Water & Hydrological investigation:

- The identification and demarcation of watercourses and wetlands present within the study area that are consistent with the definition of a watercourse in terms of the National Water Act, 1998 (NWA), Act No. 36 of 1998. The specific watercourse definitions focused on include:

    - A natural channel in which water flows regularly or intermittently.
    - A wetland, lake or dam into which, or from which water flows.
    - A river or spring.

1.6 General assumptions and limitations

1.6.1 General assumptions

- This study assumes that the project proponent will always strive to avoid, mitigate and/or offset potentially negative project related impacts on the environment, with impact avoidance being considered the most successful approach, followed by mitigation and offset. It is further assumed that the project proponent will seek to enhance potential positive impacts on the environment.
- GIS spatial datasets used as part of the desktop study (site demarcation) and analyses are accurate.
- The project proponent will commission an additional study to assess the impact(s) if there is a change in the size, location and/or extent of the study area that is likely to have a potentially highly significant and/ or unavoidable impact on the natural environment.

1.6.2 Limitations

The following refers to general limitations that affect the applicability of information represented within this report (also refer to the conditions of the Report):

- This report specifically focuses on the identification and classification of the various hydrological features characterising the study area.
- Accuracy of the maps, routes and desktop assessments is based on the current 1:50 000 topographical map series of South Africa;
- While every care is taken to ensure that the data presented are qualitatively

adequate, inevitably conditions are never such that that is possible. The nature of the vegetation, seasonality, human intervention etc. limits the veracity of the material presented.

- Hydrological assessments are based on a selection of available techniques that have been developed through the Department of Water and Sanitation (DWS) as well as the Water Research Council (WRC) based on site conditions and applicability. These techniques are however largely qualitative in nature with associated limitations due to the range of interdisciplinary aspects that have to be taken into consideration.
- Most of the watercourse systems located within the study area form part of larger systems expanding well beyond the focus area. Although their extent and down- / upstream nature and functions were taken into account, the focus of the study was restricted to the affected farm properties and the immediate surrounding landscape.
- This specific study area is affected by a variety of disturbances (historic and active) which restricts the use of available wetland indicators such as hydrophytic vegetation or soil indicators. Hence, a wide range of available indicators including historic aerial photographs are considered to help determine boundaries as accurately as possible.

2. CONDITIONS OF THIS REPORT

Findings, recommendations and conclusions provided in this report are based on the authors' best scientific and professional knowledge and information available at the time of compilation. No form of this report may be amended or extended without the prior written consent of the author. Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or make reference to this report. Whenever such recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety.

3. METHODOLOGY

3.1 DESKTOP ASSESSMENT

The assessment was initiated with a desktop study to gather hydrogeological data as well as information for evaluation and interpretation. The hydrogeological information was reviewed and assessed for relevance, to characterise the site, identify water features, and for hydrogeological characterisation.

A desktop study of the region was conducted using data obtained from the DWAF GRE2 project.

This report is not intended to be an exhaustive description of all the tasks performed, but rather a summary of the most important findings.

4. DESCRIPTION OF THE STUDY AREA

4.1 Geology

The project area is located within the Loxtonsdal kimberlite cluster which hosts two historical diamond mines. All known kimberlites in this cluster are of the Group II variety. The geology of the area belongs to Kalahari group, with red and grey Aeolian sand. The area is well known to be underlined by dolerite dyke, shale, siltstone and sandstone in isolated areas. Thirty percent of the area has calcrete as part of the underlying geology. The area is mostly covered by Karoo and doleritic intrusions as well as younger Tertiary and Quaternary surficial deposits. Historical unnamed small scale kimberlite diamond mine, 3 formally mapped kimberlite pipes and 3 more confirmed kimberlite bodies. Kimberlites protruded Ecca shales of Karoo sequence (Permian) and Jurassic dolerites.

