7. PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED ALTERNATIVE

7.1 MITIGATION HIERARCHY

Implementing the mitigation hierarchy is crucial when considering alternative sites and alternative infrastructure layouts.

The mitigation hierarchy is defined as:

- **Avoidance:** measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.
- **Minimisation:** measures taken to reduce the duration, intensity and / or extent of impacts (including direct, indirect, and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.
- **Rehabilitation/restoration**: measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised.
- **Offset:** measures taken to compensate for any residual significant adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve no net loss (NNL) or a net gain (NG) of biodiversity . Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation, or averted risk, protecting areas where there is imminent or projected loss of biodiversity.

7.2 DETAILS OF ALL ALTERNATIVES

This section describes land use or development alternatives, alternative means of carrying out the operation, and the consequences of not proceeding with the proposed Jindal MIOP.

The main project alternatives considered include:

- Locality;
- Site alternatives;
- Activity alternatives;
- Design or Layout alternatives;
- Transportation of product; and
- The “no-go” alternative.

7.2.1 Locality

Jindal was granted Prospecting Rights by the then Department of Mineral Resources (DMR) on 26 August 2011 for the North Block (PR 10644) and South Block (PR 10652) and have a total combined area of 20 170 ha. Jindal undertook drilling and exploration activities on the study area to determine the presence of a viable iron mineral resource. Following the completion of the drilling and exploration activities, the presence of an iron ore body was confirmed within the study area. As a result, Jindal investigated the feasibility of developing an iron ore mine within the study area. Consequently, no further location alternatives were considered for the Jindal MIOP as the location of the mine is restricted by the presence of the ore body.

An assessment was undertaken to determine the viability of mining the North vs the South Block first (Table 7-1, Figure 7-1). Due to difficulties with access to the North Block significantly more baseline work and detailed design has been done for the South Block. In addition, the South Block has better established access roads, is closer for water supply from the Goedertrouw Dam, has existing Eskom power lines that run past the preferred processing plant area and is the most accessible to the Nkwalini Siding (proposed for concentrate transport to Richards Bay).

The current mine plan is to undertake initial Phase 1 mining in the south-eastern section of the South Block and once established would at a later stage progress into the North Block.

Table 7-1 North vs South Block

	North Block	South Block - Preferred
Description	North Block (PR 10644)	Description
Advantages		Existing access into the area. Water supply more easily accessible. Easiest access to the existing road and rail routes. Existing power supply.
Disadvantages	Longer distance from access routes.	Numerous communities in the area.

7.2.2 Design Alternatives

Various scenarios for production rate have been assessed by A&B Global Mining (ABGM) in 2021, these were 20, 24, 28 and 32 mtpa (Table 7-2). Detailed planning for a 25 year LoM shows that each of these is a viable option for this iron ore resource.

Table 7-2 ROM Schedule of Four Assessed Scenarios (total over 25 year mine schedule)

Mtpa	Rock (Mt)	In situ Ore (Mt)	Waste (Mt)	RoM Ore (Mt)	Stripping Ratio (t/t)	Concentrate (Mt)	Average Yield
20	661.38	496.94	164.44	487.00	0.34	119.23	24.5%
24	817.59	596.33	221.26	584.40	0.38	140.86	24.1%
28	996.31	695.72	300.59	681.80	0.44	161.01	23.6%
32	1 203.76	795.10	408.66	779.20	0.52	182.01	23.4%

The generation of the schedules demonstrates, from a mining perspective, that 32 mtpa ROM is a practical limit to the production capacity of the resource (ABGM, 2021). With an average stripping ratio of 0.52, this equates to an annual rock movement of approximately 50 Mt. At this scale of operation the average concentrate production rate would be 7.5 mtpa. This volume of concentrate makes the project economically viable.

7.2.3 Site Layout Alternatives

The options for alternative placement of the processing plant and the WRD were greatly restricted due to the mountainous terrain but a minimum of two layout alternatives have been studied for the components discussed in this section. Additional layout alternatives will be assessed, where required, as part of the EIA Phase based on more detailed baseline work.

7.2.3.1 Waste Rock Dump Alternatives

Two alternative WRD sites were assessed (Table 7-3, Figure 7-1).

Table 7-3 Alternative WRD Locations

	WRD 1 - Preferred	WRD 2
Advantages	Closer to the primary crusher. Sufficient capacity for Phase 1 of mining. Visually would be less intrusive as it is proposed within a valley.	Smaller footprint than WRD 1.
Disadvantages	Footprint within a valley and intersects with large portions of Medium to Very High SEI vegetation communities resulting in direct physical habitat loss. Likely to impact watercourses in the area.	Insufficient capacity for the proposed 32 mtpa mine. WRD 2 also intersects with proposed terrestrial 'no go' areas. Visually more intrusive as it would have been situated at a higher altitude than WRD 1. Likely to impact watercourses in the area.

WRD 1 is the preferred site largely due to the greater capacity.

7.2.3.2 Processing Plant Alternatives

Two processing plant and primary crusher layout options were considered as can be seen in Table 7-4 and Figure 7-1.

Table 7-4 Alternative Plant Layouts Considered

	Plant 1	Plant 2
Advantages	Closest to the Eskom high voltage transmissions lines. Sufficient area of reasonably flat topography thus requiring less earth works and consequent disturbance for borrow material sourcing. Can be serviced by access road that also gives access to the mine pit. Closest to the pit and the preferred WRD area. Enables concentration of infrastructure and vehicle movement to a smaller area than Plant 2.	Closer to Nkwalini Siding for concentrate transport. Closer to Goedertrouw Dam for water supply.
Disadvantages	Further from the Nkwalini Siding for concentrate transport.	Further away from the pit area requiring further distances for transporting RoM. Requires more earth moving activities therefore generating additional impacts and costs.

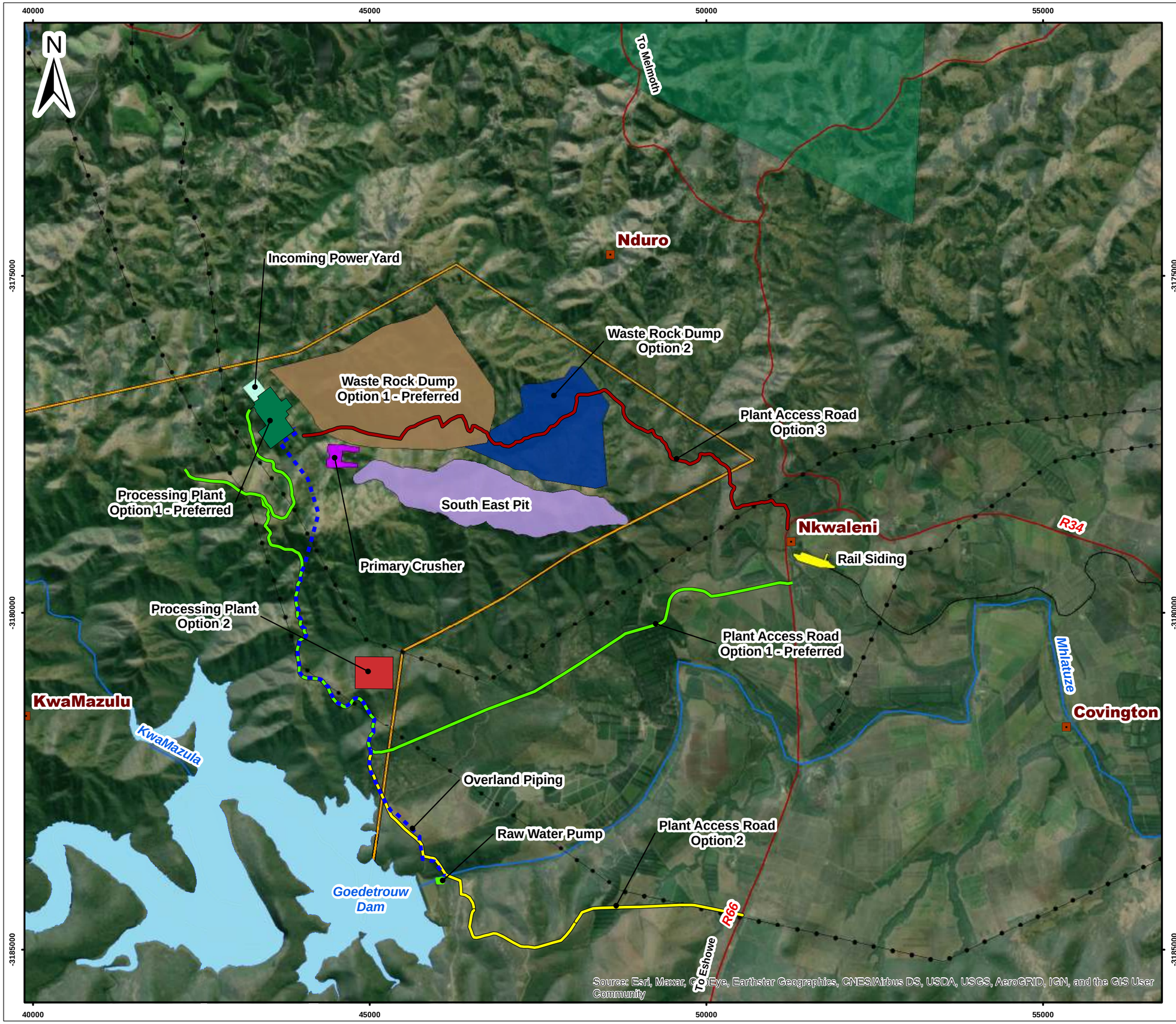
7.2.3.3 Access Road Alternatives

Three access roads have been considered for the Jindal MIOP and are included in Figure 7-1. The advantages and disadvantages of each are discussed in Table 7-5.

Table 7-5 Alternative Access Roads Considered

	Access Road 1 - Preferred	Access Road 2	Access Road 3
Description	Access from the south side of the pit, cut through privately owned land to the R66.	Access from the south side of the pit, crossing the Goedertrouw dam wall and joining the R66 further to the south than Option 1.	Access from the north side of the pit from the R66.
Advantages	There are fewer individual households on this road. Shorter distance to Nkwalini Siding. The road is further away from the Goedertrouw Dam and therefore has a lower impact on potential tourism use. The capital cost was estimated at R243 million which was the cheapest option. Follows the proposed water supply pipeline servitude for 4-5 km.	A gravel road is currently in existence therefore less clearing and earthworks required	The road is the shortest distance 12km compared to Option 1 which is 16 km.
Disadvantages	There is no existing road so additional clearing and construction would be required. Land will need to be acquired from individual landowners.	The road passes directly next to Shakaland, a tourist destination. Would require upgrading the Goedertrouw Dam wall to be able to accommodate large trucks and heavy loads. This road would require a longer distance to be travelled to the Nkwalini Siding.	Requires two river crossings and major culvert and embankment works due to the severe topographic conditions. The capital cost was estimated to be R405 million.

Access Road 1 is the preferred option due to a more direct access to the Jindal MIOP and has significantly less major engineering work required. In addition, it follows the water supply pipeline servitude and therefore minimises areas required to be cleared.



Legend

- Towns / Villages
- Roads
- Railway Line
- Power Line
- Rivers
- Dams
- South Block Prospecting Right Area
- North Block Prospecting Right Area

Options Considered

- Access Road Option 1 - Preferred
- Access Road Option 2
- Access Road Option 3
- Processing Plant Option 1 - Preferred
- Processing Plant Option 2
- Waste Rock Dump Option 1 - Preferred
- Waste Rock Dump Option 2

0 1 2 Kilometers

Scale: 1:54 500 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

Jindal Iron Ore (Pty) Ltd

Figure 7-1

Alternative Site Layout Options Considered

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

720.10023.00001 | 2022/02/04

7.2.4 Activity Alternatives – Open Pit vs Underground Mining Method

The type of mining method selected for implementation is dependent on a number of environmental factors such as topography, geology and stability of the area, and depth and orientation of the mineral resource. Technical factors taken into consideration when selecting a preferred mining method are included in Table 7-6.

Table 7-6 Open Pit/Underground Trade-off

Criteria	Underground	Open Pit	Recommendation
Pre-production capital	2 Inclined shaft complexes	Out cropping ore, low pre-strip	Open Pit
Maximum production capacity estimate	+-4Mtpa ROM	20-32Mtpa ROM	Open Pit
Mining Cost	US$27.59/t ROM	US$5.33/t ROM	Open Pit
Infrastructure required	Backfill plant/Lack of Material	None	Open Pit
Extraction	+-70%	100%	Open Pit
Stripping Ratio	N/A	0.5	Open Pit
Mineability	Challenging (BIF)	Established mining operations	Open Pit
Mine surface disturbance (relocation)	Not excluded but not total	Total	Underground
Time to develop to full production	+-3 years (slow build up)	+-2 year (ore produced from day one)	Open Pit
Closure commitments	Long term responsibility	Established closure procedure	Open Pit
After closure utilisation	None	Fresh water storage and supply	Open Pit

Source: A&B Global Mining (ABGM) (2021)

According to ABGM (2021), in order to match an open pit production capacity of 20 mtpa ROM, 10 inclined shaft complexes would be required for an underground mining operation, each made up of three inclined shafts. Each would have to be approximately 750m in length to access the whole orebody. At an estimated cost of US$3 400/m for sinking and equipping the capital cost of these excavations would be approximately US$77 million. This can be compared with a minimal pre-strip for open pit access as the geological model shows the orebody outcrops at surface.

The decision matrix in Table 7-6 and the estimated capital cost difference show that the open pit mining method is the preferred method in terms of economics.

7.2.5 Transportation Alternative

Three different methods of transporting iron ore concentrate to Richards Bay have been considered. These include rail, road and pipeline. These will be further assessed under a separate EA.

7.2.6 The 'No-Go'

The "no-go" alternative would result in the south-east section of the South Block remaining in its current state without mining operations being established onsite. Potential positive benefits of this are that the natural environment would not be impacted upon, water resources would not need to be physically impacted, ecological process would not be affected and mining operational impacts such as dust, noise etc would not be generated.

However, as discussed in Section 5.2, given the nature of the grazing across the sub-region the primary intact grasslands could to some extent already be degraded/ transformed through increased anthropogenic pressures such as grazing and too frequent burning. Ongoing engagement with local stakeholders and the development of a sustainable grassland management programme will be critical in ensuring that remaining intact primary grassland is not further degraded. These programmes could be implemented under the EMPr for the Jindal MIOP which would not occur if the Jindal MIOP does not go ahead.

Furthermore, the iron ore body identified within the area would remain unmined and the benefits (Section 5.3) associated with the establishment of mining operations and alignment with objectives laid out in the various national, provincial and local development plans would remain unrealised. Economic benefits would not be derived through wages, taxes, and profits at a local, provincial, and national level. Additionally, no indirect economic benefits would be derived through the procurement of goods and services, enhancement of socio-economic benefits for employees and members of the surrounding communities and career progression, mentorship plans, internships, and bursaries as a result of the SLP implementation. The local communities would continue with life as they know it with no additional impact to the natural receiving environment. There would be no need for residents within the mining area, prospecting site, or exclusionary buffer zones to be resettled. The 'Status Quo' would remain.

7.3 DETAILS OF THE PUBLIC PARTICIPATION PROCESS

This section describes the PPP that has been undertaken to date, and pending PPP activities in line with Chapter 6 (regulations 39 to 44) of the EIA Regulations (2014), as amended (2021). The intention of the PPP is to inform and engage with I&APs, in sufficient detail, so that they may contribute meaningfully to the EIA process.

The PPP followed is detailed in the sections below.

7.3.1 Scoping Phase Public Participation Process

The Scoping Report was made available for public review through the methods listed below:

- On the SLR website and a zero-data website; and
- Physical locations (Libraries and locations which are acceptable to the King, Izinduna/ Traditional Leaders and the wider community).

A Non-Technical Summary (NTS) was also made available, which summarised the proposed Jindal MIOP Scoping Report including the project description, potential identified impacts and the plan of study for the EIA. The NTS was made available in English and isiZulu.

7.3.2 Pre-Application Meeting with the DMRE

A pre-application meeting was held with the DMRE on 03 March 2021 (see Appendix E1 for the meeting minutes). The purpose of this pre-application meeting was to provide notification of Jindal's proposed application for the Jindal MIOP and to confirm the legislative requirements and the approach to the EA processes. Furthermore, SLR discussed the stakeholder engagement plan with the DMRE to obtain their advice and input on the requirements and approach to public participation. The DMRE approved the stakeholder engagement plan on 15 March 2021 (see Appendix E2).

7.3.3 Pre-Application Public Participation Process

Although not a legislated requirement of the EIA Regulations 2014, a pre-application PPP was undertaken. This notified landowners and other key stakeholders of the proposed project and provided potential I&APs with an initial opportunity to raise any up-front issues or concerns regarding the proposed project. Steps undertaken during the pre-application PPP are summarised in the sections below and all supporting information is presented in Appendix E of this report.

All written comments received have been collated, and responded to, in a Comments and Responses Report (CRR) (Appendix E3). The CRR will be continuously updated throughout all phases of the EIA process.

7.3.4 Interested and Affected Parties (I&AP) Database

As part of the PPP an I&AP database has been developed for the project. I&APs identified for the project include:

- Authorities (including the Entembeni Traditional Council, community leaders, State Departments with jurisdiction in the area, municipal offices and ward councillors);
- Landowners/residents, lawful occupiers, land users (within and adjacent to the application area);
- Community forums and action groups;
- Non-Government Organisations and associations and Non-Profit Companies working in the area;
- Businesses in the area;
- Parastatals;
- Service Providers; and
- Other key stakeholders

The latest copy of the I&AP database is included in Appendix E4. The database will be updated on an ongoing basis throughout the EIA process. Additional I&APs were added to the database following responses to the advertisements, Background Information Document (BID) notifications and attendees at Community, Key Stakeholder and Public Information Meetings. If there are any additional I&APs that should be included in the I&AP database, please notify SLR and/or send SLR their contact details to:

SLR Consulting
Gugu Dhlamini
Tel: (011) 467 0945
Cell: 066 082 3687
Fax: (011) 467 0978
gdhlamini@slrconsulting.com
PO Box 1596, Cramerview 2060

7.3.5 Notification to Landowners

All landowners for whom contact details were obtained were notified of the application and S&EIA process by means of a Background Information Document. This was sent via email, post or fax. An SMS was sent to those landowners for whom only a cell number was available. Proof of all I&AP notification is provided in Appendix E5. The list of landowners that have been notified of the project is provided in the I&AP database (Appendix E4).

It was not possible to source contact information for all landowners and occupiers, however, every effort was made to contact all stakeholders in the process as is outlined in the following sections. The task of notifying landowners and occupiers will be on-going during the course of the EIA process.

7.3.6 Background Information Document

On 17 June 2021 all identified I&APs were notified of Jindal's intent to apply for a Mining Right and Environmental Authorisation, and the start of the S&EIA process by means of a BID which was distributed by post and email. The purpose of the BID was to convey initial information on the proposed project, outline the environmental regulatory process, the S&EIA process and the baseline environment of the site as well as to invite I&APs to register on the project database and provide initial comment. The BID was also made available, in English and isiZulu, at all the community and stakeholder meetings.

Due to the implementation of the COVID-19 adjusted Alert Level 4 Restrictions from 28 June to 25 July 2021, which prohibited gatherings to address, prevent and combat the spread of COVID-19, the physical public information meeting which was scheduled to take place on 30 June 2021 was postponed to 18 August 2021. In that regard, a second round of BID notifications was done detailing the new date of the public meeting, following the easing of COVID restrictions. Additionally, the BID comment period was extended from end of July to the end of August 2021. Copies of both versions of the BID are included in Appendix E6. I&AP correspondence received during the BID comment period is presented in Appendix E7.

7.3.7 Stakeholder information sharing meetings

SLR and Jindal met with the Entembeni Traditional Council on 15 June 2021 to announce the Jindal MIOP and to propose dates to hold community information sharing meetings in the directly affected and adjacent project areas. The proposed dates from 21 June to 2 July 2021 were accepted by the King and the community izinduna/traditional leaders. The first round of community information sharing meetings were, however, only held for one week during the week of 21 June to 25 June 2021. This was as a result of the implementation of the COVID-19 adjusted Alert Level 4 Restrictions from 28 June to 25 July 2021. Following the easing of the COVID-19 restrictions, the second round of community information sharing meetings resumed from 16 August to 22 August 2021.

Other key stakeholders, including State Departments; Forums; Associations and Trusts, were also consulted (both virtually and physically) during the two weeks of stakeholder engagement. Furthermore, the virtual and physical public information meetings were also held within those two weeks, 06 July and 18 August 2021.

The purpose of the stakeholder information sharing meetings was to reintroduce the Jindal MIOP and introduce the environmental authorisation process to be followed for the project. Opportunity was provided to stakeholders to raise any issues or concerns. The BID was distributed to attendees during the

meetings. All attendees from the engagements have been added to the I&AP database. All meeting notes (including the presentation and attendance registers) as well as meeting photos are presented in Appendix E8. I&AP comments received at the information meetings are also presented in the CRR (see Appendix E3).

7.3.8 Advertisements and Site Notices

Newspaper advertisements providing notification of the mining right application and the S&EIA process, details of EAP to be contacted for further information and details of the public meetings to be hosted were placed in the following newspapers on:

- The Mercury, 15 June 2021, English;
- Eyethu Baywatch - 16 June 2021, English;
- Isolezwe - 18 June 2021, isiZulu; and
- Zululand Observer - 21 June 2021, English

Site notices with the same information as the adverts were placed at conspicuous locations in the towns of Melmoth and Eshowe, these locations included:

- Melmoth - BP Driving School
- Melmoth - Luthuli Store (next to Mehlamasha Combined School)
- Melmoth- Nogajuka Clinic
  Melmoth - Nogajuka Primary School
- Melmoth -Ndundulu Store
- Melmoth – Public Library
- Melmoth- Kwa Shange Store (Ndundulu area)
- Melmoth- Emthonjaneni Sanguye Traditional Court
- Melmoth - Obuka Traditional Court
- Melmoth- Thubalethu Location
- Melmoth - Early Childhood Centre next to Jindal Offices
- Melmoth- Nkwaleni Store
- Melmoth - Sitheku School (Ndabazensangu)
- Melmoth- Local Store
- Melmoth – Shoprite
- Melmoth - Boxer Superstore
- Eshowe- King Dinizulu Township Public Library
- Eshowe – The Atrium Shopping Mall
- Eshowe -Checkout Shop
- Eshowe -Pick & Pay
- Eshowe -Spar
- Eshowe - Public Library (Town)
- Eshowe - Maqhinga Store (King Dinizulu Township)
- Eshowe - uMalazi Local Municipality

Radio advertisements with key project information were aired on the following radio stations:

- Icora 100.40 fm – 15 to 19 June 2021; and
- Izwi Lomzansi 98.0 fm – 21 to 23 June 2021.

Proof of the newspaper and radio advertisements (log sheets) as well as the placement of site notices is included in Appendix E9.

7.3.9 Review of the Scoping Report

This Scoping Report was distributed for a 30-day comment period from 16 February to 18 March 2022 in order to provide I&APs an opportunity to comment on any aspect of the project and the findings of the S&EIA process to date.

7.3.10 Summary of issues raised by I&APs

The issues and concerns raised by I&APs and regulatory authorities during the pre-application phase to date have been compiled into a CRR (see Appendix E3). Also included in the CRR are responses to the questions or issue raised as well as where these will be addressed.

Copies of all written comments received from I&APs are included in Appendix E7. Comments continue to be received from I&APs and those received after this report is submitted to the DMRE will be included in the EIA Report.

The main themes to come out of the PPP thus far are summarised in Table 7-7.

Table 7-7 Summary of Comments from I&APs

#	Key Issue	Where addressed in the EIA
1	**Community relocation** Will communities need to be relocated?	A Resettlement Action Plan will be undertaken at such a stage as when the Jindal MIOP has been granted Environmental Authorisation. This is a highly regulated process and will involve a significant stakeholder engagement process during the planning phases and prior to any relocation being undertaken.
2	**Health impacts** What will the health impact from the Jindal MIOP on the communities, workers (occupational health) and the environment?	A Health Impact Assessment is proposed to understand potential impacts on community health. In addition, air quality and noise impact assessments will be undertaken to understand any impacts to human health. Impacts on the environment (flora and fauna) will be assessed through the Biodiversity specialist studies. Specific mitigation measures will be recommended in order to mitigate the impacts. The necessary Occupational Health and Safety requirements for workers will be stipulated in the EMPr. See Section 8.3 for more detailed Terms of Reference for the Health Impact Assessment.
3	**Impacts on agriculture** Will the Jindal MIOP impact on agriculture which is very important in this area.	This will be addressed as part of the Soils and Agricultural Potential Impact Assessment, and where required relevant mitigation measures will be recommended. Other impacts due to potential water and air quality aspects will also be considered by the various specialists. See Section 8.3 for more detailed Terms of Reference the Soils and Agricultural Potential Impact Assessment, Surface and Groundwater and Air Quality.
4	**Job opportunities and training for local people** Most of the employment and SME's should be for the local communities Mthonjaneni municipal area. The community must be provided with training to be able to do higher level jobs rather than only being general workers.	This will be addressed as part of the Social Impact Assessments, where the number of jobs that will be created will be made explicit, together with Jindal's commitment and plans to use local labour and to train local labour. Specific recommendations will be made to enhance these benefits. See Section 8.3 for more detailed Terms of Reference the Social Impact Assessment.
5	**Influx of job seekers** How will the influx of job seekers be managed?	The impact of a potential influx of job seekers will be addressed as part of the Social Impact Assessments. Specific mitigation measures will be recommended in order to mitigate the impacts.

#	Key Issue	Where addressed in the EIA
		See Section 8.3 for more detailed Terms of Reference the Social Impact Assessment.
6	**Process of employing job seekers and SME's** The job and training opportunities must be advertised properly to the communities so that the people have a fair chance of applying and getting a job. Local SME's should be given the opportunity to do work.	The Social Impact Assessment will provide detailed recommendations as to how to maximise local social benefits, together with Jindal's commitment and plans to use local labour and to train local labour. See Section 8.3 for more detailed Terms of Reference the Social Impact Assessment.
7	**Opposition from some stakeholders/ I&AP's** Certain communities do not support the project and support the No-Go option.	The lack of support of the project is noted by the Jindal management who is actively engaging with all relevant stakeholders in the area.
8	**Graves and other heritage sites** What will happen to our ancestral graves and other heritage sites in the area?	A Cultural Heritage and Palaeontological Study will be undertaken to identify any sites in the area. Should these sites fall within areas to be relocated stringent mitigation would be applied and relevant protocols would need to be implemented and followed in consultation with the affected families. In addition, any relocation of graves would be considered as part of the Relocation Plan. See Section 8.3 for more detailed Terms of Reference for the Cultural Heritage and Palaeontological Impact Assessment.
9	**Environmental impacts** 1. Dust pollution/generation 2. Loss of biodiversity 3. Water resource stress 4. Water contamination 5. Soil contamination	Various impact assessment studies will be undertaken by the relevant specialists to assess each of these aspects and to recommend suitable mitigation and management measures. See Section 8.3 for more detailed Terms of Reference for all proposed specialist studies.
10	**Water Resources** What is the potential impact on groundwater and surface water availability and possible contamination?	Both ground and surface water impact assessments will be undertaken. See Section 8.3 for more detailed Terms of Reference for both the Ground and Surface Water Impact Assessments.

#	Key Issue	Where addressed in the EIA
11	**Community benefits** Will benefits from the Jindal MIOP go to affected communities and be fairly distributed?	As part of a Mining Right Application a proponent is required to submit a SLP which through the social interventions can positively contribute to the LED interventions of the local municipalities, which in turn should deliver benefit to the communities directly affected by the Jindal MIOP.
12	**Impacts on sensitive biodiversity** This area contains sensitive biodiversity features including critical biodiversity areas, freshwater habitats, sensitive vegetation types, and flora and fauna of conservation significance.	As part of the process both aquatic and terrestrial biodiversity specialist studies and the related impact assessments will be undertaken. Potential impacts on wetland areas will also be assessed and management measures recommended.
13	**Water abstraction** Where will water for mine water supply be obtained from?	It is understood that the extraction of water from the Goedertrouw dam is a critical issue and this will be properly assessed. It should also be noted that in order to abstract water from the Goedertrouw Dam this would need to be licensed by the DWS.

7.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITE

The baseline information is aimed at outlining the existing status of the biophysical, cultural and socio-economic environment. Baseline information for this Scoping Report draws extensively on information contained in reports from specialist studies conducted for the Jindal MIOP. More detailed information will be provided in the EIA report, once the specialist studies commissioned for this project have been concluded. For the purpose of this section, project areas refer to the Jindal MIOP.

The NEMA EIA Regulations 2014, as amended (GNR 982) requires that the section below describes the baseline environment for all project related activities and alternatives.

7.4.1 Climate

7.4.1.1 Local Climate

Mthonjaneni Local Municipality has a warm and humid subtropical climate, which is favourable for the extensive agricultural activity in the region. This allows the production of sugarcane and largescale forestry activities. Mthonjaneni Local Municipality experiences average daily temperatures of between 16℃ and 20℃, and average rainfall of between 2 000 mm and 2 400 mm per annum (Promethium, 2021).

The project site climate data was obtained from the Water Resources Study (WR2012) (WRC, 2021), which documents the climatic and catchment information of each quaternary catchment (QC) in South Africa. The average hydro-meteorological parameters were calculated for quaternary catchments W12B and W12D. The site's Mean Annual Precipitation (MAP) for quaternary catchments W12B and W12D are 932 mm and 848 mm, respectively. The Mean Annual Evaporation (MAE) for the two quaternary catchments are 1 400 mm and 1 350 mm. The evaporation in the area is relatively higher than the amount of rainfall than this catchment receives.

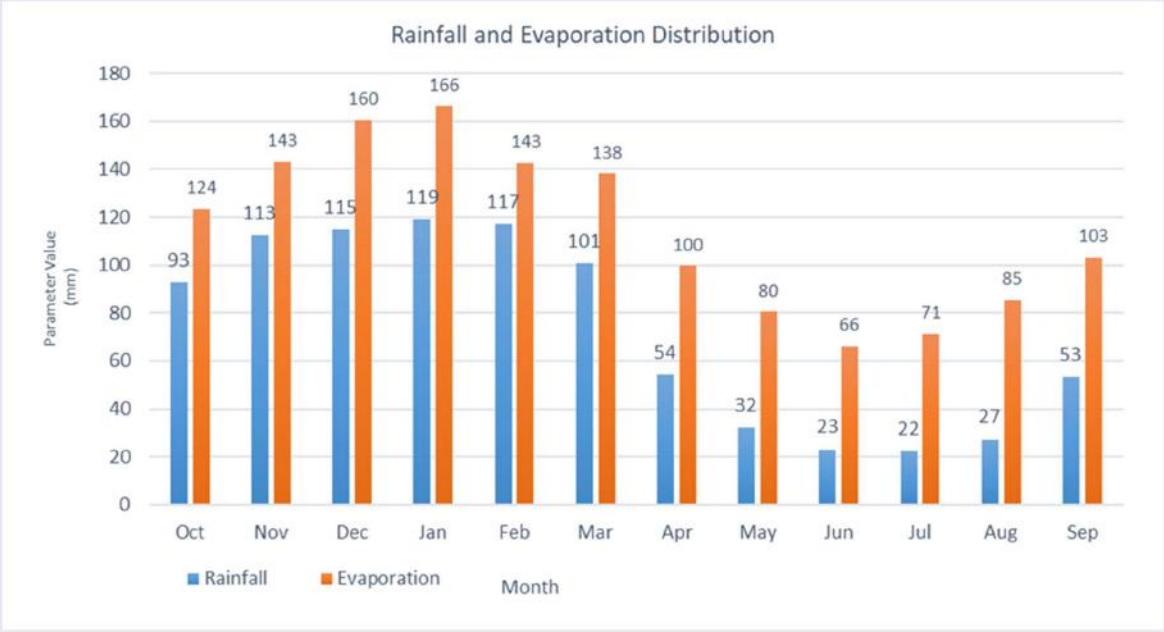


Figure 7-2 Rainfall and Evaporation Distribution for the Project Site

7.4.2 Geological Setting

7.4.2.1 Regional geology

The project site is located within the Ilangwe Greenstone Belt close to the southern margin of the Kaapvaal Craton. The geology of the Ilangwe Greenstone Belt conforms to the general description of greenstones by in that they are:

- Generally lenticular in shape with widths of between 10 – 50 km and lengths between 100 – 300 km.
- Composed largely of extrusive mafic rocks with some ultramafic and felsic rocks.
- Contain sedimentary rocks throughout but they are usually dominant in the upper part and all subjected to mainly greenschist facies metamorphism.

