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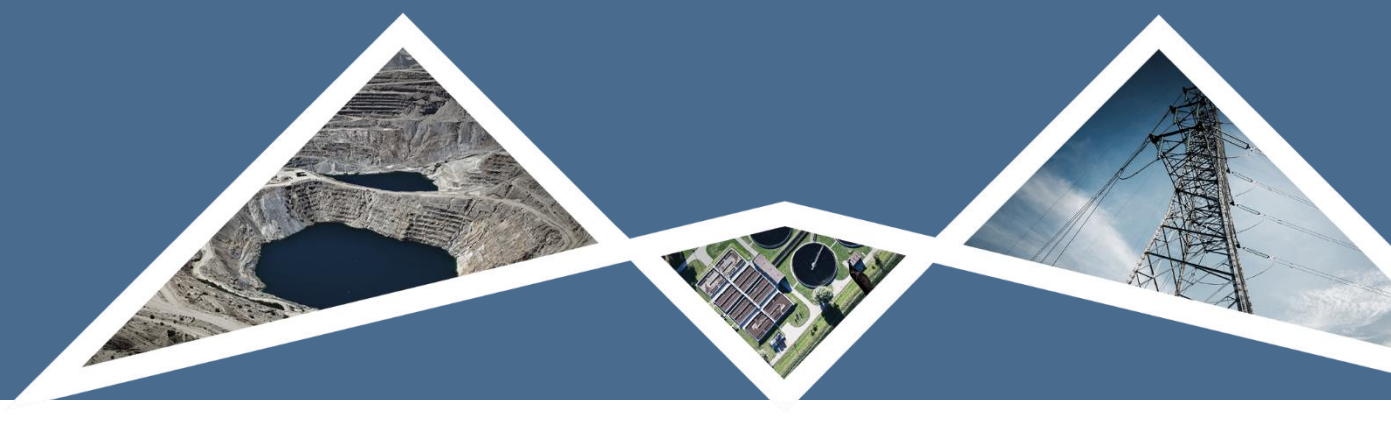
ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR PUBLIC REVIEW

KALABASFONTEIN PROJECT



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Abbreviations

AMD	:	Acid Mine Drainage
CBA	:	Critical Biodiversity Area
CMA	:	Catchment Management Agency
dBA	:	A-weighted decibels
DEA	:	Department of Environmental Affairs
DMR	:	Department of Mineral Resources
DWA	:	Department: Water Affairs
DWS	:	Department of Water Affairs and Sanitation
ECC	:	Environmental Coal Central
EIA	:	Environmental Impact Assessment
EIR	:	Environmental Impact Assessment Report
EIMS	:	Environmental Impact Management Services
ELWU	:	Existing Lawful Water Use
EMPR	:	Environmental Management Programme Report
GA	:	General Authorisation
GHG	:	Greenhouse Gas
GN	:	Government Notice
HIA	:	Heritage Impact Assessment
I&AP	:	Interested & Affected Party
MAE	:	Mean Annual Evaporation
mamsl	:	metres above mean sea level
MAP	:	Mean Annual Precipitation
MAR	:	Mean Annual Runoff
MCM	:	Million cubic metres
MWP	:	Mine Works Programme
MPRDA	:	Minerals and Petroleum Resources Development Act, 2002
NAAQS	:	National Ambient Air Quality Standards
NDCR	:	National Dust Control Regulations, 2013
NEMA	:	National Environmental Management Act, 2002
NEMA	:	National Environmental Management Act
NEM: BA	:	National Environmental Management: Biodiversity Act, 2004
NEM: WA	:	National Environmental Management: Waste Amendment Act, 2008
NGDB	:	National Groundwater Database
NHRA	:	National Heritage Resources Act
NWA	:	National Water Act, 1998

PIA	:	Palaeontological Impact Assessment
POI	:	Point of Interest
RoM	:	Run of Mine
SAHRA	:	South African Heritage Resources Agency
SDF	:	Spatial Development Framework
SDS	:	Safety Data Sheet
SIA	:	Social Impact Assessment
SR	:	Scoping Report
WMA	:	Water Management Area
WML	:	Waste Management License
WULA	:	Water Use License Application
WUL	:	Water Use Licence

1 INTRODUCTION

Forzando Coal Mines (Pty) Ltd. applied to the (DMR) for the conversion of Old Order Mining Rights to New Order Mining Rights for its mining operations at the Forzando North Mine and Forzando South Mine. These conversions were granted in November 2011 and executed on 28 June 2013.

This application is for the extension of the current mining areas (under Section 102 of MPRDA (Act No. 28 of 2002)) by inclusion of contiguous areas which are held under Prospecting Rights 1035PR and 1170PR. Through an intensive drilling exercise on these areas, economically viable blocks of coal have been defined. The plan is to access these newly defined blocks of coal from the existing Forzando South incline. Underground mining has been selected as the appropriate mining method for the Kalabasfontein Project.

The Kalabasfontein Project area is situated in Mpumalanga, approximately 20 kilometres north of Bethal. It is located to the east and south of the existing Forzando South (380MR) which fall within the Msukaligwa Local Municipality and Forzando North (381MR) respectively which fall within the Steve Tshwete Local Municipality. The project area comprises two prospecting rights, 1035PR and 1170PR, which covers a total of ~1 547.8296ha over portions 7, 8, RE, 11 and 13 of the farm Kalabasfontein 232 IS. A new ventilation shaft will be located on Portion 7 or 22 of the farm Uitgedacht 229 IS as part of the Kalabasfontein Project. Initial granting of both Prospecting Rights was in 2006 to Forzando Coal Mines (Pty) Ltd. Subsequent to this, in respect of 1035PR before the right could lapse on the 2nd of November 2009, a Prospecting Rights renewal was applied for in October 2009. In respect of PR 1170 the renewal was applied for on 12 January 2011 before the right expired on 9 April 2011. Both renewals were granted on the 31st July 2015 with execution finalised on the 27th October 2015, extending the validity of both Prospecting Rights to the 30th of July 2018. The application for S102 to include these two prospecting areas into the Forzando South right area was submitted prior to the lapsing of these prospecting rights. The proposed extension of the current mining area will require minimal new surface infrastructure as the mining method to be employed is underground mining and existing surface infrastructure from the Forzando South mine will be used.

Forzando Coal Mines (Pty) Ltd. has appointed EIMS to act as the independent EAP to undertake the EIA for the proposed Kalabasfontein Project. An application for the amendment to the existing Mine Works Programme (MWP) and Environmental Management Programme (EMPR), through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is, therefore, required to support an application for environmental authorisation (EA). A new water use licence application (WULA) for the relevant water use triggers associated with the proposed project is also being undertaken.

1.1 REPORT STRUCTURE

This EIA report has been compiled in accordance with the 2014 NEMA EIA Regulations (as amended). A summary of the reports' specific sections that correspond to the applicable regulations, is provided in Table 1 below.

Table 1: Report sections corresponding to GNR 982 Appendix 3

Reference	Description	Section in Report
Appendix 3(a):	Details of- (iii) the EAP who prepared the report; and (iv) the expertise of the EAP, including a curriculum vitae;	Section 1.2 and Section 1.3
Appendix 3(b):	The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including: (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 2 Table 3 Figure 1
Appendix 3(c):	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Figure 2 Figure 3 Appendix 2
Appendix 3(d):	A description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	Table 10
Appendix 3(e):	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 4

Reference	Description	Section in Report
Appendix 3(f):	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 5
Appendix 3(g):	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 8.6
Appendix 3(h):	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: (aa) (i) details of the development footprint alternatives considered; (bb) (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (cc) (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (dd) (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (ee) (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) (aa) can be reversed; (bb) (bb) may cause irreplaceable loss of resources; and (cc) (cc) can be avoided, managed or mitigated; (ff) (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; (gg) (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (hh) (viii) the possible mitigation measures that could be applied and level of residual risk; (ii) (ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and	Section 8 Section 6 Section 7 Section 9 Section 9.1 Section 9.3 Section 8

Reference	Description	Section in Report
	(jj) (x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	
Appendix 3(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including- (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 9.1 Section 9.3
Appendix 3(j)	An assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated;	Section 9.3
Appendix 3(k):	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 11
Appendix 3(l):	An environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 11.2

Reference	Description	Section in Report
Appendix 3(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 12
Appendix 3(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 8.7
Appendix 3(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 11.2 Section 12
Appendix 3(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 13
Appendix 3(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 11.2 Section 12
Appendix 3(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Proposed activity is mining related and therefore includes operational aspects
Appendix 3(s)	An undertaking under oath or affirmation by the EAP in relation to- (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Section 14
Appendix 3(t)	Where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Section 3.1.14
Appendix 3(u)	An indication of any deviation from the approved scoping report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	N/A

Reference	Description	Section in Report
	(ii) a motivation for the deviation;	
Appendix 3(v)	Any specific information that may be required by the competent authority; and	All documents required in the DMR SR Acceptance Letter to be attached in the report.
Appendix 3(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A

1.2 DETAILS OF THE EAP

For the purposes of this Environmental Impact Assessment Report the following person can be contacted at EIMS:

EAP Name: Bongani Darryl Khupe

SACNASP Registration Number: 400375/11

Contact no: +27 11 789 7170

Email address: bongani@eims.co.za

1.3 EXPERTISE OF THE EAP

1.3.1 QUALIFICATIONS OF THE EAP

In terms of Regulation 13 of the 2014 EIA Regulations (Government Notice R. 982), an independent Environmental Assessment Practitioner (EAP), must be appointed by the applicant to manage the application. EIMS has been appointed as the Environmental Assessment Practitioner (EAP) to assist with undertaking the necessary authorisation and amendment processes for the Kalabasfontein Project. EIMS has been appointed by the Applicant as the EAP and is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations and Section 1 of the NEMA. This includes, *inter alia*, the requirement that EIMS is:

- Objective and independent;
- Has expertise in conducting EIA's;
- Comply with the NEMA, the Regulations and all other applicable legislation;
- Takes into account all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

The declaration of independence of the EAP and the Curriculum Vitae (indicating the experience with EIAs and relevant application processes) of the consultants that were involved in the EA process and the compilation of this report are attached as Appendix 1.

1.3.2 SUMMARY OF THE EAPS PAST EXPERIENCE

Mr Khupe is an environmental project manager and environmental auditor. He is a registered Professional Natural Scientist who holds a Bachelor of Science Honours degree in Applied Environmental Science from the University of Zimbabwe and is a trained Environmental Auditor (Crystal Clear, 2012). His training included all aspects of Environmental Auditing as well as EMS auditing in terms of ISO14001. In addition, he is a trained on the ISO14001:2015 environmental standard and has completed the EMS lead auditor training in terms of ISO14001:2015. Mr Khupe is registered with the Institute of Environmental Management and Assessment (IEMA) as an Environmental Auditor and with the South African Auditor and Training Certification Authority (SAATCA) as a Provisional Auditor. He has more than 12 years' experience in the environmental field. His key focus is on environmental compliance advice and monitoring, environmental impact assessments, environmental permitting, public participation, environmental management plans and programmes, strategic environmental advice, rehabilitation advice and monitoring as well as providing technical input for projects in the environmental management field. He is conversant with the South African environmental legislation as well as sustainability auditing, including Equator Principles, IFC Performance Standards and World Bank EHS guidelines.

The declaration of independence of the EAP and the Curriculum Vitae (indicating the experience with environmental impact assessment and relevant application processes) of the consultants that were involved in the EA / Scoping process and the compilation of this report are attached as Appendix 1.

1.3.3 SPECIALIST CONSULTANTS

Specialist studies have been undertaken to address the key issues that require further investigation, namely the impact on biodiversity, groundwater impacts, heritage impacts, palaeontological impacts, soils impacts, aquatics and wetlands impacts, blast and vibration impacts, air quality and health impacts, noise impacts and social impacts. The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed project. These impacts are then assessed according to pre-defined rating scales (see Section 9.1). The specialists also recommended appropriate mitigation / control or optimisation measures to minimise potential negative impacts or enhance potential benefits, respectively.

Table 2: List of specialists

Specialist List	
Hydrogeological Impact Assessment	GCS Water and Environmental Consulting (Pty) Ltd.
Hydrological Impact Assessment	Hydrologic Consulting (Pty) Ltd.
Wetland Impact Assessment Study	The Biodiversity Company (Pty) Ltd.
Aquatic Ecology Impact Assessment	The Biodiversity Company (Pty) Ltd.
Terrestrial Biodiversity Impact Assessment	The Biodiversity Company (Pty) Ltd.
Soils Assessment/ Agricultural Impact Assessment	The Biodiversity Company (Pty) Ltd.
Noise Impact Assessment	Enviro Acoustic Research
Blasting and Vibration Impact Assessment	Blast Management and Consulting CC
Heritage and Cultural Resources Impact Assessment	PGS Heritage (Pty) Ltd.
Palaeontology Assessment	PGS Heritage (Pty) Ltd.
Air Quality Impact Assessment	WSP Environmental (Pty) Ltd.
Greenhouse Gas Emission Study	WSP Environmental (Pty) Ltd.
Closure Costing	Environmental Impact Management Services (Pty) Ltd.
Traffic Impact Assessment	Beal Consulting Engineering and Project Management
Geotechnical Impact Assessment	Exxaro

2 DESCRIPTION OF THE PROPERTY

Figure 1 indicates the locality of the Kalabasfontein Project area in relation to the Forzando South (380MR) and the Forzando North (381MR) mining right areas. It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively, which fall within the Msukaligwa Local Municipality. The Kalabasfontein Project area is situated in Mpumalanga, 20 kilometres north of Bethal. The project area comprises of two prospecting rights, 1035PR and 1170PR, which covers a total area of ~1 547.8296ha over portions 7, 8, RE, 11 and 13 of the farm Kalabasfontein 232 IS. An additional ventilation shaft and associated powerline will also be required within the Forzando South mining area. Two properties had initially been identified by the Applicant for the proposed ventilation shaft, namely Portion 7 (alternative 1) and Portion 22 (alternative 2) of the farm Uitgedacht 229 IS. However, following the environmental baseline and the environmental impact assessments conducted by the specialists, the preferred location of the ventilation shaft is Portion 22 of the farm Uitgedacht 229 IS (refer to Figure 2 and Figure 3 below).

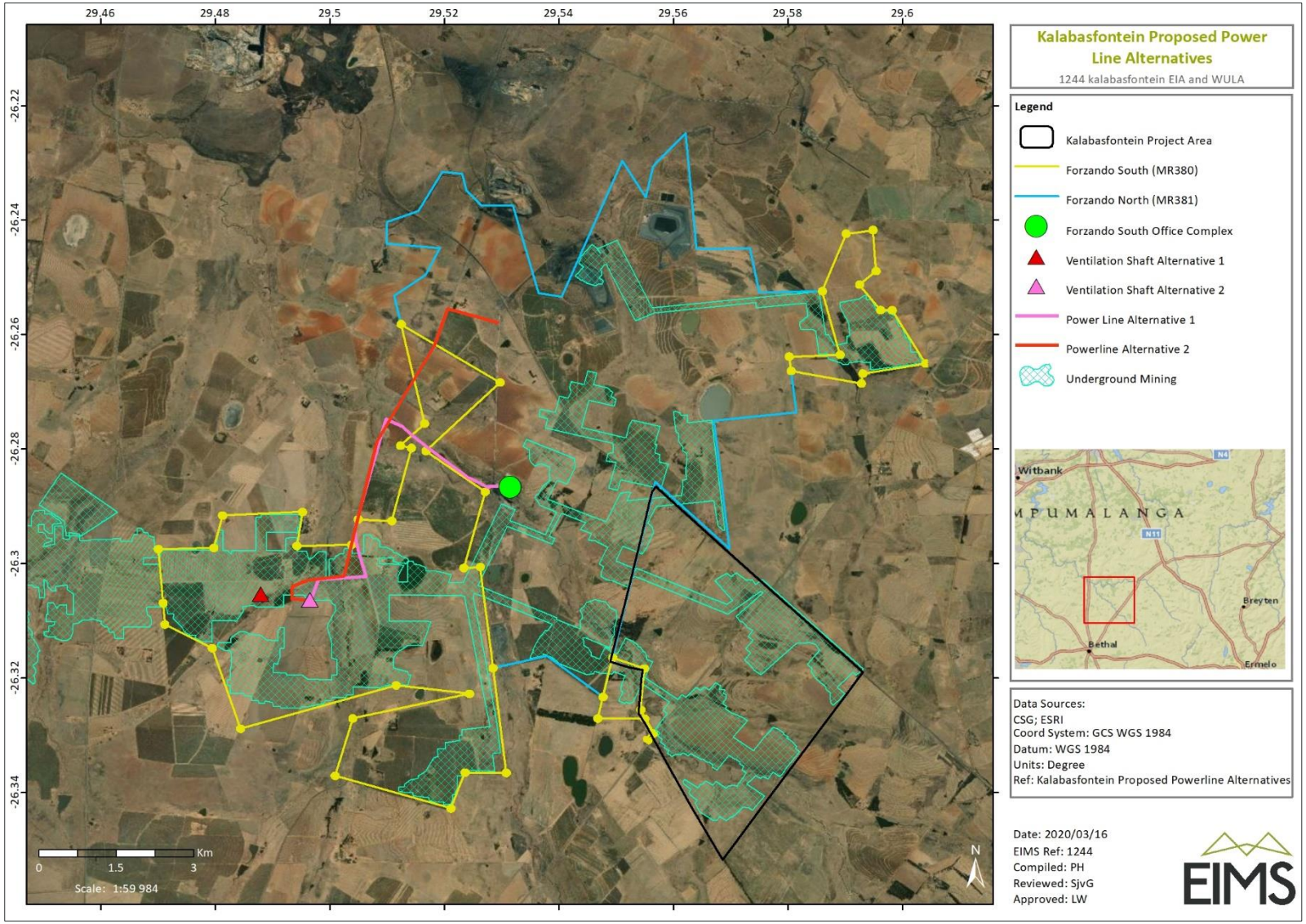


Figure 1: The proposed Kalabasfontein Project Area in relation to the Forzando South (MR380) and North (MR381) Mining Right Areas

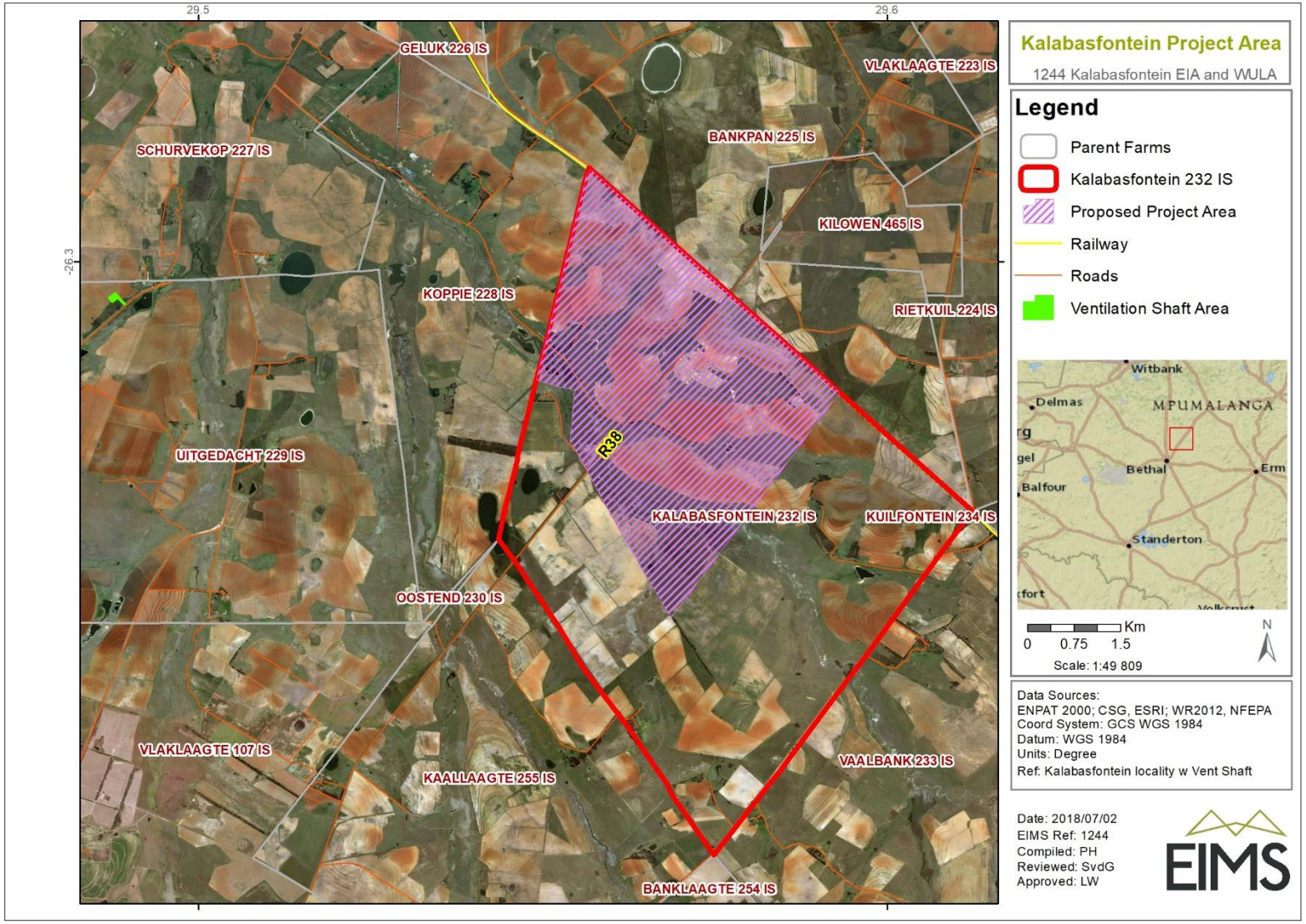


Figure 2: Locality map of Kalabasfontein Project area and the ventilation shaft (Alternative 1) on Portion 7 of the farm Uitgedacht 229 IS.

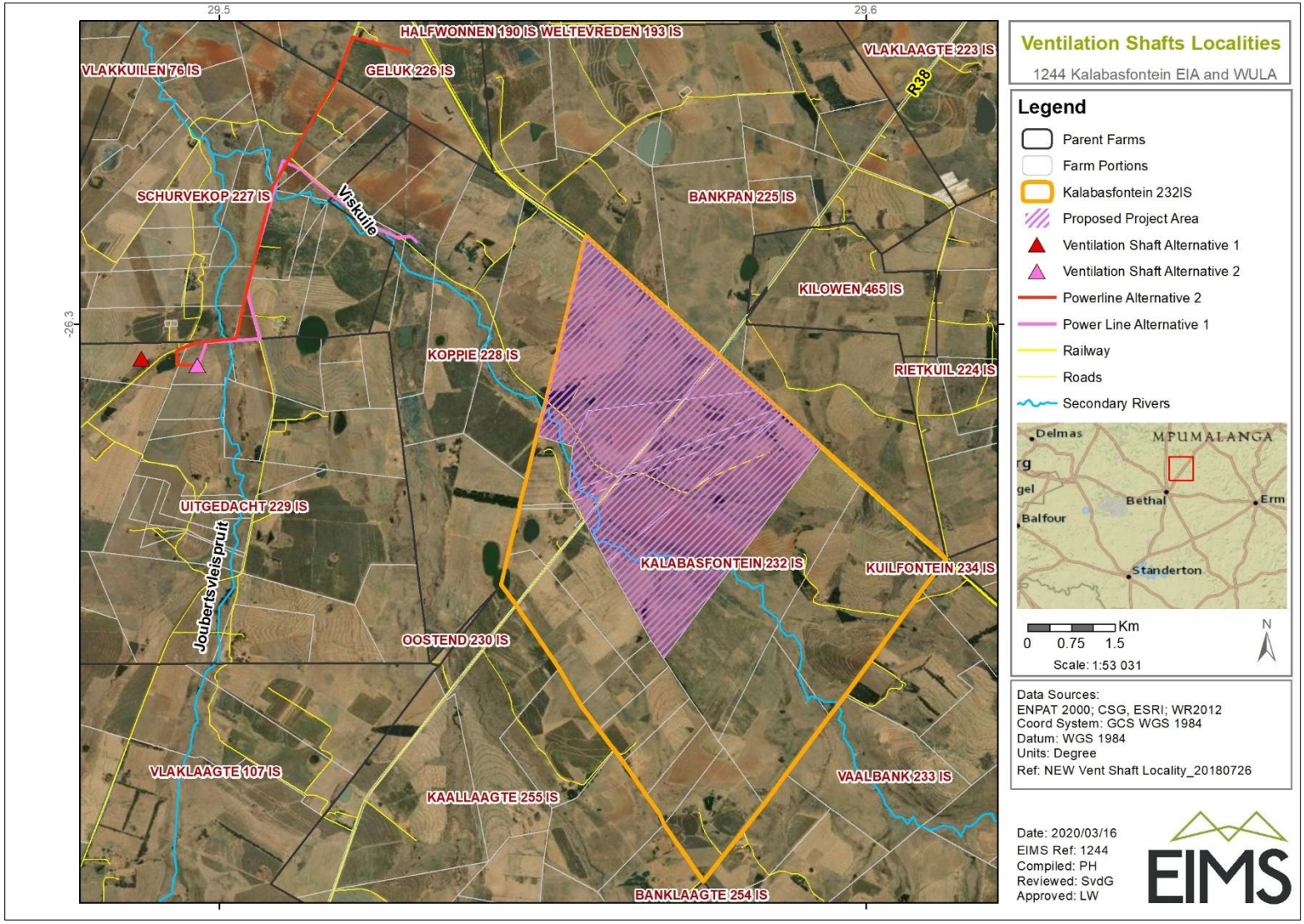


Figure 3: Location of the Kalabasfontein Project and the ventilation shaft (Alternative 2) on Portion 22 of the farm Uitgedacht 229IS.

Table 3: Property description

<table>
<tr><td>Summary</td><td colspan="6">Mining Right holder
Forzando Coal Mines (Pty) Ltd is the holder of Mining Rights in respect of the following operations:
• Forzando South (380MR)
• Forzando North (381MR)
The details of the properties where the current Forzando South Coal Mine operations are situated are provided below. The current approved EA and WUL only covers the properties listed on the left side of the table, the proposed future mining operations fall outside of these properties (but within the prospecting right area) and thus require environmental and water use authorisation.</td></tr>
<tr><td>Application Area (Ha)</td><td colspan="6">The properties affected by this application cover an area of ~1 547.8296 (ha).</td></tr>
<tr><td>Magisterial District</td><td colspan="6">The Kalabasfontein Project area is situated in the Msukaligwa Local Municipality within the Gert Sibande District Municipality, Mpumalanga Province.</td></tr>
<tr><td>Distance and direction from nearest town</td><td colspan="6">Kalabasfontein Project area is situated approximately 20 kilometres north of Bethal</td></tr>
<tr><td rowspan="8">21-digit Surveyor General Code for each Portion</td><td colspan="3">Properties <u>within Mining Right area-</u> Forzando South (380MR)</td><td colspan="3">Properties <u>affected by this Application</u></td></tr>
<tr><td>Farm Name:</td><td>Portion:</td><td>SG Codes:</td><td>Farm Name:</td><td>Portion:</td><td>SG Codes:</td></tr>
<tr><td rowspan="2">Uitgedacht 229 IS</td><td>Remainder of Portion 1</td><td>T0IS00000000022900001</td><td rowspan="4">Kalabasfontein 232 IS</td><td></td><td></td></tr>
<tr><td>Remainder of Portion 3</td><td>T0IS00000000022900003</td><td>7</td><td>T0IS00000000023200007</td></tr>
<tr><td rowspan="2">Uitgedacht 229 IS</td><td>Portion RE4</td><td>T0IS00000000022900004</td><td></td><td></td></tr>
<tr><td>Portion 5</td><td>T0IS00000000022900005</td><td>8</td><td>T0IS00000000023200008</td></tr>
</table>

	Bankpan 225 IS Schurwekop 227 IS	Portion 12	T0IS00000000022900012			
		Portion 13	T0IS00000000022900013			
		Portion 14	T0IS00000000022900014			
		Portion 15	T0IS00000000022900015			
		Portion 16	T0IS00000000022900016			
		Portion 17	T0IS00000000022900017			
		Portion 18	T0IS00000000022900018			
		Portion 7	T0IS00000000022900007			
		Portion 8	T0IS00000000022900008			
		MA 2 on Portion 2	T0IS00000000022500002			
		Portion 3	T0IS00000000022700003			
		Remainder of Portion 4 RES	T0IS00000000022700004		Remaining Extent	T0IS00000000023200000
	Schurwekop 227 IS	Portion 12	T0IS00000000022700003		11	T0IS00000000023200011
		Portion 13	T0IS00000000022700013			
		Portion 12	T0IS00000000022700003			
					13	T0IS00000000023200013
				Uitgedacht 229 IS	7	T0IS00000000022900007

3 DESCRIPTION AND SCOPE OF PROPOSED PROJECT

This section provides a detailed project description. The aim of the project description is to indicate the activities that are planned to take place at the Forzando South operations as well as the proposed Kalabasfontein Project area and amendments that are being applied for in this application. Furthermore, the detailed mine/project description is presented to facilitate the understanding of the project related activities which result in the impacts identified and assessed and for which management measures have been proposed.

3.1 MINING OPERATION OVERVIEW

Although Kalabasfontein annexation is intended to extend the Life of Mine (LOM) of Forzando South Coal Mine, it will come into production a year after the annexation is granted by the DMR. The project will increase the Forzando South reserve base by 11.7 Mt which translates to a 24% increase in the Forzando South reserve base with the project schedule and timeframe being based on the Forzando South equipment availabilities, efficiencies and both skilled and unskilled labour force. Mining in the Kalabasfontein Project area is based on two Continuous Miner (CM) sections.

The access corridor to Kalabasfontein Reserves was identified during exploration drilling. Reserves will be mined through access from one of Forzando South Reserves block. This will eliminate intense preparation work of developing a new incline, as there will be infrastructure available at the face.

Currently, Forzando South life-of-mine is scheduled until 2037. However, the Kalabasfontein portion will be mined as soon as permission is granted, in order to ensure sustained production volumes and quantities from the 5 CM sections that are currently being mined. The mine will maintain its production rate of 2.2 Million tonnes (Mt) per annum. Commissioning of Kalabasfontein will not add to the production of Forzando South but will provide relocation areas for existing Forzando South sections. Since the Kalabasfontein Project will be mined concurrently with Forzando South, production decline will be due to depletion of Reserves. In the second quarter of year 2037, the first section will pull out and leave the one section to deplete the remaining reserves.

3.1.1 THE MINERAL RESOURCES

The exploration work to date forms the basis for the current evaluation. Between 2006 and 2017, a total of 88 boreholes have been drilled with the aim of:

- Increasing the confidence level of the Resource in terms of both structure and washability data;
- Investigating possible extension to the Resource;
- Obtaining more information on dolerite activities; and
- Delineating potential access corridor/s into the area.

Coal measures at Kalabasfontein are hosted within an approximately 160m thick horizon consisting of sandstone and siltstone, subordinate mudstone and shale within the Vryheid Formation of the Ecca Group of the Karoo Super group.

Five main coal seams are recognized in the area, named, from base upwards as, S1, S2, S4, S5 and S6. However, at the Kalabasfontein project area there is no coal seam 6. The thickness and distribution of the seams are controlled by the palaeo-topography and pre-depositional events with seams having been modified by syn-depositional events (mainly influxes of detrital material as well as compaction of the sedimentary pile), dolerite intrusions and later by the erosion that sculpted the modern-day topography.

The most laterally consistent and thickest coal seams are contained in the S4 zone, while the S1 and S2 are restricted to the glaciated valley areas. S5 is only present in topographically high areas, having been removed by erosion elsewhere, whilst the S6 is only preserved in a very small area of high topographical relief.

Seam splitting is a common feature in the area. This is fundamentally attributed to the proximity to the Smithfield Ridge and thus the provenance of detrital material. S2 may be split into S2U and S2L while S4 is split

into three sub seams, S4L, S4U and S4A (See Figure 4). Furthermore, S4A may be split into S4A1 and S4A2. S5 is generally split into the S5 and S5L.

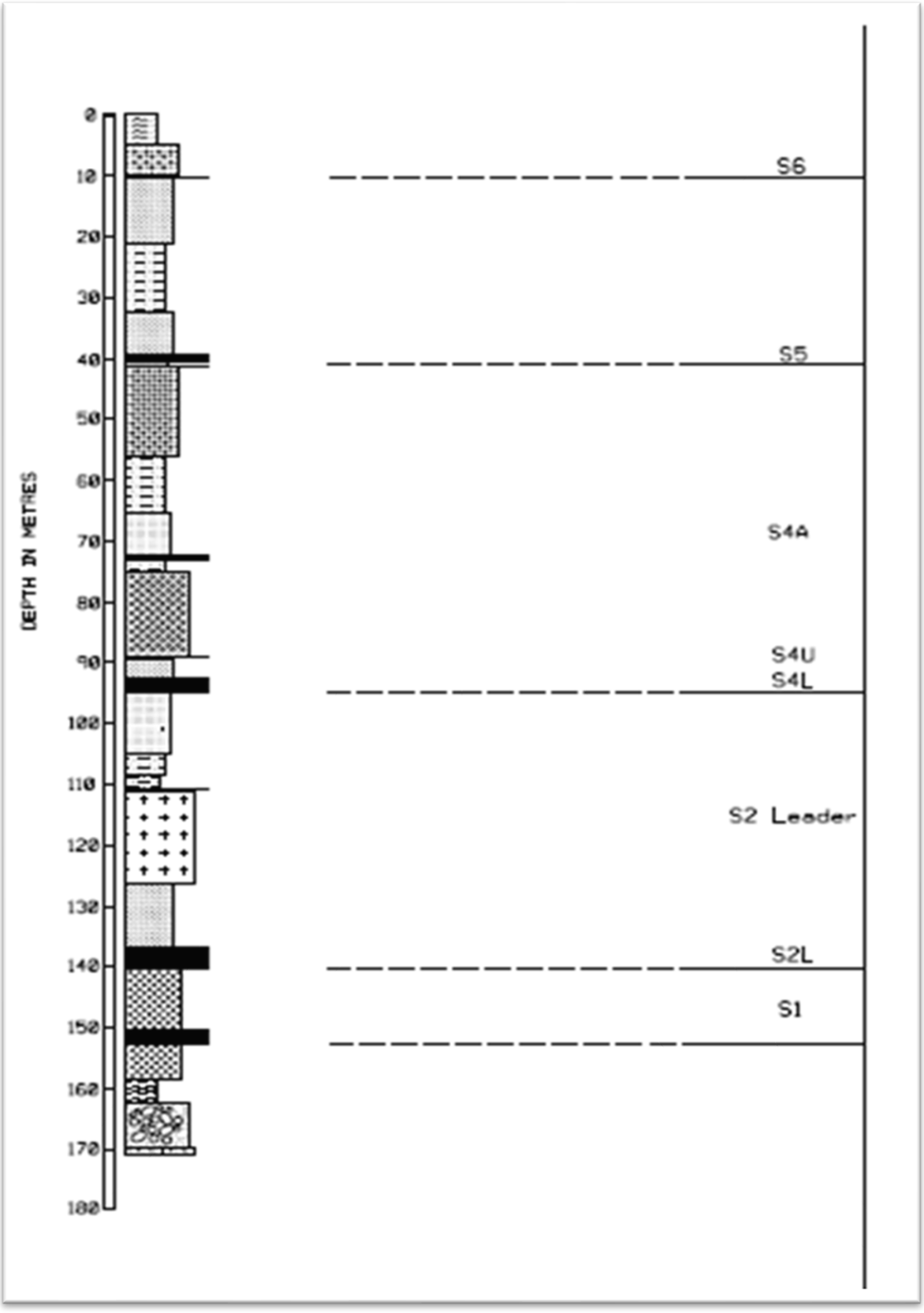


Figure 4: Stratigraphic column for the Vryheid formation

3.1.1.1 NO. 1 SEAM

The No. 1 Seam is found either very close to or on top of the Dwyka Formation. It is sporadically developed in palaeo-topographic lows and generally has thicknesses of less than 1.0m. Seam thickness distribution.

3.1.1.2 NO. 2 SEAM

The No. 2 Seam is found above the No. 1 Seam. It is developed in palaeo-topographic lows and inconsistent in nature. The seam is mainly developed in the eastern, southern and northern portions of the project area. In some areas, it has been displaced by dolerite activity and extensive devolatilised leaving some pockets of unaffected blocks of coal. It comprises a mixture of interbedded shales and coal bands, resulting in variable qualities with high ash content. Its thickness varies from 0.13m to 3.03m as illustrated in Figure 6.

3.1.1.3 NO 3 SEAM

No. 3 Seam has not developed in the project area.

3.1.1.4 NO. 4 LOWER SEAM

The No. 4 Lower Seam is the only seam that is potentially mineable as it is consistent, thick enough, and of sufficient quality in the project area. Its thickness varies from 0.02m to 2.78m. In some areas the seam has been displaced by dolerite activity. The seam comprises millimetre-to-centimetre-banded coal with predominantly bright and lustrous coal bands. Occasional shaley zones are also present in the area. Siderite and pyrite nodules are dispersed throughout the seam and calcite in-filling cleats and joints. Though not as pronounce, the floor elevation contours mirror those of the top of Dwyka.

3.1.1.5 NO. 4 UPPER SEAM

The No. 4 Upper Seam occurs over most of the project area. It is a relatively thin (less than 1.0) and poor in quality to be considered economic. Its thickness ranges from 0.21m to 0.96m.

3.1.1.6 NO. 5 SEAM

The No. 5 Seam is only present in topographic highs and has been eroded in lower lying areas. There is a consistent shale parting within this seam which renders it uneconomical. Where present, its thickness ranges from 0.02m to 1.86m.

3.1.2 MINING METHOD TO BE EMPLOYED

3.1.2.1 UNDERGROUND MINING

Bord and pillar mining using CM's was selected as the primary extraction method. In bord and pillar mining, parallel roads are developed in the development direction. Perpendicular roads, called splits, are developed at predetermined intervals to the parallel roads (see Figure 5). These roads interlink, creating pillars. The roads mined concurrently are determined by the size of the pillars required to support the overburden above the coal seam and the length of the production equipment trailing cables. Pillar size is determined by the safety factor formula; which is the pillar strength divided by the pillar load (mass of the overburden carried by the pillar). Panel design will be based on either the Probability of Failure (PoF) or the safety factor design criterion. A PoF of 0.1% or SF of 2.0 will be used for main development, whereas a PoF of 1% or SF of 1.6 will be used for production panels depending on the stability and rock engineering characteristics that will be determined by a Rock/Geotechnical Engineer. The dimensions of the roads and the support requirements are determined by a Geotechnical Engineer and documented in a code of practice for the prevention of roof falls as illustrated below.

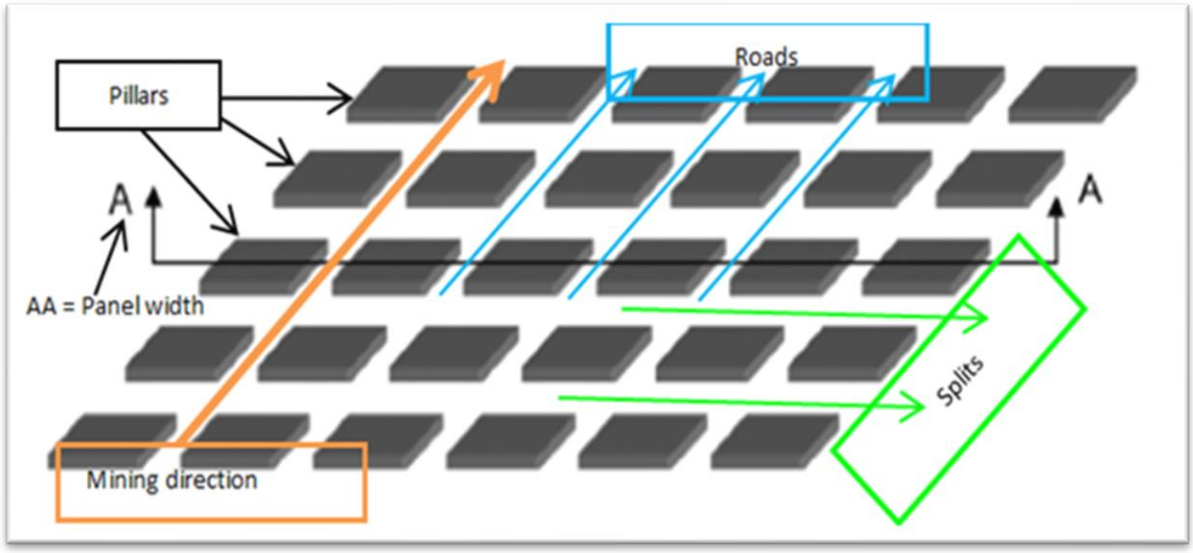


Figure 5: Typical board and pillar mining panel layout for underground extraction

3.1.3 MINE PRODUCTION RATE

Currently, Forzando South mine is scheduled until 2037. However, the Kalabasfontein Project portion will be mined as soon as permission is granted, in order to ensure sustained production volumes and quantities from the 5 CM sections that are currently mining. The mine will maintain its production rate of 2.2Mt per annum. Commissioning of Kalabasfontein will not add to the production of Forzando South but will provide relocation areas for existing Forzando South sections. Figure 6 below indicates the production schedule over the estimated LoM of 17 years.

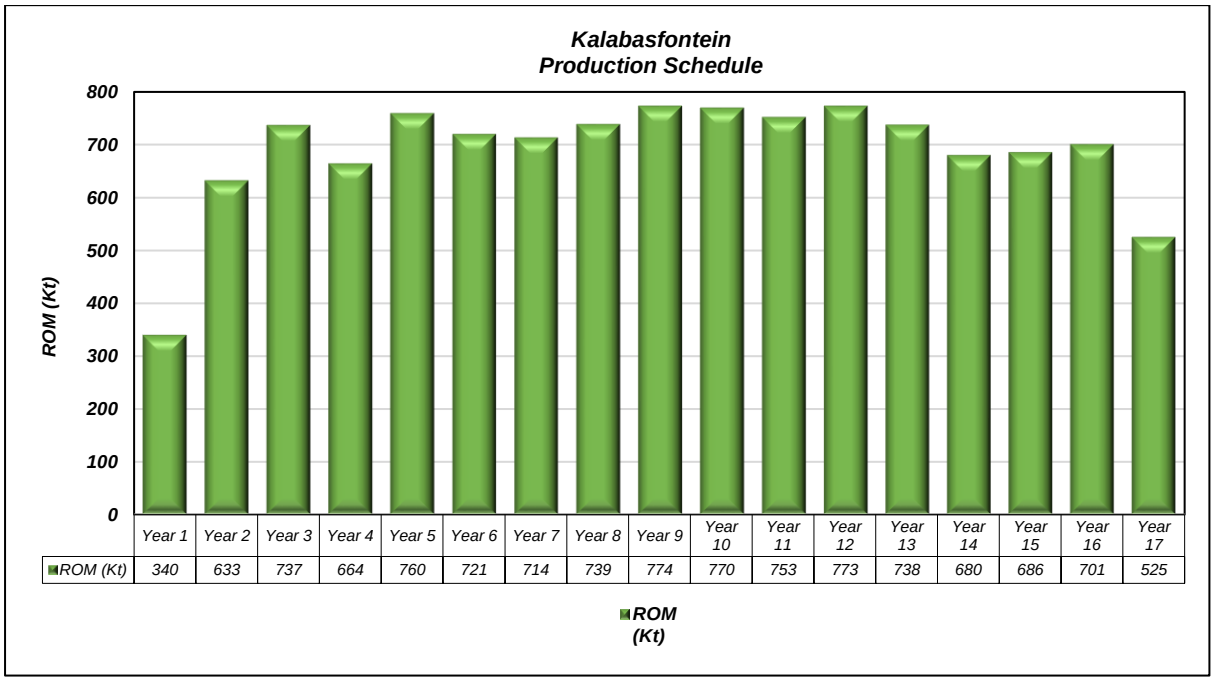


Figure 6: Kalabasfontein production schedule

Table 4 and Table 5 show the yearly Run of Mine (ROM) and product production schedule for Kalabasfontein Project.

Table 4: Seam 4 Lower ROM tonnes

Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
ROM Tonnes [Mt]	0.3	0.6	0.7	0.7	0.8	0.7	0.7	0.7	0.8
RD [t/m³]	1.79	1.79	1.76	1.66	1.74	1.76	1.8	1.78	1.77
Ash Content [%]	43.5	43.5	44.3	35.9	39.2	42.2	46.9	46	42.8
Calorific value [MJ/kg]	17.5	17.6	17.7	20	18.6	17.2	15.7	15.9	16.6
Total sulphur [%]	1.40	1.40	1.30	1.30	1.40	1.60	1.50	1.40	1.30
Description	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Total
ROM Tonnes [Mt]	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.5	**11.7**
RD [t/m³]	1.79	1.8	1.85	1.81	1.74	1.74	1.74	1.74	**1.77**
Ash Content [%]	44.7	46.1	48.7	46.4	41.8	40.7	40.5	40.8	**43.3**
Calorific value [MJ/kg]	16.2	15.4	14.8	15.8	17.5	17.7	17.8	17.9	**17.0**
Total sulphur [%]	1.30	1.50	1.30	1.30	1.40	1.60	1.70	1.60	**1.42**

Table 5: Seam 4 Lower product based on export thermal coal specifications

Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Product Tonnes [Mt]	0.2	0.3	0.4	0.4	0.5	0.4	0.3	0.4	0.4
Calorific value [MJ/kg]	25.5	26.3	26.3	26.3	26	25.1	25.5	25.1	25.2
Total sulphur [%]	1.40	1.50	1.30	1.30	1.40	1.40	1.40	1.40	1.40
Yield [%]	50.2%	52.3%	52.7%	61.8%	56.9%	53.9%	44.5%	47.1%	50.6%
Description	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Total
Product Tonnes [Mt]	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.3	**6.3**
Calorific value [MJ/kg]	25.1	25.1	25.2	25.1	25.7	25.3	25.3	25.3	**25.5**
Total sulphur [%]	1.30	1.40	1.30	1.40	1.40	1.30	1.40	1.40	**1.37**
Yield [%]	47.2%	46.0%	43.3%	47.0%	54.7%	53.8%	50.4%	49.2%	**51.0**

3.1.4 MINERAL PROCESSING

Although the Forzando complex consists of two mines, namely Forzando North and Forzando South, the Kalabasfontein ROM will be crushed at Forzando South prior to conveying it to the Forzando North beneficiation plant for processing. The beneficiated coal is railed by means of a rapid loader to Richards Bay Coal Terminal (RBCT) and then shipped from the harbour to clients overseas. All existing surface infrastructure will be retained to service production from Forzando South inclusive of Kalabasfontein Project.

The following section provides more information on the wet and dry stages of the plant process as illustrated in Figure 7.

3.1.4.1 DRY STAGE:

The raw coal is transported from a ROM stockpile by front end loaders and fed into a shallow hopper. The coal is then fed by conveyor to a feeder breaker where the coal is reduced to a size smaller than 400mm before conveyed to a primary crusher for reduction to the size to smaller than 75mm. A primary dry screen removes oversize coal (greater than 75mm) for re-crushing and raw duff (smaller than 3mm) for sale or to stockpile while the 75mm x 3mm product is conveyed to a secondary dry screen. The secondary dry screen removes the coal fractions that are larger than 25mm in size and transfer it to a wet screening section, with the coal fragments smaller than 25mm being conveyed to a transfer point for feeding to a surge bin which feeds to the two Heavy Medium Settlers (HMS) plants. Any coal material larger than 75mm is transferred to a secondary crusher for reduction and returned to the circuit.

3.1.4.2 WET STAGE:

The wet screen section consists of a rinsing screen to remove any retained coal fragments with a size smaller than 6mm, followed by a picking belt to remove obvious waste in the coal material larger than 25mm. The material is then transferred to a final dry screen where the large nuts (45mm – 75mm) and small nuts (25mm – 45mm) are removed. Any undersized coal fragments are returned to the ROM feed point. Note that this stage does not use additives in the water and thus no external pollutants are added. The surge bin can feed separately, or simultaneously, the two washing plants which washes peas (25mm x 6mm or 25mm x 4mm) and duff (6mm x 1mm or 4mm x 1mm) in a cyclone, plus fine coal (1mm x 0.1mm) in the spirals section. Magnetite grains are used as a heavy density medium in the flotation circuit. This is the only additive used in the plant process and has no water pollution potential.

The slurry (smaller than 1.5mm) is piped to a settling pond system (water to solid ratio of 5,7:1) where the water is reclaimed and returned to the washing plant for reuse. Solid discards from the cyclones and spiral plant are hauled to the discard dump for disposal.

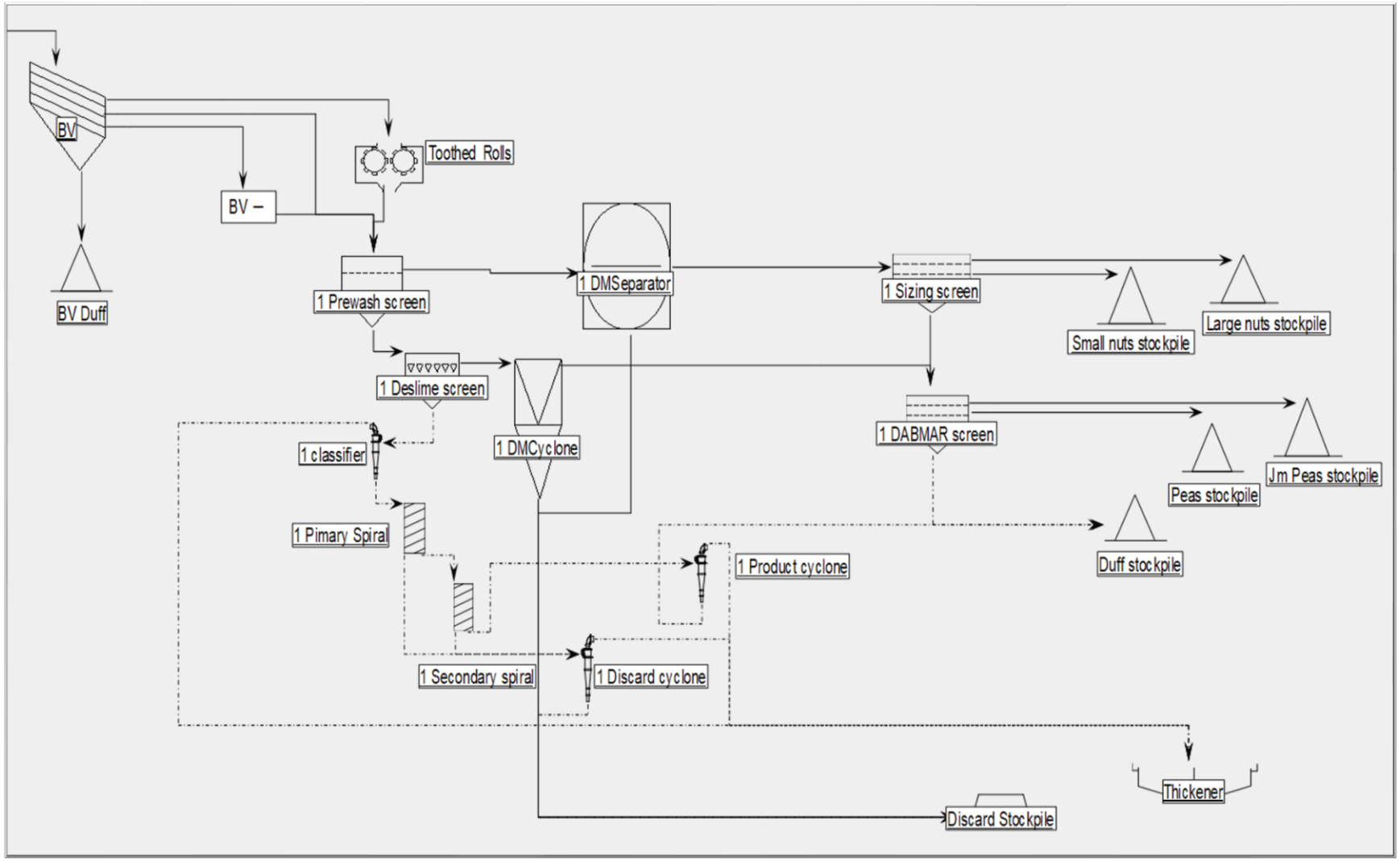


Figure 7: Forzando coal DMS plant

3.1.5 STOCKPILES

3.1.5.1 RUN OF MINE STOCKPILES

The purpose of the ROM stockpile is two-fold:

- To provide a buffer between the primary crusher and overland conveyor feed for feed rate control; and
- To provide surge capacity for when the overland conveying system is down.

Although Forzando complex has two mines, namely Forzando North and Forzando South, Kalabasfontein ROM will be crushed at Forzando South prior to conveying to Forzando North beneficiation plant for processing. Beneficiated coal is railed by means of a rapid loader to Richards Bay Coal Terminal (RBCT) and then shipped from the harbour to clients overseas. All existing surface infrastructure will be retained to service production from Forzando South inclusive of Kalabasfontein Project.

3.1.5.2 NON-CARBONACEOUS STOCKPILES

All discard will be stored on an existing discard dump located at Forzando North and will be rehabilitated /cladded as mining progresses. All product coal is stored on existing product stockpiles until it is transported to clients. As described in section 3.1.7.1, Forzando North and South operations currently have one ROM coal stockpile and a coal product stockpile, as well as a coal discard dump all located at Forzando North..

3.1.5.3 CARBONACEOUS STOCKPILES

All product coal is stored on existing product stockpiles until it is transported to clients. As described in section 3.1.7.1, Forzando North and South operations currently have a ROM coal stockpile and a coal product stockpile as well as a coal discard dump. ROM coal is beneficiated as produced. An emergency stockpile is provided to cater for situations when beneficiation is not matched with ROM production. This stockpile increases and decreases in volume as “balancing” between the ROM production rate and the beneficiation rate are required.

3.1.5.4 SOIL STOCKPILES

Before any construction activities are undertaken, the vegetation will be removed, and the topsoil will be stripped and stockpiled. This will also apply to the construction of the ventilation shaft.

3.1.6 WASTE

The following types of solid waste will be generated by the proposed Kalabasfontein Project:

- Domestic waste;
- Hazardous waste;
- Industrial and mine waste; and
- Mine residue.

The existing Forzando facilities will be utilised to temporarily store waste and all waste will be collected by an approved, registered waste contractor for removal and final disposal. No landfill will be established on the proposed Kalabasfontein Project site.

3.1.6.1 DOMESTIC WASTE STREAMS

The design philosophies for waste management are based on applicable legislation (in particular NEMWA), DWAF best practice guidelines and currently accepted good industry practice for waste management. The key principles of waste minimisation reuse and recycling are implemented wherever possible.

All domestic waste is collected in bins on site, it is removed and separated by a licensed waste management company, who responsibly disposes of all waste at the domestic waste site in Hendrina. The design philosophies for waste management are based on applicable legislation (in particular NEMWA), DWAF best practice guidelines and currently

accepted good industry practice for waste management. The key principles of waste minimisation reuse and recycling are implemented wherever possible.

3.1.6.2 HAZARDOUS WASTE STREAMS

Hydrocarbon containing waste (used oil, dirty diesel and grease) will be stored in clearly marked skip bins (solids) and containers (liquids). These will be placed in existing waste storage areas. When full, the containers will be collected by a contractor for safe disposal or recycling companies which will be appointed to collect waste. All hazardous chemicals are disposed of at a permitted hazardous waste disposal facility. A waste disposal certificate will be required from the contractor to ensure safe disposal.

3.1.6.3 INDUSTRIAL AND MINING WASTE STREAMS

Non-hazardous domestic and industrial waste comprise of typical constituents such as paper, empty cans, glass, steel and plastic containers, scrap metal, piping and tubing (plastic, metal and rubber). However, the majority of non-residue industrial waste produced on site is hazardous. This includes used oil, degreasers, lubricants and containers, mostly contaminated. The volumes applicable to the identified waste stream will fluctuate with the requirements of the mine, but the mine has committed to not dispose of any waste on site. All waste streams will be temporarily stored on site until they are removed by an appointed waste contractor.

3.1.6.4 MINE RESIDUE

There are two waste outputs arising from coal beneficiation, namely coal discards and coal slurry. Coal slurry is deposited on a coal discard dump at Forzando North Coal Mine. Currently, the mine operates one discard dump (Dump no. 3).No disposal occurs on the other dumps (Dump 1, 2A, 2B and 2C are dormant).). Slurry is disposed in dump 3 currently. Dump 1, 2A, 2B and 2c are currently being reclaimed.

3.1.7 ADMINISTRATION BUILDING, WORKSHOPS AND OTHER BUILDINGS

As the Kalabasfontein Project will use the existing Forzando South and Forzando North infrastructure, it is envisaged that additional infrastructure requirements will be minimal. A ventilation shaft will be required, this will be located outside the Kalabasfontein Project area, on portion 22 of the farm Uitgedacht 229 IS, approximately 6km away, as indicated in Figure 2. Existing access roads will be used by the mine.

3.1.7.1 ADMINISTRATION BUILDINGS, ENGINEERING BAYS, WORKSHOPS AND OTHER BUILDINGS

As the Kalabasfontein Project will be an extension of the Forzando South operations, the existing infrastructure will be utilized during all phases of the project. The existing surface infrastructure related to Forzando North can be summarised as follows:

- Coal beneficiation plant;
- Coal discard dumps;
- Rail line of about 1,6 km to the Richards Bay Coal Terminal railway line;
- Rail loop of about 400 m diameter;
- Coal product load-out stockpile located to the west of the discard dump;
- ROM coal stockpile;
- Water pollution control dams;
- Metallurgical coal stockpiles;
- Administration, workshops, change house and related buildings;
- Weighbridge; and
- Water treatment Plant.

At present the existing surface infrastructure related to Forzando South can be summarised as follows:

- Power lines;

- Ventilation shafts (one up cast and one downcast);
- ROM coal stockpile;
- Access roads;
- Overland conveyor from box cut to Forzando North plant;
- Water pollution control dams; and
- Administration, workshops, change house and related buildings.

3.1.7.2 HAZARDOUS GOODS STORAGE

All hazardous chemicals are disposed of at a permitted hazardous waste disposal facility. Three (3) 20,000 litre diesel storage tanks are located on the Forzando North mine site at present and one 10 000m^3 at the Forzando South site. These diesel tanks are located in and around the already impacted footprint area of the plant site. No additional diesel storage is required.

3.1.7.3 WASHBAY

The existing coal washing facilities will be used. All effluent will be collected in a sediment trap and effluent separation system to allow for the efficient collection of fines and solids as well as hydrocarbon separation.

3.1.7.4 WEIGH BRIDGE

Existing facilities will be used.

3.1.7.5 SITE ACCESS AND CONTROL

The infrastructural area of the mine is fenced, and access is controlled by security personnel. Access to the plant and mine site is controlled through a single entrance/exit point onto the mine footprint. Fencing has been specified as 1.8 m high razor diamond-mesh fencing. Site access and traffic flow is designed to optimise control over the flow of public, contractors and mine personnel vehicles as well as pedestrians. All visitors to the site are required to sign in at the security check point located at the entrance gate. A third-party security company is utilised for the security check point and employees are required to retain proof of identification whilst on site.

3.1.8 HAUL ROADS, CONVEYORS AND RAILWAY LINES

A well-developed network of access and haul roads (tar and gravel) exists in the area that link all mining facilities for Forzando North and South. The mine site is accessible by means of a number of gravel roads, and secondary roads which is accessible from the provincial road connecting Bethal and Hendrina (R38 and R35) (see Figure 1). Raw coal from the Forzando North and South sections is transported via trucks to the plant along the existing haul roads.

There is an existing conveyor system at the Forzando North plant area. The existing conveyor system connects the Forzando South and Forzando North operations, and transports coal from Forzando South towards the plant located on Forzando North.

3.1.9 WATER SUPPLY

The proposed Kalabasfontein Project will require bulk water for its mining operations as well as domestic water for drinking and ablutions purposes. Bulk water is required for dust suppression and any other mining operations that may require large volumes of water.

3.1.9.1 POTABLE WATER SUPPLY

Potable water is sourced from Usuthu Government Water Scheme, whilst industrial water is sourced from underground workings. A small Reverse Osmosis (RO) plant is available on site that treats water from underground workings. The treated water is then used for potable purposes. About 11m^3 per day is utilised for this purpose. An estimation of the anticipated potable water demand is presented in Table 6. A preliminary water balance will be designed for the proposed Kalabasfontein Project to determine bulk water requirements during peak production and a mine safety factor (to be determined) will be applied to ensure adequate water supply to the mine.

Table 6: Anticipated demand for water

Water Demand		
Underground		
Minimum Demand	Kilolitre / Month	6 824.7
Maximum Demand	Kilolitre / Month	8 341.3
Average Demand	Kilolitre / Month	7 583
Peak Demand	Litres / Second	3.22
Dust Suppression (Water Cart)		
Minimum Demand	Kilolitre / Month	16 353.9
Maximum Demand	Kilolitre / Month	19 988.1
Average Demand	Kilolitre / Month	18 171
Peak Demand	Litres / Second	7.71
Total Process Water Quantity		
Average Total	Kilolitre / Month	7 583
	Mega litres / Day	0.25
Maximum Total	Kilolitre / Month	8 341.3
	Mega litres / Day	0.28
Potable Water - Washrooms and Consumption		
Average Demand	Total Users / Day	4200
Water Demand	Kilolitre / Cap / Day	0.008
Average Daily Demand	Kilolitre / Day	34
Peak Demand	Litres / Second	0.43
Offices	Kilolitre / Day	34
Total Potable	Kilolitre / Day	34
Contingency	%	10
Allow for	Kilolitre / Day	3.4

3.1.9.2 PROCESS WATER

The design of the beneficiation plant is such that all water is recycled to minimize the impact on the environment and wastage. It is estimated that the process water top up requirement would not exceed 10% of the system capacity. Water use requirement is based on the estimate of average demand based on recycling. Process water is supplied from the following sources:

- Water collected in the pollution control dams; and
- Make-up from Usuthu pipeline connection only if necessary (water from the Usutu pipeline is only used for process purpose under extreme drought situations).

Both Forzando North and South are permitted to use 500 000m³/a (1 369m³/d) of water from the Usutu Vaal Scheme for domestic purposes and coal cutting if needed. Water from the Usutu Vaal scheme, if required, is stored in a dam with the name “Clean water Erikson” or alternatively called the small Erikson dam.

There is no coal beneficiation plant at Forzando South, therefore, there is no water needed in this regard. The coal from Forzando South is transported via a 5km conveyor to Forzando North’s coal beneficiation plant. At the Forzando South

water pumped from underground for the purpose of safe mining is disposed of in PCD1. In the instance that PCD 1 reaches capacity, water can be pumped to PCD 2. In the instance that PCD2 reaches capacity, water will be pumped to Erikson dam 1. If Erikson dam 1 also reaches capacity, water will be pumped to Erikson dam 2.

Water from Erikson dam 1 and 2 is returned to underground for dust suppression and coal cutting when needed. PCD3 contains contaminated stormwater runoff from the coal stockpile area and waste sorting area. In the instance that PCD3 reaches capacity, water will be pumped to Erikson dam 1 or 2 or allowed to overflow into PCD 2 through a concreted trench. Domestic sewage is treated in a package sewage treatment plant and the purified effluent is disposed of at PCD1 and not discharged to the natural environment.

3.1.9.3 CLEAN AND DIRTY WATER SYSTEMS

3.1.9.3.1 POLLUTION CONTROL DAMS AND ASSOCIATED DIRTY WATER MANAGEMENT

Forzando South has implemented clean and dirty water management systems in line with GN704 requirements. A stormwater diversion trench has been constructed around the offices and workshop areas. All dirty water collected on site is channelled to the PCD 3 for re-use. All dirty water is to be collected and stored with no discharge to the environment. A surface water monitoring program has been implemented in order to detect any changes in surface water quality. PCDs are de silted on a regular basis in order to maintain the required capacity of the dams.

The existing pollution control dams will be used to store wastewater. This section describes the management of various wastewater streams associated with the Forzando Coal Mine.

3.1.9.3.2 CLEAN AND DIRTY WATER PROCESSES

Sewerage Facilities

Domestic effluent generated is disposed of by means of two sewage plants at Forzando North and one sewage treatment plant at Forzando South. It is not foreseen that any additional sewerage facilities will be required. The domestic effluent is disposed into PCD4 after treatment at the sewage treatment plant at Forzando North and all effluent is re-used at the plant as process water. At Forzando South the treated sewage effluent water is pumped into PCD1.

Storm Water

Contaminated stormwater runoff (from the coal stockpile area and waste sorting area) is contained in PCD3. In the instance that PCD3 reaches capacity, water will be pumped to Erikson dam 1 and 2 or allowed to flow to PCD2. The washing bay at Forzando South and the water emanating from the area including from the workshop area report to dam 3 through a system of underground concrete drain and manhole system. There is also no coal slurry disposal and discard dump at Forzando South.

Groundwater

No groundwater from boreholes is abstracted for the Forzando South mining operation. The only abstraction of water at Forzando South is from the underground workings. PCD 1 and PCD 2 are HDPE lined. PCD3 which was previously clay lined, is now concrete lined. All three of the Erikson dams are cement dams and as a result do not pose a risk on the groundwater resource of the area.

3.1.9.3.3 CLEAN AND DIRTY WATER SEPARATION INFRASTRUCTURE

Existing co-disposal facilities

There are no discard or slurry disposal facilities at Forzando South. At Forzando North the co-disposal facilities are serviced by a system of linked pollution control dams. The mine site is serviced by a system of drains and berms routing contaminated water arising from the site to pollution control dams. Discard dump 3 is serviced by two dams, dam 6 and 7, whilst discard dump 1 and 2 is serviced by pollution dam 1, 2 and 3. A seepage cut-off drain is located along the toe of the co-disposal facilities. The collected seepage is routed to the pollution control dams from both dumps. No treatment of contaminated water is conducted. Collected contaminated water is reused in relevant activities directly from the pollution control dams (e.g.: dust suppression).

Beneficiation Plant

Contaminated water from the beneficiation plant and stockpile areas is routed to additional pollution control dams located downslope of these areas.

3.1.10 PLAN SHOWING THE LOCATION AND AERIAL EXTENT OF PROPOSED OPERATIONS

Figure 2 indicates the locality and extent of the Kalabasfontein Project area and the surrounding properties.

3.1.11 BULK POWER SUPPLY

Power is supplied to the mine via a 2 by 22kV overhead power line to a surface sub-station from where it is transformed to 550V and 400V for surface use and 11KV for underground use. Two powerline alternatives have been proposed for the ventilation shafts, namely; powerline alternative 1 (initial powerline route) and powerline alternative 2 (revised powerline route).

3.1.12 LIST OF MAIN MINING ACTIVITIES

The main mining actions, activities and process that are planned to take place on site are listed in the Table 7. All actions, activities and processes have been grouped into each of the relevant project phases namely: pre-construction, construction, operation, decommissioning, rehabilitation and closure. It is important to bear in mind that Forzando Coal Mine is an existing mining operation and as such, certain of these activities/phases have already commenced (i.e.: operational phase is currently underway in certain areas). For this report, the following broad definitions apply:

- Pre-construction refers to the phase in which planning takes place;
- Construction refers to the phase in which the site is prepared, and infrastructure is established;
- Operation refers to the phase in which physical mining and production takes place;
- Decommissioning refers to the phase in which infrastructure is removed and rehabilitation efforts are applied, and their success monitored; and
- Closure refers to the phase in which maintenance and rehabilitation monitoring are undertaken to ensure that the mines closure objectives are met.

Table 7: List of main action, activities or processes on site and per phase

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
Site preparation	Vegetation clearance for ventilation shaft		As required	As required	As required	
	Planned placement of infrastructure		At start of phase	As required		
Human resources management	Employment/recruitment		At start of phase	As required	As required	As required
	I&AP consultations		At start of phase	On-going	On-going	On-going
	CSI initiatives		At start of phase	On-going	On-going	On-going
	Skills development programmes	At start of phase	On-going	On-going	On-going	On-going
	Environmental awareness training		At start of phase	On-going	On-going	As required
	HIV/AIDS Awareness programmes		At start of phase	On-going	On-going	
	Integration with Municipalities' strategic long-term planning	At start of phase	On-going	On-going	On-going	
Earthworks	Stripping and stockpiling of soils (Ventilation shaft)		At start of phase	As required	As required	
	Cleaning, grubbing and bulldozing (Ventilation shaft)		At start of phase	As required	As required	
	Removal of cleared vegetation		At start of phase	As required		
	Digging trenches and foundations		At start of phase	As required	As required	
	Blasting		As required	As required	As required	
	Maintenance of storm water management measures		At start of phase	As required	As required	
	Maintenance of firebreak		At start of phase	As required	As required	
	Maintenance of infrastructure and services		At start of phase	As required		

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
Civil Works	Mixing of concrete and concrete works		As required	As required		
	PCD and storm water/return water dam		At start of phase	As required	On-going	
	Establishment of dewatering pipelines		At start of phase	As required		
	Sewage and sanitation		At start of phase	On-going	On-going	
	Existing fuel storage area		Ongoing			
	Existing chemical storage area		Ongoing			
	Existing general waste area		Ongoing	On-going		
	Access control and security		Ongoing	As required	As required	
	General site management		On-going	On-going	On-going	On-going
Underground Mining	Drilling		As required	As required		
	Blasting		As required	As required		
	Excavations		As required	As required		
	Removal of overburden by dozing and load haul			As required		
	Establishment of internal haul roads			As required	As required	
	Removal of ore			On-going		
	Continued use of existing RoM stockpiles		Ongoing	As required	As required	
	Continued use of existing Product Stockpiles			On-going	On-going	
	De-watering of underground workings			On-going	On-going	
	Pumping of water to PCD			On-going	On-going	
	Waste rock dumps for backfilling			On-going	On-going	
	Soil management		On-going	On-going	On-going	On-going

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
	Water management		On-going	On-going	On-going	On-going
	Concurrent rehabilitation			On-going	On-going	On-going
	Water treatment			On-going	On-going	On-going
Infrastructure removal	Dismantling and demolition of infrastructure				As required	
	Blasting				As required	
	Safety control				On-going	On-going
Rehabilitation	Backfilling of pits and voids (underground mine and ventilation shaft)			On-going	On-going	
	Slope stabilisation			On-going	On-going	On-going
	Erosion control			On-going	On-going	On-going
	Landscaping			On-going	On-going	On-going
	Replacing topsoil			On-going	On-going	On-going
	Removal of alien/invasive vegetation			On-going	On-going	On-going
	Re-vegetation			On-going	On-going	On-going
	Restoration of natural drainage patterns				On-going	On-going
	Remediation of ground and surface water			On-going	On-going	On-going
	Rehabilitation of external roads				On-going	On-going
Maintenance	Initiate maintenance and aftercare program				At end of phase	On-going
	Environmental aspect monitoring			On-going	On-going	On-going
	Monitoring of rehabilitation					On-going

3.1.13 ALTERNATIVES CONSIDERED IN THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

The following alternatives have been considered in the EIA phase and are referenced in the Table 37 below (more detail on these various alternatives is provided in the Alterative Section of this report in Section 8):

Ventilation shaft:

- Alternative Shaft 1; and
- Alternative Shaft 2 (Preferred).

Powerline:

- Alternative 1; and
- Alternative 2 (preferred route).

Mining:

- Underground Mining (Alternative 1).

3.1.14 CLOSURE COSTING

Mine closure is the period when the ore-extracting activities of the mine have ceased, and final rehabilitation, decommissioning and mine reclamation are being completed. Mine closure for the purposes of this report can be divided into three distinct phases, namely: Rehabilitation, Decommissioning/closure, and Post closure. It is crucial that the mine closure aligns with the commitments made in the mines original EIA and EMPR and specifically that the end land-use agreed upon in the EIA is strived for. Considering that the proposed Kalabasfontein Project is an extension of the existing Forzando South Operations it is expected that the current closure plans and objectives would generally apply to the decommissioning, rehabilitation and closure of the Kalabasfontein project area and the new ventilation shaft (refer to Section 10 of this report). Consequently, this section describing the likely closure plan that has been extracted from the 'Amended Environmental Impact Assessment and Environmental Management Programme (EIA/EMP) Report Version 2; (GCS (Pty) Ltd, 2010)' for Forzando South. The Closure and Financial Assessment Report is attached as Appendix 20.

3.1.14.1 REHABILITATION, DECOMISSIONING AND CLOSURE PLAN

The plan presented in this section has primarily been extracted from the current approved EMPR for the Forzando operations (GCS (Pty) Ltd, 2010). Reference must be made to the specific impact assessments presented in the Forzando EMP and the associated management and mitigation measures. Where relevant and applicable specific comment and recommendations applicable to the Kalabasfontein project have been incorporated. It should be noted that the plans presented herein are preliminary in nature and are based on high level outcomes for closure. At the time when closure is imminent a revised detailed closure plan will need to be developed in accordance with the requirements of the MPRDA and the NEMA to support formal applications for Closure Certificates and EA's. Relevant specialist studies will need to be updated to inform the final closure planning. It is understood that an EA under NEMA must be obtained prior to commencing with the decommissioning.

As mentioned in the introduction to this section mine closure can be divided into three distinct phases, namely: Decommissioning and rehabilitation, closure, and post closure. The scope of each if these phases is presented in this sub-section and represents both the plans presented in the approved EMPR for Forzando (GCS (Pty) Ltd, 2010) as well as suggestions for the Kalabasfontein Project.

3.1.14.1.1 DECOMMISSIONING PHASE

The decommissioning phase will commence once the mining operation has reached the end of life, and will typically involve:

- Demolishment of all infrastructure (plants, ancillary, etc.):

- All infrastructures will be removed and rehabilitated, should no alternative use be found for the structures.
- An alternative use for the brick structures will first be sought i.e. they can either be sold/donated to the post-mining landowner on sale of the land. If an alternative use cannot be found, the buildings will be demolished.
- All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, sold as scrap or made available to the local community as building materials (provided they are in a satisfactory condition following demolition).

- Removal of linear infrastructure (conveyors, railway, roads and pipelines):
  - Linear infrastructure constructed by the mine (i.e. roads, conveyors, railways and power lines) will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for social investment opportunities, this will be decided in conjunction with Integrated Development Plan (IDP) of the area and the local authorities (i.e. municipality). The soils and land capability will be rehabilitated to near pre-mining conditions.
  - All haul roads, and access roads not being handed over to the landowner, will be rehabilitated.
  - All fences erected around the mine will be dismantled and either disposed of at a permitted disposal site or sold as scrap (provided these structures will no longer be required by the post-mining land owner). Fences erected to cordon-off dangerous excavations will remain in place and will be maintained as and when required.
  - The overland conveyors and railway line, if not used as a community initiative, will be disassembled and the components removed from the site. The material can either be sold (as a unit) or the components sold as scrap.

- Decommissioning of dams:
  - All containment dams will be maintained to ensure that no leakages occur.
  - Overflow pipes and /or spillways will be kept clean.
  - Sumps will be kept clean and all pumps will be maintained.
  - The containment dams will only be demolished should the area proof to be free draining with no pollution potential after rehabilitation.

- Underground closing: All shaft adits will be made safe by sealing this infrastructure.

- Decanting into underground: The extent of decant to be defined and informed by an updated groundwater model.

Following cessation from mining activities and processing, it is planned that all infrastructure will be decommissioned and removed from site in a systematic and regulated matter.

The decommissioning phase for the Kalabasfontein project would align with the general activities listed above. The following specific actions should also be considered at the time of developing a final closure plan:

- All material and machinery (including mine machinery, pipelines, electrical infrastructure, water facilities, ablutions, etc) which can be recycled, reused, or salvaged should be removed from the underground workings. Any remnant equipment should be rendered safe for disposal and abandonment.

- Any potentially contaminated areas (including refuelling areas, hazardous material stores, etc) should be tested for contamination and where applicable remediated, and/or contaminated materials removed and disposed of at a licenced facility. It should be noted that the current plans do not include dedicated refuelling facilities for the Kalabasfontein Project and the existing facilities in place for Forzando South will be used.

- All “conduits” like exploration boreholes, emergency boreholes and ventilation shafts be sealed off after closure.

- An updated numerical groundwater model should be prepared and where applicable the closure of the underground workings should consider the need to isolate and separate certain mining areas to allow for more effective post closure water management. The model should also identify the need to install water monitoring infrastructure to monitor and inform the long-term water management.
- A survey should be conducted on the pillar conditions in the applicable mining area to inform the long-term post closure pillar collapse and subsidence predictions.
- The vent shaft must be closed in accordance with the recommendations of an updated groundwater model and a suitable plug and cap must be designed by a qualified engineer. In principle the vertical hydraulic connectivity between various intercepted aquifers must be prevented.
- An updated risk assessment on the potential for methane gas or other hazardous substances migrating through the ventilation shaft must be carried out and applicable management and mitigation measures implemented.

3.1.14.1.2 REHABILITATION

The concept of progressive rehabilitation and decommissioning should be implemented throughout the life of mine. Progressive rehabilitation and decommissioning will assist in reducing the final closure cost as well as informing the mine of suitable closure strategies for final closure. The mine must consider all options for progressive rehabilitation and decommissioning at each interval for the development and submission of both the annual rehabilitation plan and the final rehabilitation, decommissioning, and closure plan to be submitted in accordance with the NEMA financial provisioning regulations.

In accordance with the EMPR for Forzando (GCS (Pty) Ltd, 2010) the following active rehabilitation of the area will be undertaken:

- Recovery of all saleable infrastructure, including the conveyor system.
- Demolition and removal of all buildings and structures.
- Ripping of all compacted areas, which will be followed with soil amelioration and vegetation.
- Ensure that all remaining piles and slopes are sufficiently shaped to blend in with the surrounding environment.
- Soil amelioration and vegetation of all disturbed areas.
- Maintenance of all re-vegetated areas up until such areas initiate succession and create a sustainable cover.
- Monitoring of key environmental variables (i.e. soils, vegetation, groundwater and surface water) in order to demonstrate stability of rehabilitated areas.
- Weed management after closure, limited to areas disturbed by mining or included as infrastructure related to the mine.

The opportunities for progressive rehabilitation of the aspects associated with the Kalabasfontein project are limited. The progressive decommissioning of the underground working areas should be implemented as and when the mining is complete.

3.1.14.1.3 CLOSURE PHASE

Section 43 (1) of the MPRDA states that '*the holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the environmental authorisation and the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of this Act to the holder or owner concerned*'. Further, Section 43 (4) states that '*an application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the*

lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the required information, programmes, plans and reports prescribed in terms of this Act and the National Environmental Management Act, 1998.' Consequently, the mine will need to apply for a closure certificate once the decommissioning and rehabilitation has been conducted in accordance with the EMPR and the obligations provided by the NEMA EA for decommissioning have been complied with.