4.2 Catchment Analysis

The existing river systems in relation to the proposed site are categorized in 3 Tiers as follows:

- Tier 1- Water Management Area No: 05.
- Tier 2- Quaternary Catchment: C91D.
- Tier 3- Site Specific Catchment Areas.

4.2.1 Water Management Area No: 05

The study area falls within water management area number 05– Vaal. WMA 05 includes the following major rivers Wilge, Liebenbergvlei, Mooi, Renoster, Vals, Sand, Vet, Harts, Molopo, and Vaal Rivers. Water management area 05 primarily drains in region C. Figure 4 shows water management area No. 05.

Figure 2: Water Management Area Map.

4.3 Significant Surface Water Resources

The Leeu River, a tributary of the Vaal River is the significant surface water feature in the vicinity of the site area.

4.3 Topography

The surrounding land is mostly natural veld. The slope of the area is relatively flat 0.2% with the occurrence of plateau. The site is situated on the Highveld of the inland plateau at an altitude OF 1200m-1400m above sea level.

4.4 Climate

Mean Annual Precipitation (MAP) is representative of the average rainfall that occurs over an area during any given year. This rainfall is obtained by taking the total rainfall received over time at a specific point including any extreme periods and/or events and averaging it.

The area of Boshof lies on 1280 m above sea level. The climate in Boshof is a local steppe climate. There is not much rainfall in Boshof all year long. The climate here is classified as BSh by the Köppen-Geiger system. The temperature here average is 18.6 °C. The annual rainfall is 500 mm**.**

July is the driest month, with 6 mm of rainfall and January experienced the greatest amount of precipitation with an average of 82 mm. The warmest month of the year is January, with an average temperature of 24.7 °C. The lowest average temperatures in the year occur in July, when it is around 10.5 °C. The difference in precipitation between the driest month and the wettest month is 76 mm.

Table 1, and **Figure 3** shows the climate graph.

Table 1: Average Weather by Month

Month	Avg. Temperature(°C)	Min. Temperature (°C)	Max.Temperature (°C)	Precipitation(mm)
January	24.7	18.1	31.2	82
February	23.6	17.7	30.2	75
March	22	16	28.4	68
April	17.8	11.5	24.3	46
May	14.2	7.77	21.2	19
June	10.6	3.9	18	12
July	10.5	3.3	18.3	6
August	13.5	5.6	21.6	11
September	17.1	9.4	25.8	16
October	21	12.9	28.8	38
November	22.7	14.9	30.2	56
December	24.3	13.2	31.3	68