Greenstone belts were previously understood to display with basal ultramafic rocks becoming more evolved rocks towards the top, not now understood to always be the case. Also, most of the belts exhibit strong tectonism with possible duplication and elimination of the original succession. The greenstone belts are locally infolded into grey granitic gneisses composed of tonalities, trondhjemites or granodiorites of banded to migmatitic varieties.

The contact between the gneisses and the greenstone is either tectonic or intrusive, the latter displaying evidence of assimilation of greenstone material within the gneiss close to the contact. Within the Kaapvaal Craton, there are several locations of preserved greenstone belts infolded into granitoid gneiss with the ages ranging from 3 500 to 2 700 Ma.

7.4.2.2 Local geology

The study area lies within the Ilangwe Greenstone Belt, which is separated from various granitoids to the north and south by major tectonic contacts. The rocks of Ilangwe Greenstone Belt belong to the Nondweni Group, which is divided into the lower Umhlathuze Subgroup (a suite of mafic-ultramafic meta- volcanic rocks) and upper Nkandla Subgroup, a meta-sedimentary suite. Both units host banded iron formation (BIF), which is the iron resource at Melmoth (Figure 7-3).

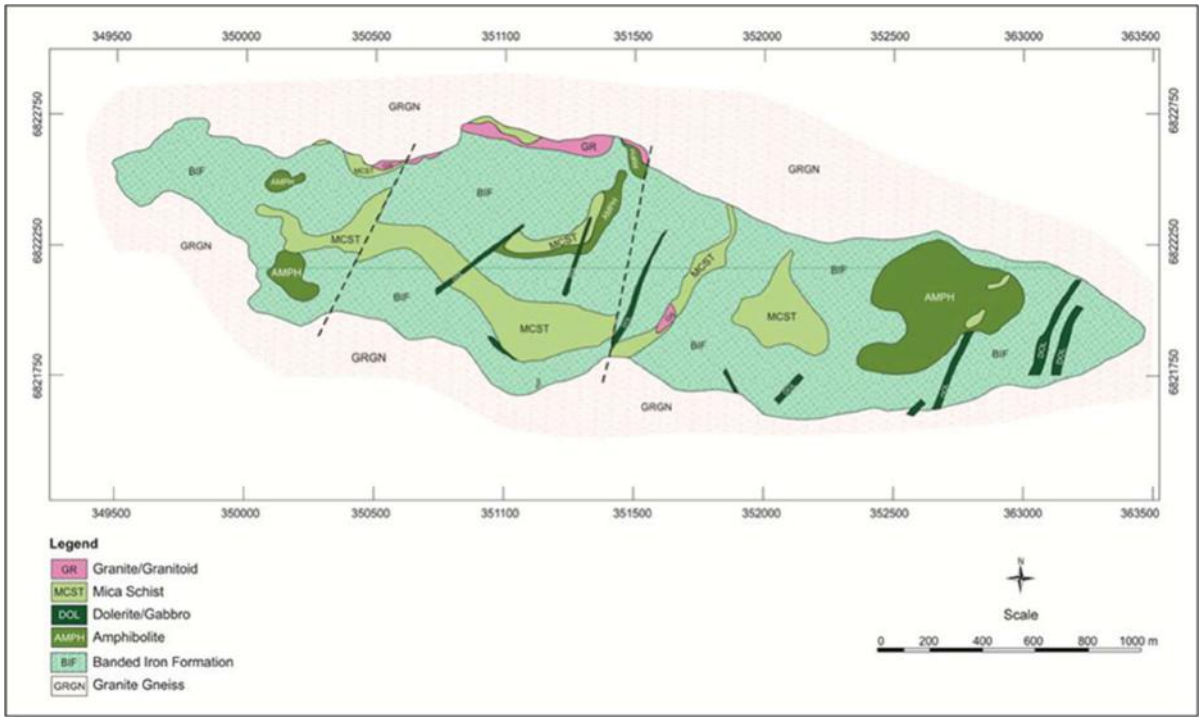


Figure 7-3 Surface Geology of the SE Block (Source: Jindal, 2014)

The ore mineralisation is hosted in the Matshansundu Formation of the Umhlatuze Subgroup and Entembeni Formation of the Nkandla Subgroup. The ore body occurs as BIF, which consists of alternating bands (on a millimetre scale) of magnetite and cherty quartz. Hematite and minor K-feldspar, stilpnomelane, grunerite and chlorite are also present. The mineralisation is considered to be most likely of an Algoma-type deposit due to its association with an Archaean greenstone belt metavolcanics.

7.4.3 Topography

The topography of the area is determined by the type of bedrock underlying the soils, the geology of the area and the dissection of the streams flowing in the area. Melmoth is 800 metres above sea level (mamsl) and is surrounded by low sandstone mountains and mudstone valleys. The regional geology of the area has given rise to a considerable diversity of relief, from gently rolling slopes to hilly and severely incised slopes found along drainage ways and stream valleys. This topography gives the area its aesthetic appeal and makes it conducive for agricultural practises.

7.4.4 Hydrogeology

7.4.4.1 General Aquifer Description

Regional hydrogeological data was sourced from the published 1:500 000 Hydrogeological Map Series of the Republic of South Africa – Sheet 2730 (Vryheid) and previous studies for the site. Golder (2016) completed an interim hydrogeological study for the South Block area and made the following conclusion relating to aquifer characteristics and general groundwater conceptual understanding:

- The aquifer is classified as intergranular and fractured;
- Regional hydrogeological data was sourced from the published 1:500 000 Hydrogeological Map Series of the Republic of South Africa – Sheet 2730 (Vryheid) and previous studies for the site.

- The Ilangwe Greenstone Belt borehole yielding potential of the aquifer is classified as d3, which implies an average borehole yield varying between 0.5 and 2.0 L/s.
- The rocks surrounding the Ilangwe Greenstone Belt are composed of Archean granites and gneisses and the borehole yielding potential of the aquifer is classified as d2, which implies an average borehole yield varying between 0.1 and 0.5 L/s.
- Hydrogeological boreholes have water strikes at depths between 94 - 241 metres below ground level (mbgl).
- The drilling yields of the water strikes ranged from dry to 6.6 l/s.
- The estimated T values range from 7.3 - 53 m^2/d.

7.4.4.2 Groundwater Levels and Flow Direction

Borehole and groundwater data captured within the DWS National Groundwater Archive within 5 km of the project site were evaluated. A total of 37 boreholes were identified within a 5 km radius of the site, with 17 groundwater levels recorded. Groundwater levels ranged between 2.1 mbgl to 56.4 mbgl.

Groundwater levels were measured by Golder (2016) during a hydrocensus investigation as part of a baseline study and after site diamond core drilling. A total of 28 boreholes with groundwater levels were identified. Groundwater levels ranged from artesian to 178.50 mbgl measured from the hydrocensus, diamond drilling and hydrogeological boreholes. Average groundwater levels were 45 mbgl.

Golder (2016) noted that it is evident that groundwater flow directions mimic surface topography to some degree. This was confirmed by 75% correlation between groundwater levels and the surface topography.

The regional groundwater movement was found to be from west to east, but Golder (2016) noted that locally the groundwater movement could vary.

7.4.4.3 Groundwater Quality

Twelve groundwater samples from existing and new boreholes were submitted for chemical analyses by Golder (2016). The results were analysed for physical parameters, macro elements and a full scan of trace metals. Groundwater quality analyses at the time were compared against the South African Water Quality Guidelines (SAWQG), Volume 1: Domestic Use (1998) and/or the WHO (2011) Drinking Water Guidelines. The groundwater quality results for the physical parameters show that all the sites tested were well below drinking water guidelines in terms of pH and salinity.

The samples were classed as Sodium – Magnesium (Na (Mg))-bicarbonate water indicating a mix between recently recharged and normal aquifer water. Golder (2016) noted that the differences in water character were normally a function of the geological formations, recharge rates and residence time in the aquifer. Although silicon is not considered a major cation in the trilinear diagram, Golder (2016) noted that the samples were relatively enriched in silicon, with an average value of 19mg/L. Golder (2016) also noted that silicon enrichment is often associated with granitic formations and with lower-than-normal pH. However, the formations had relatively high Calcium (Ca)- bicarbonate alkalinity to counter the effects of a low pH.

A complete Inductively Coupled Plasma (ICP) scan was completed to test for trace elements and metals and Aluminium (Al), Arsenic Metalloid (As), Iron (Fe), Manganese (Mn), Zinc (Zn) and Fluorine (F) exceeded Domestic Use Guidelines (DWAF (1998) Domestic Use SAWQG).

According to Golder (2016) the composition of groundwater is dependent on natural factors (geological, topographical, meteorological, hydrological and biological) in the aquifer and catchment area. These natural factors are the source of the dissolved cation and anions in groundwater, however, if there are disturbances in the hydrogeological system (i.e. sources of pollution, over abstraction) these naturally occurring compounds can be enriched or depleted compared to the natural groundwater quality. Therefore, these compounds can indicate whether the system is affected by mining or other anthropogenic activities. From the results obtained at that time all parameters measured were well below the Domestic Use Guidelines, rendering the groundwater a potable water source.

7.4.5 Hydrology

7.4.5.1 Regional and Local Hydrology North Block

The North Block falls between quaternary catchments (QC) W12B, W12C and W12D. These three QCs fall within the Pongola-Mtavuna Water Management Area (WMA) and within the Usuthi-Mhlathuze Catchment Management Agency (CMA). The natural drainage systems in these QCs flow in an eastern direction towards the outlet flowing into the Indian Ocean. The area around North Block is drained by the perennial Mfule River and its tributaries Mfulazane and the Nhlozane rivers flowing in a southeast direction to join the Mhlatuze River.

7.4.5.2 Regional and Local Hydrology - South Block

The South Block spans over quaternary catchments (QC) W12B and W12D which falls within the Pongola-Mtavuna WMA and within the Usuthu-Mhlathuze CMA. The natural drainage systems in these QCs flow in an eastern direction towards the outlet flowing into the Indian Ocean. QC W12B is drained by the perennial Mhlatuze, KwaMazula, Nyawushane and Mavungwini rivers. QC W12D is drained by the Mfule and Ntambanana rivers flowing in a south-east direction to join the Mhlatuze River. The natural drainage systems flow in an eastern direction towards the outlet flowing into the Indian Ocean.

The Usuthi-Mhlathuze CMA is characterised by quite large areas of formal and informal agricultural practices. These agricultural activities obtain water from the Goedertrouw Dam which divides the Mhlatuze River into two. The Goudertrouw Dam also supplies water to the Richards Bay Town and various industries.

The water uses of the Goedertrouw Dam and nearby watercourses for agricultural and bulk water supply services mean that the water resources are sensitive and need to be protected against activities that will compromise all water uses.

7.4.5.3 Water Quality

Water Quality Standards

Six surface water quality samples were collected by SLR on the 10th of May 2021 (Figure 7-4). Data from eight additional water monitoring points were also obtained from the DWS water quality database.

The water quality results were compared against the DWA guidelines for Targeted Water Quality Guidelines (TWQR); guidelines for irrigation, livestock watering and aquatic ecosystems, including the SANS241 guidelines for drinking water. The water quality results were mainly within the water guidelines range except for a few exceedances.

Exceedances in Aluminium (A), Copper (Cu), Mercury (Hg), and pH were recorded in all sampling points when compared to the Aquatic Ecosystems Guidelines. Electrical Conductivity (EC) was also in exceedance in all the six water sampling points sampled by SLR (Table 7-9).

From the DWS Database, exceedances have been recorded in pH and EC in all monitoring points compared to targeted water quality guidelines and SANS241 guidelines.

The exceedances in some metals may be attributed to the project area's geology, and these metals may be introduced to rivers through weathering of rocks that subsequently reached the watercourses through erosion. The site is rich in iron ore which could also be a source of other metals that have exceeded the guidelines. Even though iron ore mining has not started, there is a possibility of weathered material being washed into streams.

The exceedances in EC may be attributed to agricultural runoff as the catchments around the project site are used for intensive agricultural activities.

Exceedances are highlighted and are marked in bold in Table 7-9.

7.4.5.4 Catchment Runoff

The main reason for understanding/modelling catchment runoff is to quantify the amount of runoff before development and how the proposed development will impact (increase or decrease) the catchment runoff.

The WRSM2000/Pitman Software is a mathematical model that simulates the movement of water through an interlinked system of catchments, river reaches, reservoirs, irrigation areas and mines (WRC, 2012). WRSM2000 simulates naturalised runoff around the project site at a unit runoff of 112.5 mm per annum. The runoff, when expressed as a percentage of rainfall, equates to 13%. The monthly runoff is likely to be distributed as presented Table 7-8.

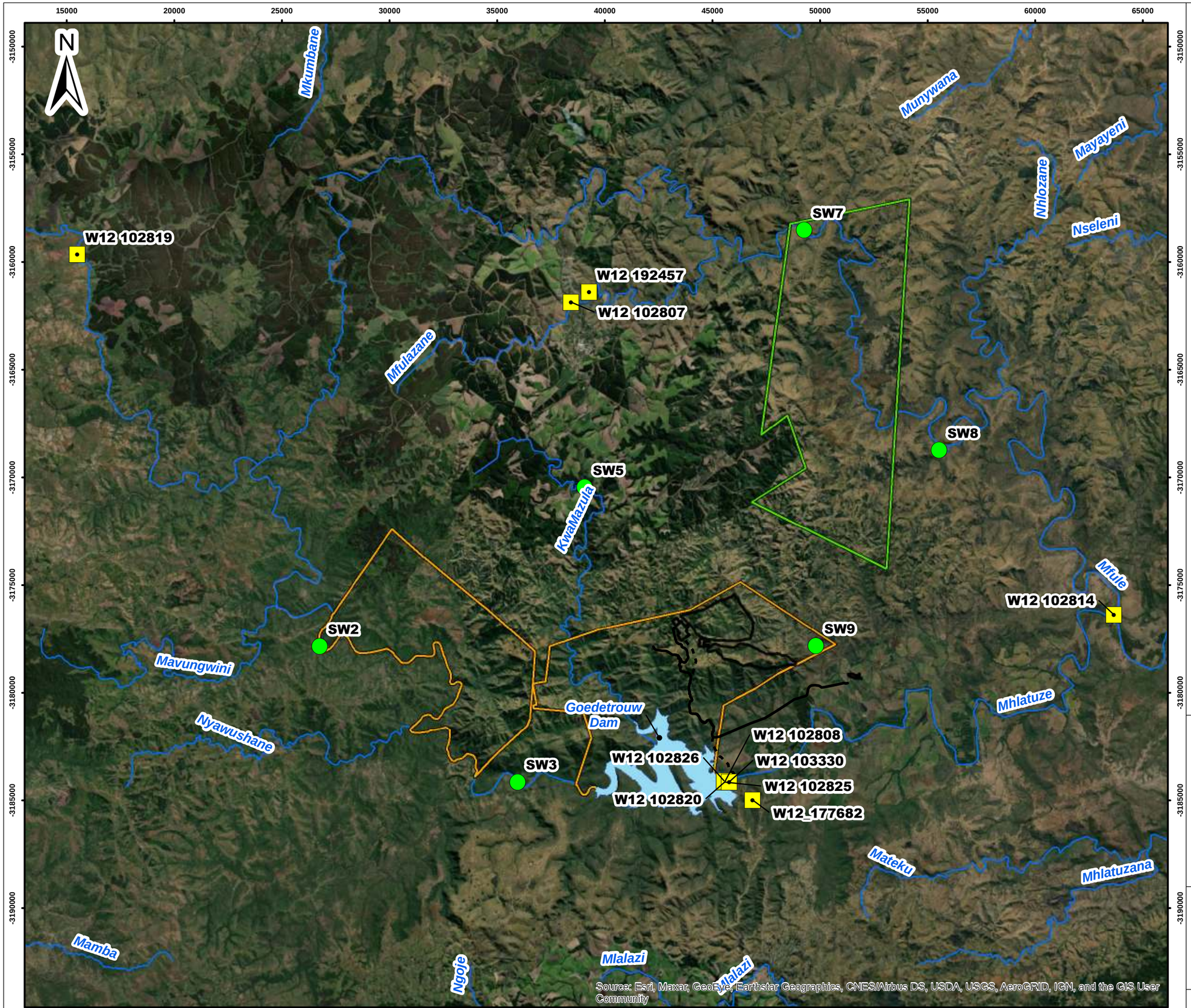
Table 7-8 Mean Annual Runoff for Catchments around the Project Site

QC	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug		MAR
W12B	6.2	5.4	5.4	5.8	9.0	10.9	7.2	5.9	5.6	5.7	5.1	6.9	79.0
W12C	7.7	7.1	6.9	7.2	11.8	13.2	8.5	6.6	5.8	6.4	5.0	7.5	93.7
W12D	12.6	17.9	17.9	19.2	21.8	18.6	13.3	10.4	7.9	8.3	7.1	9.8	164.8
Average	8.8	10.1	10.1	10.7	14.2	14.2	9.7	7.6	6.4	6.8	5.7	8.1	112.5

Table 7-9 Water Quality Guidelines compared to Water Quality Guideline Requirements (SLR Sampling Results, 2021)

Determinant	Units	Water Quality Monitoring Points						Water Users/Guidelines				
		SW2	SW3	SW5	SW7	SW8	SW9	Irrigation	Livestock Watering	Aquatic Ecosystem	SANS241: 2015	Exceedances in all guidelines
Al	mg/l	**0.48**	**0.81**	**0.18**	**0.24**	**0.23**	**0.24**	5	5	0.005	0.3-0.5	All
As	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	1	0.01	**0.01**	All
B	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5-15	0.5	-	2.4	All
Cr	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	1	0.007	≤0.05	All
Ca	mg/l	8.41	10.59	3.12	9.56	8.99	12.82	-	1000	-	<150	All
CO	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05 - 5.0	1.0 - 2.0	-	≤500	All
Cu	mg/l	**0.08**	**0.05**	**0.1**	**0.07**	**0.07**	**0.08**	0.2	0.05	0.0003	≤2	All
Pb	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	1	0.0002	≤0.01	All
Fe	mg/l	0.73	0.83	0.58	1.87	0.89	0.88	5	10	-	**≤2**	All
K	mg/l	1.39	1.34	2.98	2.43	2.62	1.67	-	-	-	-	All
Mn	mg/l	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	0.02	10	0.18	**≤0.4**	All
Mg	mg/l	4.18	4.3	2.57	9.81	7.78	3.61	-	500	-	<200	All
Na	mg/l	9.98	9.92	11.81	32.55	29.23	16.42	70	2000	-	≤ 200	All
Ni	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.02	0.1	-	≤0.07	All
SI	mg/l	7.96	8.19	5.66	6.22	7.55	10.98	-	-	-	-	
Zn	mg/l	<0.05	<0.05	0.08	<0.05	<0.05	0.05	1	20	0.002	**≤ 5**	All
Hg	mg/l	**0.008**	**<0.005**	**0.006**	**<0.005**	**<0.005**	**<0.005**	-	0.001	0.00004	**≤ 6**	All
Cl	mg/l	14.54	16.8	23.69	45.08	43.43	24	-	1500	-	**≤ 300**	All
F	mg/l	0.41	0.53	0.07	0.15	0.31	0.26	2	2	≤0.75	≤1.5	All

Determinant	Units	Water Quality Monitoring Points						Water Users/Guidelines				
		SW2	SW3	SW5	SW7	SW8	SW9	Irrigation	Livestock Watering	Aquatic Ecosystem	SANS241: 2015	Exceedances in all guidelines
NO_2-N	mg/l	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	5	10	-	≤0.9	All
NO_3-N	mg/l	<0.5	<0.5	1.03	0.78	<0.5	<0.5	5	10	-	≤11	All
SO_4	mg/l	6.71	8.59	2.22	5.55	5.55	3.93	-	1000	-	≤500	All
PO_4	mg/l	<0.2	<0.2	<0.2	0.98	<0.2	<0.2	-	-	-	-	All
pH	pH units	**8.02**	**7.87**	**7.03**	**7.93**	**8**	**7.88**	6.5-8.4	-	±5% of Background level	≥ 5 and ≤ 9.7	All
EC	µS/cm	**98**	**100**	**101**	**291**	**245**	**141**	0.4	1.54	-	≤0.17	All
TDS	mg/l	381	255	502	202	634	94	-	1000	-	≤ 1200	All
CN	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	-	-	0.001	≤0.2	All
NH_3-N	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	5	7	-	≤1.5	All
P-Alk as $CaCO_3$	mg/l	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	-	-	-	-	All
M-Alk as $CaCO_3$	mg/l	30	38	13	75	60	45	-	-	-	-	All
Total CN*	mg/l	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	-	-	0.001	≤0.2	All



Legend

- Rivers
- Dams
- North Block Prospecting Right Area
- South Block Prospecting Right Area
- Proposed Jindal Infrastructure
- DWS Water Quality Sampling Points
- SLR Water Quality Sampling Points

0 2 4 Kilometers

Scale: 1:171 600 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

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Figure 7-4

Water Quality Sampling and Monitoring Points

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7.4.6 Terrestrial Biodiversity

Melmoth falls within the Maputoland-Pondoland floristic region which is one of the richest floristic regions in Southern Africa, second to Fynbos in the Western Cape Province. Most endemics of this floristic region can be found in grasslands. According to Golder (2016) there are 682 rare and threatened plants in this floristic region that are described in the Red Data Book . The North and South Blocks are described in more detail in the following sections.

7.4.6.1 Biophysical Setting and Context – North Block

In the North Block five distinct terrestrial vegetation communities (Figure 7-5) were identified and assessed through desktop mapping of aerial imagery and based on available GIS datasets for national and provincial vegetation types indicated to occur within the property. These include:

- Ngongoni Veld/Northern Zululand Sourveld Open Savannah;
- Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland;
- Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket;
- Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah; and
- Secondary Open Savannah/Thicket/Closed Woodland.

Ngongoni Veld/Northern Zululand Sourveld Open Savannah

Vegetation cover mapped as part of this community include areas of open savannah that are either categorised as Moist/Dry Coast Hinterland Grassland or Northern Zululand Sourveld at the provincial level. These areas appear to have been spared major anthropogenic disturbances and are hypothesised to retain moderate to high levels of floristic diversity. Based on this supposition, vegetation within this community is considered to be either moderately modified or near-natural and is likely in fair to good ecological condition. It should be noted that a number of red-listed and protected plant species are highly likely to occur in this vegetation community and will require further sampling at a later stage, if planning progresses further for this potential proposed development.

Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket

Vegetation within this community likely comprises a mixture of degraded Ngongoni Veld/Natal Zululand Sourveld closed woodland or thicket areas which based on examination of aerial imagery are thought to be heavily invaded by invasive alien plant species such as *Chromolaena odorata*, *Lantana camara* and include areas which were historically open savannah under reference conditions which have now been adversely affected by bush encroachment associated with pioneer species such as *Vachellia natalitia*, *V. sieberiana*, *Dichrostachys cinerea* and *Lippia javanica*. These cumulative minor impacts have likely resulted in this vegetation community being moderately to severely modified and primarily in poor ecological condition at a desktop level. Nevertheless, this community has the potential to support red-listed plant species and protected plant species and therefore may still retain some remnant biodiversity. These areas could be considered in fair ecological condition with the potential to be rehabilitated and improve their condition further. Given this vegetation community has the potential to support threatened or protected plant species, this would need to be verified through fieldwork in the appropriate seasonal window.

Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah

Degraded areas of open savannah categorised as Moist/Dry Coast Hinterland Grassland or Northern Zululand Sourveld at the provincial level, which are situated closer to road networks and associated with

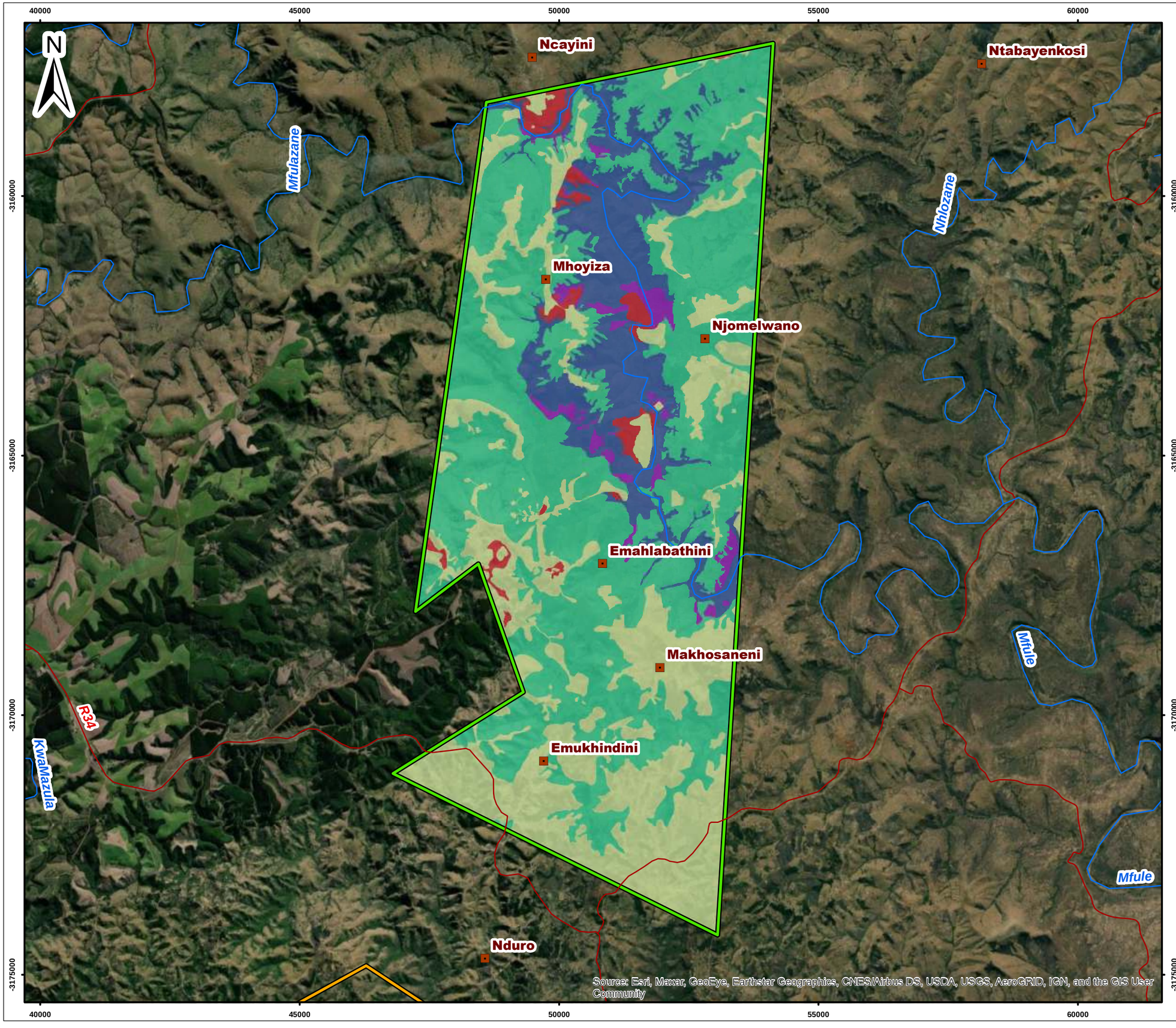
less precipitous topography form part of this vegetation community. Likely existing impacts associated with this community include overgrazing by livestock, edge effects/habitat fragmentation, alien plant invasion and bush encroachment. This community has therefore been categorised as moderately to severely modified at a desktop level and is thought to be in fair to poor ecological condition, depending on the level of alien plant invasion and the grazing and burning regime prevalent. Areas in fair condition potentially retain some level of forb diversity that would need to be verified through seasonally appropriate sampling.

Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland

Vegetation cover mapped as part of this community includes areas of closed-canopy forest categorised as Eastern Scarp Forest: Northern Coastal Scarp Forest at the provincial level grading into dry thicket vegetation categorised as Ngongoni Veld or Northern Zululand Sourveld that has remained largely undisturbed by direct impacts due to the steep terrain in which it occurs. This vegetation community is hypothesised to retain moderate to high levels of floristic diversity and ranges from natural to moderately modified and is potentially in fair to good ecological condition. It should be noted that red-listed and protected plant species are highly likely to occur in this vegetation community and in-field verification and sampling of this vegetation community will be required.

Secondary Open Savannah/Thicket/Closed Woodland

This vegetation has likely suffered disturbance in the past (direct disturbance or disturbance sufficient to facilitate alien plant invasion that has notably reduced the plant biodiversity) and as a result can be considered severely to critically modified and in poor ecological condition, at a desk-top level. It is likely to contain a similar suite of ruderal pioneer and alien invasive species as the Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland that occurs throughout the South Block, however this would require in-field verification and sampling.



Legend

- Towns / Villages
- Roads
- Rivers
- North Block Prospecting Right Area
- South Block Prospecting Right Area

Vegetation Communities

- 6.Ngongoni Veld/Northern Zululand Sourveld Open Savannah
- 7.Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland
- 8.Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket
- 9.Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah
- 10.Secondary Open Savannah/Thicket/Closed Woodland

0 1 2 Kilometers

Scale: 1:70 800 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

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Figure 7-5

Map Showing the Various Terrestrial Vegetation Communities and Habitat Types Identified Within the North Block (Source: EcoPulse, 2021)

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7.4.6.2 Biophysical Setting and Context – South Block

A field survey was undertaken from the 19 to 21 April 2021 (mid-autumn). Five broad but distinct terrestrial vegetation communities (Figure 7-6 and Figure 7-7) were also identified and described for the South Block assessed through a combination of rapid field verification and desktop mapping. These vegetation communities include:

- Ngongoni Veld/Eastern Valley Bushveld Open Savannah
- Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland
- Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah
- Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland
- Secondary Open Savannah/Thicket/Closed Woodland

Ngongoni Veld/Eastern Valley Bushveld Open Savannah

This vegetation community encompasses areas that still retain some level of floristic diversity which range from natural to moderately modified open grassland/savannah in fair to good ecological condition. It should be noted that the timing of fieldwork fell outside of the recommended sampling period stipulated by EKZNW and in national guidelines and therefore it is very likely that a number of red-listed and protected plant species were either overlooked or under sampled during this rapid baseline assessment.

Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland

Vegetation within this community comprised a mixture of primary Eastern Valley Bushveld thicket along with, to a smaller degree, Ngongoni Veld closed savannah woodland, which have a larger component of Vachellia species and lower levels of woody diversity present. Frequently encountered species in savannah woodland patches included scattered tree cover with *Vachellia natalitia*, V. *nilotica*, *V. sieberiana*, *V. karroo*, and *Aloe marlothii* dominating while grass cover included *Eragrostis curvula*, *Sporobolus pyramidalis*, *S. africanus*, *Themeda triandra*, *Melinis repens* and *Aristida* species.

Where this thicket/woodland community adjoined human settlement, edge effects were noted with some alien plant species invasion and firewood harvesting taking place. However, for the most part, the high level of species diversity and heterogeneity observed suggests this vegetation community can be considered natural to moderately modified and can be considered in fair to good ecological condition.

Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah

Degraded areas of open savannah were situated closer to road networks and associated with less precipitous topography. Overgrazing by livestock and edge effects on grassland patches within this community have collectively lowered the floristic diversity and allowed the invasion of some alien plant species and woody pioneer species from a moderate to severe degree. This community can therefore be considered moderately to severely modified, and in fair to poor condition, depending on the level of alien plant invasion and the grazing and burning regime prevalent, with areas in fair condition potentially retaining some level of forb diversity that would need to be verified through seasonally appropriate sampling (to verify red-listed plant species flagged for the area).

Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland

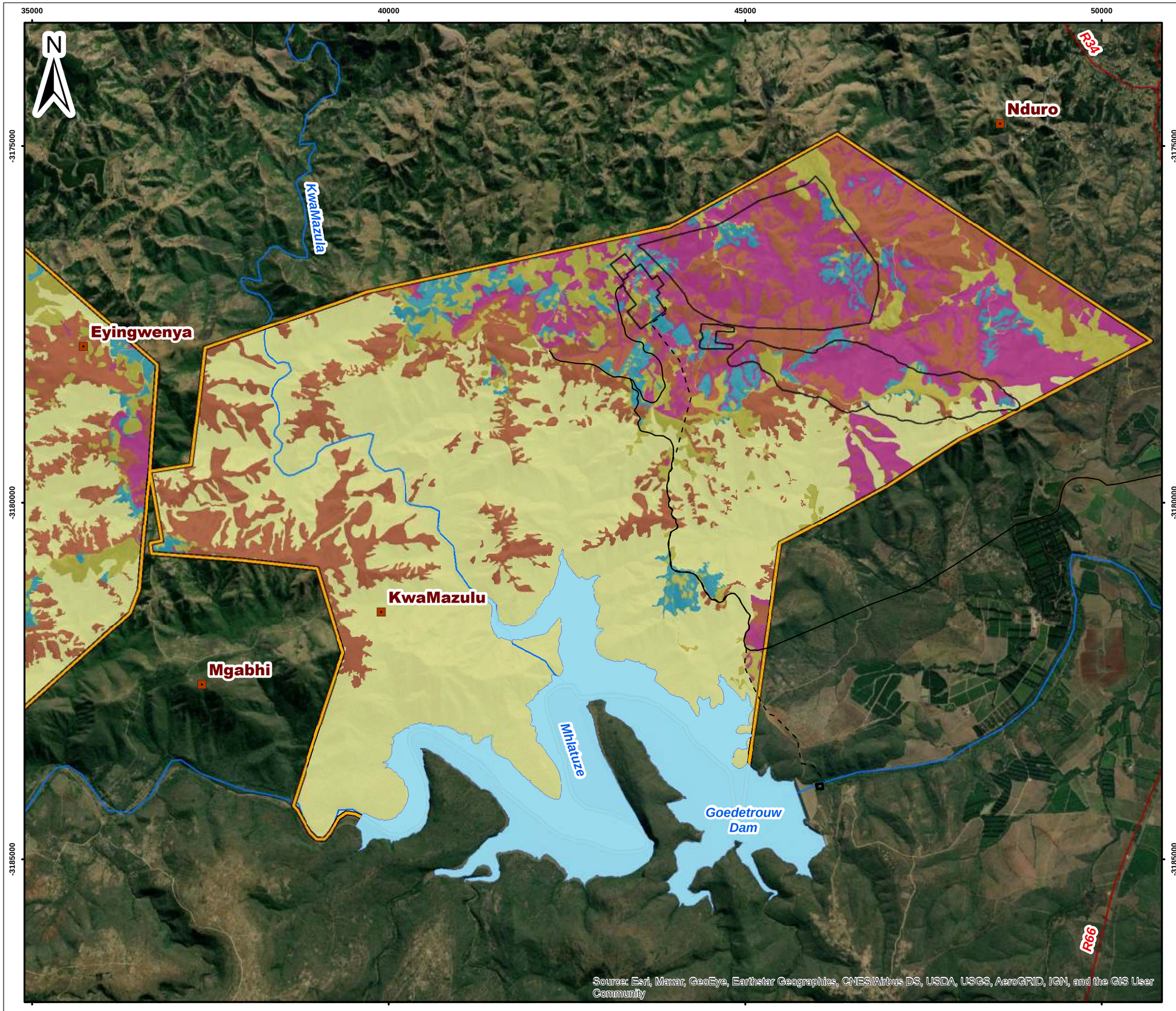
Degraded Eastern Valley Bushveld/Closed Ngongoni Woodland had been impacted negatively by edge effects, firewood harvesting, browsing by livestock (primarily goats), clearing of vegetation, and alien plant

invasion. Consequently, although retaining some level of floristic diversity this was moderately diminished in comparison to the thicket/closed woodland vegetation community described above. Moreover, ruderal/pioneer and alien invasive species were encountered at low to moderate levels of abundance within this vegetation community e.g., *Chromolaena odorata*, *Lantana camara*, *Trema orientalis*, *Cestrum laevigatum*, *Achyranthes aspera*, *Opuntia ficus-indica* and *Vachellia natalitia*. Therefore, this vegetation community is considered to be moderately to severely modified and in fair to poor ecological condition overall.

Secondary Open Savannah/Thicket/Closed Woodland
This vegetation suffered disturbance in the past (direct disturbance or disturbance sufficient to facilitate alien plant invasion that notably reduced the plant biodiversity) and as a result can be considered severely to critically modified, in poor ecological condition and no longer representative of reference vegetation types mapped for the study area.

7.4.6.3 Presence of Species of Conservation Concern

The vegetation survey conducted during the rapid field visit to the site confirmed the presence of two floral Species of Conservation Concern (SCC) , namely: the Natal Grass Cycad - *Stangeria eriopus* (Vulnerable) and Butterfly Iris - *Moraea* subsp. *graminicola* subsp. *graminicola* (Near Threatened, South African Endemic), in the open savannah and grassland areas.



Legend

- Towns / Villages
- Roads
- Rivers
- Dams
- South Block Prospecting Right Area
- Proposed Jindal Infrastructure

Vegetation Communities

- 1.Ngongoni Veld/Eastern Valley Bushveld Open Savannah
- 2.Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland
- 3.Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah
- 4.Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland
- 5.Secondary Open Savannah/Thicket/Closed Woodland

0 0,5 1 Kilometers

Scale: 1:51 500 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

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Figure 7-6

Map Showing the Various Terrestrial Vegetation Communities and Habitat Types Identified Within the South-Central and South-Eastern Blocks (Source: EcoPulse, 2021)

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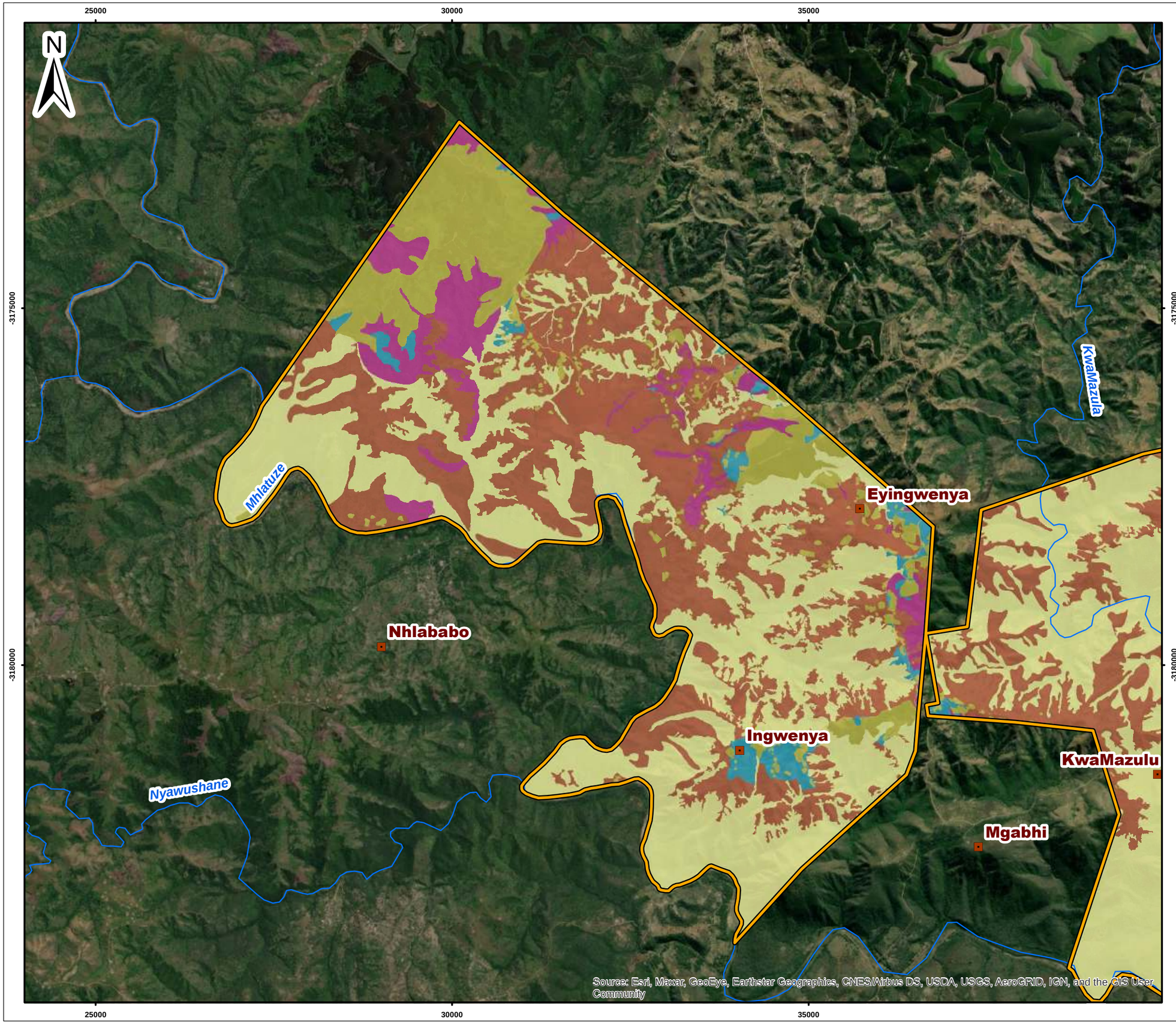

Legend

- Towns / Villages
- Roads
- Rivers
- South Block Prospecting Right Area

Vegetation Communities

- 1.Ngongoni Veld/Eastern Valley Bushveld Open Savannah
- 2.Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland
- 3.Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah
- 4.Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland
- 5.Secondary Open Savannah/Thicket/Closed Woodland

0 0,5 1 Kilometers

Scale: 1:51 500 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

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Figure 7-7

Map Showing the Various Terrestrial Vegetation Communities and Habitat Types Identified Within the South-Western Block (Source: EcoPulse, 2021)

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7.4.6.4 Desktop Threatened SCC Potential Occurrence

A desktop Potential Occurrence (POC) assessment of biota (flora and fauna) of conservation concern was also undertaken for the project in order to inform the need for any further species-specific assessments. To summarise the desktop POC assessment:

- Flora: Field verification conducted in April 2021 confirmed the presence of two floral SCC in the grassland/open savannah vegetation on site. An additional 24 floral SCC either have a high or moderate possibility of occurring on site, namely:
  - *Acalypha entumenica* – Endangered Endemic (Medium: Possible)
  - *Aloe saun*dersiae – Endangered (Medium: Possible)
  - *Begonia homonyma* – Endangered Endemic (High: Probable)
  - *Brachystelma chlorozonum* – Near Threatened Endemic (High: Probable)
  - *Brachystelma g*errardii – Endangered (High: Probable)
  - *Cassipourea gummiflua* var. *verticillata* -Vulnerable (High: Probable)
  - *Clivia gardenii* - Vulnerable Endemic (High: Probable)
  - *Clivia miniata* var. *miniata* – Vulnerable (High: Probable)
  - *Crinum moorei* – Vulnerable Endemic (High: Probable)
  - *Cryptocarya myrtifolia* – Vulnerable Endemic
  - *Dierama dubium* – Vulnerable Endemic (High: Probable)
  - *Dioscorea sylvatica* – Vulnerable (High: Probable)
  - *Disperis woodii* – Vulnerable (High: Probable)
  - *Emplectanthus cordatus* – Vulnerable Endemic (High: Probable)
  - *Euphorbia gerstneriana* – Vulnerable (High: Probable)
  - *Faurea macnaughtonii* – Rare (Medium: Possible)
  - *Gerbera aurantiaca* – Endangered Endemic (High: Probable)
  - *Habenaria culveri* – Rare (Medium: Possible)
  - *Helichrysum pannosum* – Endangered Endemic (High: Probable)
  - *Mystacidium aliceae* - Vulnerable Endemic (High: Probable)
  - *Plectranthus esculentus* - Data Deficient (Insufficient Information) (Medium: Possible)
  - *Prunus africana* – Vulnerable (High: Probable)
  - *Salpinctium natalense* – Rare Endemic (Medium: Possible)
  - *Selago zuluensis* – Endangered (High: Probable)
- Fauna (mammals): Conservation important mammal species are unlikely to occur within the degraded secondary vegetation and transformed habitats in the study area given the lack of suitable habitat, although nine mammal species may potentially utilise the more intact thicket/closed woodland, open savannah and grassland patches on site. Either as residents or transient visitors that use intact vegetation as an important ecological corridor namely: Blue duiker - *Philantomba monticola bicolor* (Vulnerable), Maquassie Musk Shrew - *Crocidura maquassiensis* (Vulnerable), Serval - *Leptailurus serval* (Near Threatened), Water Rat - *Dasymys imcomtus* (Near Threatened), African Striped Weasel - *Poecilogale albinucha* (Near Threatened), Cape Clawless Otter - *Aonyx capensis* (Near Threatened), Leopard - *Panthera pardus* (Vulnerable), Swamp Musk Shrew - *Crocidura mariquensis* (Near Threatened), Samango Monkey - *Cercopithecus albogularis labiatus* (Endangered).
- Fauna (birds): Tawny Eagle - *Aquila rapax* (Endangered), African marsh-harrier - *Circus ranivorus* (Endangered), European Roller - *Coracias garrulus* (Near Threatened), Lanner Falcon - *Falco*

biarmicus (Vulnerable), Southern Bald Ibis - *Geronticus calvis* (Vulnerable), Martial Eagle - *Polemaetus bellicosus* (Endangered), Secretary bird - *Sagittarius serpentarius* (Vulnerable) Crowned Eagle - *Stephanoaetus coronatus* (Vulnerable).

- Fauna (reptiles): Southern African Python - *Python natalensis* (Least Concern – Protected).
- Fauna (amphibians): Three frog SCC may occur within specific freshwater habitats on site, they include Bilbo's Rain Frog - *Breviceps bagginsi* (Vulnerable), the Natal Cascade Frog - *Hadromorphryne natalensis* (Not red-listed but threatened by introduced trout and habitat destruction), and the Shovel-Nosed Frog - *Hemisus guttatus* (Vulnerable).
- Fauna (invertebrates): Very few formal surveys of invertebrates have been carried out in the study area. A review of available online/desktop databases highlighted 17 species that could potentially occur in vegetation communities that are in good ecological condition on site.

7.4.7 Aquatic Biodiversity

The information in this section was obtained from the – Terrestrial Biodiversity Assessment Report dated – December 2021 (Eco-Pulse Environmental Consulting Services).

7.4.8 Watercourse Classification and Habitat Characteristics – North Block

A total of 331) river / stream units and 63 wetland units were identified and classified in the North Block study area. This included watercourses of the following classifications:

- Rivers and Streams:
  - Mountain Headwater Streams – 253 units
  - Mountain Streams – 62 units
  - Transitional Rivers – 12 units
  - Upper Foothill Rivers – 2 units
  - Lower Foothill River (Mfule River) – 1 unit
  - Lowland River (Mfule River) – 1 unit

- Wetlands:
  - Seep Wetlands – 23 units
  - Unchanneled Valley Bottom Wetlands – 40 units

The watercourse map for the North Block is shown in Figure 7-8.

In order to ascertain the Present Ecological State (PES), Ecological Importance (EI) and Ecological Sensitivity (ES) per sub-quaternary reach for secondary catchments in the North Block the DWS Resource Quality Information Services desktop assessment was used (due to inability to undertake fieldwork). The outcomes of the assessment for the North Block indicates that the sub-quaternary reach of the Mfule River that runs through the Block is largely in a natural condition with EI and ES rated as high. The activities highlighted as potentially impacting the health of the system are rural settlements, invasive alien plant encroachment and abandoned agricultural lands.

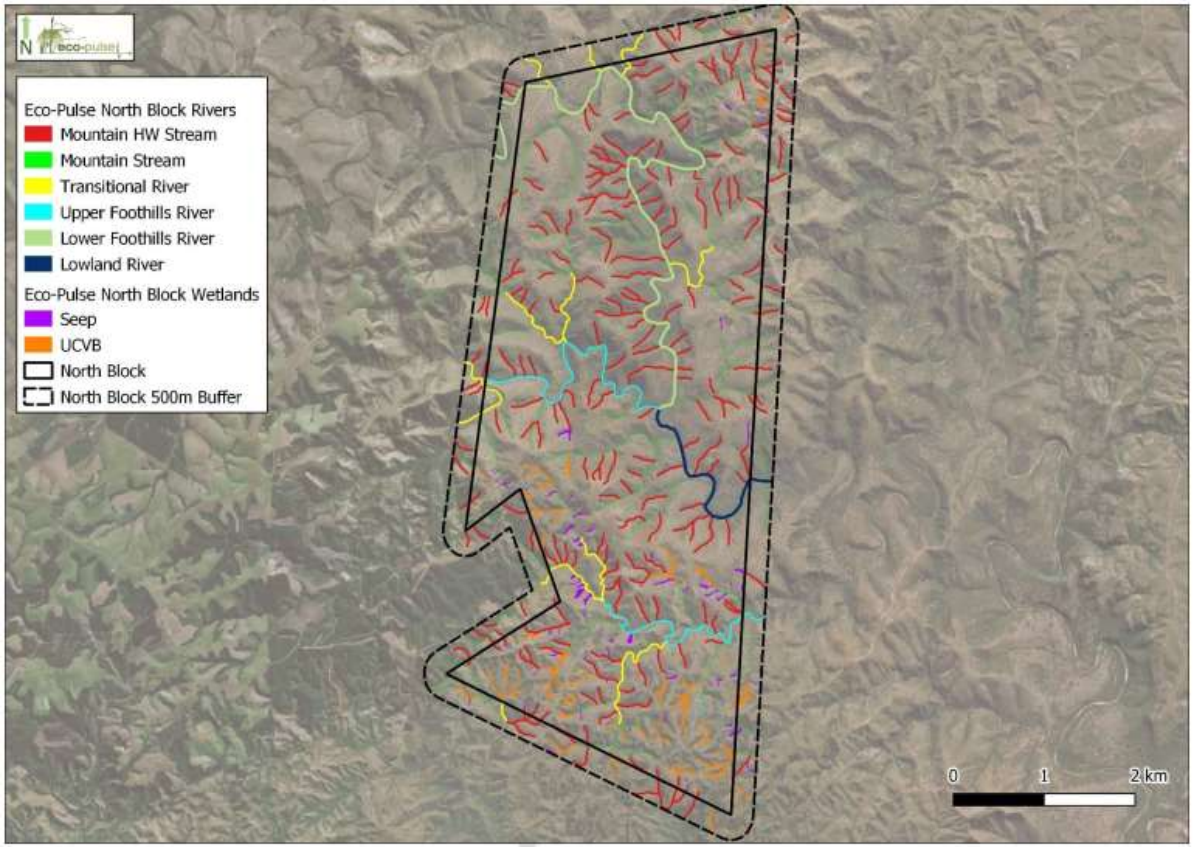


Figure 7-8 Watercourse delineation and classification map for the North Block (Source: EcoPulse,2021)

7.4.9 Watercourse Classification and Habitat Characteristics – South Block

A total of 599 river / stream units and 22 wetland units were identified and classified in the South Block study area. This included watercourses of the following classifications:

- Rivers and Streams:
  - Mountain Headwater Streams – 431 units
  - Mountain Streams – 154 units
  - Transitional Rivers – 10 units
  - Upper Foothill Rivers – 3 units
  - Lowland River (Mhlatuze River) – 1 unit

- Wetlands:
  - Seep Wetlands – 11 units
  - Unchanneled Valley Bottom Wetlands – 12 units

The watercourse map for the South Block is shown in Figure 7-9.

7.4.9.1 Determination of River/ Stream PES, EI and ES

Fish surveys were used to inform river present ecological state, ecological importance and a sensitivity assessment. A total of nine fish species were recorded across all sites during once-off field surveys. Of the species recorded, *Labeo molybdinus*, *Enteromius gurneyi*, *Labeobarbus natalensis* and *Marcusenius caudisquamatus* were the most sensitive. These four species are considered 'Moderately Intolerant' (High Sensitivity) to either modified physio-chemical water quality or 'no-flow' conditions. These species can breed under moderately modified physio-chemical conditions but do not breed under largely to seriously modified physio-chemical conditions and require flow during certain phases of their life cycles. In addition to the species recorded during fish surveys, *Micropanchax myaposae* was identified by DWS (2014) as occurring within the lower Mhlatuze sub-quaternary river reach. M. *myaposae* is regarded as 'Moderately Intolerant' (High Sensitivity) to modified water quality and 'Moderately Tolerant' (moderate sensitivity) to 'no-flow' conditions.

In terms of Threat Status, most of the recorded species are regarded as Least Concern (LC) according to the International Union for Conservation of Nature (IUCN). Most notably from the species recorded during surveys was *M. caudisquamatus*, classified as 'Endangered', and *Oreochromis mossambicus* and *E. gurneyi* which are classified as 'Vulnerable'.

River EI is an expression of the importance of the aquatic resources for the maintenance of biological diversity and ecological functioning; whilst ES refers to a system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance & Sensitivity (EIS) of rivers and streams in the South Block was assessed and is summarised below:

- Mountain Headwater Stream and Mountain Streams (Process Units 01 – 08):
  - All Mountain Headwater and Mountain Streams were rated as being of 'Low' EIS. Important considerations for the EIS assessment for onsite streams include the following:
    - Streams in the study area are 'Least Threatened' in terms of conservation threat status and are not considered Freshwater Ecosystem Priority Areas (FEPAs).

  - These stream units do not host important or sensitive taxa and provide only limited refugia for biota due to their ephemeral / seasonal flow.
  - The stream units are likely to be moderately sensitive to flow related changes and changes in water quality due to their prevailing ephemeral / seasonal flow conditions.
  - Despite the low diversity of instream habitat and absence of sensitive/intolerant biota, these stream units have relatively high levels of connectivity with the downstream watercourses. This makes these watercourses important wildlife corridors.

- Transitional and Upper foothill Rivers
  - All Transitional and Upper Foothill rivers were rated as being of 'Moderate' EIS. Important considerations for the EIS assessment for onsite streams include the following:
    - Rivers in the study area are 'Least Threatened' in terms of conservation threat status and are not considered FEPAs.
    - The perennial flow that characterises these river units means that they are likely to play host to a range of aquatic fauna that rely on the year-round presence of water for them to survive and breed.
    - These rivers likely provide vital refugia to aquatic fauna, especially during times of environmental stress such as low-flow / drought periods. The species relying on this system are therefore likely to be sensitive to reductions in flow.
    - The SASS5 and fish surveys revealed that several intolerant macro-invertebrate and fish species rely on these river systems, with these species likely using the available habitat to breed and complete their life cycles.
    - These river systems have the potential to host *M. caudisquamatus* (Endangered on the IUCN List), *O. mossambicus* (Endangered on the IUCN List) and *E. gurneyi* (Endangered on the IUCN List).
    - These river systems host *M. caudisquamatus*. The species' range is recorded as being limited to only the Mhlatuze and Nseleni river systems. This species was recorded during the fieldwork. The presence of this unique and range restricted species within the rivers of the study area makes these systems important habitat.
    - The diversity of instream habitat available to aquatic fauna makes these rivers ecologically important.

- Lowland River – Mhlatuze
  - The assessed reach of the Mhlatuze River was rated as being of 'High' EIS. Important considerations for the EIS assessment for onsite streams include the following:
    - Rivers in the study area are 'Least Threatened' in terms of conservation threat status and are not considered FEPAs.
    - The diversity of instream habitat types and the perennial nature of flow means that the unit is well suited to provide good quality refugia for aquatic biota during time of environmental stress.
    - The importance of instream and riparian habitat of the reach is further supported by high levels of connectivity of habitat, both laterally and longitudinally, with the buffer around this river remaining largely intact. This suggests that the assessed

reach of the Mhlatuze River serves as an important corridor that supports the movement of local wildlife.

- The SASS5 and fish surveys revealed that several intolerant macro-invertebrate and fish species rely on the assessed reach, with these species likely using the available habitat to breed and complete their life cycles.
- This river systems hosts *M. caudisquamatus* (Endangered on the IUCN List), *O. mossambicus* (Endangered on the IUCN List) and *E. gurneyi* (Endangered on the IUCN List).
- This river systems hosts M. *caudisquamatus*. The species' range is recorded as being limited to only the Mhlatuze and Nseleni river systems. The presence of this unique and range restricted species within the rivers of the study area makes these systems important habitat.
- The high flow volume of the system means it can buffer minor changes in flow condition and water quality, without incurring major impacts to habitat and biota.

Table 7-10 summarises the PES and EIS for all assessed watercourses within the South Block.

Table 7-10 Summary of the PES and EIS for all assessed Watercourses within the South Block

Watercourse Units	PES	EIS
Stream Process Unit 01 (Mountain HW Streams)	A: Natural	D: Low
Stream Process Unit 07 (Mountain HW Streams)	C: Fair	D: Low
Stream Process Unit 02 (Mountain HW Streams)	B: Largely Natural	D: Low
Stream Process Unit 03 (Mountain HW Streams)	C: Fair	D: Low
Stream Process Unit 04 (Mountain HW Streams)	A: Natural	D: Low
Stream Process Unit 08 (Mountain HW Streams)	C: Fair	D: Low
Stream Process Unit 05 (Mountain HW Streams)	B: Largely Natural	D: Low
Stream Process Unit 06 (Mountain HW Streams)	C: Fair	D: Low
SE-Transitional River-455	B: Largely Natural	C: Moderate
SE-Transitional River-462	B: Largely Natural	C: Moderate
SE-Transitional River-468	B: Largely Natural	C: Moderate
SE-Transitional River-469	B: Largely Natural	C: Moderate
SE-Transitional River-470	B: Largely Natural	C: Moderate
SE-Transitional River-455	B: Largely Natural	C: Moderate
SE-Transitional River-455	B: Largely Natural	C: Moderate
SW-Transitional River-463	B: Largely Natural	C: Moderate
SW-Transitional River-467	B: Largely Natural	C: Moderate
SW-Transitional River-471 - KwaMazula River	B: Largely Natural	C: Moderate
SW-Transitional River-502	D: Poor	C: Moderate
SW-Transitional River-544	B: Largely Natural	C: Moderate
SE-Upper Foothill River-466	C: Fair	C: Moderate

Watercourse Units	PES	EIS
SW-Upper Foothill River-456	B: Largely Natural	C: Moderate
SW-Upper Foothill River-457	B: Largely Natural	C: Moderate
SW-Lowland River-461 (Mhlatuze River)	B: Largely Natural	B: High

7.4.9.2 Determination of Wetlands PES

Wetland PES was assessed using the WET-Health (Macfarlane et al., 2008) assessment tool. The Wetland PES assessments were completed at a process unit level (Figure 7-10). Table 7-11 summarises the PES and EIS for all assessed wetland units within the South Block.

Table 7-11 Summary of the PES and EIS for assessed Wetlands within the South Block

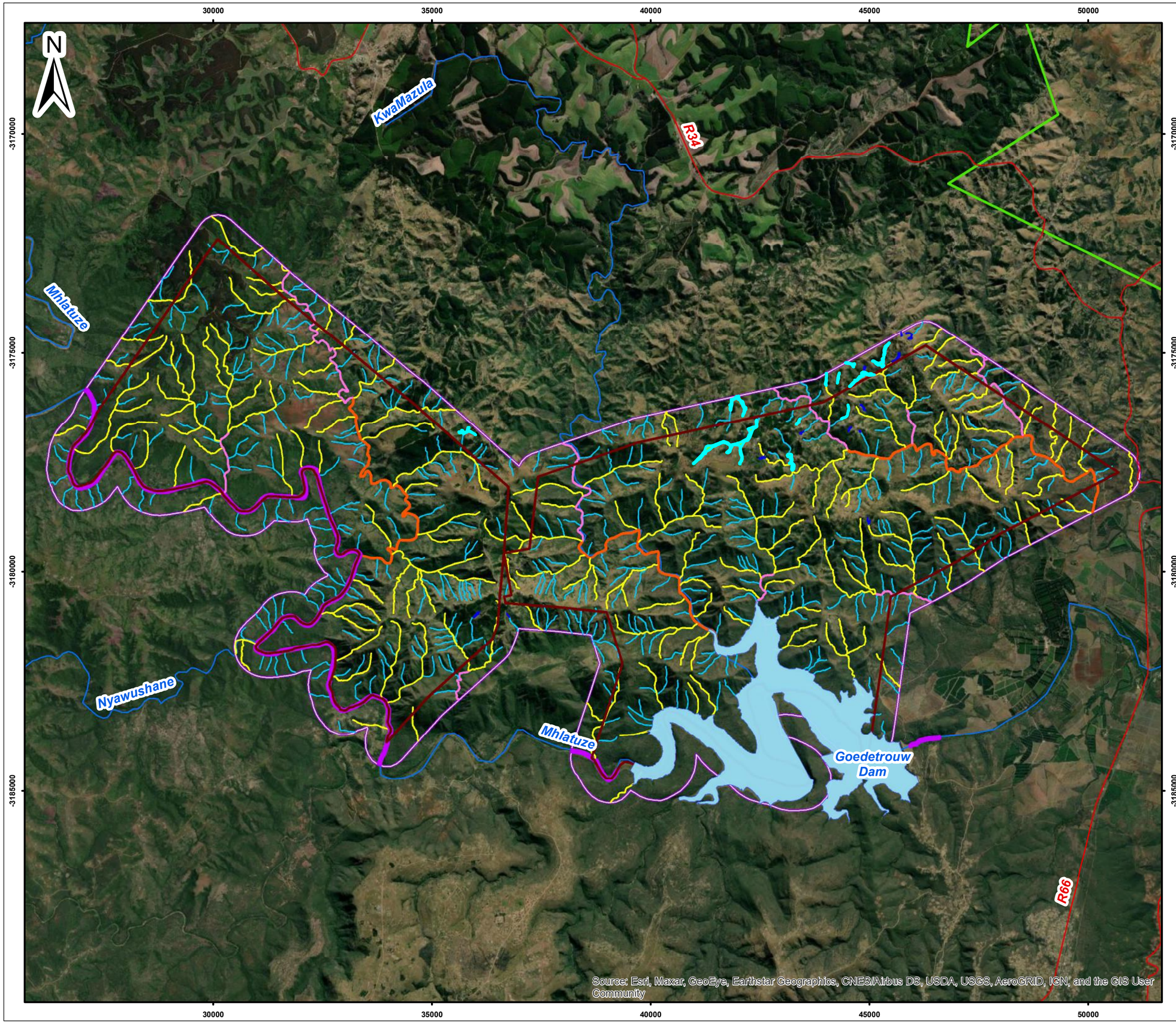
Watercourse Units	PES	EIS
Wetland Process Unit Group 01	D: Poor	C: Moderate
Wetland Process Unit Group 02	C: Fair	D: Low
Wetland Process Unit Group 03	C: Fair	D: Low
Wetland Process Unit Group 04	C: Fair	C: Moderate
Wetland Process Unit Group 05	C: Fair	C: Moderate

7.4.9.3 Wetlands Ecosystem Services

The following Ecosystem Services were identified:

- Regulating Services:
  - The most important regulating service provided by wetlands is carbon storage (the trapping of carbon in waterlogged wetland soils) which is of significance for global climate change.
  - The unchanneled valley bottom wetlands within the South Block are of high importance for carbon storage services. These wetlands were largely dominated by permanently saturated soils which are characterised by nominal decomposition rates for accumulated organic matter. The valley bottom wetlands are also larger in size than the seeps and therefore have the capacity to act as carbon sinks on a larger scale than the small seep units.
  - Another important regulatory service provided by the valley bottom wetlands is sediment trapping. These wetlands are well placed to provide this service as they are robustly vegetated and are characterised by diffuse flow patterns, creating favourable conditions for sediment accumulation.
- Provisioning and Cultural Services
  - Seeps belong to process unit group 01 are of Moderately-High provisioning importance. This rating is a result of these wetlands being used for the cultivation of subsistence crops, and the reasonably high dependence of local households on the food grown within these wetlands.
  - Seep wetlands belonging to process units' groups 02 and 03 are of Moderately-Low cultural and provisioning importance.
  - The valley bottom wetlands within the study area are of Moderate provisioning importance because of the permanent diffuse flow along the valley bottom wetlands, which could serve as an important water source for local communities. The demand for water abstraction

from wetlands for drinking or agriculture is, however, low due to the difficulties with accessing water from the wetlands, and the use of boreholes as a primary water abstraction method by local communities in the South Block.