According to the EMPR for Forzando (GCS (Pty) Ltd, 2010), when the decision is taken to decommission the mine, the activities below will be implemented[1]:

- Recovery of all saleable infrastructure.
- Rehabilitation of the railway loop to be feasible for future agricultural transportation system in conjunction with consultation with the relevant stakeholders.
- Demolition of all buildings and structures.
- Ripping of all compacted areas, which will be followed with amelioration and vegetation should self-succession not take place.
- Ensure that all remaining stockpiles and slopes are sufficiently shaped to blend in with the surrounding environment and to ensure sustainable rehabilitation in the form of self-succession.
- Soil amelioration and vegetation of all disturbed areas where necessary.
- Maintenance of all re-vegetated areas up until such areas initiate succession and create a sustainable cover.
- Monitoring of key environmental variables (i.e. soils, vegetation, groundwater, surface water and air quality) in order to demonstrate stability of rehabilitated areas.
- Weed management by local people for three (3) years after closure, limited to areas disturbed by mining or included in the mining area.
- Monitoring will be undertaken for three (3) years after closure or up until such time all areas create a sustainable cover and ecosystem.

According to the Forzando EMPR (GCS (Pty) Ltd, 2010), the following maintenance measures will be implemented as part of the closure and post-closure process:

- All natural physical, chemical and biological processes for which a closure condition has been specified must be monitored for three (3) years after closure or as long as deemed necessary at the time. Such processes include erosion of the rehabilitated surfaces, surface water drainage, air quality, surface water quality, groundwater quality, vegetative regrowth, weed encroachment and colonization by animals.
- Measures must be implemented to curb environmental impacts and to ensure that they do not worsen/cumulate over time.
- All rehabilitated areas will be monitored and maintained until such time as required to enable the mine to apply for closure of these different areas.
- The following activities will be included:
    - The closure costs (demolition, removal, re-shaping and rehabilitation quotes per key quantity) for each facility must be included in the database so that the total closure cost can be determined.
    - All facilities that become redundant during the life of the mine must be rehabilitated concurrently to lighten the rehabilitation process at the end of the mine's life.
    - Attention must be paid to the latest developments in the mine rehabilitation sciences.

[1] It is important to note that a NEMA EA will be required prior to the implementation of the decommissioning activities.

- Rehabilitation should be done as soon as possible, to ensure that the rehabilitation work required is kept to a minimum at the end of the life of the mine.
- Ensure that the area is free draining.
- Ensure that self-succession has been implemented.
- Ensure that all slopes are safe in the long term.
- Submission of closure report and application for closure to the authorities.
- Environmental monitoring and maintenance for three years after closure.

Although it is assumed that all impacts will be managed and rehabilitated by the above objectives, some residual impacts will however still be present.

In so far as the Kalabasfontein project is concerned, the key activity during this phase (i.e. post decommissioning) will be to ensure effective rehabilitation as well as monitoring. In addition to the actions listed above it is suggested that the need for closure phase monitoring of explosive gases from the underground workings and ventilation shaft should be informed by a risk assessment undertaken prior to decommissioning.

3.1.14.1.4 POST CLOSURE

Residual impacts above will continue into post closure phases. During closure and post-closure phases, the main activities will be monitoring and maintenance. Any residual impacts, particularly those discussed in the decommissioning phase regarding groundwater will be monitored and specialist advice will be obtained should any issues arise. The following specific post closure residual risks will need to be considered (see Closure plan in Appendix 20 for details):

- Long term water quality and decant, and
- Subsidence.

3.1.14.2 CLOSURE LIABILITY ESTIMATE

The assessment and calculations are based on real contractor rates and consequently aligns with the requirements of the NEMA Financial Provisioning Regulations (GNR1147). The scheduled and unscheduled closure costs are determined based on third party/contractors' rates as at July 2020. It is noted that the long running costs such as care and maintenance were not discounted and are reflected as accumulated present-day costs. The costs are also VAT exclusive. It is noted the closure costs reflected in this report only relate to the activities of Kalabasfontein and exclude Forzando's current mining areas. Refer to Table 8 for a summarised breakdown of the scheduled and unscheduled closure liability assessment for Kalabasfontein (detailed breakdown is included in Closure plan in Appendix 20).

Table 8: Scheduled and unscheduled closure liability assessment for Kalabasfontein .

Components	Unscheduled	Scheduled
Infrastructural Areas	R 1 313 776.04	R 1 313 776.04
Mining Areas	R 226 000.00	R 326 000.00
General Surface Rehabilitation	R 22 199.65	R 22 199.65
P&Gs and Contingencies	R 343 634.65	R 365 634.65
Post Closure Phase	R 3 457 572.90	R 3 457 572.90
TOTAL	**R 5 363 183.24**	**R 5 485 183.24**

4 POLICY AND LEGISLATIVE CONCEPT

This section provides an overview of the governing legislation identified which may relate to the proposed project. A summary of the applicable legislation is provided in Table 9 below. The primary legal requirement for this project stems from the need for a Mining Right (MR) and an EA to be granted by the competent authority, which is the DMR, in accordance with the requirements of both the NEMA and MPRDA. In addition, there are numerous other pieces of legislation governed by many acts, regulations, standards, guidelines and treaties on an international, national, provincial and local level, which should be considered to assess the potential applicability of these for the proposed activity. More detail on the legislative framework is presented in Section 4.1 below.

Table 9: Applicable legislation and guidelines overview

Applicable Legislation and Guidelines	Reference Where Applied
APPLICABLE LEGISLATION	
<u>Constitution of the Republic of South Africa, Act 108 of 1996</u> The constitution of any country is the supreme law of that country. The Bill of Rights in chapter 2 section 24 of the Constitution of South Africa Act (Act 108 of 1996) makes provisions for environmental issues and declares that: "Everyone has the right - (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development" Therefore, the EIA is conducted to fulfil the requirement of the Bill of Rights.	Throughout the SR and EIR process
National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) and the EIA Regulations (2014) thereunder: The NEMA (1998) requires that a project of this nature (inclusive of a Mining Right) must undergo a Scoping and Environmental Impact Assessment; an Environmental Management Programme must also be compiled. Regulations applicable to this project include the following: EIA Regulations R.982 (2014) in terms of NEMA. • Listing Notice 1: R.983 (2014) in terms of NEMA. • Listing Notice 2: R.984 (2014) in terms of NEMA • Listing Notice 3: R.985 (2014) in terms of NEMA.	Throughout the SR and EIR process
Minerals and Petroleum Resources Development Act (MPRDA) (Act no 28 of 2002), as amended and Mineral and Petroleum Resource Development Regulations, 2004 as amended: The MPRDA (2002) requires an applicant who wishes to proceed with a mining project to obtain a Mining Right, part of which requires the applicant to obtain Environmental Authorisation in terms of the NEMA (1998).	Throughout the SR and EIR process

Applicable Legislation and Guidelines	Reference Where Applied
APPLICABLE LEGISLATION	
National Water Act (NWA) (Act 36 of 1998): The NWA recognizes that water is a scarce and unevenly distributed national resource which must managed encompassing all aspects of water resources. In terms of Chapter 4 of the NWA, activities and processes associated with the proposed mine extension and associated infrastructure, are required to be licensed by the Department of Water and Sanitation (DWS). An Integrated Water Use Licence Application (IWULA) will be lodged with the DWS in terms of Section 21 of the NWA, which lists several water uses requiring authorisation. Furthermore, an amended Integrated Water and Waste Management Plan (IWWMP) will be compiled and submitted in support of the IWULA.	Throughout the process – all water related aspects
National Heritage Resources Act, 1999 (Act no 25 of 1999): The National Heritage Resources Act aims to promote good management of cultural heritage resources and encourages the nurturing and conservation of cultural legacy so that it may be bestowed to future generations. Due to the nature and extent of the project, it is likely that some heritage resources and palaeontological features are likely to occur within the project boundary area.	Heritage specialist study and Palaeontological study, EIA, EMP.
Specific Environmental Management Acts (SEMAs): The SEMAs refer to specific portions of the environment where additional legislation over and above the NEMA (1998) is applicable. SEMAs relevant to this application include the following: • National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004). • National Environmental Management: Air Quality Act, 2004 (Act no 39 of 2004).	Specialist studies, Baseline description and EMPR. Permits to be applied for if any protected tree species are to be removed from the site.
APPLICABLE GUIDELINES	
Integrated Environmental Management Information Guidelines series: This series of guidelines was published by the Department of Environmental Affairs (DEA), and refers to various environmental aspects. Applicable guidelines in the series include: • Guidelines 5: Companion to NEMA EIA Regulations of 2010. • Guideline 7: Public Participation. • Guideline 9: Need and desirability. • Additional guidelines published in terms of the NEMA EIA Regulations, in particular: • Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006. • Guideline 4: Public Participation in support of the Environmental Impact Assessment Regulations, 2006.	The guidelines will be used throughout the Scoping and Environmental Impact Report process.

Applicable Legislation and Guidelines APPLICABLE LEGISLATION	Reference Where Applied
• Guideline 5: Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations, 2006.	
Best Practice Guideline (BPG) series: The BPG series is a series of publications by the then Department of Water Affair and Forestry (now DWS – Department of Water and Sanitation) providing best practice principles and guidelines relevant to certain aspects of water management. Best practice guidelines relevant to this project include the following: • BPG A4: Pollution Control Dams. • BPG H1: Integrated Mine Water Management. • BPG H2: Pollution Prevention and Minimisation of Impacts. • BPG H3: Water Reuse and Reclamation. • BPG H4: Water treatment. • BPG G1: Storm Water Management. • BPG G2: Water and Salt balances. • BPG G3: Water Monitoring Systems. • BPG G4: Impact Prediction	Surface water and groundwater specialist studies, EIA and EMP.

4.1 APPLICABLE NATIONAL LEGISLATION

The legal framework within which the Coal Mine operates is governed by many Acts, Regulations, Standards and Guidelines on an international, national, provincial and local level. Legislation applicable to the project includes (but is not limited to):

4.1.1 THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT

The MPRDA aims to "make provision for equitable access to, and sustainable development of, the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and petroleum rights in South Africa. The MPRDA governs the sustainable utilisation of South Africa's mineral resources. The MPRDA aims to "make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and hydrocarbon rights in South Africa. The MPRDA also requires adherence with related legislation, chief amongst them is the National Environmental Management Act (Act No. 107 of 1998, NEMA) and the National Water Act (Act No. 36 of 1998, NWA).

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment of Section 102, concerning amendment of rights, permits, programmes and plans, to requiring the written permission of the Minister for any amendment or alteration; and the section 5A(c) requirement that landowners or land occupiers receive twenty-one (21) days' written notice prior to any activities taking place on their properties. One of the most recent amendments requires all mining related activities to follow the full NEMA process as per the 2014 EIA Regulations, which came into effect on 4 December 2014. Section 102 applications for amendment of both the existing EMPR, MWP and SLP for Forzando South Coal Mine and the proposed Kalabasfontein Project area will be completed as part of the project.

In support of the amendment to the mining right submitted by Forzando Coal Mine (Pty)Ltd, the applicant is required to conduct a Scoping Report, EIA /EMP and I&AP consultations that need to be submitted to the DMR

for adjudication. This report has been compiled in accordance with Appendix 2 of GN 982 of NEMA and Regulation 49 of the MPRDA to satisfy the criteria for a Scoping Report. Pending presentation of the results of the study and inclusion of comment from I&AP's, the Final Scoping Report will be submitted to the DMR for review. The PPP commenced on 20 June 2018 with an initial notification and call to register for a period of 30 days, ending on the 20 July 2018. The dates of the review and commenting period for the draft EIA/EMPR will are detailed in Section 6.

4.1.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT

The main aim of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA Environmental Impact Assessment (EIA) regulations, the applicant is required to appoint an environmental assessment practitioner (EAP) to undertake the EIA, as well as conduct the public participation process. In South Africa, EIA became a legal requirement in 1997 with the promulgation of regulations under the Environment Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant environmental authorisation. On 21 April 2006 the Minister of Environmental Affairs and Tourism promulgated regulations in terms of Chapter 5 of the NEMA. These regulations, in terms of the NEMA, were amended in June 2010 and again in December 2014. The December 2014 NEMA regulations are applicable to this project. Mining Activities officially became governable under the NEMA EIA in December 2014.

The objective of the Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the activities that have been identified. The purpose of these procedures is to provide the competent authority with adequate information to make decisions which ensure that activities which may impact negatively on the environment to an unacceptable degree are not authorized, and that activities which are authorized are undertaken in such a manner that the environmental impacts are managed to acceptable levels.

In accordance with the provisions of Sections 24 (5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIA's to apply for, and be considered for, the issuing of an EA. These Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The Regulations differentiate between a simpler Basic Assessment Process (required for activities listed in GN R. 983 and 985) and a more complete EIA process (activities listed in GN R. 984 In the case of this project there are activities triggered under GN R. 984 and as such a full EIA process is necessary. Table 10 presents all the anticipated listed activities under the NEMA EIA Regulations (2014) that are applicable to this project.

Approval is sought for the following activities:

- Any activity including the operation of that activity which requires a mining right i.e. the inclusion of the Kalabasfontein project area, which currently has a prospecting right, into the mining right of Forzando South.

The application for the amendment has been submitted to the competent authority. The EIR/EMPR report (including details on, and assessment of the amendments) will be made available for a period of 30 days, in line with the required NEMA commenting period for the EIR/EMPR.

A Scoping and EIA process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and EIA accordingly provides a mechanism for the comprehensive assessment of activities that are likely to have more significant environmental impacts. Figure 8 below provides a graphic representation of all the components of a full EIA process.

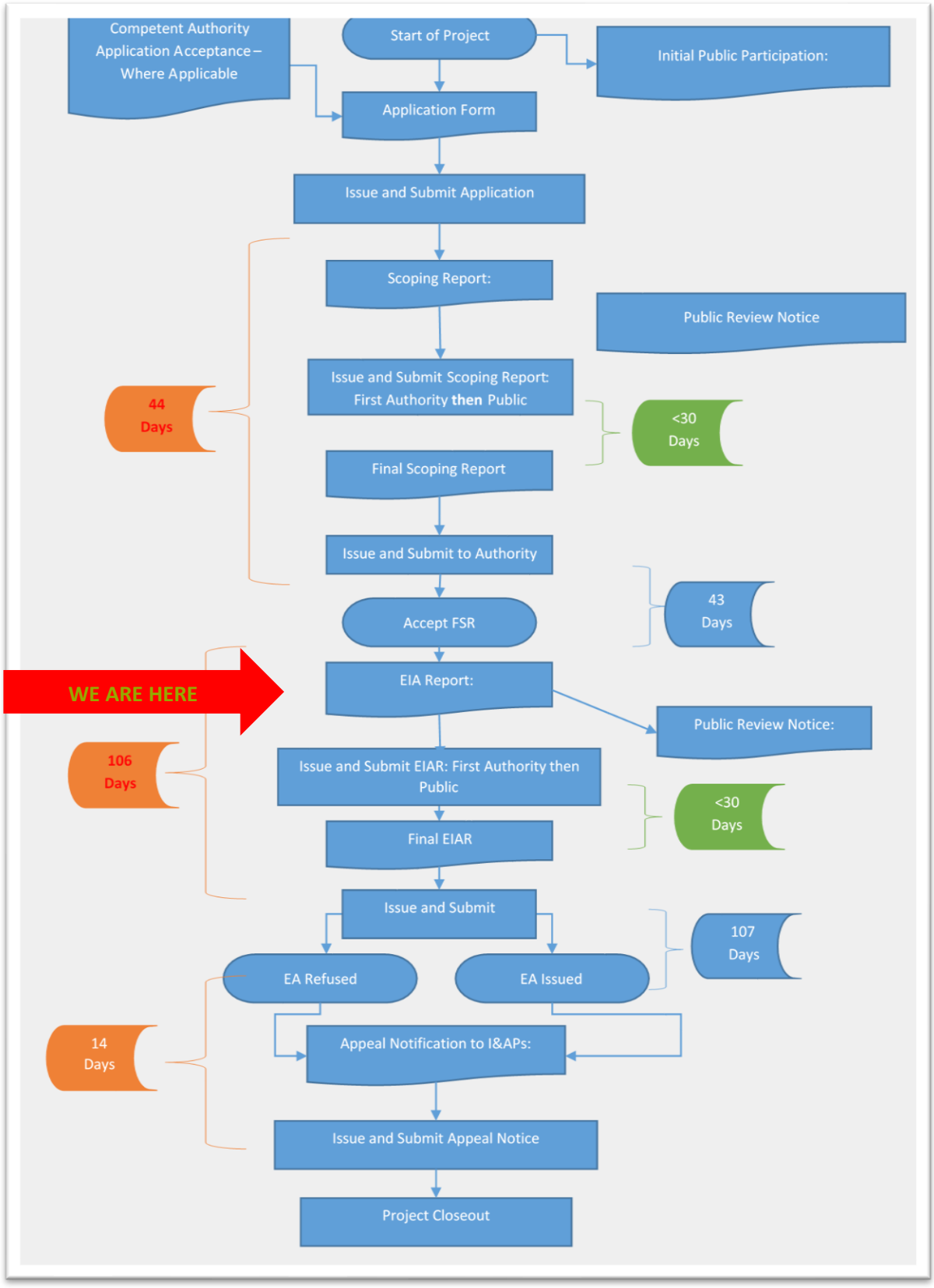


Figure 8: EIA process diagram

Section 24 P of the NEMA requires that an applicant for an environmental authorisation relating to prospecting, mining or production must, before the Minister responsible for mineral resources issues the environmental authorisation, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post

decommissioning management of negative environmental impacts. Therefore, the potential environmental liabilities associated with the proposed activity must be quantified and indicate the method of financial provision in line with the National Environmental Management Act (1998): Regulations pertaining to the financial provision for prospecting exploration, mining and production, (2015). The requirement for mines to comply with the NEMA financial provisioning regulations becomes effective as from June 2021 (as per the extension of the transitional period). However, it is understood that the transitional arrangement associated with the NEMA Financial Provisioning Regulations allow for the continuation of the past process as defined by the DMR Guideline, until this date. As such, the financial provision costs in line with DMR guidelines will be presented in the EIA report.

Table 10 below indicates the Listed Activities in terms of the NEMA Regulations that have been applied for in terms of the proposed Kalabasfontein Project. Some of these Listed Activities are no longer applicable and have been confirmed by the specialist studies that were conducted as part of the EIA phase of the project.

Table 10: Listed activities in terms of the NEMA Regulations

GNR #	Activity Number	Description of the applicable listed activity	Applicability
GNR 983	9	**Water pipelines** *The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where—* *(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.*	No new pipelines will be required; therefore, this activity is no longer applicable.
GNR 983	10	**Water Pipelines for Process Water for Mining** *The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes –* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where—* *(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.*	No new pipelines will be required for process water; therefore, this activity is no longer applicable.
GNR 983	12	**Underground Pollution Control Dam** *"The development of—*	No new pollution control dams will be required; therefore, this activity is no longer applicable.

GNR #	Activity Number	Description of the applicable listed activity	Applicability
		(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —* *excluding—* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared. "*	
R 983	13	**Underground Pollution Control Dam** *The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.*	No new pollution control dams will be required; therefore, this activity is no longer applicable.

GNR #	Activity Number	Description of the applicable listed activity	Applicability
R 983	19	**Underground Mining will result in excavation of more than 10 cubic metres of soils and rock from watercourse** *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving—* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies."*	The water found underground is considered not be a watercourse, therefore, this activity is no longer applicable.
GNR 983	24	**Internal roads – Internal Haul Roads** *"The development of a road—* *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* *but excluding a road—* *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or*	No new internal haul roads will be developed; therefore, this activity is no longer applicable.

GNR #	Activity Number	Description of the applicable listed activity	Applicability
		(c) which is 1 kilometre or shorter."	
GNR 983	27	**All infrastructure (ventilation shaft)** *"The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan."*	Footprint of the shaft area will be 5400m² and has already been disturbed. No indigenous veg to be removed therefore no longer applicable.
GNR	34	**Infrastructure Development and use of water for Dust Suppression** *The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding—* *(i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or* *(iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.*	No additional infrastructure will be developed for the Kalabasfontein project; therefore, this activity is not applicable.
GN983	45	**Utilization of existing pipelines** *The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure—* *(i) has an internal diameter of 0,36 metres or more; or* *(ii) has a peak throughput of 120 litres per second or more; and*	No new pipelines will be required; therefore, this activity is no longer applicable.

GNR #	Activity Number	Description of the applicable listed activity	Applicability
		(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or *(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;* *excluding where such expansion—* *(aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or* *(bb) will occur within an urban area.*	
GNR 983	46	**Utilization of existing pipelines** *The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure—* *(i) has an internal diameter of 0,36 metres or more; or* *(ii) has a peak throughput of 120 litres per second or more; and* *(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or* *(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;* *excluding where such expansion—* *(aa) relates to the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve or railway line reserve; or* *(bb) will occur within an urban area.*	No new pipelines will be required, therefore, this activity is no longer applicable.
GNR 983	56	**Internal roads - Upgrades to existing roads for transport of RoM to off-site minerals processing complex** *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-*	No roads will be widened or lengthened; therefore, this activity is not applicable.

GNR #	Activity Number	Description of the applicable listed activity	Applicability
		(i) where the existing reserve is wider than 13,5 meters; or *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas."*	
GNR 983	63	**Transfer of Process Water** *The expansion of facilities or -infrastructure for the transfer of water from and to or between any combination of the following-* *(i) water catchments;* *(ii) water treatment works; or* *(iii) impoundments;* *where the capacity will be increased by 50 000 cubic metres or more per day, but excluding water treatment works where water is treated for drinking purposes.*	No facilities or infrastructure need to be expanded for the transfer of water.
GNR 984	6	**Pollution Control Dam** *"The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding–* *(i) activities which are identified and included in Listing Notice 1 of 2014;* *(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or* *(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day. "*	No new pollution control dams are required; therefore, this activity will not be applicable.

GNR #	Activity Number	Description of the applicable listed activity	Applicability
GN984	7	**Conveyors** *The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods-* *(i) in gas form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 700 tons per day;* *(ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 50 cubic metres per day; or* *(iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.*	The existing conveyor will be used; therefore, this activity is not applicable.
GNR 984	11	**Pollution Control Dam** *The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following.*	No new Pollution Control Dams are required; therefore, this activity will not be applicable
GNR 984	15	**All infrastructure for underground mining extension** *"The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan."*	No infrastructure is required; therefore, this activity is not applicable.
GNR 984	16	*The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more."*	No new Pollution Control Dams are required; therefore, this activity will not be applicable.
GN 984	17	**General mining activities**	The Kalabasfontein project involves the inclusion of a prospecting right into the existing mining right of

GNR #	Activity Number	Description of the applicable listed activity	Applicability
		"Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including— *(a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or* *(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing;* *but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.*	Forzando South, this activity is, therefore, applicable.
GN 985	4	**Development of internal Roads** *The development of a road wider than 4 meters with a reserve less than 13.5 meters.*	No new roads need to be developed; therefore, this activity is not applicable.
GN985	12	**Clearance of vegetation for the Shaft** *The clearance of an area of 300 square meters or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004*	Footprint of the shaft area will be 5400m² and has already been disturbed. No indigenous vegetation to be removed therefore, this activity is not applicable.
GNR 985	14	**Pollution Control Dam** *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—*	No new pollution control dams will be developed; therefore, this activity is not applicable.

GNR #	Activity Number	Description of the applicable listed activity	Applicability
		(a) within a watercourse; *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.*	
GNR 985	18	**Haul and Access Roads** *The widening of a road by more than 4 meters; or the lengthening of a road by more than 1 kilometre.*	No roads will be widened or lengthened; therefore, this activity is not applicable.

4.1.3 THE NATIONAL WATER ACT

The National Water Act, 1998 (Act 36 of 1998) (NWA) makes provision for two types of applications for water use licences, namely individual applications and compulsory applications. The NWA also provides that the responsible authority may require an assessment by the applicant of the likely effect of the proposed licence on the resource quality, and that such assessment be subject to the EIA regulations. A person may use water, if the use is-

- Permissible as a continuation of an existing lawful water use (ELWU);
- Permissible in terms of a general authorisation (GA);
- Permissible under Schedule 1; or
- Authorised by a licence.

These processes are described in Figure 9.

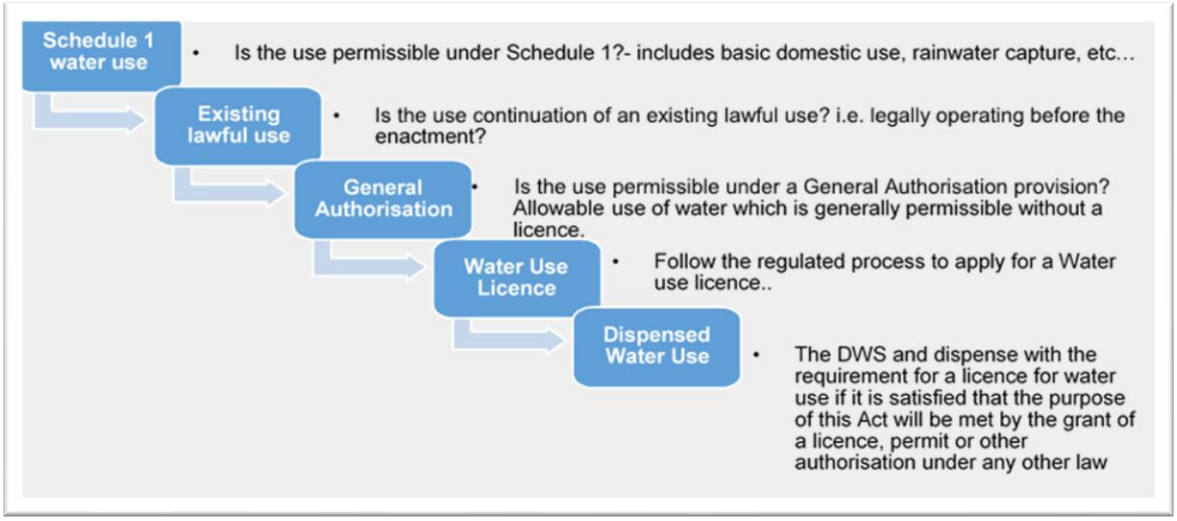


Figure 9: Authorization Process for new water uses

The NWA defines 11 water uses. A water use may only be undertaken if authorised by the DWS. Water users are required to register certain water uses that took place on the date of registration, irrespective of whether the use was lawful or not. The water uses for which an authorisation issued can be issued includes:

a) taking water from a water resource;

b) storing water;

c) impeding or diverting the flow of water in a watercourse;

d) engaging in a stream flow reduction activity contemplated in section 36;

e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);

f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits;

g) disposing of waste in a manner which may detrimentally impact on a water resource;

h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

i) altering the bed, banks, course or characteristics of a watercourse;

j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

k) using water for recreational purposes.

Total Coal SA (Pty) Ltd: Forzando South Coal Mining Operation was granted an Integrated Water Use Licence (IWUL) in terms of Chapter 4 of the NWA, Licence No: 04/B11A/A/ACGIJ/521 and File No:16/7/B100/C252, dated 19 July 2011. This licence was later amended to change the licensee name (including other amendments) to Exxaro Coal Central (Pty) Ltd: Forzando South Coal Mining Operation on 15 June 2017. The following water uses were authorized:

- Section 21(b): Storing of water;
- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource;
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse; and
- Section 21(j): Removing, discharging or disposing of water found underground.

The mine will apply for an amended IWUL to incorporate the proposed changes to the MWP and associated new water uses. The water uses that are triggered by the proposed water uses are presented in Table 11.

Table 11: Water uses that are applicable to mine expansion

Water Use	Name	Purpose
Section 21 c and i **(new water use)**	Underground mining	Undermining of water course
Section 21 c and i **(new water use)**	Ventilation shaft	Ventilation shaft is located within 500m of watercourse.
Section 21 c and i **(new water use)**	Powerline	Powerline crosses watercourse.

An important regulation under NWA is the GN704 (1999). This provides regulations on use of water for mining and related activities aimed at the protection of water resources.

4.1.3.1 MINE WATER MANAGEMENT POLICY POSITION (DRAFT - 2017)

Acid Mine Drainage (AMD) and related mine water impacts have in the past decade evolved to become a major environmental challenge. Whilst the challenge is limited to the mining sector during operations, it eventually becomes externalised during mining downturn, and is especially pertinent post-mining closure, especially if mine closure does not proceed according to regulatory-approved recommendations.

To deal with this challenge at a very high level, an Inter-Ministerial Committee (IMC) comprising the Ministers of Mineral Resources, Water and Environmental Affairs, Science and Technology, and the Minister in the Presidency: National Planning Commission was established. Mine water impacts, including AMD, are phenomena that plague all countries with rich mineral deposits. Depending on the geology/ mineralogy of a region, the terms Acid Rock Drainage (ARD), Acid Mine Drainage (AMD), Neutral Mine Drainage (NMD), and Saline Drainage (SD) are the characteristic nomenclature for reporting different mine water types. Given the long history of mining in South Africa, and the mineral wealth still locked across various parts of South Africa, and the potential this deposit has for local economic development and attracting foreign investment, it is prudent that the DWS formulates a policy principle to support its response to mine water challenges.

The draft policy document's purpose is to provide the position of the DWS on mine water management, including AMD. Furthermore, it aims to provide measures on protection of water resources from prospective, operational and historical mine activities that have negative water quality impacts. Based on the formulation of this policy document, it is clear that the DWS intends to focus more heavily on ensuring that the mining sector in particular, undertakes every possible action to prevent the deterioration of the surrounding water quality.

4.1.3.2 CATCHMENT MANAGEMENT STRATEGIES

Catchment Management Agencies (CMAs) are tasked with coordinating the water demands, interests and responsibilities of all relevant government departments, institutions and water users within a specific CMA. This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a CMA is the Catchment Management Strategy (CMS) which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources. According to DWS' water management areas delineations, the proposed Kalabasfontein Project right area falls within the Olifants Water Management Area, delineated as water management area No. 4 (WMA 4), which subsequently falls under the B Primary drainage area (Department of Water Affairs 2013).

4.1.4 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT

Although none of the listed activities detailed in National Environmental Management: Waste Act, 2008 (NEMWA) regulations are applicable to the Kalabasfontein Project, the requirements of this act must be taken into consideration. The National Environmental Management: Waste Amendment Act came into force on 2 June 2014. Waste is accordingly no longer governed by the MPRDA but is subject to all the provisions of the National Environmental Management: Waste Act, 2008 (NEMWA).

Section 16 of the NEMWA must also be considered which states as follows:

1. A holder of waste must, within the holders power, take all reasonable measures to-

    a) "Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;

    b) Reduce, re-use, recycle and recover waste;

    c) Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

    d) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;

    e) Prevent any employee or any person under his or her supervision from contravening the Act; and

    f) Prevent the waste from being used for unauthorised purposes."

These general principles of responsible waste management will be incorporated into the requirements in the EMPR to be implemented for this project.

Waste can be defined as either hazardous or general in accordance to Schedule 3 of the NEMWA (2014) as amended. "Schedule 3: Defined Wastes" has been broken down into two categories – Category A being hazardous waste; and Category B being general waste. Under Category A (hazardous waste), the act makes allowance for, but not limited to, "wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal; Oil wastes and wastes of liquid fuels; and Construction wastes".

In order to attempt to understand the implications of these waste groups, it is important to ensure that the definitions of all the relevant terminologies are defined:

- Hazardous waste: means “any waste that contains organic or inorganic elements or compounds that may, owning to the inherent physical, chemical or toxicological characteristic of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles.”
- Residue deposits: means “any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right.”
- Residue stockpile: means “any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before the implementation of this Act.”
- General waste: means “waste that does not pose an immediate hazard or threat to health or to the environment, and includes – domestic waste; building and demolition waste; business waste; inert waste; or any waste classified as non-hazardous waste in terms of the regulations made under Section 69.”

Forzando South Coal Mine currently has a Waste Storage License with the reference number (12/9/11/L180/6), which was issued on 22 February 2010.

4.1.4.1 NEMWA PLANNING AND MANAGEMENT OF RESIDUE STOCKPILES AND RESIDUE DEPOSITS REGULATIONS, 2015 (GN R 632)

The purpose of these Regulations is to regulate the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation. The identification and assessment of environmental impacts arising from residue stockpiles and residue deposits must be done as part of the environmental impact assessment conducted in terms of the NEMA. A risk analysis based on the characteristics and the classification set out in Regulation 4 and 5 must be used to determine the appropriate mitigation and management measures. The pollution control barrier system shall be defined by the-

- National Norms and Standards for the Assessment of Waste for Landfill Disposal, 2013; and
- National Norms and Standards for Disposal of Waste to Landfill, 2013.

The planning, management and reporting of residue stockpiles and residue deposits is shown schematically in Figure 10 below.

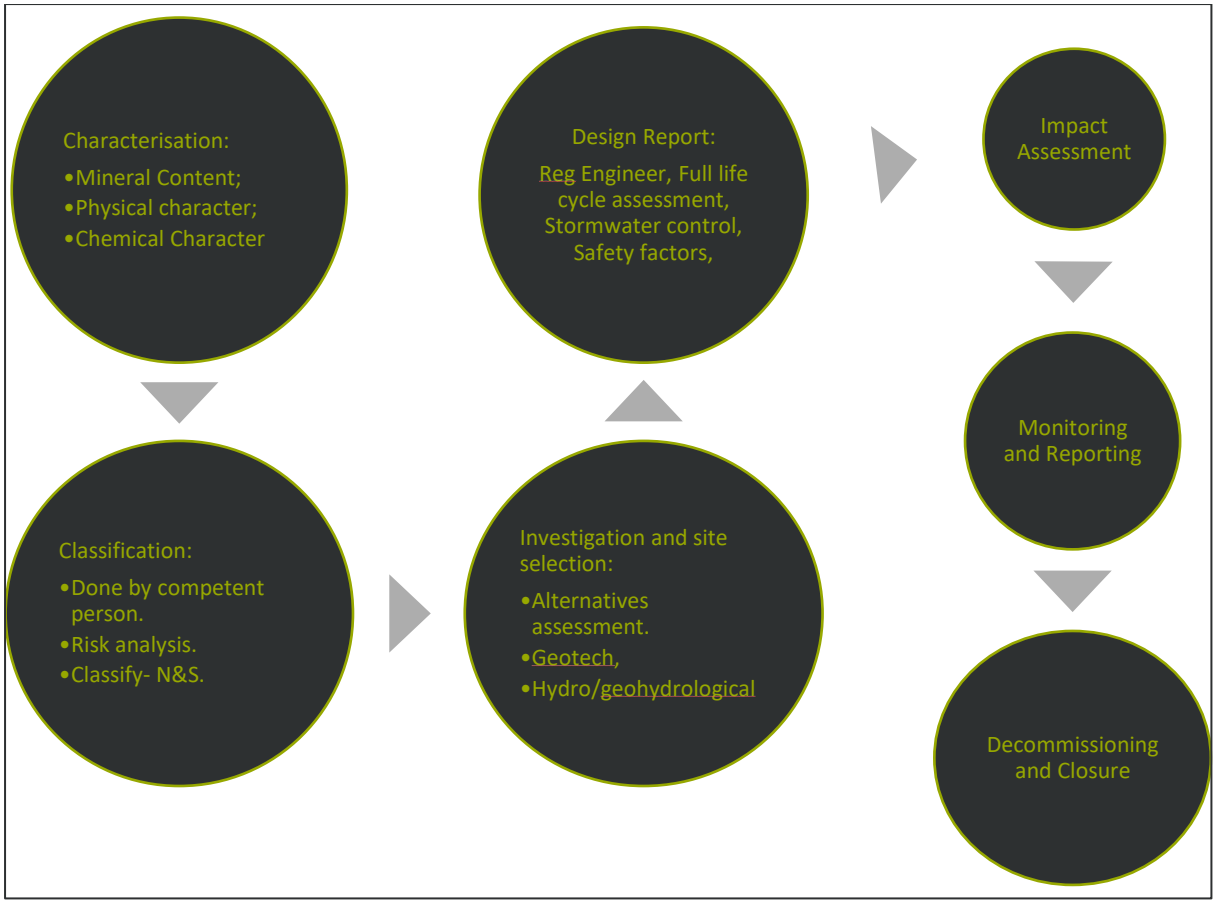


Figure 10: Overview of the planning and management of residue stockpiles and residue deposits regulations

It is anticipated that existing stockpiling areas will be used for the proposed Kalabasfontein Project and therefore there will be no requirement to identify new stockpile or residue areas.

4.1.4.2 NEMWA NATIONAL NORMS AND STANDARDS FOR THE ASSESSMENT OF WASTE FOR LANDFILL DISPOSAL, 2013 (GN R. 635)

These norms and standards prescribe the requirements for the assessment of waste prior to disposal to landfill. The aim of the waste assessment tests is to characterise the material to be deposited or stored in terms of the above-mentioned waste assessment guidelines set by the DEA. Analysis of representative samples will be discussed in the EIA phase where the characterisation of the materials will determine the required mitigation measures to be put forward in the EMPR.

4.1.4.3 NEMWA WASTE CLASSIFICATION AND MANAGEMENT REGULATIONS, 2013 (GN R. 634)

Chapter 9 of the Waste Classification and Management Regulations stipulates the requirements for a motivation for and consideration of listed Waste Management Activities that do not require a Waste Management License. The motivation must:

- Demonstrate that the waste management activity can be implemented without unacceptable impacts on, or risk to, the environment or health;
- Must provide a description of the waste;
- Description of waste minimisation or waste management plans; and
- Description of potential impacts, etc.

4.1.5 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT

The National Environmental Management: Air Quality Act (NEMAQA) is the main legislative tool for the management of air pollution and related activities. The object of the Act is:

- To protect the environment by providing reasonable measures for-
    i. the protection and enhancement of the quality of air in the republic;
    ii. the prevention of air pollution and ecological degradation; and
    iii. securing ecologically sustainable development while promoting justifiable economic and social development; and
- Generally, to give effect to Section 24(b) of the constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and wellbeing of people.

The NEMAQA (Act No. 39 of 2004 as amended) mandates the Minister of Environment to publish a list of activities which result in atmospheric emissions and consequently cause significant detrimental effects on the environment, human health and social welfare. All scheduled processes as previously stipulated under the Air Pollution Prevention Act (APPA) are included as listed activities with additional activities being added to the list. The updated Listed Activities and Minimum National Emission Standards were published on the 22nd of November 2013 (Government Gazette No. 37054).

According to the Air Quality Act, air quality management control and enforcement is in the hands of local government with District and Metropolitan Municipalities as the licensing authorities. Provincial government is primarily responsible for ambient monitoring and ensuring municipalities fulfil their legal obligations, with national government primarily as policy maker and co-ordinator. Each sphere of government must appoint an Air Quality Officer responsible for co-ordinating matters pertaining to air quality management. Given that air quality management under the old Act was the sole responsibility of national government, local authorities have in the past only been responsible for smoke and vehicle tailpipe emission control.

The National Pollution Prevention Plans Regulations were published in March 2014 (Government Gazette 37421) and tie in with the National Greenhouse Gas Emission Reporting Regulations which took effect on 3 April 2017. In summary the regulations aim to prescribe the requirements that pollution prevention plans of greenhouse gases, declared as priority air pollutants, need to comply with in terms of the NEMAQA. The regulations specify who needs to comply, and by when, as well as prescribing the content requirements. Mines do have an obligation to report on the GHG emissions under these regulations.

The National Dust Control Regulations 2013 (NDCR, 2013) are promulgated under the NEMAQA and within these regulations, the standard for the acceptable dust fall rate for residential and non-residential areas is presented in Table 12.

Table 12: Acceptable dust fall rates (National Dust Control Regulations 2013).

Restriction Areas	Dust fall rate (D) (mg/m^2/day, 30-days average)	Permitted frequency of exceeding dust fall rate
Residential area	D < 600	Two within a year, not sequential months
Non-residential area	600 < D < 1200	Two within a year, not sequential months

4.1.6 THE NATIONAL HERITAGE RESOURCES ACT

The National Heritage Resources Act (NHRA) (Act 25 of 1999) stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…”. The last few years have seen a

significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008b):

- The NEMA 23(2)(b) states that an integrated environmental management plan should, "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage".

- A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 (Fourie, 2008b).

- The MPRDA defines 'environment' as it is in the NEMA and, therefore, acknowledges cultural resources as part of the environment. Section 39(3)(b) of this Act specifically refers to the evaluation, assessment and identification of impacts on all heritage resources as identified in Section 3(2) of the National Heritage Resources Act that are to be impacted on by activities governed by the MPRDA. Section 40 of the same Act requires the consultation with any State Department administering any law that has relevance on such an application through Section 39 of the MPRDA. This implies the evaluation of Heritage Assessment Reports in Environmental Management Plans or Programmes by the relevant heritage authorities (Fourie, 2008b).

4.1.7 THE NATIONAL FORESTS ACT

According to the National Forests Act No.84 of 1998, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that "*no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister*."

The exact number of protected species on the proposed site is not known at this stage however a biodiversity study will be conducted for the EIA phase of the project.

4.1.8 NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT

The National Environmental Management Biodiversity Act (NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA as well as the protection of species and ecosystems that warrant national protection. Within the framework of this act, various regulations are promulgated which provide specific requirements and management measures relating to protecting threatened ecosystems, threatened or protected species as well as the control of alien and invasive species. An assessment of the application area will be undertaken by a biodiversity specialist and the findings of this assessment will be presented in the EIA phase. A summary of these regulations is presented below.

4.1.8.1 NATIONAL LIST OF ECOSYSTEMS THAT ARE THREATENED AND NEED OF PROTECTION (GN 1002 OF 2011)

The NEMBA provides for listing of threatened or protected ecosystems in one of the following categories:

- Critically Endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;

- Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;

- Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and
- Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

The Biodiversity Specialist has assessed whether any of these threatened or protected ecosystems occur within the study area and has provided recommendations on how the development should or should not proceed based on the findings of the assessment. The results of this assessment will be presented in detail in this report.

4.1.8.2 THREATENED OR PROTECTED SPECIES REGULATIONS (GNR 152 OF 2007)

The purpose of these regulations is to -

(a) further regulate the permit system set out in Chapter 7 of the Biodiversity Act insofar as that system applies to restricted activities involving specimens of listed threatened or protected species;

(b) provide for the registration of captive breeding operations, commercial exhibition facilities, game farms, nurseries, scientific institutions, sanctuaries and rehabilitation facilities and wildlife traders;

(c) provide for the regulation of the carrying out of a specific restricted activity, namely hunting;

(d) provide for the prohibition of specific restricted activities involving specific listed threatened or protected species;

(e) provide for the protection of wild populations of listed threatened species; and

(f) provide for the composition and operating procedure of the Scientific Authority.

4.1.8.3 ALIEN AND INVASIVE SPECIES LIST

This Act is applicable since it protects the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

- Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated;
- Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled;
- Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be; and
- Category 3 Listed Invasive Species: Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

The provisions of this Act will be considered and where relevant incorporated into the proposed mitigation measures and requirements of the EMPR.

4.1.9 THE SUB-DIVISION OF AGRICULTURAL LAND ACT

In terms of the Subdivision of Agricultural Land Act (Act 70 of 1970), any application for change of land use must be approved by the Minister of Agriculture, while under the Conservation of Agricultural Resources Act (Act 43 of 1983) no degradation of natural land is permitted.

4.1.10 THE CONSERVATION OF AGRICULTURAL RESOURCES ACT

The Conservation of Agricultural Resources Act (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal. The Conservation of Agriculture Resources Act (Act 43 of 1983) requires the protection of land against soil erosion and the prevention of water logging and salinization of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.

4.1.11 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT

The Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) promotes optimal exploitation of minerals and mineral resources. The act provides a framework for a planning system for the country. The Act introduces provisions to cater for development principles; norms and standards; inter-governmental support; Spatial Development Frameworks (SDFs) across national, provincial, regional and municipal areas; Land Use Schemes (LUS); and municipal planning tribunals.

4.1.12 NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from mines, industry and roads. They are:

- South African National Standard (SANS) 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004. 'Calculating and predicting road traffic noise';
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method';
- SANS 10181:2003. 'The Measurement of Noise Emitted by Road Vehicles when Stationary'; and
- SANS 10205:2003. 'The Measurement of Noise Emitted by Motor Vehicles in Motion'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful per se.

4.1.13 ENVIRONMENT CONSERVATION ACT

The Environment Conservation Act (Act 73 of 1989) (ECA) was, prior to the promulgation of the NEMA, the backbone of environmental legislation in South Africa. To date the majority of the ECA has been repealed by various other Acts, however Section 25 of the Act and the Noise Regulations (GNR 154 of 1992) promulgated under this section are still in effect. These regulations serve to control noise and general prohibitions relating to noise impact and nuisance.

The Noise Control Regulations were revised under GN R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. The Free State Province did promulgate provincial regulations (PN 24) in 1998 however the Mpumalanga Province has not done so yet and as such, the ECA Noise Control Regulations apply. These noise control regulations will need to be considered in relation to the potential noise that may be generated mainly during the construction and decommissioning phases of the proposed project. The two key aspects of the noise control regulations relate to disturbing noise and noise nuisance.

Section 4 of the regulations prohibits a person from making, producing or causing a disturbing noise, or allowing it to be made produced or caused by any person, machine, device or apparatus or any combination thereof. A disturbing noise is defined in the regulations as 'a noise level which exceeds the zone sound level or if no zone

sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

Section 5 of the noise control regulations prohibits the creation of a noise nuisance. A noise nuisance is defined as 'any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person'. Noise nuisance is anticipated from the proposed project particularly to those residents that are situated in close proximity to the project site. South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these regulations.

4.2 PERIOD FOR WHICH AUTHOISATION IS REQUIRED

The Kalabasfontein Project is intended to extend the Life of Mine (LOM) of Forzando South Coal Mine, it will come into production a year after the annexation is granted by the DMR. The project will increase the Forzando South reserve base by 11.7 Mt which translates to a 24% increase in the Forzando South reserve base with the project schedule and timeframe being based on the Forzando South equipment availabilities, efficiencies and both skilled and unskilled labour force.

5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

This section will examine the need and desirability of the proposed expansion project and will examine the importance of coal as a resource, as well as the desirability of continuing coal mining operations at the mine.

5.1 THE IMPORTANCE OF COAL AS A RESOURCE

Coal, because of its strategic importance is one of the five minerals selected by the DMR for local beneficiation as it is considered critical to the on-going development of South Africa (Beneficiation Strategy for the Minerals Industry, June 2011). The driving force behind the emphasis of the importance of coal, coal mining and local beneficiation is primarily due to concerns voiced by Eskom over the future security of supply in both the medium and long term of the mineral to its coal fired electricity generating power stations.

South Africa's energy is predominately coal fuelled. Eskom's existing coal fired power stations are critical in terms of electricity production and in meeting the growing energy requirements of South Africa as a whole. Coal and coal supply are consequently seen as critical and its importance is detailed in the Eskom Transmission Ten Year Development Plan 2011 to 2020 (Eskom, 2011). Without steady, secure supply of the mineral, it is unlikely that Eskom will be able to meet the energy demands of the country. As a result, coal mining, beneficiation and supply is of paramount importance to South Africa for continued electricity generation in order to meet the energy demands of the country in the short, medium and long term.

Coal produced is used locally within the region and is also exported. Eskom is the largest local buyer while China is the major export buyer. Demand for coal is generally very high for both market segments. Selling prices are generally regarded as stable both currently and in the foreseeable future.

The South African Integrated Energy Plan highlights that coal should continue to play a role in electricity generation. In addition to this, the Integrated Resource Plan (2010-2030) identifies new coal fired power stations as a means to meet the future energy demands. These plans are in the process of being revisited however, in the absence of revised plans, the base case for energy from coal as it currently stands provides further impetus for planning for future coal production.

5.2 UNDERGROUND EXTENSION

Currently, Forzando South mine is scheduled until 2037. However, the Kalabasfontein portion will be mined as soon as permission is granted, in order to ensure sustained production volumes and quantities from the 5 CM sections that are currently being mined. Since Kalabasfontein will be mined concurrently with Forzando South, production decline will be due to depletion of Reserves. The project will increase the Forzando South reserve base by 11.7 Mt which translates to a 24% increase in the Forzando South reserve base with the project schedule and timeframe being based on the Forzando South equipment availabilities, efficiencies and both skilled and unskilled labour force. If the Forzando mining operations were not to be extended, the additional economic activity, skills development and available jobs would not be created and/or maintained, and the coal reserves would remain unutilised. If Forzando were not to proceed with the proposed extension of mining, mining of these coal reserves will not necessarily be avoided, as another application in terms of the MPRDA, Act 28 of 2002 can be made by another company. Unless the government declares the area "off limits" to mining, or the demand for coal subsides, mining houses will continue to attempt to mine the coal reserves in the area. In summary, the proposed mine project will allow the applicant to continue producing a secure, steady supply of coal until 2037.

The needs and desirability analysis component of the "Guideline on need and desirability in terms of the Environmental Impact EIA Regulations (Notice 819 of 2014)" includes, but is not limited to, describing the linkages and dependencies between human well-being, livelihoods and ecosystem services applicable to the area in question, and how the proposed development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.). Table 13 present the needs and desirability analysis undertaken for the Kalabasfontein Project.

Table 13: Needs and desirability analysis for the Kalabasfontein Project

Ref No.	Question	Answer
1	Securing ecological sustainable development and use of natural resources	
1.1	How were the ecological integrity considerations taken into account in terms of: Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets, Ecological drivers of the ecosystem, Environmental Management Framework, Spatial Development Framework (SDF) and global and international responsibilities.	The following specialist studies have been conducted in support of this application: • Air Quality and Climate Change Impact Study; • Wetland Study; • Hydropedology; • Heritage and Palaeontology; • Hydrogeology; • Hydrology; • Noise Study; • Ecology; • Traffic Study; • Soils, Land Use and Capability / Agricultural Impact Study; • Blasting and Vibrations Study; and • Closure Plan and Quantum Update. The conclusions of these studies, and the identified impacts and mitigation measures stemming there from have been included in the EIA and EMPR. The need of the project in terms of the Gert Sibande District Municipal SDF will also be further considered in the EIA and EMPR.
1.2	How will this project disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to the baseline ecological information in Section 7, and the impact assessment and mitigation measures in Section 9.2 of this EIAR.
1.3	How will this development pollute and / or degrade the biophysical environment? What measures were explored to either avoid these impacts, and where impacts could not be avoided altogether, what	

Ref No.	Question	Answer
	measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	
1.4	What waste will be generated by this development? What measures were explored to avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and / or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	Refer to waste generation and disposal in 3.1.6 of this EIA and EMPR
1.5	How will this project disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to the baseline heritage and paleontological specialist studies in Section 7.7 of this report and the impacts and mitigation measures in of the EIA and EMPR.
1.6	How will this project use and / or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to the impact assessment and mitigation methods in Section 9.2 of this. It is noted that due to the nature of this project (mining of coal), a non-renewable resource will be depleted. Coal mining does, however, contribute significantly to the country's economy and power generation needs, and therefore, at the current stage mining of coal is still needed within South Africa.
1.7	How will this project use and / or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and / or impacts on the ecosystem jeopardise the integrity of the resource and / or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	Refer to the impact assessment and mitigation methods in Section 9.2 of this EIAR.

Ref No.	Question	Answer
1.7.1	Does the proposed project exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)?	The proposed project will rely on / depend on the extraction of a natural, non-renewable resource (coal) for selling to the international market.
1.7.2	Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used?	The proposed project will extend the life of the mine in an area where coal reserves have already been identified and are already being mined. Refer Section 8 on alternatives in this EIAR.
1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The Forzando South Mine is already an existing mine and the proposed project will be an extension of the existing mine partially utilising existing infrastructure. Minimal additional / new infrastructure will be required to mine the additional coal and to enhance the quality of the product.
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts?	
1.8.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	The current knowledge gaps have been identified in Section 12 of this report. Detailed and site-specific information regarding some of the environmental aspects is provided in Section 7 of this report. The impacts on all environmental aspects have been explored in more detail and quantified wherever possible during the EIA Phase. Refer to Section 9.2 of this report. The mitigation measures associated with the impacts need to still be determined.
1.8.2	What is the level of risk associated with the limits of current knowledge?	The level of risk has been informed by the various specialist studies and feedback from the I&AP's to date. Refer to Section 9.2 of this report.
1.8.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Sufficient information was gathered prior to the onset of this process to indicate that the potential mining of additional coal is feasible. In addition, it is noted that this project extends a current mining operation.
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following?	

Ref No.	Question	Answer
1.9.1	Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Refer to the impact assessment and mitigation measures in Section 9.2 of this report. .
1.9.2	Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Refer to Section 7 and the impact assessment and mitigation measures in Section 9.2 of this report.
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	Refer to the impact assessment and mitigation measures Section 9.2 of this report.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Refer to Section 8, details of the alternatives considered, and the advantages and disadvantages of the proposed activity, of this EIA and EMPR.
1.13	Describe the positive and negative cumulative ecological / biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Refer to Section 9.2 of this report.
2	Promoting justifiable economic and social development	
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following:	

Ref No.	Question	Answer
2.1.1	The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks or policies applicable to the area,	The Msukaligwa Local Municipality Integrated Development Plan (IDP) for the period of 2017 – 2018 details an unemployment rate of 22.4%. The Municipality is highly dependent on the neighbouring Ekurhuleni Metro for job opportunities. The land uses adjacent to the N12 Corridor should be developed as economic concentrations, capitalizing off the passers-by and the linkage it provides to regional markets. The local economy is relatively diversified with the largest sector, in terms of output as well as proportional contribution being the trade sector. The growing sector is trade sector followed by the agriculture sector and the mining sector. During recent years the total output of the agriculture sector experienced significant levels of growth while the mining and minerals sector declined. The proposed mining of the extension into the will extend the Life of Mine (LoM) of Forzando Coal Mine, thus allowing the mine to continue supplying for a longer time period. The surrounding communities will also continue to benefit through direct and indirect income; as well as the mine's use of local contractors and suppliers.
2.1.2	Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	The mine will make use of labourers from the local community as far as possible. Forzando has an approved Social Labour Plan (SLP), which is available from the mine on request.
2.1.3	Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	Refer to the baseline environment in Section 7 of this EIAR.
2.1.4	Municipal Economic Development Strategy ("LED Strategy").	The proposed project will promote and support the sustainability of existing business; and assist in increasing local beneficiation and shared economic growth, through extending the life of the mine.
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	Refer to the impact assessment and mitigation measures in Section 9.2 in this EIAR.
2.2.1	Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	The proposed project will increase the life of mine, which will ensure that the community projects initiated by the mine will have an increased life. This will complement the local socio-economic initiatives identified for the area.

Ref No.	Question	Answer
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Refer to the public participation process in Section 6 of this EIA and EMPR.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	Refer to the impact assessment and mitigation measures in Section 9.2 of this EIA and EMPR.
2.5	In terms of location, describe how the placement of the proposed development will:	
2.5.1	Result in the creation of residential and employment opportunities in close proximity to or integrated with each other.	Refer to Section 8, details of alternative considered, in this EIAR.
2.5.2	Reduce the need for transport of people and goods.	
2.5.3	Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms of public transport),	
2.5.4	Compliment other uses in the area,	Refer to item 1.3 of this table (above). The proposed project entails the mining of additional areas to be accessed within an approved mining area. The existing land use and mining of coal will therefore be complimented by the continuation of the project.
2.5.5	Be in line with the planning for the area.	Refer to item 2.2.1 of this table (above).
2.5.6	For urban related development, make use of underutilised land available with the urban edge.	Not applicable. The proposed project is not located in an urban area.
2.5.7	Optimise the use of existing resources and infrastructure,	Refer to Section 3 of this EIAR.
2.5.8	Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for	

Ref No.	Question	Answer
	the settlement that reflects the spatial reconstruction priorities of the settlement),	
2.5.9	Discourage "urban sprawl" and contribute to compaction / densification.	The proposed project will result in the continued employment of workers. Therefore, the influx of additional workers to the area as a direct result of the proposed project is not anticipated.
2.5.10	Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	Refer to items 2.5.7 – 2.5.9 of this table (above).
2.5.11	Encourage environmentally sustainable land development practices and processes	The proposed end land use will be developed in order to be environmentally sustainable in the long term.
2.5.12	Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	Refer to item 1.7.3 of this table (above). The proposed project is associated with a portion of a strategic mineral resource (coal reserve).
2.5.13	The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential).	The proposed project will allow the mine to continue contributing to the local, regional and national Gross Domestic Product (GDPs), and also on the local communities through continued employment of employees and local contractors, as well as other influences that the mine has in the community, such as contributions to community upliftment programmes that are undertaken by the mine through their SLP.
2.5.14	Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	Refer to impact assessment in Section 9.2 of this EIAR.
2.5.15	In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	The proposed project will ensure continued employment in the region, as well as projects implemented from the mine's SLP.
2.6	How was a risk-averse and cautious approach applied in terms of socio-economic impacts:	

Ref No.	Question	Answer
2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Refer to Section 9.2 for the socio-economic impacts and the mitigation measures associated with the impacts need to still be determined. Knowledge gaps and assumptions are discussed in Section 0 of the EIAR.
2.6.2	What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	The level of risk is low as the project is not expected to have far reaching negative impacts on socio-economic conditions. In fact, the extended LOM would have a positive impact in terms of employment security for the years to come.
2.6.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	As this project extends a current mining operation, and does not constitute a new mine, a cautious approach has been implemented.
2.7	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
2.7.1	Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Refer to the impact assessment and mitigation measures in Section 9.2 of this EIAR and EMPR.
2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	Refer to the impact assessment and mitigation measures in Section 9.2 of this the EIA and EMPR.
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Refer to the impact assessment and mitigation measures in Section 9.2 of this EIA and EMPR.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Refer to the impact assessment and mitigation measures in Section 9.2 of this EIA and EMPR.

Ref No.	Question	Answer
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to the impact assessment and mitigation measures in Section 9.2 of this EIAR. The mine will be in line with the regulatory requirements, provide financial provision to ensure that the mitigation measures proposed can be carried out.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	By conducting a Scoping and Environmental Impact Assessment Process, the applicant ensures that equitable access has been considered. Refer to the impact assessment and mitigation measures in Section 9.2 of this EIA and EMPR.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Refer to the impact assessment and mitigation measures in Section 9.2 of this EIA and EMPR.
2.13	What measures were taken to:	
2.13.1	Ensure the participation of all interested and affected parties.	Refer to Section 6 of this Report, describing the public participation process to be undertaken for the proposed project.
2.13.2	Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	Refer to Section 6 of this Report, describing the public participation process to be implemented for the proposed project. The advertisement and site notice have been made available in English and Afrikaans to assist in understanding of the project. A public meeting has been held for the scoping phase and one will be held during the EIA phase of the project.
2.13.3	Ensure participation by vulnerable and disadvantaged persons,	
2.13.4	Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	

Ref No.	Question	Answer
2.13.5	Ensure openness and transparency, and access to information in terms of the process,	Efforts have been made at the public meetings to be held to ensure that all participants can participate in a language they are able to understand (English / Afrikaans). Refer to Section 6 of this EIAR.
2.13.6	Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	
2.13.7	Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein will be promoted?	
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Refer to Section 6 of this EIAR, describing the public participation process that has been implemented for the proposed project.
2.15	What measures have been taken to ensure that current and / or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Workers are educated on a regular basis as to the environmental and safety risks that may occur within their work environment, adequate measures have been taken to ensure that the appropriate personal protective equipment is issued to workers based on the areas that they work and the requirements of their job.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1	The number of temporary versus permanent jobs that will be created.	It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period of time.
2.16.2	Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area).	

Ref No.	Question	Answer
2.16.3	The distance from where labourers will have to travel.	The current workers travel from the local area to the mine and back and as such, this aspect is an existing aspect with no new impacts.
2.16.4	The location of jobs opportunities versus the location of impacts.	It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period.
2.16.5	The opportunity costs in terms of job creation.	
2.17	What measures were taken to ensure:	
2.17.1	That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.	The Scoping and EIA Process requires governmental departments to communicate regarding any application. In addition, all relevant departments have been notified at various phases of the project by the EAP.
2.17.2	That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures.	
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Refer to Section 6 of this EIAR, describing the public participation process that has been implemented for the proposed project, as well Section 9.2, the impact on any national estate, in the EIAR.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to the impact assessment and mitigation measures in Section 9.2 of the EIA and EMPR.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	Forzando Coal Mines (Pty) Ltd will provide a Bank guarantee to DMR. The amount will be calculated using the published DMR guideline document as required by section 54 (1) of the regulations *"Guideline Document for the evaluation of Quantum of Closure Related Financial Provision Provided by a Mine"*
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different	Refer to Section 6, description of the process followed to reach the proposed preferred site, of the EIA and EMPR.

Ref No.	Question	Answer
	impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Refer to Section 9.2 of this EIA and EMPR.

6 STAKEHOLDER ENGAGEMENT

The Public Participation Process (PPP) is a requirement of several pieces of South African legislation and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their comments are considered and a record included in the reports submitted to the Authorities. The process ensures that all stakeholders are provided this opportunity as part of a transparent process which allows for a robust and comprehensive environmental study. The PPP for the proposed project needs to be managed sensitively and according to best practises to ensure and promote:

- Compliance with international best practice options;
- Compliance with national legislation;
- Establishment and management of relationships with key stakeholder groups; and
- Involvement and participation in the environmental study and authorisation/approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:

- Introduce the proposed project;
- Explain the authorisations required;
- Explain the environmental studies already completed and yet to be undertaken (where applicable);
- Solicit and record any issues, concerns, suggestions, and objections to the project;
- Provide opportunity for input and gathering of local knowledge;
- Establish and formalise lines of communication between the I&APs and the project team;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

6.1 GENERAL APPROACH TO SCOPING AND PUBLIC PARTICIPATION

The PPP for the proposed project has been undertaken in accordance with the requirements of the MPRDA and NEMA EIA Regulations (2014), and in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project and have their views considered and included as part of project planning.

An initial I&AP database was compiled based on known key I&AP's, Windeed searches and stakeholder databases provided by the mine. The I&AP database includes amongst other landowners, communities, regulatory authorities and other specialist interest groups. This database is continually being updated as the project progresses.

6.1.1 LIST OF ORGANS OF STATE/ AUTHORITIES IDENTIFIED AND NOTIFIED

The following, but not limited to, Government Authorities were notified and consulted with regards to the proposed Kalabasfontein Project:

- Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
- Mpumalanga Department of Economic Development and Tourism
- Mpumalanga Department of Health
- Mpumalanga Department of Human Settlement
- Mpumalanga Department of Mineral Resources
- Mpumalanga Department of Public Works, Roads and Transport
- Mpumalanga Department of Social Development
- Mpumalanga Department of Water and Sanitation
- Mpumalanga Lakes District Protection Group
- Mpumalanga Tourism and Parks Agency
- National Department of Agriculture, Forestry and Fisheries
- National Department of Environmental Affairs
- National Department of Mineral Resources
- National Department of Rural Development and Land Reform
- National Department of Water and Sanitation
- Gert Sibande District Municipality
- South African National Roads Agency Limited (SANRAL)
- Eskom Holdings SOC Limited
- Transnet SOC Limited
- Msukaligwa Local Municipality

6.1.2 OTHER KEY STAKEHOLDERS IDENTIFIED, NOTIFIED AND CONSULTED

- Birdlife South Africa
- Wildlife & Environmental Society of South Africa (WESSA)
- AFGRI
- Agri SA Mpumalanga
- Federation for a Sustainable Environment
- South African National Biodiversity Institute (SANBI)
- Homeland Mining & Energy SA (HMESA)
- Endangered Wildlife Trust

6.1.3 LANDOWNER CONSULTATIONS

During the scoping phase of the project individual consultations were held with all of the landowners. Minutes of these consultations were sent to each landowner. Additional meeting will be conducted during this EIA phase of the project where required. Refer to Appendix 3.

6.1.4 INITIAL NOTIFICATION (NOTICES, ADVERTISEMENTS, AND BID)

The PPP commenced on 20 June 2018 with an initial notification and call to register for a period of 20 days, ending on the 10 July 2018. These initial notifications were given in the following manner:

6.1.4.1 REGISTERED LETTERS, FAXES AND EMAILS

Notification letters (English and Afrikaans), faxes, and emails were distributed to all pre-identified key I&APs including government organisations, NGOs, relevant municipalities, ward councillors, landowners and other organisations that might be affected.

The notification letters included the following information to I&APs:

- List of anticipated activities to be authorised;
- Scale and extent of activities to be authorised;
- Information on the intended mining operation to enable I&APs to assess/surmise what impact the activities will have on them or on the use of their land;
- The purpose of the proposed project;
- Details of the affected properties (including a locality map);
- Details of the relevant MPRDA and NEMA Regulations;
- Initial registration period timeframes; and
- Contact details of the EAP.

6.1.5 BACKGROUND INFORMATION DOCUMENT (BID)

A Background Information Document (BID) in English was prepared and distributed by post with the registered letters, faxes and e-mails and made available on the EIMS website (www.eims.co.za). The BID contained the following information:

- Project name;
- Applicant name;
- Project location (including map of study area);
- Description of the EA application process, EIA flow chart, and public participation process;
- Information on future document review opportunities;
- A detailed questionnaire/ I&AP registration form; and
- Relevant EIMS contact person for the project.

6.1.6 NEWSPAPER ADVERTISEMENTS / GOVERNMENT GAZETTE

Advertisements describing the proposed project and EIA process were placed in newspapers with circulation in the vicinity of the study area. The initial advertisements were placed in the Ridge Times (English advert) and the Highvelder (Afrikaans advert) on 22 June 2018. The newspaper adverts included the following information:

- Project name;

- Applicant name;
- Project location;
- Nature of the activity; and
- Relevant EIMS contact person for the project.

6.1.7 SITE NOTICE PLACEMENT

Twenty-one (21) A2 Correx site notices were placed at 21 locations along and within the perimeter of the proposed project area during the initial notification. The on-site notices included the following information:

- Project name;
- Applicant name;
- Project location;
- Map of proposed project area;
- Project description;
- Legislative requirements; and
- Relevant EIMS contact person for the project.

6.1.8 POSTER PLACEMENT

A3 posters in English and Afrikaans were placed at 2 local public gathering places in town near the study area (Bethal) (refer to Appendix 3). The notices and written notification afforded all pre-identified I&APs the opportunity to register for the project as well as to submit their issues/queries/concerns and indicate the contact details of any other potential I&APs that should be contacted. The contact person at EIMS, contact number, email and faxes were stated on the posters. Comments/concerns and queries were encouraged to be submitted in either of the following manners:

- Electronically (fax, email);
- Telephonically; and/or
- Written letters.

6.2 SCOPING REPORT REVIEW AND NOTIFICATIONS

Notification regarding the availability of the Scoping Reports for public review was given in the following manner to all registered I&APs (which includes key stakeholders and landowners):

- Registered letters with details on where the Scoping Report is available from, as well as the public review comment period;
- Facsimile notifications with information similar to that in the registered letter described above; and/or
- Email notifications with a letter attachment containing the information described above.

The Scoping Report was made available for public review from 10 July 2018 until 10 August 2018 for a period of 30 days. In order to present the findings of the Scoping Report to the public and to solicit comments on the report, a public meeting was held on the 25th July 2018 at the Bethal Public Library (Danie Nortje Street, Contact: Bettie Jordan on 017 624 3029) from 13h00 to 15h00.

6.3 EIA REPORT AVAILABILITY AND NOTIFICATIONS

Notification regarding the availability of the EIA Reports for public review was given in the following manner to all registered I&APs (which includes key stakeholders and landowners):

- Registered letters with details on where the Scoping Report is available from, as well as the public review comment period;
- Facsimile notifications with information similar to that in the registered letter described above; and/or
- Email notifications with a letter attachment containing the information described above.

The EIA Report will be available for public review **from 14 July 2020 until 17 August 2020** for a period of 30 days. The report will be made available in the following means:

- One (1) hard copy of report will be submitted to the local community representative (i.e. ward councillor) where members of the public can view the report.
- One (1) hard copy of report can be accessed from alternative venue (e.g. entrance to mine).
- Copy of the report to be placed on the EIMS website.

Due to social distancing restriction in place due to the Covid-19 pandemic, no public meeting will be conducted but a copy of the recorded report summary presentation will be placed at the EIMS website on a date to be communicated to I&AP.

6.4 PUBLIC PARTICIPATION REPORT

Comments raised will be addressed in a transparent manner and included in the Public Participation Report (Appendix 3. The main comments to date are with respect to the following:

- I&AP registration,
- Eskom requirements when working within the servitude;
- SAHRA's response to initial notification advising of requirement to create a case on SAHRIS;
- The impact of the project on agriculture; and
- Job availability.

7 ENVIRONMENTAL ATTRIBUTES AND BASELINE ENVIRONMENT

This section of the EIA Report provides a description of the environment that may be affected by the proposed project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area, as well as specialist reports undertaken for the Kalabasfontein Project.

7.1 LOCATION

The Kalabasfontein Project area is situated in Mpumalanga, approximately 20 kilometres north of Bethal. It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively which fall within the Msukaligwa Local Municipality within Gert Sibande District Municipality. The project area comprises two prospecting rights, 1035PR and 1170PR, which covers a total of 1 547.8296ha over portions 7, 8, RE, 11 and 13 of the farm Kalabasfontein 232 IS (refer to Figure 1). The alternative 2 ventilation shaft is to be located on portion 22 of the farm Uitgedacht 229 IS.

Forzando Coal Mines (Pty) Ltd. applied to the DMR for the conversion of Old Order Mining Rights to New Order Mining Rights for its mining operations at the Forzando North Shaft and Forzando South Shaft. These conversions were granted in November 2011 and executed on 28 June 2013. This application is for the extension of the current mining areas (under Section 102 of Act No.28 of 2002) by inclusion of contiguous areas which are held under Prospecting Rights 1035PR & 1170PR. Through an intensive drilling exercise on these areas, economically viable blocks of coal have been defined. The plan is to access these newly defined blocks of coal from the existing Forzando South incline.

7.2 TOPOGRAPHY

The gently undulating highland topography is typical of the central Mpumalanga province, with fairly broad to narrowly incised valleys of headwater drainages. There are a number of marshy areas or vleis in the upper parts of the valleys and numerous pans, which vary from insignificant vegetated depressions to large deeply etched features with bare clayey floors. An ecologically important concentration of pans and freshwater lakes is located in the Chrissiesmeer area.

The municipality is roughly dissected by the (continental) divide between the Upper Vaal and Usuthu / Pongola Water Management Areas. In the north of the Municipality, certain sub-catchments drain into the Olifants and Inkomati WMA's. The headwaters of the Vaal River are found in the western half of the municipality and drain in a south-westerly direction along with the Tweefontein River.

The Usuthu River rises in the northeast of the municipality. The headwaters of the Inkomati River flow northwards from the municipality into the Inkomati WMA, and the headwaters of the Olifants and Klein-Olifants River drain the far northwest of the municipality (refer to Figure 11).

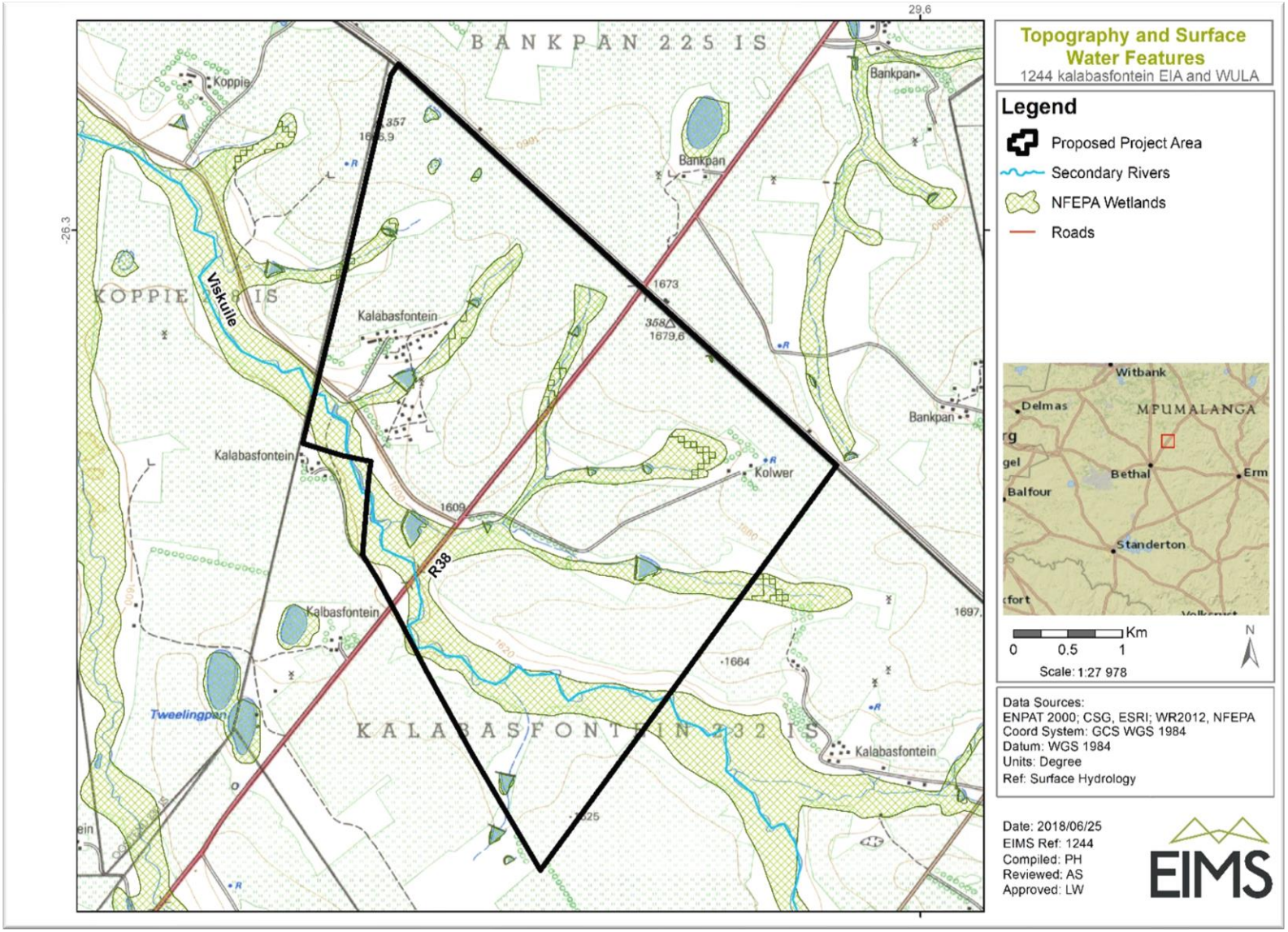


Figure 11: Topography and surface hydrology

7.3 GEOLOGY

The Kalabasfontein Project area extends to the south-east of the Forzando Complex, which is situated in the north-eastern corner of the Highveld Coalfield, where the pre-Karoo Smithfield Ridge separates the area from the Witbank Coalfield to the north (see Figure 12 and Figure 13). To the east, stratigraphic and sedimentological changes mark the transition from the Highveld Coalfield to the Ermelo Coalfield. Basement rock in the area comprise Rooiberg felsites and granites of the Bushveld Lebowa Suits, which are often palaeo-weathered to a depth of several metres.

During the Permo-Carboniferous times, erosion by continental ice-sheets shaped the pre-Karoo palaeo-topography resulting in a glaciated relief consisting of elongated low ridges and shallow valleys that have influenced the depositional patterns of sequences that followed. Noticeably, thickness of the coal seams generally correlates with the original glaciated valleys.

Dwyka Formation is characterized by sediments of glacial origin such as tillites, diamictites and varvites. Vryheid formation comprises a predominantly arenaceous sequence of sandstone and conglomerates with subordinate siltstones and coal seams. Vryheid Formation comprises a series of five upward-coarsening depositional sequences of siltstone and sandstone, each capped by a coal seam or seam package (Forzando Coal Mines (Pty) Ltd. ,2018).