Long-term Average	**18.6**	**10.5**	**24.7**	**500**

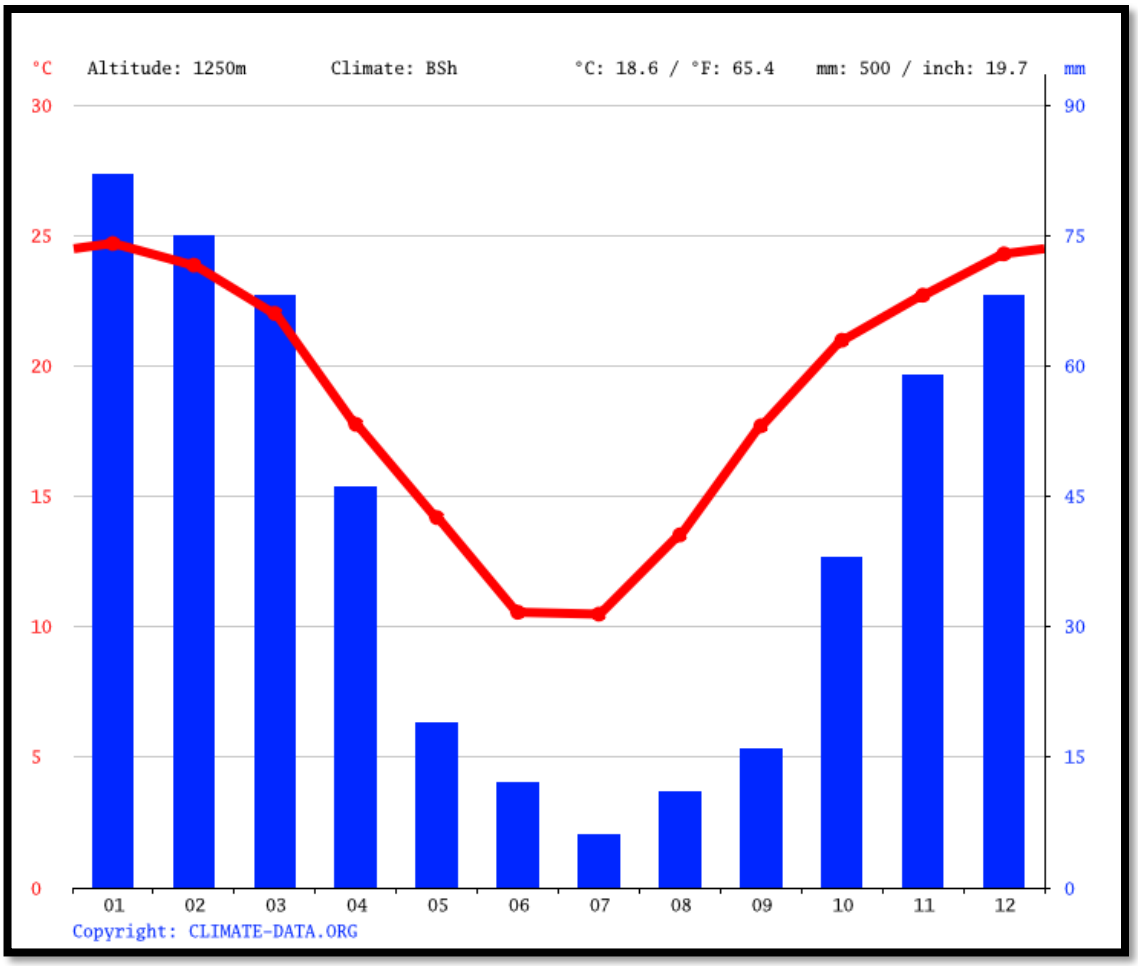


Figure 3: Climate Graph.

4.4 Hydrology

Drainage

The proposed site is in the Lower Vaal Management Area. The site is drained by means of run-off, with storm water collection towards the northwest and north of the site. No prominent surface drainage features are developed within the proposed site boundaries. See below Figure 6.