Legend

- Towns / Villages
- Roads
- Rivers
- Dams
- North Block Prospecting Right
- South Block Prospecting Right
- 500m Buffer

Wetlands

- Seep
- Unchanelled Valley Bottom

South Block Rivers

- Lowland River
- Mountain Headwater Stream
- Mountain Stream
- Transitional River
- Upper Foothill River

0 1 2 Kilometers

Scale: 1:84 000 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

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Figure 7-9

Watercourse Delineation and Classification Map for the South Block (Source: EcoPulse, 2021)

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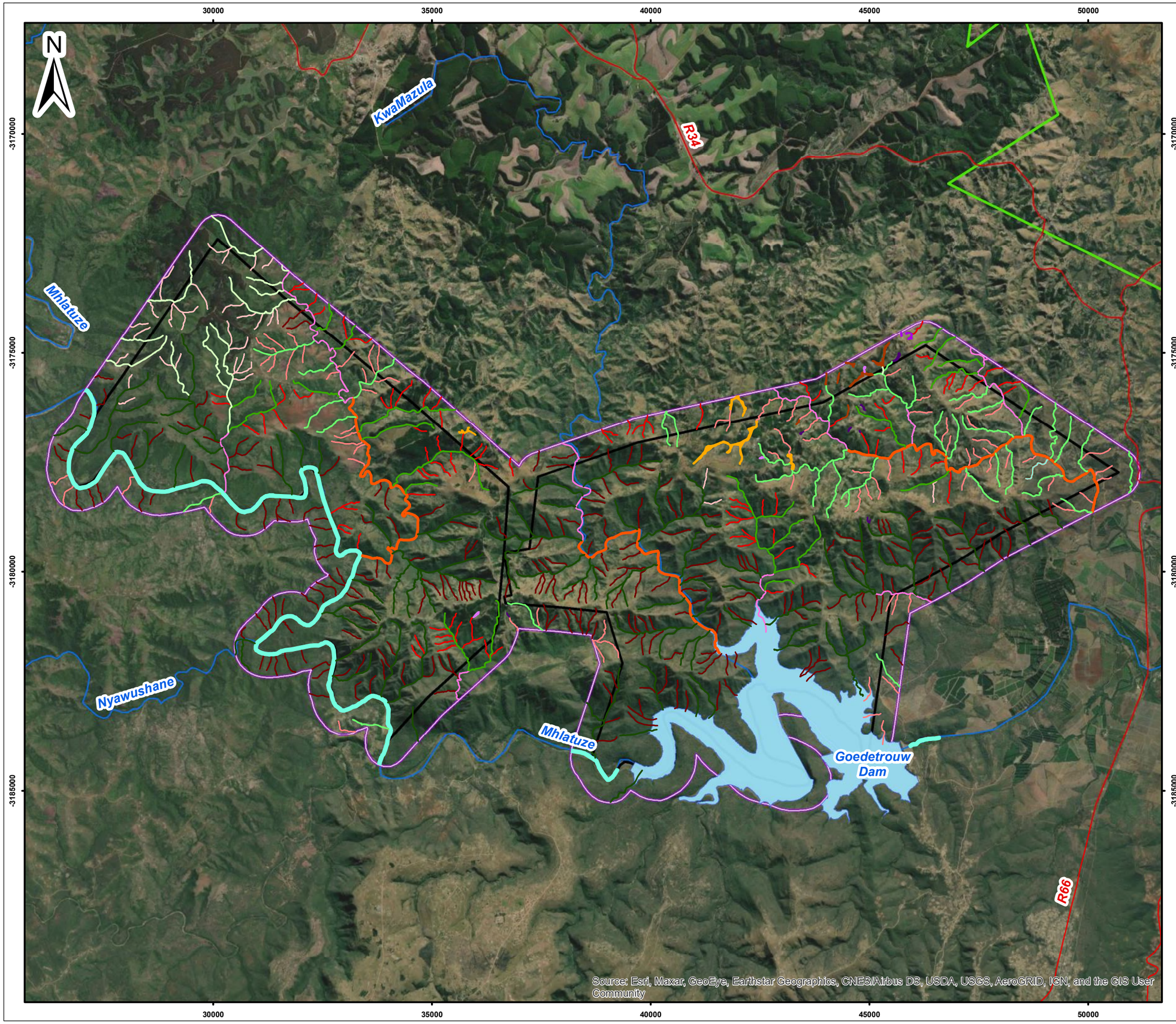

Legend

- Towns / Villages
- Roads
- Rivers
- Dams
- North Block Prospecting Right
- South Block Prospecting Right
- 500m Buffer

Mountain HW Streams
- Process Unit 01
- Process Unit 02
- Process Unit 03
- Process Unit 07

Mountain Streams
- Process Unit 04
- Process Unit 05
- Process Unit 06
- Process Unit 08
- Transitional River
- Upper Foothill River
- Lowland River

Seep Wetlands
- Process Unit 01
- Process Unit 02
- Process Unit 03

Unchannelled Valley Bottom Wetlands
- Process Unit 04
- Process Unit 05

0 1 2 Kilometers

Scale: 1:84 000 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

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Figure 7-10

River, Stream, and Wetland Assessment Units for the South Block (Source: EcoPulse, 2021)

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7.4.10 Soils and Agricultural Potential

The information in this section was obtained from the – Soil and Agricultural specialist report the Proposed Melmoth Iron Ore Mine dated January 2022 (TerraAfrica Consult CC)

7.4.10.1 Land types – North Block

The North Block consists of seven different land types as described in Table 7-12. The distribution of these land types within and around the North Block boundaries, is shown in Figure 7-11.

The seven land types belong to four main groups i.e. Ac land types, Ab land types, Fa land types and Fb land types. The Ab land types, yellow soils occupy less than 10% of the area while dystrophic and/or mesotrophic soils occupy a larger area than high base status red-yellow apedal soils. Ac (red and yellow dystrophic and/or mesotrophic) indicates land with red and yellow soils each of which covers more than 10% of the area while dystrophic and/or mesotrophic soils occupy a larger area than high base status red-yellow apedal soils. Fa land types refer to land in which lime in the soil is not encountered regularly in any part of the landscape. Fb land types indicate land where lime occurs regularly in one or more valley bottom soils.

Table 7-12 North Block Land Types

Land Type	Description
Ac61	Land Type Ac61 is present in the south-western corner and along a section of the southern boundary of the North Block. It represents a landscape with undulating hills between the flat crests and mid-slopes. Land Type Ac61 typically has short slope length ranging between 5 and 500 m, depending on the terrain unit. This land type consists of three terrain units with 10% crests, 85% mid-slopes and 5% valley bottoms. The crests have slope of 6 to 12%, while both the mid-slopes and valley bottoms have slope of 12 to 20%. The crests and mid-slopes consist of exactly the same combination of soil forms i.e. 35% Glenrosa soils, 40% Hutton soils, 10% Griffin and Clovelly soils each and 5% Mispah soils. The valley bottoms have 60% streamd beds, 30% Katspruit soils and 10% Dundee soils.
Fa124	Land Type Fa124 is located in a vertical strip that runs from the Mfule River in the north of the North Block to southern boundary of the North Block. This land type is typically consists of three terrain units although 90% of the total land type area consists of mid-slopes with slope ranging between 10 and 80% and slope length between 100 and 1 500 m. The mid-slopes consist of 5% solid rock and the dominant soil form is Glenrosa with average soil depth of 0.15 to 0.35 m. The remaining soil forms within the mid-slopes are Hutton, Oakleaf, Mispah and Shortland soils. The crests consist of a similar combination of soil forms while the valley bottoms are dominated by stream beds (about 60%) followed by Oakleaf soils and small areas with Cartref, Dundee and Fernwood soils.
Ab82	Land Type Ab82 is located in one area along the middle section of the Mfule River that runs through the North Block area. This land type represents the bottom of the hills. Land Type Ab82 consists of two terrain units i.e. mid-slopes with slope between 2 and 12% and flat valley bottoms with slope between 0 and 4%. The mid-slopes represent about 60% of the total land type area and consist of 50% Hutton soils, 20% Cartref soils and 15% each of Fernwood and Oakleaf soils. About 50% of the valley bottoms consist of stream beds while the remaining areas consist of 20% Dundee soils and 10% each of the Cartref, Oaklands and Fernwood soils.
Fb318	Land Type Fb318 is located east and south of Land Type Ab82 along the southern section of the Nhlozane River within the North Block area. The crests are flat with slope ranging between 1 and 3% and slope length between 100 and 500 m. About 15% of the total land type area consists of crests and the dominant soil forms here are Mispah and Glenrosa soils that range in soil depth between 0.2 and

Land Type	Description
	0.5 m. The mid-slopes (Terrain unit 3) have slope that ranges between 4 and 50% and slope lengths between 100 and 300 m. The soil forms of the mid-slopes are a combination of the Mispah, Glenrosa, Cartref, Oakleaf, Hutton, Swartland, Westleigh, Dundee, Valsrivier and Escourt forms. The mid-slopes are the dominant terrain unit and cover approximately 82% of the total land type area. Only 3% of the total land type area consists of valley bottoms with very short slope length (between 5 and 20 m) and slope of 2 to 25%. These valley bottoms are dominated by stream beds (about 65%), followed by Dundee soils (25%), Oakleaf soils (7%) and Valsrivier soils (3%).
Fa120	Land Type Fa120 is located along the northern part of the Mfule River (within the site boundaries) and within the largest part of the western half of the North Block. It represents the higher positions on hills, starting at 425 mamsl. This land type consists of three terrain units i.e. crests, mid-slopes and valley bottoms. The crests have slope between 1 and 15%, slope length of 50 to 400 m and is present in appxoimately 18% of the total land type area. The crests consist of a combination of rock, shallow Mispah and Glenrosa soils as well as deeper profiles of the Hutton and Cartref forms. The mid-slopes cover about 67% of this land type and here slope range between 6 and 90% and slope length between 600 and 1 700 m. A similar combination of soil forms are present as that of the crests, except that also Swartland and Fernwood soils in these areas. The remaining areas are the valley bottoms (about 15% of the total land type area) where 30% stream beds are present are a mixture of Swartland, Fernwood, Hutton, Cartref, Mispah, Oakleaf and Glenrosa soils.
Fa128	Land Type Fa128 is located in the south-eastern corner as well as a few areas along the eastern boundary of the North Block. It represent the highest position of the hills of the area, starting from 490 mamsl. The crests and mid-slopes are a mixture of shallower soil profiles of the Glenrosa and Mispah forms and deeper soils of the Oakleaf, Clovelly, Hutton and Swartland forms. The valley bottoms represent include hydric soil forms with wetland land capability such as Katspruit and Kroonstad soils, as well as 35% stream beds.
Ac62	Only two small areas of Land Type Ac62 are present along the western boundary of the North Block and directly north-east of Land Type Ac61. Areas consisting of Land Type Ac62 are typically bordering on areas with Land Type Fa120 and Land Type Ac61. This land type only consists of two terrain units. About 60% of the total land type area consists of crests with slope length between 200 and 600 m and slope between 2 and 8%. The mid-slopes have shorter slope length between 150 and 300 m and slope between 6 and 10%. Both the crests and mid-slopes consist of a mixture of soil forms including Glenrosa, Hutton, Griffin, Clovelly, Mispah and Katspruit.

7.4.10.2 Land capability – North Block

The land capability classes within and around the North Block area according to the DALRRD (2016) raster data, range between High - Very High (Class 12) to Low – Very low (Class 02) (Figure 7-12). The largest part of the North Block area has land capability that is Low-Moderate (Class 06) to Low – Very low (Class 02). These areas have lower land capability as a result of the steeper slope of the terrain and the hilly nature of the landscape. Other contributing factors to the land capability classification is the high risk of soil erosion and the shallower soil profiles of the steep mid-slopes and crests of the hills. Land capability of Class 07 or lower is considered suitable for livestock farming, with certain limitations and management requirements, depending on the constraining factors.

The flatter areas within the North Block, located along sections of the Mfule River as well as alongside the R66 road, have higher land capability ranging from Low-Moderate (Class 07) to High – Very high (Class 12).

A larger area of the higher land capability classes is also present west and south-west of the south-western corner of the North Block. There are also smaller areas of Moderate (Class 08) to Moderate-High (Class 10) land capability along the banks of the Mfulazane and Nhlozane Rivers and south-east of the south-eastern corner of the North Block. These areas have higher land capability as a result of deeper soil profiles and flatter terrain where crop cultivation under rainfed conditions is possible.

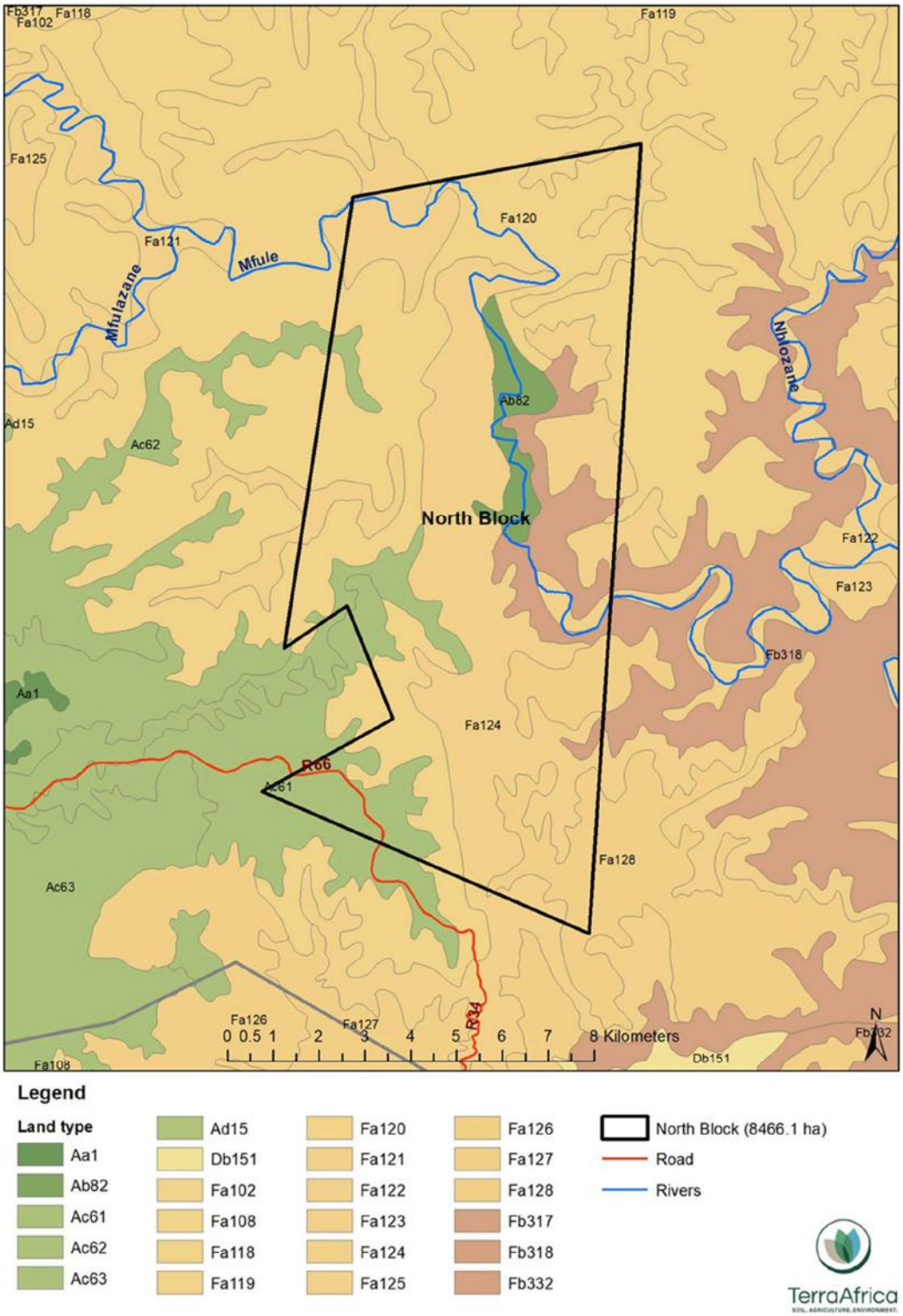

Figure 7-11 Land type classification of the North Block and surrounding area

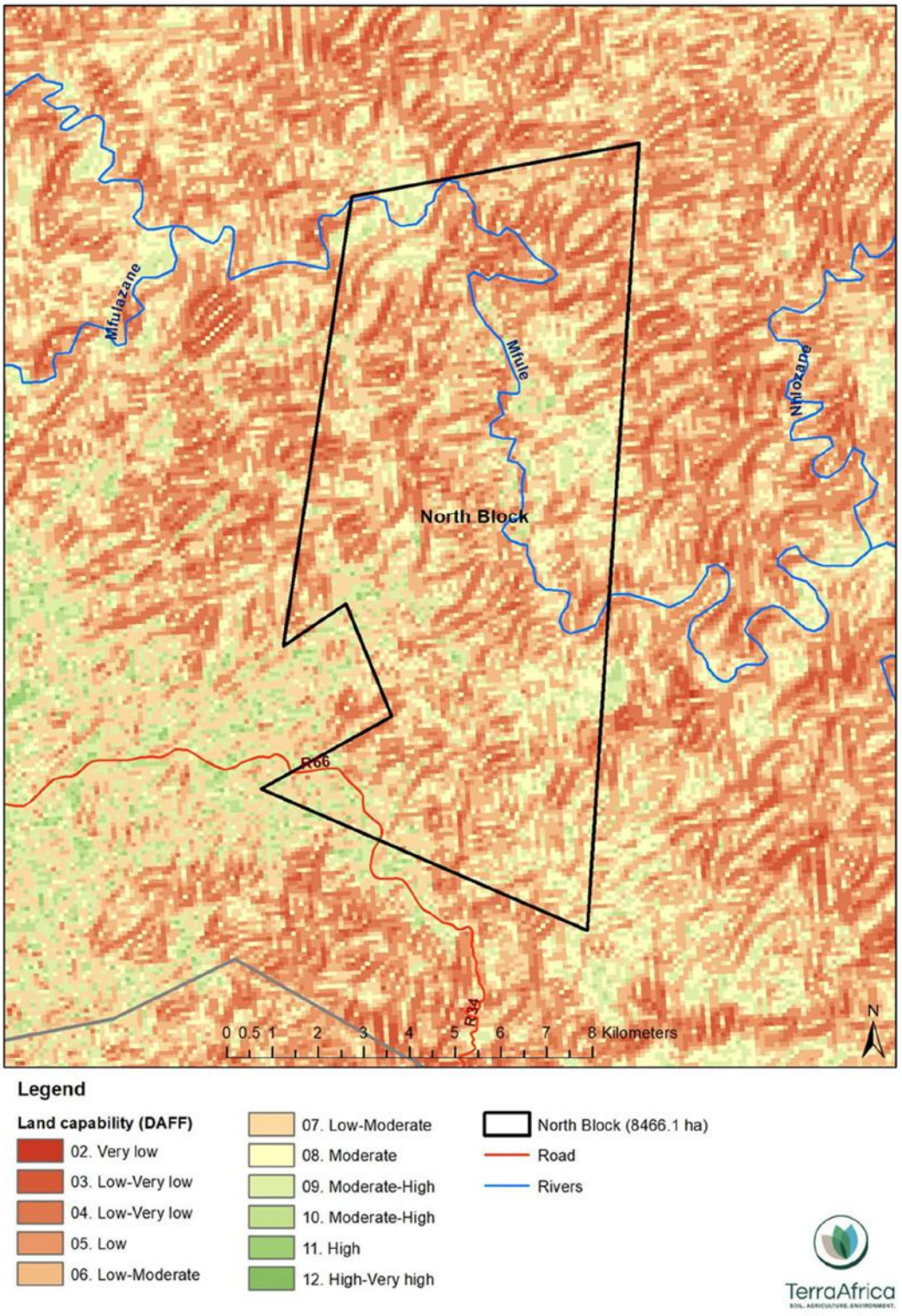

Figure 7-12 Land capability classification of the North Block and surrounding area (data source: DALRRD, 2016)

7.4.10.3 Land Types South Block

The South Block consists of nine different land types as described in Table 7-13. The distribution of these land types within and around the South Block boundaries is shown in Figure 7-13.

Table 7-13 South Block Land Types

Land Type	Description
Ac62	See Table 7-12
Ac63	Land Type Ac63 is present in one area along the northern boundary of the eastern part of the South Block. This land type consists of three terrain units representing the middle section of a hilly landscape between Land Type Aa1 (located at higher elevations) and Fa126 (located at lower elevations). The crests are present in 15% of the total land type area where 45% of the soils are Hutton soils between 0.6 and 1.0 m deep. The other soil forms Glenrosa, Griffin, Clovelly and Mispah and 2% is solid rock. The mid-slopes have an identical combination of soil forms but the slope is steeper (10 to 20%) and mid-slopes cover about 80% of the total land type area. The valley bottoms (about 5% of the total land type area) consist of 40% stream beds and 60% Katspruit soils that indicate wetland areas.
Fa108	Land Type Ac108 is present in three areas within the South Block areas. One area is the most northern corner of the western part of the South Block while a second area is found along the middle of the area. The third area is located approximately 1 km east of the KwaMazula River. This land type consists of three terrain units representing an area with undulating hills between Land Type Fa126 (located at higher elevations) and Fb308 (located at lower elevations). The crests are present in 10% of the total land type area where slope ranges between 2 and 20%, while 80% of the total land type area consists of mid-slopes with slope between 20 and 100%. The crests and mid-slopes have a similar combination of soil forms consisting of Swartland, Bonheim, mayo, Shortlands, Hutton, Glenrosa and Mispah soils. The valley bottoms, have slope between 10 and 60% and consist of 35% stream beds. The remaining areas consist of Hutton, Shortlands, Bonheim, Oakleaf and Dundee soils.
Fa126	Land Type Fa126 forms the largest part of the South Block area and runs all along the middle of it, from the far western boundary to the northern corner of the eastern part. This land type consists of four terrain units and is typically found between Land Type108 and Land Type Fa320 in the landscape. About 10% of the total land type area consists of cliff faces consisting of rock and shallow soils of the Mispah and Glenrosa forms. The largest part of the land type area consists of mid-slopes with slope between 6 and 90% and several soil forms including Glenrosa, Mispah, Cartref, Hutton, Mayo, Bonheim and Shortlands. Valley bottoms (Terrain unit 5) typically comprises of stream beds (65%), Dundee and Oaklands soils. The crests consist of a mixture of shallow soils of the Mispah, Glenrosa, Milkwood and Hutton forms and rock.
Fa127	Land Type Fa127 represent lower mid-slopes at 300 to 350 mamsl and is typically found between Land Type 124 at upper mid-slopes and Land Type Fb322 in flatter landscapes below 300 mamsl. There are two terrain units within this land type although 95% of it, consists of mid-slopes. The mid-slopes consist of 50% Glenrosa soils, 30% Mispah soils, 10% solid rock and 10% shallow Hutton soils. The remaining 5% of the total land type area consists of valley bottoms where 60% are typically wetland soils of the Katspruit form and the remaining 40% are stream beds.
Fb320	Land Type Fb320 represent the lower, flatter landscape positions between areas with Land Type Fa126 and is typically located at 230 to 235 mamsl. There are three terrain units with the mid-slopes present in 72% of the total area, crests in 8% and valley bottoms in 20%. The crests are flat with slope between 1 and 5% and slope length of 50 to 300 m. The mid-slopes have slope between 3 and

Land Type	Description
	30% and slope lengths between 200 and 800 m. The crests and mid-slopes consist mainly of Mispah and Glenrosa soils but also include soils of the Hutton, Dundee, Mayo, Bonheim and Cartref forms. The valley bottoms have short slope length (10 to 50 m) and slope between 2 and 25%. The valley bottoms have 50% stream beds, 25% Dundee soils, 15% Mayo soils, and 5% each of the Cartref and Oakleaf soils.
Bh321	Land Type Fb321 consists of three terrain units that are dominated by the mid-slopes. While the crests and valley bottoms are flat to almost flat, with slope ranging between 1 and 6%, the mid-slopes are slightly steeper with slope ranging between 3 and 12%. The crests consist of 74% shallow soils of the Mispah and Glenrosa forms and 12% solid rock. The remaining soil forms at the crests are soils of the Cartref and Swartland forms. The mid-slopes have similar soil forms and also include Valsrivier, Fernwood, Kroonstad and Hutton soils. The valley bottoms consist of 45% stream beds, while the soil forms in these areas include Swartland, Valsrivier, Dundee, Oakleaf and Katspruit soils.
Fb323	Land Type Fb323 is present in one area along the eastern part the southern boundary of the South Block, about 1 km east of the KwaMazula River. It represents an undulating terrain with short slope lengths and a typical sequence of crests, mid-slopes and valley bottoms between 200 and 280 mamsl. The crests make up 13% of the total land type area where the slope ranges between 1 and 8% and slope length between 100 and 300 m. Of the crest positions, approximately 58% consists of Glenrosa soils that range in depth between 0.3 and 0.5 m. The remaining areas are either rock or rock covered in shallow topsoil (Mispah soils). About 80% of the total land type area consists of mid-slopes where slope ranges between 3 and 50% and slope length between 200 and 700 m. The soil forms here are a similar mixture to that of the crests as well as soils of the Valsrivier, Oakleaf, Swartland and Hutton forms. The valley bottoms comprises the remaining 7% of the land tpe area and slope here ranges between 2 and 25%. The valley bottoms consist of 45% stream beds, 30% Dundee soils, 20% Valsrivier soils and 5% Oakleaf soils
Db151	Land Type Db151 represents areas with long slope length consisting mainly of mid-slopes that are typically positioned between Land Type Fb335 and Land Type Ac 64. Within the South Block area, it is present in one very small area in the far eastern corner of the site. Only 5% of this land type consists of crests and another 5% of valley. The remaining 90% consists of mid-slopes with slope between 1 and 13%. These mid-slopes consist of several soil forms including Swartland, Valsrivier, Hutton, Glenrosa, Mspah, Westleigh, Shortlands, Oakleaf and Arcadia. The crests and valley bottoms have similar soil forms but also include Rensburg, Kroonstad, Dundee and Fernwood soils in the valley bottoms.

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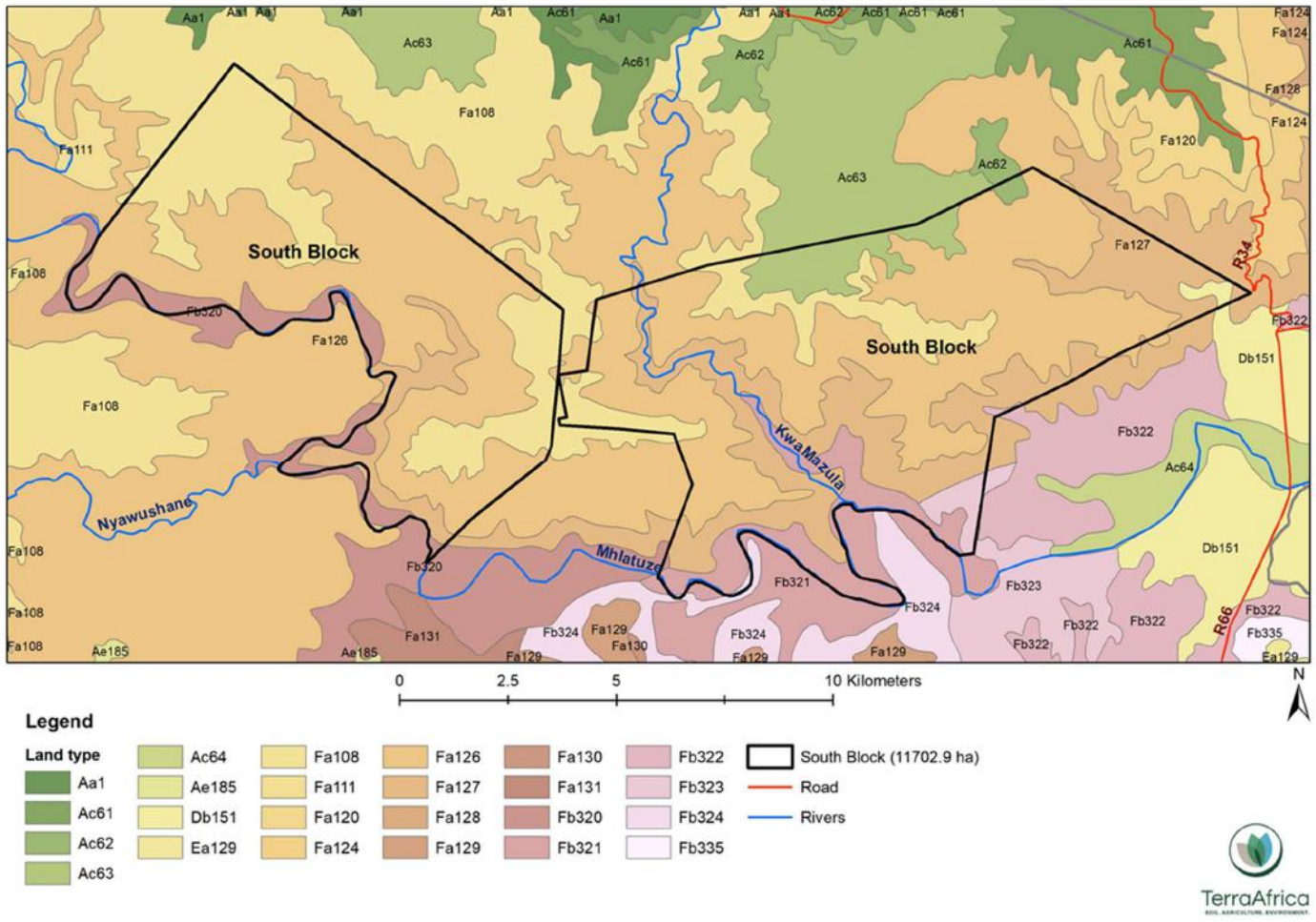


Figure 7-13 Land type classification of the South Block and surrounding area

7.4.10.4 Land Capability

The South Block area has land capability that is Low-Moderate (Class 07) to Low – Very low (Class 02). These areas have lower land capability as a result of the steeper slope of the terrain and the hilly nature of the landscape. Other contributing factors to the land capability classification is the high risk of soil erosion and the shallower soil profiles of the steep mid-slopes and crests of the hills. Land capability of Class 07 or lower is considered suitable for livestock farming, with certain limitations and management requirements, depending on the constraining factors.