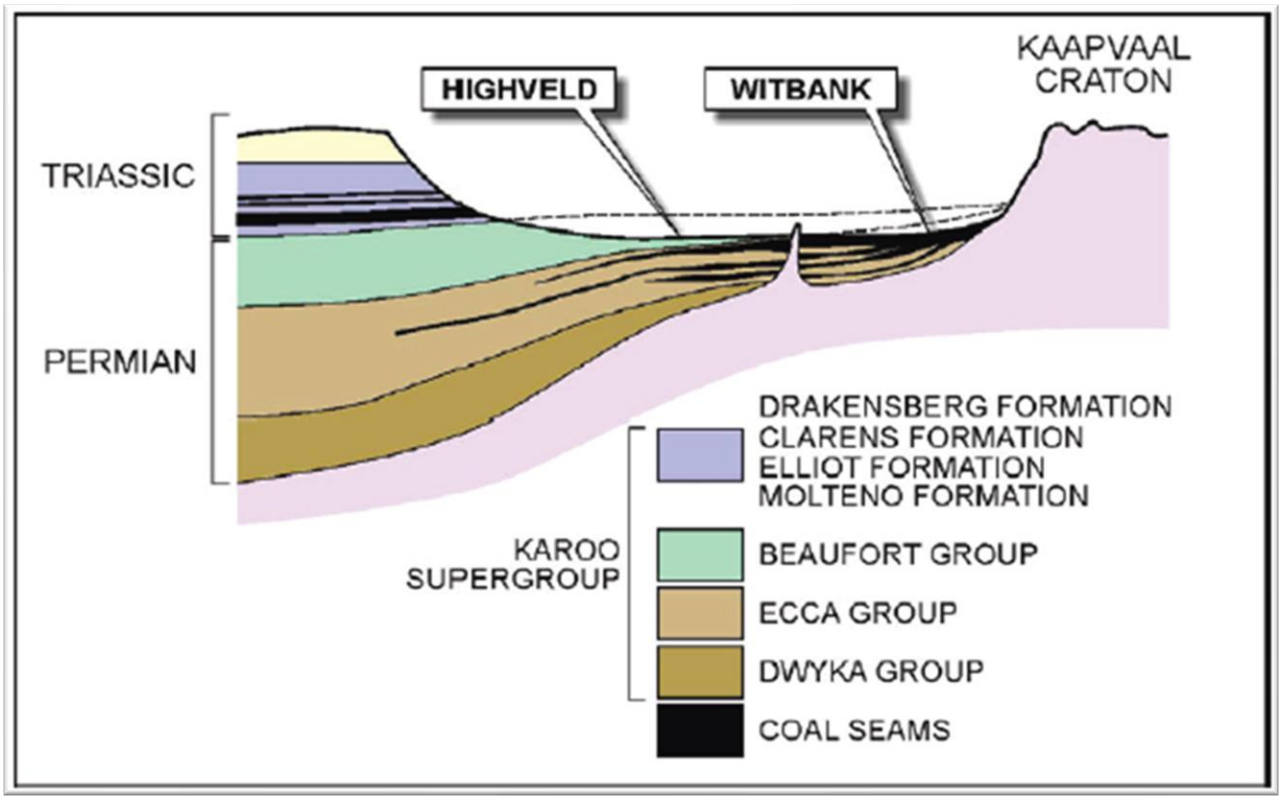


Figure 12: Schematic representation of coal deposition in South Africa

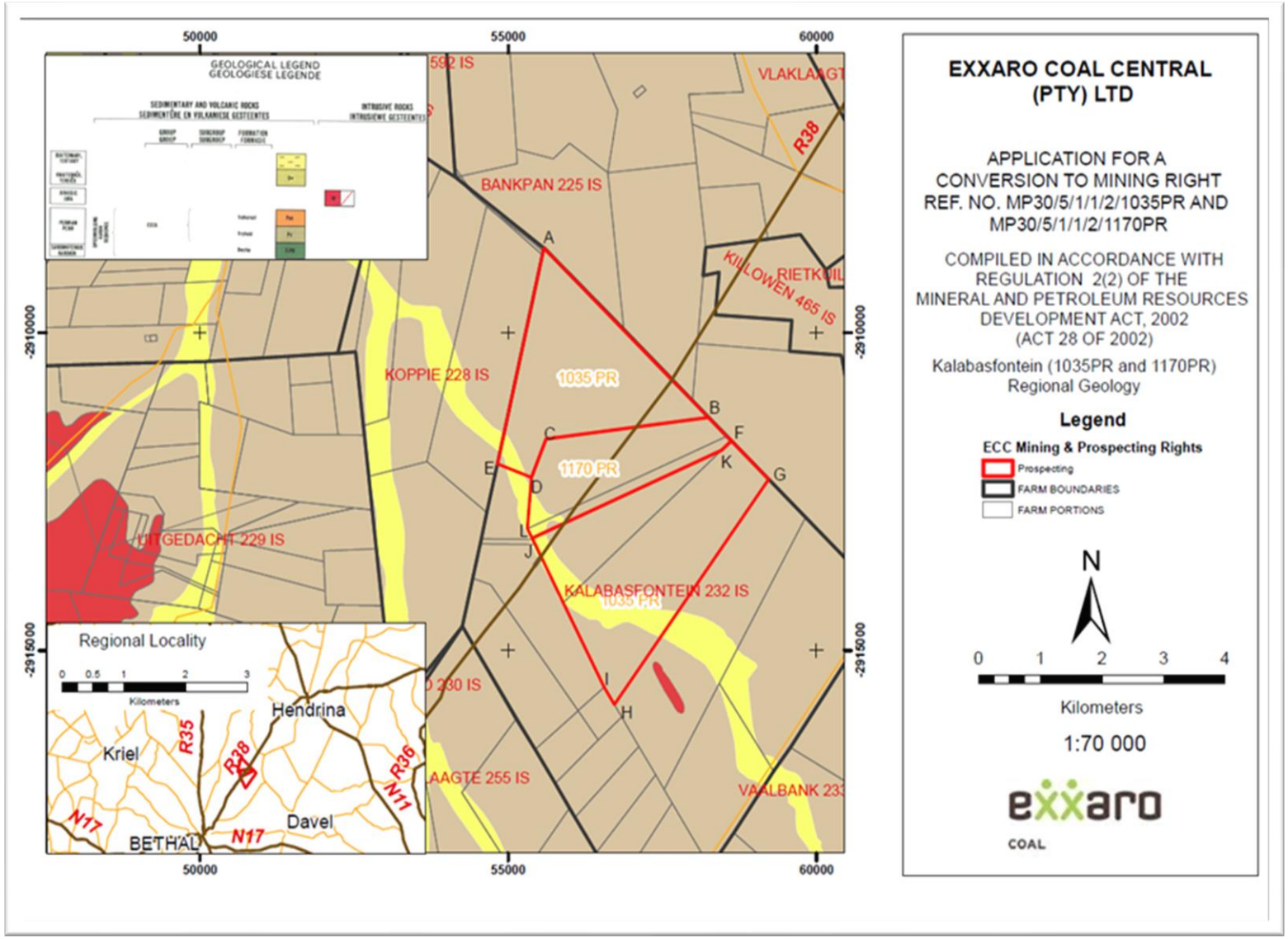
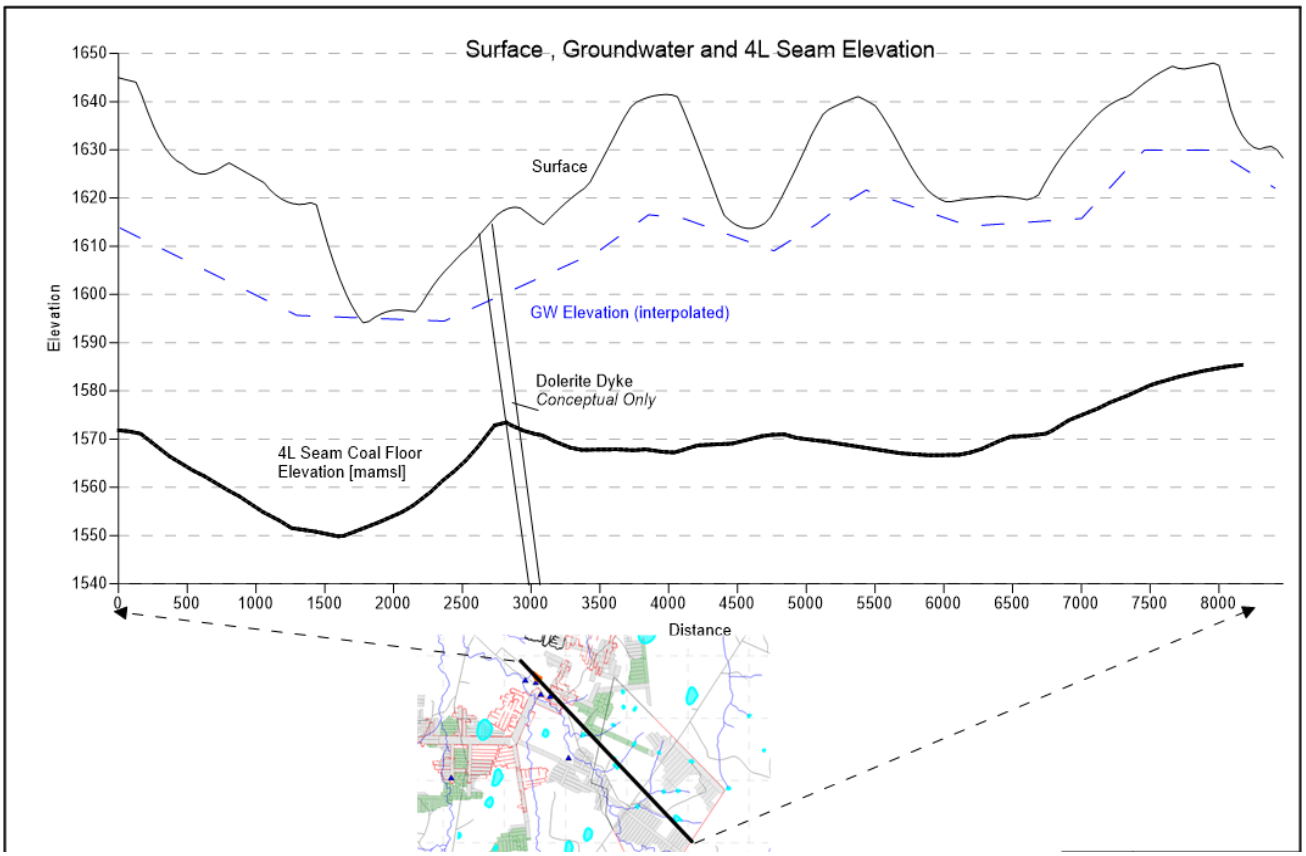


Figure 13: Regional geological map.

7.3.1 GEOLOGICAL CROSS SECTIONS

Cross-section graphs which graphically presenting the 4L coal seam were drawn based on available data and are presented below in Figure 14.

During late Jurassic times the Karoo strata were intruded by transgressive dolerite dykes/sills resulting in the displacement of seams and the de-vitalisation of coal in certain areas. Over the greater part of the area, dolerite sills lie below the coal-bearing sediments, either within the Dwyka or on the basement horizon. The No. 4 lower seam ranges in thickness from 0 to 3 m and is separated in certain areas by a horizontal dolerite sill or siltstone parting.



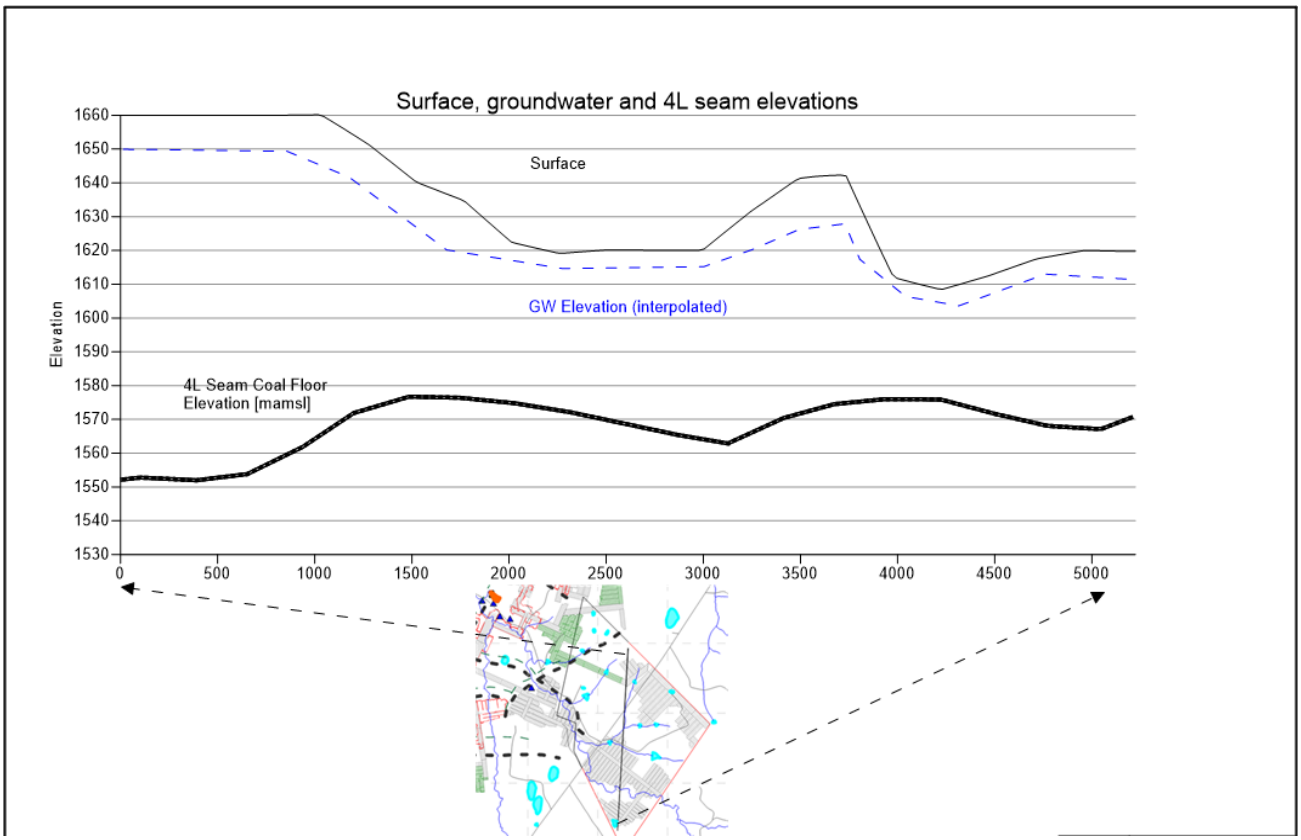


Figure 14: Cross Sections through proposed Kalabasfontein Project area (vertical over exaggerated)

7.3.2 COAL FLOOR CONTOURS

Coal floor contours for the current and future mining of the No. 4 Lower Seam is shown in Figure 15. The data was obtained from Exxaro and interpolated utilising Kriging Interpolation by applying the Surfer contouring software (Surfer ver. 12.8, Golden Software Inc.). The No. 4 lower seam is between 30 m and 60m deep at the Kalabasfontein Project area and dips slightly north-west towards the Forzando South incline adit.

7.3.3 OVERBURDEN THICKNESS

The thickness between the No. 4 lower coal seam and the surface, or overburden thickness, was interpolated and presented in Figure 16. The areas where overburden is less than 30m can be regarded as sensitive zones.

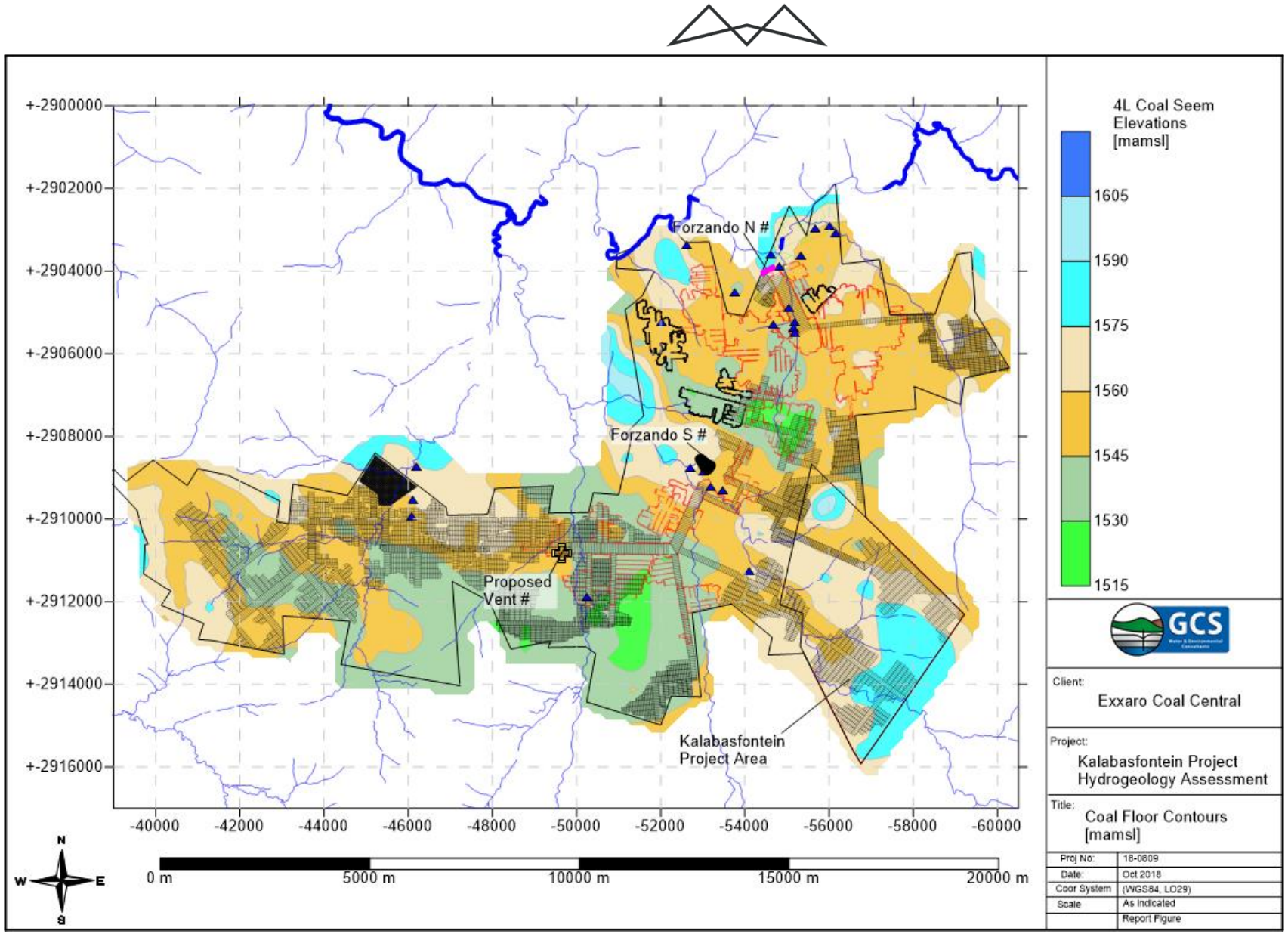


Figure 15: Forzando Coal Floor Contours (Kriging Interpolation)

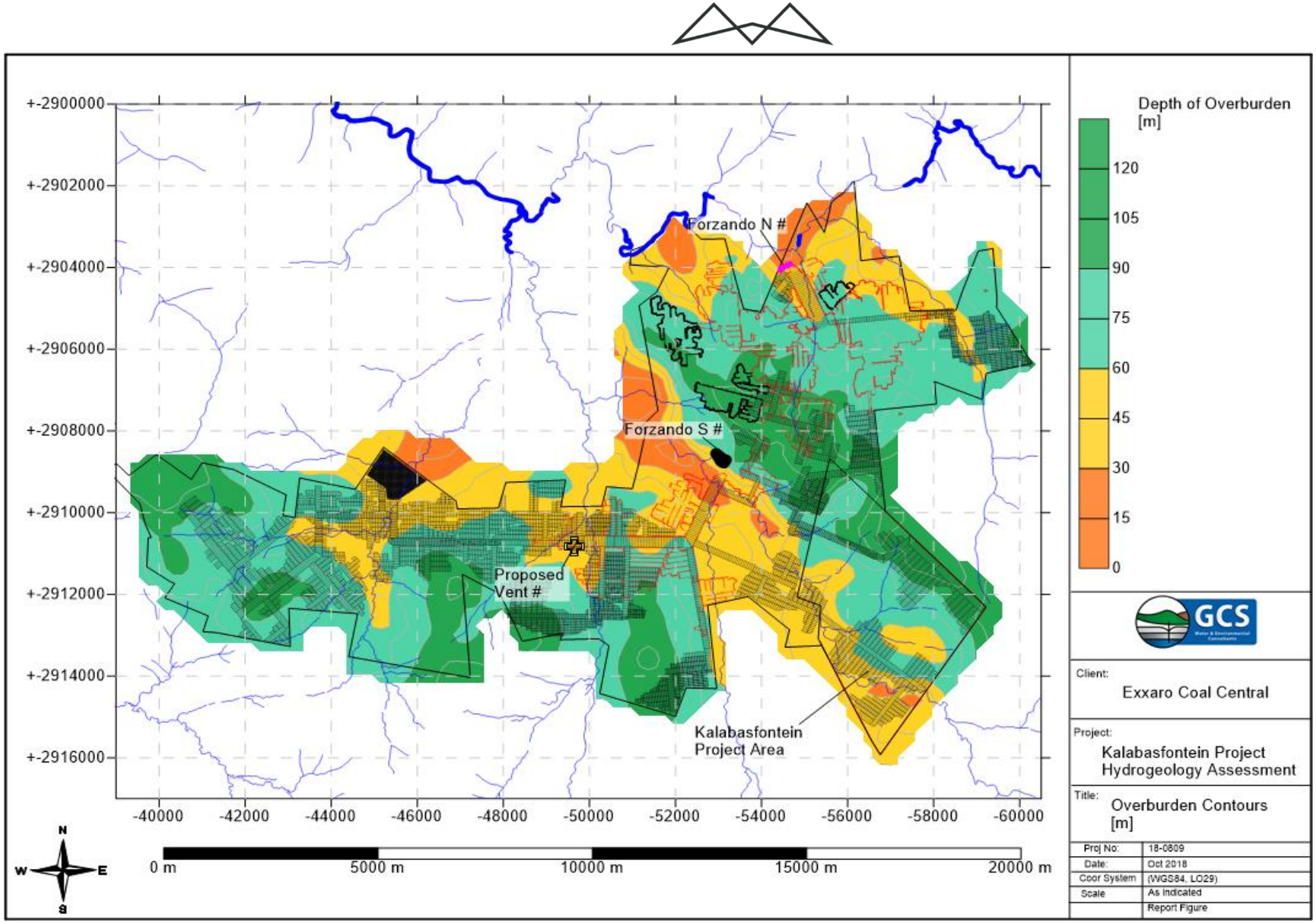


Figure 16: Overburden Thickness Contour Map (Kriging Interpolation)

7.4 GEOTECHNICAL RISK ASSESSMENT

A Geotechnical Risk Assessment for the Kalabasfontein Project was undertaken by the Exxaro Coal Central geotechnical Engineer. A copy of the report is available in Appendix 5.

As per the Geotechnical Risk Assessment, no potential pillar instability is anticipated if the reserves are mined with pillars laid-out on minimum 15.0m x 15.0 m centre and maximum 18.0 m x 18.0 m centre layout with 7.2 m bords. Pillar size variation will be a function of bord width, mining depth and mining height. Pillar sizes generally increase with increasing mining depth, mining height and bord widths. All the pillars were found to have a probability of survival of more than 99.995%, which is recommended for the highly sensitive surface structures. This, therefore, implies a probability of failure of < 0.005%. Pillar life index calculation shows that all pillars will have a life index of at least 11 046 years before a 50% probability of failure is reached. This is far more than the recommended 2000 years for highly sensitive structures.

A maximum caving height of 14.0 m was calculated for all areas should roof failure occur. No sinkhole is, therefore, expected in the reserve area as the maximum caving height does not progress to / intersect the weathered zone in any of the boreholes. Cognisance must also be given to the fact that the overburden is comprised of at least 39% competent sandstone layers. Competent means any lithological units with a thickness of at least 1.0 m and a composition of at least 80% sandstone. A minimum sandstone thickness of 15 m in the overburden was found during the investigation. This layer has an unsupported stable span of at least 20 m when jointed and 49 m when unjointed. Thus, pillar failure must occur before the overburden can fail. This means that sinkhole hole probabilities are low in the area.

The magnitude of maximum subsidence in a bord and pillar layout is dependent on the unlikely event that panel's pillar system fails. Cognisance must be taken to the fact that the calculated pillar life index and probability of survival are far greater than the recommended minimums, indicating a stable pillar system. The investigation shows that a Class C, D and E subsidence profile will occur in the area in the unlikely event that pillar fails. The subsidence profile will have the following characteristics:

- Class C: Noticeable in flat terrain, smooth, cracks 2 to 10 cm wide, compression ridges 1 to 5 cm high;
- Class D: Noticeable in most terrains, visible vertical displacements across cracks, cracks 10 to 50 cm wide, compression ridges 5 to 50 cm high; and
- Class E: Severe profile, almost vertical sides, racks wider than 50 cm, compression ridges higher than 50 cm.

Class D and E subsidence will largely be constrained to distal southern and western portion of the reserve area.

7.5 CLIMATE

The study area is situated within the eastern portion of the Mpumalanga Highveld. Climatic features of this area can be summarised as follows:

- Cool to warm, temperate climate; cold winters with frost for an average of 120 days per annum;
- Temperatures ranging from 17 to 27° C on average in summer and from 0 to 13° C on average in winter;
- Winds tend to be light, north easterly and south westerly;
- The mean annual precipitation for the area is between 600mm and 700mm;
- The site has an annual potential evaporation of 1964mm.

7.6 SOCIO-ECONOMIC

The following section provides a summary of the social and economic environment that may be influenced by the proposed project. Information in this section was sourced from Stats SA and the Integrated Development Plans (IDP's) for the Msukaligwa Local Municipality as well as the Gert Sibande District Municipality. The information provided in the IDP's and the Stats SA website are based on a 2011 National census and well as the 2016 Community Survey[2].

[2] It is acknowledged that this data may be outdated as no more recent census has been undertaken (Stats SA) and in addition, the municipal IDP 2017-2022 is still in draft mode and may be updated after review.

According to the National Environmental Management Act (NEMA, 1998) environment refers to the surroundings in which humans exist. When viewing the environment from a socio-economic perspective the question can be asked what exactly the social environment is. Different definitions for social environment exist, but a clear and comprehensive definition that is widely accepted remains elusive. Barnett and Casper (2001) offers the following definition of human social environment:

> *"Human social environments encompass the immediate physical surroundings, social relationships, and cultural milieus within which defined groups of people function and interact. Components of the social environment include built infrastructure; industrial and occupational structure; labour markets; social and economic processes; wealth; social, human, and health services; power relations; government; race relations; social inequality; cultural practices; the arts; religious institutions and practices; and beliefs about place and community. The social environment subsumes many aspects of the physical environment, given that contemporary landscapes, water resources, and other natural resources have been at least partially configured by human social processes. Embedded within contemporary social environments are historical social and power relations that have become institutionalized over time. Social environments can be experienced at multiple scales, often simultaneously, including households, kin networks, neighbourhoods, towns and cities, and regions. Social environments are dynamic and change over time as the result of both internal and external forces. There are relationships of dependency among the social environments of different local areas, because these areas are connected through larger regional, national, and international social and economic processes and power relations."*

The environment influences and constrains behaviour, but behaviour also leads to changes in the environment. The impacts of a project on people can only be truly understood if their environmental context is understood. The baseline description of the social environment will include a description of the area within a provincial, district and local context that will focus on the identity and history of the area as well as a description of the population of the area based on a number of demographic, social and economic variables. Table 14, presents a summary of the socio-economic aspects which may have a bearing on the proposed project.

Table 14: Summary of the socio-economic aspects Msukaligwa Local Municipality, 2017

Aspect	Local Municipality
District Municipality	Gert Sibande District Municipality
Province	Mpumalanga Province
Municipal Area Size	6016 km^2
Number of Wards	19 wards
Population Size	164 608
Number of households	51 809
Estimated growth/change in population size from 2001	~31.9%
Population composition	Black African (91.7%), White (6.7%), Coloured (0.6%), Indian or Asian (0.9%)
Languages	Main languages spoken are isiZulu, Afrikaans, SiSwati and English
Age	Age group 0 – 14 comprising 28% of the total population and 15 – 34 comprising of 41%, while 26% is between 35 and 64 years and 5% is 65 years and above

<table>
<tr><th>Aspect</th><th>Local Municipality</th></tr>
<tr><td>Gender</td><td>50.39% female, 49.61% male</td></tr>
<tr><td>Education</td><td>
<table>
<tr><td>Education Indicators</td><td>2001</td><td>2011</td></tr>
<tr><td>Number of people 15+ with no schooling</td><td>18 125</td><td>12 213</td></tr>
<tr><td>% Population 15+ with no schooling</td><td>21.7%</td><td>8.2%</td></tr>
<tr><td>% Population 15+ with matric and post matric qualification (%)</td><td>20.5%</td><td>23.6%</td></tr>
<tr><td>% Functional Literacy rate (%)</td><td>58.1%</td><td>51.4%</td></tr>
</table>
</td></tr>
<tr><td>Land use</td><td></td></tr>
<tr><td>Housing</td><td>The predominant settlement type is a house or brick structure on a separate stand, followed by traditional dwelling/hut structure, flats, townhouse, backyard room or hose then informal settlements. Overall, it is estimated that the housing is 75% formal and 26% informal dwelling type.</td></tr>
<tr><td>Urban development</td><td>According to the SDF as well as previous plans of the municipality, the area South to South West of Ermelo town between and along the N11 and R36 roads is a land earmarked for future urban development. Also East of Ermelo town along the N2 Piet Retief Road the area is earmarked for urban housing development.

Currently there are number of vacant stands for residential and business development besides the proposed land for future development.

Wesselton as a dormitory township for Ermelo, there is also land earmarked for future urban development bounded by N11, Hendrina Road on the West. The said land is owned the municipality and a portion further to the East of this land is privately owned.</td></tr>
<tr><td>Energy</td><td>By February 2017, nearly seven million households had been connected to the grid and now have electricity. The successful execution of Eskom’s Build and Maintenance programmes helped to ensure stability and an end to load-shedding. Work is continuing to ensure energy security. Renewable energy forms an important part of the energy mix, which also includes electricity generation from gas, nuclear, solar, wind, hydro and coal. Government is committed to the overall Independent Power Producer Programme and is expanding the programme to other sources of energy, including coal and gas, in addition to renewable energy. Eskom will sign the outstanding power purchase agreements for renewable energy in line with the procured rounds.</td></tr>
<tr><td>Access to water</td><td>The municipality had over the past years through the District and in partnership with relevant spheres of government strived to meet the millennium target in ensuring access to water for all by 2015. In striving to achieve this target, the municipality has managed to reduce the water backlog to 9%. Though the 9% reflect as a backlog, these affect communities at the farms/rural areas of the municipality where water has been provided through boreholes but below the RDP level. Provision of clean drinking water (potable water) is almost addressed with few challenges more especially at rural / farmlands within the municipality. In providing Water, the Municipality shall ensure that water is provided to schools, clinics and all other social amenities. It is therefore ensured that prior to approval of construction of clinics and schools there is water provided to such amenities more especially ensuring that farm schools have water where the farm owners cannot provide. The municipality is a water services authority and therefore responsible for supply of water within its area of jurisdiction.</td></tr>
<tr><td>Nearby towns</td><td>Breyton, Camden, Davel, Wesselton, Ermelo, Phumula, KwaZanele</td></tr>
</table>

Aspect	Local Municipality
Percentage employment	41,698 in 2011
Percentage unemployment	Unemployment rate stood at 26.8% in 2011 which has decreased by 4.4% to 22.4% in 2016
Largest Employing sector	Agriculture
Largest economic contribution	Transport
Tourism	Government has identified tourism as a key job driver. Tourist arrival numbers for January to November 2016 increased to nine million, an increase of just over a million arrivals from 2015. This represents a 13% growth in tourist arrivals

7.7 CULTURAL AND HERITAGE RESOURCES

PGS Heritage (Pty) Ltd. conducted a controlled surface survey on foot and vehicle over a period of one day in order to identify cultural and heritage resources located within the Kalabasfontein Project area. The fieldwork was conducted on the 4th October 2018 and 17th of July 2019.

Previous studies conducted in the area around Bethal have shown that the archaeological record is temporally confined to the Iron Age. During the field assessment, a total of 10 heritage sites were located. These include four burial grounds (KAL002, KAL003, KAL008, KAL010) and six historical sites (KAL001, KAL004, KAL005, KAL006, KAL007 and KAL009). Refer to Figure 17 for the locality of heritage resources in relation to the proposed development area and Appendix 6 for details of the heritage resources.

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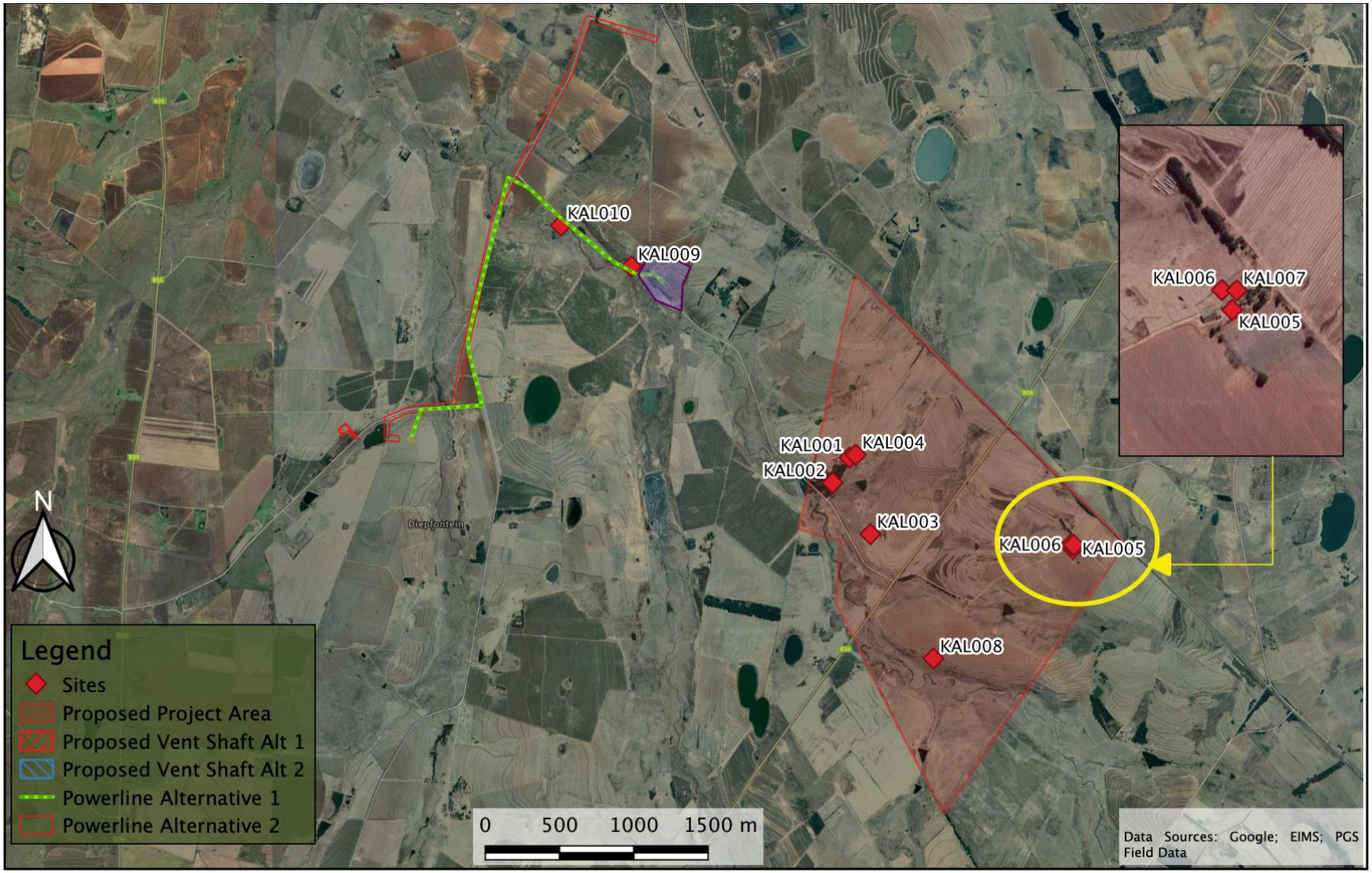

Figure 17: Heritage sites identified during field survey.

7.8 PALAEONTOLOGICAL RESOURCES

A desktop study was conducted by Banzai Environmental, who was sub-contracted by PGS Heritage, to evaluate the possible risk to palaeontological heritage (this includes fossils as well as trace fossils) in the proposed development area. A copy of the report is available in Appendix 7 of this EIAR.

The potentially fossiliferous rocks present within the development are established from 1:250 000 geological maps. The topography of the development is identified by 1:50 000 topography maps and Google Earth Images. Previous palaeontological impact studies in the same region, the PalaeoMap from the South African Heritage Resources Information System (SAHRIS); and databases of various institutions that identify fossils found in close proximity to the development, is used to identify the fossil heritage within each rock.

The palaeontological status of each rock component in the development area is calculated and the possible impact of the development on fossil heritage is determined by:

- The palaeontological importance of the rocks;
- The scale and type of development; and
- The quantity of bedrock removed.

The Kalabasfontein Mining Project is completely underlain by sedimentary rocks of the Permian aged Vryheid Formation, Ecca Group, Karoo Supergroup (Figure 18). This Formation is known to contain a rich assemblage of plant fossils and thus coal can be mined. The Vryheid formation has a very high palaeontological sensitivity.

The Vryheid Formation (Ecca Group) is world renowned for the occurrence of coal beds formed by the accumulation of plant material over long periods of time. Bamford (2011) described numerous plant fossils from this formation (e.g. *Azaniodendron fertile*, *Cyclodendron leslii, Sphenophyllum hammanskraalensis, Annularia sp., Raniganjia sp., Asterotheca spp., Liknopetalon enigmata, Hirsutum* sp., *Scutum* sp., *Ottokaria* sp., *Estcourtia* sp., *Arberia* sp., *Lidgetonnia* sp., *Noeggerathiopsis* sp., *Podocarpidites* sp., as well as more than 20 Glossopteris species.

Only a small amount of data has been published on these potentially fossiliferous deposits and that most likely good material are present around coal mines and in other areas the exposures are poor and of little interest. When plant fossils do occur, they are usually abundant (Bamford, 2011). According to Bamford (2011), it is not feasible to preserve all the sites, but in the interests of science these sites ought to be well documented, researched and the collected fossils must be housed in an accredited institution.

The occurrence of fossil insects are rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are abundantly found but the diversity is low. The mesosaurid reptile, *Mesosaurus* has been found in the southern parts of the basin but may also be present in other areas of the Vryheid formation. Regardless of the rare and irregular occurrence of fossils in this biozone a single fossil may be of scientific importance as many fossil taxa are known from a single fossil.

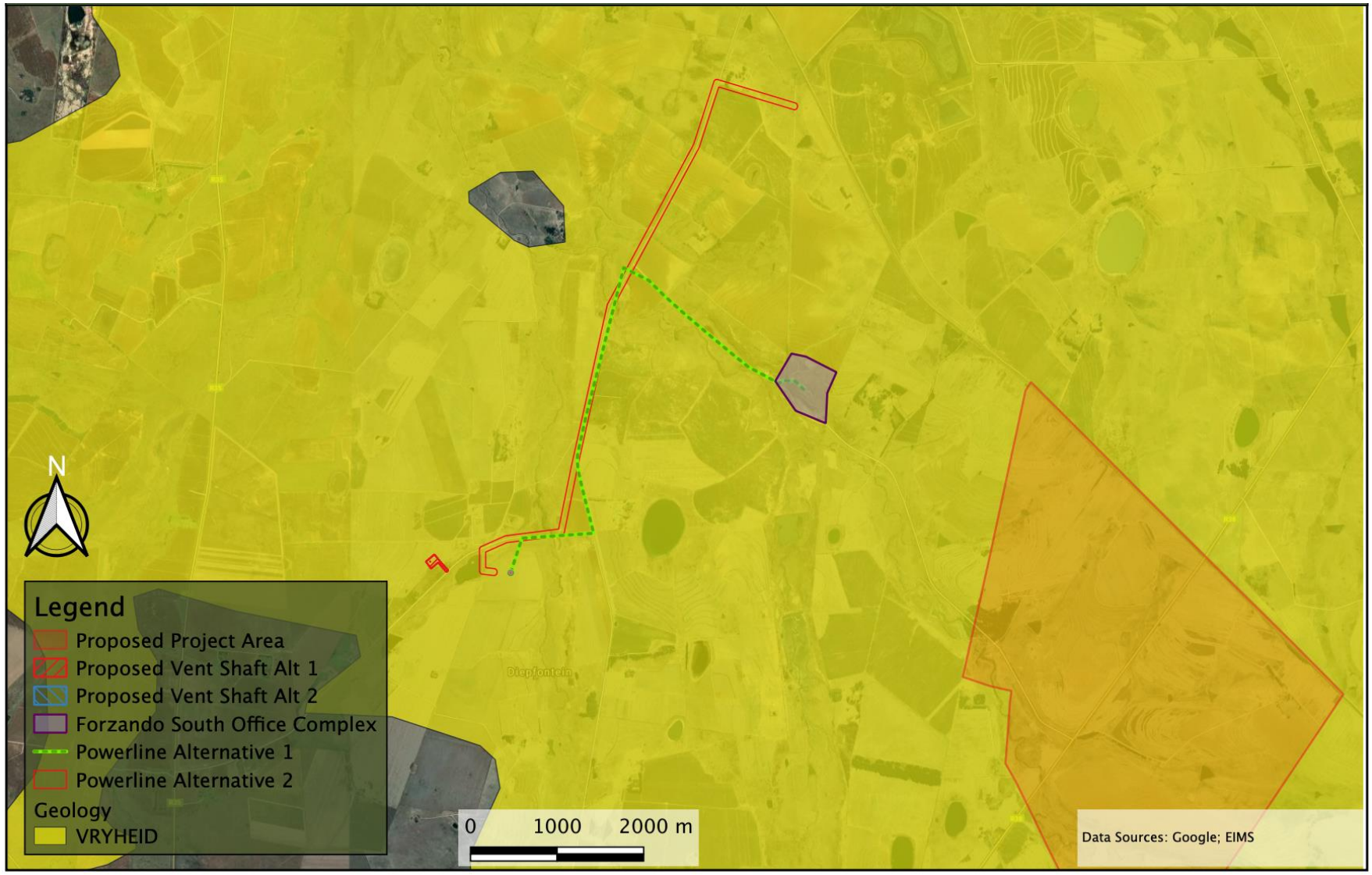

Figure 18: Surface geology of the proposed Kalabasfontein Project. The proposed development is entirely underlain by the Vryheid Formation (Ecca Group, Karoo Supergroup)

7.9 SOILS AND AGRICULTURAL POTENTIAL

7.9.1 SOILS

According to Mucina and Rutherford (2006), the geology and soils aspect of the Gm 12 vegetation type is characterised by red to yellow sandy soils of the Ba and Bb land type. The geology of this region includes sandstone and shale of the Madzaringwe Formations (Karoo Supergroup).

According to the land type database (Land Type Survey Staff, 1972 - 2006) the project falls within the Bb 4 land type, which consists of plinthic catena. Upland duplex and margalitic soils are rare and dystrophic and/or mesotrophic red soils are not widespread.

The Biodiversity Company (TBC) conducted an Agricultural Potential Study (refer to Appendix 8), which included an assessment of the land capability of the soils within the Kalabasfontein Project area. The agricultural assessment was conducted using the Provincial and National Departments of Agriculture recommendations. Various soil forms were identified during the filed study conducted by TBC . These soil forms have been delineated and are described in Table 15 and illustrated in Figure 19 according to depth, clay percentage, indications of surface crusting, signs of wetness and percentage rock. All of the hydromorphic soils identified have similar properties and depths and have, therefore, been labelled as “hydromorphic soils” rather than individual soil forms. More information about the hydromorphic soils and their properties are discussed in a recent wetland assessment of the project areas (Refer to Section 7.13 and Appendix 12).

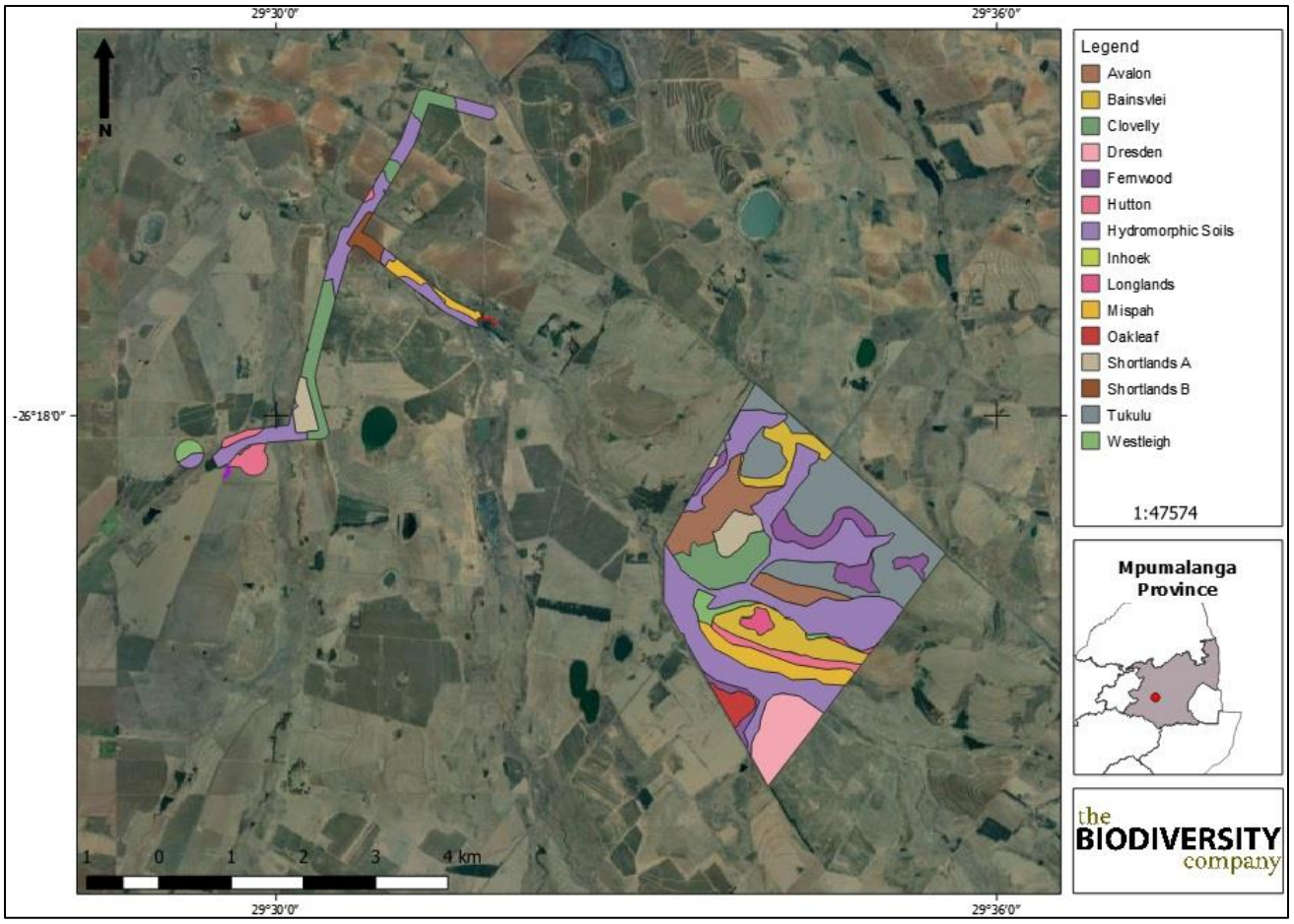

Figure 19: Soil delineations within the Kalabasfontein Project area.

Table 15: Summary of soils identified within the project area

	A-horizon					B-horizon				B-horizon/C-horizon			
	Depth (mm)	**Clay**	**Signs of wetness**	**Rock %**	**Surface crusting**	**Depth (mm)**	**Clay**	**Signs of wetness**	**Rock %**	**Depth (mm)**	**Clay**	**Signs of wetness**	**Rock %**
Dresden	600	0-15	None	0	None								
Mispah	300	0-15	None	0	None								
Westleigh	300	0-15	None	0	None								
Shortlands "A"	200	15-35	None	0	None	900	15-35	None	0	N/A			
Shortlands "B"	200	15-35	None	R3	None	300	15-35	None	0	N/A			
Clovelly	200	0-15	None	0	None	800	0-15	None	0	N/A			
Hutton	200	0-15	None	0	None	800	0-15	None	0	N/A			
Inhoek	200	>35	None	0	None	1000	15-35	None	0	N/A			
Longlands	200	15-35	W3	0	None	400	0-15	None	0	200	15-35	None	0
Hydromorphic soils	200	15-35	W3	0	None	300	0-15	None	0	400	>35	None	0
Tukulu	200	0-15	0	0	None	700	0-15	None	0	200	15-35	W1	R1
Fernwood	200	0-15	0	0	None	700	0-15	None	0	200	0-15	None	0
Bainsvlei	200	0-15	0	0	None	800	0-15	None	0	200	15-35	W1	R1
Avalon	200	0-15	0	0	None	800	0-15	None	0	200	15-35	W1	R1
Oakleaf	200	0-15	0	0	None	700	0-15	None	0	200	0-15	None	0

7.9.2 AGRICULTURAL POTENTIAL

Agricultural potential is determined by a combination of soil, terrain and climate features. Land capability classes reflect the most intensive long-term use of land under rain-fed conditions. The land capability is determined by the physical features of the landscape including the soils present. The land potential or agricultural potential is determined by combining the land capability results and the climate capability for the region.

7.9.2.1 CLIMATE CAPABILITY

The climate capability for this region was determined to be C5 classification. The C5 climate capability class has a moderate to severe rating. This climate capability class is characterised by a moderately restricting growing season due to low temperatures, frost and/or moisture stress. Suitable crops are at risk of some yield loss, (Smith, 2006).

7.9.2.2 LAND CAPABILITY

A breakdown of the land capability classes is shown in Table 16. The land capability for the soils of the project area is illustrated in Figure 21. The land capability of Shortlands "B" has been decreased from a Class II to a Class IV due to 20 to 30% rock and that the hydromorphic soils have been degraded to a Class V due to wetlands indicators within 200 mm from the surface.

Although soils in large parts of the area are not ideally suited to arable agriculture, the portion of land that falls in the project area is classified as arable (Figure 21), vast areas are being utilized for dryland crop cultivation (crops such as maize, sunflowers and beans). Apple farming in the area between Breyten and Hendrina is on the increase due to suitable climatic conditions. No significant beneficiation of agricultural produce occurs within the municipality. Improvements on the commercial farms mostly include the farmsteads (farmer's house, yard, barns, etc.) and labourers' compounds. There are no conservation or formal protected areas within the proposed project area and the municipality at large.

Table 16: Land capability for the soils within the project area

Soil Forms	Land Capability Class	Definition of Class	Conservation Need	Use-Suitability	Percentage Within Project Area	Land Capability Group
Inhoek	Class II	Slight limitations, high arable potential and low erosion hazard	Adequate run-off control	Annual cropping with special tillage or ley (25%)	2%	Arable Land
Shortlands "A"	Class III	Moderate limitations with some erosion hazard	Special conservation practice and tillage methods	Rotation of crops and ley (50%)	45%	
Clovelly	Class III					
Hutton	Class III					
Tukulu	Class III					
Fernwood	Class III					
Bainsvlei	Class III					
Avalon	Class III					
Oakleaf	Class III					
Dresden	Class IV	Severe limitations, low arable potential	Intensive conservation practice	Long-term leys (75%)	35%	
Mispah	Class IV					
Westleigh	Class IV					

Soil Forms	Land Capability Class	Definition of Class	Conservation Need	Use-Suitability	Percentage Within Project Area	Land Capability Group
Shortlands "B"	Class IV	and high erosion hazard				
Longlands	Class V	Water course and land with wetness limitations	Protection and control of water table	Improve pasture and afforestation	18%	Grazing
Kroonstad	Class V					

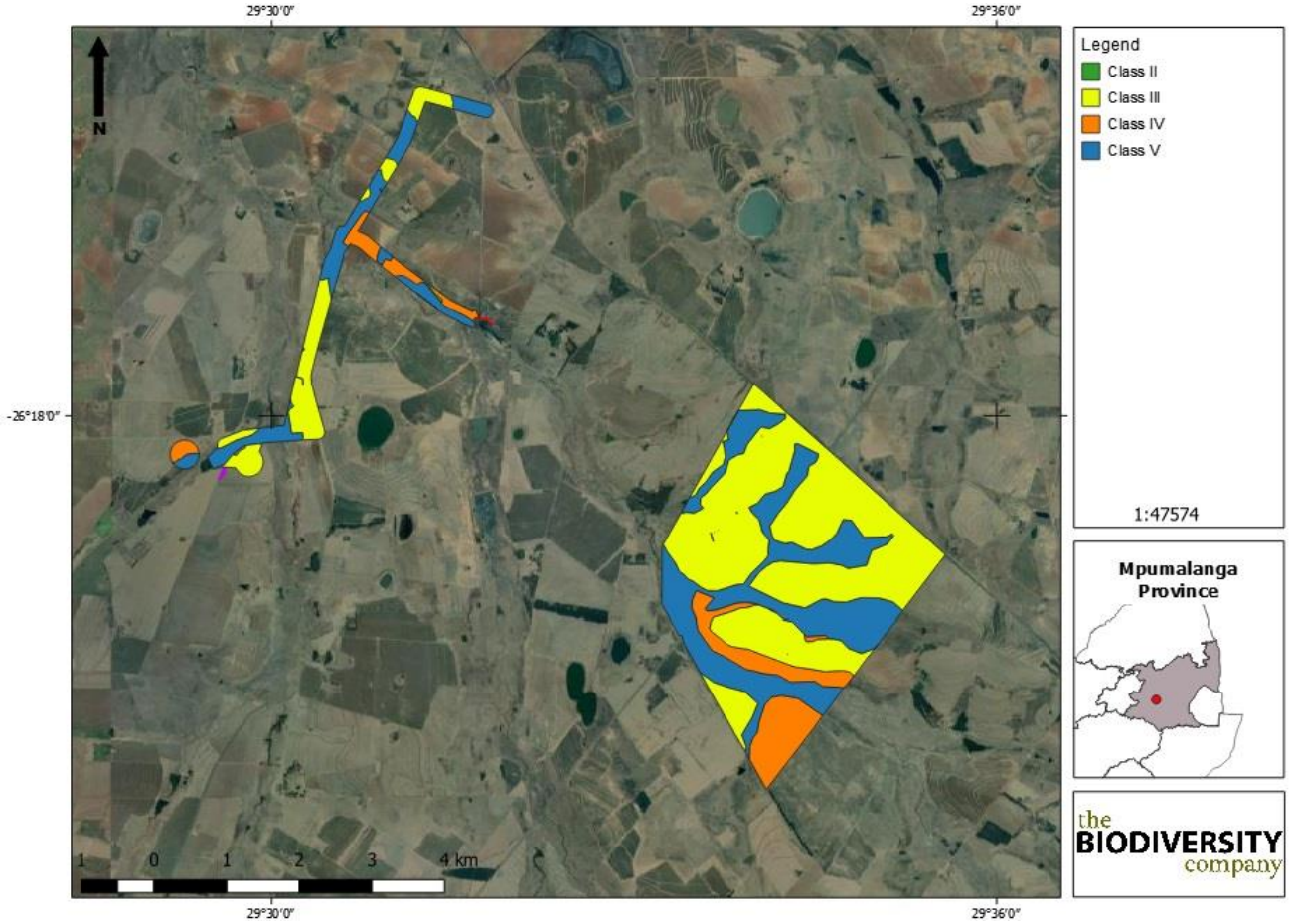

Figure 20: Soil classes for the project area.

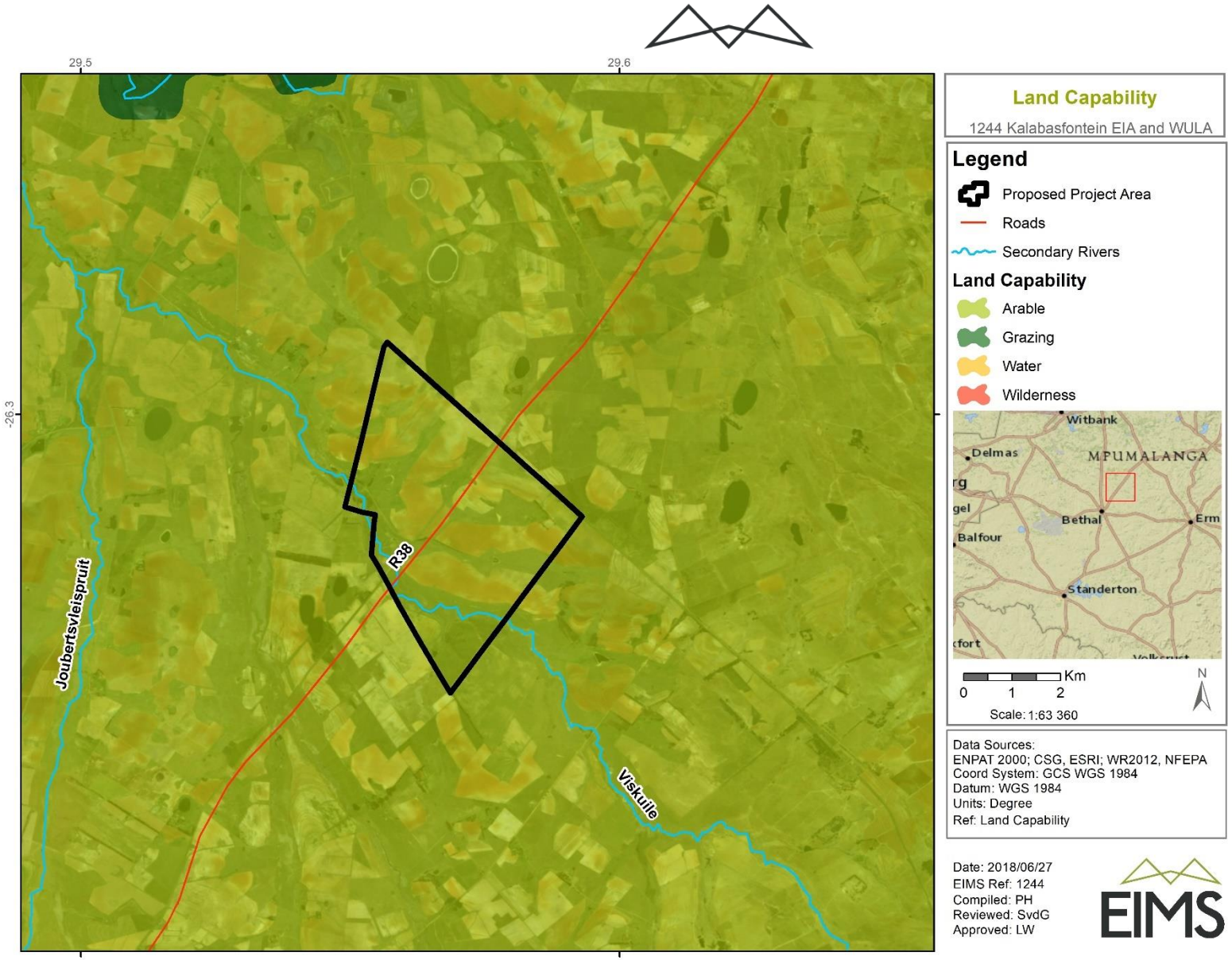

Figure 21: Land capability of the broader project area.

7.9.2.3 LAND POTENTIAL

The land potential of the project area is illustrated in Figure 22 and described in Table 17. Classes II and III have been merged into a land potential of "L3" whereas class IV has been determined to have a land potential of "L4". Lastly, the wetland areas classified as class V have been classified as having a land potential of "Vlei".

Table 17: Land potential for the soils within the project area

Soil Forms	Land Capability Class	Land Potential	Percentage	Description of Land Potential Class
Inhoek	Class II	L3	47%	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperature or rainfall. Appropriate contour protection must be implemented and inspected.
Bonheim	Class II			
Shortlands "A"	Class III			
Clovelly	Class III			
Hutton	Class III			
Tukulu	Class III			
Fernwood	Class III			
Bainsvlei	Class III			
Avalon	Class III			
Oakleaf	Class III			
Dresden	Class IV	L4	35%	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.
Mispah	Class IV			
Westleigh	Class IV			
Shortlands "B"	Class IV			
Longlands	Class V	Vlei	18%	N/A
Kroonstad	Class V			

7.9.3 CURRENT LAND USE

The project area is approximately 1500 ha in size with agriculture taking up approximately 60% of the space, wetlands taking up approximately 35%, natural veld taking up roughly 10% and built-up areas taking up approximately 5% of the project area. Figure 23 below indicates the current land use of the Kalabasfontein Project area.

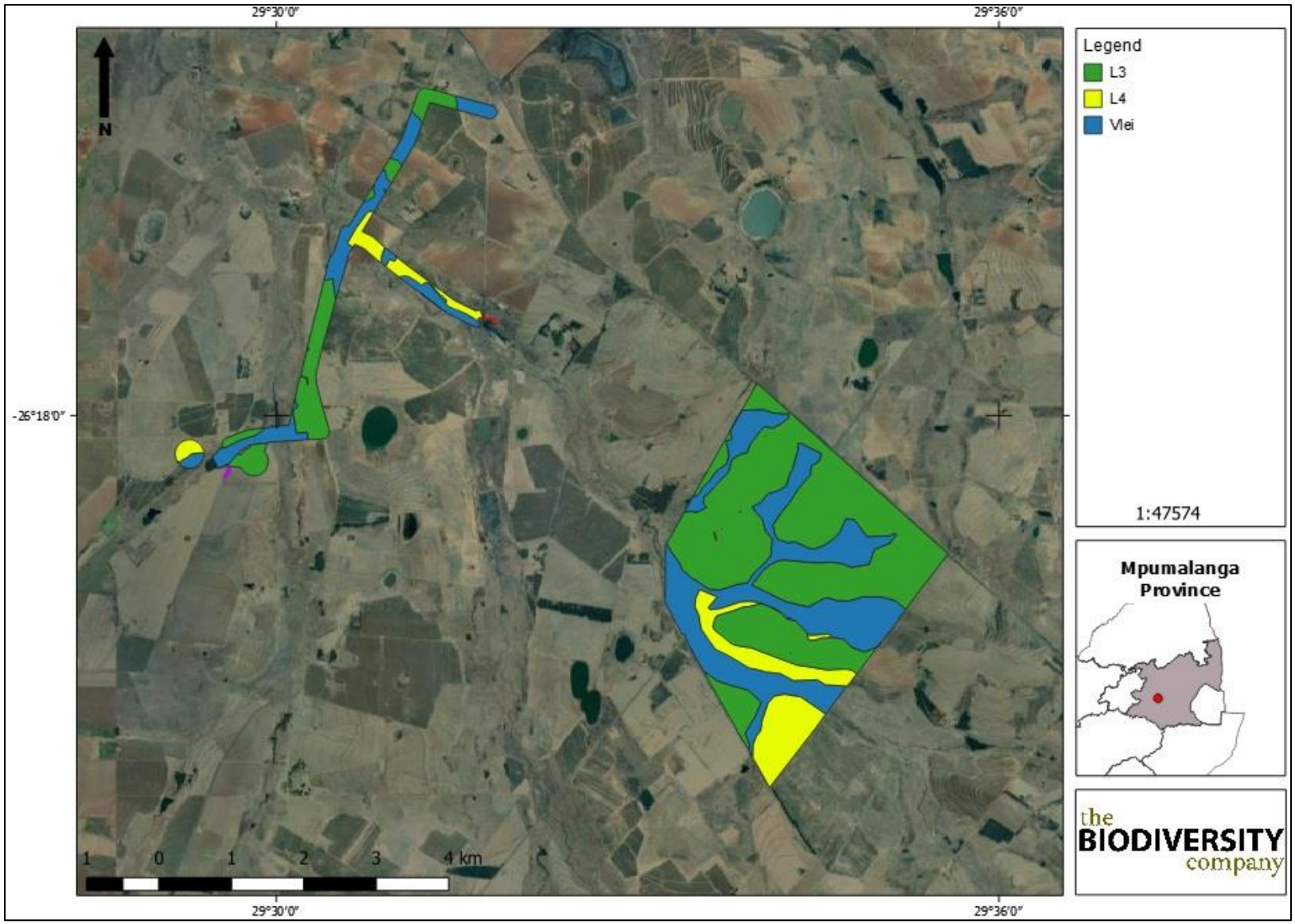

Figure 22: Land potential determined for the project area.

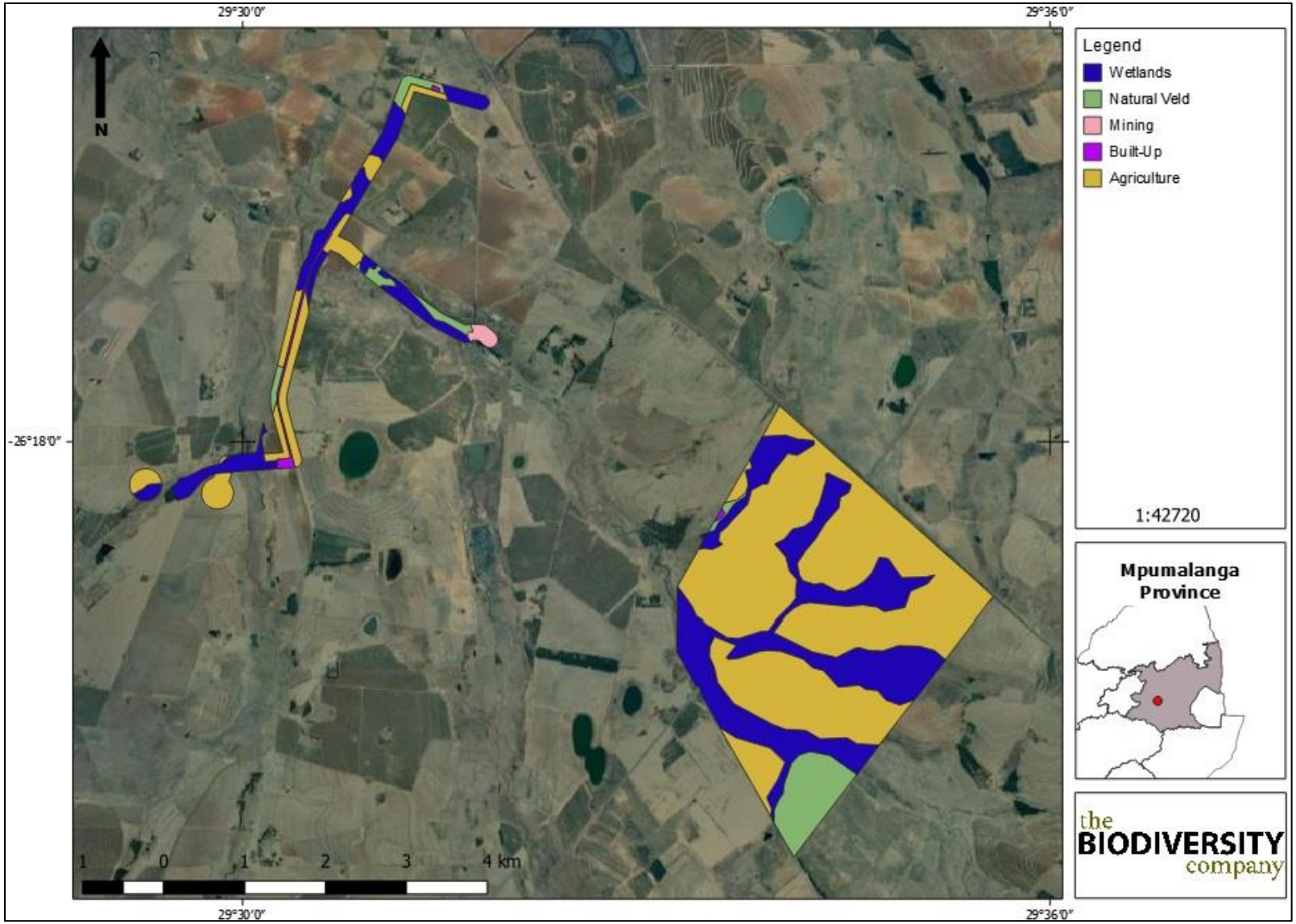

Figure 23: Land use within the Kalabasfontein Project area.

7.10 TERRESTRIAL BIODIVERSITY

The Biodiversity Company conducted a terrestrial biodiversity study. A copy of the report is available in Appendix 9. This included a comprehensive desktop study, in conjunction with surveys. The results from the desktop study and the surveys means that there is a high confidence in the information provided. The surveys which were completed, and the corresponding studies resulted in good site coverage, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts. Below is a summary of the important findings of the terrestrial study.

7.10.1.1 THE MPUMALANGA BIODIVERSITY SECTOR PLAN

The Mpumalanga Biodiversity Sector Plan (MBSP) CBA map delineates Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), Other Natural Areas (ONAs), Protected Areas (PAs), and areas that have been irreversibly modified from their natural state (MTPA, 2014). The MBSP uses the following terms to categorise the various land used types according to their biodiversity and environmental importance:

- Critical Biodiversity Area – Irreplaceable (CBA: Irreplaceable);
- Critical Biodiversity Area – Optimal (CBA: Optimal);
- Ecological Support Area (ESA);
- Other Natural Area (ONA);
- Protected Area (PA); and
- Moderately or Heavily Modified Areas (MMA's or HMA's).

Figure 24 shows the Kalabasfontein Project area superimposed on the MBSP Terrestrial CBA map. Based on this, the proposed mining areas will overlap with the following:

- Critical Biodiversity Areas (CBAs);
- Ecological Support Areas (ESAs);
- Heavily or Moderately Modified Areas (HMAs); and
- Other Natural Areas (ONAs).

Based on this desktop information, much of the project area is identified as either HMAs (Figure 24). However, a continuous and significant CBA exists across north-western and southern portions of the project area. This CBA accounts for approximately 20% of the total survey area.

Both of the proposed ventilation shaft localities are situated in areas that are HMAs or ONAs. The associated powerlines are also situated predominantly within HMAs, however, this proposed infrastructure will also cross habitats which are listed as CBAs and ESAs.

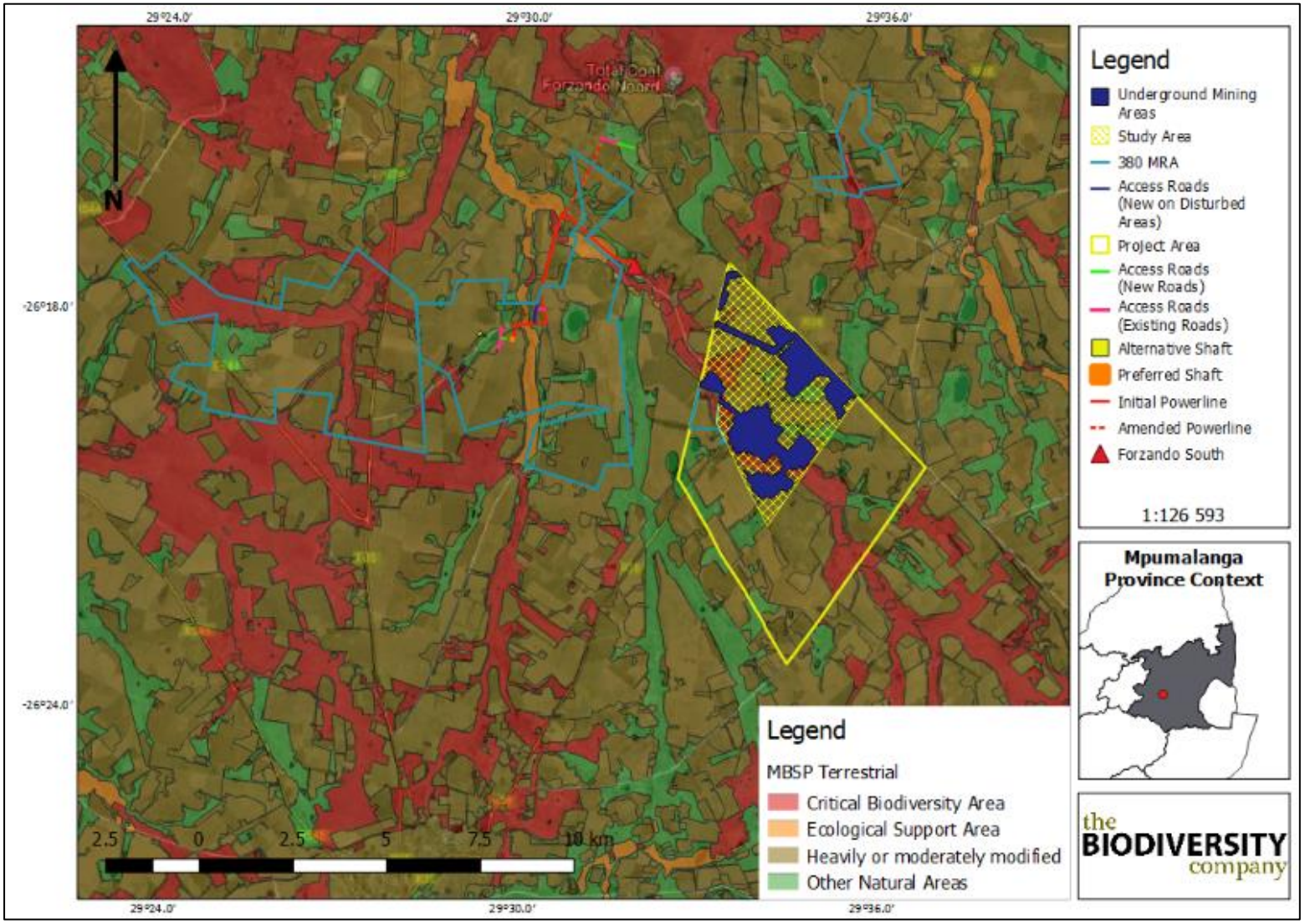

Figure 24: Kalabasfontein Project area superimposed on the MBSP Terrestrial Critical Biodiversity Areas (CBA) map (MBSP, 2014).

7.10.1.2 THE MPUMALANGA PROTECTED AREA EXPANSION STRATEGY IN RELATION TO THE PROJECT AREA

The Mpumalanga Protected Area Expansion Strategy (MPAES, 2013), commissioned by the MTPA, serves to function as a provincial framework for an integrated, co-ordinated and uniform approach in the expansion and consolidation of the Provincial PAS, in line with the requirements of the NPAES.

The priority areas for PA Expansion within Mpumalanga were spatially established based on the premise that the primary goal of these areas is to protect biodiversity targets. Several biodiversity data sources were used for the assessment, namely the: Threatened Ecosystems, MBCP Terrestrial Assessment, MBCP Aquatic Assessment, MBCP Irreplaceability, C-plan Irreplaceability, and the National Spatial Biodiversity Assessment Priority areas. A combination of all these were used, together with the spatial priorities established within the NPAES, to establish the spatial priority areas that will guide the MPAES over the next 20 years as reflected below (Figure 25).

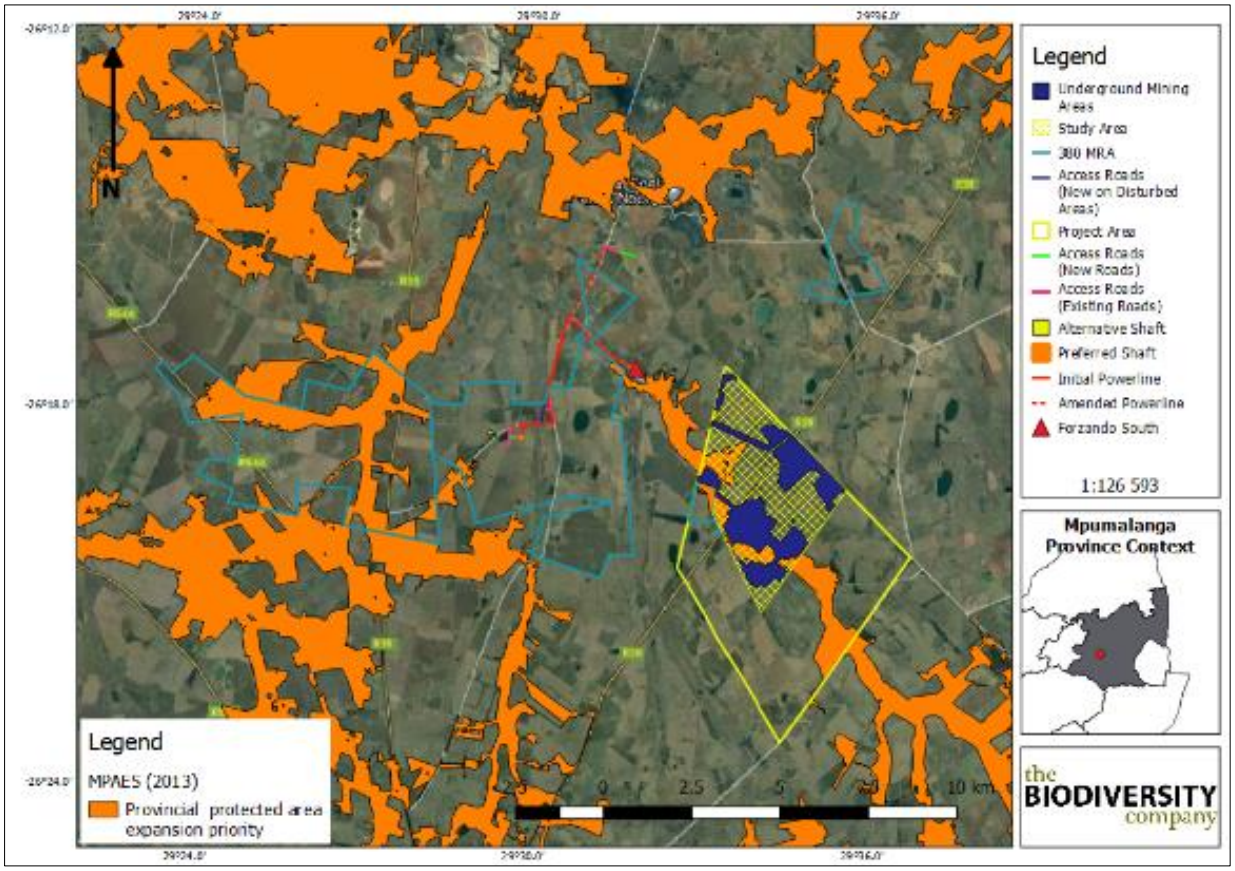

Figure 25: The project area in relation to the MPAES (MPAES, 2009)

7.10.1.3 PROJECT AREA IN RELATION TO THE NBA

The purpose of the NBA is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA is central to fulfilling SANBI's mandate to monitor and report regularly on the status of the country's biodiversity, in terms of the National Environmental Management: Biodiversity Act (NEMBA, Act 10 of 2004). The NBA endeavours to capture the challenges and opportunities embedded in South Africa's rich natural heritage by looking at biodiversity in the context of social and economic change and recognising the relationship between people and their environment. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level (Driver *et al*., 2012).

7.10.1.3.1 ECOSYSTEM THREAT STATUS

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver *et al*., 2011).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver *et al.,* 2011).

The project area was superimposed on the terrestrial ecosystem threat status (Figure 26). As seen in Figure 26 the infrastructure development portions, as well as the overall project area, overlap entirely with ecosystems that are listed as Vulnerable (VU).

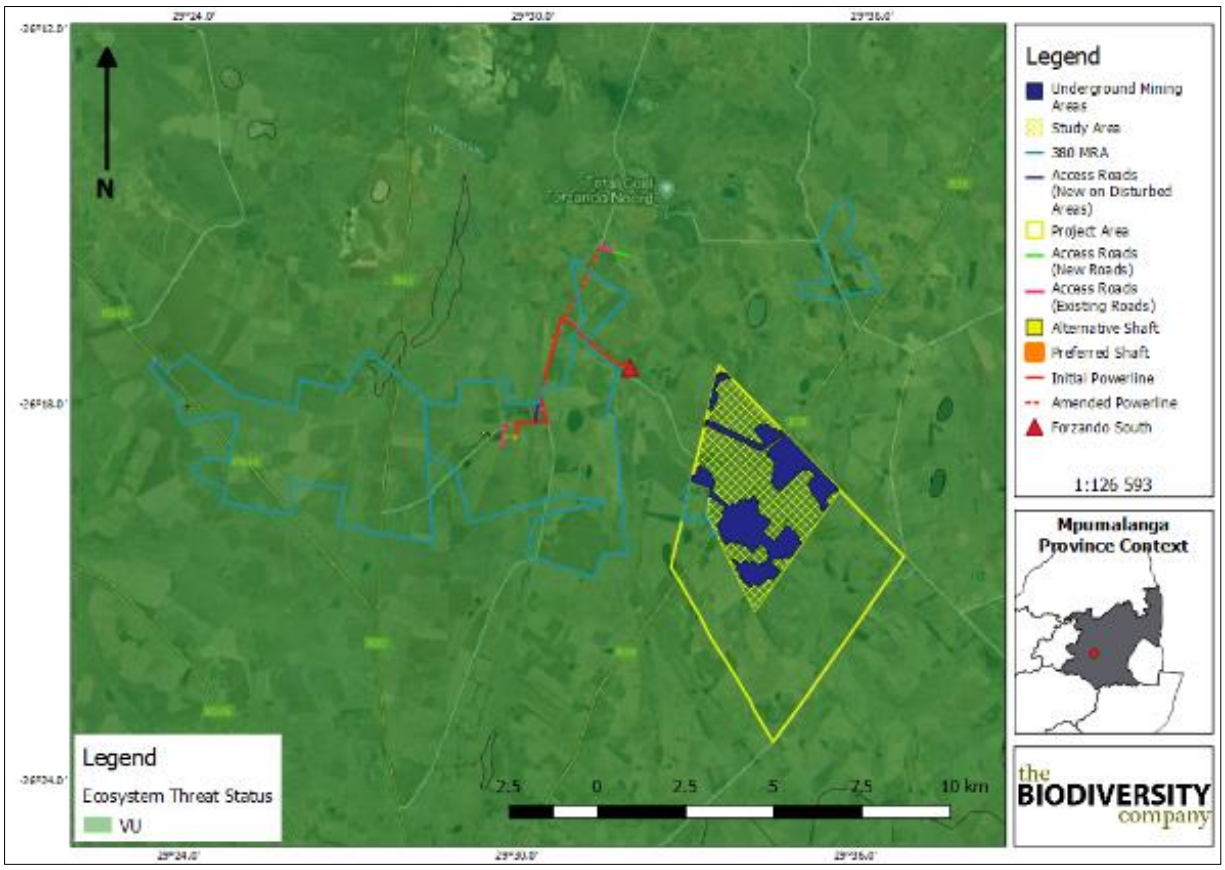

Figure 26: Kalabasfontein Project area showing the ecosystem threat status of the associated terrestrial ecosystems (NBA, 2012).