Figure 4: Lower Vaal Management Area

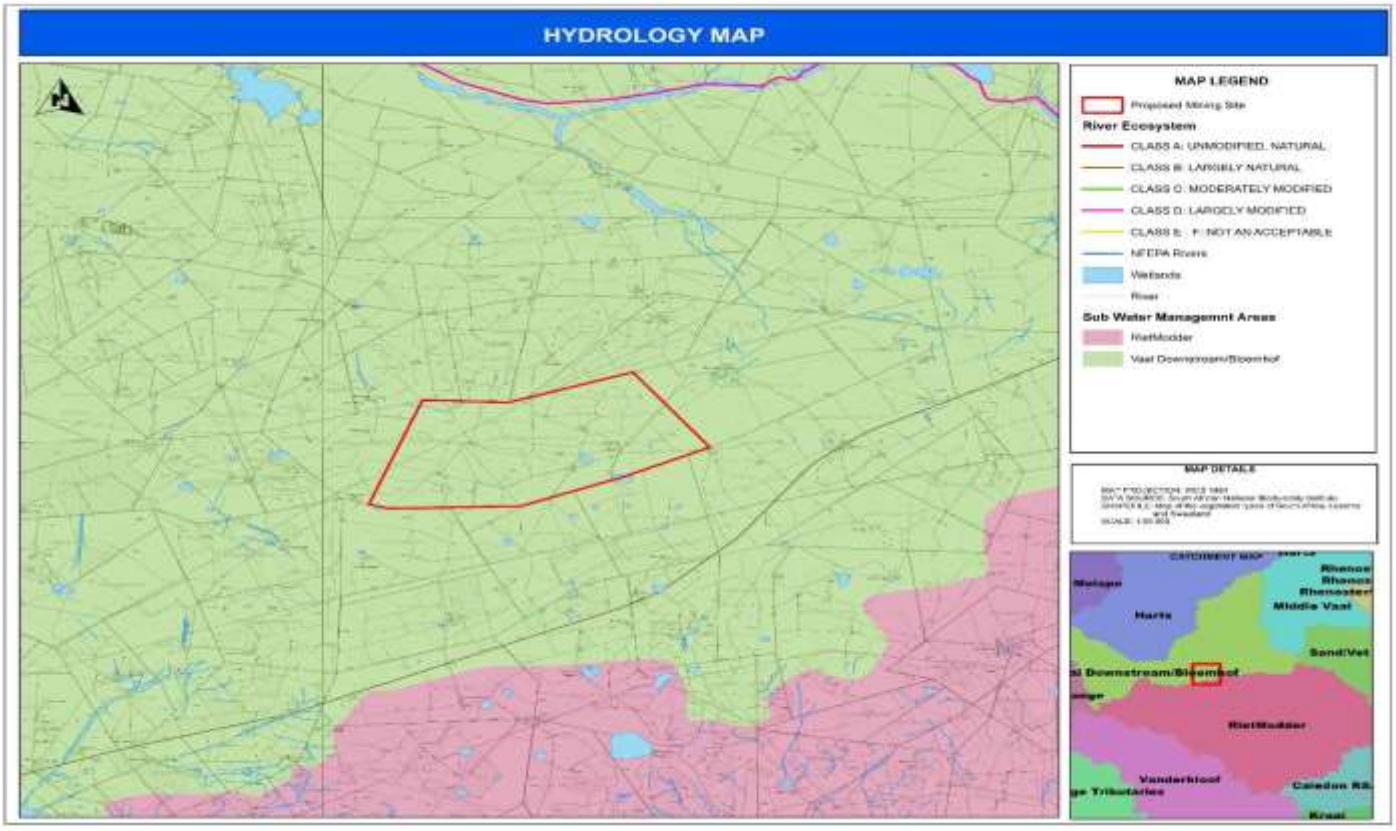
5.RESULTS

5.1 Leeu River Non-Perennial Watercourse & Riparian Fringe

The Leeu River, a tributary of the Vaal River is the significant surface water feature in the vicinity of the site area.

Figure 5: Hydrological map

The portion of the watercourse flowing through the urban area is characterised by a developed channel which may become relatively deep in areas. These deep channels



normally consist out of fine sand and silt and are normally devoid of vegetation (unstable conditions due to high velocity streamflow during rainfall events and the effects of erosion). Where flow velocities are not so intense the channels are normally shallower and may not even be prominent. These areas arenormally vegetated with a mixed grass and herb layer with numerous exotic plant species.

Plant species within these channels include:

Table 2: Plant species

Tall Trees	*Acacia erioloba*
Small Trees	*Acacia Karoo, A tortilis subsp. Heteracantha, Rhus lancea*

Tall Shrubs	*Tarchonanthus camphorantus , Diospyros pallens, Ehretia rigida subsp.rigida, Euclea crispa subsp. Ovata, Grewia flava, Lycium arenicola, Rhus tridactyla*
Low Shrubs	*Acacia Hebeclada subsp hebeclada, Anthospermum rigidum subsp pumilum, Hermannia comosa, Lycium pilifolium, Pavonia burchellii*
Graminoids	*Eragrostis Lehmanniana, Aristida canescens, A. Congesta, Cymbopogon pospischilii, Eragrostis rigidor, Heteropogon contortus, Themeda trianda*
Herbs	*Barleria macrostegia, Dicoma schinzii, Aloe grandidentata, Piaranthus decipiens*

As the river enters the adjacent town of Boshof, flow has been altered through the presence of a gravel dam. Downstream of this river structure (within the boundaries of the urban area and immediate downstream areas) the watercourse has undergone numerous alterations and transformations affecting the hydrology, geomorphology and vegetation structure.