Only small areas along the Mhlatuze River (that forms the southern boundary of the South Block) have higher land capability consisting of Moderate (class 08) and Moderate-High (Class 09) land. Very small areas in-between the hilly terrain of the rest of the South Block areas, also have land capability of Class 08 and Class 09. These areas have higher land capability as a result of deeper soil profiles and flatter terrain in valley bottoms where crop cultivation under rainfed conditions are possible. The areas with the highest land capability (High – Very High or Class 13) are located approximately 10 km south of the southern boundary of the South Block Areas. Another area where a relatively large area has the capability for rainfed crop production, is located 1 to 2 km southeast of the far eastern part of the southern boundary of the South Block.

The land capability for the South Block and surrounding areas is shown in Figure 7-14.

7.4.10.5 Agricultural Production

These subsistence farming fields are mostly scattered along the eastern part of the northern boundary as well as a small area along the western part of the southern boundary of the South Block. The subsistence farming areas within the South Block, are all classified as Subsistence Farming 1 which indicates that it is small scale or emerging farming where the output is produced primarily for home consumption (Crop Estimates Consortium, 2019). It consists of many small fields between 5 and 10 ha and it is difficult to distinguish between individual field crop boundaries within these areas. More Subsistence Farming 1 areas are located outside the South Block, approximately 1.5 km or more to the north.

There are no areas with rainfed annual crops or planted pasture within the South Block but an area of rainfed crops that are located between horticultural fields, are located about 0.5 to 1 km south-east of the most eastern part of the southern boundary. More horticultural fields are located further north and south of the South Block areas. A large area with subsistence sugarcane farming is present between 6 and 7 km south of the southern boundary of the South Block.

The South Block areas are depicted in relation to the High Potential Agricultural Areas (HPAAs) delineated by DALRRD (2020) (Figure 7-15). Following this data, the South Block borders on a Category C Rainfed HPAA along the western part of its northern boundary. It also borders on a Category A Rainfed HPAA that is located directly east of the South Block's far eastern boundary. More Rainfed HPAAs are located further north, east and south of the South Block. The presence of several of these areas in the region, indicate that the larger region has high suitability for rainfed crop production.

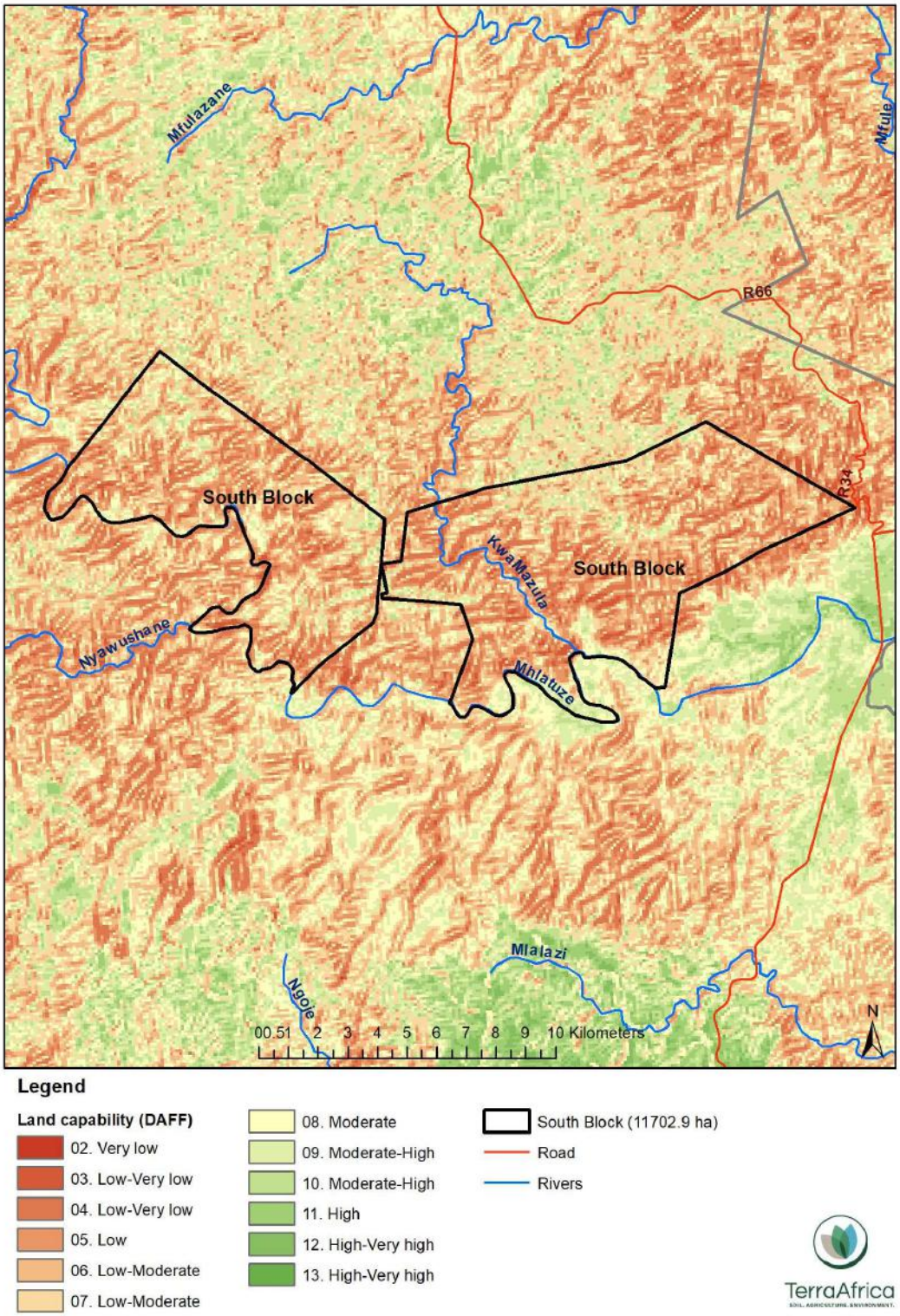


Figure 7-14 Land capability classification of the South Block and surrounding area (data source: DALRRD, 2016)

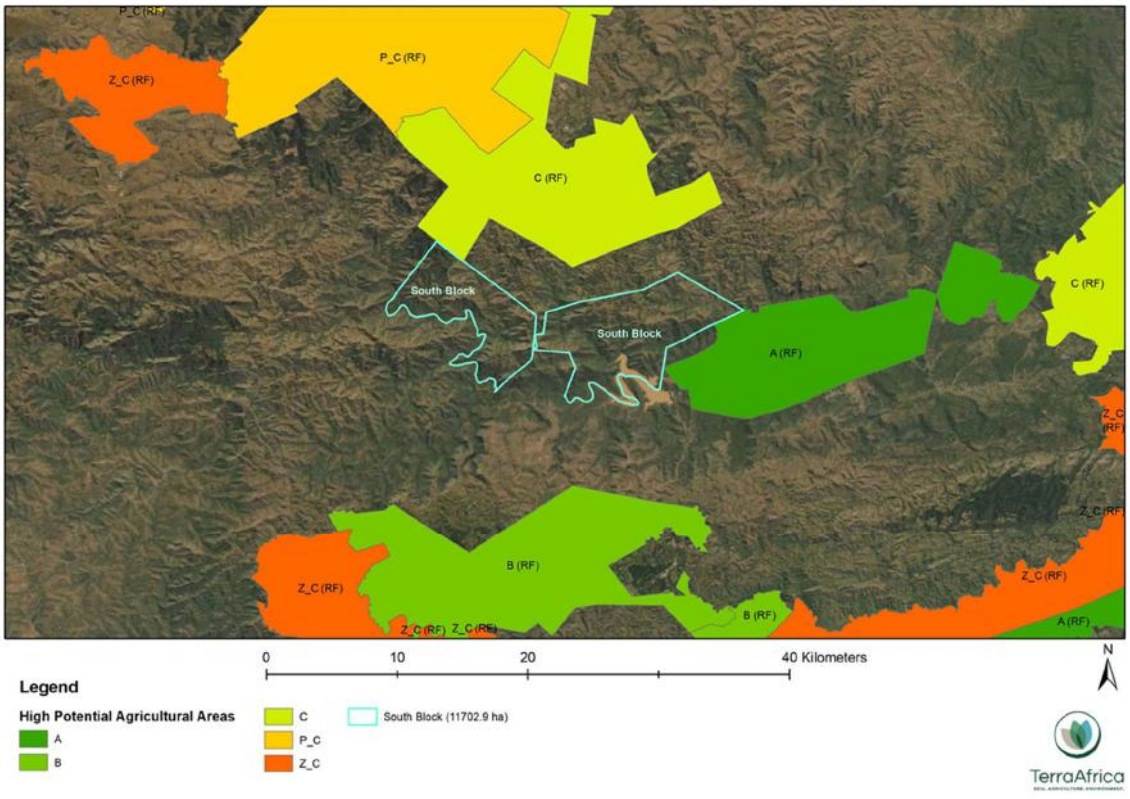


Figure 7-15 The proposed South Block boundaries in relation to HPAAs (data source: DALRRD, 2016)

7.4.11 Noise

Background ambient noise levels in the vicinity of the Jindal site are expected to be relatively low as the area is quite sparsely populated, with only a few nearby scattered rural households, subsistence and commercial agriculture contributing to background noise.

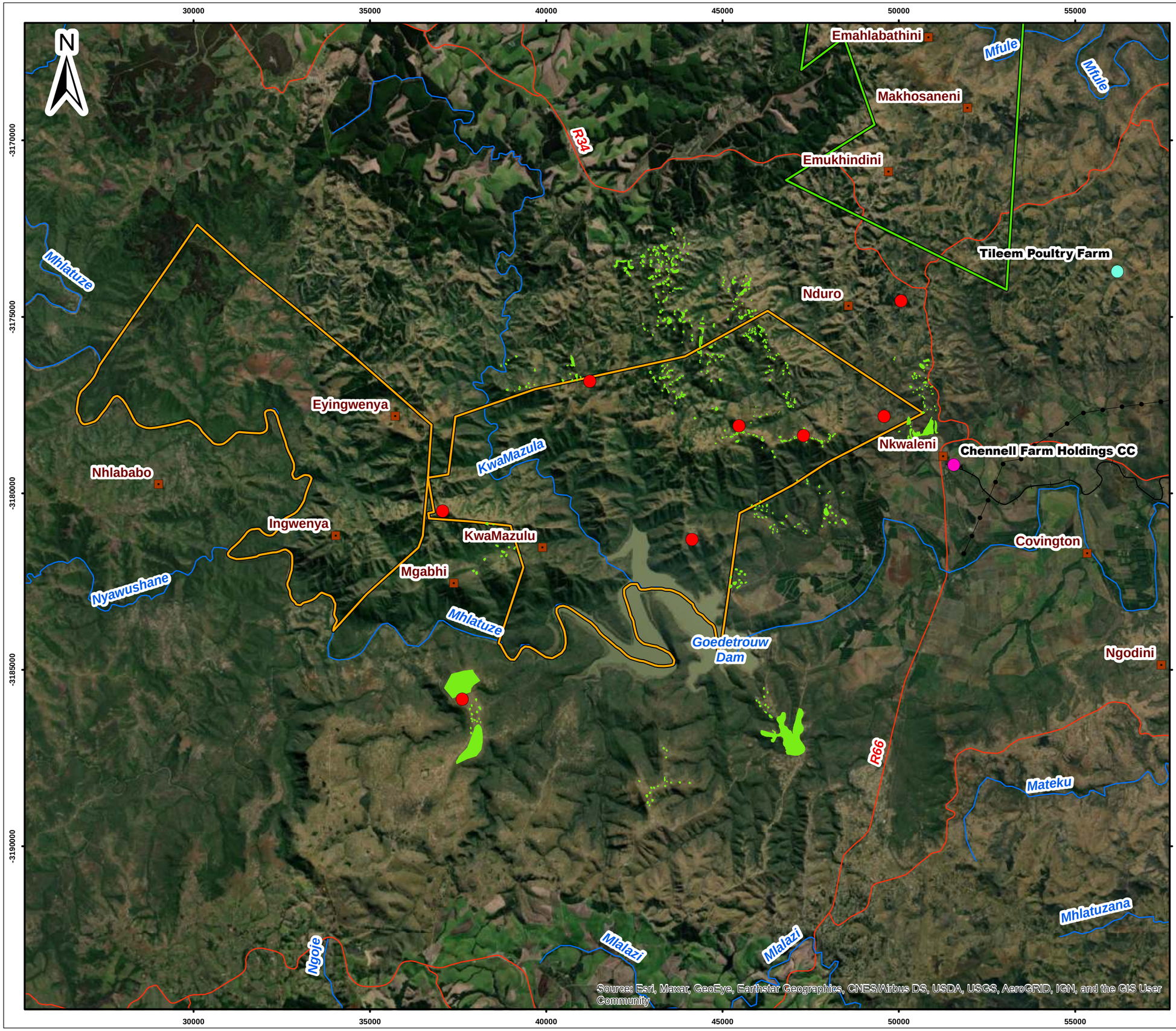
Potential noise sensitive receptors (SRs) located around the Jindal MIOP include:

- Nsukazi Primary School situated 1.91 km south west;
- Ndundulu Primary School located 2.60 km north east;
- Chennell Farm Holdings CC situated 2.76 km south east;
- Tileem Poultry Farm located 7.12 km north east; and
- Homesteads and farms within the areas surrounding the site.

The potential noise SRs are illustrated in Figure 7-16.

The general procedure used to measure baseline environmental noise at the Project site prior to operation will be guided by local legislation (stipulated by the National Environmental Management Act (NEMA, 1988), the South African National Standard (SANS 10103:2008)) and international best practice.

A noise monitoring survey is currently being undertaken during the daytime and night-time periods to characterise the existing noise conditions at the proposed Jindal MIOP site as part of the overall EIA process. The aim of the survey is to determine compliance with the local and international environmental noise limits.



Legend

- Towns / Villages
- Roads
- Railway Line
- Power Line
- Rivers
- South Block Prospecting Right Area
- North Block Prospecting Right Area

Potential Sensitive Receptors

- Homesteads
- Chennell Farm Holdings CC
- Tileem Poultry Farm
- Schools

0 2 4 Kilometers

Scale: 1:140 000 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

Jindal Iron Ore (Pty) Ltd

Figure 7-16

Potential Sensitive Receptors

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

720.10023.00001

2022/02/04

7.4.12 Air Quality

7.4.12.1Ambient air quality within the region

The following sources and activities contribute to the baseline pollutant concentrations:

- Agricultural activities: the majority of the commercial farms in the region produce sugarcane, timber and citrus. Land clearing and ploughing in preparation of fields for sowing can generate a significant amount of dust. Sugarcane burning results in products of combustion, with pollutants of concern including particulate matter (PM) as well as CO and NO_2 emissions.
- Biomass burning: biomass burning is considered as the incomplete combustion of natural plant matter with PM, CO, and NO_2 being emitted during the process. Crop residue burning and wildfires represent significant sources of combustion-related emissions associated with agricultural areas.
- Domestic fuel burning: the rural households within the vicinity of the site are anticipated to rely on wood burning for space heating and cooking purposes. Emissions from these activities are expected to have an impact on air quality. More so during the winter months due to the increased demand for space heating.
- Vehicle emissions: air pollution generated from vehicle emissions may be evaluated as primary and secondary pollutants. Primary pollutants are those emitted directly to the atmosphere as tail-pipe emissions whereas, secondary pollutants are formed in the atmosphere as a result of atmospheric chemical reactions. Given the low population density residing in the region it is anticipated that vehicle exhaust emissions will be limited and therefore relatively insignificant. The nearest major road is the R34 which is located to the north and east of the Project site. The R34 is a long provincial route that connects Vryburg with Richards Bay via Kroonstad and Newcastle.
- Unpaved roads and exposed areas: the quantity of dust emissions from unpaved roads vary based on the volume of traffic. Dust is generated by the loosened material lifted from the road surface by turbulent air currents created when the vehicle is moving. Given the rural nature of the project site, dust generated by vehicles on unpaved roads is likely to be a source of PM, however, it is expected to be limited due to low traffic volumes. The highest impacts are expected to be limited to the areas immediately adjacent to the roads (within 200m).

Due to the scale at which the above activities are likely to be occurring within the region as well as the rural nature of the surrounding environment, the ambient air quality is likely to be reflective of a rural environment.

An air quality survey is currently being undertaken and will feed into the air quality model for the EIA.

7.4.12.2 Potential air quality receptors

Potential receptors surrounding the Jindal MIOP include:

- Nsukazi Primary School situated 1.91 km south west;
- Ndundulu Primary School located 2.60 km north east;
- Chennell Farm Holdings CC situated 2.76 km south east;
- Tileem Poultry Farm located 7.12 km north east; and
- Homesteads and farms within the areas surrounding the site.

These potential air receptors are presented in Figure 7-16.

7.4.13 Visual Resource, Landscape Sensitivity and Sense of Place

7.4.13.1 Visual Resource Value, Scenic Quality, and Landscape Sensitivity

Table 7-14 summarises the various local landscape character types and their consequent sensitivities. Refer also to Figure 7-17.

Table 7-14 Value of the Visual Resource (After LiEMA 2013)

High	Moderate	Low
Goedertrouw Dam and surrounding woodland valleys and hills; other River and Valley systems	Natural grassland on hills and open bush on low lying hills; villages and homesteads on hills; Agricultural lands and forestry	Urban development and power infrastructure
This landscape type is considered to have a high value because it is a: A distinct landscape that exhibits an extremely positive character with valued features that combine to give the experience of unity, richness, and harmony. It is a landscape that may be of particular importance to conserve, and which has a strong sense of place. Sensitivity: It is sensitive to change in general and will be detrimentally affected if the change is inappropriately dealt with.	This landscape type is considered to have a moderate value because it is a: A common landscape that exhibits some positive character, but which has evidence of alteration/degradation/ erosion of features resulting in areas of more mixed character. Sensitivity: It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with	This landscape type is considered to have a low value because it is a: Minimal landscape, generally negative with few, if any, valued features. Sensitivity: It is not sensitive to change in general and scope for positive enhancement frequently occurs

7.4.13.2 Sense of Place

According to Lynch (1992), a sense of place is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own. The sense of place for the study area derives from a combination of the local landscape character types described previously, their relative 'intactness', and their impact on the senses. Although, the activities and land-uses in the study area are common within the sub-region, the areas immediately adjacent to the Goedertrouw Dam are considered as potential tourist destinations. Currently, Shakaland and the Phobane Guest House and nature area are located near the dam. These areas are potentially treasured by the tourists, from within the region, who may visit the area for recreational and tourist activities. However, Shakaland appears to be either abandoned or currently non-operational because of COVID restrictions on tourism and travel.

The combination of the cultural and agricultural/forestry activities, along with the distinctiveness of the rugged incised topography and the relative intactness of the original landscape, give the study area a relatively strong sense of place. One, in which new development needs to be carefully managed such that the combination of mining and development activities associated with the proposed Jindal MIOP and the landscape are not at odds with each other.

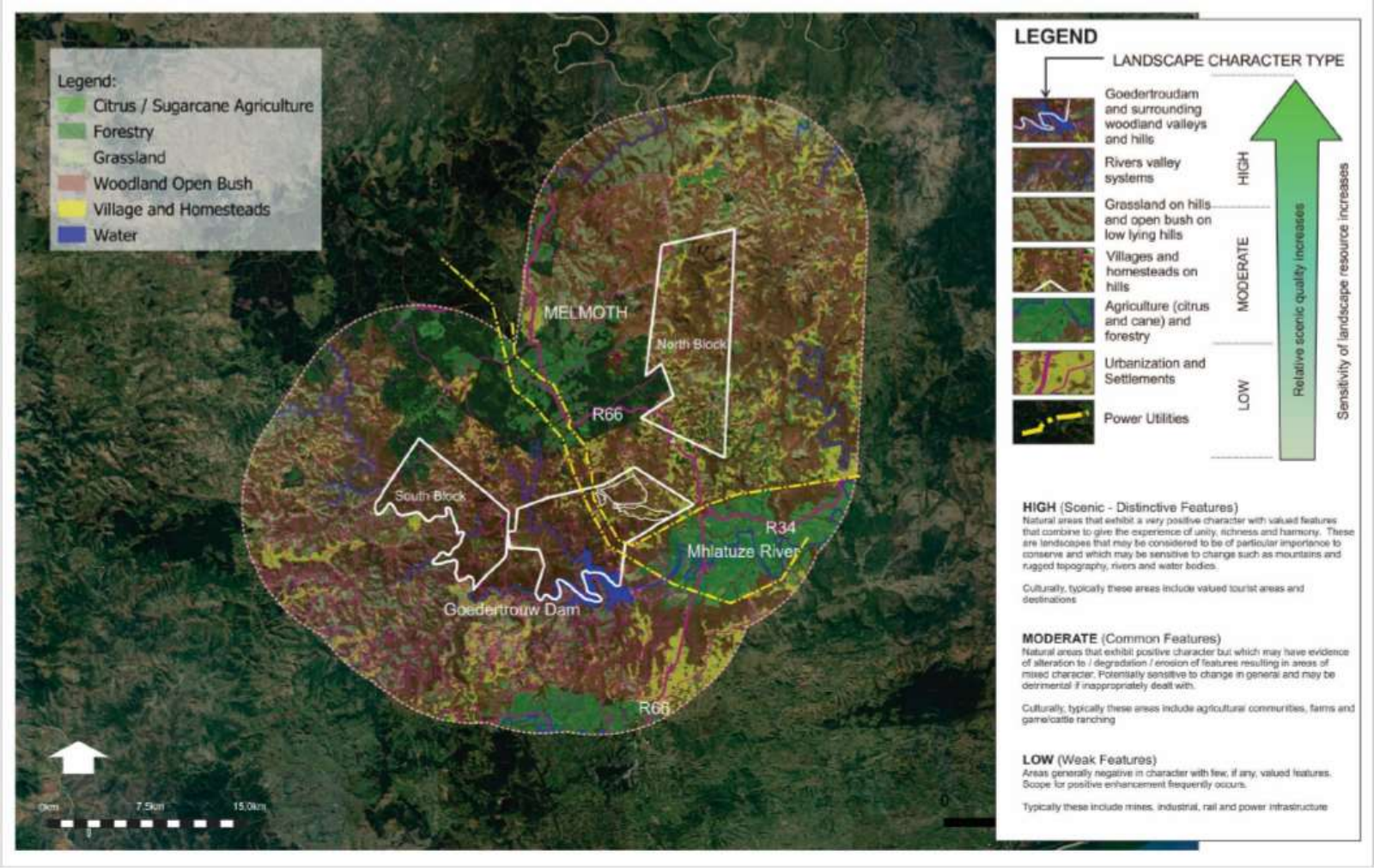


Figure 7-17 Landscape Character and Sensitivities of the site

7.4.14 Economic

7.4.14.1 South African Economy

The South African economy showed three consecutive quarters of growth in real Gross Domestic Product (GDP) from the third quarter of 2019. The outbreak of Covid and the resulting restrictions in 2021 have, however, had a negative effect on the economy. It is expected that further declines in GDP will follow due to the current pressure on state finances, the poor financial status of State-Owned Entities (SOEs) and the possible return to load shedding as winter energy demand spikes.

The main contributor to the South African economic production output is mining and quarrying, as evidenced by the 2021 sectoral performance recorded by StatsSA. Mining is the majority contributor to the primary economic sector within South Africa.

7.4.14.2 Regional economic profile

The regional economic structure of both Mthonjaneni Local Municipality (LM) and uMlalazi LM is dominated by the primary and secondary sectors. These means that the economy of these municipalities is strongly dependent on the agriculture, manufacture and mining sectors to support economic growth in both municipalities. The success of these sectors determines the job security and opportunity within the municipalities.

The level of education for the communities within the two municipalities shows the majority of job seekers have a matric and some secondary education. The employment rate is at approximately 65% for the area. The South African unemployment rate is 32.6%. The average annual household is classified as a low income category, with an annual income of less than R40 000.

A potential negative economic aspect of the mine development may be the impacts to local tourist operations. Noise, aesthetics and dust pollution may detract from the tourist products and activities in the area. As a result, the job security relating to the tourism industry may be affected.

7.4.15 Social

7.4.15.1 Demographics of the Area of Influence

The social baseline has been carried out to collect information for the estimated area of influence which falls within the administrative boundaries of Mthonjaneni LM and uMlalazi LM. Both of these municipalities show a slight downward trend in population over the next 30 years. The predominantly rural nature of these municipalities suggests that the population contraction could be driven by an outflow of people searching for economic opportunities in nearby urban areas, such as Empangeni and Richards Bay. There is evidence from StatsSA that the improving education levels has resulted in young professionals leaving the family home to find work elsewhere.

The bulk of the population falls within the working age (average of 56%). However, this is still a low ratio and creates a significant dependency burden in the area. It is important in this scenario that job opportunities are available that will support households with a single breadwinner and many dependents. As per Table 7-15 below, the average household is more than 4 people per house.

Table 7-15 Summary of the demographic profile of Mthonjaneni LM and uMlazi LM

Area Category	Mthonjaneni LM	uMlalazi LM	Unit
Population	42 599	207 251	Persons
Households	9 956	47 995	Households
Average household size	4.3	4.3	Persons per household
Household density	9.2	21.7	Households per square km
Age profile	40%	35%	Younger than 15
	55%	58%	Working Age (15-64)
	5%	8%	Elderly (older than 65)
Age dependency ratio[1]	83%	73%	Per 100 persons
Education profile	12.9%	10.7%	No schooling
	16.1%	12.4%	Some primary
	4.6%	3.2%	Complete primary
	28.9%	28.3%	Some secondary
	33.0%	38.7%	Grade 12/ National Senior Certificate
	4.4%	6.8%	Higher
Employment profile	69.8%	59.9%	Employed
	11.4%	15.3%	Unemployed
	18.8%	24.8%	Discouraged work-seeker
Household income profile	2.3%	3.7%	No income
	61.3%	54.4%	Low income
	18.7%	20.1%	Low/ Middle income
	16.5%	19.1%	Middle/ high income
	1.1%	2.7%	High income

Analysis of the income levels shows that the majority of the households are earning less than R40 000 per annum, and half of all households are earning less than R20 000 per annum. Thus, even though the potential employment levels are reasonably high this suggests high levels of poverty and deprivation and is a worrying indicator for a lack of economic growth prospects within the two municipalities.

7.4.15.2Access to Basic Services

The provision of basic services such as water and sanitation, electricity and refuse and waste removal are a critical function of the municipalities. The individual's right to basic services includes the right to an environment that is not harmful to human health or well-being.

[1] a measure of the degree to which the economically active person is relied upon to provide for and support the youth and elderly segments of the population.

Within the two municipalities, less than half of the households have access to municipal water. Poor levels of access to safe and clean potable water have the potential to create a health burden and the proportion of households accessing water from rivers and streams and other stagnant sources is a cause for concern.

Access to basic levels of sanitation is poor in both municipalities. Almost half of the households do not have access to flushing toilets. The high dependency on pit latrines is a concern as poor sanitation can be a vector for disease. Just over one third of households have access to refuse removal services supplied by the municipalities. Most households rely on their own refuse dumps, which have not been constructed effectively. This poses serious environmental and health impacts as unregulated dumping can create a disease burden as an attractor of vermin and pose a hazard to young children who encounter contaminated waste.

Less than 20% of the population has access to electricity within their households. The remaining households rely on paraffin for cooking and lighting. Paraffin has a potential for significant health consequences, including respiratory related illnesses.

The primary economic activities within the Mthonjaneni and uMlalazi LM comprise agriculture and manufacturing, with. the overall economic growth trend in the area being tied to the growth and contraction of these sectors. The household income profile of these municipal areas suggests that they are low-income areas, with approximately one fifth of all households in the combined area earning less than R38 400 a year.

Education levels within the area are low, with approximately 75.8% of the population over 20 years of age not having completed Grade 12 / National Senior Certificate. This means that most of the population can be expected to have a relatively low-skill level and would either require employment in low-skill sectors, or skills development opportunities to improve the skills level of the area.

7.4.15.3 Profile of directly affected communities

The communities that will be directly affected by the proposed mining development are located within the boundary of South Block, comprising of wards 5, 6 and 8 in Mthonjaneni LM. Table 7-16 provides a summary of the places that will be directly affect by the proposed mine. These three wards comprise of 8 195 people in 2 118 households. The significant majority of these people are Black African and the community has an unemployment rate of over 85%.

Table 7-16: Wards and sub-places within the proposed mine area of influence

Ward	Sub-place within AOI
Mthonjaneni Ward 5	kwaMazulu SP (sub-place)
	Magbhi SP
	Mthonjaneni NU (non-urban)
Mthonjaneni Ward 6	Bedlane SP
	Isibaya Esikhulu SP
	Mehlamasha SP
	Mthonjaneni NU
	Zigagayi SP

Ward	Sub-place within AOI
Mthonjaneni Ward 8	Edubeni SP
	Mbangu SP
	Nduro SP

7.4.16 Cultural Heritage

7.4.16.1 Heritage Resources

The banded ironstone of the Mhlathuze Formation (has long been known to geologists. There has been a long history of prospecting and assaying of banded ironstone formations in and around the Project area during the 20th Century. While most of the Zululand banded ironstone is of poor quality, this deposit shows some surface enrichment. These deposits are known to have been extensively worked in precolonial times with evidence of Early Iron Age settlements along the Mhlathuze riverbanks. These settlements were some of the earliest farming communities in the region c. 750-1050 AD.

As far as archaeologists have been able to determine, it is these iron deposits that were targeted for iron smelting in the 18th and early 19th Centuries by the Shezi blacksmiths of the Cube clan. The Shezi were the sought after and appointed blacksmiths to both Kings Shaka and Dingaan in their accessions to power and expansion of the Zulu Kingdom. Shallow mining pits and smelting and smithing furnaces have been the subject of archaeological investigation from the Project area and westwards to Qa-Qa-Lensirnbi (Iron Ridge), on the middle reaches of the Mhlathuze River.