7.10.1.3.2 ECOSYSTEM PROTECTION LEVEL

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Driver at al., 2012).

The Kalabasfontein Project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 27). Based on this the majority of the terrestrial ecosystems associated with the development are rated as *not protected.* Areas that are designated as *not protected* are ecosystems that are not adequately protected in formally protected areas, such as national parks.

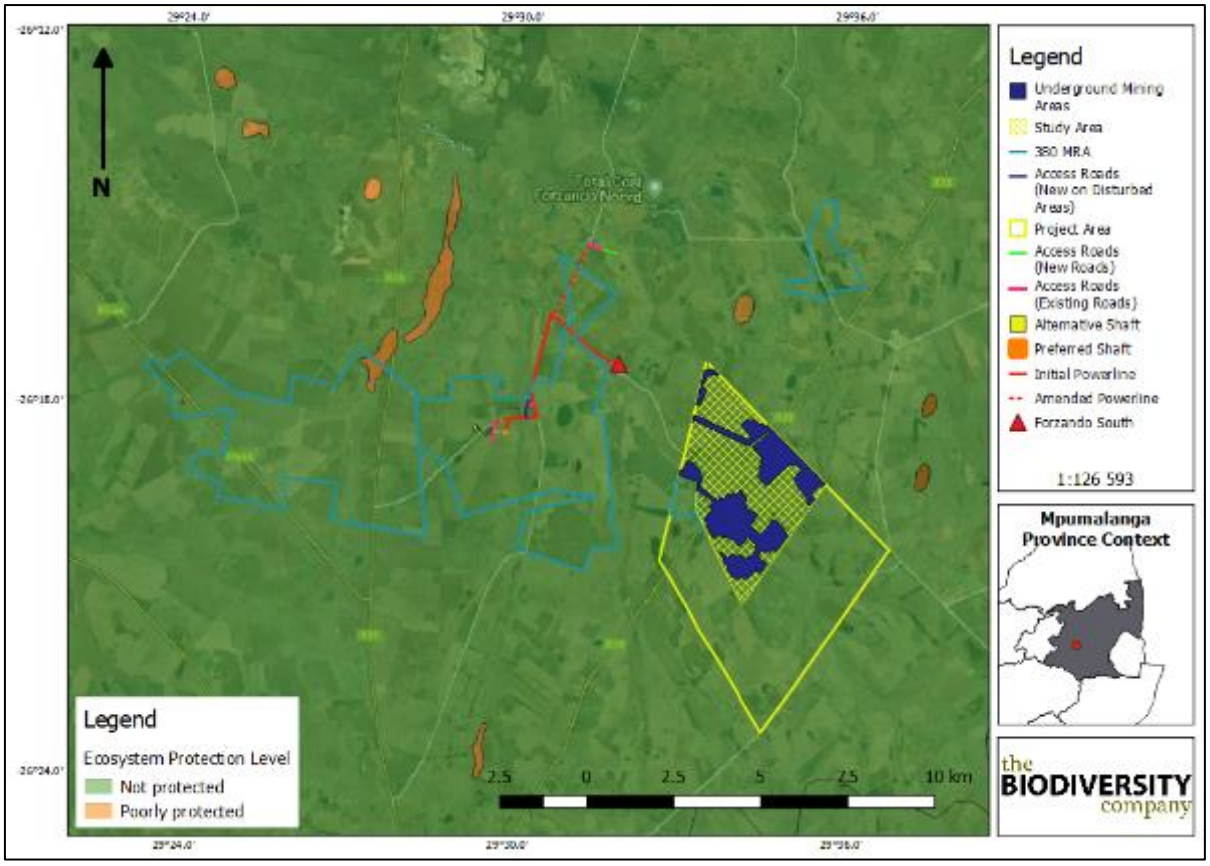

Figure 27: The Kalabasfontein Project area showing the level of protection of terrestrial ecosystems (NBA, 2012)

7.10.1.4 PROJECT AREA IN RELATION TO PROTECTED AREAS

Figure 28 shows the location of formally protected areas in relation to the Kalabasfontein Project area. Formally protected areas refer to areas protected either by national or provincial legislation.

Based on the SANBI (2010) Protected Areas Map and the National Protected Areas Development Strategy (NPAES) the project area does not overlap with any formally or informally protected area (Figure 28). The closest protected area is the Nooitgedacht Dam Nature Reserve which is situated approximately 62 km north-east of the project area (Figure 28). Based on the above information and the location of the proposed development is not expected to have an impact on any formally or informally protected areas.

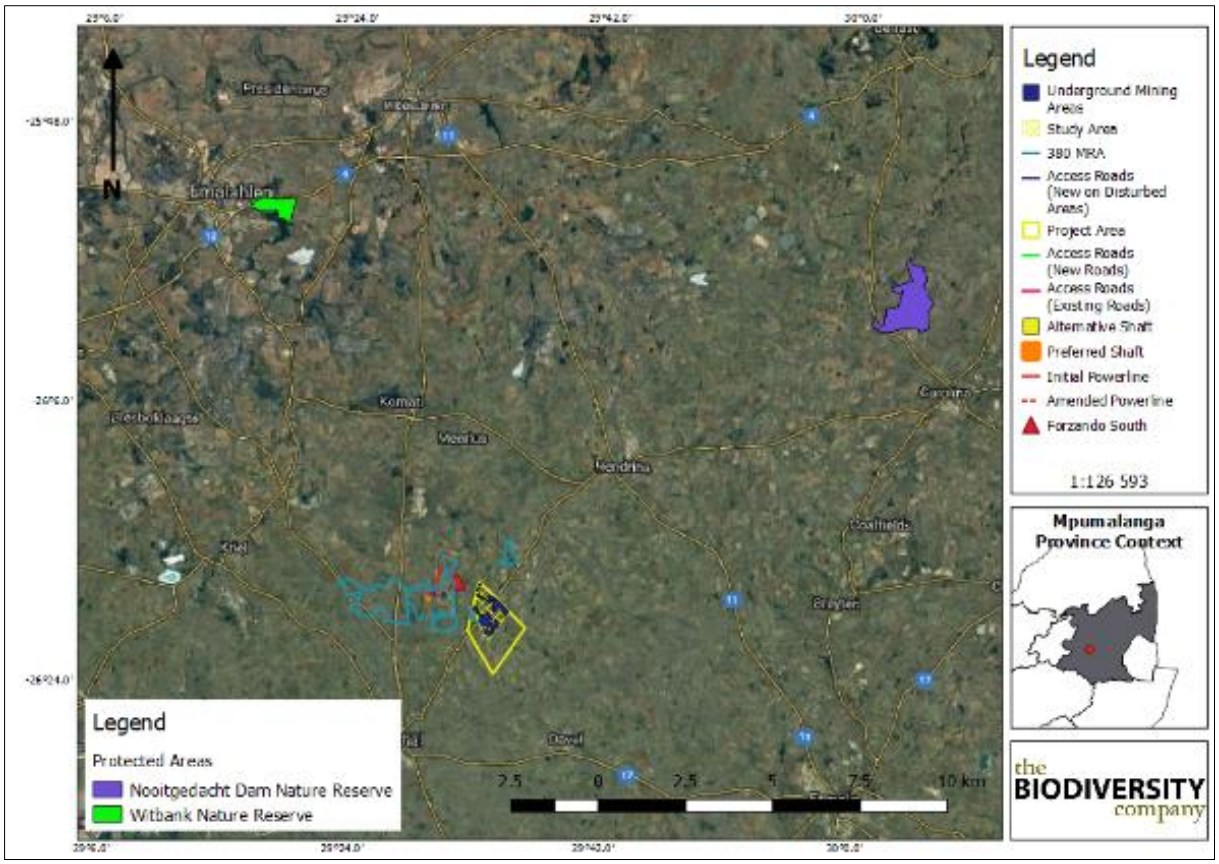

Figure 28: Formally protected areas in relation to the project area (BGIS,2017).

7.10.1.5 THE MBSP FRESHWATER ASSESSMENT

The MBSP Freshwater Assessment outlines priority areas for freshwater biodiversity in Mpumalanga. The resulting features are predominantly derived from the NFEPA products, layers include CBA Rivers (based on FEPA and free-flowing rivers), CBA Wetlands (based on FEPA wetlands), CBA Aquatic species (Odonata and crab taxa of conservation concern only), ESA Wetland Clusters (FEPA wetland clusters), and ESA Wetlands (all other non-FEPA wetlands). The MTPA created an updated land-cover using SPOT 2010 imagery. This data, together with high-resolution aerial imagery, was used to update and clean some of the features (MTPA *et al.,* Freshwater Assessment, 2011).

The Kalabasfontein Project area in relation to the MBSP Freshwater Assessment overlaps with the following areas: Ecological Support Areas (ESAs), Heavily Modified Areas (HMAs) and Other Natural Areas (ONAs) (Figure 29).

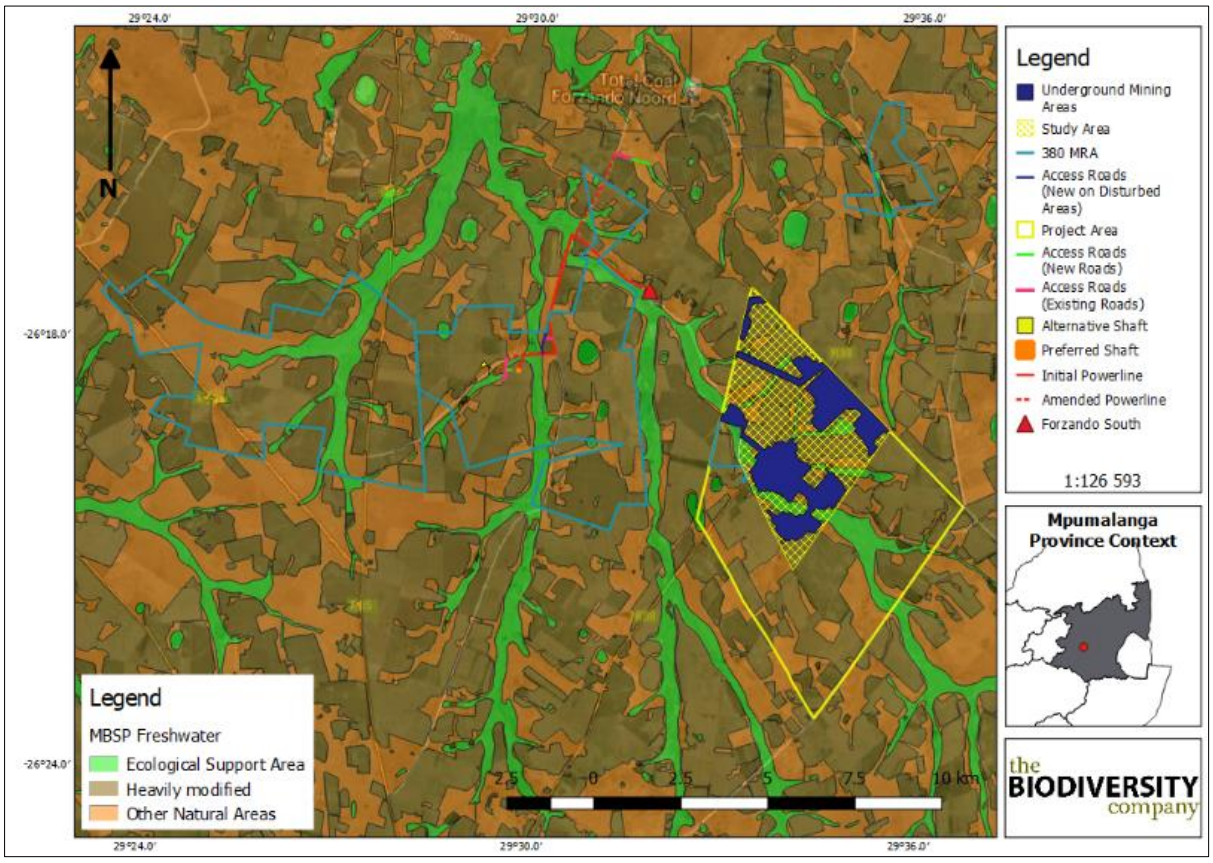

Figure 29: The Kalabasfontein Project area in relation to the MBSP Freshwater Assessment.

7.10.1.6 MPUMALANGA HIGHVELD WETLANDS

Figure 30 shows the project area in relation to the Mpumalanga Highveld Wetlands data as provided by SANBI. The Kalabasfontein Project area intersects with wetland areas classified as FEPA wetlands. The majority of these wetlands are classified as Class D wetlands (Figure 31). This means that these areas have been classified as heavily to critically modified.

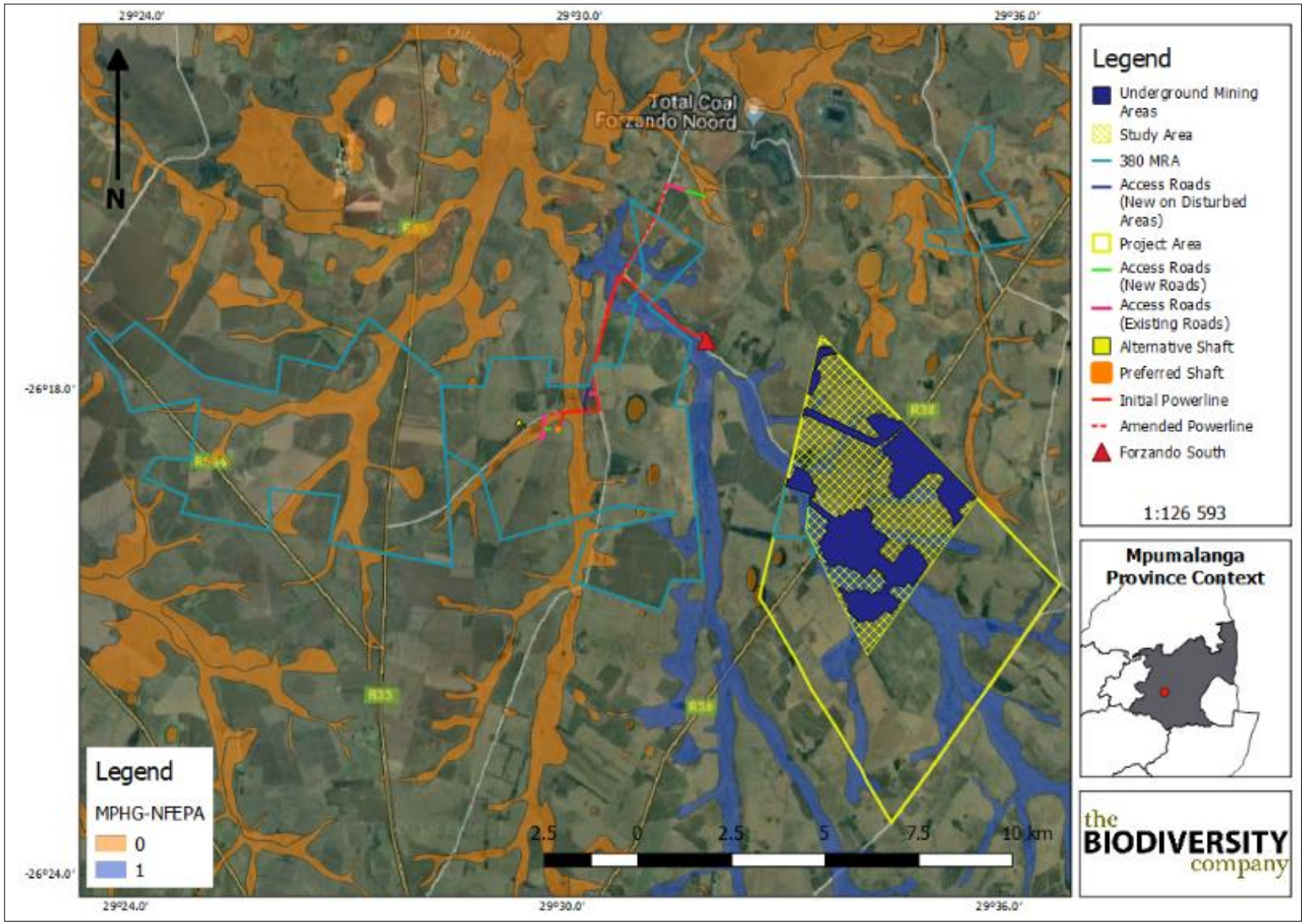

Figure 30: Shows the overall project area in relation to the Mpumalanga Highveld Wetlands (SANBI, 2012)

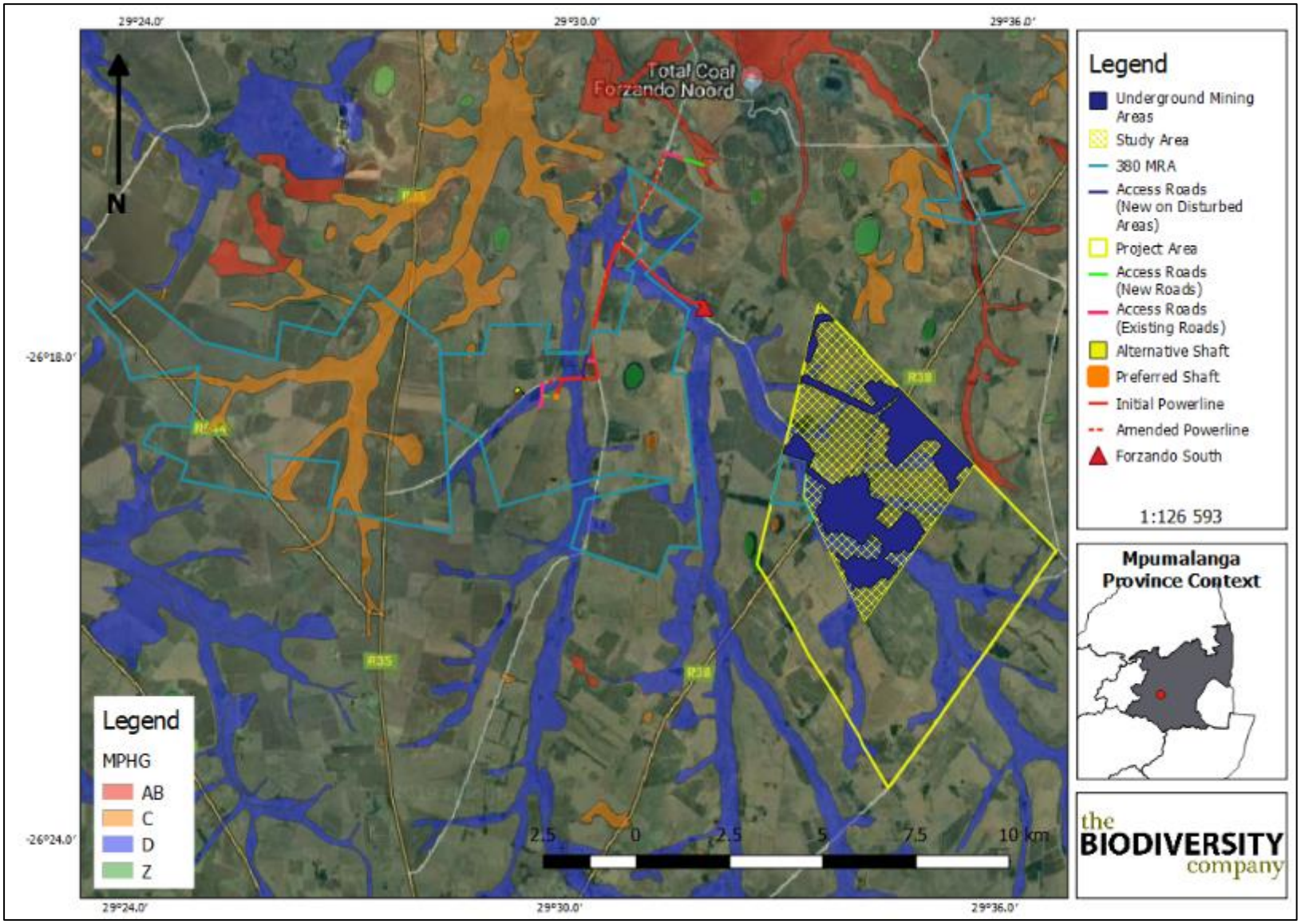

Figure 31: Shows the overall project area in relation to the Mpumalanga Highveld Wetlands in relation the wetland conditions.

7.10.1.7 IMPORTANT BIRD AND BIODIVERSITY AREAS (IBA)

Important Bird and Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other nature as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of Important Bird and Biodiversity Areas (IBAs) is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

The Kalabasfontein Project area is bisected by the Amersfoort-Bethal-Carolina IBA (Figure 32). This IBA was established in 2014 due to the presence of a number of species of conservation concern. The IBA is bounded by the main roads connecting Ermelo, Amersfoort, Bethal, Hendrina and Carolina, this area consists mostly of flat to undulating farmland. In the patches of natural vegetation remaining in this agricultural sea there are important elements of Mesic Highveld Grassland growing on black vertic clays. This highly fragmented grassland holds several streams and pans. Rocky slopes, gullies and ravines favour the development of thicket, while secondary forest occasionally develops in the deeper, fire-protected gullies.

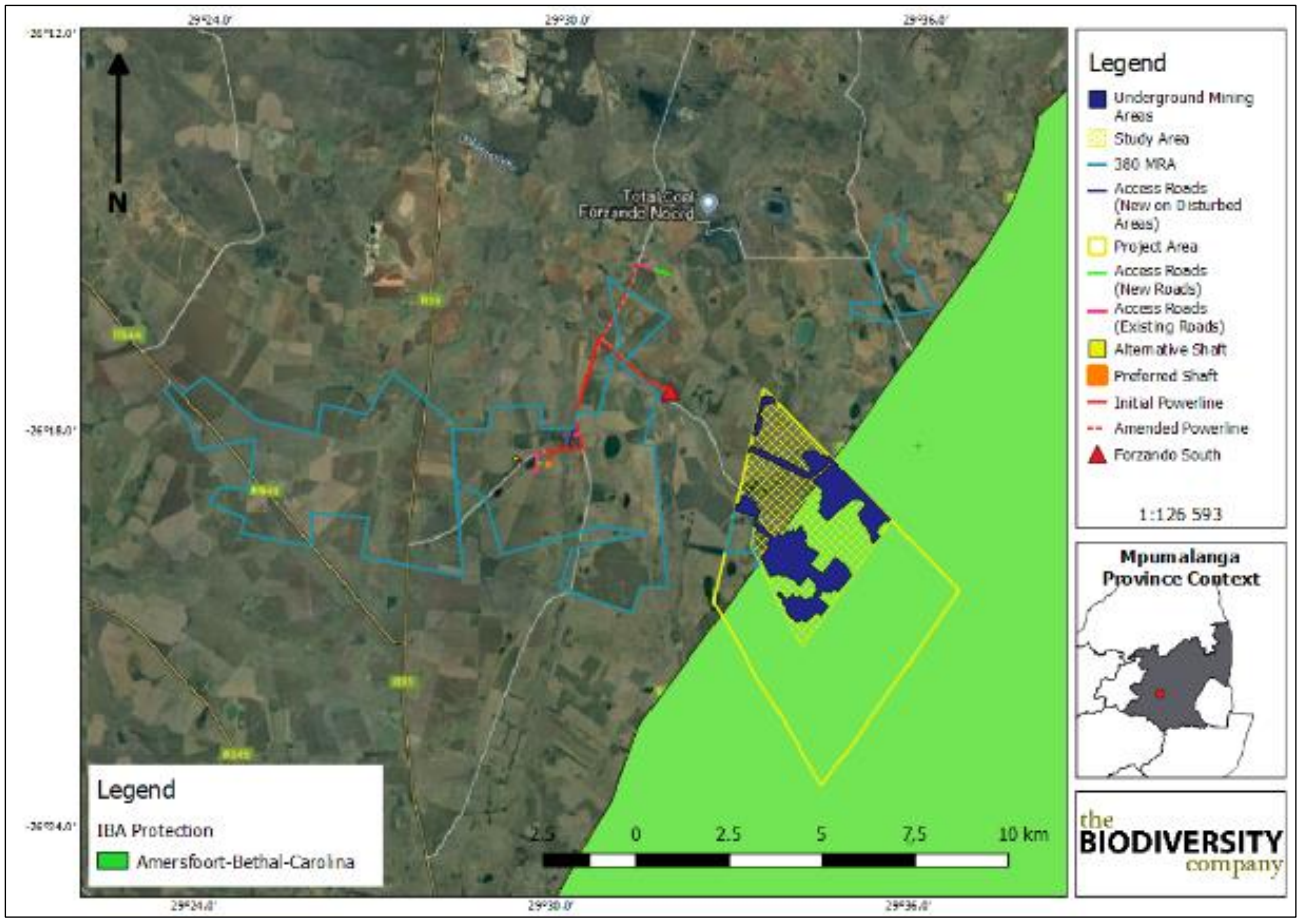

Figure 32: Proximity of the Kalabasfontein Project area to the Amersfoort-Bethal-Carolina Important Bird and Biodiversity Area

Amersfoort-Bethal-Carolina IBA was declared for its importance in supporting globally threatened bird species. The key species within this IBA is the globally threatened Botha's Lark with this IBA holding more than 10% of the total global population of this species. Other globally threatened species are Blue Crane Anthropoides paradiseus, Southern Bald Ibis, Black Harrier, Blue Korhaan, Black-winged Pratincole, Secretarybird, Martial Eagle and Denham's Bustard. Regionally threatened species are African Grass Owl, White-bellied Korhaan and Lanner Falcon. Biome- and range-restricted species are Botha's Lark, Kurrichane Thrush and Buff-streaked Chat.

Based on the initial desktop analysis there appears to be extensive habitat within the proposed project area that may be important for some of these bird species. Even semi-disturbed areas can provide suitable foraging areas for many of the species that occur within and adjacent to this IBA.

7.10.1.8 THE MINING AND BIODIVERSITY GUIDELINES

According to Mining and Biodiversity Guidelines (2013), the proposed Kalabasfontein Project area falls within an area which is considered to be 'high risk for mining' and of 'high biodiversity importance'. As can be seen in Figure 33 and according to the guidelines, mining options may be limited in these areas, and limitations for mining projects are possible. Furthermore, authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisation.

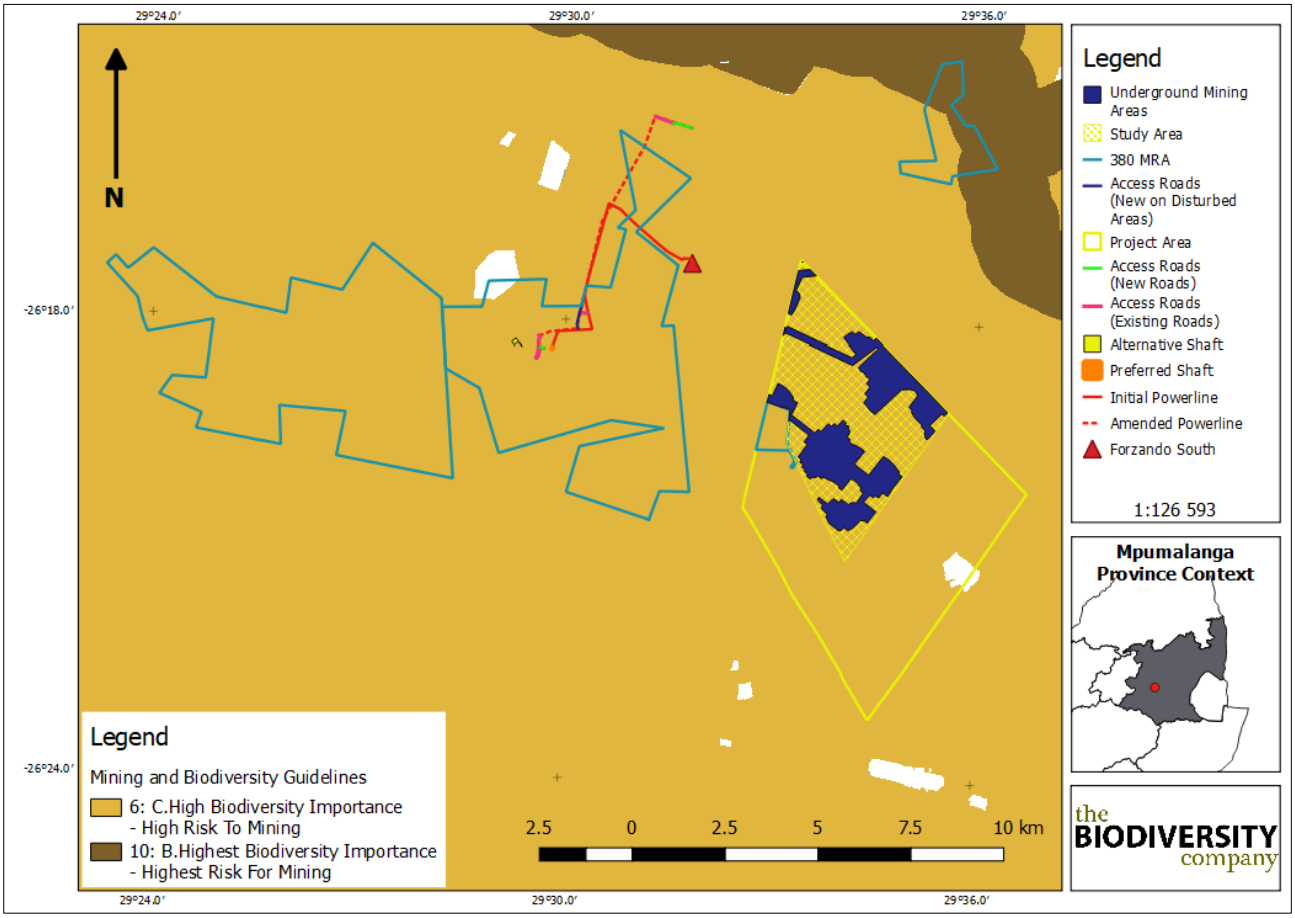

Figure 33: The project area superimposed on the Mining and Biodiversity Guidelines spatial dataset (2013).

7.10.1.9 FLORA

The project area is situated within one vegetation type; namely the Eastern Highveld Grassland (GM12) according to Mucina and Rutherford (2006) (Figure 34).

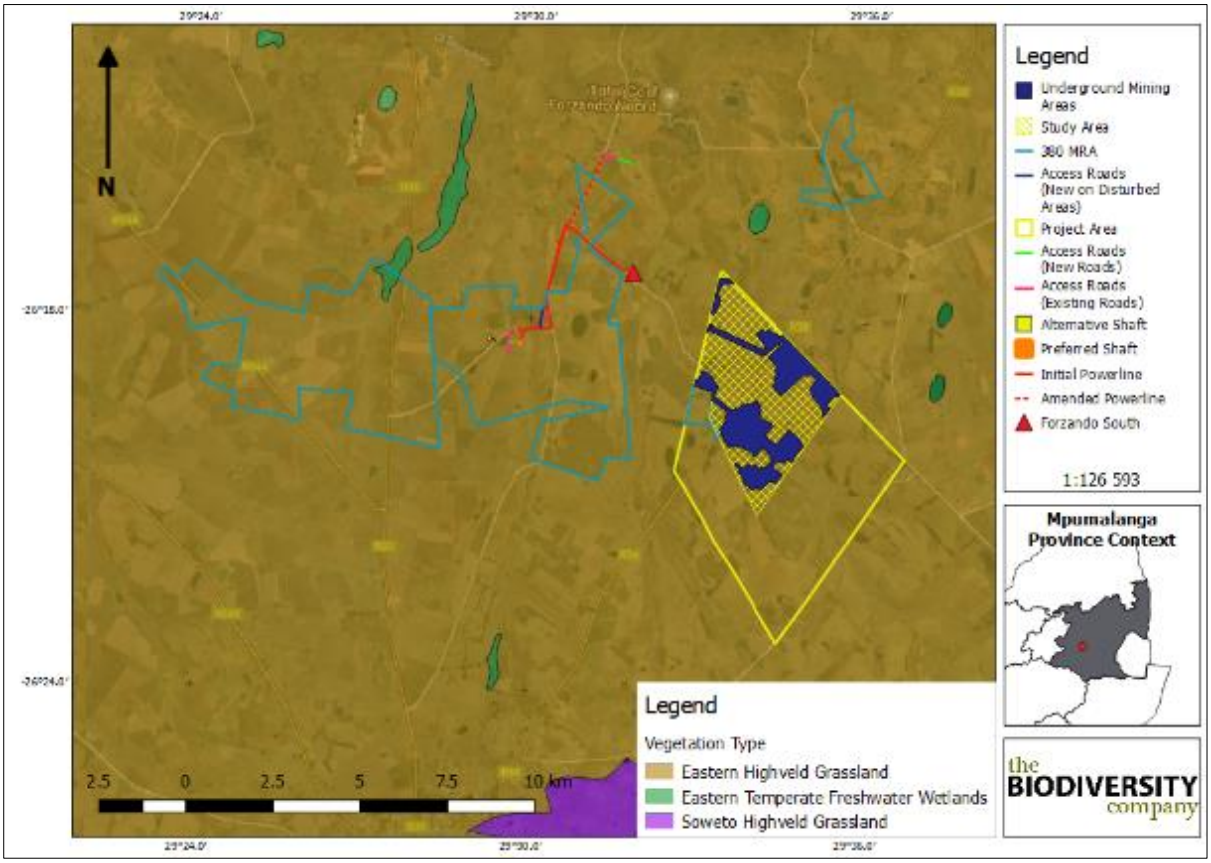

Figure 34: The project area showing the vegetation types based on the Vegetation Map of South Africa, Lesotho and Swaziland (BGIS,2017).

The Eastern Highveld Grassland occurs on slightly to moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grass land dominated by the usual highveld grass composition (Aristida, Digitaria, Eragrostis, Themeda, Tristachya etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species. Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. No serious alien invasions are reported (Mucina and Rutherford, 2006).

According to Mucina and Rutherford (2006), Eastern Highveld Grasslands is classified as Endangered. The national target for conservation protection for both these vegetation types is 24%, but only a few patches are statutorily conserved in Nooitgedacht Dam and Jericho Dam Nature Reserves and in private reserves (Holkranse, Kransbank, Morgenstond).

Some 44% of this vegetation type has already been transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed sites.

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 445 plant species are expected to occur in the area. Of the 455-plant species, four (4) species are listed as being Species of Conservation Concern (SCC) (Table 18).

Table 18: Plant Species of Conservation Concern (SCC) expected to occur in the project area (BODATSA-POSA, 2016)

Family	Taxon	Author	IUCN status	Status	Likelihood of Occurrence
Iridaceae	*Gladiolus paludosus*	Baker	VU	Indigenous	Moderate
Iridaceae	*Gladiolus robertsoniae*	F.Bolus	NT	Indigenous; Endemic	Moderate
Asphodelaceae	*Kniphofia typhoides*	Codd	NT	Indigenous; Endemic	Moderate
Amaryllidaceae	*Nerine gracilis*	R.A.Dyer	VU	Indigenous; Endemic	Moderate

Although care was taken to traverse as much of the suitable habitat during the fieldwork by the ecologist in search for these SCC, the effort failed to record most of these species. The fieldwork did however, reveal the disturbed nature of most of the habitats on the project area, largely due to overgrazing.

Based on the field observations, the likelihood of occurrence of any of the Red and Orange List plant species outlined in Table 18 is moderate and repeated field surveys throughout the phenological cycles of these plant SCC may yield observations of this species within the project area. However, two (2) plant species which are protected in terms of the Mpumalanga Nature Conservation Act, 1998 (No. 10 of 1998) were recorded and are shown in Table 19.

Table 19: Recorded Mpumalanga Protected plant species for the project area

Family	Taxon	Mpumalanga Schedule 11
Amaryllidaceae	*Crinum bulbispermum (Burm.f.) Milne-Redh. and Schweick.*	Yes
Amaryllidaceae	*Cyrtanthus tuckii Baker var. transvaalensis I.Verd*	Yes

7.10.1.10 FAUNA

7.10.1.10.1 AVIFAUNA

According to The Biodiversity Company, a total of sixty-eight (68) bird species were recorded in the project area during the October 2018 surveys based on either direct observations, or the presence of visual tracks and signs. A further thirty-nine (39) species are included that were recorded during previous field surveys (GCS, 2010).

One bird SCC was recorded during the survey, namely secretary bird (*Sagittarius serpentarius*) during the October 2018 survey. Eight (8) SCC were recorded during previous field surveys (GCS, 2010).

7.10.1.10.2 MAMMALS

The mammal diversity in the project area is moderate to high, with fifteen (15) mammal species being recorded during the October 2018 surveys (refer to Appendix 9) based on either direct observation, camera trap photographs or the presence of visual tracks and signs.

Three (3) mammal SCC were recorded in the project area. There appears to be healthy populations of Cape Clawless Otters (*Aonyx capensis*) along the wetland areas and in the dams within the project area and adjacent to it. A number of juvenile and sub-adult mammal species were recorded (notably Serval and Jackal), proving that these areas serve as important breeding sites for these species.

7.10.1.10.3 HERPETOFAUNA (REPTILES AND AMPHIBIANS)

Six (6) reptile species were recorded in the project area during the October 2018 surveys. One near-endemic and one endemic snake species were recorded in the project area. Reptile diversity was considered moderate to high in the project area considering the extent of existing agricultural activities which has already transformed some of the natural ecosystems.

Four (4) amphibian species were recorded in the project area during the October 2018 surveys based on visual observations as well as from calls made by various frog species. Due to the surveys being conducted towards

the end of the dry season when herpetofaunal activity is low, it is expected that more species should occur in this area, especially considering the extent of the rivers and wet areas.

7.11 AQUATIC BIODIVERSITY

The Biodiversity Company conducted an aquatic biodiversity study for the proposed Kalabasfontein Project. A desktop study was conducted for the project, followed by a field study (refer to Appendix 10). A field survey was conducted over a period of two days at the beginning of October 2018. The sampling points selected in this study were completed according to the proposed infrastructure layout. The layout of the sampling points and details of the points are provided in Figure 35.

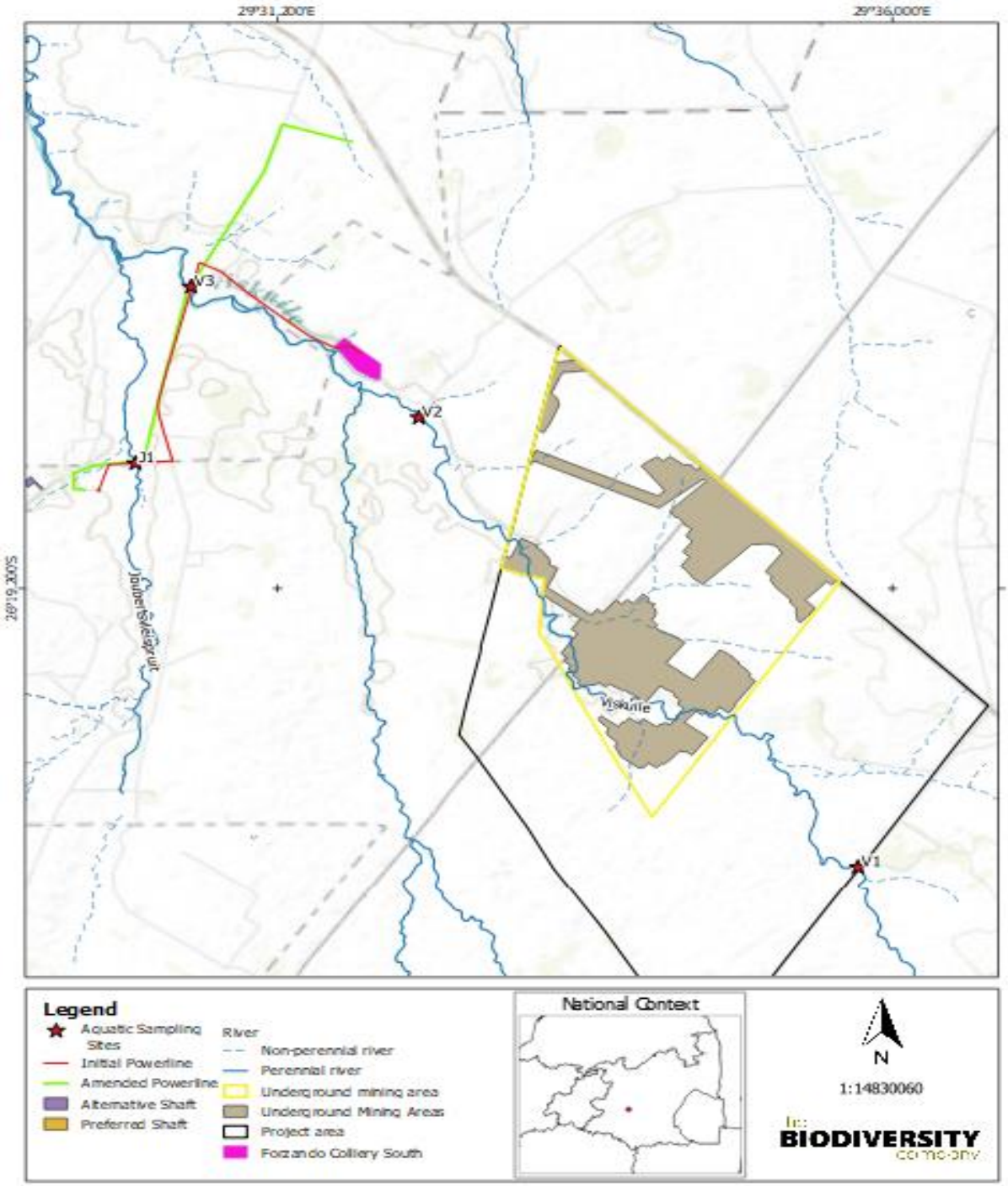

Figure 35: Sampling points for the aquatic ecology.

The results of the Present Ecological Status assessments conducted during the study indicated that the project area has been altered (historically and currently) predominantly by agricultural land use. The assessed Joubertsvleispruit river reach was classed as moderately modified (class C). Flow and instream habitat modification has resulted in modified biological responses. It was also noted that Instream habitat modification can be attributed to local agricultural activities. The assessed Viskuile River reach was classed as moderately to largely modified (class C/D). Water quality modification in the upper reaches of the watercourse compounded by modified flow in the reach resulted in the observation of modified aquatic ecology during the survey. The modification of the watercourse can be attributed to poor connectivity, agricultural activities and alteration of the river for water storage.

No red listed fish species were expected or sampled within the river reaches in the project area. However, a total of nine fish species, comprising five native, two translocated native and two alien invasive species were captured during this study. The fish community structures are largely intact, despite introductions of additional species. This diversity is indicative of the importance of these systems to collectively provide refugia and corridors for dispersal throughout the project area. Despite modification, the preservation of these systems is of importance for the consideration of the proposed mining project.

Owing to the absence of typical riparian features, no riparian delineation could be completed for the project area. The delineation of the wetland areas which were associated with the watercourse would therefore suffice for this study.

The layout of sensitive environments in respect to aquatic ecology is presented in Figure 36. It is noted that a 40 m buffer for ventilation shafts and powerline has been presented in these figures based on the delineated watercourses in the project area. The buffer value stems from those specified for the ventilation shafts and powerline in the wetland report for the current study (TBC, 2018). It was noted that the proposed powerline is in direct proximity to both the Joubertsvleispruit and the Viskuile rivers (Figure 36). The powerline traverses both rivers and falls within the proposed buffer zone. The underground mining activities are proposed to undermine the Viskuile River at an unknown depth. These activities, therefore, pose a direct threat to sensitive aquatic ecological habitats.

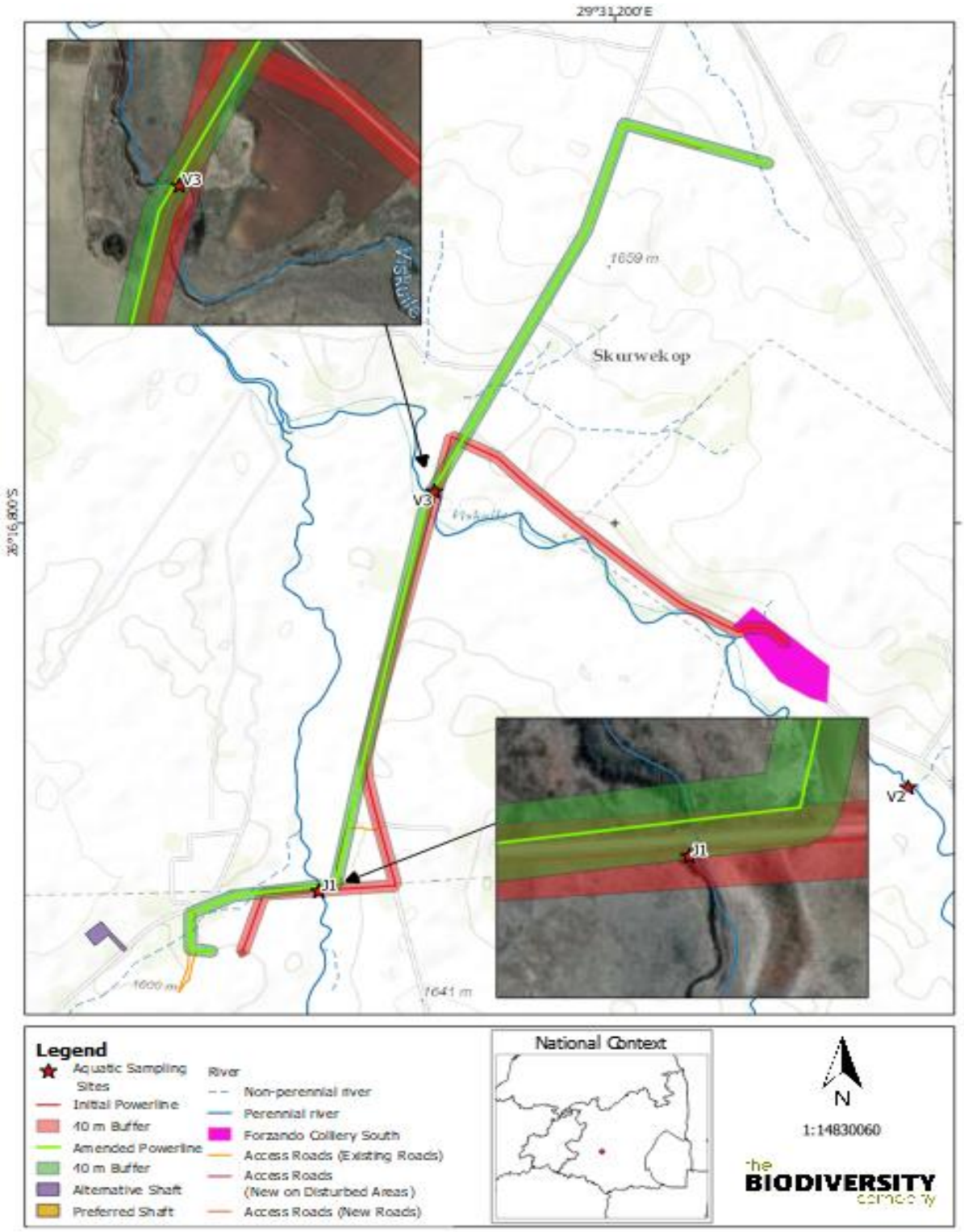

Figure 36: Sensitive Aquatic Habitats associated with the powerline river crossings.

7.12 HYDROLOGY

Hydrologic Consulting conducted a Hydrological Impact Assessment Study for the Kalabasfontein Project area (refer to Appendix 11). The aim of the hydrological study was to determine the potential hydrological impacts related to the proposed expansion and associated works, to provide a Storm Water Management Plan and Erosion Control methods for proposed surface infrastructure; and to update the Water Balance to include the increased dewatering volumes originating from the proposed Kalabasfontein Project. A site visit was undertaken in October 2018.

7.12.1 SURFACE HYDROLOGY

There are several waterbodies located within the proposed project area, these include NFEPA rivers and wetlands (see Figure 37). Four perennial rivers intersect the site, with the Viskulie River passing through Kalabasfontein 231 IS and subsequently Forzando South where after the river joins the primary Olifants River. The Viskulie River is joined by the Joubertsvleispruit River and another unnamed perennial river which pass through Forzando South while the forth perennial river passes between the two proposed ventilation shaft locations on Forzando South. Various non-perennial rivers are present on the site and serve as tributaries to the aforementioned perennial rivers. Numerous farm dams are positioned along the rivers on site with less significant and more significant (larger) dams noted. The site is also associated with several perennial pans that act as natural depressions that contain surface water.

The proposed Kalabasfontein project area is situated in quaternary catchment B11A in the Upper Olifants River catchment on the western side of the Bankspruit. The Viskuile River runs from north to south through the project area on the westerly side. The Viskuile is a stream of Present Ecological State (PES) category C watercourse, meaning that it is moderately modified. It is a tributary of the Olifants River.

7.12.2 WATER MANAGEMENT AREA (WMA)

The Kalabasfontein Project area is situated in the Upper Olifants River catchment within the Olifants Water Management Area (WMA), which may be divided into four sub-areas, namely the Upper Olifants, Middle Olifants, Lower Olifants and Steelpoort sub-areas. The main tributaries of the Olifants River are the Wilge, Elands, Ga-Selati, Klein Olifants, Steelpoort, Blyde, Klaserie and Timbavati Rivers. The Olifants River is a tributary of the Limpopo River which is shared by South Africa, Botswana, Zimbabwe and Mozambique (Department of Water Affairs, 2013). As shown in Figure 38 the Kalabasfontein Project area falls within the B11A quaternary catchment.

7.12.3 SURFACE WATER QUALITY

Aquatico Scientific (Pty) Ltd has been commissioned by Exxaro Coal Central: Forzando Mine to conduct surface water quality monitoring on a monthly basis at fifteen (15) surface water localities for Forzando South. The descriptions below are based on the quarterly surface water monitoring report undertaken by Aquatico Scientific on behalf of Forzando Mine.

Based on the calculated quarterly average (Q̄Ā) water quality conditions of the surface water monitoring localities at Forzando, the general water quality profile can be described as neutral to alkaline (Q̄Ā pH levels between 7.87 and 9.34 with an overall average of 8.39), non-saline to saline (Q̄Ā TDS between 173 and 922 mg/l with an overall average of 343 mg/l classified as non-saline), slightly hard to very hard (Between 110 mg/l and 342 mg/l) with an overall average of 178 mg/l classified as moderately hard.

7.12.4 SURFACE WATER USE

The portion of the Olifants River catchment upstream of Forzando has largely escaped mining and related industrial development experienced by most of the remainder of the catchment area. The upstream catchment area is primarily utilised for agricultural activities as evidenced by the good water quality recorded at the mine site.

Water use from the catchment comprised the uses related to the Reserve, as well as other uses including:

- Agriculture;
- Industry (primarily related to the opencast and underground coal mining as well as power generation by means of coal fired power stations;
- Domestic, primarily related to water abstracted from Witbank dam for supply to urban area related to Witbank; and
- Recreation on the Witbank dam.

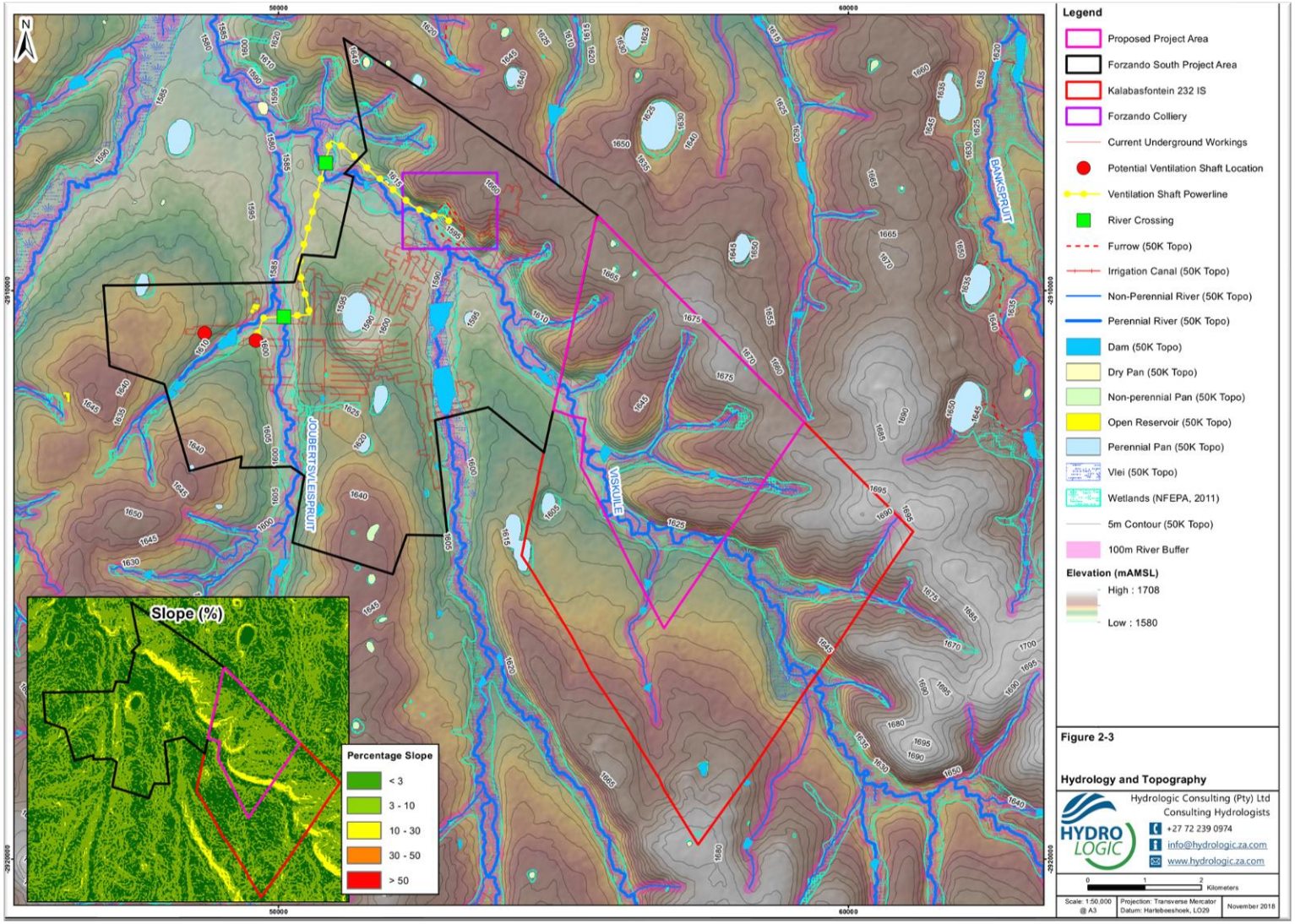

Figure 37: Hydrology and topography for the Kalabasfontein Project

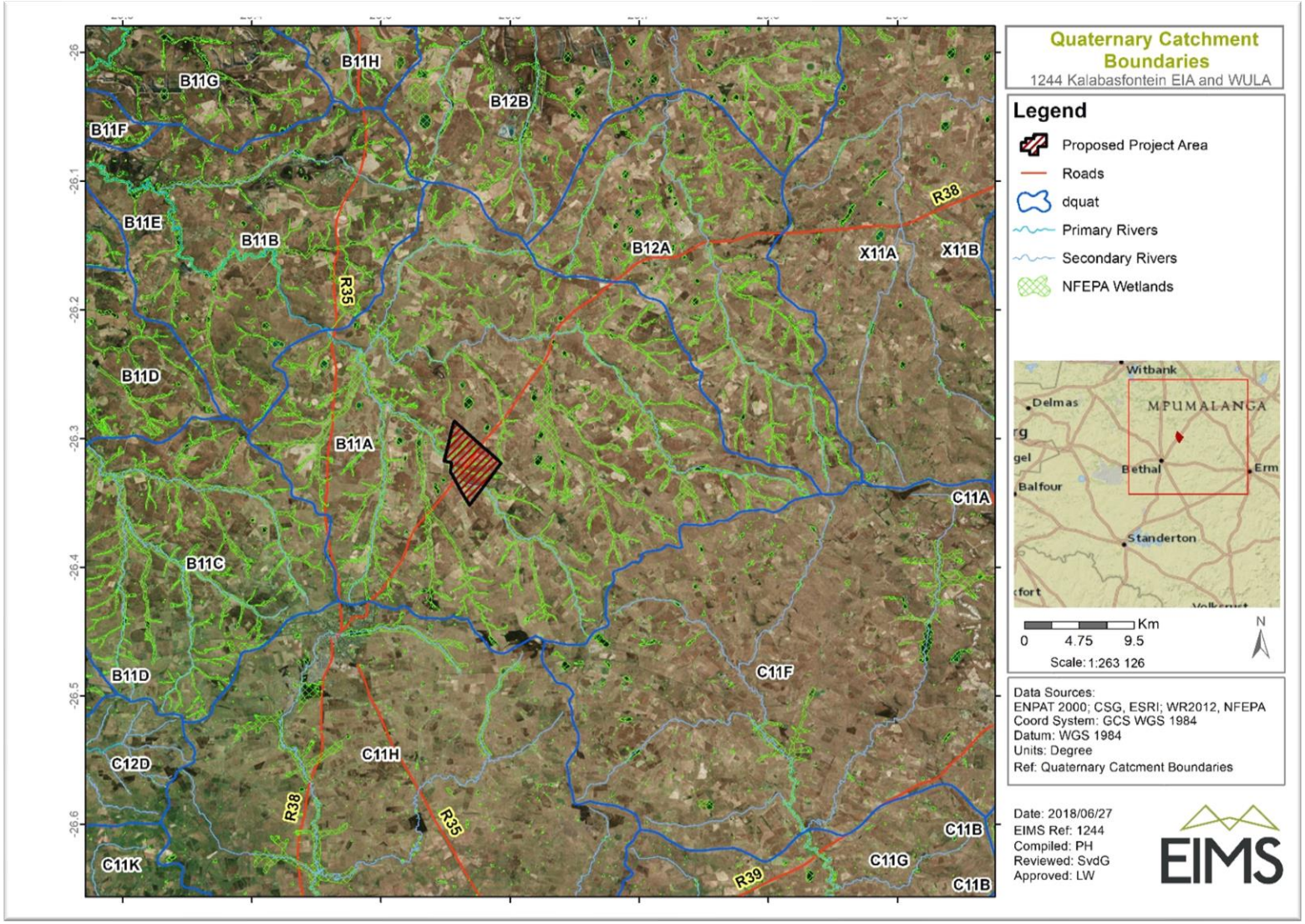

Figure 38: Quaternary Catchment Boundaries.

7.13 WETLANDS

A wetland survey was conducted in September 2018 and October 2018 by a wetland specialist from The Biodiversity Company to assess all project aspects and areas (Refer to Appendix 11). A hand-held auger and a GPS tablet was used to log all information in the field. The soils were classified to the family level as per the "Soil Classification - A Taxonomic System for South Africa" (Soil Classification Working Group, 1991). Owing to the extent of agricultural activities within the project area, Soil Form was used to supplement the wetland study.

The survey included assessing all the wetland indicators as well as assessing the integrity or health of the wetland, the wetland's ability to provide goods and services (eco-services) and the EIS of the wetlands. The results of the wetland assessment are discussed below.

7.13.1 WETLAND DELINEATION

The wetland delineation is shown in Figure 39 and the HGM units in Figure 40 with the wetland classification as per SANBI guidelines (Ollis *et al.* 2013). Seven wetland types were identified within the two project areas, and these were categorised into nine (9) HGM units (hydrogeomorphic units), namely;

- Floodplain (HGM 1 and HGM 2);
- Unchannelled valley bottom (HGM 3);
- Channelled valley bottom (HGM 4);
- Hillslope seep (HGM 5);
- Flat (HGM 6);
- Depression (HGM 7 and HGM 8); and
- Artificial dams (HGM 9).

The overall wetland health for HGM 1 was determined to be Largely Modified (D), with the remaining HGM units determined to be Moderately Modified (C). All HGM units exhibited a moderately high benefit for indirect benefits such as; sediment trapping, and phosphate/nitrate/toxicant assimilation. HGM 7, 8, and 9 had a moderately high benefit for flood attenuation. The floodplains HGM 1 and HGM 2 exhibited a moderately high benefit for biodiversity maintenance providing suitable habitat for fauna and flora. HGM 3 and HGM 8 had a moderately high benefit for erosion control. The remaining benefits were rated as intermediate or lower.

The Ecological Importance and Sensitivity (EIS) was calculated to have a Very High (A) importance for HGM 1. This rating can be attributed to the ecological importance of the floodplain from an NFEPA perspective as well as the national ecosystem classifications (see section 7.5 of the Wetland Survey Report) rating this area as vulnerable. HGM 2, 3, 4, 8, and 9 were rated as High (B) importance. HGM 5, 6, and 7 were rated as Moderate (C) importance.

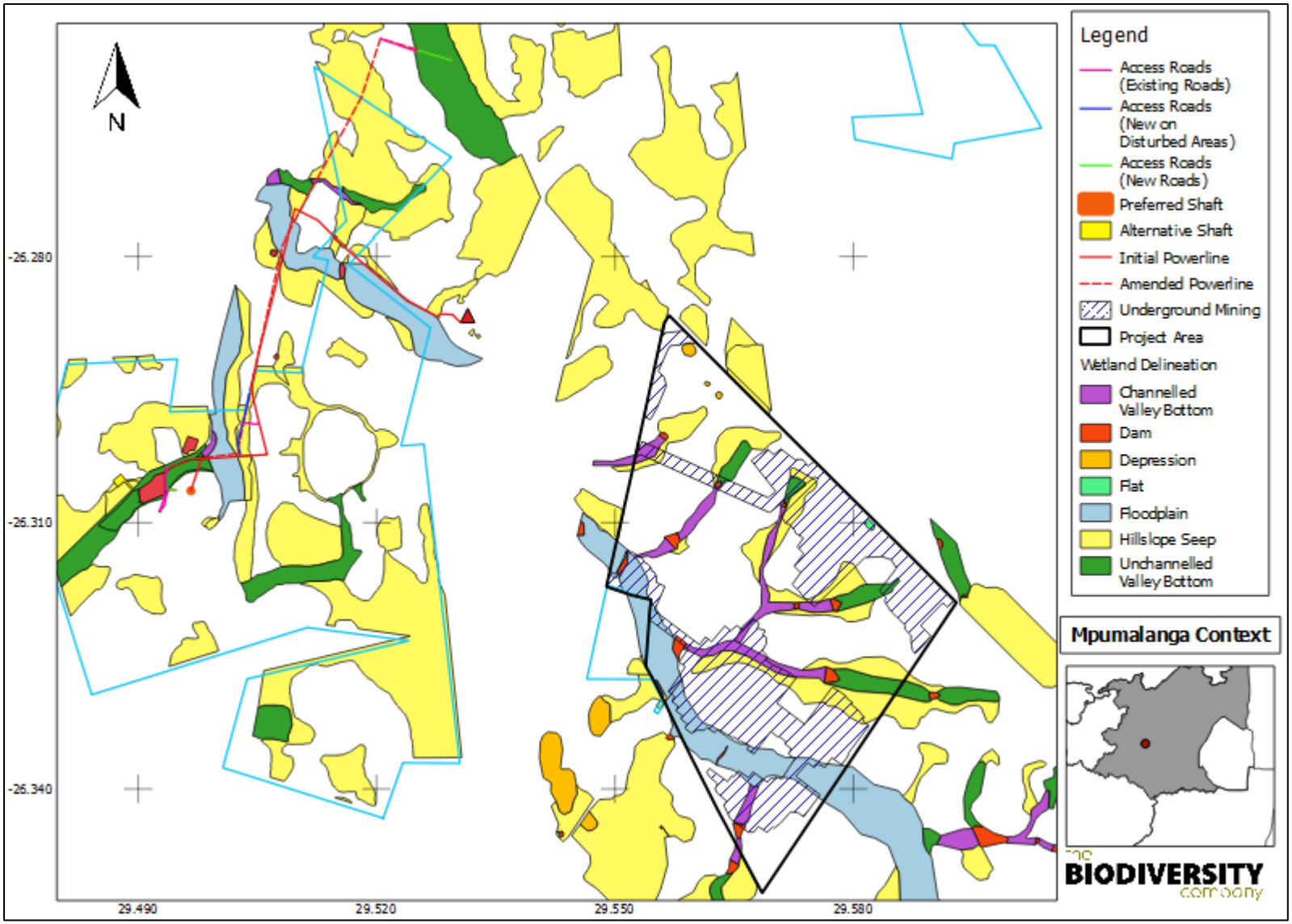

Figure 39: Kalabasfontein Project wetland delineation

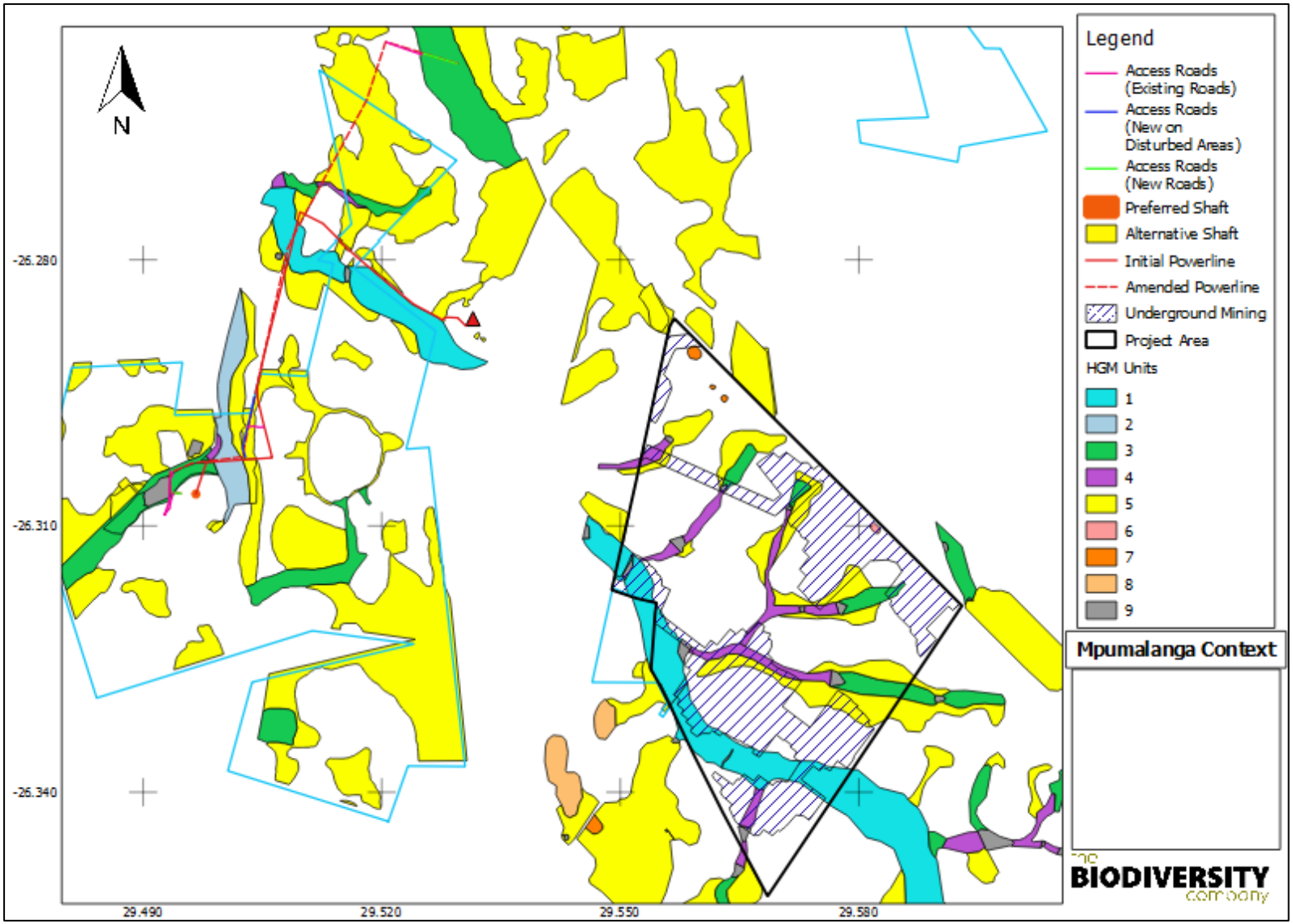

Figure 40: Kalabasfontein Project HGM units.

7.13.2 BUFFER ASSESSMENT

The buffer assessment is only applicable to the vent shaft and powerline areas, as the buffer preserves surface impacts to the wetland and cannot address the underground mining impacts.

The wetland buffer zone tool was used to calculate the appropriate buffer required for the project aspects above. According to the buffer guideline (Macfarlane, et al. 2014) a high-risk activity would require a buffer that is 95% effective to reduce the risk of the impact to a low-level threat.

The recommended minimum buffer according to the guidelines is 25 m for the vent shafts and 10 m for the associated powerline (Table 20) for all phases.

Table 20: Post-mitigation buffer requirement

Required Buffer after mitigation measures have been applied	
Vent and Shafts	**25 m**
Powerline	**10 m**

A conservative buffer zone was suggested of 25 m for the vent shafts and 10 m for the associated powerline, this buffer is calculated assuming mitigation measures are applied. This would typically include a commitment to rehabilitate and manage buffer zones to ensure that these areas function optimally.

It must be noted that the alternative vent shaft is within the wetland buffer and it is recommended that the preferred shaft location be used. Both powerline routes will traverse many wetland areas and it is recommended that the route be situated on the existing servitude as far as possible and that spans are planned to cross wetland areas and their associated buffer zones.

7.14 HYDROPEDOLOGY

A hydropedological survey was conducted by The Biodiversity Company to understand the soils present at the site, as well as the hillslope hydrology which drive the wetlands in the area if any are present. The survey was conducted by using a transect method, with the crest being the starting point and the valley bottom the end. The purpose of the maps is to indicate the hydrological hillslope classes in order to illustrate the dominant flow paths from the crest of a slope to the valley bottom.

The scope of work required that the hydropedological impacts for the two proposed vent shafts, the powerline and the underground portions be assessed. The assessment only focused on the vent shaft locations and the underground workings. The powerline infrastructure will not impact on the hydropedological functioning as the layout will be in existing servitudes where possible. It was decided that one (1) hillslope transects would describe the dominating hillslope hydrology of the proposed vent shaft and underground mining areas.

7.14.1 SOILS ANDAND HYDROLOGICAL HILLSLOPE CLASSES

During the site assessment, various soil forms were identified. These soil forms have been delineated and illustrated in Figure 41 and the hydropedological soil units in Figure 41 according to soil type and hydrological soil units (TBC, 2018).

All of the hydromorphic soils identified have similar properties and depths and have, therefore, been labelled as “hydromorphic soils” rather than individual soil forms.

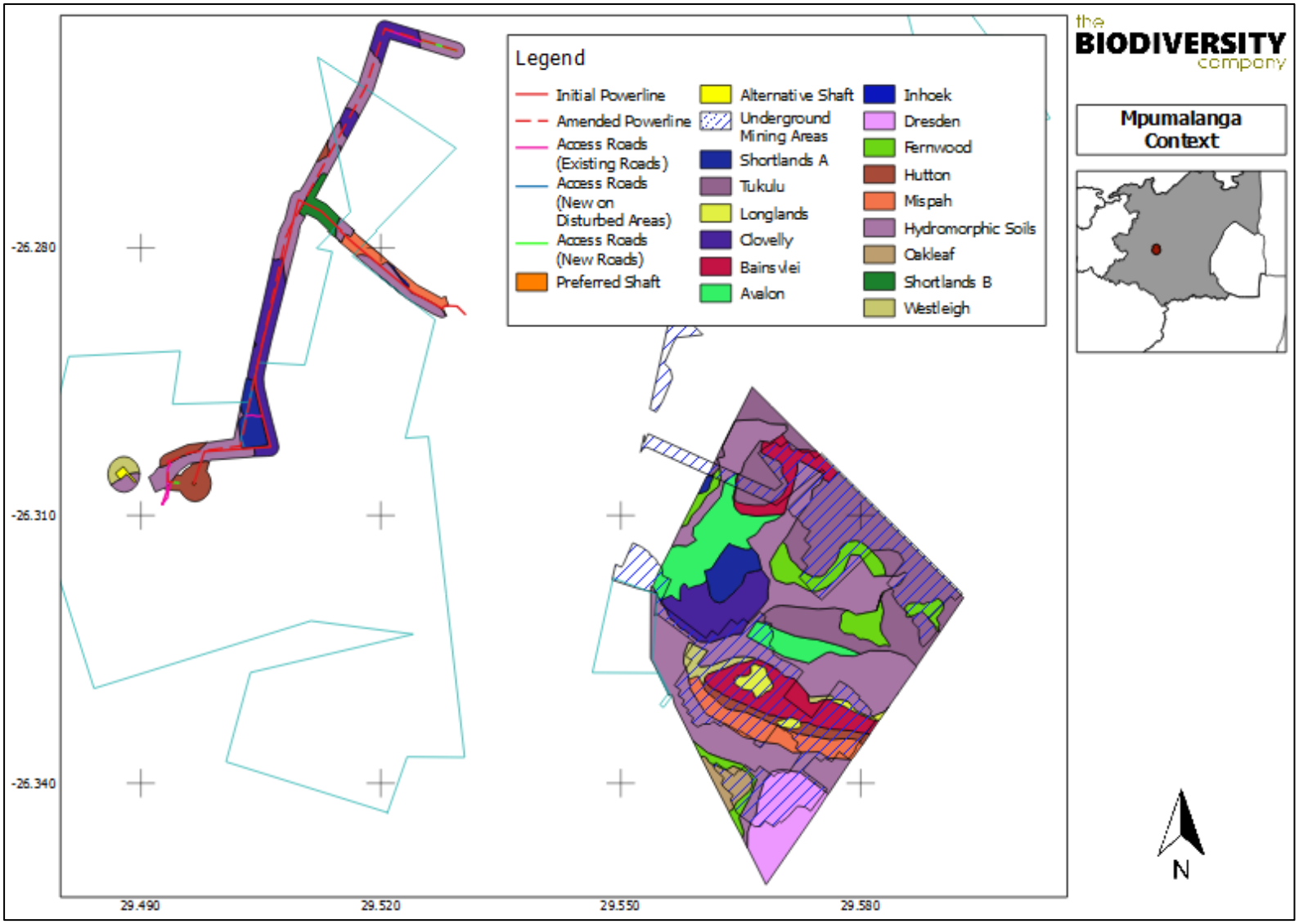

Figure 41: Soil delineations within the project area.

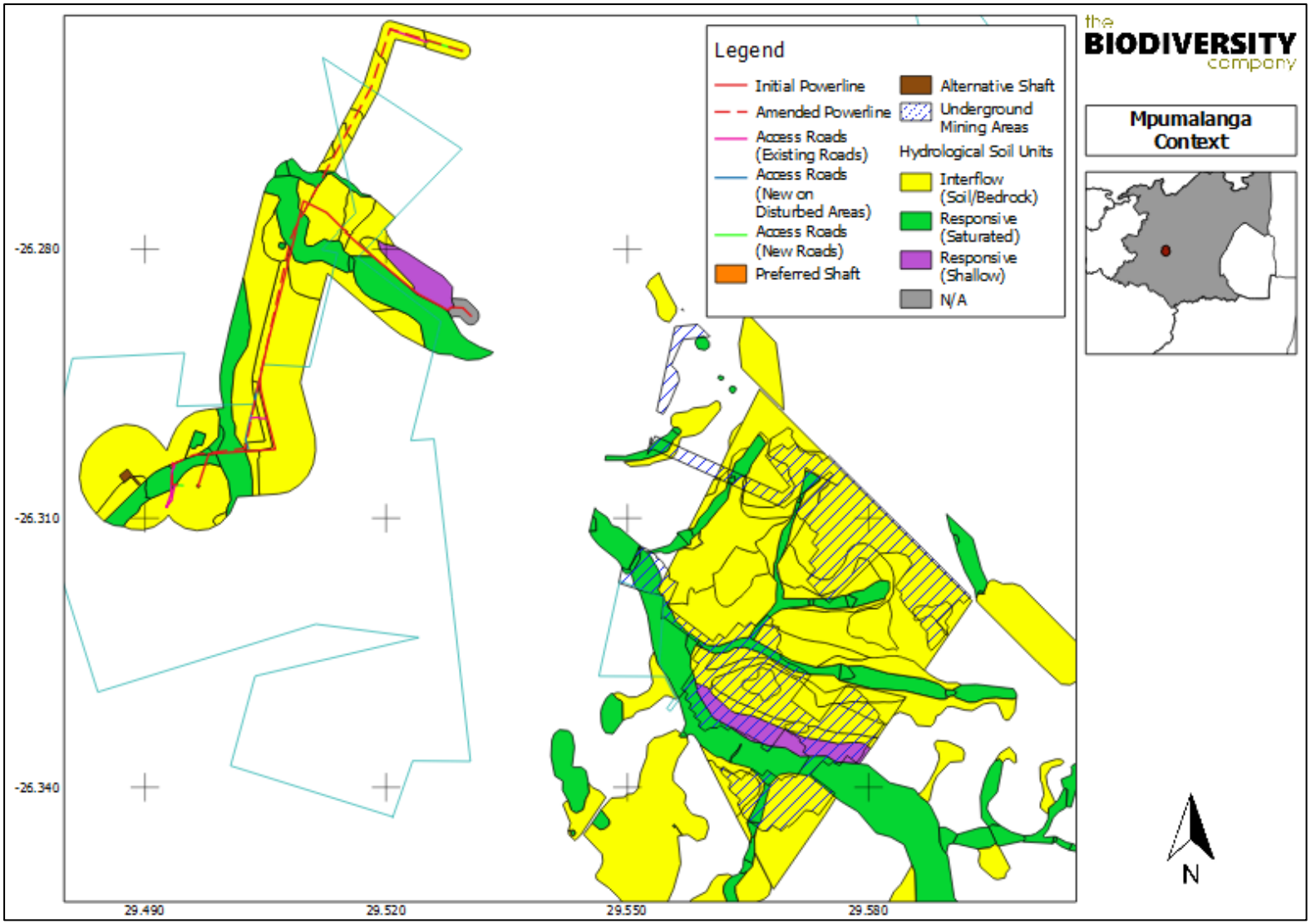

Figure 42: Hydropedological soil units within the project area.

The hydropedological behaviour of the dominant hillslopes is presented in Figure 43:

- Shallow soils are dominant on the convex areas of crest and midslope positions –responsive (shallow). The combination of relatively impermeable bedrock and shallow soil depth implies that these soils have a low storage capacity. They will saturate quickly following a rain event and contribute to the generation of overland flow;
- Concave and linear areas of the crest and upper midslope positions are dominated by soils with evidence of periodic saturation at the soil/bedrock interface – Interflow (soil/bedrock). The plinthic horizons (mostly in Avalon, Bainsvlei soil forms) are indicative that the underlying bedrock is slowly permeable, and saturation is likely, which may lead to lateral flow at the soil bedrock interface;
- Although the plinthic layers are indicative of slowly permeable bedrock there might be infiltration into fractures in the bedrock. This water can either recharge groundwater or return to the soils in the valley bottom position; and
- The accumulation of lateral discharging water from upslope positions cause long periods of saturation in the valley bottom. Responsive (Saturated) soils of the Katspruit, Rensburg, and Westleigh forms dominate on these positions. The gleyic and plinthic horizons occurring close to the surface are indicators that water levels are shallow and that additional precipitation will likely result in overland flow towards the stream.