Disturbances include:

- infringing urban expansion;
- trampling (both by humans and by livestock);
- hard surfaces surrounding the watercourse;
- overgrazing and removal of vegetation (severe grazing of the grassy river beds and riparian fringes and collection wood from the woody riparian fringe);
- invasion of invasive alien plant;
- illegal dumping of building rubble and general household waste; and
- localised deep erosion of channel beds and banks.

Due to these disturbances, the following on site alterations have occurred within the non-perennial watercourse:

- **Erosion**: Areas with deep eroded channels and relatively high banks (prone to bank erosion)

- **Increase in flow velocities**: Due to the removal of vegetation and channelisation of flowing water (e.g. deep eroded channels and through road culverts)
- **Change in peak flows**: Due to the removal of vegetation and deep channels, surface water flows rapidly away from these areas and therefore inundation occurs for a very short period.
- **Invasion with weeds and invasive plants**: Disturbed and overgrazed areas have been severely invaded with such plants.

This section of the Leeu River is characterised by a varying riparian fringe. Due to disturbances, much of this area has been transformed. Typically, this section is characterised by a relatively open tree cover (predominantly *Acacia karroo*) which may, where conditions are suitable, become very dense with an almost closed canopy (monotonous communities comprising out of almost only *A. karroo),* although such areas are small in extent and rather form isolated patches within the more open riparian fringe. Such a riparian fringe plays an important role in habitat diversity and buffer against severe flooding events. Due to the transformation of this habitat this area provides limited ecological functions.

Dominant vegetation of the riparian zone includes:

- **Trees**: *Acacia karroo, Searsia lancea, Ziziphus mucronate, Diospyros lycioides*
- **Weeds & Invading Plants**: *Eucalyptus camaldulensis, Nicotiana gluaca, Bidens pilosa*
- **Shrubs**: *Grewia flava, Asparagus suaveolens*
- **Dwaf Shrubs**: *Lycium hirsutum*
- **Herbs**: *Asclepias fruticose, Amaranthus spp., Chrysocoma ciliate & Pentzia incana*
- **Grasses**: *Cynodon dactylon, Setaria verticillata, Chloris virgata, Sporobolus fimbriatus, Tragus koelerioides, Urochloa panicoides, Aristida congesta, Eragrostis echinochloidea and E. lehmanniana.*

Disturbances within the riparian habitat include:

- Severe trampling and overgrazing with numerous footpaths traversing the area;
- Collection of wood;
- Invasion with invasive alien plant species;
- Removal of vegetation exposing areas to erosion;
- Infringing urban expansion.

The Present Ecological State scores (PES) for this portion of the watercourse and associated riparian fringe were rated as C/D (Largely modified) due to activities described above.

The preferred location for the mine is located outside these habitats. Due to the fact that construction and development within the riparian habitat will lead to further degradation of this habitat type it is suggested that the water course should be avoided at all times. Furthermore, even though the watercourse and riparian fringe in this section are highly degraded and transformed, these areas do still provide some valuable functions, such as habitat diversity, flow attenuation (although limited), grazing etc. and are subsequently regarded as High sensitivity areas.

5.2 Surface Water & Hydrological Sensitivity Analysis

5.2.1 Non-Perennial Watercourse & Riparian Fringe Upstream

Portion (Deep channel & Riparian Fringe)

Conservation status	» Moderate-High » Relatively moderate diversity, presence of keystonespecies/individual trees » Niche habitats » Some are species restricted to these areas.
Ecosystem function	» Limited absorption and reduction of occasional flash floods » Important corridor for abiotic and biotic material transfer » Keystone species maintain habitat and create specific microhabitats for a multitude of organisms » Herbaceous vegetation helps slow down floods, 'catch' sediments, and retain nutrients » Vegetation filters out possible pollutants to prevent their discharge into the Vaal River » A permanent vegetation cover is necessary to maintainthe functionality and stability of this ecosystem.
Stability	» Medium if the habitat is kept intact, despite the potential effect of occasional flash floods. » Excessive erosion, loss of seed resources, high undesirable invisibility and slow regeneration of natural vegetation will result from clearing this vegetation.
Reversibility of degradation	» Limited, slow and will be subject to high inputs of erosioncontrol and invasive species management.