The early 20th Century surveyed farms within the Project area were amalgamated as Trust farms for incorporation into the newly established KwaZulu Homeland in 1979. These Trust farms were subsequently placed under the jurisdiction of the regional Inkosi Mhlaba Sam Zulu and local amakhosi Biyela and Zulu. A gradual but systematic settlement expansion of the Project area took place from the 1980's and accelerated post 1994. These nucleated family homesteads are all likely to contain ancestral burial sites and will be further assessed during the Heritage Impact Assessment.

7.4.17 Traffic

7.4.17.1 Existing Land Use and Road Characteristics

The relevant properties where the proposed mining will take place are currently utilised for residential and grazing activities, including a powerline servitude and the public road DD395 which intersects the proposed site. For the purpose of this study, it is assumed that the vehicle traffic absorption rate by all other types of completed developments will remain the same for the next 10 years.

Road P47-4 (R66) showed limited activity at all relevant intersections during the surveys. It is anticipated that this road is infrequently utilised. There was activity observed at the intersection of Road P47-4 and Road PROW314 due to clinic and shops located in the vicinity and the public transport loading and off-loading at the lay-by facility at this intersection. See Figure 7-18 which indicates the various relevant intersections along the main Road P47-4.

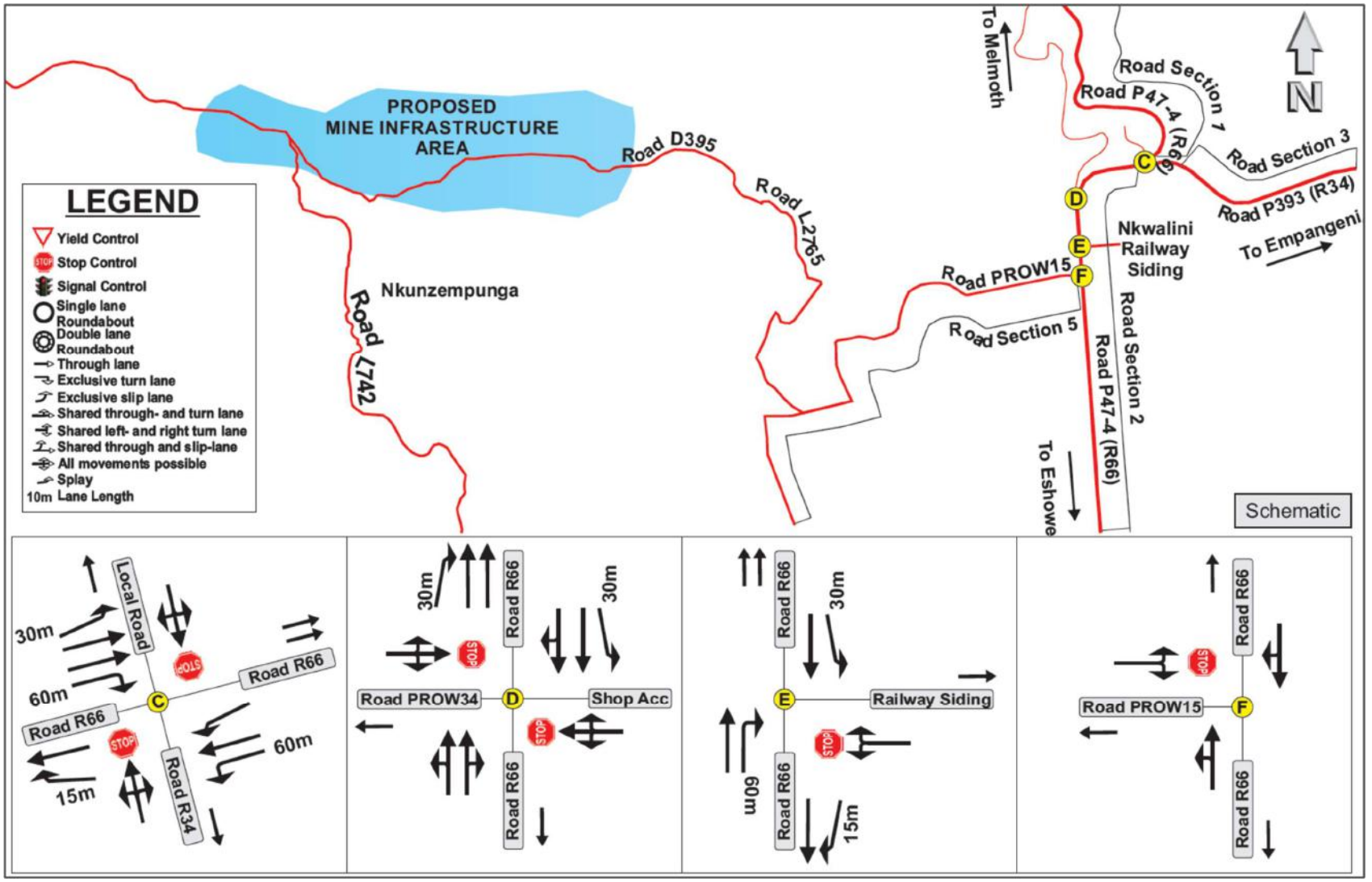


Figure 7-18 Schematic Layout of the existing road network (BTA, 2022)

The traffic count at the Road P47-4 and relevant intersections showed average morning peak hour load averages of about 370 vehicles per hour. The afternoon peak hour load average was found to be 480 vehicles per hour.

7.4.17.2 Future land use and road characteristics

At the time of the study no other significant future development were identified, including latent rights and approved future development in the area. It is expected that as part of the proposed mining development activities, that vehicle traffic on public roads would be generated. A full traffic impact assessment is required to provide a detailed vehicle trip generation estimates.

7.4.17.3 Baseline traffic and potential impacts

The intersections investigated as part of this baseline study are currently operating at acceptable levels of service. Reserve capacity is available at the relevant intersections on the existing road network. Vehicle trips generated by the proposed mining development will, however, determine if road network improvements will be required from an intersection performance and road safety perspective.

Access to and from the proposed mining development would be gained directly from Road D395 which currently traverses the site. Broader access to the site is currently gained via a series of local gravel roads including Road L742, Road L2765, Road PROW15, and Road P258. All of the roads lead to the main Road P47-4.

7.5 DESCRIPTION OF THE CURRENT LAND USES

The area surrounding the proposed Jindal MIOP is classified as fully rural/ non-urban, with 70.8% of the land under tribal/ traditional authority administration. Numerous communities inhabit the area with most households comprising of formal brick dwellings, and traditional housing.

In the North Block subsistence farming fields are mostly scattered along the eastern, southern and western boundaries. The subsistence farming areas within the North Block, are all classified as small scale or emerging farms where the output is primarily for home consumption. There are numerous small fields between 5 and 10 ha and it is difficult to distinguish between individual field crop boundaries within these areas.

In the South Block subsistence farming fields are mostly scattered along the eastern part of the northern boundary as well as a small area along the western part of the southern boundary. The subsistence farming areas within the South Block, are also classified as small scale or emerging farms where the output is primarily for home consumption. More subsistence farming is taking place outside the South Block, approximately 1.5 km to the north.

There are no areas with rainfed annual crops or planted pasture within the South Block but an area of rainfed crops that are located between horticultural fields, are located about 0.5 to 1 km south-east of the most eastern part of the southern boundary. More horticultural fields are located further north and south of the South Block areas. A large area with subsistence sugarcane farming is present between 6 and 7 km south of the southern boundary of the South Block. The South Block has a moderate capacity for grazing.

Large sections of the study area have been converted to industrial agriculture and forestry as illustrated in Figure 5. Forestry and sugarcane fields dominate the area south of Melmoth. The Mhlatuze River valley downstream of the dam is dominated by citrus and sugar can and in the far south of the study area, sugar cane fields have been cultivated (refer to views 1 and 2 in Figure 4-1 and the views in Figure 4-4). This is a common landscape type within the sub-region, which exhibits some positive characteristics.

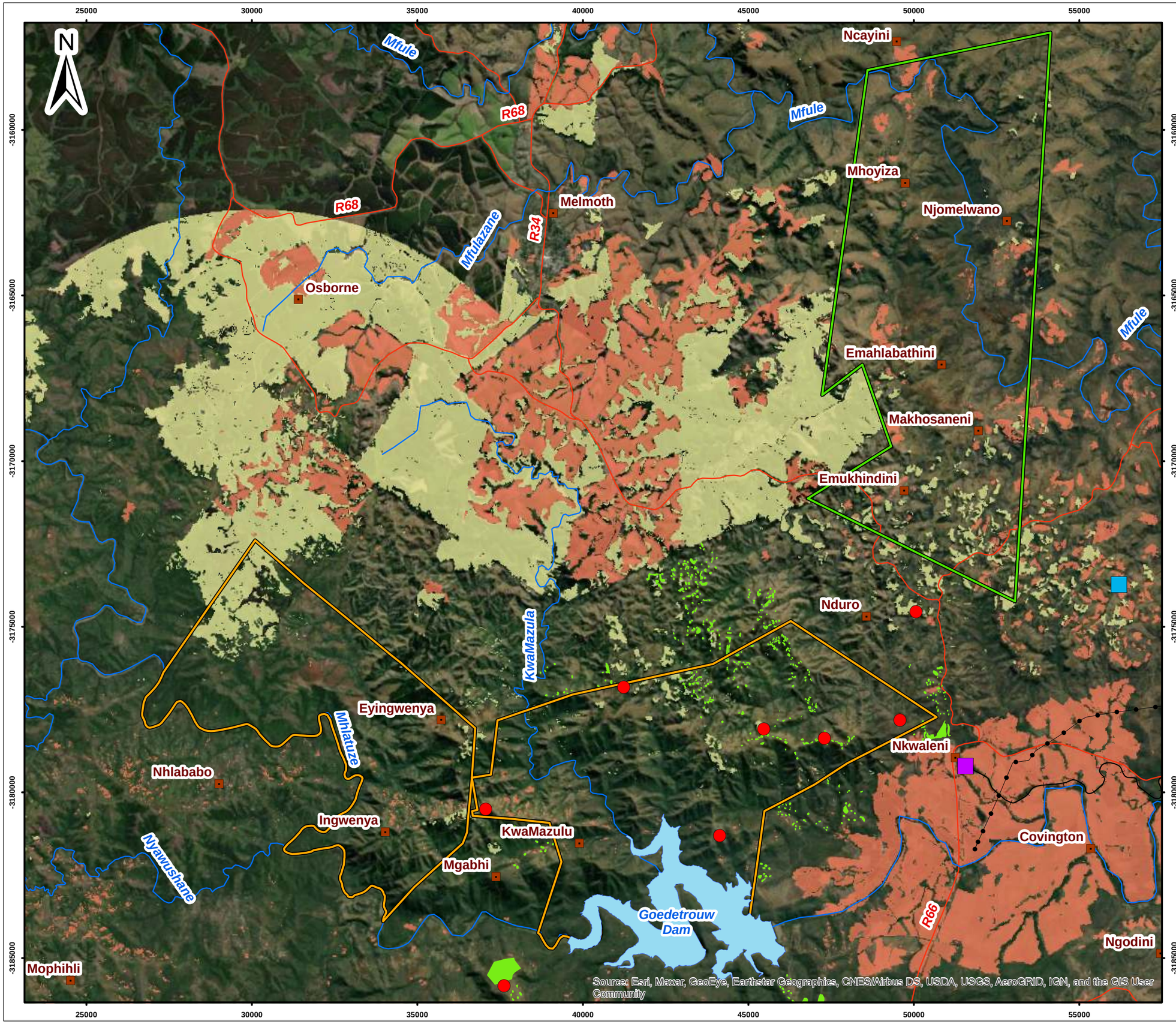
The southern border of the South Block consists of the Goedertrouw Dam and the Mhlatuze River. The Goedertrouw Dam historically was an important tourism area the infrastructure now appears to be in a state of disrepair. Currently, Shakaland and the Phobane Guest House and nature area are located near the dam. These areas potentially have some tourism from within the region, however, they now appear to be either abandoned or currently non-operational because of COVID restrictions on tourism and travel.

The only urban development within the study area is Melmoth (central west of the study area), which is approximately 15 km to the north west of the proposed Jindal MIOP. Two ESKOM transmission lines run directly through the study area and pass immediately west of the proposed mine, primary crusher and plant sites. The R66 road runs almost directly inbetween the North and South Blocks ion a north-south direction.

7.6 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON SITE

The environmental features and infrastructure within the proposed Jindal MIOP area are described in Sections 7.4 and 7.5 and shown in Figure 7-19.

7.7 ENVIRONMENTAL AND CURRENT LAND USE MAP



Legend

- Towns / Villages
- Roads
- Railway Line
- Power Line
- Rivers
- Dams
- Homesteads
- Cultivated Lands
- Plantations
- Schools
- Tileem Poultry Farm
- Chennell Farm Holdings CC

0 2 4 Kilometers

Scale: 1:140 000 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

Jindal Iron Ore (Pty) Ltd

Figure 7-19

Jindal Melmoth Iron Ore Project Surrounding Land Use

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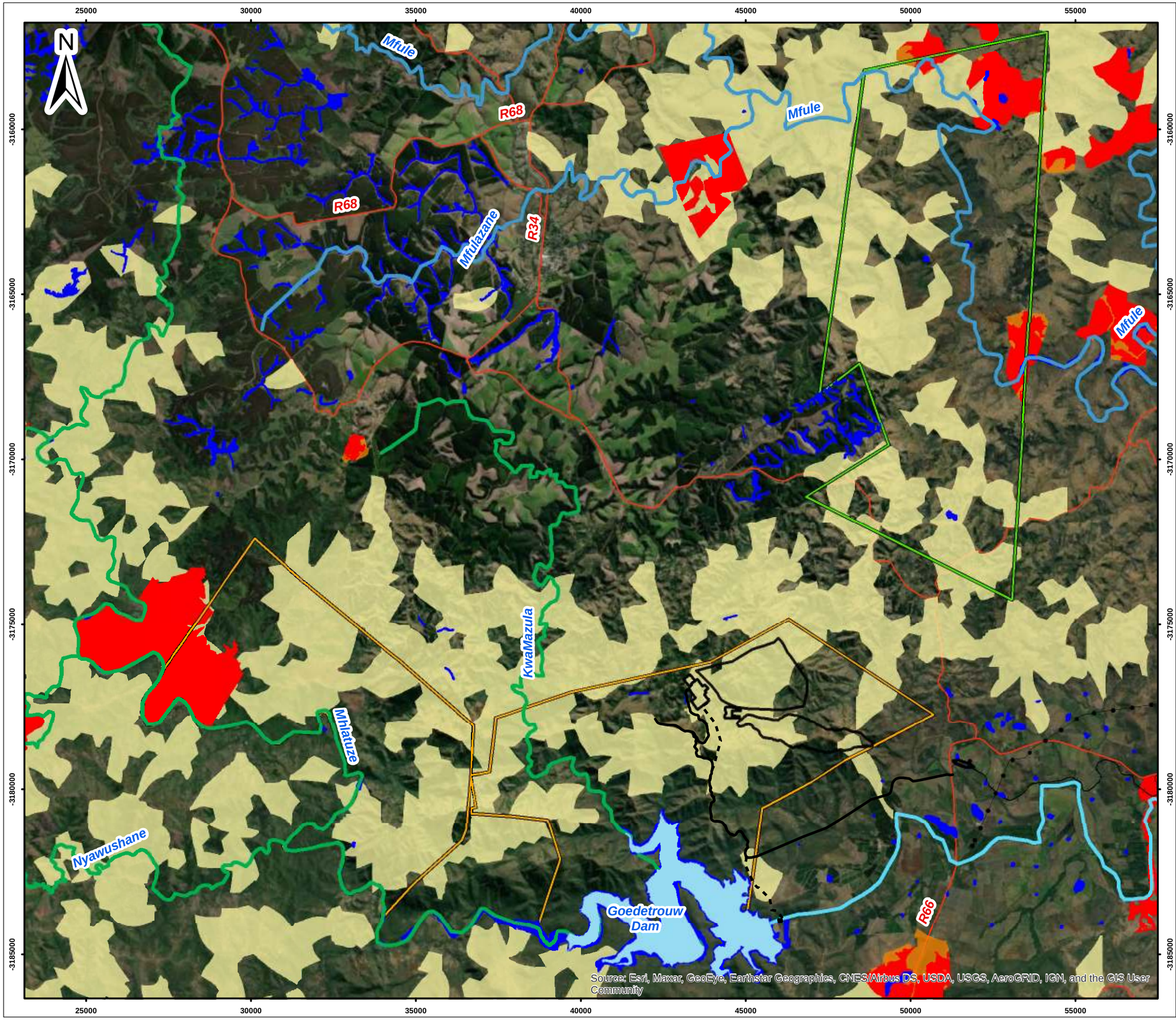
720.10023.00001 | 2022/02/04



Legend

- Roads
- Railway Line
- Power Line
- Rivers
- Dams
- North Block Prospecting Right Area
- South Block Prospecting Right Area
- Proposed Jindal Infrastructure
- NFEPA Wetlands

NFEPA Rivers

- CLASS A: Unmodified, Natural
- CLASS B: Largely Natural
- CLASS C: Moderately Modified

- Critical Biodiversity Areas - Irreplaceable
- Critical Biodiversity Area 1 Mandatory
- Critical Biodiversity Area 2 Mandatory
- Critical Biodiversity Area 3 Optimal

0 2 4 Kilometers

Scale: 1:140 000 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo31

Jindal Iron Ore (Pty) Ltd

Figure 7-20

Environmental Sensitivity

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2022/02/04

7.8 ENVIRONMENTAL IMPACTS IDENTIFIED

This section provides a list of potential impacts on the biophysical, heritage/cultural and socio-economic aspects that have been identified in respect of each of the main project actions/activities and processes for each of the project phases (Table 7-17). A discussion of each of the impacts identified is provided in Section 7.11. The preliminary ratings for consequence, probability and significance of each of the impacts in the unmitigated scenario (which assumes that no consideration is given to the prevention or reduction of biophysical and social impacts) are also provided in Table 7-17 in accordance with the DMRE report template. In this regard it must be noted that a conservative approach has been applied to these ratings in the absence of site specific studies. Once all the site specific studies have been completed the assessment and related ratings may change. The final ratings will be included in the EIA.

Table 7-17 shows impacts considered and risks for each project component.

C – Construction, O – Operational, D – Decommissioning, Cl – Closure)

Table 7-17 Preliminary List of Impacts Identified for the Proposed Project

	Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
					Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/Managed/ Mitigated
Potential biophysical impacts												
1	Topography	N/A	Site preparation Earthworks Transport systems Mineralised waste Mining activities	C,O,D,Cl	M	VH	VL	H	M	Unlikely	Possible	Managed/Mitigated
2	Reduced groundwater quality due to contamination	All	Site preparation Earthworks Transport systems Mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	C,O,D,Cl	H	VH	M	M	H	Possible	Possible	Managed/Mitigated
3	Reduced groundwater quantity due to pit dewatering – impact on 3rd party groundwater users	All	Pit dewatering	O	M	VH	M	H	H	Partially	Possible	Managed/Mitigated
4	Reduced surface water quantity	All	Establishment of mine infrastructure	C,O,D,Cl	M	VH	H	H	H	Possible	Possible	Managed/Mitigated

	Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
					Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/Managed/ Mitigated
			Raw water requirements Discharge of excess water Rehabilitation									
5	Reduced surface water quality due to contamination	All	Site preparation Earthworks Transport systems Mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	C,O,D,Cl	M	VH	H	H	H	Possible	Possible	Managed/Mitigated
6	Flooding of surface infrastructure	All	Earthworks Establishment of mine infrastructure Rehabilitation	O	M	VH	L	M	M	Possible	Possible	Managed/Mitigated
7	Direct impact on vegetation structure and plant species composition	All	Earthworks and site clearance Access road Establishment of mine infrastructure Access roads	C,O	H	VH	VL	VH	H	Partial	Possible	Managed/Mitigated

	Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
					Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/Managed/ Mitigated
			General site management									
8	Impact on populations of SCC	All	Site preparation Earthworks Mineralised waste General site management	C,O,D	H	VH	VL	VH	H	Possible	Possible	Managed/Mitigated
9	Impact on targets for threatened ecosystems	All	Earthworks and site clearance Establishment of mine infrastructure General site management Rehabilitation	C,O,D	H	VH	VH	H	VH	Partial	Possible	Managed/Mitigated
10	Impact on ecological processes and functionality of ecosystems	All	Earthworks and site clearance Establishment of mine infrastructure General site management Dewatering Rehabilitation	C,O,D,Cl	M	VH	M	M	M	Possible	Possible	Managed/Mitigated
11	Impact on species and ecosystem diversity	All	Site preparation Earthworks	C,O,D,Cl	H	VH	VH	H	VH	Partial	Possible	Managed/Mitigated

	Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
					Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/Managed/ Mitigated
			Transport systems Mineralised waste General site management Rehabilitation Maintenance and aftercare									
12	Reduced ecological connectivity	All	Site preparation Earthworks Transport systems Mineralised waste General site management Rehabilitation Maintenance and aftercare	C,O,D	M	VH	M	M	M	Possible	Unlikely	Managed/Mitigated
13	Loss of species diversity due to modification of freshwater habitat	All	Site preparation Earthworks Transport systems Mineralised waste General site management Rehabilitation Maintenance and aftercare	C,O,D,Cl	H	H	M	H	H	Possible	Possible	Managed/Mitigated

	Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
					Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/Managed/ Mitigated
14	Alteration of hydrological and geomorphological Processes	All	Site preparation Earthworks Mineralised waste	C,O,D,Cl	H	H	M	H	H	Partial	Possible	Managed/Mitigated
15	Reduced water quality	All	Site preparation Earthworks Transport systems Mineralised waste General site management Dewatering Rehabilitation Maintenance and aftercare	C,O,D,Cl	M	VH	M	H	H	Possible	Possible	Managed/Mitigated
16	Reduced ecological connectivity and/ or ecological disturbance	All	Site preparation Earthworks Mineralised waste Blasting activities Haul roads	C,O,D	M	VH	VL	H	M	Possible	Unlikely	Mitigated/Managed
17	Loss of soils and land capability through contamination	All	Site preparation Site establishment Earthworks Transport systems Mineralised waste General site management	C,O,D,Cl	H	M	L	H	M	Possible	Unlikely	Mitigated/Managed

	Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
					Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/Managed/ Mitigated
			Maintenance and aftercare									
18	Loss of soils and land capability through erosion and compaction	All	Site preparation Site establishment Earthworks Transport systems Mineralised waste General site management Maintenance and aftercare	C,O,D,Cl	M	VH	H	H	H	Largely	Possible	Mitigated/Managed
19	Increase in disturbing noise levels	All	Earthworks Site preparation Site establishment Mining activities Operation of pit	C,O, D	M	H	M	H	M	Fully	Unlikely	Mitigated/Managed
20	Reduced air quality due to emissions	All	Earthworks Site preparation Site establishment Transport systems Mining activities Processing plant	C,O,D	H	VH	M	H	H	Partially	Possible	Mitigated/Managed

	Potential impact	Alternative	Main project activity	Project phase	Consequence			Probability	Unmitigated Significance	Degree to which impact		
					Intensity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/Managed/ Mitigated
Potential socio-economic impacts												
21	Impact on existing roads and traffic due to project related traffic	All	Site preparation Earthworks Transport systems	C,O,D	M	VH	H	H	H	Possible	Possible	Mitigated/Managed
22	Negative visual impacts due to mining activities	All	Earthworks Site preparation Site establishment Mining activities Operation of pit	C, O,D	H	H	M	H	H	Partially	Possible	Mitigated/Managed
23	Positive socio-economic changes due to increased investment in local areas.	All	Throughout all phases of mining due to investment in the local economy and local employment.		H+	H	VH	H	VH+	Partially	N/A	Can be managed to enhance positive impact
24	Negative socio-economic impacts due to influx	All	Outside workforce Safety and security issues Health impacts	C,O,D,Cl	H	VH	M	M	H	Possible	Possible	Mitigated/Managed
25	Negative socio-economic impacts due to resettlement	All	Resettlement of local communities	C	H	VH	H	VH	VH	Unlikely	Possible	Mitigated/Managed
26	Loss of or damage to heritage and/or palaeontological resources	All	Site preparation Earthworks Transport systems Support services	C,O,D,Cl	H	VH	VL	H	H	Unlikely	Possible	Mitigated/Managed

7.9 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The method to be used for the assessment of impacts is set out in the table below. This assessment methodology enables the assessment of environmental impacts including: cumulative impacts, the intensity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

Table 7-18 Impact Assessment Methodology

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		Significance = consequence x probability
Definition of CONSEQUENCE		Consequence is a function of intensity, spatial extent and duration
Criteria for ranking of the INTENSITY of environmental impacts	**VH**	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**VL**	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years (likely to cease at the end of the operational life of activity).
	VH	Very long, permanent, +20 years (Irreversible, Beyond closure).

Criteria for ranking the EXTENT of impacts	**VL**	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours.
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART B: DETERMINING CONSEQUENCE							
INTENSITY = VL							
DURATION	Very long	**VH**	**Low**	**Low**	**Medium**	**Medium**	**High**
	Long term	**H**	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Medium term	**M**	**Very Low**	**Low**	**Low**	**Low**	**Medium**
	Short term	**L**	**Very low**	**Very Low**	**Low**	**Low**	**Low**
	Very short	**VL**	**Very low**	**Very Low**	**Very Low**	**Low**	**Low**
INTENSITY = L							
DURATION	Very long	**VH**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Long term	**H**	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Medium term	**M**	**Low**	**Low**	**Medium**	**Medium**	**Medium**
	Short term	**L**	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Very short	**VL**	**Very low**	**Low**	**Low**	**Low**	**Medium**
INTENSITY = M							
DURATION	Very long	**VH**	**Medium**	**High**	**High**	**High**	**Very High**
	Long term	**H**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Very short	**VL**	**Low**	**Low**	**Low**	**Medium**	**Medium**
INTENSITY = H							
DURATION	Very long	**VH**	**High**	**High**	**High**	**Very High**	**Very High**
	Long term	**H**	**Medium**	**High**	**High**	**High**	**Very High**
	Medium term	**M**	**Medium**	**Medium**	**High**	**High**	**High**
	Short term	**L**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Very short	**VL**	**Low**	**Medium**	**Medium**	**Medium**	**High**
INTENSITY = VH							
DURATION	Very long	**VH**	**High**	**High**	**Very High**	**Very High**	**Very High**
	Long term	**H**	**High**	**High**	**High**	**Very High**	**Very High**
	Medium term	**M**	**Medium**	**High**	**High**	**High**	**Very High**
	Short term	**L**	**Medium**	**Medium**	**High**	**High**	**High**
	Very short	**VL**	**Low**	**Medium**	**Medium**	**High**	**High**
			VL	**L**	**M**	**H**	**VH**
			A part of the site/ property	Whole site	Beyond the site, affecting neighbours	Extending far beyond site but localised	Regional/ National
			EXTENT				

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**VH**	**Medium**	**Medium**	**High**	**Very High**	**Very High**
	Probable	**H**	**Low**	**Medium**	**Medium**	**High**	**Very High**
	Possible/ frequent	**M**	**Low**	**Low**	**Medium**	**Medium**	**High**
	Conceivable	**L**	**Very Low**	**Low**	**Low**	**Medium**	**Medium**
	Unlikely/ improbable	**VL**	**Negligible**	**Very Low**	**Low**	**Low**	**Medium**
			VL	**L**	**M**	**H**	**VH**
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Negligible	Inconsequential, not requiring any consideration.

7.10 POSITIVE AND NEGATIVE IMPACTS OF THE PROPOSED ACTIVITY AND ALTERNATIVES

Potential biophysical, cultural and social impacts that were identified during the scoping process, in consultation with I&APs, are discussed under environmental component headings in this section. These discussions should be read with the corresponding descriptions of the baseline environment. In accordance with the DMRE report template this section requires a discussion of the potential impacts taking into consideration of all project related alternatives. The potential impacts associated with the project phases (construction, operations, decommissioning and closure) have been identified and described. The section below also references studies/investigations that are required to provide the necessary additional information. In the absence of specialist studies the assessment conclusions are conservative. It follows that the assessment provided below is a preliminary assessment which will be refined in the EIA and EMPr with specialist input, as appropriate.

The impacts as identified by specialist studies will be assessed for the areas, and surrounding potentially impacted zones, where the proposed development is currently planned (south-eastern section of the South Block).

7.10.1 Geology

No geological impacts such as sterilisation of mineral resources are expected as the proposed Jindal MIOP is being planned in a manner whereby the mining complex and WRD would not be constructed in areas which could potentially be resource areas. There will be some excavations for foundations but these are not expected to have a significant impact on the local geology.

7.10.2 Hydrogeology

The discussion below considers groundwater and focuses on third party users.

Issue: Reduction in Water Quantity and Quality Affecting Third Party Users
Mining projects have the potential to negatively impact on water resources through abstraction for water supply and dewatering activities resulting in the development of a drawdown cone around the pit area, regardless of the alternatives that are selected. Mining projects also present a number of effluent sources that can have a negative impact on water quality. Contaminants from the project are expected to include construction related consumables, silt, fuels, hydrocarbons, residues and hazardous wastes.

In the absence of mitigation (appropriate liner or barrier) the intensity of unmitigated impacts would be high, particularly for the waste rock dump facility and or TSF. Potential health impacts could occur where these water resources are used by third party users for extended periods of time. Impacts could extend beyond the site boundary to these water users and could extend beyond closure. The related unmitigated significance is, therefore, high. Important to note is that the use or potential contamination of water resources is regulated through Water Use Licensing requirements of the DWS as the custodian of water resources in South Africa. Where the project plan considers the findings of specialist studies, applies the necessary mitigation to avoid, minimises or remedy impacts in line with the mitigation hierarchy and operates under a WUL, the significance of potential impacts can be reduced.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.3 Hydrology

The discussion below considers surface water and focuses on third party users.

Issue: Reduction in water quantity and quality affecting third party users
Mining projects have the potential to negatively impact on water resources through abstraction for water supply, dewatering activities and altering drainage patterns through infrastructure placement and stormwater controls, regardless of the alternatives that are selected. Mining projects also present a number of emission sources that can have a negative impact on water quality. Contaminants from the project are expected to include construction related consumables, silt, fuels, hydrocarbons, residues and hazardous wastes.

In the absence of mitigation, given the importance of the Mhlatuze River system and based on the mine plan as presented in this report, the severity of unmitigated impacts would be high. For water quantity impacts, where water resources are used by third party users, potential impacts affecting third party supply could occur. Where these water resources are used by third party users for extended periods of time, potential health impacts could occur. Impacts could extend beyond the site boundary to the water users and could extend beyond closure. In time, any reduction in water quantity and quality could be reversed, however, at this stage, the related time period is not known. The related unmitigated significance is considered to be high. It is important to note that the use or potential contamination of water resources is regulated through water use licensing requirements of the DWS as the custodian of water resources in South Africa. Where the project plan takes into account the findings of specialist studies, applies the necessary mitigation to avoid, minimises or remedy impacts in line with the mitigation hierarchy and operates under a water use license, the significance of potential impacts can be reduced.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.4 Terrestrial Biodiversity

Issue: Physical Loss and/or General Disturbance of Terrestrial Biodiversity
The placement of infrastructure and activities in general have the potential to impact on terrestrial biodiversity through the physical loss of specific biodiversity areas, of linkages between biodiversity areas and related species (flora and fauna) which are considered to be significant because of their status, and/or the role that they play in the ecosystem.