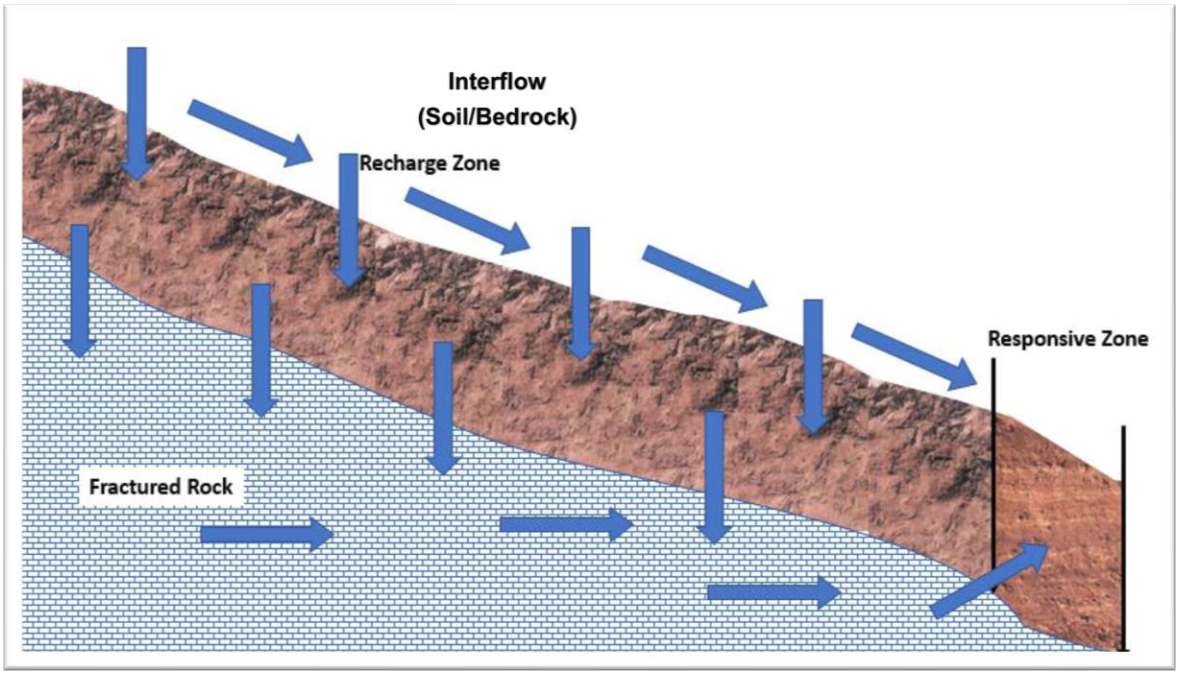

Figure 43: The hydrological flow paths in the project area

7.15 GROUNDWATER

The descriptions below are based on the hydrogeological study conducted by GCS in 2018 for the inclusion of the Kalabasfontein Project area the Forzando South mining right area. A copy of the report is available in Appendix 14.

7.15.1 AQUIFER CHARACTERISTICS

Aquifer hydraulic data was obtained from aquifer tests completed on the boreholes drilled in 2008, 2010 and 2012. The following is observed:

- Groundwater was intersected at an average depth of 14 m with an average blow yield of 0.3 l/sec for the upper Karoo formations and an order of magnitude higher for dolerite contact zones.

The aquifer characteristics can be summarised as follows:

- Transmissivity values decreased with depth;
- The average hydraulic conductivity is around 0.1 m/day for the upper Karoo formation;
- Shales and sandstone at depths exceeding 15 m has a hydraulic conductivity between 0.004 and 0.02 m/day; and
- The shallow boreholes close to the streams at the Forzando South box-cut exhibit hydraulic conductivities an order of magnitude higher, ranging from 0.3 m/day to >1 m/day. It is fair to assume that the alluvial sediments along the streams have higher permeability values.

Boreholes drilled along a north-east, south west trending dyke, directly south of the old discard complex, by Hodgson *et al* (1993) did indicate high yields along the dolerite contact zones according to the old reports. Boreholes FNGW3, 4 and 5 are either next to these old boreholes or near them. However, these boreholes do not indicate any significant yields or are currently depleted in terms of groundwater levels and appears to be drilled within the shallower zones. It is proposed to investigate this area to confirm if the old "M" boreholes can be detected.

7.15.2 AQUIFER CLASSIFICATION

The weathered / fractured aquifer that underlies the site may be classified as a minor aquifer (Parsons, 1995) due to the general yields of less than 2.0 l/s. The Minor Aquifer System is defined as "*fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important both for local supplies and in supplying base flow to rivers.*"

7.15.3 HYDROCENSUS

Two hydrocensus investigations were conducted by GCS. One in August and November 2014 and a more recent hydrocensus completed in September 2018 for the Kalabasfontein Project area. A total of 25 boreholes were visited. A follow-up Hydrocensus was conducted in September 2018 and 13 boreholes were visited. Refer to Figure 44 and Table 21 below for the locality map and data table of these boreholes. It was evident that the boreholes are used for mainly domestic supply, small scale and semi-large-scale irrigation (gardens and crop fields) and livestock watering.

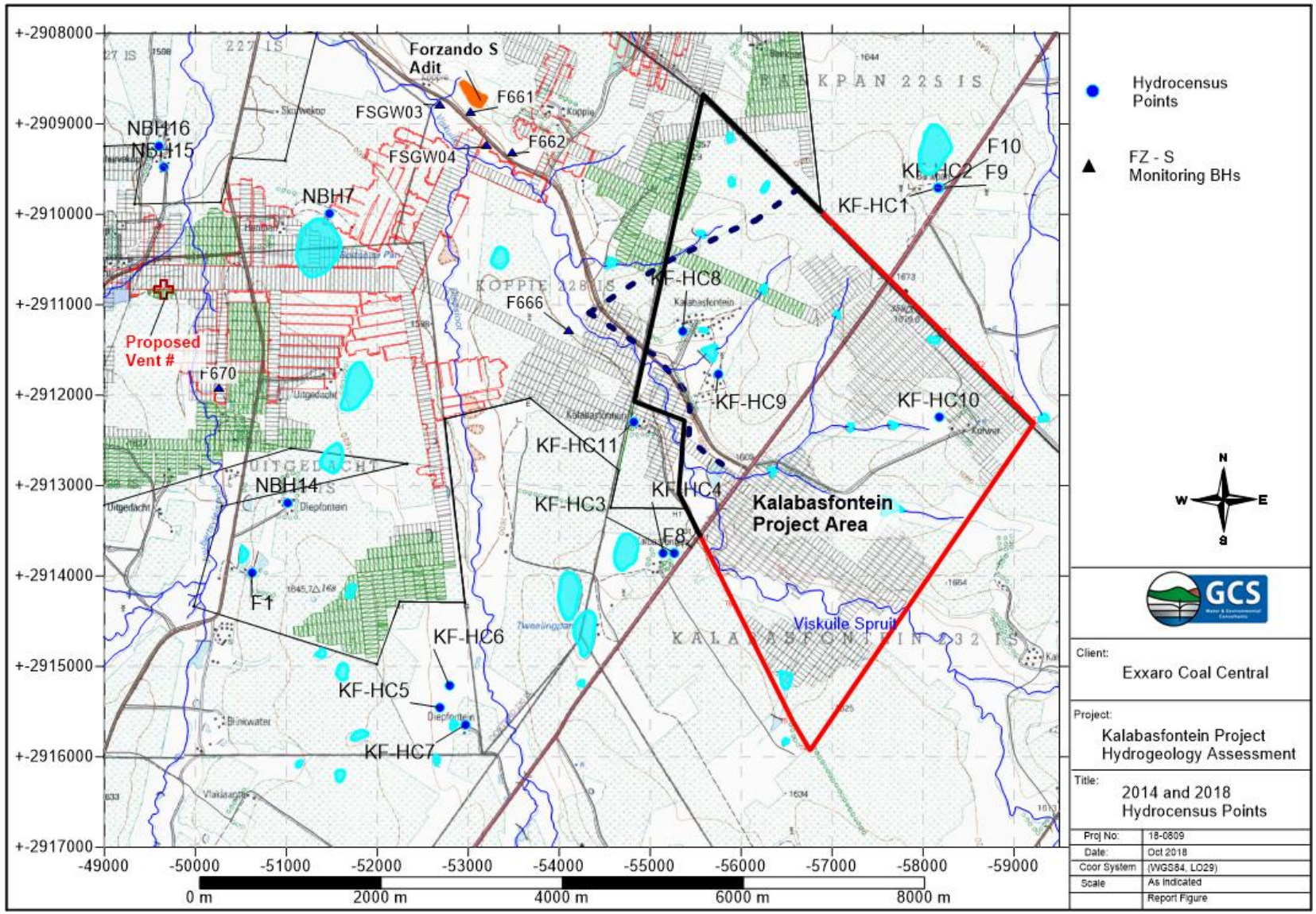

Figure 44: Locality map of the 2014 and 2018 borehole hydrocensus data points

Table 21: Field data collected during the 2018 hydrocensus.

2018 ID	2014 ID	Farm Name	Farm Owner	Contact Details	Description	X (WGS84 LO29)	Y (WGS84, LO29)	Alt (mamsl)	WL (mbgl)	Equipment	Use	Sampled	Sample ID
KF-HC1	F9	Portion 8, Bankpan.	J Coetzer	071 679 3308	Windpump. No WL accesses. Not pumping. Directly next to F10.	58175.52	-2909700.79	1665	-	Wind pump	Drinking water	No	No
KF-HC2	F10	Portion 8, Bankpan.	J Coetzer	071 679 3308	Submersible pump. At farmhouse.	58165.50	-2909707.39	1660	3.58	Submersible pump	Drinking water	yes	P8
KF-HC3	F8	Prt 13, Bankpan.	R Hirschowitz.	082 277 5334	Old wind pump NE of old farmhouse	55270.926	-2913745.45	1616	2.81	Wind Pump	Cattle watering and domestic	no	
KF-HC4	F9	Prt 13, Bankpan.	R Hirschowitz.	083 277 5334	Old farmhouse BH next to farm dam No WL access.	55147.94	-2913746.67	1616		Wind Pump	Cattle watering and domestic	yes	P1B
KF-HC5		Diepfontein			Newly Drilled exploration BH	52684.41	-2915452.54	1618	3.55	none	none	yes	P3A
KF-HC6		Diepfontein			Newly Drilled exploration BH	52789.693	-2915209.3	1615	2.7	none	none	No	
KF-HC7		Diepfontein			Old Farmhouse BH next to catchment dam.	52968.66	-2915642.91	1616		hand pump	Farm domestic	yes	P3C
KF-HC8		Kalabasfontein, 232IS, PTN8	R Hirschowitz.	083 277 5333	Old Wind pump replaced with submersible SE of main farmhouse and setup. Obtain water samples at main farm setup from tap.	55358.5	-2911285.69	1602.6	13.7	Submersible pump	Farm domestic	yes	P6A

2018 ID	2014 ID	Farm Name	Farm Owner	Contact Details	Description	X (WGS84 LO29)	Y (WGS84, LO29)	Alt (mamsl)	WL (mbgl)	Equipment	Use	Sampled	Sample ID
KF-HC9		Kalabasfontein, 232IS, PTN11	R Hirschowitz.	083 277 5333	Wind pump at workers houses. No WL measured. Obtained water sample from JoJo	55748.036	-2911772.18	1623		Wind Pump	Farm domestic	yes	P6B
KF-HC10		Kalabasfontein, 232IS, PTN7	R Hirschowitz.	083 277 5333	East of R38, Mono pump installed, BH 100m away from farm setup. Obtain Water sample at tap at farm setup. No WL	58176.76	-2912242.85	1655		Mono Pump	Farm domestic	yes	P5
KF-HC11		Kalabasfontein, 232IS, PTN13	R Hirschowitz.	083 277 5333	Borehole western side of R38 and Viskuile spruit. Equipped with hand pump, no WL measured. Obtain water sample.	54818.27	-2912295.29	1609		hand pump	Farm domestic	yes	P7

7.15.4 REGIONAL GROUNDWATER LEVEL

A linear correlation is observed between groundwater levels and surface topography in general. The correlation obtained for the 2014 and 2018 hydrocensus boreholes is 94% and 97% respectively. The boreholes from the Bankpan Area show deeper groundwater level data with an average water level elevation of 19 mbgl. The other boreholes show an average water level elevation of 6.2 mbgl. The difference in groundwater levels may be a result of:

- Deeper boreholes connected to the zone of de-watering from mining activities;
- Over utilisation of boreholes from farming activities.

This evidence suggests that the groundwater levels for the area generally mimic topography in the absence of anthropogenic activities in the identified aquifers. The correlation of groundwater levels versus surface topography further indicates that mining activities has a minor impact on the monitoring borehole groundwater levels in the area in general except for the Bankpan area, which needs to be confirmed with more detailed hydrogeological testing. Once it has been established that a correlation between the groundwater table and the topography exists, a Bayesian Interpolation, that incorporates both the topography and the measured groundwater elevations, can be done. The groundwater contours are graphically presented in Figure 45.

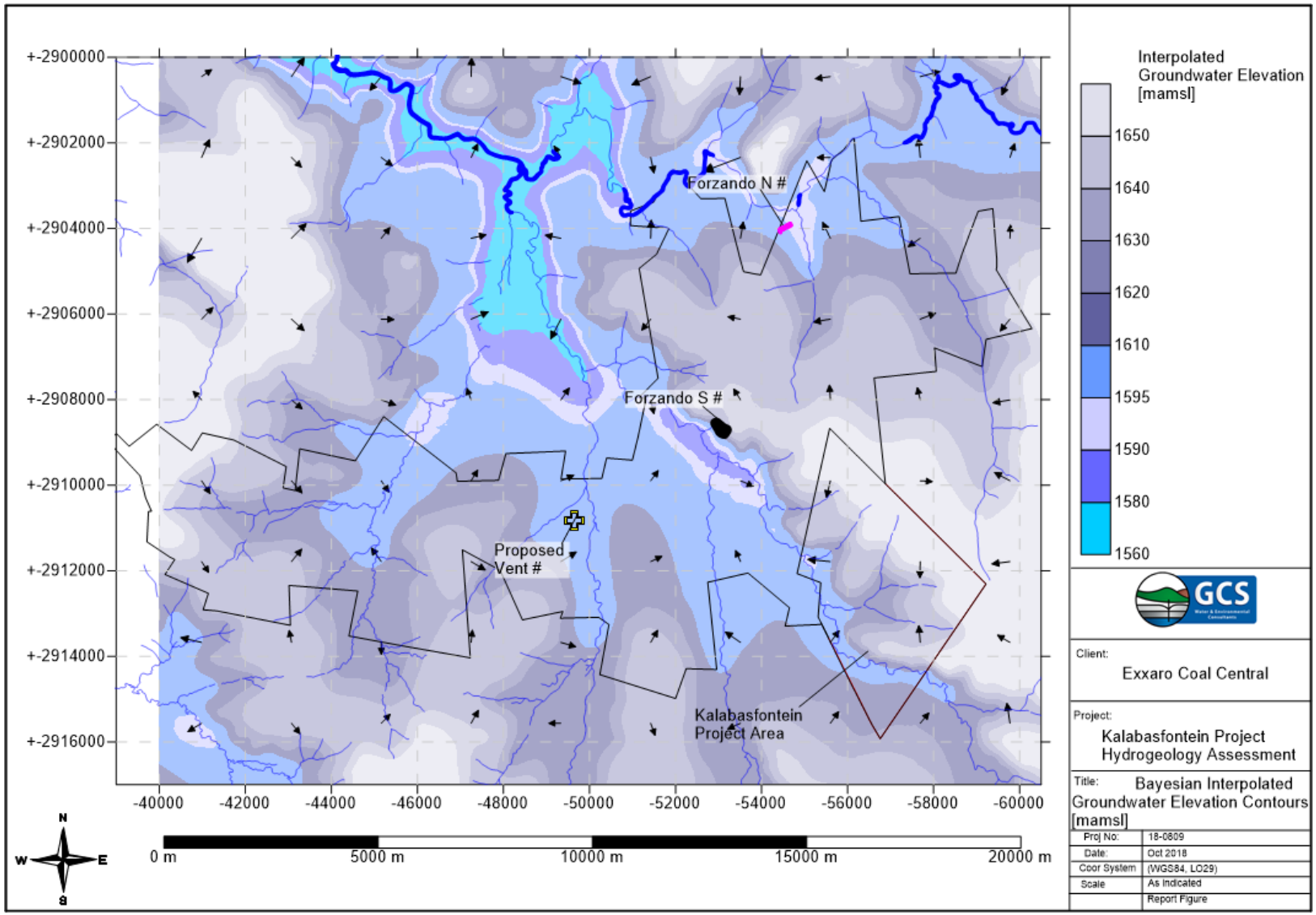

Figure 45: Bayesian Interpolated groundwater levels for the Forzando Mine Area

7.15.5 GROUNDWATER QUALITY ASSESSMENT

The analytical results were compared to the Department of Water Affairs' and Forestry (now DWS) South African Water Quality Guidelines for Domestic Use Target Water Quality Range (DWA SAWQ TWQR) and the South Africa National Standard (SANS 241-1:2011) for Drinking Water in order to evaluate the groundwater quality. It should be noted that these guidelines are intended for potable water use and not environmental compliance. The hydrochemistry results should be analysed in context of the natural ambient groundwater quality of the area.

7.15.5.1 REGIONAL AND AMBIENT WATER QUALITY DATA

According to the specialist report, the hydrocensus boreholes exceeded the following compliance objectives:

- Electrical conductivity of samples NBH7, NBH13 and KF-HC9 exceeded the least stringent limits as set by the SAWQG Domestic Use TWQR;
- Although the Ca concentrations are all fairly low (between 38 and 70 mg/l) it exceeded the SAWQG Domestic Use TWQR which is 32 mg/l;
- High Mg concentrations at NBH13 exceeded the SAWQG Domestic Use TWQR.;
- Three sites (KF HC 8, 9 and 11) exceeded the 100mg/l concentration level which marks the SAWQG Domestic Use TWQR; and
- Three sites, KF HC 2, 4 and 8, indicates NO_3 concentrations above TWQR.

7.15.5.2 FORZANDO GROUNDWATER MONITORING WATER QUALITY OVERVIEW

Sulphate concentrations at the two Forzando South Boreholes were found to be consistently low with some seasonal fluctuations for monitoring borehole FSGW3. The pH values were neutral for all monitoring boreholes.

7.15.6 GEOCHEMICAL ASSESSMENT

The Geochemical data was generated through three phases, two preliminary acid base accounting (ABA) exercises (2002 and 2010) and 1 detailed geochemical assessment phase conducted in 2014. The 2002 and 2010 data, as well as the detailed 2014 report is attached in Appendix C of the Hydrogeology report attached in Appendix 11 of this EIAR. The data will be used for the Kalabasfontein Project also since the coal characteristics are similar to the samples already analysed.

7.15.6.1 GEOCHEMICAL ASSESSMENT 2014

A total of fourteen (14) samples were collected for geochemical testing. The following concluding remarks can be made from the geochemical assessment:

- Sampling

A total of 14 samples from the discard dump and the underground roof and floor were collected for geochemical testing.

- Mineralogy

Pyrite was the only sulphide mineral detected in the samples. Pyrite is generally elevated in coal with respect to clastic rocks due to formation under reducing conditions. In general, oxidation of pyrite is a major source of acid-mine drainage generation;

Carbonate minerals detected include calcite, dolomite and siderite. Calcite and dolomite are important minerals in the neutralization of acidity produced by pyrite oxidation in acid-mine drainage (AMD) and frequently occurs in Karoo sedimentary rocks. Siderite does not contribute to the neutralization of AMD as it only neutralizes the acid generated by the oxidation of its own Fe;

- Acid-base Accounting and Net Acid Generation tests

The 4 roof and floor coal samples have a %S higher than ~1% and 1 sample with very high %S of 5.17%. The neutralization potential of 2 samples are very low compared to the acid potential and have a significant potential to generate acid mine drainage. The other 2 samples have a higher neutralization potential but are still likely to generate acid mine drainage. The NAG test results confirmed that the first samples have the potential to generate acid mine drainage, but the latter 2 did not acidify during the test;

4 of the 5 discard samples have a %S higher than ~1% and 1 sample 0.46%. The samples have a relatively low, to no, neutralization potential compared to the acid potential and are most likely to generate acid mine drainage. Only 2 of the 5 samples acidified during the NAG test;

The 3 slurry samples have a %S higher than 0.3%, 1 sample has a very high %S of 2.60%. The samples have a high acid potential and low neutralization potential and have a significant potential to generate acid mine drainage. 1 sample acidified during the NAG test and the other 2 were classified as uncertain;

The run of mine sample has a %S of 0.78%. The sample has almost no neutralization potential and is likely to generate acid mine drainage. During the NAG test the samples also acidified;

Overall, it could be concluded that both the coal samples from the underground as well as the discard samples have a significant potential to generate acid mine drainage/seepage under oxidizing conditions. Whether acidification will actually take place will depend on the availability of oxygen and the ability of the host rock to buffer any ARD (which is fortunately high in Ca and Mg minerals).

- Potential impact on drainage quality

Discard dump: Most discard will form hot-spot material and will acidify over the long-term. Hot spot interburden material will have a SO_4 of probably up to 4 500 mg/l although it will vary over the dump (even up to 8 000 mg/l in high %S discard);

Underground: Acid-mine drainage generation in the underground will depend on the oxygen ingress vs time for the mine to flood. While oxygen is still present, the underground mine water will reach SO_4 concentrations of about 2 700 - 2 900 mg/l for the higher (4% of MAP) and lower recharge rates (2% MAP) respectively. After oxygen is depleted no more SO_4 is generated and the mine water will slowly be flushed with infiltrating groundwater. The recharge on the underground mine is however so low that SO_4 will remain at a fairly constant concentration of around 2 500 - 2 800 mg/l for several decades;

It is not foreseen that metals will be significantly present in neutral drainage conditions. Al, Fe and Mn will be present at elevated concentrations in acidic mine drainage conditions. Other metals that may leach in acidic drainage conditions include Ni, Co and Pb.

7.15.7 NUMERICAL GROUNDWATER MODEL

The numerical model used by the hydrogeologist was based on the hydrogeological conceptual model and numerical groundwater model developed in the previous studies (GCS, 2009 and 2014). The model was updated with the 2018 field work data, as well as monitoring, geology and mine plan data received from the client. Updated changes were also applied to the model and includes grid and layer refinement as well as model boundary refinement.

The scenarios to be simulated using the Forzando regional model include the following:

- Potential groundwater ingress;
- Groundwater drawdown; and
- The potential extent of groundwater contamination from both the mine workings and the surface infrastructure.

Although the groundwater model included the Forzando North and South mining areas, as well as the Kalabasfontein Project area, the discussion below is applicable to Forzando South mining area and the Kalabasfontein Project area.

7.15.7.1 STATUS QUO OF GROUNDWATER QUANTITY (GROUNDWATER LEVEL DRAWDOWN)

The mine workings will have an impact in terms of groundwater flow because of the current zone of de-watering or "cone of depression" around the underground workings. Influx rates of water into underground bord-and-pillar areas are usually low. Water seeps are usually present in the coalface of a new and existing development within the South African coal fields and Karoo formations. The vertical hydraulic conductivity of the over- and underlying sediments is too low to convey significant amounts of water into underground mines. Sub-vertical fissures that yield water for a limited period (weeks rather than months) may be intersected on occasion. In exceptional cases, a sustained but low flow of groundwater may be intersected. Instances where coal mining had to stop for a length of time because of groundwater influx are almost non-existing.

The accurate quantification of groundwater influx into bord-and-pillar workings is difficult. A vast number of depressions in the coal floor exist where water accumulates. Water on the coal seam is usually only notable when it interferes with mining.

Mining and associated dewatering activities will result in some inflow of groundwater into the mine which could reduce the groundwater available to local farm users. The extent of dewatering of the upper aquifer system is expected to be minimal and will be confined to parts of the existing areas at Forzando and proposed mining (Kalabasfontein) area where the depth to the seam is shallow (i.e.25- 30 m below surface) and where geology structures connects the upper weathered zone with the lower S4 seam and associated geological formations.

7.15.7.1.1 FORZANDO SOUTH AREA

For the calibration of the Forzando South/West area the proposed Kalabasfontein Project area was included. The model was calibrated on the current predicted and assumed inflow rates which is in the order of 500 to 1000 m^3/day. However, current figures from the client suggest significantly lower pump rates to surface; volumes between 200 and 500 m^3/day were historically measured but since Oct 2016 these reduced significantly to below 100 m^3/day (Figure 46). At the time of modelling it was uncertain how much water is used underground and how much is stored underground.

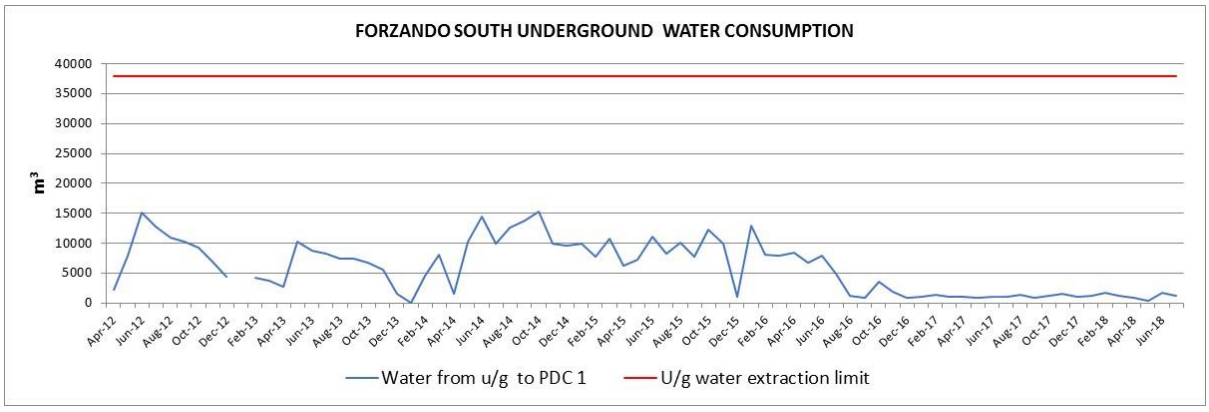

Figure 46: Data graph Water pump from FS UG workings (ECC, 2018).

7.15.7.1.2 WATER BALANCE CONSIDERATIONS

The results of the Water Balance (GCS, 2014 /Ref13-609) show that:

- From the results it can also be seen that the process unit that accounts for the largest amount of water is the underground workings - a total of 418 752m^3/a (1 147.26 m^3/day) flows in and out of the underground workings. An average of 887 m^3/day was applied.
- The Water Balance also shows that water from PCD 1 and PCD 3 is pumped into PCD 2, where a total of 334 611 m^3/a is then pumped to Erickson Dam 1 and Erickson Dam 2. Water from Erickson Dams 1 and 2 is then pumped into the underground workings and the crusher, where it is re-used. The remaining water is then used for dust suppression - an annual average of 272 379 m^3/a.

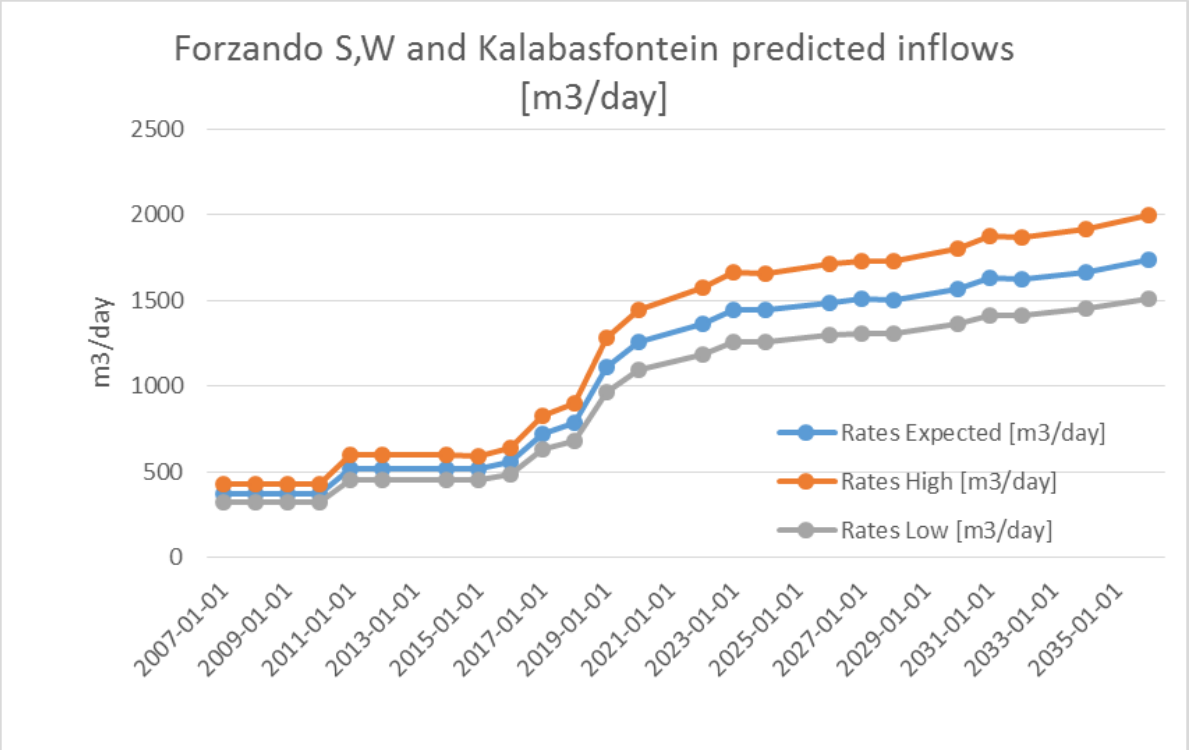

Figure 47: Simulated inflow rates for the Forzando South Area

7.15.7.2 REGIONAL AQUIFER DRAWDOWN PREDICTION

The current status (2018) of regional aquifer drawdown is presented in Figure 48; the numerical groundwater models' drawdown simulation was completed in transient state and available groundwater level trends were applied together with the calibrated or pre-defined inflow rates discussed above

The maximum aquifer drawdown is in the region of 3 to 5m within the shallow upper aquifer system but in certain areas this may be higher. No trend graphs exist for the regional farm boreholes and this can be highlighted as a critical feature going forward. No real evidence can be used to simulate any potential or current farm boreholes in the numerical model because not enough data for trends exist. Also, it is uncertain if aquifer drawdown at farm boreholes are caused by farming activities or de-watering activities from the mine or a combination of the two.

The life of mine (LOM) predicted aquifer drawdown zone can be viewed in Figure 49. The identified farm boreholes that are, and may be in future, impacted on are marked on the map.

7.15.7.3 POTENTIAL FOR STREAM FLOW REDUCTION DUE TO SHALLOW AQUIFER DRAWDOWN

It is not foreseen that any significant stream flow reduction will occur within the Viskuile Spruit and/or the Olifants River due to the aquifer drawdown in the area. The numerical model indicated a short period of maximum drawdown and restricted to the area around the Forzando South Adit area. Baseflow may be slightly reduced in this area and this will only be evident during the dry winter months.

To start with monitoring shallow aquifer characteristics within the Forzando South and Kalabasfontein Project Area it is proposed that shallow groundwater monitoring sites be installed during the operations phase to determine any impact on shallow groundwater flow conditions. This information will be used to update impact assessment and model calibration. Refer to Figure 49.

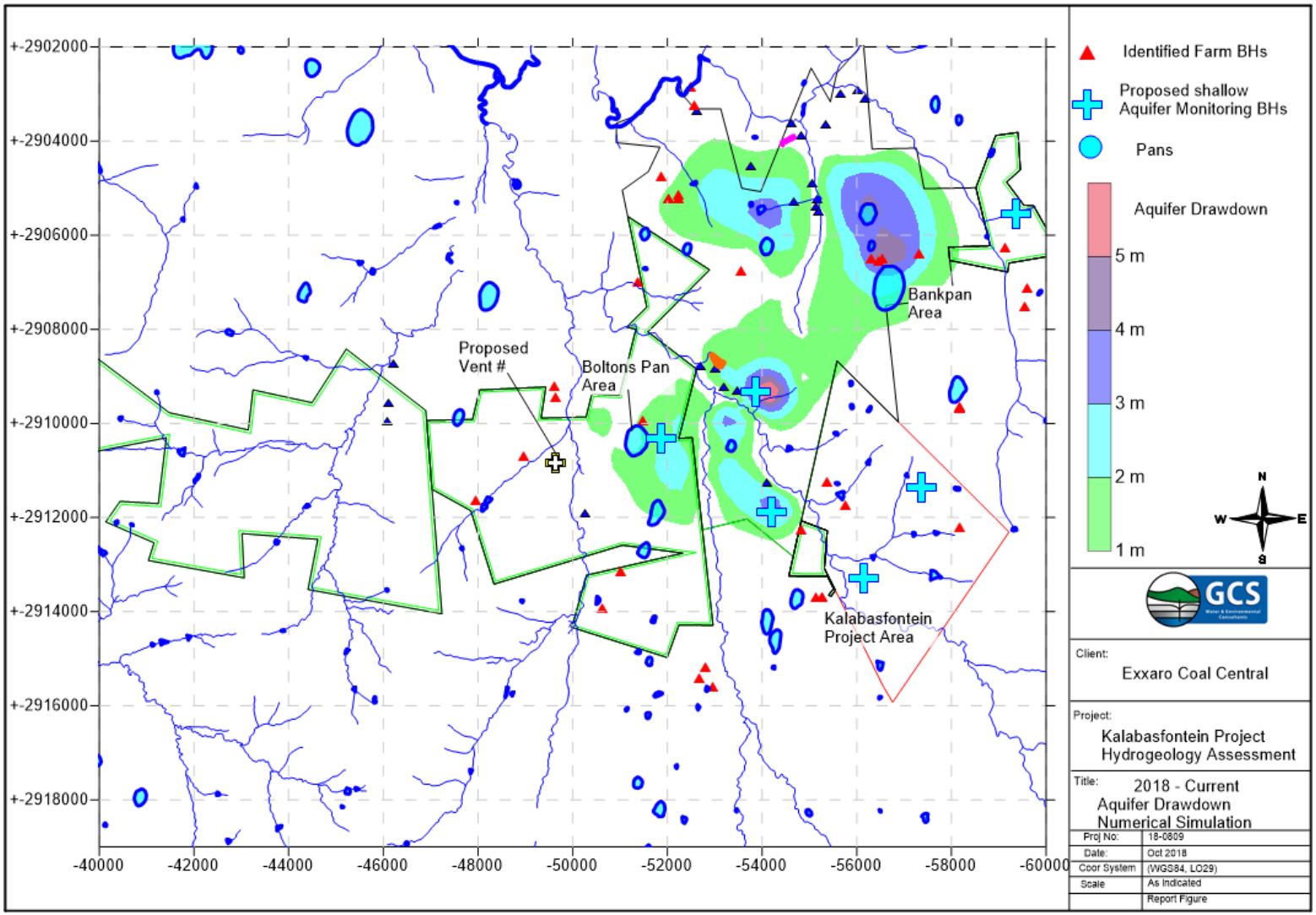

Figure 48: Forzando North and South regional groundwater dewatering contours in meter [m] – Status Quo

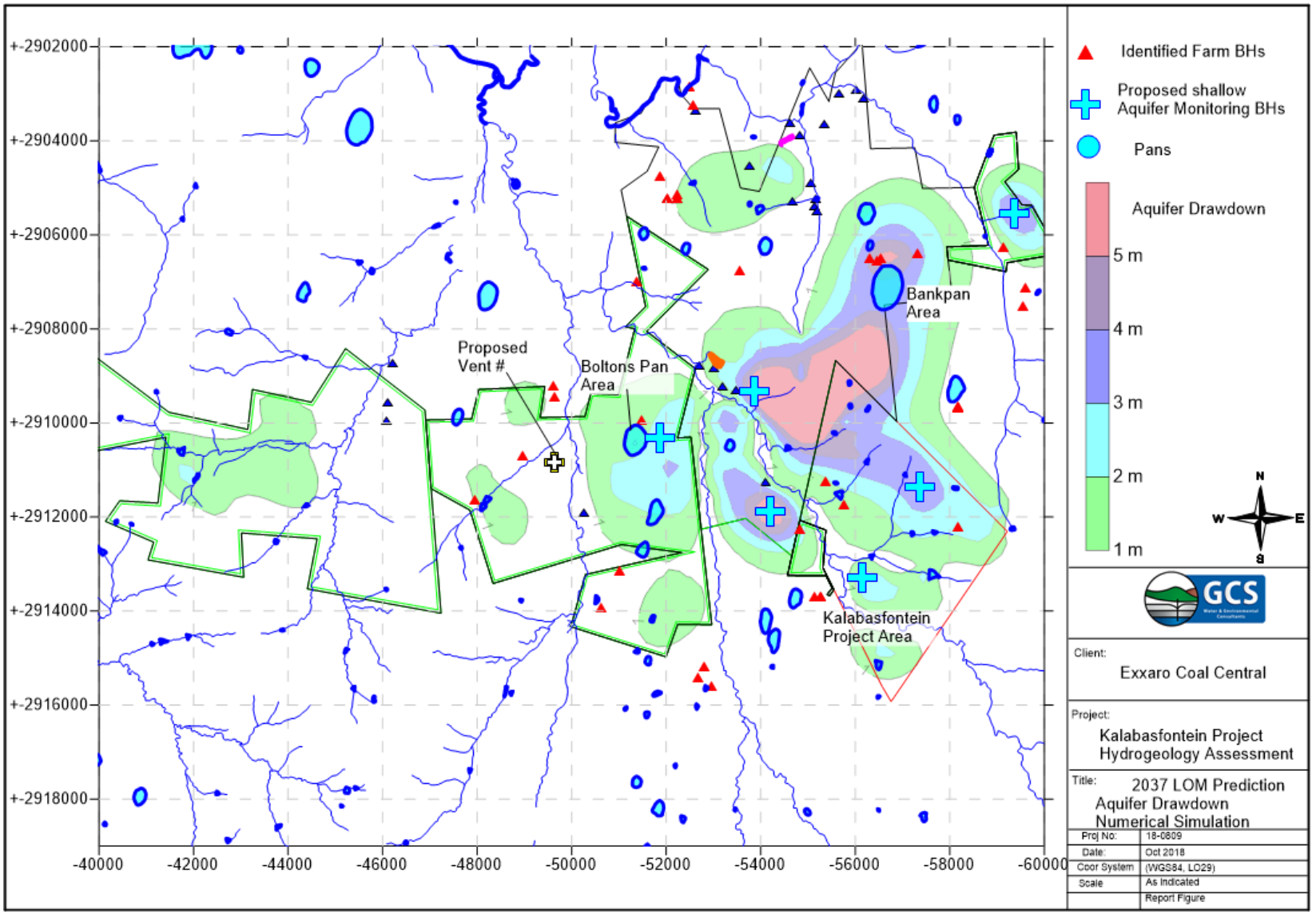

Figure 49: Forzando North and South regional groundwater dewatering contours in meter [m] – LOM prediction

7.15.7.4 MASS TRANSPORT CALIBRATION

The calibrated flow model was applied to simulate the transport or potential transport of mass which, for the purpose of the model, will be sulphate. The mass transport model is calibrated against available sulphate data as received from the monitoring phases; Figure 50 shows the correlation achieved between the monitoring data and the model simulated or "calculated" sulphate values. The correlation achieved was satisfactory and it is fair to assume that the sulphate plumes, as presented below, reflects the real field scenario and current status scenario (GCS, 2009).

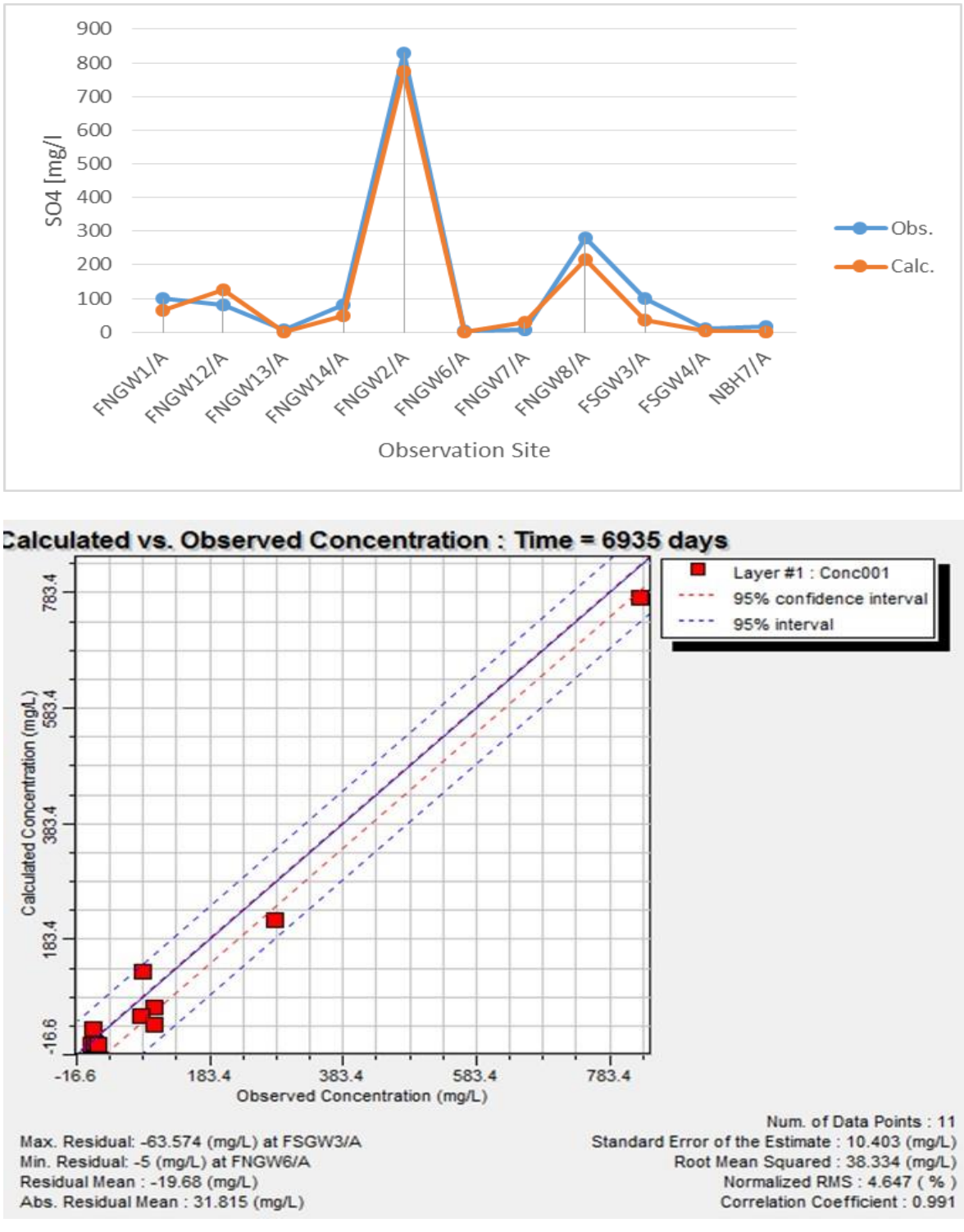

Figure 50: Current status Mass Transport calibration outcome for the Forzando Operations – shallow aquifer

7.15.7.4.1 CURRENT SULPHATE STATUS

As most of the surface infrastructure, like the processing plant and waste storage facilities, are located at Forzando North, the majority of sulphate leachate or potential leachate will occur in this area. These shallow seepage or sulphate plumes will eventually discharge into streams and rivers as baseflow[3]. The extent of the sulphate plumes in the shallow aquifer are available in Figure 51 below.

Monitoring boreholes FNGW2 and FNGW8, located down gradient of the PCDs and discard dump area, are impacted by typical mining related contaminants (i.e. sulphate). However, none of the other monitoring sites currently indicate sulphate seepage or saline mine drainage. As mentioned earlier, the pH readings remain neutral and metal concentrations low. Some degree of shallow seepage from the underground mine workings may occur and these zones are also demarcated on the map in Figure 51. These were only demarcated as a precautionary management toll and need to be re-calibrated after field confirmations. Field confirmations will include EC profiling of streams during wet and dry seasons.

Groundwater flow directions will be directed towards the mining areas during the operational phase due to mine dewatering. Therefore, contamination will be contained within the mining area, and little contamination will be able to migrate away from the mining area within the deeper horizons.

No monitoring boreholes exist within the underground workings to monitor the re-bound rate or recharge of the underground mine area. Sulphate is currently monitored at three different locations as previously discussed.

The plume map in Figure 52 can be regarded as a simplified version of current sulphate distribution in the deeper horizons. However, the mass transport has been modelled based on the worst-case scenario, therefore the model represents the maximum expected extent of the sulphate plume within the deeper aquifer systems.

[3] *Baseflow (also called drought flow, groundwater recession flow, low flow, low-water flow, low-water discharge and sustained or fair-weather runoff) is the portion of streamflow that comes from "the sum of deep subsurface flow and delayed shallow subsurface flow". It should not be confused with groundwater flow.*

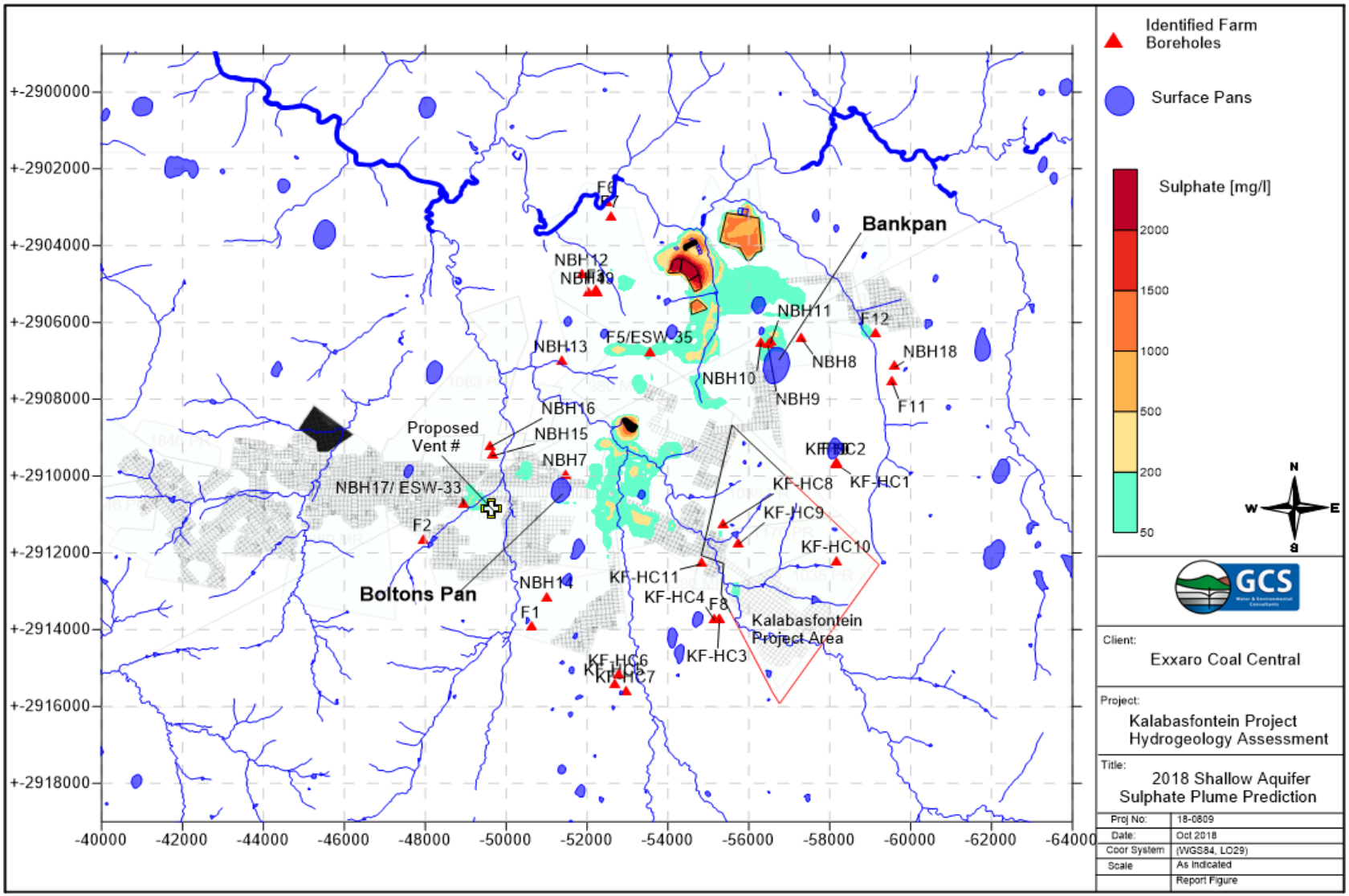

Figure 51: Current status sulphate contour map for the Forzando Coal Mines – Shallow Aquifer

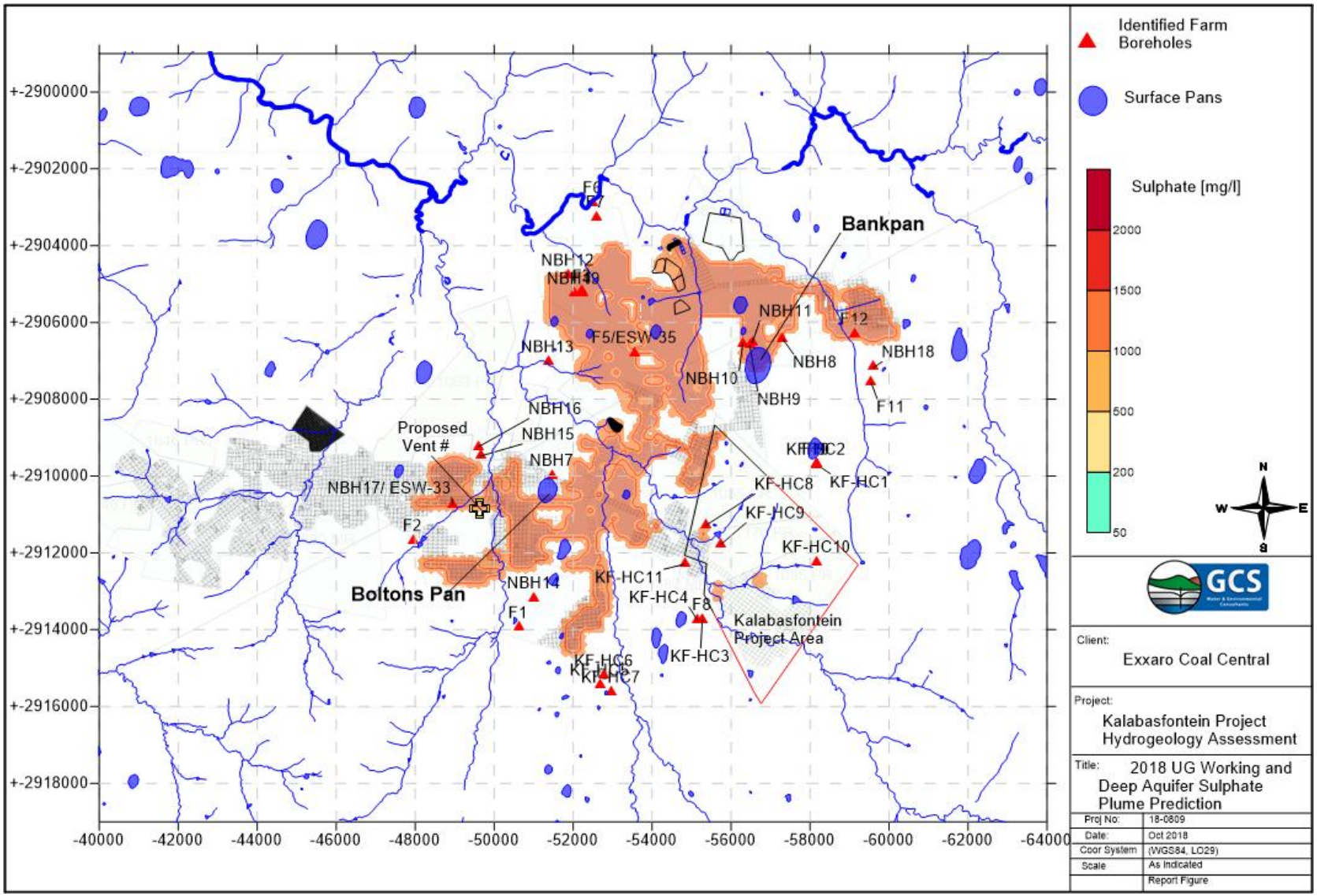

Figure 52: Sulphate contour map for the Forzando Coal Mines – Deeper Aquifer / Coal Horizon

7.16 AIR QUALITY

Mining operations like drilling, blasting, hauling, and transportation are the major sources of emissions and air pollution. Emissions of particulate matter and nuisance dust will result from mineral plant operations such as crushing, screening and processing for final transportation. Fugitive emissions are also possible from roads and open stockpiles.

Nuisance dust can reduce visibility; soil or damage buildings and other materials; and increase costs due to the need for washing, cleaning and repainting. Plants can be affected by dust fallout through reduced light transmission which affects photosynthesis and can result in decreased growth. Fallout dust can also collect in watercourse causing sedimentation and a reduction in the water quality and can also affect aquatic life through the smothering of riverine habitat and fish gill clogging. Coarse dust particles are produced during mining operations which can lead to an increase in fallout dust. An Air Quality assessment was undertaken by WSP Environmental (Pty) Ltd. (refer to Appendix 15).

7.16.1 DUST FALLOUT MONITORING

Forzando South currently operates a network of two dust fallout samplers, as indicated in Figure 53. Over the monitoring period of January to December 2019, the dust fallout levels fell below the non-residential standard at both sites. As such, these two sites are complaint with the non-residential standard. The dust fallout monitoring results are indicated in Table 22.

Table 22: Dust fall-out monitoring results

Period	National Non-residential Standard (mg/m^2/day)	T1 (mg/m^2/day)	T2 (mg/m^2/day)
Jan 2019	1200	Contaminated	367
Feb 2019	1200	Contaminated	Contaminated
Mar 2019	1200	241	354
Apr 2019	1200	49,3	184
May 2019	1200	298	197
Jun 2019	1200	463	216
Jul 2019	1200	679	233
Aug 2019	1200	480	215
Sep 2019	1200	477	246
Oct 2019	1200	296	270
Nov 2019	1200	675	516
Dec 2019	1200	336	249
Exceedances		-	-

Figure 53: Dust monitoring points

7.16.2 SENSITIVE RECEPTORS

Receptors are identified as areas that may be impacted negatively due to emissions from the Kalabasfontein project. Examples of receptors include, but are not limited to school, shopping centres, hospitals, office blocks and residential areas. Twenty sensitive receptors were identified for the proposed Kalabasfontein project and are presented in Figure 54.

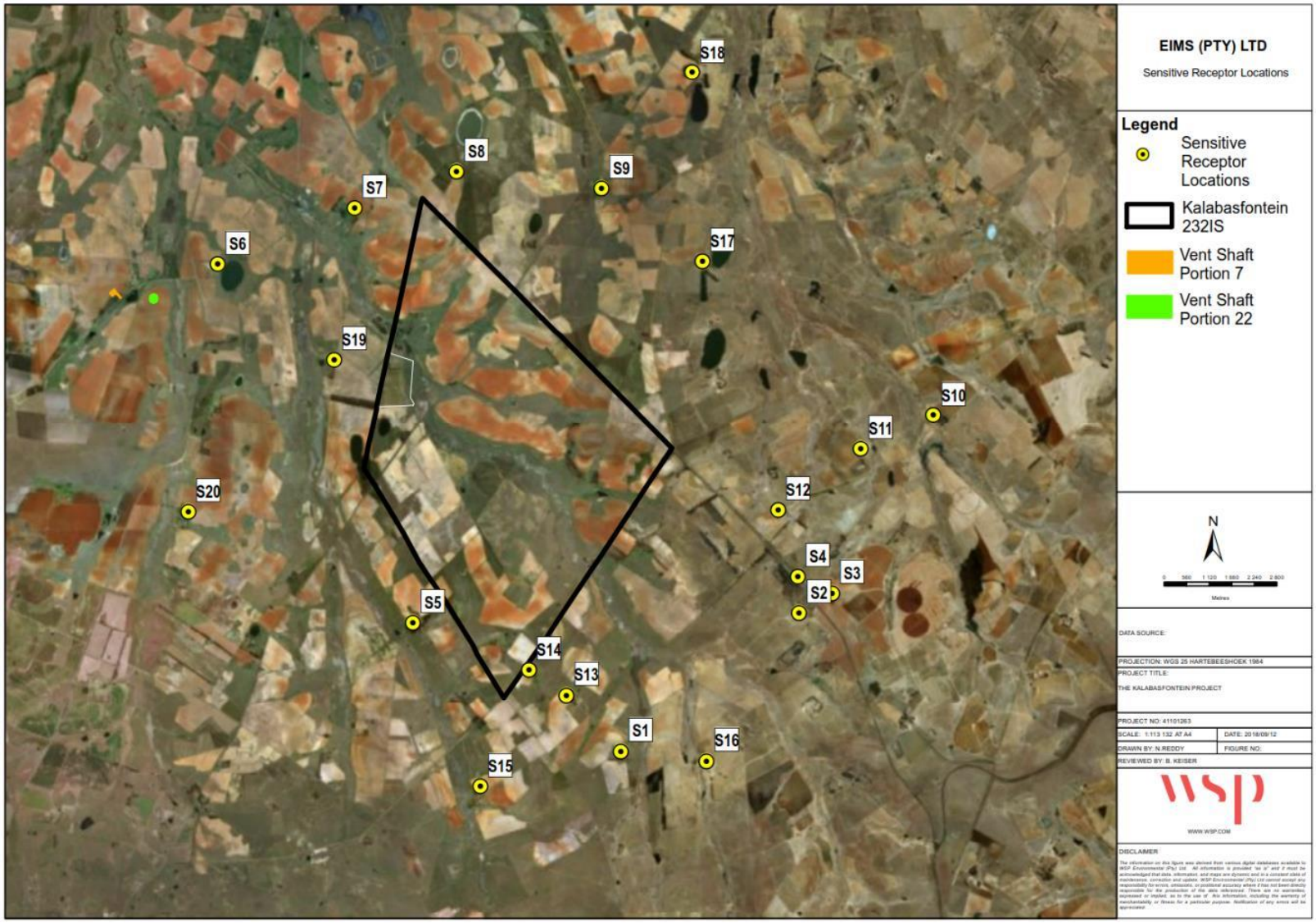

Figure 54: Sensitive receptors within and around the Kalabasfontein project area

7.16.3 AIR EMISSION MODEL

An emission inventory was developed using site-specific data and emission factors sourced from the United States Environmental Protection Agency database. This emissions inventory was input into a Level Two atmospheric dispersion model, AERMOD, together with prognostic MM5 meteorological data, to calculate ambient air concentrations at specific sensitive receptors of key pollutants, associated with the proposed operations. Twenty sensitive receptors were identified for the Kalabasfontein project area, within a 10km radius, and were used for assessment.

Construction activities for the ventilation shaft area was estimated on an area wide basis. The emission rate used to calculate such emissions is environmentally conservative for most construction sites, with results likely being higher than those that will be experienced in reality. Furthermore, construction activities are transient in nature. Therefore, the construction phase has only been semi-quantitatively been assessed.

Long-term (annual) and short-term (24-hour average) concentrations for the pollutants of concern for the operational phase were compared with the applicable National Ambient Air Quality Standards (NAAQS).

Dispersion modelling simulations for the mitigated operational phase indicate the:

- The highest offsite 24-hour average PM_{10} concentrations for 2015- 2017, 2015, 2016 and 2017 are approximately 232 µg/m^3, 232 µg/m^3, 227 µg/m^3 and 245 µg/m^3 respectively. All predicted concentrations exceed the 24-hour PM_{10} NAAQS of 75 µg/m^3 for each year. This exceedance occurs approximately 2.85km away from the project boundary at the primary crushing area (i.e. the largest contribution to emissions).

- The highest offsite period average concentrations for 2015- 2017, 2015, 2016 and 2017 are approximately 66 µg/m^3, 64 µg/m^3, 70 µg/m^3 and 60 µg/m^3 respectively. All predicted concentrations exceed the annual PM_{10} NAAQS of 40 µg/m^3. This occurs approximately 2.7 km away from the primary project area at the primary crushing site.

- The highest offsite 24-hour average PM_{25} concentrations for 2015-2017, 2015, 2016 and 2017 are approximately 60 µg/m^3, 57 µg/m^3, 60 µg/m^3 and 62 µg/m^3 respectively. All predicted concentrations exceed the 24-hour PM_{25} NAAQS of 40 µg/m^3 for each year. This occurs approximately 2.7 km away from the primary project area at the primary crushing site.

- The highest offsite period average concentrations for 2015-2017, 2015, 2016 and 2017 are approximately 15 µg/m^3, 14 µg/m^3, 16 µg/m^3 and 14 µg/m^3 respectively. All predicted concentrations demonstrate compliance with the annual PM_{25} NAAQS of 20 µg/m^3. Predicted period and annual PM_{25} average concentrations for 2015, 2016 and 2017 also demonstrate compliance with the annual average PM_{25} NAAQS at all sensitive receptors.

- Predicted dust fallout concentrations for 2015-2017, 2015, 2016 and 2017 are below the residential standard at all sensitive receptor locations. Large dust particles do not remain suspended for long distances and are likely to deposit in closer proximity to emission source. At such maximum predicted offsite concentrations have not been presented in the Air Quality study due to the over estimation of the model, whilst in reality they are likely to be much lower.

All impacts of the proposed project were evaluated (refer to Section 9). The resultant air quality risks for sensitive receptors were ranked as “low” during the construction and operational phases, with mitigation in place.

7.17 GREENHOUSE GAS EMISSION INVENTORY

WSP Environmental (Pty) Ltd. compiled a Greenhouse Gas (GHG) emissions inventory and report for the proposed Kalabasfontein Project (refer to Appendix 15).

In line with the National Environmental Management: Air Quality Act 39 of 2004 (NEM:AQA), Government Notice of 275 of 2017 (Government Gazette 40762), the National Greenhouse Gas Emission Reporting Regulations promulgated on 3 April 2017 requires all qualifying process activities in Annexure 1 to be quantified

and submitted. Activities undertaken for the Kalabasfontein Project fall within the Energy Sector for Coal Mining and Handling under Annexure 1 of the National Greenhouse Gas Reporting Regulations and as such, must quantify such information. Under Section 29 of the NEM:AQA 39 of 2004, Government Notice 710 of 2017 (Government Gazette 40996), the GHGs (carbon dioxide, (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6)) have been declared as priority pollutants. The key GHG emissions associated with activities for the Kalabasfontein Project will only include CO_2, CH_4, and N_2O from the diesel, coal and electricity usage for mining operations. Further, persons falling within the list of production processes, specified in Annexure A, which involves emission of GHGs in excess of 0.1 Mt annually are required to prepare and submit to the Minister pollution prevention plans for approval. The operations for the proposed Kalabasfontein Project triggers the Coal Mining process outlined in Annexure A, but will not be in excess of 0.1 Mt GHG annually. As such, a pollution prevention plan will not be required.

As per the GHG reporting regulations, Tier 1 mission factors (IPCC default factors) are applied for diesel consumption and Tier 2 (country specific) emission factors are applied for coal and electricity consumption to estimate GHG emissions for the Kalabasfontein Project. Additionally, GHG emission activities are divided into three scopes of which only two scopes are applicable to the Kalabasfontein Project (Scope 1 – direct emissions, and Scope 2 – indirect emissions) within the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard.

The Kalabasfontein Project will not add to the production of Forzando South but will provide relocation areas for the existing Forzando South sections. As such, existing diesel, coal and electricity consumption data from the Forzando South relocation sections for the 2015-2017 period was used to estimate the current emissions (refer to Table 23).

The total GHG emissions for the year 2017 was estimated to be 82,354 t CO_{2eq} (CO_2 equivalent terms to reflect the contribution of the various GHG emissions), which is approximately a 6% increase from both 2016 and 2015, respectively. Within the Scope 1 sources for 2015 to 2017, the coal consumption from underground mining contribute the highest GHG emissions, which make up 57%, 68% and 69%, respectively of the total CO_{2eq} emissions. Scope 2 (i.e. electricity consumption) contributes to 42%, 32% and 30% for 2015, 2016 and 2017 of the total CO_{2eq} emissions.

Table 23: Source specific greenhouse gas emissions for 2015 – 2017

Scope	Source	Main Activity	2015 Total CO_2e (tons/year)	2016 Total CO_2e (tons/year	2017 Total CO_2e (tons/year
Scope 1	Diesel consumption	Underground machinery	662.52	662.47	824.42
	Coal consumption	Mined for export market	33,814.92	37,699.85	38,306.26
Scope 2	Electricity consumption	Underground machinery, support services, administration buildings and change house	37,069.92	26,143.72	24,737.58
TOTAL GHG EMISSIONS			**71,547.36**	**64,506.04**	**63,868.26**

Proposed emissions for the Kalabasfontein Project have, therefore, been determined by taking an average of the existing diesel, coal and electricity consumption data from the Forzando South relocation sections for the 2015 -2017 period (refer to Table 24). Given the similar trends over the past three years, it is assumed that this will be an accurate representation of the likely GHG emissions emitted from the Kalabasfontein Project.

Table 24: Gas, petrol, diesel and electricity consumption data for the Kalabasfontein Project

Scope	Source	Main Activity	Unit	Quantity/Annum
Scope 1	Diesel consumption	Underground machinery	Litres	**270,061.10**
	Coal consumption	Mined for export market	Tonnes	**2,276,060**
Scope 2	**Electricity consumption**	**Underground machinery, support services, administration buildings and change house**	**MWh**	**42,405.68**

The total GHG emissions for the Kalabasfontein Project was estimated to be 82,917 t CO_{2eq} (refer to Table 25). Within the Scope 1 sources, the coal consumption from underground mining contribute the highest GHG emissions, which make up 44%, respectively of the total CO_{2eq} emissions. Scope 2 contributes to 55% of the total CO_{2eq} emissions.

Table 25: Source specific greenhouse gas emissions for the Kalabasfontein Project

Scope	Source	Main Activity	CO_2 (tons/year)	CH_4 (tons/year)	N_2O (tons/year)	Total CO_2e (tons/year)
Scope 1	Diesel consumption	Underground machinery	716.41	0.73	1.73	**718.87**
	Coal consumption	Mined for export market	389.21	36,217.80	-	**36,607.01**
Scope 2	Electricity consumption	Underground machinery, support services, administration buildings and change house	45,374.08	11.56	205.98	**45,591.61**
TOTAL GHG EMISSIONS						**82,917.49**

Additionally, according to the climate action tracker analysis, South Africa will need to implement additional policies to reach its proposed targets to limit GHG emissions to between 398 and 614 $MtCO_{2eq}$ over the period 2025–2030, and as such, the Kalabasfontein Project should seek methodologies in order to reduce their GHG emissions and become environmentally friendly.

7.18 TRAFFIC STUDY

A traffic study was conducted by Beal Consulting Engineering and Project Management (refer to Appendix 16). A site inspection was conducted on 27th September 2018 and included observations and photography in and around the project area. The purpose of the specialist traffic study was to evaluate the impact of project-related traffic on the receiving environment, to propose alternative mitigation measures, and to identify any conditions for inclusion in the Environmental Authorisation and EMPR.

Four scenarios have been defined by the traffic specialist, namely:

- Baseline scenario (current);
- Interim scenario (construction phase of the mine expansion/relocation);
- Sustained scenario (post-construction phase for the duration of mining); and
- Closure scenario (during closure of the mine and incline, and thereafter).

7.18.1 BASELINE SCENARIO

7.18.1.1 EXISTING MINE INFRASTRUCTURE

The existing Forzando South Coal Mine surface infrastructure comprises of an incline providing access to the underground workings, an adjacent office complex and workshop, conveyor infrastructure, ventilation shaft, and other engineering and environmental infrastructure. The proposed Kalabasfontein Project will make use of all of the infrastructure, without any changes or upgrades.

7.18.1.2 SITE ACCESS CONTROL

The Forzando South Coal Mine complex is served by the main access gate and one maintenance gate, about 500 m apart. The public road network connecting the mine complex is shown in Figure 55 below. The network elements are discussed subsequently.

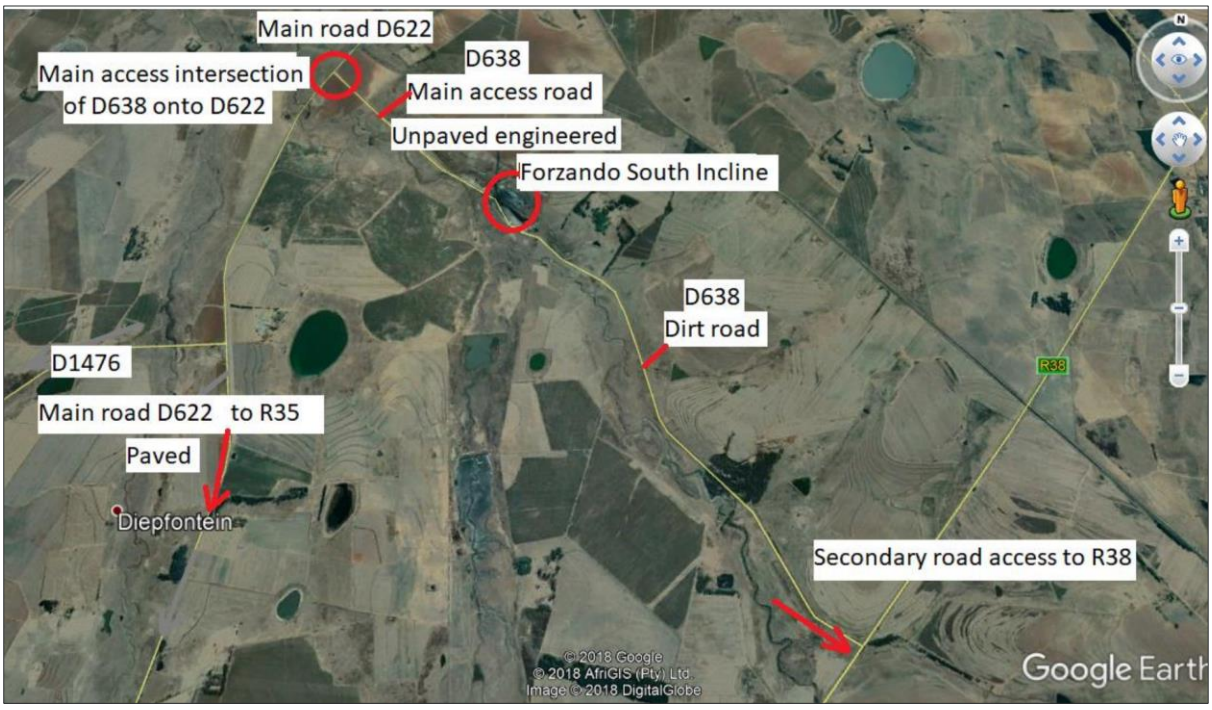

Figure 55: Road network around Forzando South and the Kalabasfontein Project area

The mine complex is connected by an engineered unpaved road (D638) to the nearest paved road (D622) approximately 2.3 km to the north-west. The road reserve of D638 is 8 m wide with no low-level stream crossings (drifts) or narrow bridges that could restrict access to large vehicles (even abnormal loads). The road is being maintained by the mine despite it being a public road. The road does not meet the required standard commensurate with its road class and function and is in need of spot improvement and re-gravelling to provide safe all-weather travelling.

7.18.1.3 CURRENT TRAFFIC PATTERNS

Sudor Coal and Overlooked Colliery are among the mines in the area that currently transport coal product via the roads in the study area. No coal from the Forzando South Coal Mine is however conveyed by road, since all haulage is undertaken by conveyor. This will remain the case with the proposed Kalabasfontein Project.

Due to the proximity to town, no housing is or will be provided on site, except for very limited residential facilities on an adjacent farm to the south-east of the mine complex.

There is no school in the area. The majority of workers is shuttled by mine bus daily between Bethal and the mine. The number of white-collar workers using private transport is limited. During the site visit on Thursday 27 September 2018, less than 30 cars were observed around 12h00 in the staff car park. Another 20 cars or less were observed in the visitor's car park.

It is imagined that visitor trips are spread throughout the day. During the entire traverse by the authors from the R38 to the junction with the paved road D622 in the north, only one small car and one agricultural implement were observed using RoadD638. Worker trips (both by shuttle and private) are expected to be concentrated in the morning and afternoon peak hours, during which an estimated 30 light vehicles and perhaps two of three taxi-buses will enter and exit the complex.

All mine traffic uses the main access road D638 to the north-west, most of which turning left onto the paved district road D622, and connecting to the R35, where most traffic turns left to Bethal. The mine uses the secondary dirt road D638 to the south-east only as far as the adjacent residential farm goes, and very little through traffic (those trips not connected to the mine) uses this road to and from R38. Use of this road is almost exclusively limited to the few farms south of the mine that do not have an alternative access road to the main road network.

7.18.2 INTERIM SCENARIO

The Interim Scenario refers to the duration of the transition from the current southern mining area to the proposed Kalabasfontein mining area adjacent to the north.

No upgrading of the surface infrastructure at the existing mining complex will take place. The mining equipment currently mining the Forzando South mining area will continue to mine the proposed Kalabasfontein mining area, and no general upscaling or replacement of equipment is envisaged.

Based on the above, no additional traffic will be generated during the transition phase. This phase was thus not assessed further.

7.18.3 SUSTAINED SCENARIO

The sustained scenario refers to the post-transition phase, when the proposed Kalabasfontein Project has fully substituted the current Forzando South Coal Mine.

The existing access incline and conveyor system will be retained in their current form. Still, no road haulage of product will be done from the proposed Kalabasfontein mining area. The proposed new ventilation shaft, some five kms to the west of the Forzando South Coal Mine incline, will not generate notable traffic and will thus have no traffic impact at all.

Production will remain at the current level, during the transition phase, the operations phase, up until the closure phase. It thus follows that the sustained scenario will generate traffic volumes of the same level and patterns as currently.

No alterations are foreseen to the adjacent road network and access arrangements. The default scenario is that all access roads will remain public roads, unless the mine pursues the closure of the secondary dirt road D638 where it passes the mine complex, meaning that south of the mine it will remain a public road but that through traffic is disallowed.

7.18.4 CLOSURE SCENARIO

The closure scenario refers to the post-mining phase when all mining has ceased. During the closure phase the incline with associated mining infrastructure will be dismantled, and the land rehabilitated. During these operations, traffic volumes on D638 can be expected to increase temporarily. Upon completion of closure, traffic volumes on D638 will drop to well below current levels.

7.19 VISUAL

At present the visual character of the area is dominated by agricultural activities (maize cultivation and grazing of cattle), as well as mining related infrastructures such as the existing plant area and existing coal discard facilities. The mine site is located remotely from any substantial population settlement or any major thoroughfares. As a result, the limited deterioration in aesthetic quality will only be witnessed by the persons located in close proximity of the mine site. Furthermore, the infrastructure related to the mine is limited in height and does not involve any facility to a height of greater than approximately 50m. The undulating nature

of the surrounding landscape is effective in concealing the mine related infrastructure from the surrounding area at present (GCS (Pty) Ltd, 2010). Since there will be minimal surface infrastructure for the Kalabasfontein Project, the visual impact of the proposed project is relatively low.

7.20 BLASTING AND VIBRATION

Blast Management and Consulting undertook a blasting and vibration study (refer to Appendix 17) in order to determine the impact of blasting on the surrounding environment. The Kalabasfontein Project was reviewed on impact assessment phase. Points of interest were identified for possible influence. Various installations were identified within close proximity of the mining surface area. The possible influences and level of influence were investigated. A summary of the results is indicated in the below sections.

7.20.1 SOURCE AND RECEIVING ENVIRONMENT

The receiving environment is considered as the area expected to be influenced directly and adjacent to the Kalabasfontein Project Area. Figure 56 shows the location of the Kalabasfontein Project Area and the anticipated receiving environment around the mining area, indicated as the project area.

In a blasting operation, the receiving environment is classed into three areas. The areas are defined by the type of operation and the expected levels of influence generated. In an opencast environment the range of influence is expected to be rather large up to 3500 m primarily or in some cases even further. In an underground blasting environment, the possible influence is reduced significantly due to type and size of blasting conducted. This range of influence may extend to the immediate area above underground workings and a small distance around the underground area. In an underground mining where blasting is done the following ranges may be applicable:

- Immediate surface area is considered the most critical. Due to Kalabasfontein being an underground mine only ground vibration will be considered. The levels of ground vibration will be very dependent on the drilling and blasting parameters applied;
- Lesser sensitive is the area adjacent to the underground operations and this may vary in range, but generally no more than 500 m[4]. In this case a 250 m boundary is considered. This range is considered by Blast Management and Consulting as a range where influence may be less than damaging levels but still requires active monitoring; and
- The lowest critical or low sensitivity area is the area beyond 500 m. In this area the effects are expected to be none.

Indicated in Figure 57 is the planned mining area and two locations identified as possible positions for the single vent shaft that is to be constructed. Various points of interest to be considered were identified and are also indicated in the Figure 57 and summarised in Table 26. These points are locations of possible receptors.