Levels of acceptable Change	» Minimal change in the riparian fringe may be allowed. Apart from the decommissioning no additional activities and changes may be allowed within this riparian section. Therefore, ,mine should be included and should form part of the final layout as this option is located outside of the riparian fringe.

Rating » Moderate sensitivity

6.IMPACT ASSESSMENT

During the desktop impact assessment study, a number of potential key issues / impacts were identified and these were assessed based on the methodology supplied by Biomental Services (Pty) Ltd.

The following direct and indirect impacts were assessed with regard to construction, operation and decommissioning impacts on the riparian areas and watercourses:

- Impact 1: Loss of riparian systems and alluvial water courses
- Impact 2: Potential impact on localised surface water quality
- Impact 3: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function
- Impact 4: Increase in sedimentation and erosion.

The impacts were assessed as follows:

Construction & Decommissioning Phase Impacts

Impact Nature: Impact 1 – Loss of riparian systems and alluvial watercourses The physical removal of riparian zones within the footprint area and disturbance of anyalluvial watercourses, being replaced by hard engineered surfaces during construction.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Highly Probable (4)
Significance	**Medium (45)**	**Medium (36)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated?	Yes, to a limited extent	

Mitigation	» This potential impact can be avoided if all can be performed outside of any watercourse and riparian boundary. » No vehicles to refuel within watercourses / riparian vegetation. » Ensure the vegetation removal is minimised to an absolute minimum,restricted only to the footprint area.
Cumulative Impacts	Increase in the surface run-off velocities, reduction in thepotential for groundwater infiltration and the spread of erosion into downstream wetlands.
Residual Impacts	Possible impact on the remaining catchment due to changes in the run-off characteristics in the developmentsite.

Impact Nature: Impact 2 – Impact on localised surface water quality

During preconstruction, construction and to a **limited degree** the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cementpowder, wet concrete, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.

Appropriate ablution facilities should be provided for the construction workers during the construction phase of the mine and on-site staff during the operation phase of the mine.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (21)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	Medium	Low
Can impacts be mitigated?	Yes, to a large extent.	
Mitigation	» This potential impact can be avoided by sticking to the selecting the preferred are that is located well outside of any watercourse and riparian boundary .	

	» Implement appropriate measures to ensure strict use and management of all hazardous materials used on site. » Implement appropriate measures to ensure strict management of potential sources of pollutants (e.g. litter hydrocarbons from vehicles and machinery, cement during construction etc.). » Implement appropriate measures to ensure the containment of all contaminated water by means of careful run-off management on the development site. » Implement appropriate measures to ensure strict control over the behavior of construction workers. » Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.
Cumulative Impacts	None
Residual Impacts	Residual impacts will be negligible after appropriate mitigation.

Impact Nature: Impact 3 - Increase in sedimentation and erosion within the development footprint. This may alter the local watercourse morphology and influence water quality downstream.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Very Short (1)
Magnitude	Low (2)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	**Low (21)**	**Low (4)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes, to a large extent	
Mitigation	» This potential impact can be avoided by sticking to selecting the preferred are that is located well outside of any watercourse and riparian boundary. » Any erosion problems observed to be associated with the project infrastructure should be rectified as soon as possible and monitored	