Mining and mineral processing related activities have the potential to directly disturb vegetation, vertebrates and invertebrates in all project phases, regardless of the alternatives that are selected. Disturbances from mining and anthropogenic activities could include use of lighting, mortality of fauna, removal of fauna and flora species, settlement of dust on vegetation and related effects on vertebrates, generation of noise or vibrations, road kills, contamination of soil or water resources, general litter and occurrence of fires.

Based on the findings of this specialist study, ten broad vegetation communities were described on-site, four of which are considered to be in fair to natural condition and have a Very High SEI rating (according to SANBI, 2020). The remaining six vegetation communities on site range in SEI from Medium to Very Low. In addition to being in good to fair ecological condition the four largely intact vegetation communities are highly likely to support a number of floral SCC that are either red-listed, rare, or endemic, however, this would need to be verified through additional in-field sampling during the appropriate seasonal window. Following the initial site inspection, two SCC were confirmed to occur within open savannah/grassland vegetation on-site, namely *Stangeria eriopus* (Vulnerable) and *Moraea graminicola* subsp. *graminicola* (Near Threatened, South African Endemic). In addition to the two threatened plant species occurring on site, which are protected under the National Environmental Management: Biodiversity Act, there are a number of plant species that are protected under the Natal Conservation Ordinance and National Forest Act that will also require relevant plant permits from the relevant competent authorities (i.e., DAFF and EKZNW). In addition, several faunal SCC have been flagged as potentially occurring within the study area and therefore faunal surveys by appropriately qualified specialists for avifauna, mammal, frog, reptile, and invertebrate species will need to be conducted to address any potential impacts associated with Animal Species.

In the absence of mitigation measures any potential impacts would result in long term impacts that could extend beyond the site boundary. The significance of these impacts are likely to range between medium and very high (due to the presence of SCCs in the area) in the unmitigated scenario. Where relevant mitigation measures are implemented the significance of potential impacts can be reduced.

The additional work required to address these issues is described in Section 8.3 of this Scoping Report.

7.10.5 Aquatic Biodiversity

Issue: Loss or Disturbance of Aquatic Ecosystems
Where natural freshwater features exist within or adjacent to a project footprint, aquatic ecosystems can be impacted through physical loss of specific aquatic areas, of linkages between biodiversity areas and

related aquatic species which are considered to be significant because of their status, and/or the role that they play in the ecosystem. Aquatic ecosystems are also sensitive to flow and water quality changes.

The majority of the South Bock is located within DWS quaternary catchment W12B. A portion of the eastern extent of the South Block crosses into W12D. The primary river draining both catchments is the Mhlatuze River which, along with the Goedertrouw Dam, forms the southern boundary of the South Block. A large tributary of the Mhlatuze River, the KwaMazula River, drains much of the central portion of the South Block. A dense drainage network of 1st, 2nd and 3rd order tributaries is linked to the Mhlatuze and KwaMazula Rivers.

The mine plan includes open pit mining in close proximity to some of these drainage lines. Erosion, siltation, contamination and changes in flow due to water supply and dewatering activities could impact on aquatic ecosystems. In the absence of mitigation measures any potential impacts would result in long term impacts that could extend beyond the site boundary. The significance of these impacts are likely to range from medium to high in the unmitigated scenario. Where relevant mitigation measures are implemented the significance of potential impacts can be reduced.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.6 Soils and Agricultural

Issue: Loss of soil and land capability through removal, erosion and compaction
Topsoil is generally a resource of high value containing a gene bank of vegetation seeds and other organisms. Soil resources can be lost through removal, erosion and compaction which can result in a loss of soil functionality as an ecological driver. The conservation of topsoil, soil management practises and the related rehabilitation strategy and initiatives are highly important in achieving the post-closure land use. A number of activities/infrastructure in all phases have the potential to result in the loss of soils and related land capability, regardless of the alternatives that are selected.

There is the potential for soil erosion as opencast mining will require the removal of vegetation from the soil surface. The area is characterised by hillslopes with varying slope that include steep slopes as well as high rainfall. In the absence of mitigation, the combination of unvegetated soil surfaces and high rainfall can exacerbate the risk of soil erosion and result in high intensity impacts that could be irreversible. Soil erosion can extend beyond the site boundary when left unmitigated and can affect the productive land of nearby communities. The unmitigated significance is, therefore, high.

In addition, soil compaction will occur as a result of the heavy vehicles and equipment moving over the soil surface in areas where infrastructure will be constructed. In the areas where the parking areas, workshop and the offices will be constructed, soil will be deliberately compacted to stabilise the surface and to meet engineering requirements for compacted surfaces underneath structures. The weight of the soil stockpiles will also compact the surface underneath. Soil compaction will result in a moderate disturbance of the soil quality and without any mitigation measures, will remain permanently. Without mitigation measures, the extent of the impact may affect the entire site (Low Extent). With the implementation of mitigation measures, the extent can be limited to only the development footprint. This impact will definitely occur, both in the mitigated and unmitigated scenarios.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

Issue: Loss of soil and land capability through contamination
Mining projects in general have the potential to result in the loss of or damage to soil resources through contamination. Contamination of soil resources would result in a decrease in the rehabilitation and post-closure land use potential.

Soil contaminants from the project are expected to include construction related consumables, fuels, hydrocarbons, residues and hazardous wastes. Without the implementation of mitigation measures, soil pollution is considered to be a high intensity impact that can remain for a medium-term of 5 to 10 years, depending on the specific contaminants. In the absence of suitable mitigation and management, it can affect the whole site. This is considered an impact with medium significance but with the application of mitigation measures, can be reduced.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.7 Noise

The discussion below focuses on potential human health impacts.

Issue: Increase in noise levels
Mining projects have the potential to contribute to an increase in ambient noise levels in all phases. For this proposed project pre-mining ambient noise environment can be described as rural in nature. Project-related noise sources would include construction related activities, emergency power supply, operation and movement of machinery and equipment (including reverse beepers), crushing, transport of product off site and demolition activities. These activities have the potential to lead to an increase in noise levels at SRs/ community areas during the daytime and night-time periods.

In the absence of mitigation measures that consider potential receptor sites in relation to project activities the severity is expected to be high. Noise pollution impacts would extend beyond the site boundary and would occur until full closure is reached. The related unmitigated significance would be high. With mitigation that focuses on minimising impacts through the application of noise control measures, the significance could reduce to medium-high as the severity, duration and probability would reduce.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.8 Air Quality

The discussion below focuses on potential human health impacts.

Issue: Reduced Air Quality
Mining projects usually present a number of emission sources that are likely to have a negative impact on ambient air quality during the construction, operation and decommissioning phases. Emission sources would include land clearing activities for construction, mining activities, materials handling, wind erosion from stockpiles, wind erosion from open pits, vehicle movement along unpaved roads, crushing, drying and exhaust emissions. The main pollutants would include PM2.5, PM10 and TSP. Potential receptors in the area comprise agricultural areas, educational facilities, homesteads and the natural environment.

In the absence of mitigation measures that focus on the control of emissions at source during the construction and operations phase and a rehabilitation plan that allows for rehabilitation and support post closure land use, the severity is expected to be high. Where third parties are exposed to project-related emissions negative impacts could result in health impacts and cause a nuisance impact. Air pollution impacts would extend beyond the site boundary and potentially beyond the closure phase of the mine should successful rehabilitation not be implemented. The related unmitigated significance would be high. With mitigation that focuses on controlling emissions sources, the significance could be reduced to medium as the severity, duration, spatial scale and probability would reduce.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.9 Visual

Issue: Negative Visual Impacts
Visual impacts on the receiving environment may be caused by activities and infrastructure associated with all mine phases. Given the size of the resource area and planned mining areas the area of visual disturbance could be significant if rehabilitation that supports the post-closure land use is not followed. The project activities would be visible to varying degrees from visual receptors in the surrounding areas.

Most of the study area's scenic quality has been rated moderate to high within the context of the sub-region, and sensitive viewing areas and landscape types identified and mapped indicating potential sensitivity to the project. The site itself is in a landscape type rated as moderate. Impacts on views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. The visual impact of the Jindal MIOP will cause changes in the landscape that are noticeable to viewers experiencing the study area from the R66, local roads, and most importantly, homesteads and some tourist facilities within a 5 km radius of project activities. Visual impacts that would potentially result are likely to be, adverse, long-term, and will cause a loss of landscape and visual resources. In the absence of mitigation, the intensity of unmitigated impacts would most likely be high.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.10 Socio-economic

Issue: Positive and Negative Socio-Economic Impacts
The proposed establishment of the Jindal MIOP is an extensive project that is likely to impart significant positive socio-economic impacts on the local, provincial, and national economy. Given the nature and scale of the project - the creation of employment opportunities, the contribution to the local, provincial, and national Gross Value Added (GVA)/ Gross Domestic Product (GDP), the stimulation of new business activity, and the raising of income levels – is likely to result in medium to very high positive socio-economic impacts

However, there are foreseeable/ anticipated negative impacts which should be expected because of the establishment and operations of the project. Social impacts of the project have the potential to create challenges for the project proponent and be a source of community resistance and complaints if not carefully managed. In particular, the most significant impacts are likely to emerge because of the

resettlement of community members and their households, and relocation of infrastructure such as schools, healthcare facilities, and places of worship which will be required as the area for the proposed Jindal MIOP is already populated. Additional negative impacts related to influx – such as changes in family dynamics, community health and security, increased demand on basic services etc. – would occur over the long term but would likely be limited to nearby communities. The impacts related to influx are likely to have a high negative significance.

Table 7-19 summarises the potential socio-economic impacts that will be further assessed in the Social Impact Assessment:

Table 7-19 Summary of Identified Impacts

Potential Impact	Impact Category
Positive Impacts	
Impact on community development due to skills development through training and capacity building	Community Development
Impact on community due to employment creation and income generation	Economic Aspects
Impact on business community through stimulation of entrepreneurship and business activities in the value chain	
Negative Impacts	
Impact on communities due to in-migration of jobseekers	Livelihoods
Impact on communities due to changes in family dynamics	
Impact on agriculture due to changes in air and water quality	
Impact on health of communities	
Impact on culture and heritage due to exhumation and relocation of burial sites	Culture and Religion
Impact on customary and religious practices due to resettlement	
Impact on community due to population displacement and resettlement	Community Development
Impact on communities through misrepresentation by traditional authorities	
Impact on tourism sector due to mine activities	Economic
Impact on communities due to increased incidents of crime and increased burden on police services	Security
Impact on country's citizens, communities and businesses due to increased demand on services, water and electricity	Infrastructure and related impacts

Potential Impact	Impact Category
Impact on communities due to disruption in social dynamics	Human Rights
Impact on service delivery and the national fiscus due to corruption, fraud and political interference	
Impact on communities due to fear and uncertainty about the future	
Impacts with both a positive and negative dimension	
Overall impact of the project (positive and negative)	Livelihoods & Economic Aspects
Impacts on community lifestyle (positive and negative)	Livelihoods

The additional work required to address these issues is described in Section 8.3 of this Scoping Report.

7.10.11 Health

Issue: Positive and Negative Health Impacts
The most important aspects of the Health Impact Assessment are potential economic, social, psychological and biological impacts on environmental health for those who are to be resettled, and for those remaining in the area in close proximity to the Jindal MIOP. Project exposures will impact both the surrounding community and the project workforce in terms of exposures to changed environmental conditions. The traditional and formal health systems supporting the community are also likely to change in terms of accessibility and utilisation. Project exposures could impact health status both negatively and positively.

Other specialist EIA components dealing with air, water, and soil quality as well as human and industrial waste management are key for understanding other potential health-relevant environmental health impacts and corresponding mitigation measures.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.12 Cultural Heritage

Issue: Loss of or damage to heritage and/or paleontological resources
The placement of infrastructure and mining activities in general, in all phases prior to closure, have the potential to remove, damage or destroy heritage/cultural and palaeontological resources, either directly or indirectly, and result in the loss of the resource for future generations.

There is high potential for irreversible damage to the archaeological sites described (Section XX). Survey, mapping, and limited excavations of identified sites during the Heritage Impact Assessment can mitigate this to a medium impact.

However, open cast mining will have an irreversible and therefore very high impact on the cultural and historical landscape that cannot be mitigated. Human burials are accorded the highest significance in heritage criteria. Unless universal free, prior and informed consent for exhumation and reinterment can be achieved with the affected families, the impact of the Jindal MIOP is very high. If the latter can be negotiated and achieved the impact would then reduce to medium.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.13 Traffic

Issue: Effect on roads due to project related traffic
Mining projects contribute to increased traffic and introduce mine-related trucks on public road networks which can result in an inconvenience to current road users, higher accidents (for people and animals) decreased road service levels and/or increased road damage. This in turn can put pressure on the relevant roads authority to increase the maintenance programmes and/or upgrade the roads.

Based on the relevant information gathered, access to and from the proposed Jindal MIOP would be gained directly from Road D395 which is classified as a U4b road. Road D395 currently traverses through the site where mining infrastructure is proposed. The existing intersections evaluated are currently performing at an acceptable Level of Service (LoS).

It is envisaged that due to the current low vehicle volumes on the relevant existing road network under investigation, as determined from the manual vehicle traffic counts and the available reserve capacity, that the existing road network would be able to accommodate additional vehicle trips.

Any additional mitigating measures would be identified at the time of preparing the BTA and would be investigated in more detail as part of the Traffic Impact Assessment. The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.14 Blasting and Vibrations

Issue: Blasting and vibration related impacts (air blasts, ground vibration and fly rock)
The primary objective of blasting operations is the fracture of ground / rock material to a suitable and manageable size for excavation. In this case blasting in the opencast areas will be required on overburden rock material in order to access the ore resource. The ore resource will also require drilling and blasting operations in order to excavate for processing. Specific blast designs will define the parameters and volume of the blast operation. The blasting operation in the opencast pit areas has the potential to yield secondary effects such as ground vibration, air blast, fly rock and fumes. These aspects may have a negative impact on the surrounding areas depending on the levels generated.

The EIA study will investigate in detail the related levels and possible influences of expected ground vibration, air blast, fly rock and noxious fumes on the area of 3 500m surrounding the blast areas. The receiving environment is classed into three areas.

- 0 to 500 m which is considered the most critical. Ground vibration and air blast will be most significant within the 500 m radius. The levels of ground vibration will be dependent on the drilling and blasting parameters applied. In most blasting operations this area is considered the unsafe zone and is normally cleared of all people and animals when blasting is done in a mining environment. Specific legal requirements from the Mine Health and Safety Act are also applicable for mining within 500 m from private infrastructure.

- Lesser sensitive or medium sensitivity is the 500 m to 1 500 m reference area. The 1 500 m radius is considered as a range where influence may be less but still requires active monitoring.
- The lowest critical or low sensitivity area is the 1 500 m to approximately 3 500 m radius. In this area the effects have more possibility of upsetting people than causing damage to structures.

Receptors are classified based on the distance between the receptor and the open pit boundary. Receptors within 500 m are considered highly sensitive followed by medium sensitivity and low sensitivity.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.10.15 Climate Change

The areas in and around the proposed project location are dotted with environmental protected land and predominantly rural communities. The extensive agricultural activities and nearby water sources make the project location particularly vulnerable to the impacts of the mineral extraction in conjunction with potential climate change.

The impacts of the local demographics, nearby available infrastructure, the current state of the environment and the employment and education of local communities will be explored within the CCIA for this project, in light of the vulnerability of the project's operations, value chain of the project, as well as the impact on the social and natural environments.

The additional work required to address this issue is described in Section 8.3 of this Scoping Report.

7.11 THE POSSIBLE MITIGATION MEASURES AND THE LEVEL OF THE RESIDUAL RISK

Table below provides a list of the impacts identified by the EAP or raised by interested and affected parties, as well as the possible management and mitigation measures. The level of residual risk after management or mitigation is also estimated. This will be refined during the EIA phase with specialist input as appropriate.

Table 7-20 Possible Mitigation Measures and Anticipated Level of Residual Risk

Potential impact	Activity	Possible mitigation	Potential for residual risk
Reduced groundwater quality due to contamination	Site preparation Earthworks Transport systems Mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	• Mine infrastructure will be constructed and operated so as to comply with the NWA No. 36 of 1998 and Regulation 704 (4 June 1999). • Design and implement contamination containment measures. • Use of appropriate liner or barrier. • Infrastructure that has the potential to pollute groundwater will be identified and included into a groundwater pollution management plan which will be implemented as part of the operational phase through post-closure as required. • Conduct groundwater monitoring and implement remedial actions as required. This includes compensation for mine related loss of third party water supply. • Apply and operate in line with a WUL. • Effective equipment and vehicle maintenance. • Fast and effective clean-up of spills. • Effective waste management.	Medium
Reduced groundwater quantity due to pit dewatering – impact on 3rd party groundwater users	Pit dewatering	• Conduct groundwater monitoring and implement remedial actions as required. • Undertake a hydrocensus investigation to establish groundwater level and quality. • Apply and operate in line with a WUL.	Medium
Reduced surface water quantity	Establishment of mine infrastructure Raw water requirements Discharge of excess water Rehabilitation	• Water balance must be undertaken to quantify the amount of water required for construction to ensure that downstream reserves are not impacted.	Low

Potential impact	Activity	Possible mitigation	Potential for residual risk
Reduced surface water quality due to contamination	Site preparation Earthworks Transport systems Mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	• Construction of mine infrastructure must be undertaken during dry season (i.e., between April and August). This will significantly reduce the potential for sedimentation through erosion due to construction activities. • Minimise disturbance of soils by restricting construction to selected areas. • Progressive rehabilitation of disturbed soils to minimize soil erosion. • Continuous water quality monitoring to pinpoint pollution and remedy it as soon as possible. • Drip trays must be used for collection of fuel and oil for stationary and leaking vehicles. • Decommissioning of surface infrastructure must be undertaken during dry season to avoid washing of hazardous material into nearest water bodies. • A post rehabilitation plan must be developed to ensure that the environment returns to its natural state.	Low
Flooding of surface infrastructure	Earthworks Establishment of mine infrastructure Rehabilitation	• Floodlines and flood risk assessments must be undertaken for all rivers and streams located near proposed infrastructure to understand the possibility of encroachment as well as determining suitable measures to mitigate the impacts of flooding. • Road crossing and culvert crossings must be designed to allow larger flood events to flow without causing concentration. • Where necessary side berms must be designed to minimize the risks of flooding. • Regular maintenance of culvert crossings must be undertaken.	Low
Direct impact on vegetation structure and plant species composition	Earthworks and site clearance Access road Establishment of mine infrastructure	• Protected flora rescue and translocation plan to be prepared by a terrestrial ecologist or botanist. • Permits for the destruction or relocation of protected plants will need to be acquired subject to the submission of the relevant appositions to	Medium
Impact on populations of SCC			Medium - High

Potential impact	Activity	Possible mitigation	Potential for residual risk
	Access roads General site management Site preparation Earthworks Mineralised waste General site management	Ezemvelo KZN Wildlife. This will be required prior to the implementation of the flora rescue and relocation plan. • Undertake flora rescue and relocation in line with the approved rescue and relocation plans. The flora rescue and relocation should be undertaken by a qualified Botanist, Horticulturalist in consultation with EZNW. • The construction zone must be clearly demarcated, and demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences. • Demarcations are to remain until construction and any required rehabilitation work has been completed. • All areas outside of the formal demarcated working area must be considered no-go areas for the entire construction phase. No equipment laydown or storage areas must be located within the primary vegetation areas identified. • Access to and from the development area should be either via existing roads or within the construction servitude. • Any contractors found working inside the 'No-Go' areas (areas outside the construction/ working servitude) should be fined as per a fining schedule/system setup for the project. • Vegetation removal/stripping must be limited to the construction footprint. • No clearing of indigenous vegetation outside of the defined working servitudes is permitted for any reason (i.e. for firewood or medicinal use). • Grubbing is not permitted as a method of clearing vegetation. Any trees needing clearing must be cut down using chain saws and hauled from the site using appropriate machinery where practically possible. • Vegetation clearing/stripping must only be done as construction progresses to minimise areas of bare soil left standing for prolonged periods.	
Impact on targets for threatened ecosystems	Earthworks and site clearance Establishment of mine infrastructure General site management Rehabilitation		High
Impact on ecological processes and functionality of ecosystems			Low-Medium
Impact on species and ecosystem diversity	Earthworks and site clearance Establishment of mine infrastructure General site management Dewatering Rehabilitation		High
Reduced ecological connectivity	Site preparation Earthworks Transport systems Mineralised waste General site management Rehabilitation Maintenance and aftercare Site preparation Earthworks Transport systems Mineralised waste General site management		Low

Potential impact	Activity	Possible mitigation	Potential for residual risk
	Rehabilitation Maintenance and aftercare	• Access to sensitive habitat types outside of the construction zone is not permitted. • All alien invasive vegetation that colonises the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal. • All bare surfaces across the construction site must be checked for AIPs every two weeks and AIPs removed by hand pulling/uprooting and adequately disposed of. • Herbicides should be utilised where hand pulling/uprooting is not possible. ONLY herbicides which have been certified as safe for use by an independent testing authority are to be used. The ECO must be consulted in this regard. • No firewood or medicinal plants may be harvested from natural areas; • No wild animal may under any circumstance be hunted, snared, captured, injured, killed, harmed in any way or removed from the site. This includes animals perceived to be vermin. • Any fauna that are found within the construction corridor should be moved to the closest point of natural or semi-natural vegetation outside the construction servitude. • The handling and relocation of any animal perceived to be dangerous/venomous/poisonous must be undertaken by a suitably trained individual. • No burning of vegetation to be permitted, even as part of AIP management. • No open fires to be permitted within the construction zone or temporary construction site camp. • Ensure that no refuse waste is buried or burnt on the site or surrounds.	

Potential impact	Activity	Possible mitigation	Potential for residual risk
Loss of species diversity due to modification of freshwater habitat	Site preparation Earthworks Transport systems Mineralised waste General site management Rehabilitation Maintenance and aftercare	• Avoid, reduce and mitigate potential mining-related risks and impacts to the environment. • The layout of a project such as a mine should consider options in project location, siting, scale, layout, technology, and phasing to avoid impacts on biodiversity. • Establish a rock dump location and size that will affect (directly and indirectly) as few watercourses as is possible. • Placing a suitable geotextile in areas near or on top of watercourses/wetlands, before placement of the soils, may help maintain some sub-surface soil processes. • Compact and revegetate eroded areas. • Establish where the waste rock will be placed, and if the area is suitable to receive the excavated material. • Ensure all captured interflow water (i.e. water flowing into the opencast pit) and water captured by the stormwater systems of all facilities is discharged to the closest drainage line; or back to the downstream environment via artificial discharge points (i.e. swales or attenuation ponds). • Only excavate areas applicable to the project area. • Cover excavated soils with a temporary liner to prevent contamination. • Discharging stormwater into the receiving environment is recommended. Releasing enough water during rainfall events, and gradually after rainfall events (i.e. captured stormwater) will help to stabilise interflow to lower topographical areas. • Irrigation of open spaces at the site may help to maintain the hydropedological function of soils and the functionality of wetlands in the area. • Keep the site clean of all general and domestic wastes. • All mine and laydown footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential.	Medium - High
Alteration of hydrological and geomorphological processes	Site preparation Earthworks Mineralised waste		Medium
Reduced water quality	Site preparation Earthworks Transport systems Mineralised waste General site management Dewatering Rehabilitation Maintenance and aftercare		Medium
Reduced ecological connectivity and/ or ecological disturbance	Site preparation Earthworks Mineralised waste Blasting activities Haul roads		Low

Potential impact	Activity	Possible mitigation	Potential for residual risk
		• Retain as much indigenous vegetation as possible. • Exposed soils to be protected using a suitable covering or revegetated. • Existing roads should be used as far as practical. • Emergency oil spill kits must be kept on site and emergency clean up procedures implemented in the case of any leaks or spills. • Soil quality monitoring undertaken by the ECO.	
Loss of soils and land capability through contamination	Site preparation Site establishment Earthworks Transport systems Mineralised waste General site management Maintenance and aftercare	• Basic infrastructure design that is adequate to contain polluting substances including lining of the secured landfill site. • Training of workers to prevent pollution. • Equipment and vehicle maintenance. • Fast and effective clean-up of spills. • Effective waste management. • In case of major spillage incidents an emergency response procedure must be implemented.	Low
Loss of soils and land capability through erosion and compaction	Site preparation Site establishment Earthworks Transport systems Mineralised waste General site management Maintenance and aftercare	• Limit site clearance to what is absolutely necessary for the immediate smelter complex and secured landfill area. • Strip, handle, stockpile and re-use soil resources in line with site specific soil conservation and management plan.	Medium
Increase in disturbing noise levels	Earthworks Site preparation Site establishment Mining activities Operation of pit	• Construction barriers may be required to reduce construction noise levels if nearby receptors are likely to be disturbed. • As far as possible, construction should be limited to daytime periods. Where this is not feasible, the noisiest operations should be limited to daytime operations. • Noise monitoring should be carried out at the nearest sensitive receptors (SRs) during critical construction periods in order to identify non-compliance and the need for additional noise control measures.	Medium-Low

Potential impact	Activity	Possible mitigation	Potential for residual risk
		• Site inductions to cover the importance of noise control and available noise reduction measures must be undertaken for all employees on site. • Construction contractors should be required to use equipment that is in good working order, is properly maintained according to the equipment's manufacturer requirements and that meets current best practice noise emission levels. This should be achieved by making it a component of contractual agreements with the construction contractors. • As far as reasonably practicable, sources of significant noise should be enclosed. The extent to which this can be done depends on the nature of the machines and their ventilation requirements. • Electrically powered equipment instead of pneumatic or internal combustion powered equipment shall be used, where feasible. • Site speed limits shall be established and enforced. • A gradual start to noisy activities as far as it is feasible, establish a schedule for noisy activities to reduce overlapping of works. • Community grievance mechanism and active information dissemination regarding the construction schedule and noisy activities. • The on-site construction supervisor shall have the responsibility and authority to receive and resolve noise complaints. A clear appeal process to the Owner shall be established prior to construction commencement that will allow for resolution of noise problems that cannot be immediately solved by the site supervisor. • Plant operations should always be carried out using equipment that is in good working order and that meets current best practice noise emission levels. • Noise monitoring should be undertaken during the initial commissioning and early operational stages of the Project in order to determine the operational noise emission levels and to aid the selection of additional noise controls where necessary. • Select equipment with lower sound power levels.	

Potential impact	Activity	Possible mitigation	Potential for residual risk
		• Install suitable mufflers on engine exhausts and compressor components. • Site inductions for all employees that operate machinery with the potential to generate significant noise should cover the importance of noise control and available noise reduction measures. • Minimise reversing of equipment to prevent nuisance caused by reversing alarms. • Driver practices when approaching and leaving the site should minimise noise emissions created through activities such as unnecessary acceleration and breaking screech. • Material stockpiles and mobile equipment staging, parking, and maintenance areas shall be located as far as practicable from SRs. • The use of noise-producing signals, including horns, whistles, alarms, and bells shall be for safety warning purposes only. • Ensure that all haul roads are maintained and kept free of potholes, ruts and bumps in order to reduce noise. • Limit night-time operations near SRs. • Install acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m^2 in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective. • Develop a mechanism to record and respond to complaints.	
Reduced air quality due to emissions	Earthworks Site preparation Site establishment Transport systems Mining activities Processing plant	• Regular inspection and wet suppression of stockpiles where necessary (including wind shielding or complete enclosure, storage away from site boundaries, and restricted height of stockpiles). • Ensure that vehicles carrying dry soil and other materials are covered during travel.	Low

Potential impact	Activity	Possible mitigation	Potential for residual risk
		• Grading activities should be monitored on a daily basis. Emissions resulting from grading activities are best mitigated through application of water and reduction of grader speeds. • Best practices adopted to control emissions from loading and dumping material include water application, minimisation of drop heights and suspension or modification of activities during adverse weather conditions. • Restricting vehicle speeds on haul routes and other unsurfaced areas of the work site. • Inspection of unsurfaced haul routes and wet suppression should this be necessary (e.g. during prolonged dry periods). • Increase frequency of site inspections by ECO for air quality and dust issues on site when activities with a high potential to produce dust are being carried out. • Restrict vehicle access to defined areas to avoid unnecessary off-road vehicle movements outside of the active work sites. • Display details of responsible person for air quality and dust issues at the site boundary. • Ensure that construction plant and equipment are well maintained, correctly operated and not left to idle/run unnecessarily. • All equipment with visible black smoke emissions in normal operations to be withdrawn and maintained before reuse. • Use of low sulphur fuels.	
Impact on existing roads and traffic due to project related traffic	Site preparation Earthworks Transport systems	• The detail design phase of the Proposed Mining Development should take into consideration the potential road safety related risk which could result from dust generated by mine related vehicles and therefore determine a potential need for a paved roadway. • It is recommended that at least a dedicated right-turn lane be provided on the northern approach. Point F might need to be repositioned to the	Medium-Low

Potential impact	Activity	Possible mitigation	Potential for residual risk
		south to accommodate a right-turn lane due to limited space between Point F and the river crossing located approximately 30 meters to the north (needs to be addressed by a geometrical design specialist). • The pavement quality of gravel roads that will be utilised due to the proposed Jindal MIOP needs to be assessed by a pavement design engineer in order to determine the best economical solution in terms of road design. • Contracted transport might be required for the transportation of staff to strategic points where public transport is readily available, alternatively negotiations could be conducted with current local based public transport providers to include routes to mine as part of existing operations. • The need for public transport loading and off-loading bays should be identified and implemented as part of the detailed design phase in order to minimize potential conflict between heavy vehicles and public transport on "access routes". • Road D395 currently traverses through the site of the proposed Jindal MIOP where mining infrastructure is proposed and would require further investigation and liaison with relevant roads authority as part of the detailed road design phase in terms of re-routing or diverting the relevant section of Road D395.	
Negative visual impacts due to mining activities	Earthworks Site preparation Site establishment Mining activities Operation of pit	• Minimise the areas of existing vegetation and topsoil to be removed. • Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site rehabilitation. • All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use. The construction contract must include the stripping and stockpiling of topsoil. Topsoil would be used later during the rehabilitation phase of disturbed areas. The presence of degraded areas and disused construction roads, which are not rehabilitated, will increase the overall visual impact.	Medium-Low

Potential impact	Activity	Possible mitigation	Potential for residual risk
		• Specifications with regards to the placement of construction camps, as well as a site plan of the construction camp, indicating waste areas, storage areas, and placement of ablution facilities should be included in the EMPr. These areas should either be screened or positioned in areas where they would be less visible from human settlements and main roads. • Construction activities should be limited to between 08:00 and 17:00 where possible. It is recommended that discussions are undertaken with local landowners who would be affected by the project during the construction phase, to determine what would be a reasonable time to carry out construction activities, given the relative location of households to the proposed project activities. • Adopt responsible construction practices aimed at strictly containing the construction/establishment activities to within specifically demarcated areas. • Building or waste material discarded should be undertaken at an authorised location, which should not be within any sensitive areas. • Earthworks should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed activities are exposed. In all other areas, the naturally occurring vegetation should be retained, especially along the periphery of the sites. • All cut and fill slopes (if any) and areas affected by construction work should be progressively top soiled and re-vegetated as soon as possible. • Any soil must be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure to wind and water erosion and to minimise dust generation. • Where new vegetation is proposed to be introduced to the site, an ecological approach to rehabilitation, as opposed to a horticultural approach should be adopted. For example, communities of indigenous plants will enhance biodiversity, a desirable outcome for the area. This	

Potential impact	Activity	Possible mitigation	Potential for residual risk
		approach can significantly reduce long-term costs as less maintenance would be required over conventional landscaping methods as well as the introduced landscape being more sustainable. • Progressive rehabilitation of all construction areas should be carried out immediately after they have been established. • Paint all structures with colours that reflect and compliment the colours of the surrounding landscape. This can be achieved by painting rooftops and walls of buildings in the hues and tones of the surrounding grasslands. To further reduce the potential of glare, the external surfaces of structures should be painted with matt paints. Avoid pure whites and blacks. • Ensure the perimeter fence is of a 'see through' variety and that its colour blends with the environment. • Housekeeping" procedures should be developed for the project to ensure that the project site and lands adjacent to the project site are kept clean of debris, garbage, graffiti, fugitive trash, or waste generated onsite; procedures should extend to control of "track out" of dirt on vehicles leaving the active sites. • During construction, temporary fences surrounding the material storage yards and laydown areas should be covered with 'shack' cloth (khaki coloured). • Operating facilities should be actively maintained during operation. • Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the site i.e. lights (spotlights) are to be aimed away from sensitive viewing areas. • Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site. • Minimise the number of light fixtures to the bare minimum, including security lighting.	