[4] Estimated from experience by Blast Management & Consulting

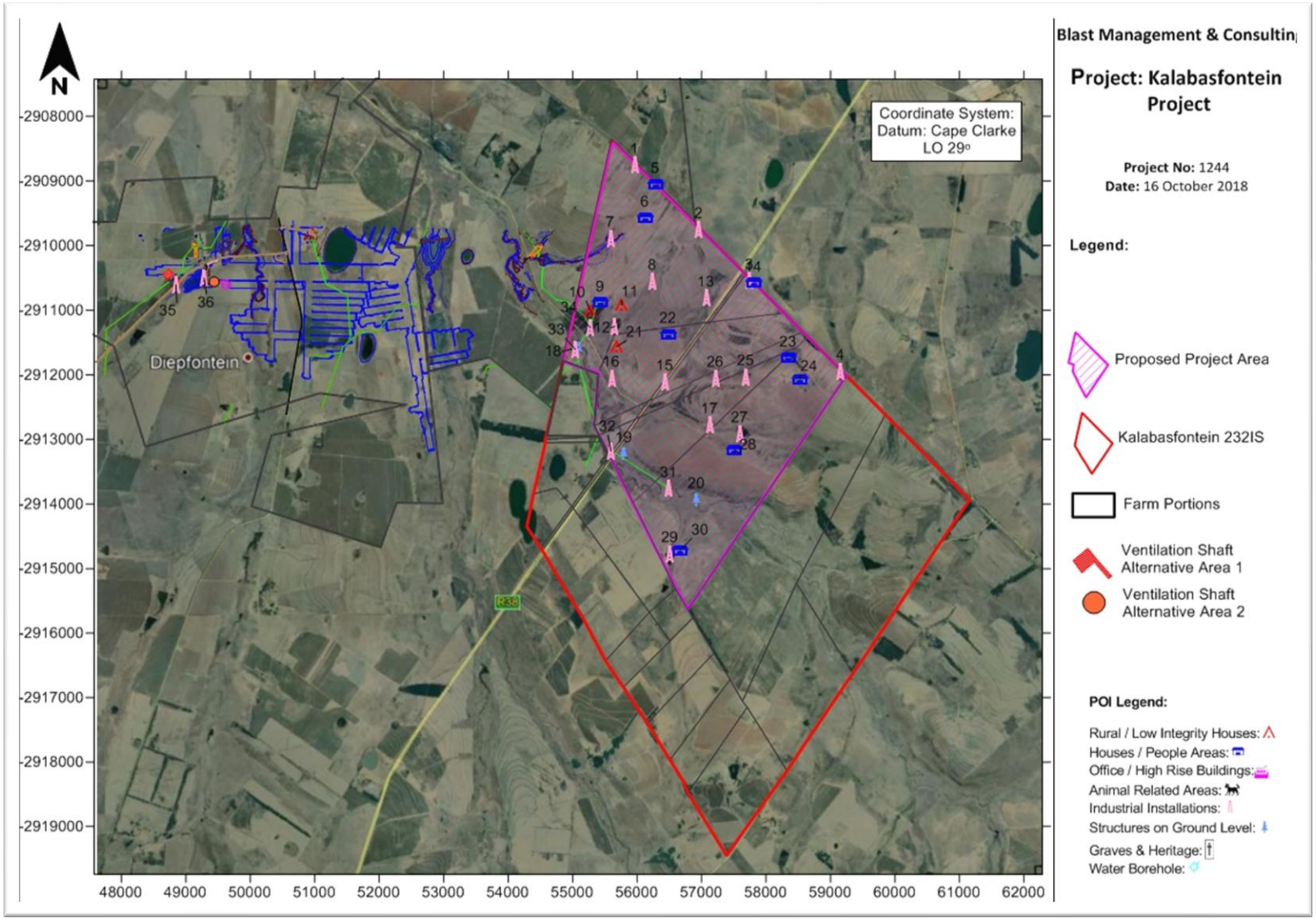

Figure 56: Anticipated receiving environment around the mining area and the Kalabasfontein Project area

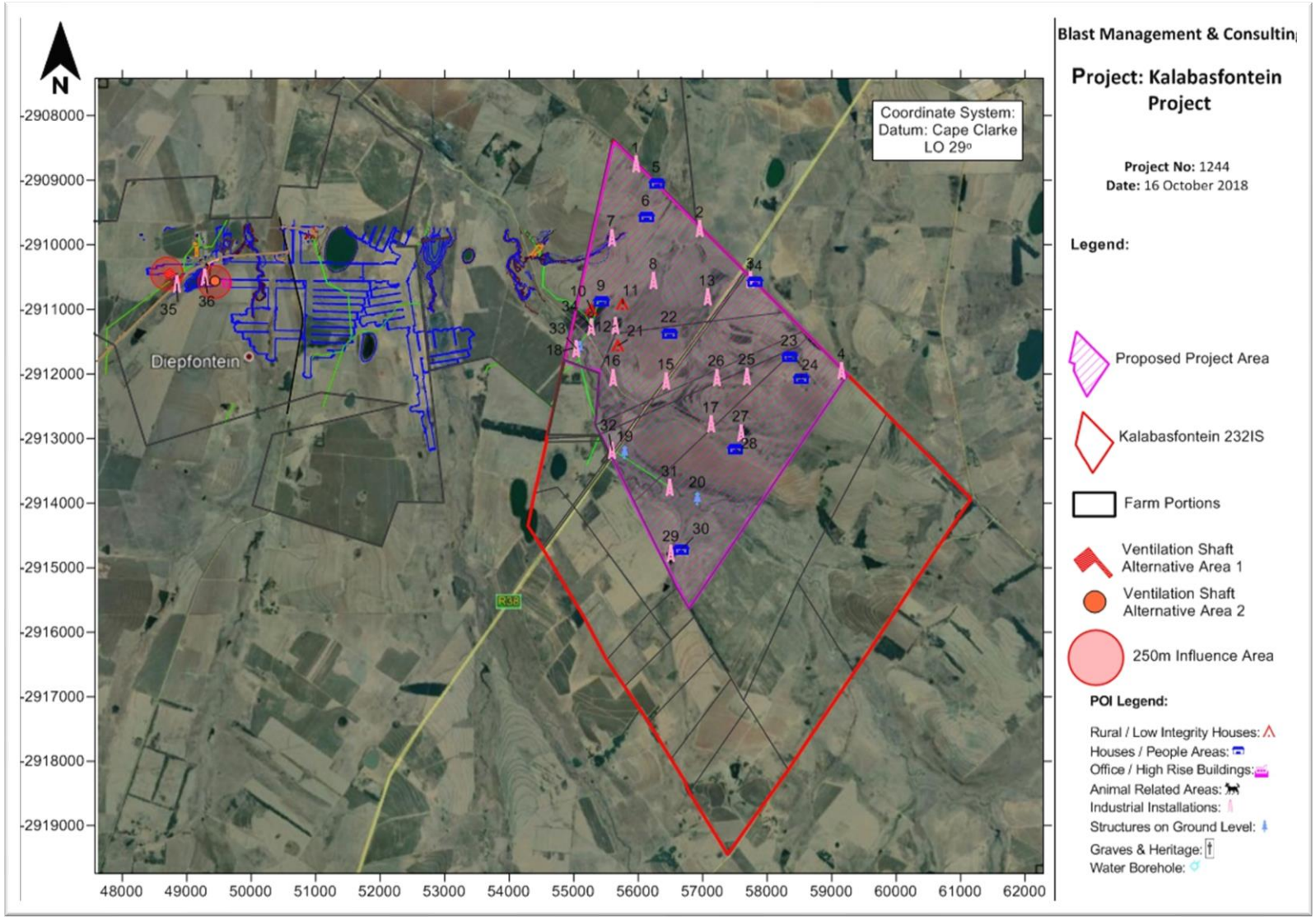

Figure 57: Study Area with POI and ranges from the project area

Table 26: Identified points of interest

Tag	Description	Y	X
1	Railway Line	-55962.36	2908752.25
2	Railway Line	-56958.50	2909750.78
3	Railway Line	-57748.56	2910541.39
4	Railway Line	-59160.17	2911946.55
5	Structure	-56286.89	2909054.24
6	Structure	-56121.85	2909572.35
7	Dam	-55587.50	2909888.17
8	Dam	-56239.00	2910550.67
9	Farm Buildings/Structures/Grain Silo's	-55429.27	2910885.33
10	Informal Housing	-55273.45	2911006.66
11	Informal Housing	-55762.81	2910915.16
12	Dam	-55651.52	2911253.34
13	Dam	-57072.95	2910810.82
14	Structure	-57809.29	2910580.80
15	R38 Road	-56430.80	2912107.91
16	Road	-55605.72	2912051.23
17	Road	-57128.82	2912775.85
18	Viskuile River	-55089.33	2911576.35
19	Viskuile River	-55796.60	2913201.68
20	Viskuile River	-56925.36	2913914.06
21	Informal Housing	-55681.71	2911561.56
22	Structure	-56483.50	2911375.11
23	Structures	-58345.07	2911742.09
24	Farm Buildings/Structures	-58524.01	2912067.98
25	Dam	-57687.67	2912031.43
26	Dam	-57216.83	2912052.04
27	Dam	-57595.72	2912913.77
28	Structures	-57508.95	2913163.98
29	Dam	-56510.06	2914767.96
30	Structures	-56664.27	2914719.42
31	Power lines/Pylons	-56493.77	2913762.97
32	Power lines/Pylons	-55595.36	2913179.71
33	Power lines/Pylons	-55042.37	2911603.98
34	Power lines/Pylons	-55279.48	2911269.82
35	Road	-48844.51	2910607.60
36	Dam	-49284.29	2910507.05

7.20.2 INFLUENCE FROM BLASTING OPERATIONS

Blasting operations are required to break rock for excavation to access the targeted ore material. Explosives in blast holes provide the required energy to conduct the work. Ground vibration, air blast and fly rock result from the blasting process. Based on the regulations of the different acts consulted and international accepted standards these effects are required to be within certain limits. The following sections provide guidelines on these limits. As indicated, there are no specific South African ground vibration and air blast limit standards.

7.20.2.1 GROUND VIBRATION LIMITATIONS ON STRUCTURES

Ground vibration is measured in velocity with units of millimetres per second (mm/s). Ground vibration can also be reported in units of acceleration or displacement if required. Different types of structures have different tolerances to ground vibration. A steel structure or a concrete structure will have a higher resistance to vibrations than a well-built brick and mortar house. A brick and mortar house will be more resistant to vibrations

than a poorly constructed or a traditional built mud house. Different limits are then applicable to the different types of structures. Limitations on ground vibration take the form of maximum allowable levels or intensity for different installations or structures. Ground vibration limits are also dependent on the frequency of the ground vibration. Frequency is the rate at which the vibration oscillates. Faster oscillation is synonymous with a higher frequency and lower oscillation is synonymous with a lower frequency. Lower frequencies are less acceptable than higher frequencies because structures have a low natural frequency. Significant ground vibration at low frequencies could cause increased structure vibrations due to the natural low frequency of the structure and this may lead to crack formation or damages to occur.

The United States Bureau of Mines (USBM) criteria for safe blasting are applied as the industry standard where private structures are of concern. Ground vibration amplitude and frequency is recorded and analysed. The data is then evaluated accordingly. The USBM graph is used for plotting of data and evaluating the data. Figure 58 below provides a graphic representation of the USBM analysis for safe ground vibration levels. The USBM graph is divided mainly into two parts. The red lines in the Figure 58 are the USBM criteria:

- Analysed data displayed in the bottom half of the graph shows safe ground vibration levels; and
- Analysed data displayed in the top half of the graph shows potentially unsafe ground vibration levels.

Added to the USBM graph is a blue line and green dotted line that represents 6 mm/s and 12.5 mm/s which are additional criteria that were used by the specialist. 6 mm/s is used for traditional built rural structures and 12.5 mm/s is used for structures that are considered being of lesser structural integrity than brick and mortar structures built according to building regulations.

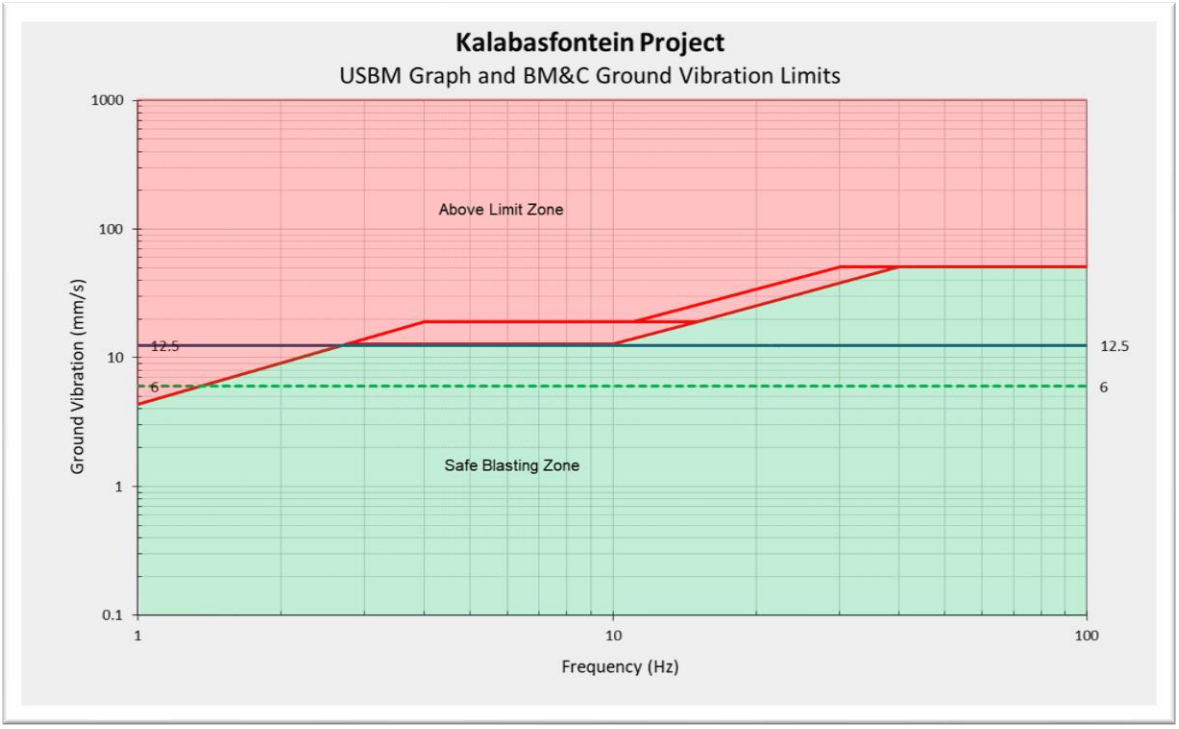

Figure 58: USBM Analysis Graph

Additional limitations that should be considered were determined through research and prescribed by the various institutions; these are as follows:

- National roads/tar roads: 150 mm/s;
- Steel pipelines: 50 mm/s (Rand Water Board);
- Electrical lines: 75 mm/s (Eskom);

- Sasol Pipelines: 25 mms/s (Sasol);
- Railways: 150 mm/s;
- Concrete less than 3 days old: 5 mm/s;
- Concrete after 10 days: 200 mm/s;
- Sensitive plant equipment: 12 mm/s or 25 mm/s, depending on type. (Some switches could trip at levels of less than 25 mm/s.); and
- Water wells: 50 mm/s.

Considering the above limitations, the specialist work was based on the following:

- USBM criteria for safe blasting;
- The additional limits provided above;
- Consideration of private structures in the area of influence;
- Should structures be in poor condition the basic limit of 25 mm/s is halved to 12.5 mm/s or when structures are in very poor condition limits will be restricted to 6 mm/s. It is a standard accepted method to reduce the limit allowed with poorer condition of structures;
- Traditional built mud houses are limited to 6 mm/s. The 6 mm/s limit is used due to unknowns on how these structures will react to blasting. There is also no specific scientific data available that would indicate otherwise; and
- Input from other consultants in the field locally and internationally.

7.20.2.2 GROUND VIBRATION LIMITATIONS AND HUMAN PERCEPTIONS

A further aspect of ground vibration and frequency of vibration that must be considered is human perceptions. It should be realized that the legal limit set for structures is significantly greater than the comfort zone of human beings. Humans and animals are sensitive to ground vibration and the vibration of structures. Research has shown that humans will respond to different levels of ground vibration at different frequencies.

Ground vibration is experienced at different levels; BM and C considers only the levels that are experienced as “Perceptible”, “Unpleasant” and “Intolerable”. This is indicative of the human being’s perceptions of ground vibration and clearly indicates that humans are sensitive to ground vibration and humans perceive ground vibration levels of 4.5 mm/s as unpleasant (See Figure 59). This guideline helps with managing ground vibration and the complaints that could be received due to blast induced ground vibration.

Indicated on Figure 59 is a blue solid line that indicates a ground vibration level of 12.5 mm/s and a green dotted line that indicates a ground vibration level of 6 mm/s. These are levels that are used in evaluation.

Generally, people also assume that any vibration of a structure - windows or roofs rattling - will cause damage to the structure. Air blast is one of the causes of vibration of a structure and is the cause of nine out of ten complaints.

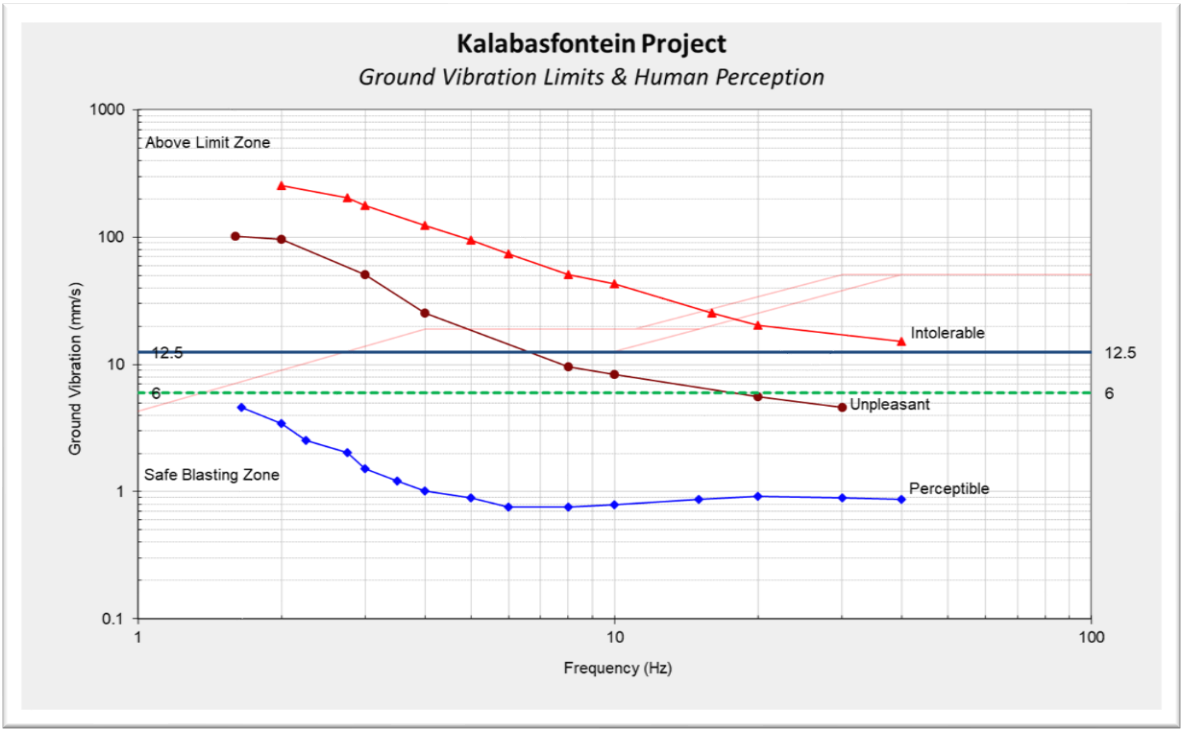

Figure 59: USBM Analysis with Human Perception

7.20.2.3 CONSTRUCTION PHASE IMPACT ASSESSMENT

No blasting operations are anticipated as part of the construction phase. No specific impact is expected regarding ground vibration. The vent shaft will be a raise bore drilling operation, thus no blasting operations to be conducted.

7.20.3 OPERATIONAL PHASE IMPACT ASSESSMENT

During the operational phase the mine operations will be conducted mechanically. No drilling and blasting are anticipated as part of the operational phase. Mechanical continuous miners do not generate ground vibration levels of any significant level that could attribute to a measurable level on surface. The occurrence of dykes and sills are expected to be blasted but the frequency will be low. The exact locations and specific blasting required is unknown and not possible to define specific influence. Blasting is expected to be small with insignificant or no influence on surface. There will be no ground vibration generated that requires impact evaluation. No specific impact is expected regarding ground vibration on the surface areas.

7.20.4 CLOSURE PHASE IMPACT ASSESSMENT

During the closure phase no mining, drilling and blasting operations are expected. It is uncertain if any blasting will be done for demolition. If any demolition blasting will be required, it will be reviewed as civil blasting and addressed accordingly.

7.21 NOISE STUDY

Enviro-Acoustic Research CC. determined the potential noise impact on the surrounding environment due to the proposed extension of the Forzando South Mining Right by including the underground mining of the Kalabasfontein Project area and a new ventilation shaft. A copy of the report is available in Appendix 18. A summary of the noise assessment is provided in the sections below.

7.21.1 POTENTIAL NOISE-SENSITIVE RECEPTORS (DEVELOPMENTS) AND NO-GO AREAS

With Forzando South being an existing mine, the proposed underground extension will not change or increase the noise levels at the mining complex. The risk to increased noises mainly related to the proposed development of the ventilation shaft, the subject of this report. Potentially sensitive receptors, also known as noise-sensitive developments (NSDs), located close to the proposed ventilation fan (and power line) were identified using Google Earth®. As per the guideline distances proposed by SANS 10328:2008, the following buffer areas were considered:

- 500 m from a potential noise source for the construction of the power line, and
- 2 000 m from a potential source for low-frequency sound (ventilation fans).

All potential NSDs within this approximate buffer area were identified as illustrated in Figure 60 and Figure 61.

Figure 60: Aerial image indicating potentially noise-sensitive receptors close to potential project area (and powerline alternative 1)

Figure 61: Aerial image indicating potentially noise-sensitive receptors close to potential project area (and powerline alternative 2)

7.21.2 AMBIENT SOUND LEVEL MEASUREMENTS

Ambient sound levels were measured on 12 September 2018 in accordance with the South African National Standard SANS 10103:2008 *"The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication."*

The standard specifies the acceptable techniques for sound measurements including:

- Type of equipment;
- Minimum duration of measurement;
- Microphone positions;
- Calibration procedures and instrument checks; and
- Weather conditions.

The measurements mainly consisted of a number of short-term recordings around the project site to assess the ambient sound levels in the area. Traffic events were low and had a minimal influence on the measurements. Considering the developmental character as well as the $L_{Aeq,f}$ and L_{A90} sound level descriptors, ambient sound levels in the area have sound levels typical of a rural noise district. The sound measurement locations are illustrated in Figure 62 as a blue square, with the sound level descriptors summarized as measured at these measurement locations. A summary of the ambient sounds that were measured have been included in Table 27.

Table 27: Summary of ambient sound levels measured onsite

Measurement location name	$L_{Amax,i}$	$L_{Aeq,f}$	$L_{Aeq,f}$	L_{AF90}	$L_{Amin,f}$	Comments
	dBA	dBA	dBA	dBA 90	dBA	
FKSTSL01	86	64	19	60	23	Microphone 10m from road centre. Birds dominating with slight wind induced noises. Three light delivery vehicles (LDV) and one heavy truck passed.
FKSTSL02	78	55	18	52	21	Microphone 10m from road centre. Birds dominating. Very quiet area without traffic. Two LDV passed.
FKSTSL03	79	57	18	54	20	Bird sounds dominate. Noises from passing traffic audible, especially heavy trucks. Three LDVs passed during measurement.
FKSTSL04	57	38	19	33	23	Birds dominating. Cows at times. Rural noise district. Wind induced noises at times. Plane overflight at distance audible.

Figure 62: Localities where ambient sound levels were measured

7.21.3 PROPOSED CONSTRUCTION PHASE NOISE IMPACT

A conceptual noise model was developed considering the noisiest activity (drilling). It is assumed that all equipment would be operating under full load (generate the most noise) and that atmospheric conditions would be ideal for sound propagation. Mining equipment is operating at surface level. This is likely the worst-case scenario that can occur during the construction phase of the project.

Noise rating level contours for construction activities are illustrated in Figure 63 (day time) and Figure 64 (night time) for the alternative location 2. Noise rating level contours are illustrated in Figure 65 (day time) and Figure 66 (night time) for the alternative location 1.

7.21.4 OPERATIONAL PHASE NOISE IMPACT

A conceptual noise model was developed considering the operation of the ventilation fan. It is assumed that the ventilation fan would be operating under full load (generate the most noise) and that atmospheric conditions would be ideal for sound propagation. A worst-case scenario was assumed.

Noise rating level contours are illustrated in Figure 67 for conceptual daytime operational activities and Figure 68 for the conceptual night-time operational activities (for the alternative location 1). Noise rating level contours for the operation of the ventilation fan are illustrated in Figure 69 (day time) and Figure 70 (night time) for the alternative location 2.

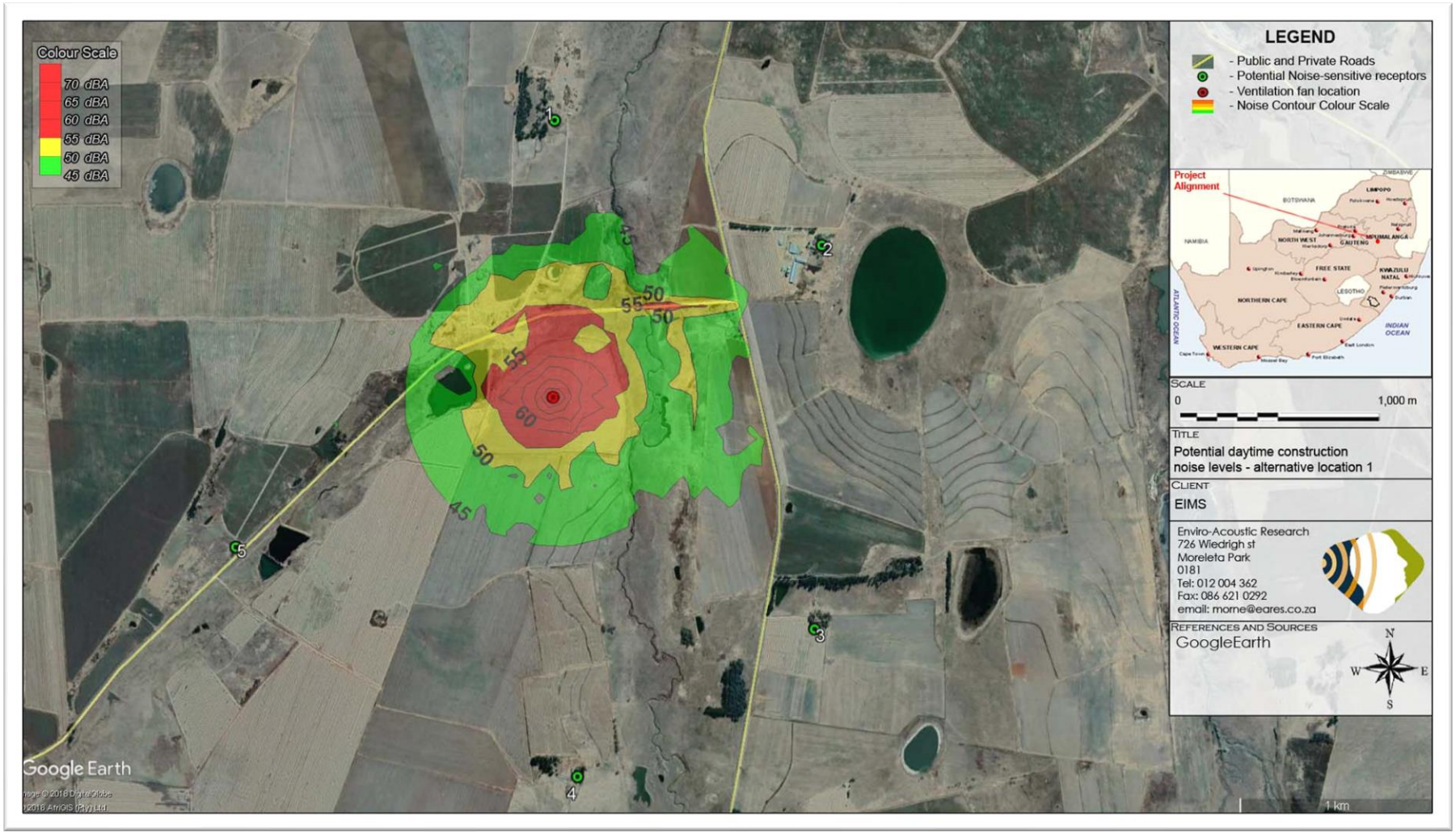

Figure 63: Projected conceptual daytime construction noise levels – Alternative 2

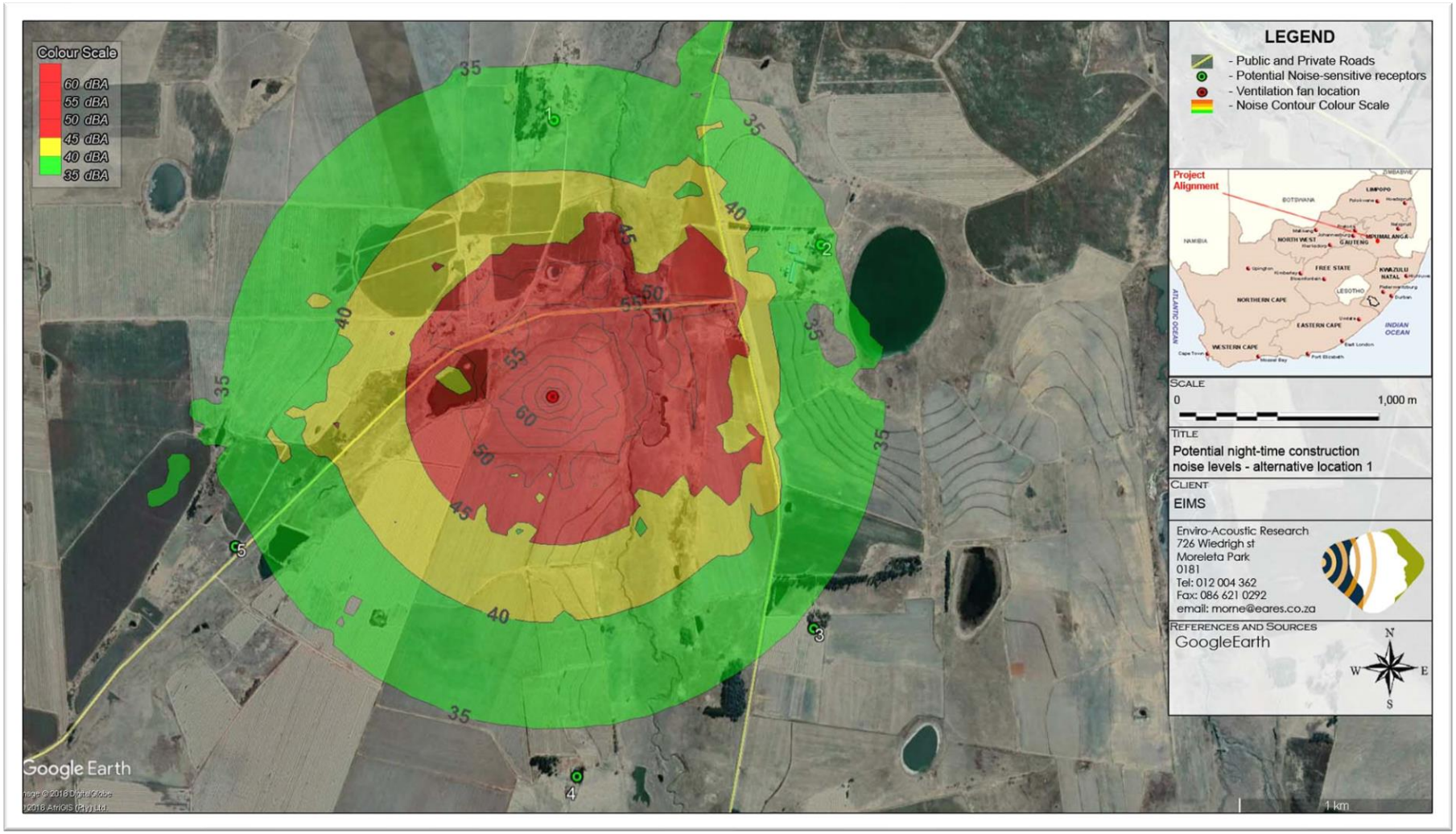

Figure 64: Projected conceptual night-time construction noise levels – Alternative 2

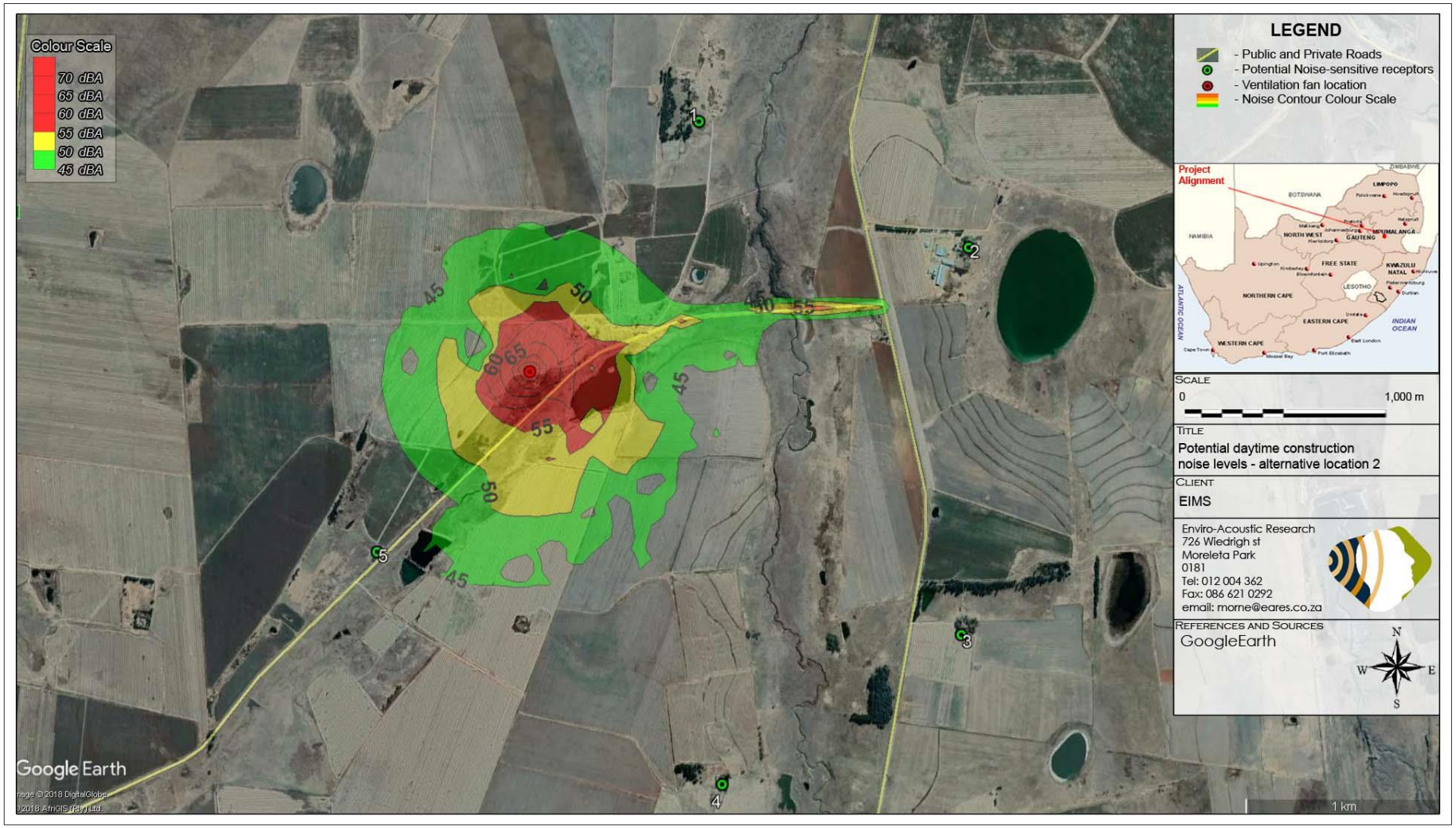

Figure 65: Projected conceptual daytime construction noise levels – Alternative 1

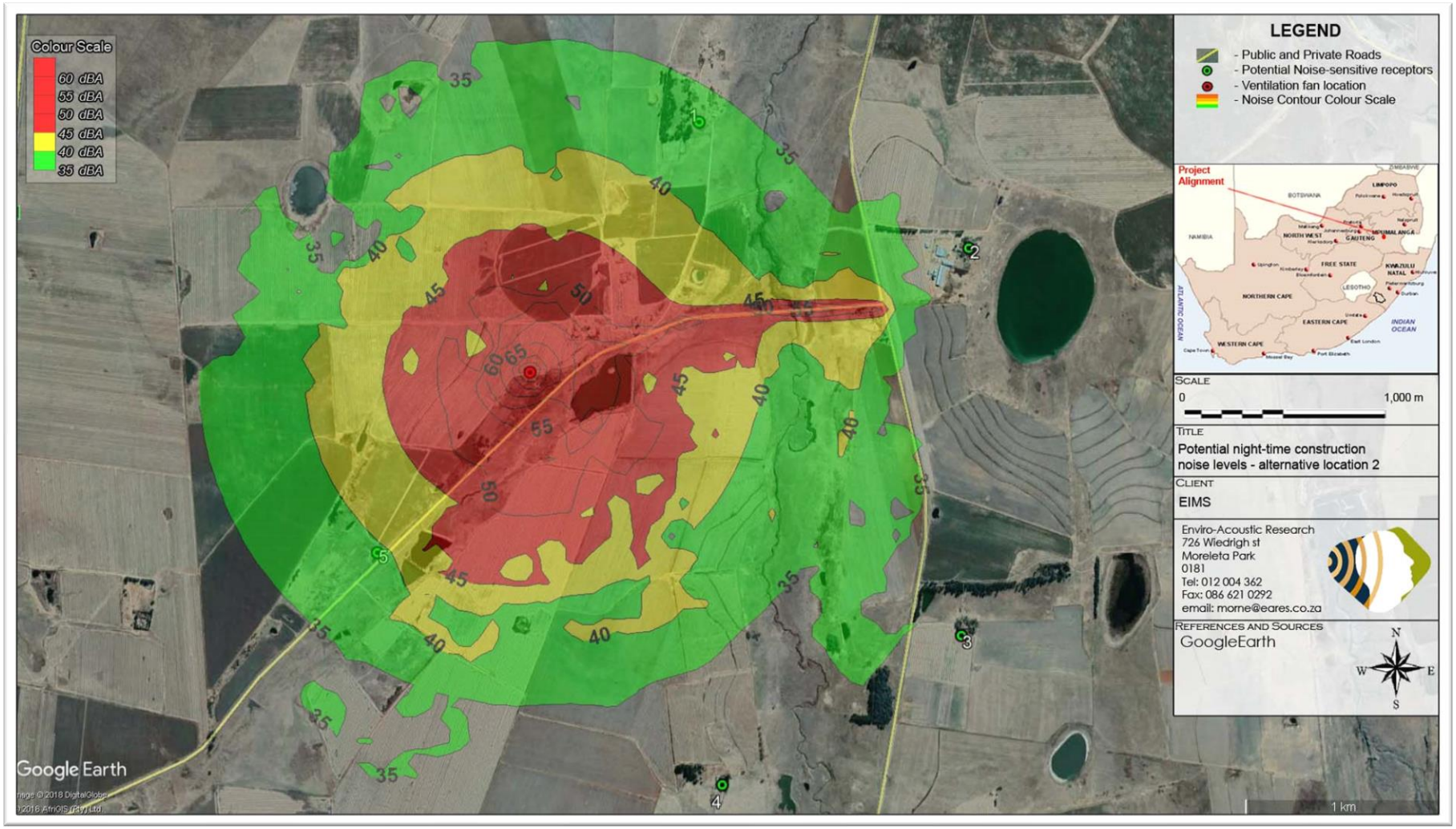

Figure 66: Projected conceptual night-time construction noise levels – Alternative 1

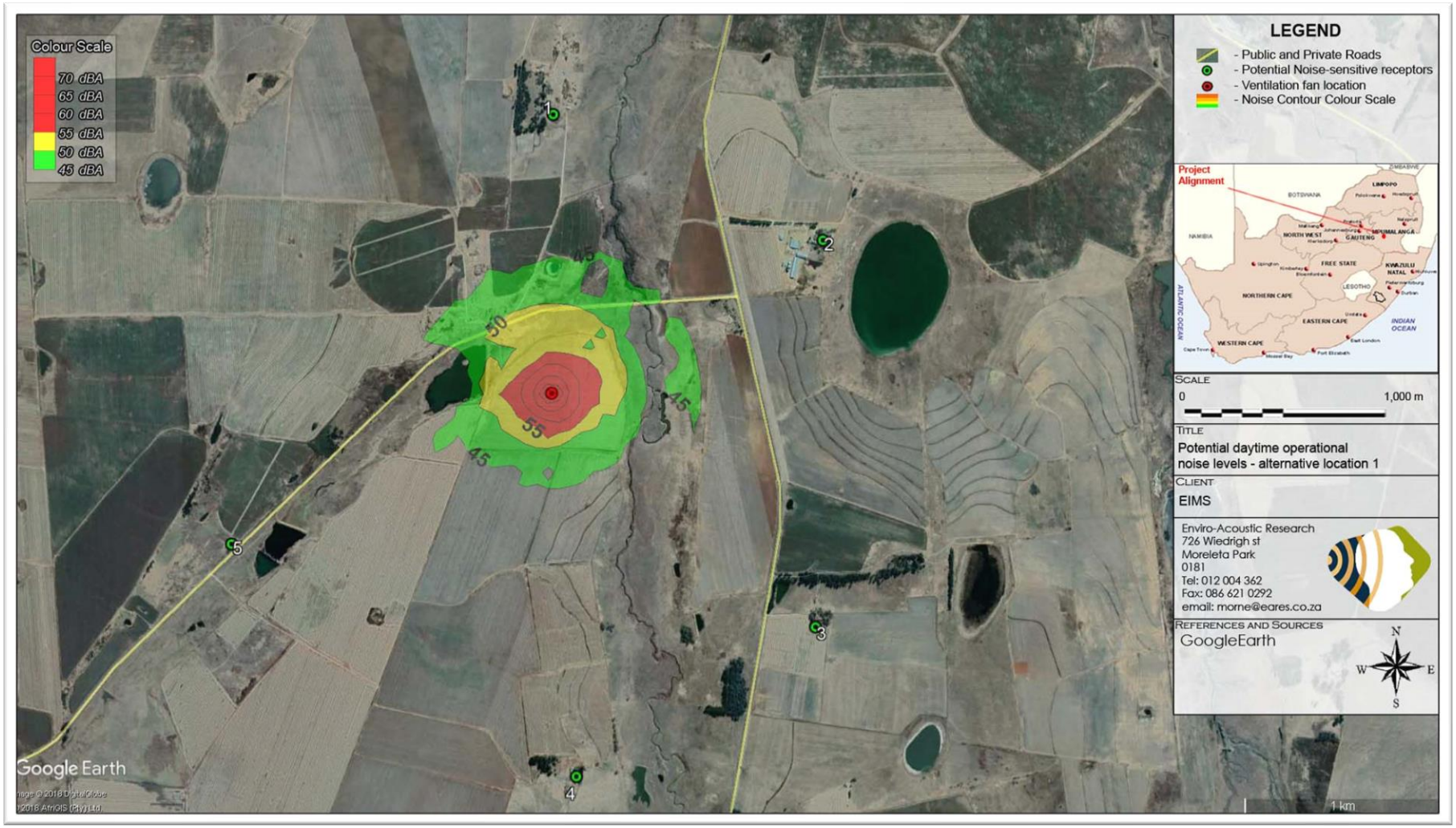

Figure 67: Projected conceptual daytime operational noise rating levels – Alternative 2

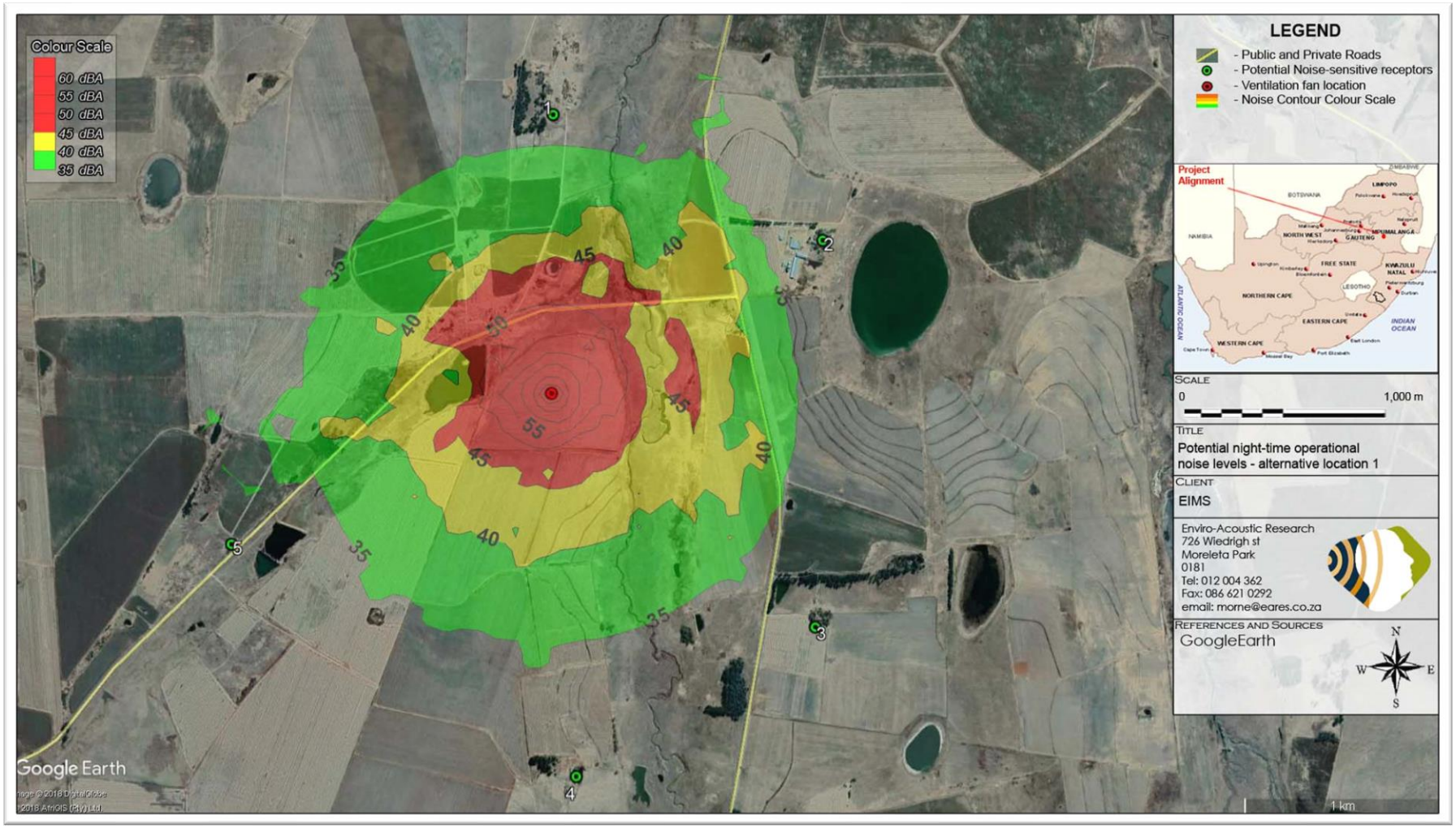

Figure 68: Projected conceptual night-time operational noise rating levels – Alternative 2

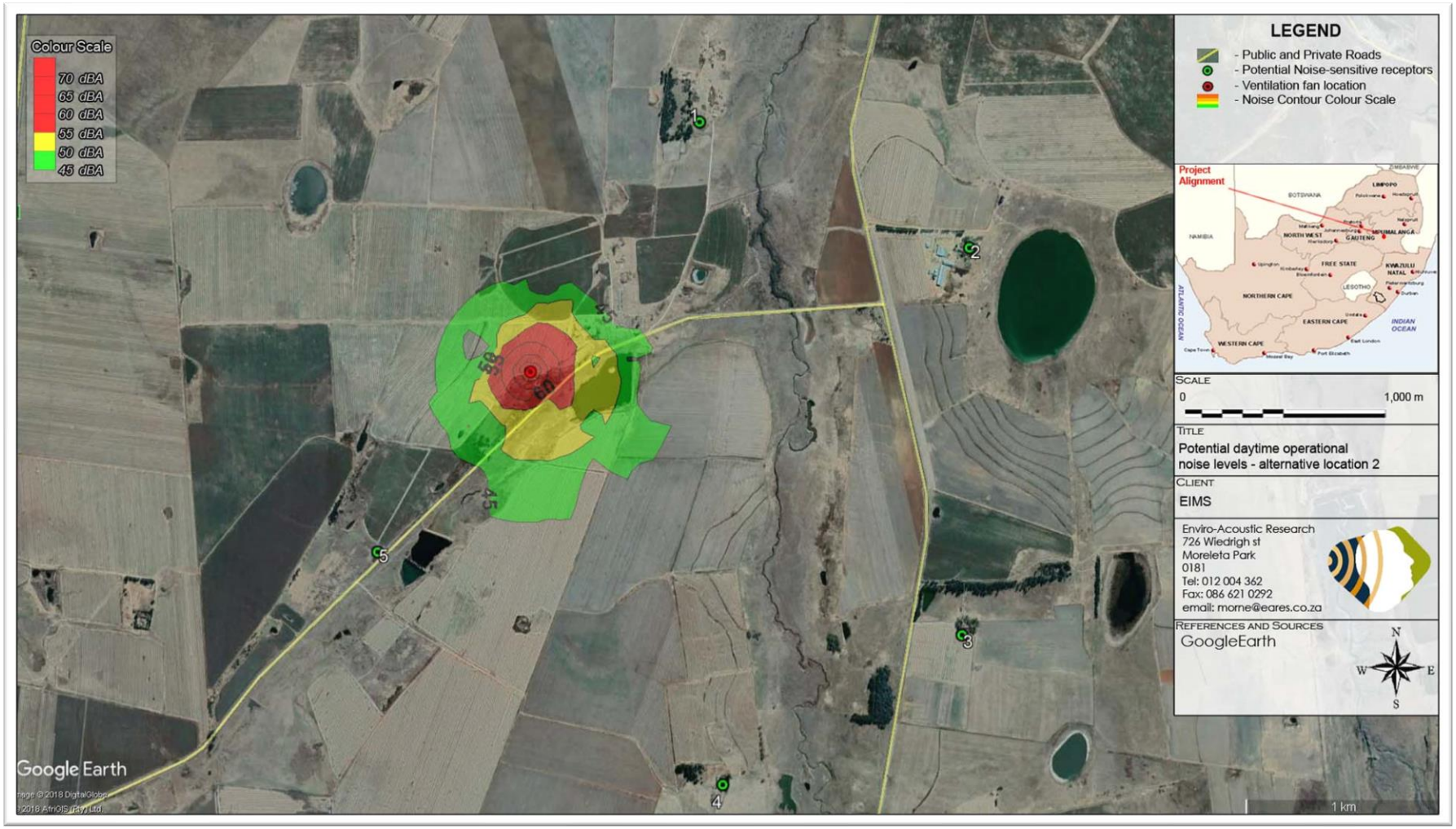

Figure 69: Projected conceptual daytime operational noise rating levels – Alternative 1

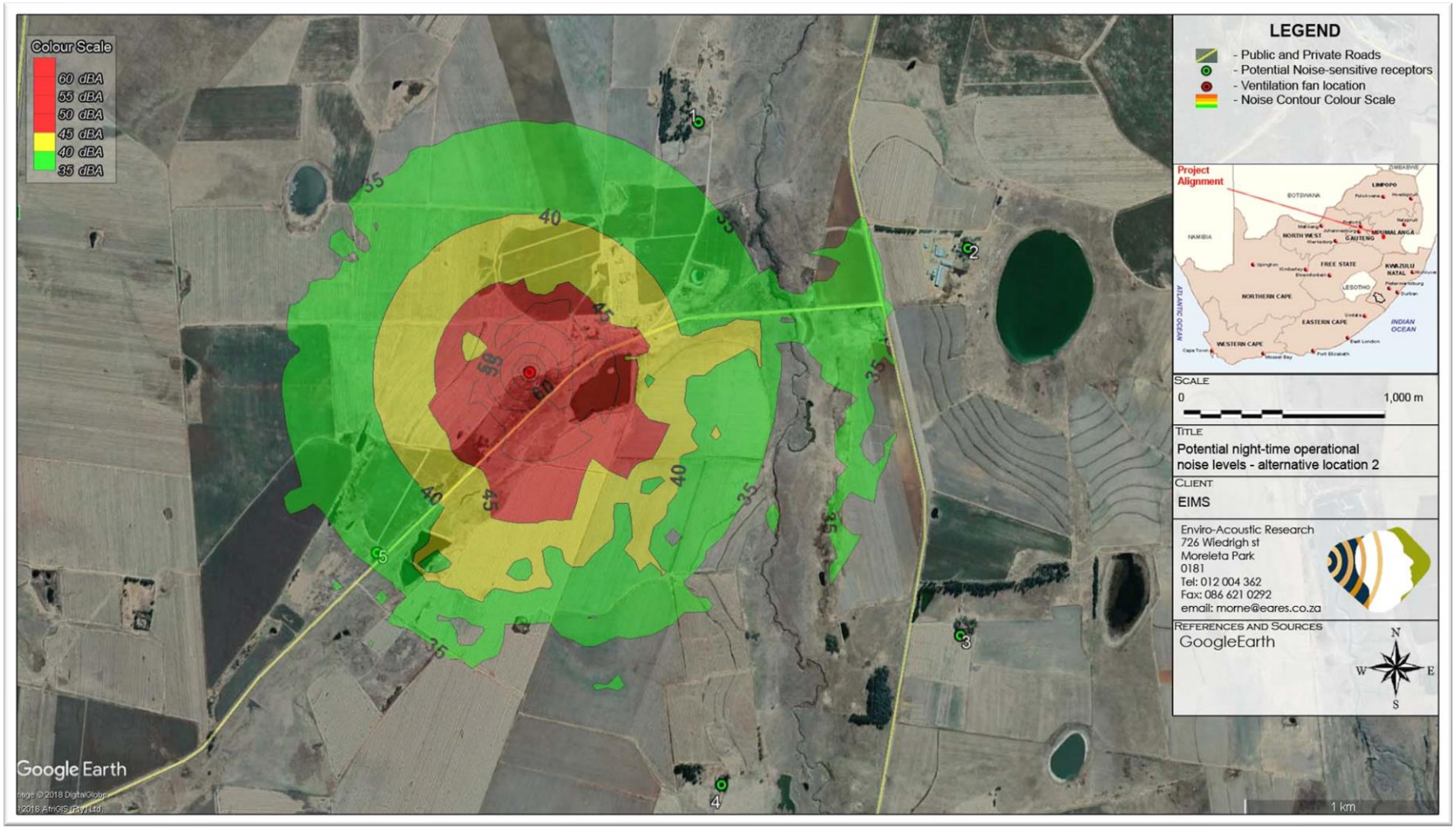

Figure 70: Projected conceptual night-time operational noise rating levels – Alternative 1

7.21.5 POTENTIAL DECOMMISSIONING AND CLOSURE NOISE IMPACTS

The potential for a noise impact to occur during the decommissioning and closure phase will be much lower than that of the construction and operation phases and noise from the decommissioning and closure phases will not be investigated further.

7.21.6 POTENTIAL POST-CLOSURE NOISE IMPACTS

The potential for a noise impact to occur during the post-closure phase will be minimal and mainly relate to maintenance activities. The noise impact from this phase will not be investigated further.

8 PROJECT ALTERNATIVES

The identification of alternatives is a key aspect of the success of the scoping and EIA process. All reasonable and feasible alternatives must be identified and screened to determine the most suitable alternatives to consider and assess. There are however some significant constraints that must be taken into account when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental issues, which are discussed in the evaluation of the alternatives. Alternatives can typically be identified according to:

- Location alternatives;
- Process alternatives;
- Technological alternatives; and
- Activity alternatives (including the no-go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. As mentioned in Section 5, the need for the proposed project includes the following key drivers:

- The importance of coal as a resource; and
- The continued livelihood of community members working at the mine.

The alternatives are described, and the advantages and disadvantages are presented. It is further indicated which alternatives are considered feasible from a technical as well as environmental perspective. The no-go option is also assessed herein (Section 8.5.1).

8.1 DETAILS OF LOCATION ALTERNATIVES

The section below describes the site / location alternatives considered as part of the project. As indicated above, Forzando Coal Mine is an existing operational mine, and has been subject to previous environmental processes, which considered alternatives in the form of both development and land use alternatives prior to approval.

8.1.1 CONSIDERATION OF PROPERTY

No alternative properties were considered for this mining right application as Forzando currently holds a prospecting right on the proposed Kalabasfontein Project area. However, two alternative properties have been identified for the new ventilation shaft, namely Portion 7 and Portion 22 of the farm Uitgedacht 299 IS. Two alternatives were also identified for the powerline route to the preferred vent shaft location. The alternatives have been identified as follows in this EIA:

Ventilation shaft:

- Shaft Alternative 1 (Alternative 1) located on Portion 7 of the farm Uitgedacht 229 IS.
- Shaft Alternative 2 (Preferred) located on Portion 22 of the farm Uitgedacht 229 IS; and

Power Line:

- Powerline Alternative 1, and
- Powerline Alternative 2.

According to the specialist studies undertaken, the impacts of developing either ventilation site are very similar and with the exception of the Agricultural Potential Assessment, the environmental opinion of various specialists is to develop the Preferred Ventilation Shaft (Alternative 2). A summary of the specialist recommendations is presented in Table 29.

8.1.2 LOCATION, LAYOUT OR DESIGN OF THE ACTIVITY

he exploration work to date forms the basis for the current location selection for the proposed mining area (Kalabasfontein). Between 2006 and 2017, a total of 88 boreholes have been drilled to date to confirm Resource structure hence no alternative location, layout or design of the underground activities were considered for the project.

8.2 LAND USE ALTERNATIVES

The land use of the extension area consists predominantly of agricultural land (grazing and crop land) which is adjacent to the current mining and related activities. Forzando currently holds a prospecting right over the proposed extension area and therefore, there is a practical development alternative for the future mining area. The proposed extension of the current mining area has taken into consideration economic viability and practicality as well as the location of the coal resource. In this regard, as detailed in the Scoping Reports, mining was found to be the only reasonable and feasible alternative and no other land use alternatives were considered in the EIA.

8.3 DETAILS OF MINING METHOD ALTERNATIVES

Longwall mining and bord-and-pillar mining are two of the basic methods of mining coal underground and both methods are well suited to extracting the relatively flat coalbeds (or coal seams). Due to the high capital cost and its suitability for much deeper coal fields, longwall mining has not been considered and assessed further in the EIA Phase. Board and pillar mining was found to currently be the most reasonable and feasible alternative.

8.4 DETAILS OF TECHNOLOGY ALTERNATIVES

The subsections below describe the technological alternatives considered in this Report.

8.4.1 PROCESSING TECHNOLOGY TO BE USED IN THE ACTIVITY

There are two main types of washing processing technology which could be used for coal beneficiation, namely:

- Technology Alternative T1a - Dry processing: A dry coal separator uses less water than a conventional wet processing alternative. The main and most obvious advantage of dry processing of coal is that no water is required. Dry processing is, however, not applicable on all mines and with all coal types and quantities.
- Technology Alternative T1b - Wet washing: This is the conventional processing alternative employed at most processing facilities.

The Forzando Mining operations currently uses both technology alternatives. As the Kalabasfontein Project is an extension of the Forzando South Mining operations, both of these technological alternatives will be used and have not been assessed separately as the Forzando Mining operations has an existing EIAR and EMPR in place.

8.4.2 TRANSPORT OPTIONS

There are several coal product transport options. The feasibility of these options would hinge on the final market for the coal, as well as the proximity of available transport infrastructure. The following alternatives have been considered:

- Technology Alternative T2a – Road: This would involve the transport of the product by existing road networks to the respective buyer;
- Technology Alternative T2a – Rail: This option would involve transport of the coal by rail utilizing a railway siding; and
- Technology Alternative T2a - Use of conveyor: This option would involve transport of the coal by conveyor to the buyer.

There is an existing coal conveyor network within close proximity to the mine. This is the alternative currently used to transport the coal and will also be used for the Kalabasfontein Project. In this was considered the most feasible and reasonable alternative hence no further assessments were conducted in the EIA phase.

8.5 DETAILS OF ACTIVITY ALTERNATIVES

The following activity alternatives have been considered in the EIA phase.

8.5.1 ALTERNATIVE 1: NO GO ALTERNATIVE

This alternative will imply that no development takes place and that the environment remains unchanged and unaltered. The proposed development site for the Kalabasfontein Project area comprises a mixture of "undisturbed" natural vegetation and land used for cultivation. It is worth noting that other than the isolated wetland and grassland areas, the proposed project area is located in areas dominated by agriculture with consequently low overall biodiversity. If the development should not take place, no additional socio-economic benefits will be created by mining activities in the area, the mineral resource will be lost, and the additional GDP from the coal export will be compromised. Further implications of the No-Go alternative include the loss of economic input into the area and a loss of regional socio-economic benefit.

8.5.2 ALTERNATIVE 2: MAXIMUM MINE PRODUCTION

In this alternative, the mining and production of coal is emphasised, and mining is considered to have replaced the dominant agriculture land use. Less restrictive mitigation measures will be used to protect the environmental features, thus allowing for maximum coal production and promotion of economic aspects. This approach will increase the financial viability of the proposed Kalabasfontein Project at the potential cost of impacting more severely on environmental features. This alternative is likely to impact more on aspects such as hydrology, air quality and the isolated pockets of biodiversity, as mining operations will likely move through these sensitive environmental features.

8.5.3 ALTERNATIVE 3: SENSITIVITY PLANNING APPROACH

This alternative emphasises on resource protection and use of stringent mitigation measures to minimise identified adverse impacts. This alternative uses specialist planning and evaluation of the following in order to avoid impacting on consolidated sensitive environmental features:

- Mining footprint;
- Mining methodology;
- Powerline placement;
- Vent shaft Placement; and
- General infrastructure requirements.

This alternative will allow for the proposed development of the Kalabasfontein Project whilst protecting identified consolidated sensitive environmental features as indicated in the consolidated sensitivity map. The concept of *in-sit*u conservation and biodiversity off-sets to account for significant residual impacts may also be explored. In addition, this alternative will consider the continuation of agricultural activities (grazing and cultivation) on the surface and use the consolidated sensitivity map to assist in the design, layout, and planning of the proposed Kalabasfontein Project.

8.6 PREFERRED ALTERNATIVES

Based on the findings from the scoping study several of the alternatives presented in Section to Section 8.5 were deemed unfeasible and were not carried through for assessment into this EIA report. The Alternatives which were nominated for consideration and comparative assessment in this EIA are indicated in Table 28. Note that the "do-nothing" alternative (Alternative A2) is assessed in Section 8.5 above and is not considered to be preferred or discussed further. Table 28 shows the other alternatives considered in this EIA report:

Table 28: Alternatives Considered in EIA

Alternatives Considered in the EIA	
Activity Alternatives	Alternative 1: No Go Alternative..
	Alternative 2: Maximum Mine Production.
	Alternative 3: Sensitivity Planning Approach.
Location Alternatives	Shaft Alternative 1 (Alternative) located on Portion 7 of the farm Uitgedacht 229 IS; and
	Shaft Alternative 2 (Preferred). located on Portion 22 of the farm Uitgedacht 229 IS
	Powerline Alternative 1.
	Powerline Alternative 2 (new additional alternative to avoid impacting on adjacent landowners aerodrome).

8.7 FINAL ALTERNATIVE SELECTION

This section describes the advantages and disadvantages of various alternatives described above. Input from specialists was obtained to complete this section. The findings are presented here in Table 29 including recommendations regarding the preferred alternatives.

Table 29: Summary of alternative options assessment

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
Activity Alternative 1: No Go Alternative.	• This alternative will imply that no development takes place and that the environment remains unchanged and unaltered. The proposed development site for the Kalabasfontein Project area comprises a mixture of "undisturbed" natural vegetation and land used for cultivation. It is worth noting that other than the isolated wetland and grassland areas, the proposed project area is located in areas dominated by agriculture with consequently low overall biodiversity.	• If the development should not take place, no additional socio-economic benefits will be created by mining activities in the area, the mineral resource will be lost, and the additional GDP from the coal export will be compromised. Further implications of the No-Go alternative include the loss of economic input into the area and a loss of regional socio-economic benefit.	The most appropriate development alternative is considered to be Alternative 3: Sensitivity Planning Approach which utilises the Consolidated Sensitivity Map generated (see Figure 78 and Figure 79) with both specialist and EIMS input as a planning tool. The sensitivity map is based on a desktop assessment and specialist input.
Activity Alternative 2: Maximum Mine Production	• In this alternative, the mining and production of coal is emphasised, and mining is considered to have replaced the dominant agriculture land use, thus allowing for maximum coal production and promotion of economic aspects. This approach will increase the financial viability of the proposed Kalabasfontein Project.	• Less restrictive mitigation measures will be used to protect the environmental features. • This alternative is likely to impact more on aspects such as hydrology, air quality and the isolated pockets of biodiversity, as mining operations will likely move through these sensitive environmental features.	
Alternative 3: Sensitivity Planning Approach.	• A commercial mining operation with a sustainable life of mine; • Provision of sustainable employment and employment retention; • On-going economic input into the immediate and surrounding area; • Improvement of existing infrastructure; • Local economic development through the implementation of the SLP;	• Numerous potential significant negative social and environmental impacts; • Limited (17 years) duration of socio-economic benefits; • Additional water use requirements; • Rezoning of land required; • Changes to existing land use and land character; • Long-term environmental liability; and	

Alternative description	Advantages	Disadvantages / Impacts / Risks	Recommended / Preferred Alternative Discussion
	• Economic injection into the region in terms of small business enterprise development; • On-going supply of both export quality coal and coal for the domestic South African market.	• Residual/latent environmental impacts that requiring management and monitoring post mining	
Shaft Alternative 1	• Within the buffer area of a delineated wetland	• Powerline from this ventilation shaft would have less river crossings. •	Ventilation shaft alternative 2 was found to be the most preferred by a most of the specialist due to its location and that it avoids the wetland buffer of a demarcated wetland.
Shaft Alternative 2	• Ventilation shaft is located outside wetland buffer within an agricultural field.	• Powerline from this ventilation shaft would have to cross the river crossings through various river crossings.	
Powerline Alternative 1.	• The powerline is shorter that the other alternative.	• Power line route impacts on an adjacent landowners' s aerodrome.	No powerline alternative was found to be most preferred than the other as the potential impacts were found to be almost similar by most of the specialist. In order to mitigate the potential impacts in terms of hydrology the power line will need to be designed in such a way that it is outside the drainage lines as much as possible. Given the above the project can proceed with the planned Powerline alternative 2.
Powerline Alternative 2.	• Avoids impacting adjacent landowner's aerodrome.	• Powerline route is longer and has more river crossings than the alternative powerline.	

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 THE IMPACT ASSESSMENT METHODOLOGY

The impact significance rating methodology is guided by the requirements of the NEMA EIA Regulations. The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S).

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$\boldsymbol{C = \left(\frac{(E + D + M + R)}{4}\right) \times N}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 30.

Table 30: Criteria for determination of impact consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),

Aspect	Score	Definition
Intensity	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 31.

Table 31: Probability scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$\boldsymbol{ER = C \times P}$$

Table 32: Determination of environmental risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5

		1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 33.

Table 33: Significance classes

Environmental Risk Score	
Value	**Description**
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥ 9; < 17	Medium (i.e. where the impact could have a significant environmental risk),
≥17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/ mitigated.

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented above it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition, it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision-making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority / significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/ mitigation impacts are implemented.

Table 34: Criteria for the determination of prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented Table 34. The impact priority is therefore determined as follows:

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (refer to Table 35).

Table 35: Determination of prioritisation factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance). The environmental significance rating is presented in Table 36.

Table 36: Environmental Significance Rating

Environmental Significance Rating	
Value	Description
≤ -20	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
> -20 ≤ -10	Medium negative (i.e. where the impact could influence the decision to develop in the area).
> -10 < 0	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
0	No impact
>0 <10	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥ 10 < 20	Medium positive (i.e. where the impact could influence the decision to develop in the area).
≥ 20	High positive (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

9.2 IMPACTS IDENTIFIED

Potential environmental impacts were identified during the EIA process. These impacts were identified by the EAP, the appointed specialists, as well as the public. Table 37 provides the list of all potential impacts identified in the various specialist studies.

Without proper mitigation measures and continual environmental management, most of the identified impacts may potentially become cumulative, affecting areas outside of their originally identified zone of impact. The potential cumulative impacts have been identified, evaluated, and mitigation measures proposed. When considering cumulative impacts, it is vitally important to bear in mind the scale at which different impacts occur. There is potential for a cumulative effect at a broad scale, such as regional deterioration of air quality, as well as finer scale effects occurring in the area surrounding the activity. The main impacts which have a cumulative effect on a regional scale are related to the transportation vectors that they act upon. For example, air movement patterns result in localised air quality impacts having a cumulative effect on air quality in the region. Similarly, water acts as a vector for distribution of impacts such as contamination across a much wider area than the localised extent of the impacts source. At a finer scale, there are also impacts that have the potential to

result in a cumulative effect, although due to the smaller scale at which these operate, the significance of the cumulative impact is lower in the broader context.

Table 37: Identified Environmental Impacts.

Main Activity / Action / Process	Ancillary Activity	Geo-physical (geology, topography, air, water)	Biological	Socio-economic	Heritage and cultural
Site preparation (Planning)	Vegetation clearance for ventilation shaft Planned placement of infrastructure Ventilation shaft		• Removal of threatened and protected species • Loss/ Destruction of Natural Habitat • Displacement of Faunal Species • Flora Direct and Indirect Mortality • Fauna Direct and Indirect Mortality	• Dust (health and nuisance impact) • Safety and Security (i.e. access to properties, theft, fire hazards, etc.). • Damage/ Disruption of services (i.e. water, electricity, etc.). • Impact on Existing Infrastructure (i.e. roads, fences, etc.).	• Disturbance/Destruction of Archaeological Sites • Disturbance/Destruction of Historic Buildings or Structures • Disturbance/ Destruction of Graves and Cemeteries • Disturbance/ Destruction of Unmarked Graves
Human resources management (Planning)	Employment/recruitment I&AP consultations CSI initiatives Skills development programmes Environmental awareness training HIV/AIDS Awareness programmes Integration with Municipalities' strategic long-term planning			• Perceptions and Expectations. • Employment Opportunities. • Inability of the community to capture economic benefits and managing expectations.	
Earthworks (Construction)	Stripping and stockpiling of soils (Ventilation shaft) Cleaning, grubbing and bulldozing (Ventilation shaft) Removal of cleared vegetation	• Loss/ Disturbance of Topsoil (including contamination, erosion and compaction)	• Pollution of habitats • Removal of threatened and protected species • Loss/ Destruction of Natural Habit	• Loss of agricultural resource • Visual impacts • Damage to property and infrastructure due to blasting, as well as	• Disturbance/ Destruction of fossils • Disturbance/Destruction of Archaeological Sites

	Digging trenches and foundations Blasting Maintenance of storm water management measures Maintenance of firebreak Ventilation shaft	• Gaseous and particulate emissions; fugitive dust • Deterioration of water quality • Increase in the occurrence of alien invasive vegetation • Decline in habitat integrity • Loss of species sensitive to changes in water quality • Altered hydrological regimes • Contamination of Groundwater • Surface Water Contamination • Damage to Wetlands/ Drainage Lines • Alteration of the topography during excavation	• Habitat Fragmentation and Edge Effects • Displacement of Faunal Species • Blockage of Seasonal and Dispersal Movements • Flora Direct and Indirect Mortality • Fauna Direct and Indirect Mortality	safety as a result of fly rock	• Disturbance/Destruction of Historic Buildings or Structures • Disturbance/ Destruction of Graves and Cemeteries. • Disturbance/ Destruction of Unmarked Graves
Civil Works (Construction)	Maintenance of infrastructure and services Mixing of concrete and concrete works Establishment of PCD and storm water/return water dam Establishment of dewatering pipelines	• Gaseous and particulate emissions; fugitive dust • Generation of $PM_{2.5}$ and PM_{10} • Gaseous and particulate emissions; fugitive dust.	• Loss of primary vegetation communities. • Removal of threatened and protected species. • Loss/ Destruction of Natural Habitat.	• Loss of agricultural resource	• Disturbance/Destruction of Archaeological Sites • Disturbance/Destruction of Historic Buildings or Structures • Disturbance/ Destruction of Graves and Cemeteries

	Existing Mobile office and ablution block Sewage and sanitation Existing fuel storage area Existing Chemical storage area Existing General waste area Access control and security General site management	• Deterioration of water quality • Decline in habitat integrity • Loss of species sensitive to changes in water quality • Altered hydrological regimes • Decline in aquatic habitat integrity • Impacts on wetlands • Surface water contamination	• Habitat Fragmentation and Edge Effects. • Displacement of Faunal Species. • Blockage of Seasonal and Dispersal Movements. • Flora Direct and Indirect Mortality. • Fauna Direct and Indirect Mortality. • Contamination of Groundwater. • Altered Hydrological Regime. • Loss of species sensitive to changes in water quality • Surface Water Contamination. • Damage to Wetland/ Drainage Line. • Increase in the occurrence of alien invasive vegetation		• Disturbance/ Destruction of Unmarked Graves
Underground Mining (Operation)	• Drilling • Blasting • Excavations • Removal of overburden by dozing and load haul	• Potential risk of subsidence • Ground water pollution or contamination due to spillage of chemicals,	• Displacement of Faunal Species	• Change of land use from agriculture to mining • Sustainable employment for	• Disturbance of graves/ burial sites • Potential damage of Palaeontological material

	• Upgrade of internal haul roads • Removal of coal • Continued use of existing RoM stockpiles • Continued use of existing Product Stockpiles • Pumping of water to PCD • Waste rock dumps for backfilling • Soil management • Water management • Concurrent rehabilitation • Water treatment	hydrocarbons, or contaminated water during mining activities; • A reduction in recharge to groundwater due to surface compaction; • Reduction of ground water reserves due to mine dewatering; • Reduction of stream baseflow, surrounding ground water levels, and aquifer levels as a result of mine dewatering; and • The potential contamination of groundwater due to the continued oxidation of coal material in the mine void and the waste material on-site.		current mine employees • Increase traffic incidences due to additional haulage • Increase in traffic on adjacent road network resulting in additional damage to the roads	
Infrastructure removal (Decommissioning)	Dismantling and demolition of infrastructure Safety control	• Gaseous and particulate emissions; fugitive dust • Generation of PM2.5 and PM10 • Contamination of Groundwater. • Damage to Wetland/ Drainage Lines	• Fragmentation and Edge Effects. • Displacement of Faunal Species.	• Safety and Security (i.e. access to properties, theft, fire hazards, etc.)	

Rehabilitation (Closure)	Backfilling of pits and voids Slope stabilisation Erosion control Landscaping Replacing topsoil Removal of alien/invasive vegetation Re-vegetation Restoration of natural drainage patterns Remediation of ground and surface water Rehabilitation of external roads	• Contamination of Groundwater. • Acid Mine Drainage • Damage to Wetland/ Drainage Lines • Spontaneous combustion of remnant coal resource	• Fragmentation and Edge Effects. • Displacement of Faunal Species. • Fuel, waste, sedimentation.	• Reduction in future land capability. • Safety risk to public	
Maintenance (Post closure)	Initiate maintenance and aftercare program Environmental aspect monitoring Monitoring of rehabilitation	• Fugitive dust • Damage to Wetland/ Drainage Lines • Treatment of extraneous water and long terms pollution potential • Potential impacts associated with residue stockpiles in the long term.			

9.3 DESCRIPTION AND ASSESSMENT OF IMPACTS

The following potential impacts were identified during the EIA assessment. The impact assessment matrix is included in Appendix 4 and the below subsections describe each impact in more detail. Note the following alternatives were considered in this section and are referenced in the tables below (more detail on these various alternatives is provided in the Alterative Section of this report in Section 8):

- Ventilation shaft:
    - Alternative 1; and
    - Alternative 2 (Preferred Shaft location);
- Powerline:
    - Alternative 1; and
    - Alternative 2.
- Mining:
    - Underground Mining (Alternative 1).

9.3.1 IMPACTS ON HERITAGE AND PALAEONTOLOGICAL RESOURCES

This section presents the potential impacts identified with regard to heritage resources. While several project phases exist, only impacts associated with the Site Establishment and Earthworks/Construction Phase are included here. The reason for this is that no impacts are anticipated on the identified heritage resources during the other phases of the project. A heritage and palaeontological specialist study was undertaken and used to inform this EIA report.

The following construction phase impacts (as well as their impact rating) on heritage resources were identified during the EIA phase:

9.3.1.1 IMPACTS ON BURIAL GROUNDS

Four burial grounds were identified during the field work. Due to the social and cultural significance of burial grounds and graves, a high heritage significance is given to such sites. KAL002, KAL003, KAL008 have not been demarcated formally (see Figure 17). The impact of the proposed project on the burial ground is rated as having a LOW negative significance before mitigation and with the implementation of mitigation measures as having a LOW negative significance.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Impacts on burial grounds	All Powerlines	Construction	-4.00	-3.00	-4.50	Low	Medium

Proposed Mitigation:

Demarcate the site with a 50-meter buffer and avoid it. If the site cannot be avoided a grave relocation process will need to take place. In the event of any heritage resources being uncovered, SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on mitigation

9.3.1.2 IMPACTS ON HISTORICAL STRUCTURES

The impact of the proposed project on the historic heritage resources at KAL001, KAL004, KAL005, KAL006, KAL007, KAL009 is rated as LOW negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative (see Figure 17).

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Impacts on Historical Structures	All Powerlines	Construction	-6.00	-3.00	-4.50	Low	Medium

Proposed Mitigation:

The sites should be avoided with at least a 20 m buffer if activities should occur near them. If the sites will be affected directly, they will need to be documented before a destruction permit can be applied for at the provincial heritage resources authority (Mpumalanga). Only site KAL009 may be affected as it is located near the road where the power line will be erected. In the event that any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on mitigation.

9.3.1.3 LOSS OF FOSSIL HERITAGE

The impact of the development will only occur on the site but most probably the fossil heritage will be negatively impacted on. When fossil heritage is destroyed the impact will be irreversible. The impact will be long term to permanent and the magnitude and probability of the impact will be high. The impact of the proposed project on the Palaeontology is rated as having a MODERATE negative significance before mitigation with LOW negative significance after mitigation.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss of fossil heritage	All	Construction	-7.50	-3.25	-4.88	Low	Medium

Proposed Mitigation:

As no fossils have been recovered from the existing mining area the proposed development is deemed feasible and will not lead to detrimental impacts on the palaeontological resources of the area. A chance find protocol for finding fossils from the proposed development site will need to be included as detailed in the Heritage and Palaeontological study in Appendix 6.

9.3.2 IMPACTS ON ECOLOGY

This section provides impacts on the ecological resources within the study area that were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). The summary tables below show the significance of the various impacts, which range from moderate to low before mitigation for the construction phase of the underground mining portion of the project. The significance of the impact's changes to a

significance of moderate or low for all listed activities following the implementation of mitigation measures and recommendations.

Overall, the impacts of the underground mining have much lower significance and impact than those for opencast mining operations as this type of mining has less of an influence on biodiversity in the area. Nonetheless, underground mining also requires some surface infrastructure (including powerline and ventilation shaft in the case of this project), and the significance of these impacts cannot be overlooked or underestimated. However, for this particular project existing infrastructure will be used and as such there is a lower impact rating overall.