	thereafter to ensure that they do not re-occur. » All bare areas, as a result of the development, should be revegetated with locally occurring species, to bind the soil and limit erosion potential. » Silt traps should be used where there is a danger of topsoil or material stockpiles eroding and enteringstreams and other sensitive areas. » Topsoil should be removed and stored separately and should be reapplied where appropriate as soon aspossible in order to encourage and facilitate rapidregeneration of the natural vegetation on cleared areas. » There should be reduced activity at the site after largerainfall events when the soils are wet. No driving off ofhardened roads should occur immediately following large rainfall events until soils have dried out and the risk of bogging down has decreased.
Cumulative Impacts	Downstream erosion and sedimentation of the downstream systems. During flood events, any unstable banks (erodedareas) and sediment bars (sedimentation downstream) may be vulnerable to erosion. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.
Residual Impacts	Altered streambed morphology, however due to the extent and nature of the development this residual impact isunlikely to occur.

Operation Phase Impacts

Impact Nature: Impact 4 - Impact on riparian systems during operation as a result of hard engineered surfaces and the removal of vegetation during construction. This couldpossibly increase the surface water runoff on the riparian form and function.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No

Can impacts be mitigated?	Yes, to a large extent

Mitigation	» Avoid the areas that will have an impact on the riparian habitat fringing the upper reaches (within the town boundary) of the Leeu River. » any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduced flow velocities. » Ensure the vegetation removal is minimised to an absolute minimum, restricted only to the footprint area.
Cumulative Impacts	Downstream erosion and sedimentation of the downstream systems. During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) may be vulnerable to erosion. However due to a low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.
Residual Impacts	Altered streambed morphology, however due to the extent and nature of the development this residual impact is unlikely to occur.

Cumulative Impacts

Cumulative Impact 1: Compromised ecological processes as well as ecological functioning of important habitats

Impact Nature: Transformation of intact habitats could potentially compromise ecological processes as well as ecological functioning of important habitats and would contribute to habitat fragmentation and potentially disruption of the habitat connectivity and furthermore impair their ability to respond to environmental fluctuations. This is especially of relevance for larger watercourses and wetlands serving as important groundwater recharge and floodwater attenuation zones, important microhabitats for various organisms and important corridor zones for faunal movement.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects within the area**
Extent	Local (1)	Local (1)
Duration	Long Term (4)	Long Term (4)
Magnitude	Small (1)	Small (1)
Probability	Highly Improbable (1)	Highly Improbable (1)
Status	Negative	Negative
Reversibility	High	High

Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	» The development footprint should be kept to a minimum and natural vegetation should be encouragedto return to disturbed areas. » Use existing service roads when crossing the watercourses. » Avoid placing pylons within the boundaries of the watercourses. » Avoid any activities within wetlands. » Avoid clearing the fringing shrubby vegetation associated with wetlands.	
Significance	**Low (6)**	**Low (6)**

7. ASSESSMENT OF HYDROLOGICAL IMPACTS (RISK ASSESSMENT)

7.1 RISK ASSESSMENT ACCORDING TO DWA RISK MATRIX FOR GENERAL AUTHORISATIONS

The impacts identified above are assessed according to the activities and aspects that may cause them. This is done for the construction and operation phase of the development.

Activities: Construction of the new proposed mine.

Phase: During the construction and operation phases.

Environmental Aspect: Generation of waste during construction and maintenance.

Environmental impact: This may lead to the pollution, eutrophication and general reduction in water quality and may potentially threaten downstream habitats and biota.

Aspect	Impact				Risk Rating	Borderline LOW MODERATE rating classes
	Severity	Consequence	Likelihood	Significance		
Hazardous wastes (Hydrocarbons and other chemicals)	2	7	7	49	**L**	N/A
Suspended solids (building rubble, concrete, stockpiled material)	2	6.75	7	47.25	**L**	N/A
Stockpiled topsoil	1	4.5	6	27	**L**	N/A

Sight Specific Mitigation:

» Refer to mitigation provided in Impact Assessment (Section 5)

Activities: Construction and maintenance of the mine.

Phase: During the construction and operation phases.