Potential impact	Activity	Possible mitigation	Potential for residual risk
Positive socio-economic impacts:	Throughout all phases of mining due to investment in the local economy and local employment.	• Ensure that the Social and Labour Plan (SLP) prioritises employment from the surrounding communities and promotes investment in skills development, capacity building and training, while also supporting the inclusion of empowered suppliers in the value chain. • The severity of these impacts will need to be mitigated to ensure that, on-balance, the proposed project delivers more benefits than losses. • Carefully managing the socio-economic impacts of the project, while focusing on community development and ensuring that the communities around the mine benefit from its operations should enhance the positive dimension of the impacts on community livelihoods and lifestyles by creating avenues for social mobility and upliftment.	Low-Medium (+ve)
Negative socio-economic impacts due to influx	Outside workforce Safety and security issues Health impacts	• Ensure that any job opportunities advertised are first filled by the local community to alleviate the impact of in-migration. • Provision of decent family housing for workers could reduce tensions placed on the household units due to increased absenteeism from the home for those working on the mine. • It is difficult to mitigate against the impacts on the tourism sector, especially for those products that are centred on nature, culture and heritage as mining activities are, for the most part, incompatible with the impacts. Tourism product owners who can shift focus to business tourism could shield themselves from this impact. • Proactive engagement with police services to minimise security issues. • Specialist studies to address other impacts e.g. blasting, geotechnical, traffic etc. • Engage with the relevant local and traditional authorities to secure a social license to operate. •	Medium
Negative socio-economic impacts due to resettlement	Resettlement of local communities	• Engage in transparent and ethical negotiations with communities to understand their needs desires, fears and anxieties and offer fair	High

Potential impact	Activity	Possible mitigation	Potential for residual risk
		compensation to those that need to be resettled, or who have the burial sites of their ancestors exhumed and relocated. • Proactive, transparent and ethical engagement with communities about the future plans for the mine would help manage expectations.	
Loss of or damage to heritage and/or palaeontological resources	Site preparation Earthworks Transport systems Support services	• Plan project to avoid any resources of significant importance. • Training of employees regarding the heritage and cultural sites that may be encountered and about the need to conserve these. • Fence off and limit access to the heritage and cultural sites in the Mining Right Area that could be indirectly disturbed. • In the event that resources are identified a chance find procedure should be implemented. • Open cast mining will have an irreversible impact on the cultural and historical landscape that cannot be mitigated. • Exhumation and reinterment can be achieved with the affected families should burial sites be uncovered.	Medium

7.12 THE OUTCOME OF THE SITE SELECTION MATRIX

Various alternatives were assessed in order to come to the proposed final layout for the Jindal MIOP. The final proposed layout is included in Figure 3-2.

7.13 MOTIVATION WHERE NO ALTERNATIVES WERE CONSIDERED

Not applicable.

7.14 THE PREFERRED ALTERNATIVE

Refer to Section 7.2.

8. PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT

The main objectives of the EIA phase is to:

- Assess the potential impacts associated with the preferred project alternatives.
- Identify and describe procedures and measures that would enhance potential positive impacts and avoid, minimize, remedy or compensate potential negative impacts.
- Liaise with relevant government departments on issues relating to the proposed development to ensure compliance with existing guidelines and regulations.
- Undertake consultation with I&APs and provide them with an opportunity to review and comment on the outcomes of the EIA process and acceptability of mitigation measures.
- Develop an EMPr and a conceptual closure/decommissioning plan.
- Provide measures for ongoing monitoring (including environmental audits) to ensure that the project plan and proposed mitigation measures are implemented as outlined in the detailed EIA report.

This chapter describes the nature and extent of further investigations to be conducted in the EIA, and sets out the proposed approach to the EIA phase.

8.1 ALTERNATIVES TO BE CONSIDERED

The alternatives considered and the preferred site layout alternatives are provided in Section 7.1.

8.2 ASPECTS TO BE ASSESSED BY THE EAP

Aspects to be assessed include those listed in Section 8.3 where specific specialist input is required as well as aspects where specialist investigations are not required as outlined below.

8.2.1 Topography

It is proposed that no specialist investigation is required in this regard. The assessment and detailed mitigation measures will be provided in the EIA by SLR with input from the project team visual specialist.

8.3 ASPECTS TO BE ASSESSED BY THE SPECIALISTS

The aspects to be assessed by the various specialists are included in Figure 8 1. Each specialist study will undertake the following steps:

- Identify specific issues of concern through an understanding of the project and the sensitivity of the affected environment as well as a review of all issues raised by stakeholders;
- Interact with other specialists, where required, to ensure the integration of issues of concern and appropriate assessment;
- Define relevant laws and regulations that apply to the specific specialist study;
- Define the baseline environment through review of available information from past studies and additional field studies, where required;
- Assess the direct, indirect and cumulative impacts;
- Provide mitigation measures to reduce impacts to an acceptable level i.e. residual impact and where necessary provide recommendations to address residual impacts i.e. biodiversity offsets; and
- Where required, provide detailed monitoring plans.

Table 8-1 Plan of Study: Aspects to be Assessed by Specialists

Specialist Study	Plan of Study
Geology	The blast and vibration specialist study is being undertaken by Blast Management & Consulting and will focus on the following: • Obtain all relevant data and information on proposed blasting methods and methodology. • The expected impact will be modelled based on planned drilling and blasting information for the operation will be done. Various accepted mathematical equations are applied to determine the attenuation of ground vibration, air blast and fly rock. These values are then calculated over distance from site and shown as amplitude level contours. Overlay of these contours with the location of the various receptors gives an indication of the possible impact and expected result of potential impact. Evaluation of each receptor according to the predicted levels will indicate the level of possible influence and required mitigation, if necessary. • Evaluate typical structures and installations that are found within the influence radius from the blasting operations. The possible environmental and/or social impacts are addressed in the detailed EIA phase investigation and mitigation measures recommended.
Hydrogeology	The groundwater specialist study is being undertaken by SLR and will focus on the following: • Review all existing hydrogeological data: this includes monitoring data and baseline hydrogeology (water levels and water quality). • Review previous studies that were undertaken for the Jindal MIOP, including the groundwater model report and all groundwater monitoring data. • Examine the new infrastructure map and determine possible source term sites. • Extract all pertinent data and compile the Conceptual Hydrogeological Model. • Groundwater numerical modelling: based on the source term derived from the geochemical study, the existing groundwater numerical model will be updated. • Model results will inform the EIA and WULA regarding whether or not there is any potential for groundwater contamination. • The groundwater study will include a geochemical and waste assessment to inform the contamination potential of any residues/discards generated by the project. The waste assessment will be undertaken in terms of the National Norms and Standards (Regulation 635 and 656 of 2013). • Detailed Impact Assessment- Qualitative assessment of the impacts of the project and summary of mitigation measures, including any cumulative impacts.

Hydrology	The surface water specialist study is being undertaken by SLR and will focus on the following:
	• Baseline:
	  ○ Review of topographical data, existing site layout, future site layout, geotechnical/ground conditions information etc; and
	  ○ Climate characterisation including rainfall, evaporation and design storm intensities.

Specialist Study	Plan of Study

	• Storm water Management.
	  ○ Floodlines determination;
	  ○ Water and salt balance; and
	  ○ Water Balance: Collate and review input from project team including inflows process plant water balance, storm water management, water quality etc. to inform the impact assessment.
	• Detailed impact assessment - Qualitative assessment of the impacts of the project and summary of mitigation measures, including any cumulative impacts.

Terrestrial Biodiversity	The terrestrial biodiversity specialist study is being undertaken by Eco-Pulse Environmental Consulting Services and will focus on the following:
	• Baseline: The baseline information has been collected and will be further interrogated to understand any potential impacts.
	• Impact significance assessment will be completed using the SLR EIA methodology. This assessment will include:
	  ○ cumulative impacts;
	  ○ the intensity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources);
	  ○ the extent of the impacts, the duration and reversibility of impacts ;
	  ○ the probability of the impact occurring; and
	  ○ the degree to which the impacts can be mitigated.
	• The outcomes of the impact significance assessment, along with the baseline ecosystem assessment, will be captured in a Terrestrial Ecosystem Impact Assessment Report. This report will contain all methodologies used in the assessment and will outline any assumptions made as part of the assessment process.

Aquatic Biodiversity	The wetland and aquatic biodiversity specialist study is being undertaken by Eco-Pulse Environmental Consulting Services and will focus on the following:
	• Baseline: The baseline information has been collected and will be further interrogated to understand any potential impacts.
	• Once the mine layout and design has been finalised, the impact significance assessment will be completed using the SLR EIA methodology. This assessment will include:
	  ○ cumulative impacts;
	  ○ the intensity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources);
	  ○ the extent of the impacts, the duration and reversibility of impacts ;
	  ○ the probability of the impact occurring; and
	  ○ the degree to which the impacts can be mitigated.
	• In addition to the impact significance assessment, Eco-Pulse will apply the "DWS Risk Assessment Matrix" to Phase 1 of the proposed project. This will be done at a project level as detailed in the General Authorization in terms of Section 39 of the National Water Act No. 36 of 1998 for Water Uses as defined in Section 21 (c) or Section 21 (i), as contained in Government Gazette No. 40229, 26August 2016 and contained within the DWS document titled 'Section 21(c) and (i) Risk-based assessment and authorization,

Specialist Study	Plan of Study
	October 2014, Edition 2' to inform water licensing requirements for the project (i.e. full WULA vs GA). • The outcomes of the impact significance and DWS risk assessment, along with the baseline ecosystem assessment information contained in this document, will be captured in a Wetland & Aquatic Ecosystem Impact Assessment Report. This report will contain all mythologies used in the assessment and will outline any assumptions made as part of the assessment process.
Soils and Agricultural Potential	The agricultural agro-ecosystem specialist study is being undertaken by TerraAfrica Consult CC and will focus on the following: • Once the infrastructure layout for the proposed project has been finalised, a buffered zone of at least 50m around all the proposed development footprint, will be surveyed in detail. The survey will include soil classification according to the Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018). It will also include the collection of soil samples for analysis of soil texture, organic carbon, pH and major cations. • The areas outside of the development footprint but within the boundaries of the South Block area, will be surveyed on a reconnaissance level and mapped using digital soil mapping approaches. The baseline information of the North Block will be verified by the assessment of a few typical hillslope transects within the area. • Where possible, the landowners and/or land users will be consulted for discussion of the productivity and employment data associated with the areas that will impacted by the proposed development. If not possible, the agricultural productivity will be calculated using data such as the long-term grazing capacity of the area. • For the impact assessment, impacts will be rated according to the methodology provided by SLR Consulting (South Africa). The report will be prepared in alignment with all the relevant NEMA regulations as well as General Notice 320 of 2020 that specifically address Agricultural Agro-Ecosystem reporting for other projects (that are not associated with renewable energy generation).

Noise	The noise specialist study is being undertaken by WKC Group and will focus on the following:
	• Baseline noise will be assessed based on the data collected from the baseline noise survey.
	• Construction Phase Noise Impact Assessment
	  ○ A noise emissions inventory of construction equipment will be collated based on available construction data and published noise level databases.
	  ○ Calculations will be based on first acoustic principles to determine if the relevant guidelines and or local bylaws will be met. It will also be important to determine the locations of existing and proposed noise sensitive areas / receptors and the national and international standards and guidelines for these areas.

Specialist Study	Plan of Study
	○ Calculations will be carried out based on BS 5228:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' and the 'inverse square law' to determine whether the proposed boundary noise limits will impinge on the noise sensitive areas. ○ If necessary, noise reduction measures will be recommended. ○ A summary of the impact assessment for construction activities will be presented using SLR impact assessment methodology. • Operations Phase Noise Impact Assessment ○ A noise model will be developed using Project noise limits and background ambient noise measurements to determine compliance with environmental noise standards. ○ In order to predict operational noise levels, the internationally recognised noise modelling software, SoundPLAN, will be utilised. ○ The propagation methodology adopted within the SoundPLAN model is the International Organisation for Standardisation (ISO) 9613 'Acoustics – Attenuation of Sound During Propagation Outdoors' (ISO, 1996). ○ ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level (LAeq) under meteorological conditions favourable to propagation from sources of known sound emission. • The noise study report will include the following: ○ A list of all potentially noisy equipment with estimates of noise emissions in octave bands or vendor specified noise levels (sound power and pressure levels); ○ A tabulated assessment of noise levels at the Project site boundary and at identified noise SRs; ○ Noise contour maps illustrating the Project noise contribution at the Project boundary and surrounding environment; ○ Noise impact assessment of the Project noise contribution in isolation and a cumulative noise impact assessment taking into account ambient noise levels using SLR impact assessment methodology; ○ The effective change in ambient noise levels (pre and post mitigation); and, ○ A summary showing to what extent Project noise requirements are being met by assessing compliance of results with regulatory requirements.
Air Quality	The air quality specialist study is being undertaken by WKC Group and will focus on the following: • Baseline air quality will be assessed based on the data collected from the baseline ambient air quality survey. • Meteorological data (MM5 or WRF) for a three-year period (both surface and upper air files) no older than five years to the year of assessment will be utilised, in accordance with the modelling Code of Practice. The data will be inclusive of the various parameters (temperature, relative humidity, wind

Specialist Study	Plan of Study
	speed, wind direction, solar radiation, cloud height and cloud cover) and will be suitably quality assured. • Fugitive dust emissions are expected from mining activities, material handling points, stockpiles and haul routes. An emissions inventory will be developed to quantify the fugitive emissions for the project. Default emission factors from United States Environmental Protection Agency (US EPA) AP – 42 or similar internationally recognised emission factors will be used in conjunction with project design data to calculate emission rates for all project related emission sources. Pollutants assessed will be limited to PM10, $PM_{2.5}$ and TSP / Dust Fallout. • In order to estimate ground level concentrations for each pollutant, an ADM study will be undertaken using AERMOD (Version 9.9.0), which is recommended in the Code of Practice. AERMOD is a straight-line, steady-state Gaussian plume model that can model the dispersion of pollutants over rural and urban areas, flat and complex terrain. AERMOD considers surface and elevated releases, and multiple sources (including, point, area and volume sources) to determine ground level pollutant concentrations at specified receptor points. • AERMOD is a new generation air quality modelling system, developed by the US EPA in collaboration with the American Meteorological Society. It contains improved algorithms for convective and stable boundary layers, for computing vertical profiles of wind, turbulence and temperature, and for the treatment of all types of terrain. One of the major improvements that AERMOD brings to applied dispersion modelling is its ability to construct vertical profiles of required meteorological variables, allowing improved modelling of the dispersion of pollutants (particularly of vertical dispersion). • AERMOD is the model recommended by the Department of Environmental Affairs for more sophisticated near-source applications in all terrain types (where 'near' is considered to be < 50 km from source). • The ADM will focus on assessing the PM_{10}, $PM_{2.5}$ and TSP emissions associated with project activities. • The modelled pollutants will be compared to the local air quality standards, and the significance assessed using a recognised impact assessment methodology.
Visual	The visual specialist study is being undertaken by Graham A Young Landscape Architect and will focus on the following: • Data collected during a site visit (carried out on 15 and 16 May 2021) allows for a description and characterization of the receiving environment. • Describe the landscape character, quality and assess the visual resource of the study area. • Describe the visual characteristics of the components of the project. • Identify and rate (high level) issues that must be addressed in the impact assessment phase including cumulative impacts. • Proposed mitigation options to reduce the potential impact of the project.
Economic	The economic specialist study is being undertaken by Urban-Econ Development and Economists (Pty) Ltd and will focus on the following:

Specialist Study	Plan of Study

	• To quantify the effects of the most likely economic impacts of the proposed Jindal MIOP, three types of economic impact can be measured, viz. direct, indirect, and induced (multiplicative) impacts.
	• Economic effects - Four different impacts can be measured in this analysis:
	  ○ GVA;
	  ○ Multiplier Effect;
	  ○ Income Multiplier Effect; and
	  ○ Employment Multiplier Effect.
	• The above-mentioned effects can be determined for the establishment (construction) and operational phase of the project, with the establishment phase effects determined through undertaking the multiplier analysis utilising the CAPEX estimate (less any imported machinery equipment/ services), and the operational phase effects determined through utilisation of the OPEX estimate figures.
	• There are overlaps between economic and socio-economic impacts and they are not mutually exclusive.
	• Socio-economic impact assessment is largely an interpretation of the significance of the economic impact on local communities.
	• To perform the economic multiplier analysis described above, the following economic/ financial information for the project is required:
	  ○ Capital development cost;
	  ○ Operational expenditure; and
	  ○ Decommissioning costs:
	• The primary source of this information is the project proponent, viz, Jindal, and consultations will be undertaken with the designated representatives to secure the required information. Where the information is unknown, case studies will be utilised to determine key benchmarks and ratios.

Social	The social specialist study is being undertaken by Urban-Econ Development and Economists (Pty) Ltd and will focus on the following: • Interact closely with the noise, visual, economics and air quality specialist to better understand the outputs of these studies and how these may impact surrounding communities; • Refine the Project's Area of Influence (AoI) and scope of the SIA, if necessary; • Address issues that have been raised during the EIA process; • Address and assess alternatives to the proposed activity; • Identify, describe and assess positive, negative and cumulative impacts (pre- and post-mitigation); and • Formulate impact enhancement, avoidance, management and mitigation measures for incorporation into the management plan. The preparation of the Social Impact Assessment (SIA) will be based on: • Information obtained from primary and secondary data gathering; • Feedback from stakeholders via the public participation process; • Consideration and understanding of planned project activities for all project phases; • Input from other project specialist studies (e.g. noise, visual, air quality, traffic) and the project management team; • Review of impacts of similar projects; and

Specialist Study	Plan of Study
	• Professional experience/ judgement of the social specialists and the project team. Impact identification will consider positive and negative impacts, as well as cumulative impacts. They will also include perceived risks, as determined through, amongst others, data gathering and the public participation process.
Health	The health impact assessment is being undertaken by professor J.E. Myers and will focus on the following: • Phase 1: An initial scoping study is in progress resulting in this Scoping Report. • Phase 2: A baseline health survey may be required going forward depending upon data gaps identified in this report. • Phase 3: Integration of project-specific socio-economic and environmental baseline studies, i.e. (i) reviewed for any health-relevant information and (ii) for comparison and alignment with data obtained in the previous two phases. • Phase 4: Impact assessment and risk rating and ranking. This process is designed to systematically and consistently evaluate potential project related impacts. • Phase 5: Development of a Public Health Action Plan (PHAP) which is designed to maximize potential positive health benefits and prevent or mitigate any detrimental health impacts that the Project may have on local communities. Preliminary mitigation measures are discussed within the HIA impact ranking and ratings discussion.

Cultural Heritage	The cultural heritage specialist study is being undertaken by Ethembeni Cultural Heritage and will focus on the following:
	• Commission a full Phase 1 Heritage Impact Assessment as per legislative and Statutory requirements of NEMA and the NHRA, to include:
	  ○ Archaeological overview of the project area;
	  ○ Identify heritage resources;
	  ○ Field assessment;
	  ○ Community survey to identify sacred sites, burial sites;
	  ○ Palaeontological rating as required by South African Heritage Resources Agency (SAHRA); and
	  ○ Cultural and heritage sensitivity mapping.
	• Detailed impact assessment - Qualitative assessment of the impacts of the project and summary of mitigation measures, including any cumulative impacts.

Traffic	The traffic specialist study is being undertaken by Siyazi Thula Transportation Planning (Pty) Ltd and will focus on the following:
	• The Traffic Impact Assessment (TIA) will include:
	  ○ Assessment of all vehicle traffic related data for the identified intersections that could potentially be affected by the proposed Jindal MIOP;
	  ○ Gather all information for the proposed activities as part of the proposed Jindal MIOP in terms of potential production, staff compliment, timeline, and mining phases;

Specialist Study	Plan of Study
	○ Conduct calculations to determine the potential number of vehicle trips anticipated to be generated during identified vehicle peak times; ○ Conduct detailed intersection performance evaluations for the identified intersections (Micro simulation); and ○ Determine mitigation measures, if required, in order to mitigate the potential impact of the proposed activities as part of the on the adjacent road network. • The following Development scenarios will be investigated as part of the full TIA: ○ Scenario 1: 2021 peak hour traffic without the Proposed Mining Development (Status Quo). ○ Scenario 2: 2021 peak hour traffic with the Proposed Mining Development. ○ Scenario 3: 2031 peak hour traffic without the Proposed Mining Development. ○ Scenario 4: 2031 peak hour traffic with the Proposed Mining Development.
Climate Change	The climate change specialist study is being undertaken by Promethium Carbon and will focus on the following: • Climate change impact of the project: GHG inventory and impact assessment. The specialist will undertake an assessment of the extent to which the proposed project will contribute to climate change over its lifetime by quantifying its GHG emissions during construction, operation and decommissioning. This will include quantifying direct and indirect emissions pertaining to the project and its value chain, should this information be available. This will include: ○ Calculating the greenhouse gas inventory of the proposed Jindal MIOP; ○ Analysis of the project's greenhouse gas emissions and the impact of these emissions on global anthropogenic climate change. ○ Consider the impact of the Jindal MIOP on South Africa's GHG emissions inventory and aligning the Project with South Africa's climate policy and international GHG reduction commitments. ○ The greenhouse gas inventory will be calculated in light of the IFC Performance Standard 3: Resource efficiency and pollution prevention. • Climate change resilience of the project: vulnerability and resilience assessment. When considering a project's resilience to climate change, a climate change vulnerability and resilience model that is based on the following: ○ Exposure e.g. temperature, precipitation, evapotranspiration and climatic water balance, as well as extreme events such as heavy rain and meteorological drought; ○ Sensitivity determines the degree to which a system is adversely or beneficially affected by a given climate change exposure; and ○ Adaptive capacity - a set of factors which determine the capacity of a system to generate and implement adaptation measures. • As part of this study climate change impacts and risks will be assessed and relevant mitigations recommended.

Specialist Study	Plan of Study

Closure	The closure and rehabilitation specialist study is being undertaken by SLR and will focus on the following:
	• Annual Rehabilitation Plan (Annexure 3):
	  ○ Compile a conceptual annual rehabilitation plan (based around the latest mine plan made available) as part of the requirements of the Financial Provisioning Regulations, 2019.
	• Preliminary Mine Closure Plan (Annexure 4):
	  ○ Incorporate baseline specialist information ;
	  ○ Develop the closure strategy, closure objectives and mechanisms, design principals and motivations for achieving the closure objectives;
	  ○ Include stakeholder comments related to closure;
	  ○ Assess any long term latent impacts and mitigation strategies (to be informed by specialist studies);
	  ○ Outline monitoring, auditing and reporting procedures;
	  ○ Identify any knowledge gaps (to be followed up by future closure plan work); and
	  ○ Generate quantities and calculate the cost estimate associated with the closure activities (based on final mine plan) as per the anticipated Financial Provisioning Regulations, 2019 - after the first 12 months of operation, at LOM, and the residual/latent post closure liability.
	• Environmental Risk Assessment (Annexure 5):
	  ○ Compile environmental risk assessment (using available information).

8.4 METHOD OF ASSESSING THE ENVIRONMENTAL ASPECTS

Refer to Section 7.9.

8.5 METHOD OF ASSESSING DURATION SIGNIFICANCE

Refer to Section 7.9.

8.6 CONSULTATION WITH THE COMPETENT AUTHORITY

The final Scoping Report including all comments received during the I&AP review process will be prepared and submitted to the DMRE for their review and decision-making. A site visit and meeting will be held, if requested.

8.7 THE PUBLIC PARTICIPATION IN THE EIA

8.7.1 Notification of interested and Affected Parties

All registered I&APs included on the project database will be involved in the EIA process of the project. Notifications will be in the form of emails and bulk SMS notifications. The relevant I&APs identified for the project are listed below:

- Competent authority: DMRE- KZN Province.
- Commenting authorities:
  - Department of Rural Development and Land Reform (DRDLR);
  - Department of Agriculture and Rural Development (DARD);

  - National Department of Agriculture, forestry and Fisheries;
  - Department of Water and Sanitation (DWS);
  - Department of Human Settlements (DHS);
  - Department of Economic Development, Tourism and Environmental Affairs (EDTEA);
  - Department of Transport (DoT);
  - Ezemvelo KZN Wildlife;
  - AMAFA KZN; and
  - Department Co-operative Governance & Traditional Affairs (COGTA).
- Authorities (including the Entembeni Traditional Council, community leaders, State Departments with jurisdiction in the area, municipal offices and ward councillors);
- Landowners/residents, lawful occupiers, land users (within and adjacent to the application area);
- Community forums and action groups;
- Non-Government Organisations and associations and Non-Profit Companies working in the area;
- Businesses in the area;
- Parastatals;
- Service Providers; and
- Other key stakeholders

8.7.2 Details of the engagement process to be followed

Table 8-2 outlines the details of the public participation process that will be followed during the EIA phase of the project.

Table 8-2 Details of the Public Participation Process to be Followed During the EIA Phase

Task	Description
Scoping Report DMRE Decision	
Notification of DMRE decision on the Scoping Report	All I&APs will be notified via email and SMS notifications of the DMRE's decision of the Scoping Report. Once the Scoping Report is accepted, the EIA phase can be initiated.
Review of the EIA and EMPr	
I&APs review of the EIA and EMPr	The EIA and EMPr will be made available for public review and comment for a period of 30 calendar days to all I&APs registered on the project database. Non-technical summaries of the EIA and EMPr will be made available to all I&APs registered on the project database via email. The EIA and EMPr will also be made available on SLR's data-free website. I&APs will be notified when the EIA and EMPr will be available for public review and comment via a combination SMS notifications, emails and WhatsApp groups. All comments received will be included in the updated CRR.
Submission of the EIA and EMPr to the DMRE.	The EIA and EMPr will be updated to include any comments received during the review of the report by I&APs. The updated report will be uploaded onto SAMRAD for consideration by the DMRE.
Notify I&APs of the DMRE's decision.	Notify I&APs of the decision taken by DMRE and applicable appeals processes.

8.7.3 Information to be provided to Registered and Affected Parties

The following information will be included in the EIA report and made available for public review:

- detailed description of the current biophysical, cultural and socio-economic environments;
- detailed description of the project including information pertaining to the scale, extent and duration of the project activities;
- details of authorisations required in terms of the MPRDA, NEMA and NEM:WA;
- responses to issues and comments received from I&APs;
- copies of the specialist reports undertaken for the proposed project;
- an assessment of the biophysical, cultural and socio-economic impacts identified during the EIA process, with input from I&APs and specialists; and
- an EMPr, with detailed management measures and mitigation to reduce and control identified impacts.
- as part of the review of the EIA report a Non-Technical Summary of the EIA report would be provided to I&APs in both English and isiZulu.

Once the DMRE has issued a decision on the application, SLR would, on behalf of the applicant, inform registered I&APs of the decision and the opportunity for appeal.

8.8 TASKS TO BE UNDERTAKEN DURING THE EIA

A description of the tasks that would be undertaken during the EIA phase is provided in Table 8-3. A preliminary schedule for the EIA phase that aligns with regulatory timeframes is included.

Table 8-3 EIA Tasks and Timing

Phase	EAP Activity	Opportunities for Consultation and Participation		Schedule
		Competent Authority	I&APs	
Specialist Assessment and Input	EAP to manage specialist activities and receive inputs for EIA. Specialists to be kept informed of issues raised throughout the EIA process.			February 2021 – April 2022
EIA Phase	Compile EIA report	N/A	N/A	February 2022 – May 2022
	Distribute EIA for review	Provide copy to DMR for records	Review of EIA (30 days), Comments to EAP	May 2022 – June 2022
	I&AP consultations	N/A	Consultation with I&APs	May 2022 – June 2022
	Collate and respond to comments and finalise EIA report	N/A	N/A	June 2022

Phase	EAP Activity	Opportunities for Consultation and Participation		Schedule
		Competent Authority	I&APs	
	Submit EIA to DMR	N/A	N/A	July 2022
Competent authority review and decision-making	EIA report to DMR (106 days from acceptance of Scoping Report).	DMRE Acknowledge Receipt of EIA (10 days).	Notify I&APs of final report submission	July 2022 – October 2022
		DMRE Review (107 days)	N/A	
		Environmental Authorisation Granted / Refused	N/A	
Decision	Notify registered I&APs of decision (within 14 days of date of decision)	N/A	N/A	November 2022
Appeal Phase	EAP to provide information on appeal process as and when required.	Consultation during processing of appeal if relevant.	Submit appeal in terms of National Appeal Regulations, 2014	120 day process after DMRE decision is received.

8.9 MEASURES TO AVOID, REVERSE, MITIGATE, OR MANAGE IDENTIFIED IMPACTS

See Table 7-20 in Section 7.11. It should be noted that this table has been compiled with the information available at present and will be refined during the EIA phase.

9. OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No additional requests for information have been received to date.

10. OTHER MATTERS REQUIRED IN TERMS OF THE SECTION 24(4)(A) AND (B) OF THE ACT

No other matters are required in terms of Section 24(4)(A) and (B) of the act.

11. UNDERTAKING OF THE EAP

I, Katherine de Courcy Hamilton, the Environmental Assessment Practitioner responsible for compiling this report, undertake that:

- the information provided herein is correct;
- the comments and inputs from stakeholders and I&APs have been correctly recorded;
- information and responses provided to stakeholders and I&APs by the EAP is correct to the best of SLR's knowledge at the time of compiling the report; and
- the level of agreement with I&APs and stakeholders has been correctly recorded and reported.

Signature of the EAP

Date:

Commissioner of Oaths

Date: 17/03/2022

OREN JAN VAN VREDE
COMMISSIONER OF OATHS
EX OFFICIO
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12. REFERENCES

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WKC Group. Noise Input for Scoping Report. November 2021.

APPENDIX A: PROOF OF EAP REGISTRATION

APPENDIX B: CURRICULUM VITAE

APPENDIX C: LOCAL SETTING

APPENDIX D: SITE LAYOUT

APPENDIX E: STAKEHOLDER ENGAGEMENT DOCUMENTS

APPENDIX F: ENVIRONMENTAL AUTHORISATIONS AND MINING RIGHT

There are no Environmental Authorisations or Mining Rights.

APPENDIX G: NEMA AND NEM:WA APPLICATIONS

APPENDIX H: A3 MAPS

RECORD OF REPORT DISTRIBUTION

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