9.3.2.1 TEMPORARY DISTURBANCE OF WILDLIFE DUE TO INCREASED HUMAN PRESENCE AND POSSIBLE USE OF MACHINERY AND/OR VEHICLES.

Table below presents the significance of potential planning phase impacts on the terrestrial ecosystems and terrestrial biodiversity before and after implementation of mitigation measures. All project aspects scored the same low level of risk as the planning phase is considered largely desktop with minimal impacts to the existing ecosystems. The activities for the planning phase for the construction of the ventilation shaft, the powerline and underground mining are considered to be the same and the impacts for the planning phase are therefore presented jointly.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Disturbance of Wildlife Due to Increased Human Presence	All	Planning	-9.75	-5.50	-5.50	Low	Low

Proposed Mitigation:

The following mitigation measures are recommended:

- It is recommended that where possible there should be no development in the high-sensitivity wet areas, rocky ridges and grasslands portions of the project area where species of conservation concern occur;
- The proposed ventilation shaft areas and associated powerlines should be positioned (as far as feasible) in areas that are already disturbed (such as along existing road verges) or in areas that are regarded as least sensitive based on this report;
- Where the proposed powerline crosses wetland areas (if it is unavoidable to do so otherwise), appropriate bird mitigation measures should be put in place to avoid bird collisions and direct impacts to the infrastructure. This includes the use of 'bird-flappers' and bird-friendly powerline structures;
- If any faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action. This is applicable to all species, even smaller species such as rodents, reptiles and amphibians;
- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited;

- The areas rated as highly sensitive in the project area as defined in this report, should be declared a 'no-go' area during the construction phase and operational phase and all efforts must be made to prevent access to this area from construction workers and machinery; and
- No domestic animals are to be allowed into the project area under any circumstances, especially any dogs and cats. Any and all feral cats which may enter the project area must be removed immediately by an appropriate specialist.

9.3.2.2 LOSS AND FRAGMENTATION OF THE VEGETATION COMMUNITY AS WELL THE DESTRUCTION OF A PORTION OF AN ENDANGERED VEGETATION TYPE (NBA, 2012

No construction phase impacts were considered for the underground mining, as it will be continuation of mining operation once approval is received. Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA, an IBA and the location of the development within an Endangered vegetation type the significance was generally rated as moderate to high prior to mitigation. In regard to the shafts, Alternative 1 is expected to have a higher impact whereas with the powerlines the Alternative 1 is expected to have the highest impact between the powerline alternatives.

Both of the proposed ventilation shaft locations are predicted to have the same impact during the operational phase and pose relatively low levels of disturbance. The two alternative powerlines are anticipated to have the same impact however a higher impact during operation as during this time the powerline will pose a significant threat to avifauna, especially sensitive species which do occur in the area. If mitigation measures are followed this impact can be reduced as shown.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss and fragmentation of vegetation community	Ventilation shaft (Alt 1)	Construction	-12.00	-10.00	-10.00	Low	Medium
		Operation	-9.75	-9.00	-9.00	Low	Medium
	Ventilation shaft (Alt 2)	Construction	-9.75	-9.00	-9.00	Low	Medium
		Operation	9.75	-9.00	-9.00	Low	Medium
	Powerline (Alt 1)	Construction	-11.25	-10.00	-10.00	Low	Medium
		Operation	-16.00	-8.00	-8.00	Low	Medium
	Powerline (Alt 2)	Construction	-9.00	-7.00	-7.00	Low	Medium
		Operation	-16.00	-8.00	-8.00	Low	Medium
	Underground Mining	Operation	-16.00	-9.00	-9.00	Low	Medium

Proposed Mitigation:

The following mitigation measures are recommended

- As far as possible, the proposed developments should be placed in areas that have already been disturbed (low sensitivity areas as defined in this report), and no further loss of secondary grassland or wetlands should be permitted;
- The proposed ventilation shaft areas and associated powerlines should be positioned (as far as feasible) in areas that are already disturbed (such as along existing road verges) or in areas that are regarded as least sensitive based on this report;
- Wherever possible, the new powerline development should avoid crossing sensitive CBAs or wetland areas;
- It is recommended that areas to be developed be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All work areas, and access roads must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances;
- Areas of indigenous vegetation, even secondary communities should under no circumstances be fragmented or disturbed further or used as an area for dumping of waste;
- Areas rated as highly sensitive in this report, should be declared as 'no-go' areas during the construction phase and operational phase and all efforts must be made to prevent access to this area from construction workers and machinery;
- It should be made an offence for any staff to bring any plant species into any portion of the project site, including offices. No plant species whether indigenous or exotic should be brought into the project area, to prevent the spread of exotic or invasive species;
- An experienced, qualified environmental control officer must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna/flora that are found during construction (this includes all species of flora and fauna including reptiles and amphibians);
- Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated. No dust is allowed, whether intentionally or otherwise, to be blown across the wetland areas as they are demarcated in this report;
- Areas of indigenous vegetation should be delineated, and rehabilitation measures implemented in areas where the indigenous community is still present but degraded;
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species;
- Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation
- All dumping of waste material, especially bricks and contaminated materials or soils, must be prevented; and
- Implementation of an alien vegetation management plan for the entire site, including the surrounding project area and especially the wetland areas.

9.3.2.3 LOSS OF IMPORTANT IRREPLACEABLE CRITICAL BIODIVERSITY AREAS, ECOLOGICAL SUPPORT AREAS AND OTHER NATURAL AREAS (MTPA, 2014).

No construction phase impact was considered for the underground mining, as it will be continuation of mining operation once approval is received. Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA, an IBA and the location of the development within an Endangered vegetation type the significance was generally rated as moderate to high prior to mitigation. In regard to the shafts, Alternative 1 is expected

to have a higher impact whereas with the powerlines the Alternative 1 is expected to have the highest impact between the powerline alternatives.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss important irreplaceable CBAs	Ventilation shaft (Alt 1)	Construction	-12.00	-10.00	-10.00	Low	Medium
	Ventilation shaft (Alt 2)	Construction	-9.75	-9.00	-9.00	Low	Medium
	Powerline (Alt 1)	Construction	-11.25	-10.00	-10.00	Low	Medium
	Powerline (Alt 2)	Construction	-9.00	-7.00	-7.00	Low	Medium
	Underground Mining	Operation	-16.00	-9.00	-9.00	Low	Medium

Proposed Mitigation:

See section 9.3.2.1 and Section 9.3.2.2 for recommended mitigation measures.

9.3.2.4 DISPLACEMENT, DIRECT MORTALITIES AND DISTURBANCE OF FAUNAL COMMUNITY (INCLUDING MULTIPLE THREATENED SPECIES) DUE TO HABITAT LOSS AND DISTURBANCES (SUCH AS DUST AND NOISE).

No construction phase impact was considered for the underground mining, as it will be continuation of mining operation once approval is received. Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA, an IBA and the location of the development within an Endangered vegetation type the significance was generally rated as moderate to high prior to mitigation. In regard to the shafts, Alternative 1 is expected to have a higher impact whereas with the powerlines the Alternative 1 is expected to have the highest impact between the powerline alternatives.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Displacement, direct mortalities and disturbance of faunal communities	Ventilation shaft (Alt 1)	Construction	-12.00	-10.00	-10.00	Low	Medium
		Operation	-9.75	-9.00	-9.00	Low	Medium
		Decommissioning	-9.75	-9.00	-9.00	Low	Medium
	Ventilation shaft (Alt 2)	Construction	-9.75	-9.00	-9.00	Low	Medium
		Operation	9.75	-9.00	-9.00	Low	Medium
		Decommissioning	-9.75	-9.00	-9.00	Low	Medium
		Construction	-11.25	-10.00	-10.00	Low	Medium

	Powerline (Alt 1)	Operation	-16.00	-8.00	-8.00	Low	Medium
		Decommissioning	-13.00	-4.50	-4.50	Low	Medium
	Powerline (Alt 2)	Construction	-9.00	-7.00	-7.00	Low	Medium
		Operation	-16.00	-8.00	-8.00	Low	Medium
		Decommissioning	-13.00	-4.50	-4.50	Low	Medium
	Underground Mining	Operation	-16.00	-9.00	-9.00	Low	Medium
		Decommissioning	-16.00	-10.50	-10.50	Low	Medium

Proposed Mitigation:

See section 9.3.2.1 and Section 9.3.2.2 for recommended mitigation measures.

9.3.2.5 INFRINGEMENT BY HUMANS INTO THE FEW REMAINING NATURAL GRASSLAND AND WETLANDS AREAS, WITH ASSOCIATED IMPACTS SUCH AS POACHING, LITTER AND INTRODUCTION OF DISEASES

Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA: Optimal and the presence of the development within a VU vegetation type the significance was generally rated as moderate prior to mitigation. The spread of alien or invasive plant species was rated as the most significant impact for the operational phase. Both of the proposed ventilation shaft locations are predicted to have the same impact during the operational phase and pose relatively low levels of disturbance. The two alternative powerlines are anticipated to have the same impact however a higher impact during operation as during this time the powerline will pose a significant threat to avifauna, especially sensitive species which do occur in the area. If mitigation measures are followed this impact can be reduced as shown.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Infringement by humans into the few remaining natural grassland and wetlands areas	Ventilation shaft (Alt 1)	Operation	-9.75	-9.00	-9.00	Low	Medium
	Ventilation shaft (Alt 2)	Operation	-9.75	-9.00	-9.00	Low	Medium
	Underground Mining	Operation	-16.00	-9.00	-9.00	Low	Medium

Proposed Mitigation:

See section 9.3.2.1 and Section 9.3.2.2 for recommended mitigation measures.

9.3.2.6 SPREAD AND/OR ESTABLISHMENT OF ALIEN AND/OR INVASIVE SPECIES

Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA: Optimal and the presence of the development within a VU vegetation type the significance was generally rated as moderate prior to mitigation. The spread of alien or invasive plant species was rated as the most significant impact for the operational phase. Both of the proposed ventilation shaft locations are predicted to have the same impact during the operational phase and pose relatively low levels of disturbance. The two alternative powerlines are anticipated to have the same impact however a higher impact during operation as during this time the powerline will pose a significant threat to avifauna, especially sensitive species which do occur in the area. If mitigation measures are followed this impact can be reduced as shown.

Due to the fact that the rehabilitation phase will entail a significant decrease in the certain disturbances to the area, such as presence of people, vehicles and the possible re-establishment of natural vegetation, many of the associated impacts are significantly low or even positive. However, the possible risk and impact of subsidence (which is also difficult to mitigate) remains at a moderate level.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Spread and/or establishment of alien and/or invasive species	Powerline (Alt 1)	Operation	-16.00	-8.00	-8.00	Low	Medium
		Decommissioning	-13.00	-4.50	-4.50	Low	Medium
		Rehabilitation	-9.75	6.75	6.75	Low	Low
	Powerline (Alt 2)	Operation	-16.00	-8.00	-8.00	Low	Medium
		Decommissioning	-9.75	-4.00	-4.00	Low	Medium
		Rehabilitation	-9.75	6.75	6.75	Low	Low
	Ventilation shaft (Alt 1)	Decommissioning	-9.75	-9.00	-9.00	Low	Medium
		Rehabilitation	-9.75	-9.00	-9.00	Low	Low
	Ventilation shaft (Alt 2)	Decommissioning	-9.75	-9.00	-9.00	Low	Medium
		Rehabilitation	-9.75	-9.00	-9.00	Low	Low
	Underground Mining	Decommissioning	-15.00	-10.50	-10.50	Low	Medium
		Rehabilitation	-16.00	-9.00	-9.00	Low	Low

Proposed Mitigation:

See section 9.3.2.1 and Section 9.3.2.2 for recommended mitigation measures.

9.3.2.7 SUDDEN SINKING OR GRADUAL DOWNWARD SETTLING OF THE GROUND'S SURFACE OVER THE AREAS WHERE THE UNDERGROUND MINING IS TO TAKE PLACE

Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA: Optimal and the presence of the development within a VU vegetation type the significance was generally rated as moderate prior to mitigation. The spread of alien or invasive plant species was rated as the most significant impact for the operational phase. Both of the proposed ventilation shaft locations are predicted to have the same impact during the operational phase and pose relatively low levels of disturbance. The two alternative powerlines are anticipated to have the same impact however a higher impact during operation as during this time the powerline will pose a significant threat to avifauna, especially sensitive species which do occur in the area. If mitigation measures are followed this impact can be reduced as shown.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Sudden sinking or gradual downward settling of the ground's surface	Underground Mining	Operation	-16.00	-9.00	-9.00	Medium	Medium

Proposed Mitigation:

See section 9.3.2.1 and Section 9.3.2.2 for recommended mitigation measures.

9.3.2.8 POSSIBLE RE-ESTABLISHMENT OF INDIGENOUS VEGETATION.

Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas, the existence of a CBA: Optimal and the presence of the development within a VU vegetation type the significance was generally rated as moderate prior to mitigation. The spread of alien or invasive plant species was rated as the most significant impact for the operational phase. Both of the proposed ventilation shaft locations are predicted to have the same impact during the operational phase and pose relatively low levels of disturbance. The two alternative powerlines are anticipated to have the same impact however a higher impact during operation as during this time the powerline will pose a significant threat to avifauna, especially sensitive species which do occur in the area. If mitigation measures are followed this impact can be reduced as shown.

Due to the fact that the rehabilitation phase will entail a significant decrease in the certain disturbances to the area, such as presence of people, vehicles and the possible re-establishment of natural vegetation, many of the associated impacts are significantly low or even positive. However, the possible risk and impact of subsidence (which is also difficult to mitigate) remains at a moderate level.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Possible re-establishment of indigenous vegetation.	Ventilation shaft (Alt 1)	Rehabilitation	-9.75	-9.00	-9.00	Low	Low
	Ventilation shaft (Alt 2)	Rehabilitation	-9.75	-9.00	-9.00	Low	Low
	Powerline (Alt 1)	Rehabilitation	-9.75	6.75	6.75	Low	Low
	Powerline (Alt 2)	Rehabilitation	-9.75	6.75	6.75	Low	Low
	Underground Mining	Rehabilitation	-16.00	-9.00	-9.00	Low	Low

Proposed Mitigation:

See section 9.3.2.1 and Section 9.3.2.2 for recommended mitigation measures.

9.3.3 IMPACTS ON WETLANDS

Overall, the impacts of the underground mining have much lower significance and impact than those for opencast mining operations as this type of mining has less of an influence on biodiversity in the area. Nonetheless, underground mining also requires some surface infrastructure (and ventilation shafts in the case of this project), and the significance of these impacts cannot be overlooked or underestimated. However, for this particular project existing infrastructure will be used and as such there is a lower impact rating overall.

Below are the potential impacts on wetlands for the construction, operation, and rehabilitation and closure phases, as well as their impact rating.

9.3.3.1 LOSS / DEGRADATION OF WETLAND HABITAT

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

The construction phase activities have the potential to degrade wetland health and functioning through added sediment loads, erosion, and diversion. Hydrological or flow dynamic impacts are likely to include reduced water volumes, sedimentation, bed, channel and flow modification, as well as the loss of wetland habitat through direct modification during the construction of wetland crossings (where needed), infrastructure, ventilation shafts and powerlines.

The removal of infrastructure and rehabilitation activities will be a large-scale operation and thus has the potential to contaminate surface water. Typically, following the cessation of underground mining activities groundwater returns to the voids created by the mining process. This process results in the contamination of the groundwater resource. Following this influx of groundwater, seepage and decant at specific locations can result in the ingress of contaminated water in downstream wetland systems, thus severely degrading the health and functioning of the wetlands.

In addition, in line with the precautionary principle, it is anticipated that the undermining of wetlands and river systems within the Kalabasfontein project area will result in the subsidence of the surface. The resultant potential impacts include serious changes to surface hydrology resulting in the significant alteration of catchment areas and subsequent habitat levels impacts.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Wetland: Loss / degradation of wetland habitat	Ventilation Shaft (Alt 1)	Planning	-7,5	2,5	2,92	Low	Medium
		Construction	-12	-2	-2,33	Low	Medium
		Operation	-12	-4,5	-5,25	Low	Medium
		Decommissioning	-8,25	-4,5	-5,25	Low	Medium
		Rehab and closure	-8,25	2,5	2,92	Low	Medium
	Ventilation Shaft (Alt 2)	Planning	-7,5	2,5	2,92	Low	Medium
		Construction	-12	-2	-2,33	Low	Medium
		Operation	-12	-4,5	-5,25	Low	Medium
		Decommissioning	-8,25	-4,5	-5,25	Low	Medium
		Rehab and closure	-8,25	2,5	2,92	Low	Medium
	Powerline (Alt 1)	Planning	-7,5	-2,5	-2,92	Low	Medium
		Construction	-12	-2,5	-2,92	Low	Medium
	Powerline (Alt 2)	Planning	-7,5	-2,5	-2,92	Low	Medium
		Construction	-12	-2,5	-2,50	Low	Medium
	Underground Mining	Planning	-7,5	2,5	2,92	Low	Medium
		Construction	-3,5	-2,5	-2,92	Low	Medium
		Operation	-7,5	-2,5	-2,92	Low	Medium
		Decommissioning	-7,5	-2,5	-2,92	Low	Medium
		Rehab and closure	-7,5	2,5	2,92	Low	Medium

Proposed Mitigation:

The following mitigation measures are proposed:

- Underground workings must adhere to a safety factor that will minimise the risk of subsidence.
- Any loss/alteration of flow dynamics must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed.
- Separate clean and dirty water.
- Construct diversion berms and drains around working areas.
- Incorporate green /soft engineering storm water measures. Avoid unnecessary vegetation clearing and avoid preferential surface flow paths.
- No cleaning of vehicles, machines and equipment in water resources.
- No servicing of machines, vehicles and equipment on site.
- Storage of potential contaminants in bunded areas.
- All contractors must have spill kits available and be trained in the correct use thereof.
- All released water must be within DWAF (1996) water quality standards for aquatic ecosystems, and discharge must be managed to avoid scouring and erosion of the receiving systems.
- Contain wastewater in a PCD. Contaminated water must not be discharged into the watercourses.
- Clean and dirty water must be separated. This water could be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydro-dynamics.
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”.
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area.
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems.
- Compile a suitable stormwater management plan.
- Construct cut-off berms downslope of working areas.
- Demarcate footprint areas to be cleared to avoid unnecessary clearing.
- Exposed areas must be ripped and vegetated to increase surface roughness.
- Create energy dissipation at discharge areas to prevent scouring.
- Temporary and permanent erosion control methods may include silt fences, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed areas, erosion mats, and mulching.
- Separate clean and dirty water, continue with surface water and biomonitoring programmes.
- All chemicals and toxicants during construction must be stored in bunded areas.
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site.
- All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported.

9.3.4 IMPACTS ON HYDROPEDOLOGY

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

Below are the potential impacts on hydropedology for the planning, construction, operation, and rehabilitation and closure phases, as well as their impact rating

9.3.4.1 LOSS / DEGRADATION OF HYDROPEDOLOGICAL DRIVERS TO WETLANDS

The construction phase activities have the potential to degrade hydro-pedological drivers to wetlands through altered or removed sub-surface flow paths. Hydrological or flow dynamic impacts are likely to include reduced water volumes, bed, channel and flow modification, as well as the loss of wetland habitat through secondary alteration of water sources to the wetlands. During the operational phase altered flow dynamics both at surface and subsurface could impact on the hydropedological drivers to the wetlands. The underground mining has a slight risk of subsidence and this would alter the hydropedological drivers as well as the wetlands.

The removal of infrastructure and rehabilitation activities will be a large-scale operation and thus has the potential to alter flow dynamics during this period. Typically, following the cessation of underground mining activities groundwater returns to the voids created by the mining process. This process results in the alteration of the groundwater resources as well as possible subsidence.

In addition, in line with the precautionary principle, it is anticipated that the undermining of wetlands systems and the hillslopes that feed them could result in the subsidence of the surface. The resultant potential impacts include serious changes to surface hydrology resulting in the significant alteration of catchment areas and subsequent habitat levels impacts.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Hydropedological services: Loss / degradation of hydropedological drivers to wetlands	Ventilation Shaft (Alt 1))	Planning	-1,00	1,00	1,00	Low	Low
		Construction	-9,00	-6,00	-6,00	Low	Medium
		Operation	-9,00	4,00	4,00	Low	Medium
		Decommissioning	-4,00	4,00	4,00	Low	Medium
		Rehab and closure	-4,00	2,5	2,50	Low	Low
	Ventilation Shaft (Alt 2)	Planning	-1,00	1,00	1,00	Low	Low
		Construction	-9,00	-6,00	-6,00	Low	Medium
		Operation	-9,00	-6,00	-6,00	Low	Medium
		Decommissioning	-4,00	4,00	4,00	Low	Medium
		Rehab and closure	-4,00	2,50	2,50	Low	Low
	Underground Mining	Planning	-7,5	2,50	2,92	Low	Medium
		Operation	-5,00	-2,50	-2,50	Low	Medium
		Decommissioning	-4,00	3,00	3,00	Low	Medium
		Rehab and closure	-4,00	2,50	2,50	Low	Low

Proposed Mitigation:

The following mitigation measures are proposed:

- Underground workings must adhere to a safety factor that will minimise the risk of subsidence.
- Any loss/alteration of flow dynamics must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed.
- Separate clean and dirty water.
- Construct diversion berms and drains around working areas.
- Incorporate green /soft engineering storm water measures. Avoid unnecessary vegetation clearing and avoid preferential surface flow paths.
- No cleaning of vehicles, machines and equipment in water resources.
- No servicing of machines, vehicles and equipment on site.
- Storage of potential contaminants in bunded areas.
- All contractors must have spill kits available and be trained in the correct use thereof.
- All released water must be within DWAF (1996) water quality standards for aquatic ecosystems, and discharge must be managed to avoid scouring and erosion of the receiving systems.
- Contain wastewater in a PCD. Contaminated water must not be discharged into the watercourses.
- Clean and dirty water must be separated. This water could be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydro-dynamics.
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”,
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area.
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems.
- Compile a suitable stormwater management plan.
- Construct cut-off berms downslope of working areas.
- Demarcate footprint areas to be cleared to avoid unnecessary clearing.
- Exposed areas must be ripped and vegetated to increase surface roughness.
- Create energy dissipation at discharge areas to prevent scouring.
- Temporary and permanent erosion control methods may include silt fences, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed areas, erosion mats, and mulching.
- Separate clean and dirty water, continue with surface water and biomonitoring programmes.
- All chemicals and toxicants during construction must be stored in bunded areas.
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site.
- All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported

9.3.5 IMPACTS ON AQUATIC ECOLOGY

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

The construction phase activities have the potential to degrade water and habitat quality within the considered river systems. Water quality impacts may include increased dissolved/suspended solids, as well as potential persistent pollutants within the water column and sediments of the associated

watercourses. Considering this, general water chemistry modification may occur as a result of changed salt balances stemming from the influx of runoff from a modified catchment. Habitat quality impacts are likely to include reduced water volumes, sedimentation, bed, channel and flow modification, as well as the specific loss of aquatic habitat through direct modification during the construction of watercourse crossings (where needed), infrastructure, ventilation shafts and powerline.

Although the PES (baseline) of the river reaches assessed were derived to range from moderately to largely modified from reference conditions, further deterioration is possible and thus a potential decline in the PES could be observed. Thus, impacts described above will result in reduced aquatic biodiversity on a catchment scale.

Owing to the nature of construction phase activities and the initial disturbance of ground, the significance was rated as low to moderate prior to mitigation.

During the operational phase, the storage, transport and processing of carboniferous material presents a risk to contaminate the downstream river reaches. During rainfall events runoff which has been in contact with this material may enter local aquatic ecosystems. Once rainwater is in contact with the carboniferous material, dissolved substances will alter downstream water chemistry resulting in the loss of sensitive aquatic biota. Due to the intricacies related to groundwater and pumping of water from active underground shafts, the decant is likely to have the greatest risk to with regard to the impact assessed. The significance ranged from low to moderate prior to mitigation.

Below are the potential impacts on aquatic ecology for the planning, construction, operation, and rehabilitation and closure phases, as well as their impact rating.

9.3.5.1 LOSS / DEGRADATION OF AQUATIC HABITAT AND BIOTA

Project activities that can cause loss of habitat include the following among others:

- Physical removal of vegetation
- Access roads and servitudes
- Alteration of flow volumes in river reaches
- Construction of culverts/bridges for vehicle access
- Construction camps & laydown areas
- Earth moving (removal and storage of topsoil and overburden)
- Blasting and excavation
- Pollution of water resources due to dust effects, chemical spills, acid mine drainage, etc.
- Intentional killing of fauna for food (fishing)
- Infrastructure development (buildings)
- Linear trench excavation and berm creation
- Coal dust precipitation
- Stochastic events such as fire (cooking fires or cigarettes from staff)

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss / degradation of aquatic habitat and biota	Ventilation Shaft (Alt 1)	Planning	1	1	1,00	Low	Low
		Construction	-6,75	-2	-2,00	Low	Low
		Operation	-4,5	-1,75	-1,75	Low	Low
		Decommissioning	-4	-1,5	-1,50	Low	Low
		Rehab and closure	-4	-1,25	-1,25	Low	Low
	Ventilation Shaft (Alt 2)	Planning	1	1	1,00	Low	Low
		Construction	-6,75	-2	-2,00	Low	Low
		Operation	-4,5	-1,75	-1,75	Low	Low

		Decommissioning	-4	-1,5	-1,50	Low	Low
		Rehab and closure	-4	-1,25	-1,25	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss / degradation of aquatic habitat and biota	Powerline (Alt 1)	Planning	1	1	1,00	Low	Low
		Construction	-10	-5,25	-6,13	Low	Low
		Operation	-2	-2	-2,00	Low	Low
		Decommissioning	-8	-3,5	-3,50	Low	Low
		Rehab and closure	-4	-1	-1,17	Low	Low
	Powerline (Alt 2)	Planning	1	1	1,00	Low	Low
		Operation	-2	-2	-2,00	Low	Low
		Construction	-10	-5,25	-6,13	Low	Low
		Decommissioning	-8	-3,5	-3,50	Low	Low
		Rehab and closure	-4	-1	-1,17	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Loss / degradation of aquatic habitat and biota	Underground Mining	Planning	1	1	1	Low	Low
		Operation	-9,75	-5,5	-8,25	Low	Low
		Decommissioning	-9,75	-5,5	-8,25	Low	Low
		Rehab and closure	-12	-8,25	-12,38	Low	Low

Proposed Mitigation:

The following mitigation measures are proposed:

- The construction of linear infrastructure such as the powerline, ventilation shafts, roadways and conveyor systems should consider the following mitigation actions when encountering wetland systems and watercourses:
    - No crossings over riffle/rapid habitats. These should be avoided as these are the most sensitive; slow deep/shallow habitats should be favoured for crossings;
    - The crossing points should be stabilised to reduce the resulting erosion and downstream sedimentation;
    - The amended powerline should be suspended over the river crossings rather then buried underneath rivers. It can be attached to existing river crossing structures (bridges and culverts) such as those as sites J1 and V3;
    - Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years;

- The indiscriminate use of heavy vehicles and machinery within the instream and riparian habitat will result in the compaction of soils and vegetation and must be controlled;
- Erosion prevention mechanisms such as gabions must be employed to ensure the sustainability of all structures to prevent instream sedimentation;
- The crossing points should be unobtrusive (outside riparian and instream habitat) to prevent the obstruction and subsequent habitat modification of downstream portions;
- Diversion trenches and berms should convey dirty water to temporary ditches so as to contain runoff. These trenches and ditches can be vegetated to improve soil stability and clean the water;
- Soils adjacent to the river that have been compacted must be loosened to allow for germination of vegetation; and
- Stockpiling of removed soil and sand must be done outside the 1:100 flood line or riverine buffer (whichever is greater). This will prevent solids from washing into the river during high flow events.

- The removal of vegetative cover, as well as the construction of roads has been recognised as being responsible for increased runoff, sedimentation and subsequent water and habitat quality degradation in downstream portions of river systems (WRC, 2014). As such the careful management of vegetation removal and sedimentation control should take place. This can be achieved through the brief points below:
  - Minimise the removal of vegetation in the infrastructure footprint area;
  - Re-vegetation of the construction footprint as soon as possible;
  - Where storm water enters river systems, sediment/silt and debris trapping, as well as energy dissipation control measures must be put in place;
  - Storm water must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of storm water flow;
  - Sequential removal of the vegetation (not all vegetation immediately); and
  - The vegetation of unpaved roadsides/margins.
- During the operational phase of the proposed project, the storage and handling of carboniferous material can result in the degradation of downstream aquatic ecosystems. In order to prevent this, the use of diversion and containment management is of importance. This can be achieved through effective groundwater and surface water management. Important management actions are briefly listed below:
  - Diversion trench and berm systems which diverts clean storm water around pollution sources and convey and contain dirty water to central pollution control impoundments;
  - Barrier systems, including synthetic, clay and geological or other approved mitigation methods to minimise contaminated seepage and runoff from stockpiles and pollution control facilities from entering the local aquatic systems;
  - Where storm water enters river systems from disturbed sites, sediment and debris trapping, as well as energy dissipation control measures must be put in place; and

- The planting of indigenous vegetation around pollution control impoundments and structures as well as along road sides on routes used to transport coal should be completed as this has been shown to be effective in erosion and nutrient control.

- As described in the potential impacts of this proposed project, there is potential for Acid Mine Drainage to develop as a result of underground mining activities. The only mitigation possible for potential mine water decant is the use of passive or active water treatment. This is therefore recommended.
- General mitigation measures would include the following:
  - An experienced, qualified environmental control officer must be on site when construction begins to oversee environmental compliance to the proposed mitigation;
  - Dust-reducing mitigation measures must be put in place and must be strictly adhered to;
  - Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation;
  - All dumping of waste material, especially bricks and contaminated materials or soils, must be prevented; and
  - Compilation of and implementation of an alien vegetation management plan for the entire site, including the surrounding project area and especially the aquatic and wetland areas

9.3.5.2 IMPAIRED WATER QUALITY IN WATERCOURSES

Project activities that can cause impaired water quality in watercourses include the following among others:

- Chemical (organic/inorganic) spills
- Erosion and sedimentation
- Untreated runoff or effluent
- Soil dust depression (spraying of roads & exposed areas)
- Produce stockpiles and storage
- Discharge of contaminated groundwater from shafts & voids
- Elevated water temperatures from discharged water
- Runoff from RoM and stockpiles
- Seepage from mine infrastructure, waste and stockpile areas
- Leaks, breaches, overtopping and subsurface leaking of PCD's
- Transport of coal
- Sewage from ablutions
- Mismanagement of dirty water systems
- Acid mine drainage (decanting)

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Impaired water quality in watercourses	Ventilation Shaft (Alt 1)	Planning	1	1	1,00	Low	Low
		Construction	-6,75	-3,5	-3,50	Low	Low
		Operation	-3,5	-1,5	-1,50	Low	Low
		Decommissioning	-5,25	-3	-3,00	Low	Low

		Rehab and closure	-6,75	-1,5	-1,50	Low	Low
	Ventilation Shaft (Alt 2)	Planning	1	1	1,00	Low	Low
		Construction	-6,75	-3,5	-3,50	Low	Low
		Operation	-3,5	-1,5	-1,50	Low	Low
		Decommissioning	-5,25	-3	-3,00	Low	Low
		Rehab and closure	-6,75	-1,5	-1,50	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Impaired water quality in watercourses	Powerline (Alt 1)	Planning	1	1	1,00	Low	Low
		Construction	-12,5	-6	-7,00	Low	Low
		Operation	-2	-1	-1,00	Low	Low
		Decommissioning	-10	-4	-4,67	Low	Low
		Rehab and closure	-4,5	-1,25	-1,46	Low	Low
	Powerline (Alt 2)	Planning	1	1	1,00	Low	Low
		Construction	-12,5	-6	-7,00	Low	Low
		Operation	-2	-1	-1,00	Low	Low
		Decommissioning	-10	-4	-4,67	Low	Low
		Rehab and closure	-4,5	-1,25	-1,46	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Impaired water quality in watercourses	Underground Mining	Planning	1	1	1,17	Low	Low
		Construction	-9	-4,5	-6,75	Low	Low
		Operation	-11,25	-9	-13,50	Low	Medium
		Decommissioning	-12,75	-10,5	-15,75	Low	Medium
		Rehab and closure	-17	-14	-21,00	Low	Low

Proposed Mitigation:

See section 9.3.5.1 for recommended mitigation measures.

9.3.5.3 ALTERATIONS IN HYDROLOGICAL REGIME (FLOW OF SURFACE AND SUB-SURFACE WATER) AND SURFACE TOPOGRAPHY

Project activities that can cause alterations in hydrological regime include the following among others:

- Vegetation removal
- Excavations and infrastructure development
- Trenches for powerline burial
- Road network creation
- River crossing infrastructure development
- Alterations to surface topography (due to voids and surface structures)
- Underground mining
- Dewatering of working areas

- Abstraction of water for use in mine operational phase
- Decant of water

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Ventilation Shaft (Alt 1)	Planning	1	1	1,00	Low	Low
		Construction	-6,75	-3,5	-3,50	Low	Low
		Operation	-4,5	-2	-2,00	Low	Low
		Decommissioning	-4	-3	-3,00	Low	Low
		Rehab and closure	-4	-2,5	-2,50	Low	Low
	Ventilation Shaft (Alt 2)	Planning	1	1	1,00	Low	Low
		Construction	-6,75	-3,5	-3,50	Low	Low
		Operation	-4,5	-2	-2,00	Low	Low
		Decommissioning	-4	-3	-3,00	Low	Low
		Rehab and closure	-4	-2,5	-2,50	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Powerline (Alt 1)	Planning	-1	1	1,00	Low	Low
		Construction	-10	-3,5	-4,08	Low	Low
		Operation	-1,5	-1,25	-1,46	Low	Low
		Decommissioning	-9	-3	-3,50	Low	Low
		Rehab and closure	-4,5	-1	-1,17	Low	Low
	Powerline (Alt 2)	Planning	-1	1	1,00	Low	Low
		Construction	-10	-3,5	-4,08	Low	Low
		Operation	-1,5	-1,25	-1,46	Low	Low
		Decommissioning	-9	-3	-3,50	Low	Low
		Rehab and closure	-4,5	-1	-1,17	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Underground Mining	Planning	1	1	1,17	Low	Low
	Underground Mining	Operation	-15	-9	-13,50	Low	Medium
	Underground Mining	Decommissioning	-15	-9,75	-14,63	Low	Medium
	Underground Mining	Rehab and closure	-15	-14	-21,00	Low	Low

Proposed Mitigation:

See section 9.3.5.1 for recommended mitigation measures.

9.3.6 IMPACTS ON GEOHYDROLOGY

The following impacts on geohydrology within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). Below are the potential impacts on geohydrology for the construction, operation, and rehabilitation and closure phases, as well as their impact rating.

9.3.6.1 GROUNDWATER QUALITY DETERIORATION: STOCKPILES

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Groundwater Quality Deterioration: Stockpiles	Underground Mining (Alt 1)	Operation	-10	-6	-8,00	Low	Low

Proposed Mitigation:

- Minimise the footprint of dirty areas like coal stockpiles, workshops and oil and diesel storage areas. Proper storm water management should be implemented. Berms should be constructed to ensure separation of clean water and dirty water areas.
- Compaction of coal discard and concurrent rehabilitation methods will be applied. The objective is to reduce rainfall infiltration into coal discard by aiming for <1% of recharge per annum.
- Interception of contaminated groundwater may be required where seepage is observed and saline drainage enters surface water bodies. Normal pump and treat / re-use applications will be required.

9.3.6.2 GROUNDWATER ALTERED HYDROGEOLOGICAL REGIME (AQUIFER DRAWDOWN)

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Groundwater Altered Hydrogeological Regime (Aquifer Drawdown)	Underground Mining	Operation	-13	-9	-15,00	Low	Medium

Mitigation Measure:

The following mitigation measures are proposed:

- Static groundwater levels should be monitored monthly to ensure that any deviation of the groundwater flow patterns and water levels from the idealised predictions is detected in time.
- If the mining operation is indeed affecting the quantity of groundwater available to identified farm users, the affected parties should be compensated. A monitoring program must be implemented where groundwater levels are measured on a routine basis. If it is established that the mine de-watering activities have impacted the farm boreholes the mine must install additional boreholes for water supply purposes or supply an alternative water source.

9.3.6.3 CONTAMINATION OF GROUNDWATER

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Contamination of Groundwater	Underground Mining	Operation	-14	-9	-12,00	Low	Medium

Mitigation Measures

The following mitigation measures are proposed:

- Some degree of shallow seepage from the underground mine workings may occur. These were demarcated as a precautionary management tool and need to be re-calibrated after field confirmations. Field confirmations will include EC profiling of streams during wet and dry seasons.
- The groundwater and surface water monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network must be audited annually to ensure compliance with regulations. The monitoring network should be re-evaluated by a qualified hydrogeologists at least 2 years before mine closure so that decommissioning and closure strategies pertaining to groundwater level rebound and decant assessments can be confirmed.
- The rate of flooding and water level recovery as well as water quality in the underground voids should be monitored towards mine closure. Stage curves should be calibrated with the updated information to aid in the management of the Closure Phase (refer to the "Post Closure Impact" section below for the existing stage curve prediction.

- It is recommended that the geochemical assessment is updated during the life of the mine in order to calibrate and validate its results and to construct an effective closure plan.

9.3.6.4 CONTAMINATED GROUNDWATER SEEPAGE TO STREAMS (SALT LOAD) FROM REHABILITATED SURFACE AREAS - DISCARD, PLANT, PCDS, ETC

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Contaminated groundwater seepage to streams (salt load) from Rehabilitated surface areas - Discard, Plant, PCDs, etc	All	Rehab and closure	-10,5	-5,5	-5,50	Low	Low

Mitigation Measures

The following mitigation measures are proposed:

- Some degree of shallow seepage from the underground mine workings may occur. These were demarcated as a precautionary management tool and need to be re-calibrated after field confirmations. Field confirmations will include EC profiling of streams during wet and dry seasons.
- It is recommended that the geochemical assessment is updated during the life of the mine in order to calibrate and validate its results and to construct an effective closure plan.
- During the Operational Phase the groundwater pumped from the underground mine workings must be re-used as far as possible. The volumes de-watered and re-used must be measured by flow meters and reported in a database on a monthly basis.
- Adequately sized pollution control facilities should be constructed and lined. Contain poor quality runoff from dirty areas and divert this water to pollution control dam for re-use.
- Excess water must be pumped to dedicated underground storage dams and/or surface dirty water dams or pollution control facilities. Longer residence times in the underground workings results in higher overall TDS values due to prolonged exposure.
- The numerical model should be updated at least every three (3) years by using the measured water ingress, mine schedule and water levels to re-calibrate and refine the impact prediction scenarios.
- A detailed mine closure plan should be prepared during the Operational Phase, including a risk assessment, water resource impact prediction etc. as stipulated in the DWAF Best Practice Guidelines. The implementation of the mine closure plan, and the application for the closure certificate can be conducted during the Closure Phase.
- Best Practice Guideline - A6: Water Management for Underground Mines – DWA, July 2008 states the following: Plan, design, operate and close the underground mining operations in a manner that reduces the ingress of clean water into the mine, minimizes the volume of water

used in mining operations, maximizes water reuse, minimizes the water quality deterioration within the mine and minimizes the impacts on the water resource.

- The following general management strategies must be considered to manage any long term AMD:
    - Plan for closure with regard to understanding where water enters the mine and would normally accumulate, how it flows, how it should preferably flow in order to minimize water quality deterioration.
    - Adits can be major sources of surface and groundwater ingress if not properly sealed. It is therefore recommended that all potential mine entry points like boreholes, old ventilation shafts, old rescue bays and mine portals/adits be sealed off as per the DMR regulations.
    - Sufficient pillars must be left underground, as part of sound mine planning, to avoid subsidence of the roof to surface along the shallower areas (where underground mining is less than 40m from surface). This will ensure that the rate of recharge to the underground workings remain at natural rates and will minimise decant from the workings post-closure.

9.3.6.5 CONTAMINATION OF STREAMS DUE TO MINE DECANT AND WEATHERED AQUIFER SEEPAGE FROM OLD MINE WORKINGS

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Contamination of streams due to mine decant and weathered aquifer seepage from old mine workings	Underground Mining	Rehab and closure	-11,25	-7	-10,50	Low	Medium

Mitigation Measures

The following mitigation measures are proposed:

- Some degree of shallow seepage from the underground mine workings may occur and these zones are also demarcated on the map in Figure 9 8. These were demarcated as a precautionary management tool and need to be re-calibrated after field confirmations. Field confirmations will include EC profiling of streams during wet and dry seasons.
- The groundwater and surface water monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network must be audited annually to ensure compliance with regulations. The monitoring network should be re-evaluated by a qualified hydrogeologists at least 2 years before mine closure so that decommissioning and closure strategies pertaining to groundwater level rebound and decant assessments can be confirmed.
- The rate of flooding and water level recovery as well as water quality in the underground voids should be monitored towards mine closure. Stage curves should be calibrated with the

updated information to aid in the management of the Closure Phase (refer to the "Post Closure Impact" section below for the existing stage curve prediction.

- It is recommended that the geochemical assessment is updated during the life of the mine in order to calibrate and validate its results and to construct an effective closure plan.

9.3.6.6 CONTAMINATION OF FARM BOREHOLES DUE TO MINE DECANT AND WEATHERED AQUIFER SEEPAGE FROM OLD MINE WORKINGS

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Contamination of farm boreholes due to mine decant and weathered aquifer seepage from old mine workings	Underground Mining	Rehab and closure	-11,25	-7	-10,50	Low	Medium

Mitigation Measures

The following mitigation measures are proposed:

- Some degree of shallow seepage from the underground mine workings may occur. These were demarcated as a precautionary management tool and need to be re-calibrated after field confirmations. Field confirmations will include EC profiling of streams during wet and dry seasons.
- It is recommended that the geochemical assessment is updated during the life of the mine in order to calibrate and validate its results and to construct an effective closure plan.
- During the Operational Phase the groundwater pumped from the underground mine workings must be re-used as far as possible. The volumes de-watered and re-used must be measured by flow meters and reported in a database on a monthly basis.
- Adequately sized pollution control facilities should be constructed and lined. Contain poor quality runoff from dirty areas and divert this water to pollution control dam for re-use.
- Excess water must be pumped to dedicated underground storage dams and/or surface dirty water dams or pollution control facilities. Longer residence times in the underground workings results in higher overall TDS values due to prolonged exposure.
- The numerical model should be updated at least every three (3) years by using the measured water ingress, mine schedule and water levels to re-calibrate and refine the impact prediction scenarios.
- A detailed mine closure plan should be prepared during the Operational Phase, including a risk assessment, water resource impact prediction etc. as stipulated in the DWAF Best Practice Guidelines. The implementation of the mine closure plan, and the application for the closure certificate can be conducted during the Closure Phase.

- Best Practice Guideline - A6: Water Management for Underground Mines – DWA, July 2008 states the following: Plan, design, operate and close the underground mining operations in a manner that reduces the ingress of clean water into the mine, minimizes the volume of water used in mining operations, maximizes water reuse, minimizes the water quality deterioration within the mine and minimizes the impacts on the water resource.
- The following general management strategies must be considered to manage any long term AMD:
    - Plan for closure with regard to understanding where water enters the mine and would normally accumulate, how it flows, how it should preferably flow in order to minimize water quality deterioration.
    - Adits can be major sources of surface and groundwater ingress if not properly sealed. It is therefore recommended that all potential mine entry points like boreholes, old ventilation shafts, old rescue bays and mine portals/adits be sealed off as per the DMR regulations.
    - Sufficient pillars must be left underground, as part of sound mine planning, to avoid subsidence of the roof to surface along the shallower areas (where underground mining is less than 40m from surface). This will ensure that the rate of recharge to the underground workings remain at natural rates and will minimise decant from the workings post-closure.

9.3.6.7 POTENTIAL FOR ACID MINE DRAINAGE

Acid Mine Drainage (AMD) can be defined as the outflow or seepage of acidic water from old metal or coal mine areas. AMD is comprised of a low pH, iron and sulphate water and it usually occurs when water is exposed to the atmosphere via outflow or seepage, thus oxidising. The assessment of potential for acid mine drainage is based on findings of the EIA Report compiled by GCS (Pty) Ltd (GCS) for Forzando Coal Mines in 2010.

The oxidation of the pyrite present in the coal seam and the roof and the floor of the underground mine workings will lead to the formation of acid mine drainage (AMD) and an increase in total dissolved solids (TDS) as the acidification is countered by the neutralising potential of the local geology. As detailed in the EIAR, the results indicate that the floor and roof material could leach contaminants. It is anticipated that flooding of the back areas will, however, continue until total flooding of the workings has occurred after closure. The significance of the impact during the operational phase will be low. The decommissioning will result in the potential generation of acid mine water within the mine workings, which will gradually reduce as oxidation of the pyrite is inhibited by the flooding. Owing to the general dip of the coal seam away from the sub-outcrop, flooding will occur progressively back from the deeper sections of the mined-out area.

9.3.6.7.1 GROUNDWATER QUALITY

Once mining has ceased, AMD is likely to form in the underground workings given the unsaturated conditions in the facility causing oxidation of sulphide minerals which, when in contact with infiltrated groundwater, creates sulphuric acid. Influx of groundwater into the underground workings results in plume migration. Therefore, groundwater contaminant plumes are likely to migrate from the mining areas once the water level in the underground voids have reached long term steady state conditions.

Shallow Aquifer contaminated seepage

The predicted sulphate plumes for the shallow aquifer system can be seen in Figure 71 for 50 years after mine closure.

Deeper Contaminated Seepage

The contaminant plume emanating from the underground voids will have an impact on the groundwater quality as seen in the post mining simulations, refer Figure 72. The sulphate plume is basically restricted to the mine workings area and limited down-stream migration will occur after closure.

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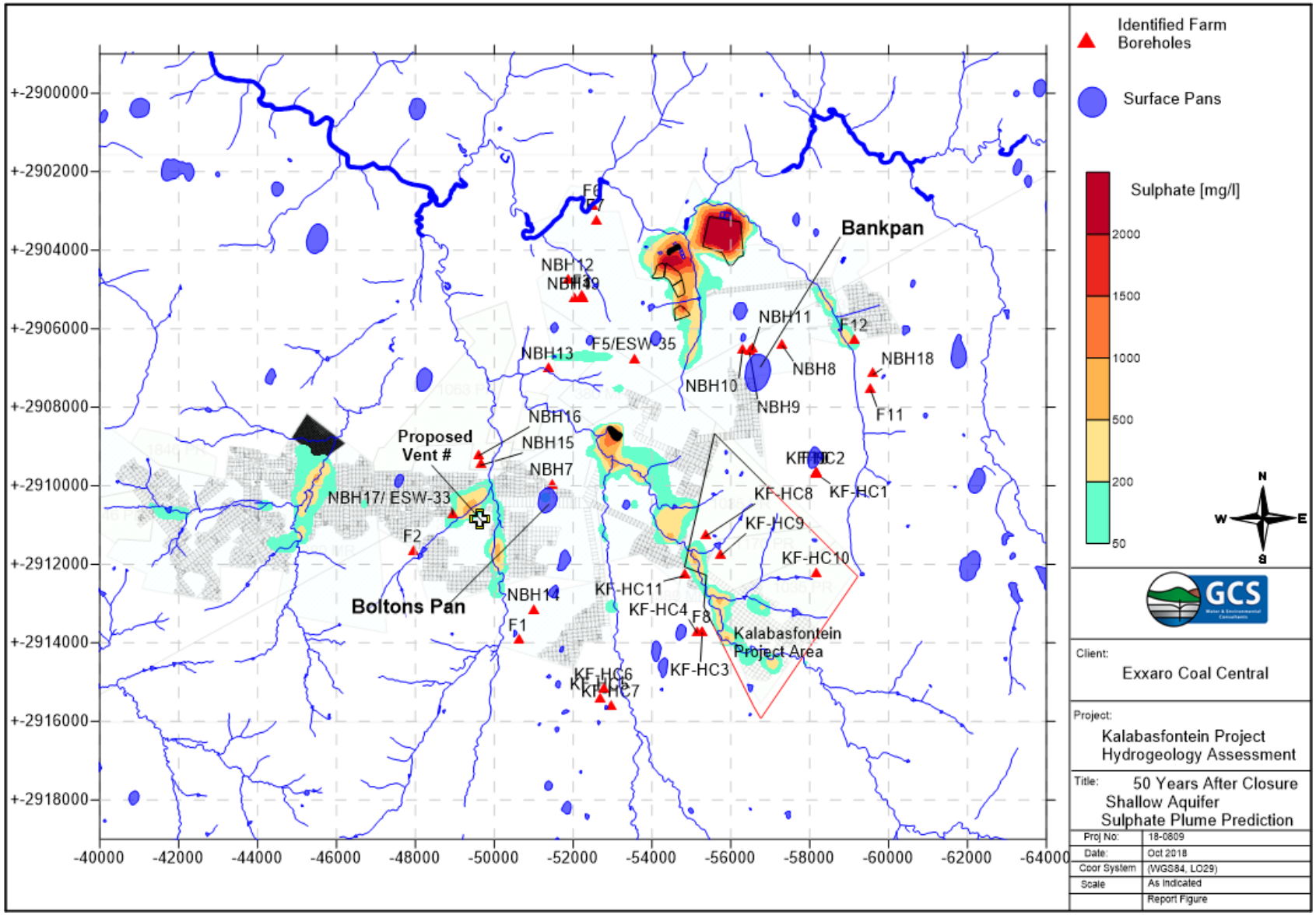

Figure 71: Forzando Coal Mines sulphate contours in [mg/l] 50 years after final closure - Shallow Aquifer

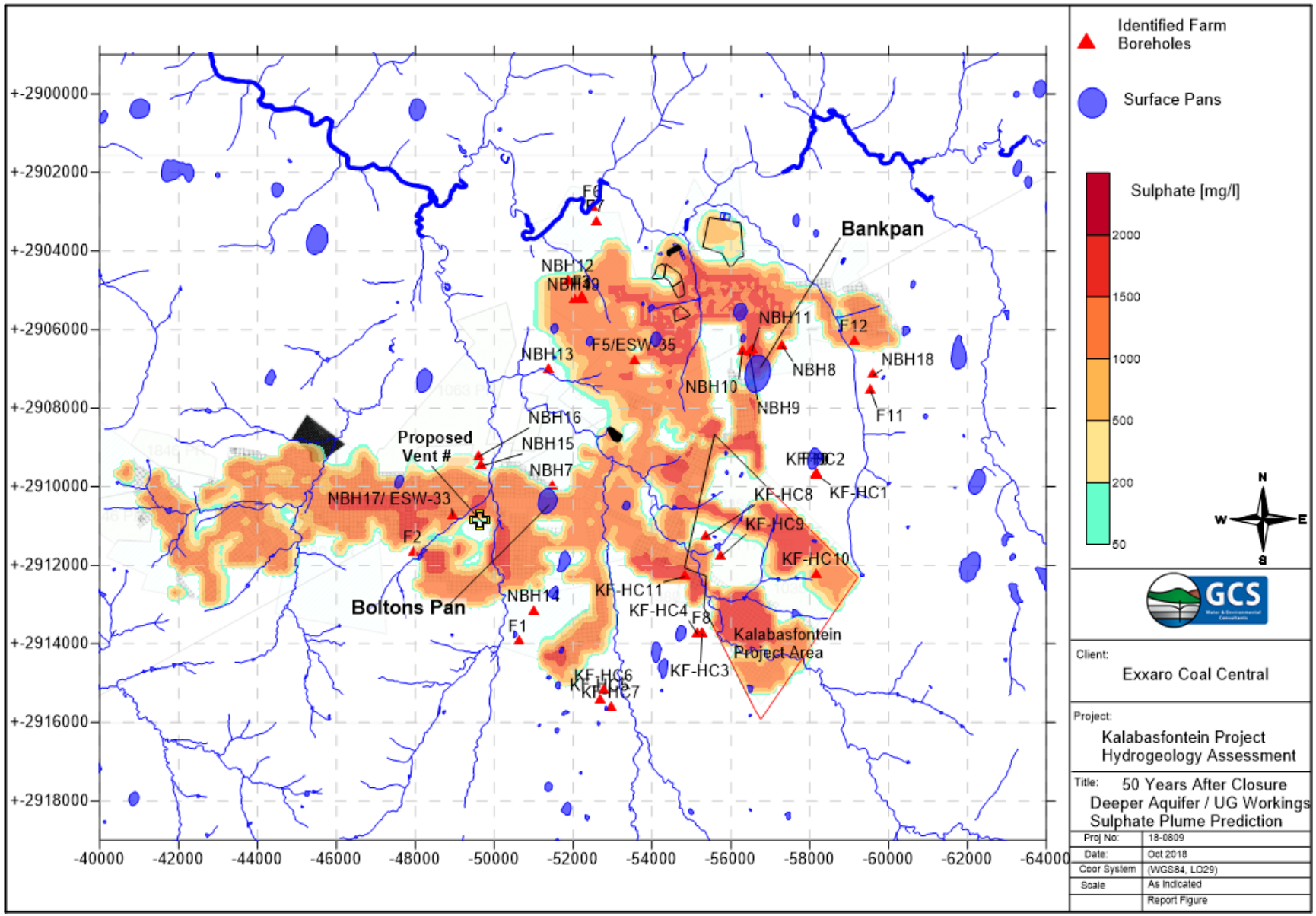

Figure 72: Forzando Coal Mines deeper coal seam horizon sulphate contours in [mg/l] 50 years after closure

Several “sensitive” areas can be highlighted from the predicted sulphate contour maps. These areas represent a worst-case scenario of expected groundwater seepage from the underground workings which may reach the shallow upper aquifer zone. It is recommended that groundwater and surface water monitoring points be installed in certain areas to monitor any seepages; this will be discussed later in this report.

Experience has shown that the plume stagnates after about 50 years, and no further movement after such time is expected. This statement is also supported by the geochemical modelling which indicates either a decrease or flattening of predicted concentrations.

According to the existing information and hydrocensus data, none of the privately-owned boreholes are affected by the deeper seepage plumes “rising” into the upper weathered aquifer as indicated in Figure 72.

However, farm boreholes in the vicinity of the Bolton Pan and Bankpan areas need to be monitored as a pre-caution. The pans itself also need to be monitored at regular intervals to ensure a proper understanding of any water quality fluctuations are in place. In general, the deeper flow will not affect the farm boreholes which are usually only within the upper aquifer zones.

9.3.6.7.2 MINE WATER DECANT

The Forzando North and South adits are situated along the up dip of the coal seam. The coal seam (No. 4 L) is about 20 m below surface at the North Adit and slightly shallower at the South Adit. Total recovery of groundwater levels will be in the region of 40 to 50 years after closure based on 3 % recharge (refer to Table 38). As the underground workings will recover due to normal rainfall recharge and regional aquifer inflow, water should rise to its original level. However, if the recharge is different in comparison to pre-mining conditions, groundwater levels can “recover” to a higher level.

In principle, the possibility of decanting is dependent on the dip of the coal floor, the topography, the characteristics of the static groundwater levels, the presence of any geological feature that acts as a conduit /barrier and the rate of recharge to the mining area. It is therefore critical that the rate of recharge be as close to natural conditions as possible (i.e. between 2 and 3% of annual rainfall). This requires that all “conduits” like exploration boreholes, emergency boreholes and ventilation shafts be sealed off after closure. The assessment indicates that it is highly unlikely that direct decant will occur according to the existing layout and adit positions.

Table 38: Forzando Underground water storage and re-bound calculations

Parameter	Forzando South		Forzando North	
	Upper Re Range	Lower Re Range	Upper Re Range	Lower Re Range
Area (m^2)	1 584 125	1 584 125	10 345 707	10 345 707
Minimum floor elevation (mamsl)	1 529	1 529	1 510	1 510
Maximum floor elevation (mamsl)	1 565	1 565	1 512	1 512
Minimum roof elevation (mamsl)	1 531	1 531	1 580	1 580
Maximum roof elevation (mamsl)	1 568	1 568	1 582	1 582
No. 4 L coal volume (Mm3)	3 485 075	3 485 075	22 760 555	22 760 555

Pillar Ratio	0.5	0.5	0.5	0.5
Water storage (Mm3)	1 742 537	1 742 537	11 380 278	11 380 278
Recharge (% MAP)	3.0	2.5	2.5	2.0
Water make (m3/a)	39 207	32 673	213 380	170 704
Years to flood (a)	44	53	53	67

9.3.6.7.3 MANAGEMENT AND MITIGATION

Figure 71 above and Figure 73 below indicate areas where shallow and deeper aquifers could be connected through mining. It is generally recommended that no mining occur <20-30 mbgl, typically along topographically low areas like rivers and streams.

It is also suggested that no stooping or any other pillar mining along dyke/sill contact zones and / or along areas where mining is shallower than 40 to 50 m. It is important to ensure that natural recharge conditions continue and that no additional recharge occurs. The risk of subsidence becomes greater where underground mining occurs along shallow zones. Subsidence will subsequently result in additional recharge. Sound geotechnical and/or rock mechanical principles must be applied during mining to prevent subsidence, especially in areas where the underground workings are shallow.

Other possible issues that can lead to decant or shallow seepage is:

- Additional recharge from rainfall into the underground workings. If recharge becomes higher than what is naturally occurring, surplus water will be generated that exceeds the aquifers storage capacity and will subsequently migrate along the shortest route to the surface. The natural recharge is between 2 and 4% of annual rainfall. If more recharge is allowed through old exploration boreholes, surface cracks, shallow underground workings, etc then upward plume migration will occur.
- Decant can also take place from the monitoring borehole (FNGW03) drilled into the underground workings, depending on the hydraulic pressure exerted on the borehole. An unplugged borehole acts as a conduit for flow and a preferential pathway for decant if no other pathways exist. Unless this borehole will be used for monitoring (see comment below), it should be sealed at closure to limit the possibility of decanting. It is also critical that any future monitoring boreholes that will be installed to measure rebound in the underground workings be placed outside the sensitive areas marked on Figure 73.
- The “Up-thrust” compartment is bound by dolerite dykes; the degree of weathering and possible recharge into this compartment must be confirmed by looking at current inflows and possible connection from ground surface to the underground workings.

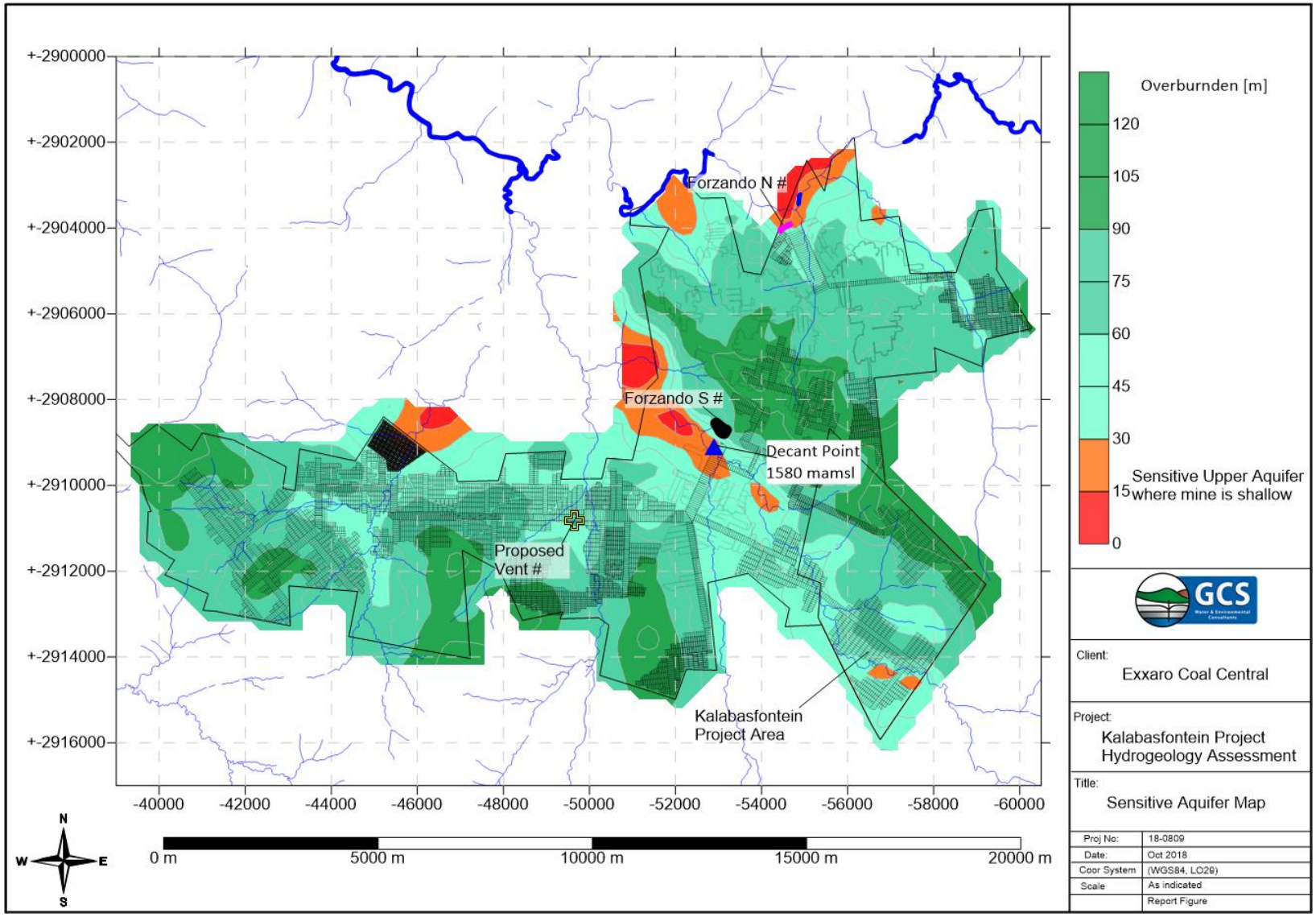

Figure 73: Potential decant point

9.3.6.7.4 GROUNDWATER AND SURFACE WATER INTERACTION

Naturally, base-flow contributes to most of the stream and river flow in the area (refer to Figure 74 for a typical illustration). This flow generally is not connected to the deeper aquifer flow where mining occurs but might be connected along geological structures in some places and manmade features like boreholes and adits or where the 4L coal seam is shallow and interconnects shallow weathering. This might connect deeper flow with shallow flow, poor quality water can filter through the weathered zone and add saline underground water to the shallow base-flow component.

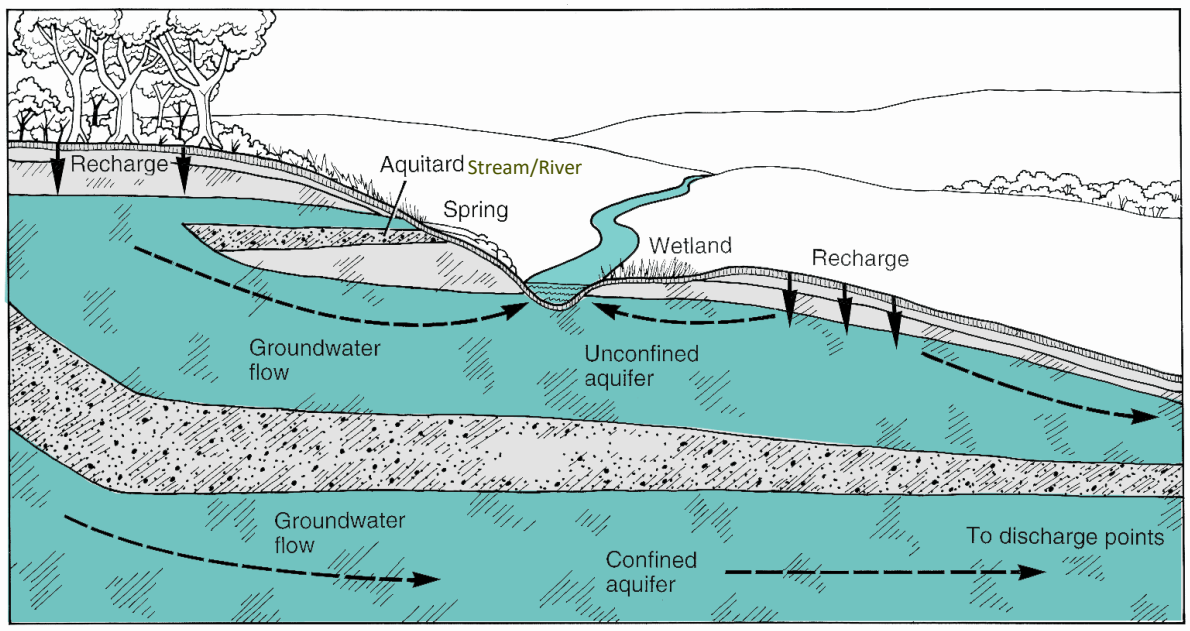

Figure 74: Graphical illustration of shallow groundwater interaction with streams and wetlands

Forzando South and Kalabasfontein

The Viskuile Spruit and the Boltons Pan Area are the main surface water bodies in this area. The Viskuile Spruit flows through the proposed Kalabasfontein Project area and next to the Forzando South Adit area in a northerly direction.

The following summary was extracted from the latest water monitoring report (Aquatico, 2nd Q March to June 2018):

- Water from Boltons pan (FSSW07) was classified as Poor (Class 03) water quality due to the Fluoride concentrations in the water, high TDS, high alkaline pH, high Na and Cl.
- Refer to Figure 75 for the TDS time graph, which indicates that the TDS concentrations is generally higher in the up-stream Viskuile samples sites FSSW1 and 2, when comparing to the downstream site FSSW5;
- Spatial Assessment Table 39 was used to compare the upstream and downstream sampling localities of the Viskuile Stream. This table quantifies the potential impacts observed from the upstream aquatic environment towards the downstream environment by highlighting any variable concentrations in red which can be assumed as contributions to the total degradation or improvement (indicated in green) of downstream water quality, by the Forzando South Area situated between these two localities or any other potential contributor residing between them. This does not necessarily mean the contribution of any particular parameter exceeded the permissible concentration of that variable, but is merely an indication of impact. Qualities obtained for the Viskuile Upstream (FSSW01) was more or less the same than the qualities obtained from the Viskuile River at Bridge – downstream of mine (FSSW05) with slight improvements. The water qualities for both localities were neutral, non-saline and slightly hard (FSSW05) to hard (FSSW01) (DWAF, 1996 & 1998).

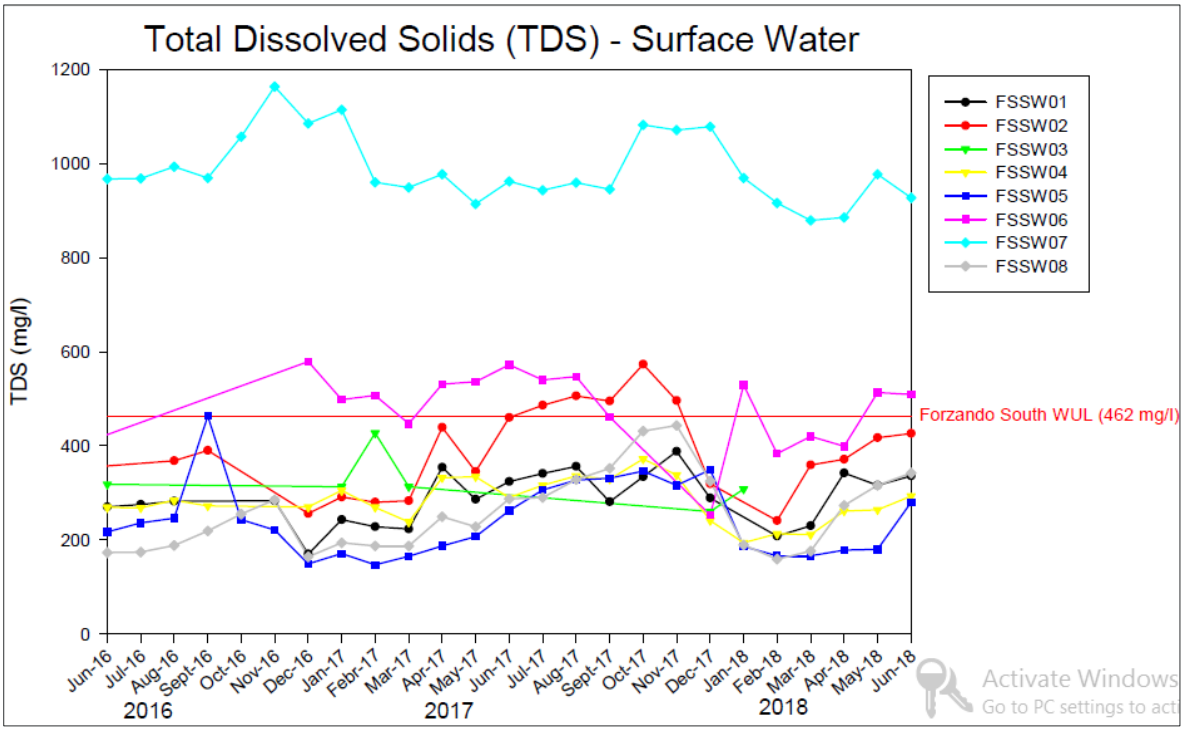

Figure 75: TDS time graph for the Forzando South surface water monitoring sites

Table 39: Viskuile Spruit up and down-stream comparison (June 2018)

PROJECT NAME			Forzando Coal Mines		
DATE RANGE			2018/04/01 to 2018/06/30		
ASSESSMENT SET			Forzando South Water Resource		
VARIABLE	UNIT	ASSESSMENT VALUE	Locality		CALCULATED CHANGE
			Upstream	Downstream	
			FSSW01 (Viskuile River by R38)	FSSW05 (Viskuile on bridge)	
pH @ 25°C	pH	5.0-9.5	8.31	8.17	-0.14
Electrical Conductivity (EC) @ 25°C	mS/m	-	53.7	33.6	-20.1
Total Dissolved Solids (TDS)	mg/l	462.0	331	213	-118
Total Hardness	mg $CaCO_3$/l	-	209	131	-78
Calcium (Ca)	mg/l	45.0	40.8	26.6	-14.2
Magnesium (Mg)	mg/l	24.0	26	15.7	-10.3
Sodium (Na)	mg/l	36.0	43.9	26.7	-17.2
Potassium (K)	mg/l	6.5	4.15	5.18	1.03
Total Alkalinity	mg $CaCO_3$/l	-	211	128	-83
Chloride (Cl)	mg/l	23.0	22.8	14.4	-8.4
Sulphate (SO_4)	mg/l	152.0	56	38.1	-17.9
Nitrate (NO_3) as N	mg/l	-	0.21	0.456	0.246

The overall predicted and cumulative salinity load to the Viskuile Spruit system, just before the confluence of the Olifants River will be in the order of 20 to 50 mg/l of TDS. This is graphically presented in Figure 76.

It is not foreseen that the proposed new Kalabasfontein Project and Forzando South will have any related impacts after closure on the Viskuile Spruit due to seepage from any surface mine infrastructure; the coal stockpile areas will be removed and the areas rehabilitated after closure.

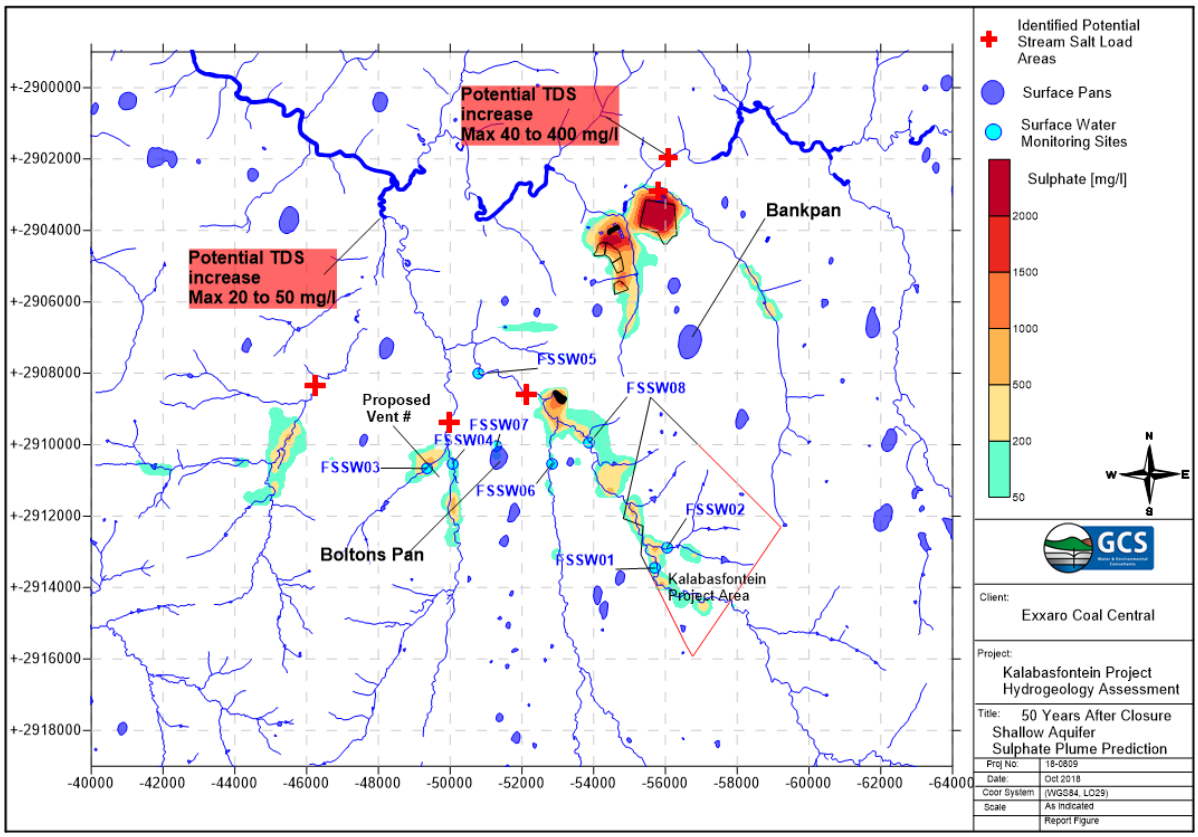

Figure 76: Maximum salinity increase / load prediction within the post-closure phase and areas where post closure monitoring will be required

9.3.6.7.5 LONG TERM MANAGEMENT STRATEGY FOR AMD

The Best Practice Guideline - A6: Water Management for Underground Mines – DWA, July 2008 states the following: *"Plan, design, operate and close the underground mining operations in a manner that reduces the ingress of clean water into the mine, minimizes the volume of water used in mining operations, maximizes water reuse, minimizes the water quality deterioration within the mine and minimizes the impacts on the water resource."*

General

The following general management strategies must be considered to manage any long term AMD:

- Plan for closure with regard to understanding where water enters the mine and would normally accumulate, how it flows, how it should preferably flow in order to minimize water quality deterioration;
- Adits can be major sources of surface and groundwater ingress if not properly sealed. It is therefore recommended that all potential mine entry points like boreholes, old ventilation shafts, old rescue bays and mine portals/adits be sealed off as per the DMR regulations; and
- Sufficient pillars must be left underground, as part of sound mine planning, to avoid subsidence of the roof to surface along the shallower areas (where underground mining is less than 40m from surface).

This will ensure that the rate of recharge to the underground workings remain at natural rates and will minimise decant from the workings post-closure.

Site Specific

The main focus areas for AMD management should be:

- To reduce oxygen ingress into the old mine workings. Oxygen usually enters the mine where mine workings are not flooded or via excessive rainfall recharge/inflows. Shallow areas where the overburden is less than 30m are more susceptible to higher rainfall ingress, oxygen ingress and AMD; and
- To reduce excessive rainfall recharge/inflows into the underground workings after flooding.

9.3.7 IMPACTS ON HYDROLOGY

The following preliminary impacts on the hydrological resources within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). Below are the preliminary impacts on hydrological resources for the construction, operation, and rehabilitation and closure phases, as well as their impact rating.

9.3.7.1 EROSION OF SOILS

Eroded soils have the potential to cause sedimentation of downstream watercourses. The construction of the ventilation shaft, the access road and associated powerline has the potential to disturb soils resulting in their erosion during times of rainfall, while the decommissioning of this infrastructure will result in the same (although to a lesser degree as less disturbance is expected than in the construction phase). If not mitigated, erosion could continue during the operational phase, although it is expected soils would settle to a degree, reducing the potential volume of erosion for any given rainfall event. The rehab/closure phase may have an overall positive impact on any existing erosion without formal erosion mitigation in place, although there could also be some increase in erosion due to earthworks.

Potential erosion is exacerbated by the moderately high runoff potential of the soils in the area which would cause a higher proportion of rainfall to be converted into runoff, thereby increasing the runoff's potential erosivity, although the limited surface area to be disturbed will limit the overall erosion of soils on site during all project phases.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Erosion of soils	Ventilation Shaft (Alt 1)	Construction	-11	-2,5	-2,50	Low	Low
		Operation	-8,25	-2,5	-2,50	Low	Low
		Decommissioning	-11	-2,5	-2,50	Low	Low
		Rehab and closure	-8,25	-2,5	-2,50	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Erosion of soils	Ventilation Shaft (Alt 2)	Construction	-11	-2,5	-2,50	Low	Low
		Operation	-8,25	-2,5	-2,50	Low	Low

		Decommissioning	-11	-2,5	-2,50	Low	Low
		Rehab and closure	-8,25	-2,5	-2,50	Low	Low

Mitigation Measures

The following mitigation measures are proposed among others:

- Suitable erosion control should be utilised where necessary.
- Disturbed areas or areas rehabilitated with soils should be stabilised as soon as possible using plants (e.g. grass) or other mechanical methods (e.g. profiling or erosion control blankets).
- A rehabilitation plan for the site inclusive of topsoil replacement, a re-vegetation strategy and maintenance/aftercare and should be developed for disturbed areas.

9.3.7.2 POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT

Operation of earth moving machinery or maintenance vehicles on site during construction, operation, decommissioning and rehab/closure (including the possible storage or handling of hydrocarbons) poses a potential source of hydrocarbon contamination with regards to the surface water environment. In addition, coal soot originating from the ventilation shaft has the potential to accumulate and find its way into the surface water environment if mobilised by runoff during the operational phase.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Pollutants entering the surface water environment	Ventilation Shaft (Alt 1)	Construction	-9	-1,75	-1,75	Low	Low
		Operation	-10,5	-1,75	-1,75	Low	Low
		Decommissioning	-9	-1,75	-1,75	Low	Low
		Rehab and closure	-9	-1,75	-1,75	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Pollutants entering the surface water environment	Ventilation Shaft (Alt 2)	Construction	-9	-1,75	-1,75	Low	Low
		Operation	-10,5	-1,75	-1,75	Low	Low
		Decommissioning	-9	-1,75	-1,75	Low	Low
		Rehab and closure	-9	-1,75	-1,75	Low	Low

Mitigation Measures

The following mitigation measures are proposed among others:

- An emergency response plan for unforeseen hydrocarbon spills should be developed while the existing surface water monitoring for the Forzando South Colliery and associated mining should be extended to include Kalabasfontein Project.

- Handle hydrocarbons carefully to limit spillage.
- Ensure vehicles are regularly serviced so that hydrocarbon leaks are limited.
- Designate a single location for refuelling and maintenance where possible.
- Keep a spill kit on site to deal with any hydrocarbon leaks.
- Remove soil from the site which has been contaminated by hydrocarbon spillage.
- Undertake surface water monitoring to enable change detection related to contaminants originating from the site.