Environmental Aspect: Alteration and transformation of riparian fringe and catchment area

Environmental impact: Removal of riparian vegetation may lead to a loss of niche specific habitats, nesting sites for avifaunal species and food sources for faunal and avifaunal species. It may lead to an unstable vegetation cover around the mine and furthermore, result in these areas becoming unstable and prone to soil erosion, the invasion of invasive alien plants and further loss of ground cover. The hard surfaces and compacted soils associated with the mine will furthermore contribute to the effect of erosion, loss of vegetation and topsoil. This may in turn reach watercourses and decrease the water quality within downstream aquatic habitats through siltation.

Aspect	**Impact**					
	Severity	**Consequence**	**Likelihood**	**Significance**	**Risk Rating**	**Borderline LOW MODERATE rating classes**
Removal of riparian vegetation	2.75	7.75	6	46.5	**L**	N/A
Creation of hard surfaces & compacted soils	2.5	7.5	6	45	**L**	N/A

Sight Specific Mitigation:

» Refer to mitigation provided in Impact Assessment (Section 5)

Activities: Construction and maintenance of the mine.

Phase: During the construction and operation phases.

Environmental Aspect: Alteration and transformation of the riparian fringe and catchment area.

Environmental impact: Removal of vegetation may lead to an unstable vegetation cover around the mine and furthermore, result in these areas becoming unstable and prone to soil erosion, the invasion of invasive alien plants and further loss of ground cover. The hard surfaces and compacted soils associated with the mine will furthermore contribute to the effect of erosion, loss of vegetation and topsoil. This may in turn reach watercourses and decrease the water quality within downstream aquatic habitats through siltation.

Aspect	Impact				Risk Rating	Borderline LOW MODERATE rating classes
	Severity	Consequence	Likelihood	Significance		
Removal of vegetation	1.25	5.25	4	21	**L**	N/A
Creation of hard surfaces & compacted soils	1.25	5.25	4	21	**L**	N/A

Sight Specific Mitigation:

» Refer to mitigation provided in Impact Assessment (Section 5)

8. DISCUSSION AND CONCLUSION

Based on the results obtained during this desktop study the following conclusions can be drawn:

- The only natural wetlands within the larger environment are small, endorheic (closed depressions) pans. These depressions form due to micro-topography variations of the underlying substrates (shallower soils over calcrete), giving rise to low grasslands on pan bottoms (may even be devoid of vegetation). None of this depression (pan) structure were identified within the study area of the proposed mine.

- This portion of the watercourse as well as its associated riparian fringe (dominated by *Acacia karroo*) has been severely altered and transformed due to:
    - ✓ Severe trampling and overgrazing with numerous footpaths traversing the area;
    - ✓ Collection of wood;
    - ✓ Invasion with invasive alien plant species;
    - ✓ Removal of vegetation exposing areas to erosion;

The Present Ecological State scores (PES) for this portion of the watercourse and associated riparian fringe were rated as C/D (Largely modified) due to the activities described above.

- From the Risk Assessment, the following results were obtained:

Activity	Phase	Environmental Aspect:	Risk Rating	Borderline LOW MODERATE rating classes
Construction of mine.	Construction- & Decommissioning phase	Hazardous wastes (Hydrocarbons and other chemicals)	**L**	N/A
		Suspended solids (building rubble, concrete, stockpiled material)	**L**	N/A
		Stockpiled topsoil	**L**	N/A
		Application of herbicides	**L**	N/A
Construction and maintenance of mine and transformation of riparian fringe and catchment area	During the construction and operation phase.	Removal of riparian vegetation	**L**	N/A
		Creation of hard surfaces &compacted soils	**L**	N/A
Construction and maintenance of mine.	During the construction and operation phase.	Removal of vegetation	**L**	N/A
		Creation of hard surfaces &compacted soils	**L**	N/A

From the Surface Water & Hydrological Study no objections or motives for the project not to proceed was determined, and therefore the development may occur within the proposed development boundaries.

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