9.3.7.3 INCREASE IN RUNOFF WATER

The proposed construction of the ventilation shaft, access road and powerline will increase impermeable hardstanding, although the impermeable area to be covered is negligible (~0.014ha of permanent hardstanding for the ventilation shaft). The potential access road is expected to be gravel or dirt based in which case its impact will relate more to compaction. There is consequently a limited area of hardstanding that would increase runoff. Impermeable areas would relate to the construction, operational and decommissioning phases and not the rehab/closure phase. Compaction resulting from movement of machinery and use of laydown areas would be noticeable at the activity level, however, not at the site level due to the small area of works (e.g. 1.6ha associated with the western ventilation shaft). Reducing the duration and area over which machinery operates or over which laydown areas are utilised would reduce the influence of compaction. Compaction would primarily relate to the construction, decommissioning and rehab/closure phases.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Increase in runoff water	Ventilation Shaft (Alt 1)	Construction	-5,25	-3,5	-3,50	Low	Low
		Operation	-6	-6	-6,00	Low	Low
		Decommissioning	-5,25	-3,5	-3,50	Low	Low
		Rehab and closure	-4,5	-3	-3,00	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Increase in runoff water	Ventilation Shaft (Alt 2)	Construction	-5,25	-3,5	-3,50	Low	Low
		Operation	-6	-6	-6,00	Low	Low
		Decommissioning	-5,25	-3,5	-3,50	Low	Low
		Rehab and closure	-4,5	-3	-3,00	Low	Low

Mitigation Measures

The following mitigation measures are proposed among others:

- Limiting the time and area over which machinery operates will limit the compaction of soils on the site.
- Laydown areas should likewise be kept to a minimum with regards to area and time.
- The influence of hardstanding cannot be mitigated

9.3.7.4 DECREASE IN RUNOFF AND STREAM FLOW

Subsidence of land and potential undermining of surface water features resulting from underground workings is a possibility although during a cursory investigation during the site visit by the hydrologist, surface water features appeared intact (no evidence of undermining, although subsidence was not assessed). In considering the geotechnical report for the project (Exxaro, 2018), the occurrence of subsidence requires a portion of the pillar system in the underground workings to fail, which the report indicates is 'unlikely'. Following pillar failure, some subsidence could occur which would have the impact of containing either runoff (if outside of a watercourse) or streamflow (if within a watercourse), which could result in a substantial change to the hydrological regime on the site and downstream of the site. The potential for river undermining has not explicitly been considered by the Exxaro report, with sinkhole likelihood only being defined. The development of sinkholes could coincide with river undermining, however, the Exxaro report indicates that sinkhole probability is 'low', requiring pillar failure. Development of a sinkhole that leads to river undermining would have a substantial impact on the hydrological regime, possibly causing a total loss in streamflow for a period of time.

The assessment of the probability of either subsidence of land or sinkholes as they relate to river undermining, is (according to the Exxaro, 2018 report), dependant on the failure of the pillar system which has been indicated as unlikely or low. As such, the assessment of this impact is based upon a low probability of occurrence (which is solely informed by the Exxaro, 2018 report) for all project phases, since no distinction is made in report. This probability is assumed to be reduced to improbable based upon the recommended mitigation measures.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Hydrology: Decrease in runoff and/or stream flow	Alternative Shaft (Alt 1)	Construction	-9	-4	-4,67	Low	Low
		Operation	-9	-4	-4,67	Low	Low
		Decommissioning	-9	-4	-4,67	Low	Low
		Rehab and closure	-9	-4	-4,67	Low	Low
	Ventilation Shaft (Alt 2)	Construction	-9	-4	-4,67	Low	Low
		Operation	-9	-4	-4,67	Low	Low
		Decommissioning	-9	-4	-4,67	Low	Low
		Rehab and closure	-9	-4	-4,67	Low	Low

Mitigation Measures

The following mitigation measures are proposed among others:

- Maintain the pillar system to prevent failure.
- Monitor surface levels to detect any change that may indicate possible subsistence or sinkhole development.
- In many instances subsided land may be left to rehabilitate naturally where subsidence occurs.
- Instances of river undermining would possibly require a river diversion to stop ingress of streamflow into the mine.

9.3.7.5 POTENTIAL FLOODING (RIVER AND SURFACE WATER)

Flood risk is an impact to the proposed Kalabasfontein Project and not the environment as with the other impacts identified in this report. This risk is expected to be present during all phases due to the presence of a shaft that would allow ingress of water into the underground mine, as well as the possibility of river undermining. Flood risk is, however, only considered relevant prior to closure when underground workings will be active.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Potential Flooding (River and Surface Water)	Preferred Shaft (Alt 1)	Construction	-4,5	-1,75	-1,75	Low	Low
		Operation	-4,5	-1,75	-1,75	Low	Low
		Decommissioning	-4,5	-1,75	-1,75	Low	Low

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Potential Flooding (River and Surface Water)	Ventilation Shaft (Alt 2)	Construction	-4,5	-1,75	-1,75	Low	Low
		Operation	-4,5	-1,75	-1,75	Low	Low
		Decommissioning	-4,5	-1,75	-1,75	Low	Low

Mitigation Measures

The following mitigation measures are proposed among others:

- Maintain the pillar system to prevent failure.
- Monitor surface levels to detect any change that may indicate possible subsistence or sinkhole development.
- A low berm around the ventilation shafts would add additional protection from flooding, whether from surface water run-on or from the river
- The powerline should be offset above and the pylons placed outside of the 1:100 year flood-line or the 100m river buffer (where flood-lines are not available) to protect against high velocity flood flows or associated debris.
- Works should ideally not take place within 100m of the river or within the 1:100 year flood-line so as to limit the applicability of Section 21 water uses and GN704 Condition 4.

9.3.8 IMPACTS ON SOILS AND AGRICULTURAL POTENTIAL

The following potential impacts were considered on soil resources based on all the project phases of the proposed power lines, access roads, ventilation shafts and the underground mining operations. The only expected impact pertaining to soil resources is that of “Degradation and/or loss of soil resources.

9.3.8.1 DEGRADATION AND/OR LOSS OF SOIL RESOURCES

The following potential impacts were considered on soil resources based on all the project phases of the proposed power lines, access roads, ventilation shafts and the underground mining operations. The only expected impact pertaining to soil resources is that of “Degradation and/or loss of soil resources.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Soil: Loss of Land Capability	Ventilation Shaft (Alt 1)	Planning	-1,25	-1,25	-1,67	Low	Low
		Construction	-20	-12	-16,00	Low	Medium
		Operation	-13	-7,5	-10,00	Low	Medium
		Decommissioning	-11	-10	-13,33	Low	Medium
		Rehab and closure	-10,5	-3,5	-4,67	Low	Low
	Ventilation Shaft (Alt 2)	Planning	-1.25	-1,25	-1,67	Low	Low
		Construction	-22,5	-14	-18,67	Low	Medium
		Operation	-14	-12	-16,00	Low	Medium
		Decommissioning	-12	-11	-14,67	Low	Medium
		Rehab and closure	-10,5	-3,5	-4,67	Low	Medium
	Powerline (Alt 1)	Planning	-1.25	-1,25	-1,25	Low	Medium
		Construction	-13	-9,75	-9,75	Low	Medium
		Operation	-5	-5	-5,00	Low	Low
		Decommissioning	-7,5	-7,5	-7,50	Low	Low
		Rehab and closure	-9,75	-3,5	-3,50	Low	Low
	Powerline (Alt 2)	Planning	-1,25	-1,25	-1,25	Low	Medium
		Construction	-13	-9,75	-9,75	Low	Medium
		Operation	-5	-5	-5,00	Low	Low
		Decommissioning	-7,5	-7,5	-7,50	Low	Medium
		Rehab and closure	-9,75	-3,5	-3,50	Low	Medium
	Underground Mining	Planning	-1.25	-1,25	-1,25	Low	Medium
		Construction	-9,75	-9,75	-9,75	Low	Medium
		Operation	-9,75	-9,75	-9,75	Low	Medium
		Decommissioning	-10,5	-9,75	-9,75	Low	Medium
		Rehab and closure	-12	-1.25	-1.25	Low	Low

Proposed Mitigation:

See section 9.3.2.1 and Section 9.3.2.2 for recommended mitigation measures

9.3.9 IMPACTS ON AIR QUALITY

A ventilation shaft is proposed for the project via which emissions from the underground activities (the removal of ore and drilling activities) will be emitted into the atmosphere. It is assumed that the total emissions from these activities will be emitted from the ventilation shaft. Below is the potential impacts on ambient air quality for the construction and operation phases, as well as associated impact rating.

Impact	Alternative	Phase	Pre-mitigation Score	Post-mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Air Quality: Decline in Ambient Air Quality	Ventilation Shaft (Alt 1)	Construction	-6,75	-6	-6,00	Low	Low
		Operation	-9,75	-8,25	-8,25	Low	Low
		Construction	-6,75	-6	-6,00	Low	Low

	Ventilation Shaft (Alt 2)	Operation	-9,75	-8,25	-8,25	Low	Low

Proposed Mitigation:

The following construction phase mitigation measures are proposed among others:

- Information regarding construction activities should be provided to all local communities. Such information include contact details of a responsible person on site should complaints arise, to reduce emissions in a timely manner,
- Complaints register must be kept to record all events,
- Avoid dust generating works during the most windy conditions,
- When working near (within 100 m) a potential sensitive receptor, limit the number of simultaneous activities to a minimum as far as possible, and
- Wet suppression and wind speed reduction are common methods used to control open dust sources at construction sites as a source of water and material for wind barriers tend to be readily available.

9.3.10 NOISE IMPACTS

The proposed development of the ventilation fan for Forzando Coal mine will slightly raise the noise levels at a number of closest potential noise-sensitive developments. The noises are not expected to be disturbing and are unlikely to impact on the quality of living for the receptors. Below are the potential impacts on noise receptors for the construction, operation, and rehabilitation and closure phases, as well as their impact rating.

9.3.10.1 INCREASE IN NOISE LEVELS AT SURROUNDING RECEPTORS DUE TO CONSTRUCTION ACTIVITIES IN THE DAY

Construction activities include:

- Site establishment;
- Construction of access roads;
- Vegetation and topsoil removal;
- Drilling and blasting of hard rock;
- Civil work to construct the ventilation fans.

The level and character of the construction noise will be highly variable as different activities with different equipment take place at different times, for different periods of time (operating cycles), in different combinations/sequences and on different parts of the construction site. For the purpose of the noise study, the nosiest activity was considered to be drilling activities.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Increase in noise levels at surrounding receptors due to construction activities in the day	Ventilation Shaft (Alt 1)	Construction	-1,75	-1,75	-2,04	Low	Low
	Ventilation Shaft (Alt 2)	Construction	-1,75	-1,75	-2,04	Low	Low

Proposed Mitigation:

It was determined that the potential noise impact would be of low significance and no additional mitigation is required for the construction phase.

However, it should be noted that community involvement needs to continue throughout the project. Annoyance is a complicated psychological phenomenon and as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational reaction to the sound itself. At all stages surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations.

9.3.10.2 INCREASE IN NOISE LEVELS AT SURROUNDING RECEPTORS DUE TO OPERATION OF VENTILATION FANS IN THE DAY

Operational noises will be limited to the noise due to the ventilation fans operating. The noise generated by a fan is related to the turbulence of air around its blades and housing as well as mechanical vibration noise associated with the fan parts (motor, bearings, drive shaft or belt, etc) which can be transmitted though the ductwork. Air turbulence can also occur as a result of abrupt changes within the ductwork and associated fittings. Poor maintenance can increase turbulence and mechanical vibration noises. This normally creates a noise with a relative broadband character, although very large fans rotating at low speeds can also have a significant low-frequency component.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Increase in noise levels at surrounding receptors due to operation of ventilation fans in the day	Ventilation Shaft (Alt 1)	Operation	-2,25	-2,25	-2,63	Low	Low
	Ventilation Shaft (Alt 2)	Operation	-2,25	-2,25	-2,63	Low	Low

Proposed Mitigation:

It was determined that the potential noise impact would be of low significance and no additional mitigation measures are proposed or required

9.3.10.3 INCREASE IN NOISE LEVELS AT SURROUNDING RECEPTORS DUE TO CONSTRUCTION ACTIVITIES AT NIGHT

Construction activities include:

- Site establishment;
- Construction of access roads;
- Vegetation and topsoil removal;
- Drilling and blasting of hard rock;
- Civil work to construct the ventilation fans.

The level and character of the construction noise will be highly variable as different activities with different equipment take place at different times, for different periods of time (operating cycles), in different combinations/sequences and on different parts of the construction site. For the purpose of the noise study, the nosiest activity was considered to be drilling activities.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Increase in noise levels at surrounding receptors due to construction activities at night	Alternative Shaft (Alt 1)	Construction	-4,5	-4,5	-5,25	Low	Low
	Ventilation Shaft (Alt 2)	Construction	-4,5	-4,5	-5,25	Low	Low

Proposed Mitigation:

It was determined that the potential noise impact would be of low significance and no additional mitigation is required for the construction phase.

However, it should be noted that community involvement needs to continue throughout the project. Annoyance is a complicated psychological phenomenon and as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational reaction to the sound itself. At all stages surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations.

9.3.10.4 INCREASE IN NOISE LEVELS AT SURROUNDING RECEPTORS DUE TO OPERATION OF VENTILATION FANS AT NIGHT

Operational noises will be limited to the noise due to the ventilation fans operating. The noise generated by a fan is related to the turbulence of air around its blades and housing as well as mechanical vibration noise associated with the fan parts (motor, bearings, drive shaft or belt, etc) which can be transmitted though the ductwork. Air turbulence can also occur as a result of abrupt changes within the ductwork and associated fittings. Poor maintenance can increase turbulence and mechanical vibration noises. This normally creates a noise with a relative broadband character, although very large fans rotating at low speeds can also have a significant low-frequency component.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Increase in noise levels at surrounding receptors due to operation of ventilation fans at night	Alternative Shaft (Alt 1)	Operation	-2,25	-2.25	-2.63	Low	Low
	Ventilation Shaft (Alt 2)		-5,5	-5,5	-6,42	Low	Low

Proposed Mitigation:

It was determined that the potential noise impact would be of low significance and no additional mitigation measures are proposed or required.

9.3.11 BLASTING AND VIBRATION

In blasting operations, the primary objective is break rock, ore material or mineral in expected fragmented sizes that can be mechanically excavated or removed. The blasting operation 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 proposed mining operation is an underground operation. There are no surface influences pertaining to air blast and fly rock associated with underground mining operations. Only ground vibration may be applicable if drilling and blast is done.

Points of interest were identified for possible influence from the mining activities. Various installations were identified within close proximity of the mining surface area. The possible influences and level of influence were investigated and based on the type of mining no specific negative influences on the surface areas were identified. The underground operation with mechanical mining is expected to have no significant influence on surface regarding ground vibration.

Below are the potential impacts due to blasting and vibration for the construction and operation phases, as well as their impact rating.

9.3.11.1 GROUND VIBRATION IMPACT ON HOUSES

Ground vibration levels greater than recommended limits may be damaging to structures. Different structures will also have different permitted levels. Ground vibration may cause damage if levels exceed the structures safe limit. People may also experience ground vibration as perceptible at very low levels and normally react negatively to the experience of ground vibration. Ground vibration impact on houses was found to be low and require no mitigation measures.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Ground vibration Impact on houses	Underground Mining	Operation	-4	-4	-5,33	Low	Low

9.3.11.2 GROUND VIBRATION IMPACT ON ESKOM POWERLINES, RAILWAYS, ROADS AND OTHER SURFACE INFRASTRUCTURES

Ground vibration levels greater than recommended limits may be damaging to structures. Different structures will also have different permitted levels. Ground vibration may cause damage if levels exceed the structures safe limit. People may also experience ground vibration as perceptible at very low levels and normally react negatively to the experience of ground vibration. The significance of ground vibration impact on Eskom powerlines, railways, roads and other surface infrastructure was found to be low and require no mitigation measures.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Ground vibration Impact on Eskom powerlines, railways, roads and other surface infrastructure	Underground Mining	Operation	-4	-4	-4,00	Low	Low

9.3.11.3 AIR BLAST IMPACT ON SURFACE INFRASTRUCTURE

Air blast Impact on surface infrastructure was found to be low and require no mitigation measures.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Air blast Impact on surface infrastructure	Underground Mining	Operation	-2	-2	-2,67	Low	Low

9.3.11.4 FLY ROCK IMPACT ON SURFACE INFRASTRUCTURE

The significance of fly rock impacts on surface infrastructure was found to be low and require no mitigation measures.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Fly Rock Impact on surface infrastructure	Underground Mining	Operation	-2	-2	-2,33	Low	Low

9.3.11.5 VIBRATION FROM DRILLING ON RAISE BORE FOR THE VENTILATION SHAFT

The significance of vibration from drilling on raise bore for the ventilation shaft was found to be low and require no mitigation measures.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Vibration from drilling on raise bore for the ventilation shaft	Ventilation Shaft (Alt 1)	Construction	-1,5	-1,5	-2,00	Low	Low
	Ventilation Shaft (Alt 2)	Construction	-1,5	-1,5	-2,00	Low	Low

9.3.12 TRAFFIC SAFETY

Some negative effects may be caused directly by traffic generated by the mine. These may include the road grader that grades the road, the mine bus transporting workers, and an abnormal load delivering mining equipment. Foreseeable negative effects of traffic may take the form of dust, and road surface damage after rain. These effects are caused mainly by the access road not having an all-weather hard surface. It is well documented that the mere surfacing of a dirt road significantly improves levels of service, driving comfort and road safety of the road. Below is the potential traffic impacts during the construction, operation, and rehabilitation phases, as well as the associated impact rating.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Socio-economic: Road Traffic Safety	Underground Mining	Construction	-14	-3	-3,00	Low	Low
		Operation	-22,5	-5	-6,67	Low	Medium
		Rehab and closure	-23,75	-5,5	-9,17	Low	Low

Proposed Mitigation:

The following mitigation measures are proposed among others:

- Heavy vehicle deliveries must be limited to daylight periods.
- Abnormal loads must be limited to daylight periods and dry weather, escort must be provided, and stop-go control must apply at locations of restricted road width.
- A road maintenance team, under the guidance of a dedicated road inspector, must be on standby to immediately repair road surface damage that may occur on D638
- D638 north of the mine entrance must be graded at such intervals as deemed necessary by the road inspector, so as to maintain the road surface free from large stones, potholes and corrugation.
- A road maintenance team, under the guidance of a dedicated road inspector, must be on standby to repair road surface damage that may occur on D638 north of the mine entrance.

9.3.13 SOCIO-ECONOMIC IMPACTS

The following preliminary impacts on the socio-economic environment within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure).

Below are the construction and operational phase preliminary impacts on socio-economic environment, as well as their impact rating.

9.3.13.1 SAFETY AND SECURITY (I.E. ACCESS TO PROPERTIES, THEFT, FIRE HAZARDS, ETC

Future mining activities may result in a risk to the safety and security of landowners, lawful occupiers, and community members in close proximity to the mining areas due to the increase in number of unfamiliar people in the area. Furthermore, any spontaneous combustion of carbonaceous material could cause fires if not adequately controlled.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Socio-economic: Safety and Security (i.e. access to properties, theft, fire hazards, etc	Underground Mining	Planning	-4.5	-3,5	-3,50	Low	Low
		Operation	-7.5	-4,5	-4,50	Low	Low
		Rehab and closure	-4,0	-3,5	-3,50	Low	Low
		Decommissioning	-4.0	-3,5	-3,50	Low	Low

Proposed Mitigation:

All mining contractors and employees should wear appropriate identification. Vehicles should be clearly marked for ease of identification. Entry and exit points at the mine should also be controlled. Adequate control of any combustion of coal stockpiles must immediately be initiated.

9.3.13.2 IMPACT ON EXISTING INFRASTRUCTURE (I.E. ROADS, FENCES, ETC.)

Activities may impact on existing infrastructure such as increased traffic on the adjacent road network, damage to fences and other local infrastructure.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Impact on Existing Infrastructure (i.e. roads, fences, etc.)	Underground Mining	Planning	-5.25	-4,0	-4,0	Low	Low
		Construction	-6.75	-4,0	-4,0	Low	Low
		Rehab and closure	-6.75	-4,0	-4,0	Low	Low
		Operation	-4.0	-4,0	-4,0	Low	Low
		Decommissioning	-6.75	-4,5	-4,50	Low	Low

Proposed Mitigation:

An asset and infrastructure baseline of any new public and/or private infrastructure that may be affected by mining activities must be compiled. A copy of the baseline records should be given to the relevant landowner/s or service providers, and a master document kept by the applicant. If any damage occurs it should be reinstated to its pre-project status on conclusion of investigations into the cause.

9.3.13.3 INABILITY OF THE COMMUNITY TO CAPTURE ECONOMIC BENEFITS & MANAGING EXPECTATION

The proposed mine extension is likely to create great interest, particularly with regards to the potential for employment, perceived safety and security risks, and the exact nature of the proposed project. It must be born in mind that the mine is already in operation and the proposed extension will largely only result in ongoing employment, etc. The scale of the mining operation is not anticipated to be ramped up to such a degree that the current impacts would be greatly exacerbated

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Inability of the community to capture economic benefits & managing expectation	Underground Mining	Planning	-12	-4,5	-4,50	Low	Low
		Construction	-12	-4,5	-4,50	Low	Low
		Rehab and closure	-12	-4,5	-4,50	Low	Low
		Operation	-12	-4,5	-4,50	Low	Low
		Decommissioning	-12	-4,5	-4,50	Low	Low

Proposed Mitigation:

Perceptions and expectations must be managed through ongoing, open and transparent communication with affected stakeholders, communities, landowners and occupiers

9.3.13.4 EMPLOYMENT OPPORTUNITIES

Minor employment opportunities for some unskilled, skilled labour as well as providing services during construction (e.g. accommodation, transportation, etc.) may arise from this project. It is important to note that the project is an extension of the existing mining operations to extend the life of mine and therefore new job opportunities may be limited.

Impact	Alternative	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance	Residual Impact	Irreplaceable Loss
Employment Opportunities	Underground Mining	Construction	11	12	16,00	Low	Low
		Operation	11	12	16,00	Low	Low
		Decommissioning	-12	-4,5	-4,50	Low	Low
		Rehab and closure	-12	-4,5	-4,50	Low	Low

Proposed Mitigation:

Recruitment for any additional labour or services should be focused in the local area and preference given to the local communities if possible

9.3.14 CUMULATIVE IMPACTS

Without proper mitigation measures and continual environmental management, most of the identified impacts identified above may potentially become cumulative, affecting areas outside of their originally identified zone of impact. The cumulative impacts associated with the proposed Kalabasfontein Project in addition to impacts associated with other activities/developments in the area are discussed in this section.

The following is a list of some of the key potential impacts that may result in a significant cumulative impact as a result of the project:

- Contribution to losses of potentially productive agricultural land, along with a reduction in land capability as a result of site sterilisation due to mining activities;
- Contribution to air quality impacts, specifically relating to increased suspended particulate matter (dust);
- Contribution to reduction in surface water quality;
- Disturbance of fauna;
- Invasion of alien plant species;
- Increase in ambient noise levels and potential adverse effect of noise sensitive receptors;
- Disturbance, damage or destruction of heritage features;
- Increased vulnerability and community safety-related risks and impacts; and
- Localised areas of acid mine drainage and groundwater contamination.

Table 40: Preliminary cumulative impacts

Impact	Alternative	Phase	Pre-mitigation Score	Post-mitigation Score	Final score
Contribution to losses of potentially productive agricultural land	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-4,5	-5,25
Air quality impacts	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-5	-5,83
Reduction in surface water quality	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-5	-5,83
Increase in traffic	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-4,5	-5,25
Disturbance of fauna	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-4,5	-5,25
Invasion of alien plant species	Ventilation shaft (Alt 2)	Rehab and closure	-5	-4,5	-5,25
Noise	Ventilation shaft (Alt 2)	Rehab and closure	-5	-4,5	-5,25
Disturbance, damage or destruction of heritage features	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-4,5	-5,25
Increased vulnerability and community safety-related risks and impacts	Ventilation shaft (Alt 2)	Rehab and closure	-5	-4,5	-5,25
Localised areas of acid mine drainage and groundwater contamination	Ventilation shaft (Alt 2)	Rehab and closure	-8,25	-7,5	-8,75
Contribution to losses of potentially productive agricultural land	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-4,5	-5,25
Air quality impacts	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-4,5	-5,25
Reduction in surface water quality	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-4,5	-5,25
Increase in traffic	Ventilation shaft (Alt 2)	Rehab and closure	-5	-5	-5,83
Disturbance of fauna	Ventilation shaft (Alt 2)	Rehab and closure	-5	-4,5	-5,25
Invasion of alien plant species	Ventilation shaft (Alt 2)	Rehab and closure	-5	-4,5	-5,25
Noise	Ventilation shaft (Alt 2)	Rehab and closure	-5	-4,5	-5,25
Disturbance, damage or destruction of heritage features	Ventilation shaft (Alt 2)	Rehab and closure	-5	-4,5	-5,25
Increased vulnerability and community safety-related risks and impacts	Ventilation shaft (Alt 2)	Rehab and closure	-5	-4,5	-5,25
Localised areas of acid mine drainage and groundwater contamination	Ventilation shaft (Alt 2)	Rehab and closure	-5,5	-5	-5,83

10 CLOSURE OBJECTIVES

The 2010 EIA and EMPR report (GCS (Pty) Ltd, 2010) lists the following main environmental closure objectives:"

- With regard to every activity the mitigation of all environmental impacts and addressing all environmental aspects on the basis of the EMP;
- To ensure an effective surface runoff control system in order to deal with the separation of clean and dirty water environment;
- Rehabilitate areas as soon as possible;
- The sustainable and safe rehabilitation of all activities, in order to address all environmental impacts as far as practical according to the EMP;
- The sustainable rehabilitation of all activities and the mining area as a whole in order to ensure a sustainable end use for the majority of the activity sites/areas;
- Return of land to its pre-mining state where possible (i.e. agriculture/grazing for the majority of the mine's lease area);
- Make all areas safe for both humans and animals;
- Ensure that all areas remaining upon closure are stable, which will prevent dust and water erosion;
- Minimise the impact on the local community;
- Minimise the impact on the surrounding economic environmental and other mining activities;
- Maintenance requirements for rehabilitated activity areas/sites need to be established and documented within the capability of the subsequent land user;
- Financial provision for post closure maintenance cost of rehabilitation activity area/sites will at all times be appropriate to provide for premature closure in terms of the MPRDA;
- No rehabilitation work, demolition of buildings shall take place without the approval of the General Manager in consultation with the Manger (Group Environmental Manager); and
- Final rehabilitation of all infrastructures shall be completed within a period as specified in the appropriate closure document and rehabilitation activities will comply with the specifications as per the appropriate closure document. Should the mine, due to unforeseen circumstances, need to deviate from the closure plan, approval from the DME (now DMR) and relevant State Departments will be obtained.

The aim of the maintenance measures is to ensure that the area affected by the mining operations is rehabilitated according to the closure plan and to apply for closure. The objective is for the area to be rehabilitated sustainably (ensuring self-succession of plants and the associated return of natural wildlife; as well as the improvement of the natural watercourses and groundwater systems)." The closure objectives presented above remain unchanged for the mine moving forward. It should be noted that in the next annual assessment and determination of financial provisions, and/or the compilation of the NEMA Financial Provisioning Reports, these closure objectives should be reviewed and, where applicable, amended.

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11 CONCLUSIONS AND RECOMMENDATIONS

The Scoping Phase of the EIA process identified potential issues associated with the proposed project and defined the extent of the studies required within the EIA Phase. The EIA Phase addressed those identified potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report provides sufficient information regarding the potential impacts and the acceptability of these impacts in order for the Competent Authority to make an informed decision regarding the proposed project. The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised through the EIA process have been captured and adequately considered.

The EIA Phase aims to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project.
- Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed coal mine extension project and associated infrastructure.
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
- Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

11.1 CONCLUSIONS FROM SPECIALIST STUDIES

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive, and every effort has been made to include representatives of all stakeholders in the study area. The main conclusions from each of the specialist studies are presented below.

11.1.1 GEOTECHNICAL STUDY

11.1.1.1 SUMMARY OF FINDINGS FROM THE GEOTECHNICAL STUDY

Pillar life index calculation shows that all pillars will have a life index of at least 11 046 years before a 50% probability of failure is reached. This is far more than the recommended 2000 years for highly sensitive structures. Pillar failure must occur before the overburden can fail. This means that sinkhole hole probabilities are low in the area. The magnitude of maximum subsidence in a bord and pillar layout is dependent on the unlikely event that panel's pillar system fails. The calculated pillar life index and probability of survival are far greater than the recommended minimums, indicating a stable pillar system. The investigation shows that a Class C, D & E subsidence profile will occur in the area in the unlikely event that pillar fails. The subsidence profile will have the following characteristics:

- Class C: Noticeable in flat terrain, smooth, cracks 2 to 10 cm wide, compression ridges 1 to 5 cm high;
- Class D: Noticeable in most terrains, visible vertical displacements across cracks, cracks 10 to 50 cm wide, compression ridges 5 to 50 cm high; and
- Class E: Severe profile, almost vertical sides, racks wider than 50 cm, compression ridges higher than 50 cm.

Class D and E subsidence will largely be constrained to distal southern and western portion of the reserve area.

11.1.1.2 RECOMMENDATIONS FOR THE GEOTECHNICAL STUDY

The following is recommended based on the investigation:

- The following mine design will apply when mining in the area:
    - Pillar Centres Range: Minimum 15.0 m x 15.0 m and Maximum of 18.0 m x 18.0 m
    - Bord width: 7.2 m
    - Mining Height: Total seam thickness extraction
    - Pillar design process will be such that the Probability of survival criterion for the different surface features is met or satisfied.
- Surface elevation monitoring points should be installed at positions surrounding the sensitive structures such as building and tarred road at convenient points. During mining, surveys should be conducted monthly and continued monthly for three months after mining has ceased for a period of three months. Thereafter the periods can be relaxed to quarterly for a further year and after that annual surveys should be conducted;
- Survey beacons should consist of 20 mm rebar and be anchored in concrete with the anchor at least a metre deep. The protruding end of the beacon should not protrude more than 10 cm, to avoid accidental damage; and
- Similar beacons should be installed in an area with similar ground conditions, more than 200 m away from any undermining to serve as control measurements.

11.1.2 HERITAGE STUDY AND PALEONTOLOGICAL STUDIES

Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant.

11.1.2.1 SUMMARY OF FINDINGS IN TERMS OF ARCHAEOLOGY

The data analysis has enabled the identification of possible heritage sensitive areas that included:

- Dwellings;
- Clusters of dwellings (homesteads and farmsteads);
- Archaeological Sensitive areas (based on historical descriptions); and
- Structures.

Note that these structures refer to possible heritage sites as listed in Table 41.

Table 41:Tangible Heritage site in the study area

Name	Description	Legislative protection
Architectural Structures	Possibly older than 60 years	NHRA Sect 3 and 34
Cemeteries	Graves	NHRA Sect 3 and 36 and MP Graves Act

Previous studies conducted in the area around Bethal, have shown that the archaeological record is temporally confined to the Iron Age. During this study, ten heritage sites were identified, including four burial grounds and six historical sites. Refer to Appendix 6 for the locality of heritage resources in relation to the proposed development area.

It must be considered that the heritage significance of the identified sites plays a role in the evaluation of the impact and must influence the magnitude rating of the impact tables. Thus, a heritage resource with a high heritage significance rating will have a higher impact magnitude rating than a resource with a low or no heritage

significance rating. Consequently, mitigation measures will be more extensive for a heritage resource with a high heritage significance than for those with a low heritage significance.

The management and mitigation measures as described in the Heritage Impact Assessment Report have been developed to minimise the project impact on heritage resources. Impacts on burial grounds and graves are rated as being LOW NEGATIVE before mitigation and LOW NEGATIVE after mitigation measures are implemented. Impacts on Historical sites are rated as being LOW NEGATIVE before mitigation and LOW NEGATIVE after mitigation measures are implemented.

The development of the powerline impacts on heritage resources is seen as acceptably low after the recommendations have been implemented and, therefore, impacts can be mitigated to acceptable levels.

11.1.2.2 SUMMARY OF FINDINGS IN TERMS OF PALAEONTOLOGY

The proposed development footprint of the proposed Kalabasfontein development is entirely underlain by sedimentary rocks of the Permian aged Vryheid Formation, (Ecca Group, Karoo Supergroup). The Vryheid Formation of the Ecca Group has a Very High Palaeontological Sensitivity. No significant fossils are expected to be found before deep excavation (>1.5m) are completed. It is very possible that important fossils will be documented during excavations. The recording of fossils will improve our knowledge of the Palaeontological Heritage of the development area.

Two alternative sites have been suggested for a new ventilation shaft, namely Portion 7 of the farm Uitgedacht 229 IS and Portion 22 of the farm Uitgedacht 229 IS. The planned extension of the current mining area will involve minimal new surface infrastructure as the mining method is underground mining and existing surface infrastructure from the Forzando South mine will be utilized. As the geology of these alternatives is similar there are none preferred alternative.

Impacts on Palaeontological resources are rated as MODERATE NEGATIVE before and LOW NEGATIVE after mitigation measures are implemented.

11.1.2.3 RECOMMENDATIONS WITH REGARDS TO HERITAGE RESOURCES AND PALEONTOLOGY

The recommendations provided by both the heritage and the paleontological specialists refer to the palaeontology and includes the following:

- A Phase I field-basis assessment is recommended for the palaeontology. This report will be conducted during deep excavation to assess the value and occurrence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the Phase I field-bases assessment is to expand on the issues and potential impacts identified during the desktop assessment. This is achieved by site visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase;

- The EAP and ECO must be notified that the whole study area has a Very High Palaeontological Sensitivity. A Phase 1 PIA study and “Chance Find Protocol” must be completed during the first month of excavation;

- The developer must apply for a collection and destruction permit for plant fossils encountered during the mining operation;

- A qualified palaeontologist must be employed to visit the present mining operations at regular intervals (this must be determined by the mine and palaeontologist) to record any extraordinarily well-preserved fossils and collect representative samples of these fossils for further study at an appropriate institution. These fossils may be placed on a stockpile where the palaeontologist may examine them;

- In the event that heritage resources are discovered during site clearance, construction activities must stop, and a qualified archaeologist appointed to evaluate and make recommendations on mitigation measures; and

- These recommendations must be incorporated in the EMPR of this project.

11.1.3 AGRICULTURAL POTENTIAL STUDY

11.1.3.1 SUMMARY OF FINDINGS IN TERMS OF AGRICULTURAL POTENTIAL

The project area is non-uniform with sudden increases in slope percentage up to 30%. Thirteen soil forms have been identified within the project area during the site visit. These soil forms, depending on clay percentage, depth, rock percentage ad surface crusting have been assigned land capability classes, of which four classes have been classified (class II, III, IV and V). These classes have then been assigned land potential classes given the climatic and land capability conditions, of which three have been identified (L2, L3 and "Vlei").

The project area is approximately 1500 ha in size with agriculture taking up approximately 50% of the space, wetlands taking up approximately 35%, natural veld taking up roughly 10% and built-up areas taking up approximately 5% of the project area.

11.1.3.2 RECOMMENDATIONS FOR THE AGRICULTURAL POTENTIAL STUDY

A rehabilitation plan must be completed to tend to all expected impacts (discussed in this report) to minimise the impact on soil resources. This rehabilitation plan should focus on (but not limited to) the five situations expected to result in "Moderate (negative)" significance ratings after the application of mitigation measures. This should include revegetation of stockpiles and any other rehabilitation strategies.

Additionally, a soil stripping guideline must be set-up and a fertility assessment must be carried out on the chosen shaft area to determine the fertility of the relevant soil resources prior to construction. This information will be vital during the rehabilitation phase to ensure that the fertility and land capability be restored back to the soil's state prior to construction.

Lastly, the preferred vent shaft currently is located within a "Class III" land capability class with the alternative class being located within a "Class IV" and "Class V" land capability class. It is recommended that the vent shaft rather be constructed in the "Class IV" land capability class area in the vicinity of the alternative vent shaft.

11.1.4 TERRESETRIAL BIODIVERSITY

11.1.4.1 SUMMARY OF FINDINGS IN TERMS OF TERRESTRIAL BIODIVERSITY

The completion of a comprehensive desktop study, in conjunction with the detailed results from the surveys mean that there is a high confidence in the information provided. The surveys which were completed, and the corresponding studies resulted in good site coverage, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area has been somewhat altered (historically and currently) predominantly by agricultural land use and nearby mining activities. It is further evident that the remaining natural habitats have been impacted on as a result of poor grazing practices and agricultural land use. However, despite these impacts the remaining natural habitats (including grassland and wetland habitats) exhibited a healthy balance between various common grassland species and associated herbaceous plants.

The ecological integrity, importance and functioning of the natural grassland and wetland systems within the larger project area is furthermore reflected in the diverse community structures. This diversity is indicative of the importance of these systems to collectively provide refugia, food and corridors for dispersal in and through the project area. The preservation of these systems, albeit the majority are modified to some extent, is the most important aspect to consider for the consideration of the proposed mining project.

According to the Mining and Biodiversity Guidelines (2013), the proposed Kalabasfontein Project area falls within an area which is considered 'high risk for mining' and of 'high biodiversity importance'. Consideration must be afforded each of the recommendations provided in the Biodiversity Assessment Report. In the event that environmental authorisation is issued for this project, proven ecological (or environmental) controls and mitigation measures must be entrenched in the management framework.

11.1.4.2 RECOMMENDATIONS FOR TERRESTRIAL BIODVIERSITY

These recommendations may supplement the prescribed mitigation measures, but these recommendations must be investigated prior to the issuing of environmental authorisation. These recommendations must be investigated for the feasibility to realistically achieve what is intended for this project. The following recommendations are applicable for this project:

- It is recommended that a rehabilitation plan must be compiled and implemented, this should include the implementation of the alien vegetation control plan.

11.1.5 HYDROLOGY

11.1.5.1 SUMMARY OF FINDINGS IN TERMS OF HYDROLOGY

Baseline information including rainfall, evaporation, design event rainfall, soils, vegetation and land cover, as well as site topography and regional and local catchment hydrology have been considered for the proposed Kalabasfontein 231 IS project. A conceptual storm water management plan has not been developed due to the limited surface infrastructure and absence of GN704 defined 'dirty areas', with erosion control instead being recommended. This likely includes the use of silt fences to manage erosion at the location of disturbance although low berms can be utilized to redirect run-off away from the proposed area of surface works as is necessary.

A site wide static climate water balance model has been updated for Forzando South and the proposed Kalabasfontein 231 IS operation (the reason for the water balance update). The incorporation of the Kalabasfontein 231 IS project area into the existing Forzando South operation via underground mining, will introduce additional groundwater into the process water circuit.

Surface water impacts for the proposed expansion were limited to the surface infrastructure (i.e. the ventilation shafts and associated powerline). The impact of the proposed underground workings (at Kalabasfontein 231 IS) on the surface water environment, has not been considered in detail as this requires input from a groundwater specialist with regards to possible reductions in river baseflow (due to lower water tables resulting from dewatering), the potential for seepage of contaminated groundwater into surface water resources and the potential for flooding of the proposed underground workings. A wetland specialist will also be required to comment on the potential impact to the numerous wetlands over the site.

Lastly, a surface water monitoring programme was recommended, although no water quality sampling was undertaken as part of this assessment.

11.1.5.2 RECOMMENDATIONS FOR HYDROLOGY

The following recommendation have been included by the specialist:

- A surface water monitoring programme is recommended for the Kalabasfontein Project area;
- Erosion control methods are recommended to be implemented due to limited surface infrastructure for the Kalabasfontein Project. This likely includes the use of silt fences to manage erosion at the location of disturbance although low berms can be utilized to redirect run-off away from the proposed area of surface works as is necessary

11.1.6 HYDROPEDOLOGY

11.1.6.1 SUMMARY OF FINDINGS IN TERMS OF HYDROPEDOLOGY

Although interflow in soils and shallow bedrock dominates, indicating that a large part of rainfall serves terrestrial ecosystems, the wetlands in valley bottoms indicate that a significant amount of water is supplied during the rainy season and post seasonal, to the wetlands. It implies that the hills in most sites (as indicated) primarily partition the rainfall in shallow interflow, yet all leaks water to the deep fractured rock system, stores and release it slowly long after the rain, keeping wetlands wet. Wetland controls contribute well to keep water in the wetland longer.

These flow paths serving recharge/interflow/release of water to wetlands and storing it in the wetland, must be preserved. The impact of underground mining is 'low'. Shallow flow paths dominates the hillslopes, yet all have flow and storage mechanisms maintaining wetlands. Shallow interflow down to the mid-slope, feed terrestrial ecosystems and disturbance of these flow paths will not significantly affect wetlands.

These recommendations may supplement the prescribed mitigation measures, but these recommendations must be investigated prior to the issuing of environmental authorisation. These recommendations must be investigated for the feasibility to realistically achieve what is intended for this project.

11.1.6.2 RECOMMENDATIONS FOR HYDROPEDOLOGY

The following recommendations are applicable for this project:

- The recommended buffer width is 25 m for the ventilation shaft and 10 m for the powerlines should be implemented from the onset of the construction phase of the project.
- In the event that wetland areas will be impacted, a wetland rehabilitation plan is required.

11.1.7 WETLAND STUDY

11.1.7.1 SUMMARY OF FINDINGS IN TERMS OF WETLANDS

Seven wetland types were identified within the two project areas, and these were split into nine (9) HGM units. The overall wetland health for HGM 1 was determined to be Largely Modified (D), with the remaining HGM units determined to be Moderately Modified (C).

All HGM units exhibited a moderately high benefit for indirect benefits such as; sediment trapping, and phosphate/nitrate/toxicant assimilation. HGM 7, 8, and 9 had a moderately high benefit for flood attenuation. The floodplains HGM 1 and HGM 2 exhibited a moderately high benefit for biodiversity maintenance providing suitable habitat for fauna and flora. HGM 3 and HGM 8 had a moderately high benefit for erosion control. The remaining benefits were rated as intermediate or lower.

The EIS was calculated to have a Very High (A) importance for HGM 1. This rating can be attributed to the ecological importance of the floodplain from an NFEPA perspective as well as the national ecosystem classifications (see section 7.5) rating this area as vulnerable. HGM 2, 3, 4, 8, and 9 were rated as High (B) importance. HGM 5, 6, and 7 were rated as Moderate (C) importance.

The recommended minimum buffer according to the guidelines is 25 m for the vent shafts and 10 m for the associated powerline for all phases. A conservative buffer zone of 25m was suggested for the ventilation shaft and 10 m for the associated powerline. This buffer is calculated assuming mitigation measures are applied. This would typically include a commitment to rehabilitate and manage buffer zones to ensure that these areas function optimally.

It must be noted that the alternative ventilation shaft is within the wetland buffer and it is recommended that the preferred ventilation shaft location be used. The powerline will traverse many wetland areas and it is recommended that the powerline route be situated on the existing servitude and that spans are planned to cross wetland areas and their associated buffer zones

Overall, the impacts of the underground mining have much lower significance and impact than those for opencast mining operations as this type of mining has less of an influence on biodiversity in the area. Nonetheless, underground mining also requires some surface infrastructure (and ventilation shafts in the case of this project), and the significance of these impacts cannot be overlooked or underestimated. However, for this particular project existing infrastructure will be used and as such there is a lower impact rating overall.

11.1.7.2 RECOMMENDATIONS FOR THE WETLANDS

The following recommendations are applicable for this project:

- The recommended buffer width is 25 m for the ventilation shaft and 10 m for the powerlines should be implemented from the onset of the construction phase of the project;

- In the event that wetland areas will be impacted, a wetland rehabilitation plan is required.

11.1.8 AQUATIC BIODIVERSITY

11.1.8.1 SUMMARY OF FINDINGS WITH REGARD TO AQUATIC BIODIVERSITY

The results of the PES assessments indicated that the project area has been altered (historically and currently) predominantly by agricultural land use. The assessed Joubertsvleispruit river reach was classed as moderately modified (class C). Flow and instream habitat modification has resulted in modified biological responses. Instream habitat modification can be attributed to local agricultural activities compounded by poor rainfall. The assessed Viskuile River reach was classed as moderately to largely modified (class C/D). Water quality modification in the upper reaches of the watercourse compounded by modified flow in the reach resulted in modified aquatic ecology. The modification of the watercourse can be attributed to poor connectivity due to poor rainfall, agricultural activities and alteration of the river for water storage.

No red listed fish species were expected or sampled within the river reaches in the project area. However, total of nine fish species, comprising five native, two translocated native and two alien invasive species were captured during this study. The fish community structures are largely intact, despite introductions of additional species. This diversity is indicative of the importance of these systems to collectively provide refugia and corridors for dispersal throughout the project area. Despite modification, the preservation of these systems is of importance for the consideration of the proposed mining project.

Owing to the absence of typical riparian features, no riparian delineation could be completed for the project area. Underground mining requires the placement of new infrastructure (ventilation shaft, powerline and infrastructure associated with new underground area) and associated mining activities. These activities will have a significant impact on the local environment and ecological processes. Both of the proposed infrastructure areas (underground area and powerline/ventilation shafts area) at Kalabasfontein are situated in proximity to, underlay or traverse watercourses considered sensitive to further modification.

Careful consideration must be afforded each of the recommendations provided in this report. In the event that environmental authorisation is issued for this project, proven ecological (or environmental) controls and mitigation measures must be entrenched in the management framework. It is recommended that the existing aquatic biomonitoring plan be reassessed to ensure that it is comprehensive and covers all associated project areas prior to the issuing of any environmental authorisation.

11.1.8.2 RECOMMENDATIONS FOR AQUATIC BIODIVERISITY

The following recommendations were reached based on the results of aquatic biodiversity assessment:

- The Resource Quality Objectives for the Water Management Area should be complied to, with the aim to meet the default and recommended ecological category (REC) of moderately modified (class C) for the project area watercourses;
- The primary recommended mitigation measure for this project is to ensure that an appropriate, proactive and adaptive Acid Mine Drainage management plan be implemented from the onset of the proposed project; and
- A secondary recommended mitigation measure is to ensure that the powerline be attached to existing river crossing infrastructure before undisturbed areas are considered.

11.1.9 GEOHYDROLOGY

11.1.9.1 SUMMARY OF FINDINGS WITH REGARD TO GEOHYDROLOGY

Overall, the Kalabasfontein Project will have a low to medium impact on the regional hydrogeological environment. If sound environmental management practices are applied and the monitoring, management and mitigation mentioned in this report, it is our opinion that the project may be authorised.

The following points relate to aquifer and groundwater use characteristics in the Forzando and the proposed Kalabasfontein Project area:

- Groundwater at the identified farm boreholes is mainly used for domestic supply, small scale irrigation (gardens) and livestock watering. The groundwater quality in the area is generally good;
- Groundwater levels generally follow topography at an average water level of approximately 5.5 mbgl;
- Hydraulic conductivity values for the weathered layer are in the order of 2- 10 m/d. Hydraulic conductivity of the fractured Karoo unit decreases with depth and will range between 10^{-2} m/d in the upper layers and 10^{-4} m/d for the lower layers. These values are typical of the Karoo type aquifers; and
- Groundwater monitoring shows only minor fluctuations since 2010 and most groundwater levels are within 5 to 8m below ground level.

The following points relate to key water quality aspects in the Forzando area:

- Forzando Coal Mines are existing operations and as a result there are contaminant sources already present such as operational underground workings, two discard dump complexes at FZ-N, coal stockpiles, pollution control dams, return water dams and plant areas (FZ-N); and
- Monitoring boreholes at the Forzando North Area indicates localised sulphate plumes at both the older western and newer eastern coal discard dumps.

The following outlines the predicted impacts to groundwater quantity and quality:

- As a result of dewatering groundwater levels could be lowered over a relatively large area around the underground mine;
- Groundwater flow directions will be directed towards the mining areas due to the mine dewatering. Therefore, contamination will be contained within the mining area, and little contamination will be able to migrate away from the mining area. It is anticipated that groundwater contamination during the Operational Phase will be highest in the area around the surface infrastructure;
- The contaminant plume emanating from the discard dump facility at Forzando North will move in a northerly direction towards the Olifants River. Shallow contaminated seepage may impact on the unnamed perennial tributary to the Olifants River. This impact is likely to be moderate.
- Several farm boreholes were identified that falls within the potential post closure impact and sensitive zones. These are:
    - Bolton Pan Area – Hydrocensus borehole NBH17 (2014 HC data),
    - Kalabasfontein Area – Hydrocensus Borehole KF- HC11 (2018 HC data), and
    - Bankpan Area – Hydrocensus boreholes NBH9, 10 and 11 (2014 HC Data).
- At Forzando South the potential decant point is located south west of the adit area.

11.1.9.2 RECOMMENDATIONS FOR GEOHYDROLOGY

The following general recommendations are made by hydrogeologist:

- The groundwater monitoring network should be expanded for the existing and future mining activities at Forzando, including the Kalabasfontein Project area;
- The rate of water level recovery in the underground voids should be monitored. Stage curves should be developed which would aid in the management of Closure Phase;

- The numerical model should be updated and calibrated according to agreed EMPs and IWULA timeframes using the measured water ingress and water levels to re-calibrate and refine the impact prediction scenarios. Should there be any significant change in mining plan or water volumes then that will be done a year after such a change has been realised; and
- Decant volumes and time-to-decant should be re-assessed once more information regarding rehabilitation is obtained.

11.1.10 TRAFFIC STUDY

11.1.10.1 SUMMARY OF FINDINGS FROM THE TRAFFIC STUDY

The proposed Kalabasfontein Project in *lieu* of the current Forzando South Coal Mine will have a moderate impact from a road traffic safety and level of service viewpoint. Some cost-effective measures are proposed in mitigation of possible negative impacts and prevention of negative incidents.

Additional measures are proposed, mostly of a capital nature, which will significantly enhance road traffic safety and levels of service on a sustainable basis and reduce road user costs. If discounted over the life of the proposed mining activities, it is believed that these investments will be economically justified.

Due to the low intensity of traffic, it is not deemed justified environmentally to place a condition on the Applicant to surface the gravel access road, although it will be highly beneficial both to the travelling public and the mine staff and stakeholders, and should be considered by the mine.

Certain close-out measures are proposed to ensure minimal impact to the travelling public in the long-term.

Provided that the recommendations proposed below are adhered to, there is no reason for withholding environmental authorization from a traffic impact point of view.

11.1.10.2 RECOMMENDATIONS FOR TRAFFIC ASSESSMENT

Based on the assessment and conclusions, it is proposed that the following pre-conditions and accompanying monitoring mechanisms be included in the Environmental Authorization and EMPR:

- During the implementation phase of the Kalabasfontein project.
- Heavy vehicle deliveries must be limited to daylight periods.
- Abnormal loads must be limited to daylight periods and dry weather, escort must be provided, and stop-go control must apply at locations of restricted road width.
- Road maintenance team, under the guidance of a dedicated road inspector, must be on standby to immediately repair road surface damage that may occur on D638.
- D638 north of the mine entrance must be graded at such intervals as deemed necessary by the road inspector, so as to maintain the road surface free from large stones, potholes and corrugation.
- A road maintenance team, under the guidance of a dedicated road inspector, must be on standby to repair road surface damage that may occur on D638 north of the mine entrance.

11.1.11 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

Proposed emissions for the Kalabasfontein Project have been determined by taking an average of the existing diesel, coal and electricity consumption data from the Forzando South relocation sections for the 2015 -2017 period. Given the similar trends over the past three years, it is assumed that this will be an accurate representation of the likely GHG emissions emitted from the Kalabasfontein Project.

The total GHG emissions for the Kalabasfontein Project was estimated to be 84,306 t CO_{2eq}. Within the Scope 1 sources, the coal consumption from underground mining contribute the highest GHG emissions, which make up

64%, respectively of the total CO_{2eq} emissions. Scope 2 contributes to 35%, of the total CO_{2eq} emissions. Further, CH_4 and CO_2 emissions account for majority of the emissions of the total CO2eq emissions.

No further recommendation was provided by the Air Quality and Greenhouse Gas Emission specialist.

11.1.12 NOISE STUDY

This Noise Impact Assessment Study covers the proposed development of a ventilation fan on the farm Uitgedacht by Forzando Coal Mine. The potential noise rating levels were calculated using a sound propagation model for two alternative locations. Conceptual scenarios were developed for the construction and operational phase with the output of the modelling exercise indicating a low risk for a noise impact.

No mitigation measures are required or recommended due to the low risk of a noise impact to occur during all the phases of the project. There is a slight preference for the alternative location one for the ventilation fan.

It is concluded that the increases in noise levels does not constitute a fatal flaw. It is, therefore, the recommendation that the ventilation fan development be authorized (from a noise impact perspective).

11.1.13 BLASTING ASSESSMENT

The Kalabasfontein Project was reviewed on impact assessment phase. Points of interest were identified for possible influence. Various installations were identified within close proximity of the mining surface area. The possible influences and level of influence were investigated and based on the type of mining no specific negative influences on the surface areas were identified. The underground operation with mechanical mining is expected to have no significant influence on surface regarding ground vibration.

In view of the evaluation and planned operations there is no significant influence expected on surface from the planned project. There is no reason to believe that the project will have a negative influence for the aspects evaluated. There is no reason to believe that the project cannot continue based on the aspects evaluated.

11.1.14 CLOSURE AND FINANCIAL PROVISION ASSESSMENT

The Closure and Financial Provision Assessment indicated that the closure objectives presented the 2010 EIA and EMPR report (GCS (Pty) Ltd, 2010) remain unchanged for the mine moving forward. It should be noted that in the next annual assessment and determination of financial provisions, and/or the compilation of the NEMA Financial Provisioning Reports, these closure objectives should be reviewed and, where applicable, amended.

The quantum for financial provisions for un-scheduled closure was been estimated using the rule-based approach defined in the DMR Guideline. Based on this calculation the closure liability was estimated to be R 20 854 428.14.

The following were made in the assessment:

- The mine should prepare the financial provisioning reports as required by the 2015 NEMA Regulations.
- The mine should undertake engagements with the surrounding community to discuss the current closure objectives and plans, and where applicable revise and optimise these

11.2 ENVIRONMENTAL IMPACT STATEMENT

The findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the mine, the findings of the EIA studies, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures.

Despite the impacts caused by the mine, it must be considered that there are positive impacts as well, mostly based on the economic contributions, skills development and SLP initiatives. The mine employs a number of

people in the community, and the mine closure would result in them losing their jobs. This will probably mean that they will struggle to find new employment.

Based on the nature and extent of the proposed and the predicted impacts as a result of the construction, operation and closure of the facility, the findings of the EIA, and the understanding of the mostly low - moderate post-mitigation significance level of potential environmental impacts, it is the opinion of the EIA project team that the environmental impacts associated with the application for the proposed Kalabasfontein Project can be mitigated to an acceptable level and the project should be authorized.

11.3 SENSITIVITY MAPPING

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural and social assets, opportunities, and constraints in a defined spatial context. The sensitivity mapping technique integrates numerous datasets (base maps and shapefiles) into a single consolidated layer making use of Geographic Information System (GIS) software and analysis tools. Environmental sensitivity mapping is a rapid and objective method applied to identify areas which may be particularly sensitive to development based on environmental, cultural and social sensitivity weightings – which is determined by specialists input within each respective field based on aerial or ground-surveys. Environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of Environmental Assessment processes. Table 42 below provides a breakdown of the sensitivity rating and weightings applied to determine the sensitivity score of each aspect. Figure 77 provides a graphical illustration of the sensitivity mapping exercise applied to determine the overall environmental sensitivity within the study area.

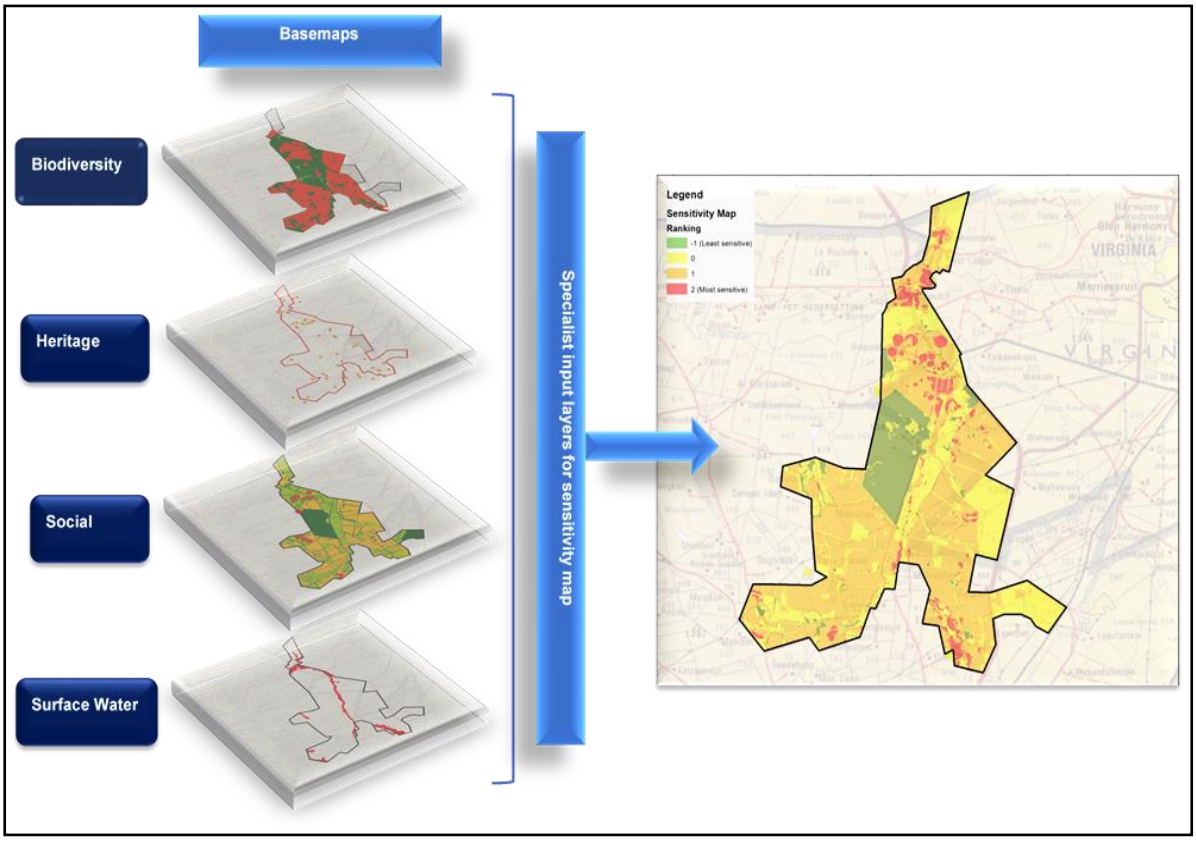

Figure 77: Sensitivity mapping approach

Table 42: Sensitivity rating and weighting

Sensitivity Rating	Description	Weighting
Least concern	The inherent feature status and sensitivity is already degraded. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for mining or infrastructure placement.	-1
Low/Poor	The proposed development will not have a significant effect on the inherent feature status and sensitivity.	0
High	The proposed development will negatively influence the current status of the feature.	1
Very high	The proposed development will have a significantly negative influence on the current status of the feature.	2

The overall sensitivity is of the underground mining area of the Kalabasfontein project is indicated in Figure 78. Figure 79 indicates the overall sensitivity of the ventilation shaft locations. Ventilation shaft 2 is the preferred alternative in terms of the environmental sensitivity.

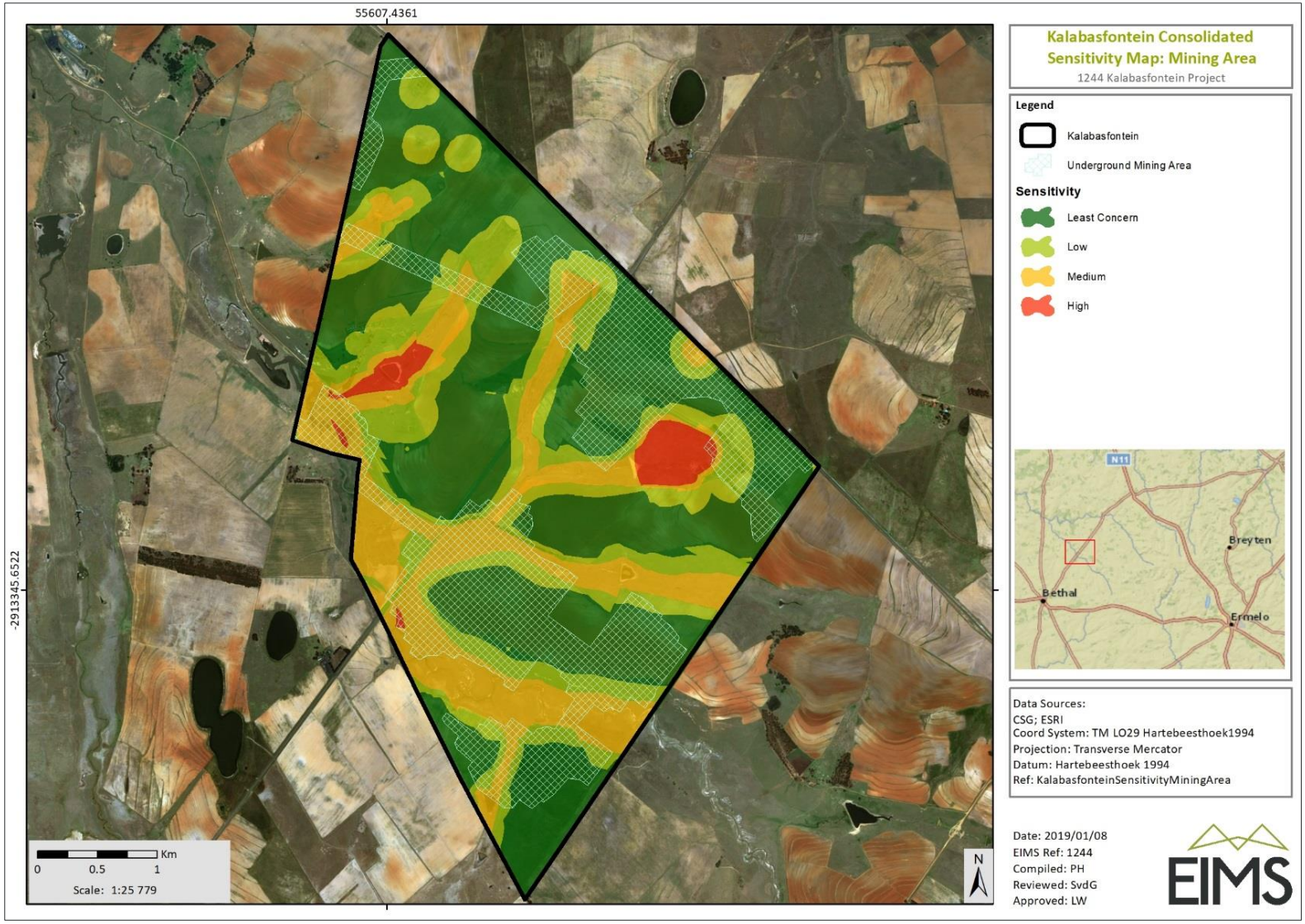

Figure 78: Sensitivity planning for the underground mining at Kalabasfontein

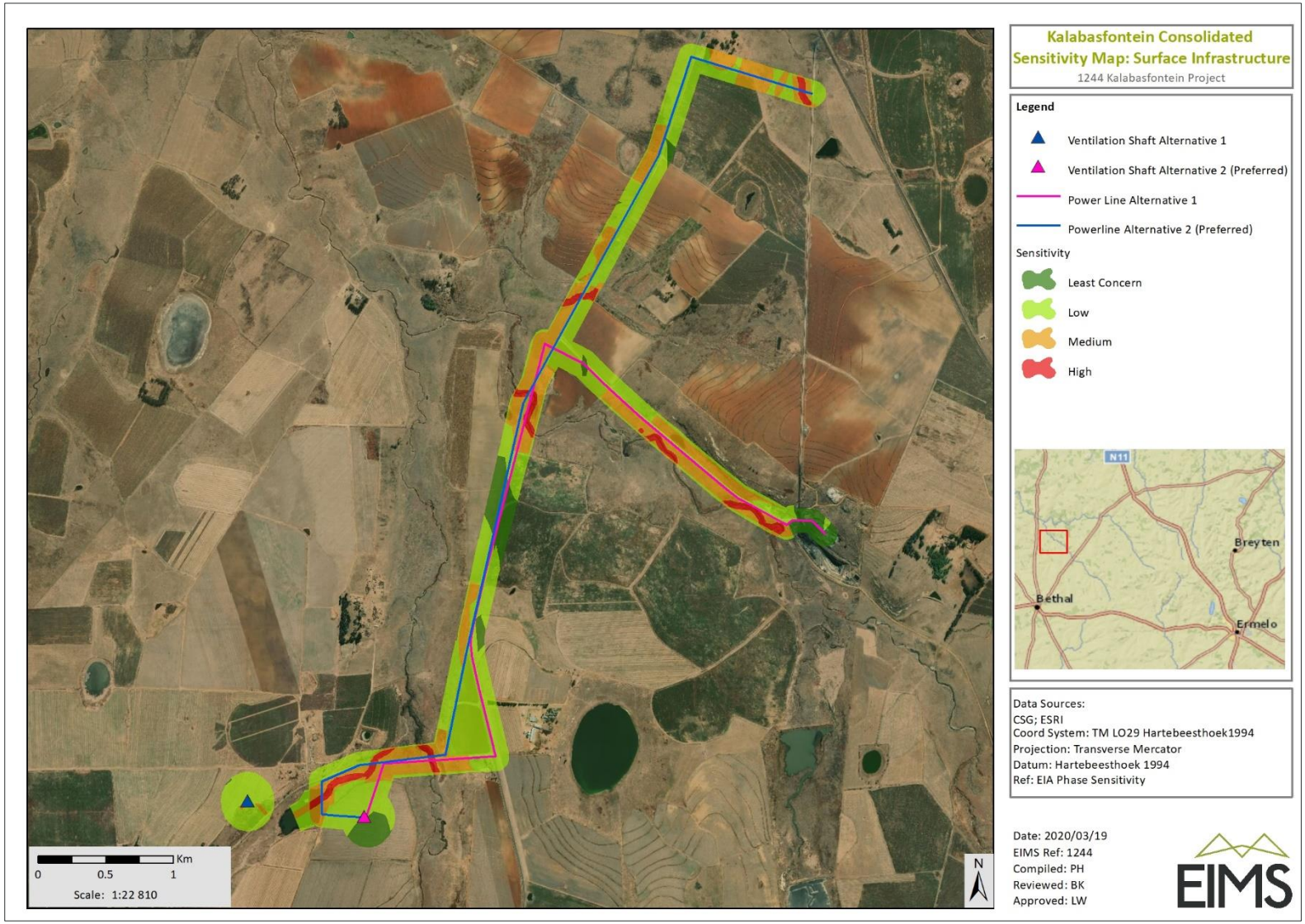

Figure 79: Sensitivity planning with regards to the alternative ventilation shafts locations and associated powerlines

12 RECOMMENDATIONS FOR INCLUSION IN ENVIRONMENTAL AUTHORISATION

The following key recommendations are made and should be included in the Environmental Authorisation:

- An alien invasive plant management plan must be implemented to control and prevent the spread of invasive aliens.
- The procurement policy for the mine should focus on utilising service providers from the local area to encourage the growth of businesses.
- Groundwater and surface water monitoring should be ongoing, and the recommendations made in the EMPr and specialist studies must be implemented.
- The Environmental Management Programme (EMPr) and all mitigation measures therein are an extension of the Environmental Authorisation and must be complied with at all times.
- Should artefacts or archaeological/palaeontological items be observed in the area of disturbance, then all activity in this area should cease immediately, the area marked off and a specialist consulted prior to any further activity.
- Heritage sites should be avoided with at least a 20 m buffer if activities should occur near them. If the sites will be affected directly, they will need to be documented before a destruction permit can be applied for at the provincial heritage resources authority (Mpumalanga). Only site KAL009 may be affected as it is located near the road where the power line will be erected.
- There should be no development in the high-sensitivity wet areas, rocky ridges and grasslands portions of the project area where species of conservation concern occur.
- Where the proposed powerline crosses wetland areas (if it is unavoidable to do so otherwise), appropriate bird mitigation measures should be put in place to avoid bird collisions and direct impacts to the infrastructure. This includes the use of 'bird-flappers' and bird-friendly powerline structures.
- Underground workings must adhere to a safety factor that will minimise the risk of subsidence.
- Interception of contaminated groundwater may be required where seepage is observed and saline drainage enters surface water bodies. Normal pump and treat / re-use applications will be required.
- Static groundwater levels should be monitored monthly to ensure that any deviation of the groundwater flow patterns and water levels from the idealised predictions is detected in time.
- If the mining operation is indeed affecting the quantity of groundwater available to identified farm users, the affected parties should be compensated. A monitoring program must be implemented where groundwater levels are measured on a routine basis. If it is established that the mine de-watering activities have impacted the farm boreholes the mine must install additional boreholes for water supply purposes or supply an alternative water source.
- The rate of flooding and water level recovery as well as water quality in the underground voids should be monitored towards mine closure. Stage curves should be calibrated with the updated information to aid in the management of the Closure Phase.
- It is recommended that the geochemical assessment is updated during the life of the mine in order to calibrate and validate its results and to construct an effective closure plan.

13 ASSUMPTIONS, LIMITATIONS AND UNCERTAINTIES

This report is based on information that is currently available and, as a result, the following assumptions and limitations are applicable:

- The report is based on project information provided by the client (i.e.: mine works programme, etc.).
- The description of the baseline environment has been obtained from various sources including recent monitoring reports and specialist studies commissioned for the purposes of this EIA. Every effort was made to find the most recent applicable data. Where possible up-to-date information was obtained from development plans or online portals (SANBI, SAHRA etc).
- In determining the significance of impacts, with mitigation, it is assumed that mitigation measures proposed in the report will be correctly and effectively implemented and managed throughout the life of the project.

Additional assumptions and limitations applicable to each specialist study are included in Table 43.

Table 43: Assumptions and Limitations from Specialist Reports

Assumptions and Limitations	
Specialist Study	**Description**
Heritage Study	The heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as required and governed by the following legislation: • National Environmental Management Act (NEMA), Act 107 of 1998 • NHRA, Act 25 of 1999; and • Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002.
Paleontological Study	The accurateness of a desktop paleontological impact assessment study is reduced by old fossil databases that do not always include relevant locality or geological formations. The geology in various remote areas of South Africa may be less accurate because it is based entirely on aerial photographs. The accuracy of the sheet explanations for geological maps is inadequate as the focus was never intended to be on palaeontological material. The entirety of South Africa has not been studied paleontologically. Similar Assemblage Zones but in different areas, might provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations generally assume that unexposed fossil heritage is present within the development area. Therefore, the accuracy of the desktop paleontological impact assessment study is improved by a field-survey.
Agricultural Potential	The following limitations should be noted for the study:

	• The assessments were conducted on those portions of the project area as originally defined by the client, any changes in the project boundary subsequent to this may negatively impact the robustness of this report; • Wetland delineations correlate with the findings presented within the recent wetland assessment carried out within the project area, (TBC, 2018); and • The portion in the north-western corner of the project area was not accessed due to the fact that access could not be arranged for this portion. This portion has subsequently been removed from the project area for the agricultural potential study.
Terrestrial Biodiversity	The following limitations should be noted for the terrestrial biodiversity study: • The fieldwork component of the assessment comprised one assessment only, that was conducted during the early wet season. Minimal rainfall had occurred prior to the survey. This study has not assessed any temporal trends for the respective seasons; • The assessments were conducted on those portions of the project area as originally defined by the client, any changes in the project boundary subsequent to this may negatively impact the robustness of this report; • The impact assessment was completed for the proposed mining areas and supporting infrastructure for the project area. The impact assessment has considered these layouts to be final, and have not considered the No Go alternative; and • Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.
Aquatic Ecological Study	The following limitations should be noted for the study: • A single aquatic ecology survey was completed for this assessment. Thus, temporal trends were not investigated; • No baseline biomonitoring data/report(s) was received for the project area. Therefore, information presents the findings of the single aquatic survey. • No wetlands were considered in this aquatic study. • Due to the rapid nature of the assessment and the survey methods applied, fish diversity and abundance was likely to be underestimated. • Invertebrates were only considered to the Family level and thus a defined species list for aquatic invertebrates was not completed. • The river systems were in drought at the time of the survey with low water levels and flow limited to a trickle, limiting habitat diversity. Drought conditions affect aquatic faunal communities. • Only sites where there will be a proposed activity were selected for this assessment; • The proposed activities listed in this study are based on the assessment of several existing underground coal mine activities. A number of assumptions have been made through the compilation of the activity list. • The assessments were conducted on those portions of the project area as originally defined by the client, any changes in the project boundary subsequent to this may negatively impact the robustness of this report; • The impact assessment was completed for the proposed mining areas and supporting infrastructure for the project area. The impact assessment has considered these layouts to be final, and have not considered the No Go alternative; and • Despite these limitations, a desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.

Hydrological Study	The following assumptions we made during model development: • The original 2017 GCS model is accurate and representative and closely reflects the current Forzando South operation; • A groundwater ingress volume of 1500m3/day was estimated for the combination of the Forzando South and Kalabasfontein 231 IS expansion (i.e. the decant flow). This is based on the previous GCS model, together with input from the groundwater specialist for this project (GCS); • The overall rate of mining and associated water uses at the Forzando South operation (inclusive of the Kalabasfontein 231 IS expansion) is consistent with the previous GCS water balance model; and • The model is based upon static input information and is therefore not dynamic in nature.
Hydrogeology	It is important to note that a numerical groundwater model is a representation of the real system. It is, therefore, at most an approximation, and the level of accuracy depends on the quality of the data that is available. This implies that there are always errors associated with groundwater models due to uncertainty in the data and the capability of numerical methods to describe natural physical processes
Hydropedology	The following aspects were considered as limitations for the hydropedological study: • The GPS used for the hydropedological field assessment is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side. • The study has been supplemented by supporting wetland studies and geohydrological information which are considered to be true and accurate.
Wetland Study	The following aspects were considered as limitations: • The results of this assessment are based on data collected during a single season survey. Aquatic and wetland ecosystems are dynamic by nature and seasonal changes can be extreme, the absence of phenological data is a limiting factor of this assessment; • The GPS used for wetland and riparian delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side; • Wetland systems identified at desktop level within 500 m of the project area were considered for the identification and desktop delineation, with wetland areas within the project area being the focus for ground truthing; • Due to the extent of agricultural activities on site, the use of vegetation as a means to identify and delineate the boundary of wetlands was limited. In order to address this shortcoming", findings from the soil assessment were used to supplement the delineation and characterisation of the wetland areas; and • A buffer zone was determined using methods prescribed by Macfarlane et al., 2014. Whilst caution was taken in applying this tool, a notable limitation is that the tool does not consider groundwater linkages that may be sustaining a wetland system.
Air Quality Study	The following assumptions and limitations are applicable to air quality study: • Data input into the model has been based on the information provided by the Client. It is assumed that the information provided by the Client is accurate and complete at the time of modelling; • In order to determine the PM2.5 emission rates for the ROM stockpile, a factor of 15% was applied to the PM10 equation and a control efficiency of 50% for watering (as specified by the Client) was applied to the stockpile (NPI, 2012);

	• An average wind speed of 3.26 m/s and a moisture content of 6.9% was used for material handling. Control efficiency of 50% for water sprays and miscellaneous transfer points was applied to the various material handling activities, as provided by the Client (NPI, 2012); • In order to determine the PM10 and PM2.5 emission rates, a factor of 52% and 3% was applied respectively to the TSP equation for drilling (USEPA, 1995). A control efficiency of 70% for water sprays was applied to emissions from drilling, as provided by the Client; • In order to determine the PM2.5 emission rates for crushing, a factor of 30% was applied to the PM10 equation (USEPA, 1995). Controlled efficiencies of 50% for water sprays were applied to the crushing activities (NPI, 2012), as provided by the Client; • It must be noted the removal of ore and drilling activities takes place underground and as such, as a conservative approach, the total emissions from these activities was assumed to be emitted from the ventilation shafts into the atmosphere; • Material handling and wind erosion operations were assumed to occur 24 hours a day, seven days week; • Crushing activities were assumed to be operational for 15 hours a day, seven days a week and drilling was assumed to occur during the winter months only, as provided by the Client; • Blasting only occurs when a dyke is encountered and for development purposes of the underground workings. Limited information was available as to how often a dyke would be encountered as well as how often blasting would occur for the development of the underground workings and as such, no blasting activities were taken into account for this assessment; and • The impacts in this assessment are limited to incremental impacts as long-term ambient monitoring data was not available to assess future cumulative impacts.
Noise Study	Various assumptions are made in the Noise Study report (Appendix 19). The following categories of assumptions are made (see report for details): o Measurements of Ambient Sound Levels o Calculating Noise Emissions – Adequacy of Predictive Methods o Adequacy of Underlying Assumptions o Uncertainties Associated with Mitigation Measures o Uncertainties of Information Provided
Blasting Assessment	The following assumptions were made with regards to the blasting assessment: • The planned operation is underground and mechanical miners will be used. This leaves that no continuous drilling and blasting operations will be done; • It is assumed that dykes and sills will be encountered and will require blasting. The frequency and occurrence are expected to be low and insignificant on the surface areas; and • The work done is based on the author's knowledge and information provided by the project applicant. • Surface surroundings change continuously, and this should be considered. This report may need to be reviewed and updated if necessary. This report is based on data provided and internationally accepted methods and methodology used for calculations and predictions where applicable.
Closure and Financial	The following assumptions and quantifications apply to the closure cost determination in the Closure and Financial Provision Assessment:

Provision Assessment	• Costs have been determined within the assumption that an outside (third party) contractor would establish an on-site camp and conduct the rehabilitation-related work; • The closure costs do not cover components such as staffing of the site after decommissioning, the infrastructure and support services (e.g. power supply, etc) for the staff, as well as workforce matters such as separation packages, re-training /re-skilling, etc. • The fixed ratio of preliminary and general (P&Gs) and contingencies are included in the costs for site establishment by the dedicated contractors that would be commissioned to conduct the rehabilitation; • The cost estimates allow for post-closure care and maintenance work, as well as compliance monitoring by specialist contractors and consultants; • No cost off-sets due to possible salvage values were considered as this is not in accordance with GN R. 1147, or internationally accepted good practice. Only gross decommissioning and rehabilitation costs are detailed in this report; • Both the scheduled and unscheduled closure costs have been determined. The scheduled closure takes place at a planned future date (end of life), in accordance with overall mine planning. The unscheduled closure entails immediate closure of a site, representing decommissioning and rehabilitation of the site in its present state The following assumptions and limitations were made with regards to the Closure and Financial Provision Assessment: • The remainder of the Forzando Mine has not been assessed and included in the calculation of this closure cost. It is understood that Forzando updates and revises their quantum for financial provision for rehabilitation, decommissioning and closure on an annual basis as part of their Mining Right obligations. Once approved, the Kalabasfontein Project will be included in these regular review and assessments for the Forzando mine. • The potential risk of methane and consequently specific closure management and mitigation measures have not been included. • The potential risk of spontaneous combustion and associated management have not been included in this closure cost estimate. • The costs associated with long term water management and where necessary treatment have not been included in this financial provision estimate. It is expected that the long-term water liability and treatment for the greater Forzando Complex will have adequate capacity to accommodate the Kalabasfontein area.

14 UNDERTAKINGS

14.1 UNDERTAKING REGARDING THE LEVEL OF CORRECTNESS OF INFORMATION

I, Bongani Khupe, herewith undertake that that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected Parties has been correctly recorded in the report.

_____

14.2 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I, Bongani Khupe, herewith undertake that the information provide in the foregoing report is correct, and that the level of agreement with Interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

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15 REFERENCES

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